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**LASER DANGER:** The Laser symbol and the Danger alert call your attention to information about the lasers in this product that, if ignored, can cause physical harm to you.

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**IMPORTANT:** The Important symbol calls your attention to information that should stand out when you are reading product details and procedural information.

**TIP:** The Tip symbol calls your attention to parenthetical information that is not necessary for performing a given procedure, but which, if followed, might make the procedure or its subsequent steps easier, smoother, or more efficient.

In addition to these symbols, this guide may use the following text conventions:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typed Command</td>
<td>Indicates the text that you type in at the keyboard prompt.</td>
</tr>
<tr>
<td>&lt;Ctrl&gt;, &lt;Ctrl&gt;+&lt;Shift&gt;</td>
<td>A key or key sequence to press.</td>
</tr>
<tr>
<td>Links</td>
<td>The <em>italics in blue</em> text to indicate Cross-references, and hyperlinked cross-references in online documents.</td>
</tr>
<tr>
<td>Bold</td>
<td>Indicates a button to click, or a menu item to select.</td>
</tr>
<tr>
<td>ScreenOutput</td>
<td>The text that is displayed on a computer screen.</td>
</tr>
<tr>
<td>Emphasis</td>
<td>The <em>italics</em> text used for emphasis and document references.</td>
</tr>
</tbody>
</table>

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Introduction

Congratulations on choosing a Harmonic MediaGrid system. This guide provides information on how to install and configure a Harmonic MediaGrid system. Choose from the following sections:

- **Introduction** (this section) gives an overview of the Harmonic MediaGrid Documentation Suite and lists terms and conventions.

- **System Overview and Requirements** provides information to help you plan your installation, including descriptions of system components, system requirements, network configuration diagrams, and supported RAID configurations.

- **System Installation with the ContentServer 4000 Series** provides instructions for installing a basic Harmonic MediaGrid 4000 Series system.

- **System Installation with the ContentServer 3000 Series** provides instructions for installing a basic Harmonic MediaGrid 3000 Series system.

- **System Configuration** provides instructions on configuring the network switches, ContentDirectors, ContentServers, and ContentBridges using the on-screen Configuration Assistant. Also included are instructions on joining Harmonic MediaGrid to a domain and additional configuration procedures required to complete the Harmonic MediaGrid setup.

- **Installing the File System Driver** provides instructions for installing the Harmonic MediaGrid file system drivers and mounting Harmonic MediaGrid from the supported client platforms.

- **Accessing the Harmonic MediaGrid** instructions for accessing the Harmonic MediaGrid system, as well as managing file and directory permissions.

- **Administrative Procedures** includes Harmonic MediaGrid power on and off procedures, setting switch and ContentDirector passwords, and software upgrade procedures.

- **Hardware Reference** includes descriptions of each MediaGrid component.

- **Troubleshooting** includes ContentStore controller power on instructions, information about log files and basic troubleshooting procedures.

- **ContentDirector Limits** includes information on capacity specifications and resource limits for ContentDirectors.

- **Legacy Hardware Platforms** includes information about legacy Harmonic MediaGrid platforms.

**IMPORTANT:** Several Harmonic MediaGrid installation procedures, as well as detailed information about the SystemManager platform and application, are covered in the Harmonic SystemManager Installation Guide and the Harmonic SystemManager User Guide. Make sure to download these accompanying guides prior to installing Harmonic MediaGrid. Refer to Harmonic MediaGrid Documentation Suite for download instructions.

### Harmonic MediaGrid Documentation Suite

The following table describes the items that comprise the Harmonic MediaGrid Documentation Suite. All items are available for download from the Harmonic software downloads website.
<table>
<thead>
<tr>
<th>This source...</th>
<th>Provides this information...</th>
</tr>
</thead>
</table>
| *Harmonic MediaGrid Installation & Configuration Guide* (this guide) | - Overview of the complete system  
- Detailed information about each system component  
- Hardware installation procedures  
- Software installation procedures  
- Hardware and software configuration |
| *Harmonic MediaGrid Component Replacement Guides* | - Component replacement instructions                                                       |
| *Harmonic MediaGrid Quick Reference Guides*       | - Detailed front and rear panel button and LED descriptions of each Harmonic MediaGrid device |
| *Harmonic SystemManager User Guide*               | - New features in the SystemManager release  
- Harmonic MediaGrid system operations procedures  
- Harmonic MediaGrid system configuration procedures |
| *Harmonic SystemManager Installation Guide*       | - Software installation and upgrade details                                                  |
| Release Notes                                     | - Last-minute information regarding the product release                                    |

**Locating the Latest Documentation on the Harmonic Web Site**

The latest product technical documentation, as well as information provided for older releases, is available at:

http://www.harmonicinc.com/documents-detail

**Documentation Terms and Abbreviations**

The following terms and abbreviations are used throughout this guide.

- **CIFS (Common Internet File System)** is an interface used by a computer user to exchange files between computers. Refer to ContentBridge.
- The **Configuration Assistant** is an on-screen method of configuring a Harmonic MediaGrid system.
- **Cluster** refers to a collection of one or more Volumes and their associated ContentDirectors and ContentServers within a Harmonic MediaGrid.
- The **ContentDirector** is the device that manages operation of the Harmonic MediaGrid, including load balancing. It is the primary point of contact for clients and determines the ContentServer availability.
- The **ContentBridge** is an optional device that provides standard interfaces to the Harmonic MediaGrid for clients that do not have the Harmonic MediaGrid File System Driver (FSD) installed, or where an FSD is not available. The supported protocols are CIFS, FTP, and NFS.
The **ContentServer** provides storage capacity for holding user data, processing for file serving functions, and network bandwidth for client access. ContentServers can be used to manage ContentStores, which provide additional storage.

The **ContentStore** is a storage device, which can be connected to a ContentServer to provide additional storage bandwidth and capacity for holding user data.

A ContentServer **Controller** is the node within a ContentStore which performs processing for file serving functions. If one controller is down, the second controller takes over the processes.

**CX4** is a copper-based interface cable used to connect the Network Switches. The 10GbE connections use CX4 and **multi-mode fiber** cables. These cables have a limit of 15 meters.

A **Domain** is a group of computers running the same Windows operating system that also share the same directories. Refer to Domain Controller.

A **Domain Controller** is the server that responds to authentication requests and manages access to resources within a Windows domain.

A **File system** is a way of storing data, making the data accessible to client computers.

**FSD (File System Driver)** is software installed on a client platform to allow standard file system access to the Harmonic MediaGrid.

**FTP (File Transfer Protocol)** is an interface used by a computer user to exchange files between computers. Refer to ContentBridge.

A **Group** refers to a collection of one or more ContentServers in a Harmonic MediaGrid.

**NFS (Network File System)** is a protocol that allows access to files from a client computer over a network.

A **Slice** is a segment of a file. Each file splits into one or more slices when stored, with each slice stored on a different ContentServer. Each slice carries information indicating to which file and where in that file it belongs.

A **Stretch Cluster** is a cluster stretched across two sites, which uses replication to provide an additional level of data protection. For details, refer to *About a Harmonic MediaGrid Stretch Cluster*.

---

**NOTE:** At this time, the stretch cluster configuration is not supported on Harmonic MediaGrid systems with the ContentServer 4000 Series.

A **Subnet** is a smaller network within a network.

The **SystemManager** is comprised of both hardware (SystemManager **platform**) and software (SystemManager **application**) components that communicate with the Harmonic MediaGrid network over Ethernet, providing software update capability, network management, configuration, security and fault monitoring services. See the *Harmonic SystemManager Installation Guide* and the *Harmonic SystemManager User Guide*.

**UI** refers to the SystemManager **application**’s **User Interface**, viewed through a Web browser.

**Volume** refers to a collection of one or more Groups and their associated ContentServers in a Harmonic MediaGrid.

A **VLAN (Virtual Local Area Network)** is a network of computers that behave as if physically connected, even though they may connect to different segments of a LAN.
Chapter 1
System Overview and Requirements

This chapter provides an overview of system components as well as system requirements. This section includes the following topics:

- About Harmonic MediaGrid
- Harmonic MediaGrid Components
- About Clusters, Volumes and Groups
- About a Harmonic MediaGrid Stretch Cluster
- Network Configuration
- About a Harmonic MediaGrid Stretch Cluster
- Required Information for a Windows Domain Controller
- Required Information for Network Configuration

About Harmonic MediaGrid

Harmonic MediaGrid is a powerful disk storage server system specifically designed with the needs of large file storage and access in mind. Harmonic MediaGrid boasts unique capabilities to meet the most demanding capacity, performance and data availability requirements. The software RAID implementation is tightly integrated into the File System delivering high performance and fast RAID rebuilds.

Harmonic MediaGrid is configured in a single VLAN and single subnet architecture. This configuration is designed for easier configuration, and provides faster failover response time in the event of a Harmonic MediaGrid switch failure, ensuring data protection and reliable system operation. Depending on the number of switches and Content Servers, failover time is reduced to a matter of seconds.

Harmonic MediaGrid Components

A Harmonic MediaGrid system is comprised of the following components:

- Network Switches
- ContentDirector
- ContentServer
- ContentStore
- ContentBridge
- SystemManager
- Harmonic MediaGrid File System Driver Software

Network Switches

The network switches interconnect the many components both within a rack and to the client network. The Harmonic MediaGrid 4000 Series and 3000 Series require multi-port network switches with both 1 GbE and 10 GbE modules.
Harmonic provides one network switch, which can only be used for systems with the ContentServer 3000. However, Harmonic MediaGrid supports several switches. For information on switches that are currently Harmonic MediaGrid-qualified, contact your Harmonic representative.

Switches may be qualified for Harmonic MediaGrid based on specifications or testing. If you wish to have a new switch qualified, please make an effort to obtain data on latency, throughput, non-blocking fabric, and port buffering from the manufacturer and include it with a qualification request to your Harmonic representative.

**IMPORTANT:** The ContentServer 3000/4000 series cannot be connected directly to CX4 ports.

If you are supplying a switch for a Harmonic MediaGrid system with the ContentServer 3000 or 4000, the following switch functionality is required:

- Full wire-speed, non-blocking architecture
- Latency of less than 5uS
- Port buffers of 10 MB per port

**ContentDirector**

ContentDirectors act as the overall file system controllers, managing the distribution of data throughout the system and providing data maps to clients for writing and retrieval of media from the system. In addition, the ContentDirector performs storage management and file housekeeping functions.

Two models of ContentDirectors are available. Refer to ContentDirector 1000F and High Performance ContentDirector 2000C for additional information about this component.

**ContentServer**

ContentServers store data on disk drives and deliver files upon request from desktop clients or from legacy clients through a ContentBridge. ContentServers with RAID support have dual active-active controllers and redundant data paths to protect against any storage node failures.

- **ContentServer 3000 (16-drive, 3RU server):** The ContentServer 3000 is available with ether 1 GbE or 10 GbE Ethernet ports for connections to the network switch. Refer to ContentServer 3000 for additional information about this server.

- **ContentServer 4000 (24-drive, 4RU server):** The ContentServer 4000 is equipped with 10 GbE Ethernet ports. Refer to ContentServer 4000 for additional information about this server.

**ContentStore**

ContentStores can be connected to ContentServers to provide additional storage bandwidth and capacity for holding user data.

- **ContentStore 3160 (16-drive, 3RU server):** In single stack, up to 5 ContentStore 3160 nodes can connect to the ContentServer 3000. Refer to ContentStore 3160 for additional information about this server.

- **ContentStore 4240 (24-drive, 4RU server):** In a single stack, up to 4 ContentStore 4240 nodes can connect to the ContentServer 4000. Refer to ContentStore 4240 for additional information.
Harmonic MediaGrid Components

Chapter 1 System Overview and Requirements

- **ContentStore 5840 (84-drive 5RU server):** At this time, a single ContentStore 5840 can connect to the ContentServer 3000 or 4000. Refer to *ContentStore 5840* for additional information about this server.

  **IMPORTANT:** Harmonic MediaGrid 3000 series and 4000 series units cannot be combined in a single stack.

---

**ContentBridge**

The ContentBridge is an optional server that provides access to Harmonic MediaGrid for client platforms that do not have the File System Driver (FSD) installed or do not use the Harmonic MediaGrid API. The ContentBridge also supports active files transfers. This server provides a translation function for the following protocols:

- CIFS (Common Internet File System)
- FTP (File Transfer Protocol)
- NFS (Network File System)

Refer to *ContentBridge 2010F* for additional information about this component. The 2010F is available with copper CX4 or multi-mode fiber connectors.

---

**SystemManager**

The SystemManager platform is comprised of both hardware and software components that communicate with the Harmonic MediaGrid network over Ethernet, providing software update capability, network management, configuration, security and fault monitoring services.

Harmonic MediaGrid features that are enabled, modified, or part of the SystemManager application are described in the SystemManager documentation. See the *Harmonic SystemManager User Guide* for more information.

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**Harmonic MediaGrid ContentManager**

A separate ContentManager application is also available from Harmonic. ContentManager is used for setting, reviewing and changing attributes on associated files, directories, and user permissions of Harmonic MediaGrid. Refer to the *ContentManager User’s Guide* for more information.

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**Harmonic MediaGrid File System Driver Software**

Harmonic MediaGrid file system driver software, installed on customer supplied desktops, communicates with the system to store and retrieve files. See the *Harmonic MediaGrid Release Notes* for your particular client platform for the latest supported client operating systems.

---

**About Jumbo Frames Support**

Jumbo frames are a feature that allows for larger transmission sizes of Ethernet frames over a network. Harmonic MediaGrid supports jumbo frames; however, every device on your network between Harmonic MediaGrid and the client (including the client itself) must also support jumbo frames, with a common packet size, to take advantage of this feature. Network performance is severely impaired otherwise.
Jumbo frames may improve transfer performance between Harmonic MediaGrid and other devices on the network in some cases. However, an improvement will not always be obtained, depending on the devices' ability to process data relative to the maximum network transfer speed available.

The Network Switches are enabled by default. Refer to Configuring a ContentServer to enable jumbo frames on the remaining Harmonic MediaGrid devices.

Harmonic strongly recommends that the Harmonic MediaGrid be initially set up and tested with all other parts of the system infrastructure with jumbo frames disabled, to ensure correct functionality, before enabling jumbo frames.

About Naming Files and System Elements

The following table provides important notes about the naming of files, devices, hosts and file systems on a Harmonic network.

<table>
<thead>
<tr>
<th>Element</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filename Clip Name</td>
<td>Naming conventions follow Windows32™ rules. In general, names can be quite long. Standard alphanumerics are allowed: a-z, A-Z, 0-9. Most characters, including spaces, are valid except: / \ : * ? &lt; &gt;</td>
</tr>
<tr>
<td>Device Name Host Name</td>
<td>Maximum name length is fifteen characters. Standard alphanumerics are allowed: a-z, A-Z, 0-9 also _ (underscore) and -(dash). 9 special characters are allowed for Device or Host names: ! ^ () {} - _ ~ No spaces are allowed.</td>
</tr>
<tr>
<td>File system Name</td>
<td>Maximum name length is eight characters. Standard alphanumerics are allowed: a-z, A-Z, 0-9 also _ (underscore) and -(dash). 9 special characters are allowed: ! ^ () {} - _ ~ No spaces are allowed.</td>
</tr>
</tbody>
</table>

Keep in mind the following additional points:

- For a Harmonic system with an Omnibus automation system, clip names are usually generated on the Omnibus side. To create clips for use on an Omnibus system, follow these guidelines:
  - Avoid creating long Harmonic clip names that only differ in the last few characters as long Harmonic clip names are truncated to 25 characters when Omnibus clip names are generated.

Avoid creating file (or clip) names that differ only in uppercase/lowercase iteration. Harmonic MediaGrid correctly preserves the case of the file names and treats the files as separate. However, some operating systems (Windows most notably) and some applications do not properly handle file names that are identical except for differences in case.
About Clusters, Volumes and Groups

When setting up a Harmonic MediaGrid 4000 or 3000 system, generally, there will be one cluster, one volume, and one group, all of which are generated automatically by the configuration assistant.

Keep in mind the meaning of these concepts:
- A **Cluster** includes a Volume and its associated ContentDirectors, ContentServers and ContentStores within a Harmonic MediaGrid.
- A **Volume** includes the file system, one Group, and its associated ContentServers and ContentStores in a Harmonic MediaGrid.
- A **Group** is a collection of one or more ContentServers and ContentStores in a Harmonic MediaGrid.

About a Harmonic MediaGrid Stretch Cluster

Harmonic MediaGrid supports using replication on systems with the ContentServer 3000 Series. This feature provides an additional level of data protection by allowing you to set up a Harmonic MediaGrid system across two different sites and replicate data across sites. This configuration is known as a "stretch cluster." In the event of a site failure, replication ensures that the data will be available at the second site.

Because of the added redundancy in a stretch cluster, note that storage capacity will be reduced. Make sure to work with your Harmonic representative to size your system appropriately. Also note that although this configuration results in faster read operations, write operations are slowed.

**NOTE:** At this time, the stretch cluster configuration is not supported on Harmonic MediaGrid systems with the ContentServer 4000 Series.

System Requirements

- To configure a stretch cluster, you must have a **minimum** of six nodes in the cluster. This means each of the two sites in the cluster must include at least one ContentServer with two ContentStores connected to it.
- The two sites in a stretch cluster must be no more than 500 meters apart.
- Each ContentDirector in your system must have a fiber optic network card installed. For assistance, contact your Harmonic representative.
- Systems must be configured with two groups, one for each site.
- Each group in the cluster must have the same amount of storage with exactly the same combination of ContentServers and ContentStores.
- The replication factor for the cluster must be set to 2.

Sample Diagram

*Figure 1–1* shows a sample stretch cluster.

**NOTE:** The dark blue lines and gray lines represent different connections on the same Public VLAN.

**NOTE:** For cross-site connections, you must use fiber optic cable attached to a fiber optic card installed on the ContentDirector.
Supported RAID Configurations

Understand the difference between “capacity optimized” and “performance optimized” RAID configurations, and which configurations are supported in each ContentServer and ContentStore model.
About the Capacity Optimized RAID Configuration

In the capacity optimized RAID configuration, the disk drives are configured in a Dual Parity (DP) RAID array, ensuring that the system can continue to function despite the failure of any two disk drives. This configuration optimizes storage capacity at the cost of bandwidth. A capacity optimized RAID set typically uses a 6+2 configuration.

**NOTE:** In the ContentStore 5840, capacity optimized RAID sets use a 5+2 configuration.

About the Performance Optimized RAID Configuration

In a system configured for performance optimized RAID, each RAID set has a single redundant disk drive, and each enclosure has N total number of hot spares. This configuration optimizes bandwidth at the cost of storage capacity.

**IMPORTANT:** If using SystemManager to create RAID sets, make sure that all ContentServers and ContentStores in a stack are configured with the same RAID geometry.

### Table 1–1: RAID Configurations for the ContentServer 4000 and ContentStore 4240

<table>
<thead>
<tr>
<th># Drives</th>
<th>RAID Sets</th>
<th>Capacity per Drive</th>
<th>Storage Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>3 x (6+2)</td>
<td>2 TB</td>
<td>36 TB</td>
</tr>
<tr>
<td>24</td>
<td>3 x (6+2)</td>
<td>4 TB</td>
<td>72 TB</td>
</tr>
<tr>
<td>24</td>
<td>3 x (6+2)</td>
<td>6 TB</td>
<td>108 TB</td>
</tr>
<tr>
<td>24</td>
<td>7 x (2+1) +3</td>
<td>2 TB</td>
<td>28 TB</td>
</tr>
<tr>
<td>24</td>
<td>7 x (2+1) +3</td>
<td>4 TB</td>
<td>56 TB</td>
</tr>
<tr>
<td>24</td>
<td>7 x (2+1) +3</td>
<td>6 TB</td>
<td>84 TB</td>
</tr>
</tbody>
</table>

### Table 1–2: RAID Configurations for the ContentServer 3000 and ContentStore 3160

<table>
<thead>
<tr>
<th># Drives</th>
<th>RAID Sets</th>
<th>Capacity per Drive</th>
<th>Storage Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>2 x (6+2)</td>
<td>1 TB</td>
<td>12 TB</td>
</tr>
<tr>
<td>16</td>
<td>2 x (6+2)</td>
<td>2 TB</td>
<td>24 TB</td>
</tr>
<tr>
<td>16</td>
<td>2 x (6+2)</td>
<td>3 TB</td>
<td>36 TB</td>
</tr>
<tr>
<td>16</td>
<td>2 x (6+2)</td>
<td>4 TB</td>
<td>48 TB</td>
</tr>
<tr>
<td>16</td>
<td>2 x (6+2)</td>
<td>6 TB</td>
<td>72 TB</td>
</tr>
<tr>
<td>16</td>
<td>5 x (2+1) +1</td>
<td>1 TB</td>
<td>10 TB</td>
</tr>
<tr>
<td>16</td>
<td>5 x (2+1) +1</td>
<td>2 TB</td>
<td>20 TB</td>
</tr>
<tr>
<td>16</td>
<td>5 x (2+1) +1</td>
<td>3 TB</td>
<td>30 TB</td>
</tr>
<tr>
<td>16</td>
<td>5 x (2+1) +1</td>
<td>4 TB</td>
<td>40 TB</td>
</tr>
<tr>
<td>16</td>
<td>5 x (2+1) +1</td>
<td>6 TB</td>
<td>60 TB</td>
</tr>
</tbody>
</table>
Table 1–3: RAID Configurations for the ContentStore 5840

<table>
<thead>
<tr>
<th># Drives</th>
<th>RAID Sets</th>
<th>Capacity per Drive</th>
<th>Storage Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>84</td>
<td>12 x (5+2)</td>
<td>4 TB</td>
<td>240 TB</td>
</tr>
<tr>
<td>84</td>
<td>12 x (5+2)</td>
<td>6 TB</td>
<td>360 TB</td>
</tr>
<tr>
<td>84</td>
<td>26 x (2+1) +6</td>
<td>4 TB</td>
<td>208 TB</td>
</tr>
<tr>
<td>84</td>
<td>26 x (2+1) +6</td>
<td>6 TB</td>
<td>312 TB</td>
</tr>
</tbody>
</table>

**NOTE:** No other disk drive configurations are supported.

**About Drive Replacement**

For systems with version 3.2.2 and later, you may use different capacity Harmonic-supplied drives in the same ContentServer or ContentStore RAID set.

Note the following when replacing a ContentServer or ContentStore drive with a different capacity drive than the others in the same RAID set:

- Any drive you add to an existing RAID set must be at least as large as the smallest existing drive in that RAID set.
- Adding a drive that is larger than the smallest drive in the RAID set will cause it to be treated as if it were the lesser capacity drive. In other words, the RAID set capacity will not increase by replacing smaller drives with larger drives.

For drive replacement instructions, refer to the *Harmonic MediaGrid Component Replacement Guides*.

**Network Configuration**

This section lists site-specific information required to join a Harmonic MediaGrid system to a Windows domain and to incorporate Harmonic MediaGrid into an existing network. This information is provided for both customers and the installers. This information must be available prior to Harmonic MediaGrid installation.

**Public VLAN**

Before installing your Harmonic MediaGrid system, you must allocate an IP address range for the Harmonic MediaGrid Public VLAN. The Public VLAN is an IP subnet, which will be visible by all parts of the network that access the Harmonic MediaGrid. Make sure the Public VLAN is dedicated to Harmonic MediaGrid components, and accessible by clients that will access the Harmonic MediaGrid. See *Figure 1–2* for an example.

**IMPORTANT:** You must allocate a dedicated IP address range for your Harmonic MediaGrid Public VLAN, advertise it to all routers on your network, and know this range before configuring your Harmonic MediaGrid system or switches.

**IMPORTANT:** The Public VLAN should include Harmonic MediaGrid devices ONLY. Adding non-Harmonic MediaGrid devices to the Public VLAN may cause unpredictable problems with the Harmonic MediaGrid system.
Private VLANs

Before installing your Harmonic MediaGrid system, you must also allocate IP address ranges for two Private VLANs. The Private VLANs are private IP subnets that create redundant paths between the ContentDirectors, allowing them to communicate information and keeping them synchronized. Make sure each Private VLAN is accessible by both ContentDirectors, and isolated from the other Private VLAN. See Figure 1–2 for an example.

![Network Configuration Diagram]

**Figure 1–2: Network Configuration Diagram**

**NOTE:** The connections shown in Figure 1–2 do not necessarily represent the number of IP addresses needed per device.
Network Diagram with 10 GbE Network

The network topology diagram in Figure 1–3 shows a basic network configuration using the ContentServer 4000, or the ContentServer 3000 with 10 GbE NIC cards.

In Figure 1–3, note the following:

- Private VLAN 1 is a dedicated VLAN defined on the 1 GbE switch shown on the left. Private VLAN 2 is a dedicated VLAN defined on the 1 GbE switch shown on the right. The ContentDirectors must communicate on both private VLANs.
- To allow failover, the Public VLAN indicated with the blue cables must also be connected to the switch or module from the Public VLAN indicated with the gray cables. The separate colors indicate failover configuration only; in reality these are the same VLAN.
- The BMC connection indicated by turquoise cables is used for a troubleshooting utility called the Baseboard Management Console (BMC). This requires a 1 GbE connection from each controller on a ContentServer to the 1 GbE switch. The BMC cables should be connected to the Public VLAN.
- ContentStores are connected to a ContentServer via SAS cables.
In Figure 1–3, note the following:

■ The blue cables and the gray cables represent different connections on the same Public VLAN.

■ Private VLAN 1 is a dedicated VLAN defined on the 1GbE switch shown on the left. Private VLAN 2 is a dedicated VLAN defined on the 1GbE switch shown on the right. The ContentDirectors must communicate on both private VLANs.
At this time, a single ContentStore 5840 can be connected to a ContentServer.

**Network Diagram with 1 GbE Network**

The network topology diagram in Figure 1–4 shows a basic network configuration using the ContentServer 3000 with 1 GbE NIC cards.

In Figure 1–4, note the following:

- Private VLAN 1 is a dedicated VLAN defined on the 1 GbE switch shown on the left. Private VLAN 2 is a dedicated VLAN defined on the 1 GbE switch shown on the right. The ContentDirectors must communicate on both private VLANs.
- To allow failover, the Public VLAN indicated with the blue cables must also be connected to the switch or module from the Public VLAN indicated with the gray cables. The separate colors indicate failover configuration only; in reality these are the same VLAN.
- The connection indicated by turquoise cables is used for a troubleshooting utility called the Baseboard Management Console (BMC). This requires a 1 GbE connection from each controller on a ContentServer to the 1 GbE switch. This connection can be used for data transfer in addition to the BMC. The BMC cables should be connected to the Public VLAN.
In Figure 1–4, note the following:

- The blue cables and the gray cables represent different connections on the same Public VLAN.
- Private VLAN 1 is a dedicated VLAN defined on the 1GbE switch shown on the left. Private VLAN 2 is a dedicated VLAN defined on the 1GbE switch shown on the right. The ContentDirectors must communicate on both private VLANs.
At this time, Harmonic supports connecting only one ContentStore 5840 to a ContentServer.

Required Information for a Windows Domain Controller

A domain controller server, which manages access to resources within a Windows domain, is required at the installation site. Harmonic MediaGrid must be “joined” to the site’s Windows domain for user authentication and security when clients attempt to access Harmonic MediaGrid file systems.

**NOTE:** Instructions on how to configure a Windows Domain Controller are not included in this guide. The domain controller should be set up before installing Harmonic MediaGrid.

The following information is required to join Harmonic MediaGrid to a Windows domain:
- The name of the Windows domain controller.
- The IP address and the name of the Windows Active Directory controller machine.
- A domain administrator’s user name and password for the Windows Active Directory controller.
- The site’s Active Directory domain name. The Active Directory domain name must be a Fully Qualified Domain Name (FQDN), which is a domain name containing three or four parts, (for example, “ahost.example.com”).
- The site’s Windows NT domain name. This may often be the first word of the Active Directory domain name.
- The IP address of the DNS (Domain Name System) server that contains entries for the Windows Active Directory controller machine.

Required Information for Network Configuration

Harmonic MediaGrid is a network storage system, running its own DHCP server for management of the subnets within the system. The ContentDirector that runs the DHCP server assigns IP addresses to the ContentServers. A range of IP addresses must be reserved for integrating Harmonic MediaGrid into the customer network.

**NOTE:** Instructions on how to design a network infrastructure are not included in this guide. The network should be set up before installing Harmonic MediaGrid.

The following information is required for network configuration of the Harmonic MediaGrid system. You will need this information when you run the configuration assistant to configure your system:
- The total number of each Harmonic MediaGrid device.

**NOTE:** The Harmonic MediaGrid configuration assistant asks for the maximum number of devices you wish to allow for in your system. If you select a number that is too low for future expansion, you may be forced to incur system down-time in order to reconfigure the system at a later time.

- Cluster names and device names
- For the Harmonic MediaGrid 3000 Series only: Type of network (1GbE or 10 GbE)
- MTU (maximum transmission unit) size per ContentBridge
- Device user names and passwords
- Networking details, including:
  - Base Network address and Subnet Mask for the public subnet or VLAN
  - Default Router IP address
  - Base Network address and Subnet Mask for the first private subnet (private VLAN 1)
  - Base Network address and Subnet Mask for the second private subnet (private VLAN 2)
- Site specific details, including:
  - Site Timezone
  - NTP Server IP address
  - Domain Suffix
  - Primary DNS Server IP address
  - Secondary DNS Server IP address
  - File System Name
- ActiveDirectory Server authentication details (if using ActiveDirectory), including:
  - Whether or not you wish to enable authentication on both the ContentDirector and ContentBridge or just the ContentDirector.

**NOTE:** ActiveDirectory authentication on the ContentDirector is required in order to enable it on a ContentBridge.

- ActiveDirectory Realm
- ActiveDirectory Workgroup
- ActiveDirectory server Hostname
- ActiveDirectory server FQDN (Fully Qualified Domain Name)
- ActiveDirectory server IP address
- ActiveDirectory server Administrator Username and Password
Chapter 2
System Installation with the ContentServer 4000 Series

This section provides step-by-step installation instructions for a Harmonic MediaGrid system with the ContentServer 4000 series. This section includes the following topics:

- Site Preparation
- Installation Overview
- Racking Precautions
- Rack Mounting the Harmonic MediaGrid 4000 Series System
- Connecting the Harmonic MediaGrid 4000 System Components
- Expanding a Harmonic MediaGrid 4000 Series System

Site Preparation

Note the following prerequisites for installation of your Harmonic MediaGrid System.

- Environmental
  Harmonic equipment is designed to operate in a clean, air-conditioned control room environment. Care must be taken to avoid temperature and humidity extremes.

- Power
  When connecting equipment, care must be taken to avoid power lines that are subject to noise and voltage spikes. Do not install units on a power circuit that is common to such equipment as air conditioners and refrigeration units. For optimum protection, AC noise filters and surge protectors are recommended if unstable power conditions are present.

- Site
  Harmonic MediaGrid equipment is designed for rack mounting. Be sure to read racking precautions before you begin unpacking system components.
  
  Be aware of the weight of the ContentServers and ContentStores so that you may safely move and lift devices.
  - An unpopulated ContentStore 5840 weighs approximately 46 kg (101 lb), and 131 kg (288 lb) with all disk drives installed.
  - A fully populated ContentServer 4000 weighs approximately 47 kg (104 lb).
  - A fully populated ContentStore 4240 weighs approximately 29 kg (64 lb).

Required Components

The following components are required for a Harmonic MediaGrid system.

- One or more client computers. See the Harmonic MediaGrid Release Notes for your particular client platform for the latest supported client operating systems.

- A SystemManager platform including keyboard, monitor and mouse. The latest version of the SystemManager application should be installed on the SystemManager platform. See the Release Notes accompanying this release for the exact SystemManager application version required. See the Harmonic SystemManager Installation Guide for more information.
Shipping Container Components

When you receive each component of a Harmonic MediaGrid storage system, inspect each shipping container for signs of damage. Contact your local Harmonic representative and the carrier immediately if you suspect any damage has occurred during shipping. Check the contents of each box against the packing list to ensure that all parts are included. If any items are missing, contact your local Harmonic representative immediately.

Cables and Mounting Hardware

A rack mounting kit is provided with each Harmonic MediaGrid component, which provides the items needed to mount each component on a rack. Mounting instructions are also included.

The type, quantity and length of the cables depends on the customer site and will likely differ for each separate installation.

IMPORTANT: CX4 cables have a limit of 15 meters. The cables must be factory terminated and ordered in appropriate lengths to meet specifications.

Installation Overview

Before you begin, ensure that the site is properly prepared, with adequate power, ventilation and rack space.

IMPORTANT: Make sure to leave a space for the SystemManager keyboard/monitor tray. It is recommended that you mount the keyboard monitor and tray 71.12 cm (28.0 in.) off the floor. This height is ideal for using the SystemManager while seated or standing.

Here is an overview of the steps you will complete:

1. Read all rack mounting precautions.
   - Refer to Racking Precautions. If the ContentStore 5840 is also part of your system, refer to Racking Precautions for the ContentStore 5840 for the ContentStore 5840 as well.

2. Rack the devices from the bottom of the rack in the following order:
   a. ContentStores, followed by ContentServers
      - If the ContentStore 5840 is part of your system, rack mount this server first. Refer to Rack Mounting the ContentStore 5840 and Rack mounting the ContentServer 4000 and ContentStore 4240.
   b. SystemManager
      - Refer to the SystemManager Platform documentation for installation instructions.
   c. ContentBridges (optional), followed by ContentDirectors
      - Refer to Rack Mounting the ContentDirector 1000F/2000C and ContentBridge 2010F
   d. Network switches
      - Refer to the network switch product manual.
   3. Connect the network cables, SAS cables, and power cables. Refer to Connecting the Harmonic MediaGrid 4000 System Components.

Racking Precautions

CAUTION: Read the following precautions before racking the Harmonic MediaGrid system.
Chapter 2 System Installation with the Content-Server 4000 Series

Racking Precautions

**IMPORTANT:** For precautions specific to the ContentStore 5840, see *Racking Precautions for the ContentStore 5840*.

- Safe handling of this system requires at least TWO people. Harmonic recommends that you use THREE people to rack mount a system; two to lift and one to help guide the system onto the rack rails.
- When lifting the system, two people at either end should lift slowly with their feet spread out to distribute the weight. When lifting, always keep your back straight and lift with your legs.
- Ensure that the leveling jacks on the bottom of the rack are fully extended to the floor with the full weight of the rack resting on them.
- In single rack installation, stabilizers should be attached to the rack. In multiple rack installations, the racks should be coupled together.
- Load the rack from the bottom to the top, with the heaviest component at the bottom of the rack.
- Always make sure the rack is stable before extending a component from the rack.
- You should extend only one component at a time—extending two or more simultaneously may cause the rack to become unstable.
- To eliminate any possibility of tipping over, ensure that the equipment rack is securely fastened to the floor or wall.

**Additional Racking Precautions for the ContentServer and ContentStore 4000 Series**

- The rack design should take into consideration the maximum operating ambient temperature, which is 35°C.
- Disconnect power cords from your system before rack mounting.
- Do not open the system’s top cover. If opening the cover for maintenance is a must, only a trained technician should do so.
- The openings on the enclosure are for air convection to protect the equipment from overheating. DO NOT COVER THE OPENINGS.
- The ContentServer 4000 must only be operated from a power supply input voltage range of 100 to 240 VAC, 47 to 63 Hz. Make sure the voltage of the power source is within the specification on the label when connecting the equipment to the power outlet.
- Place power cords out of the way of foot traffic. Do not place anything over the power cord.
- Make sure the voltage of the power source is within the specification on the label when connecting the equipment to the power outlet. The current load and output power of loads shall be within the specification.

**IMPORTANT:** Use only the power cables provided by Harmonic.

**IMPORTANT:** The ContentServer and ContentStore 4000 series must be connected to reliable grounding before applying power.

**IMPORTANT:** The ContentServer and ContentStore 4000 series will not receive sufficient airflow or cooling if it is operated with any of the front or rear modules missing. It is essential that every module bay is filled either with a module or a blank module.
Unpacking the System

Before removing the subsystem from the shipping carton, visually inspect the physical condition of the shipping carton. Exterior damage to the shipping carton may indicate that the contents of the carton are damaged. If there is any damage, photograph the packaging for future reference before opening.

Rack Mounting the Harmonic MediaGrid 4000 Series System

A rack mounting kit is provided with each device, which includes the necessary hardware along with detailed mounting instructions. For each device, always follow the instructions in the mounting kit and use the screws that are included with the mounting hardware.

**IMPORTANT:** If the ContentStore 5840 is part of your system, rack mount this unit first. Refer to Rack Mounting the ContentStore 5840 for instructions.

**NOTE:** Each device should be placed on the rack and then secured to the rails before mounting the next device.

Rack mounting the ContentServer 4000 and ContentStore 4240

1. Install the inner rack rails as follows:
   a. Extend the inner rail toward the front of the rail assembly as far as possible.
   b. Depress the locking tab and then continue to pull the inner rail until it separates from the middle rail.
   c. Place the inner rail on the side of the chassis, aligning the hooks of the chassis with the rail extension holes.
   d. Slide the inner rail toward the front of the chassis until it clicks into the locked position.
e. Secure the inner rail to the chassis with the provided screws.

f. Repeat Step a through Step e to install the other inner rail.

2. On each outer rail, press the locking tab and push the middle rail toward the back of the rail to collapse the rail assembly.

**NOTE:** If your rack system has round holes, follow instructions provided in the mounting kit to install adapters and then mount the rails to the rack. Then, continue to *Step 5*.

3. Install the left outer rail onto the racking unit as follows:
   a. Push the front bracket to unlock it.
   
   b. Guide the bracket hooks through the rack holes, and then press down firmly.
   
   c. Secure the rail to the front of the rack with two screws.
4. Repeat Step 3 to install the right outer rail.
5. Install the chassis into the rack as follows:
   a. Confirm that the inner and outer rails are properly installed.
b. Fully extend the middle rails, making sure that the ball bearing shuttle is locked at the front of each middle rail.

c. With two people holding the chassis level and a third guiding the chassis, line up the inner (chassis) rails with the front of the middle (rack) rails so that the chassis is square with the rack rails.

d. Slide the chassis rails into the rack rails, applying pressure evenly on both sides until it clicks into the fully extended position.

e. Simultaneously depress the locking tabs on both sides of the chassis, and then push the chassis all the way into the rack.

f. Secure the chassis handles to the front of the rack with two screws.

Installing Disk Drives in the ContentServer 4000 and ContentStore 4240

Due to the weight of the enclosure, disk drives ship separately from the ContentServer and ContentStore 4000 series units, and must be installed after the units have been rack mounted.

**NOTE:** To maintain proper system cooling, all externally accessible drive bays must be populated with a drive carrier.

1. Press the blue release button on the drive carrier to open the lever.

2. Insert the drive carrier into the bay, sliding the drive until it contacts the backplane.
The drive tray is in the correct position when its front edge lines up with the edge of the drive bay.

3. Close the drive carrier lever to lock the drive into place.

Installing the Bezel on the ContentServer 4000 and ContentStore 4240

The bezel ships separately from the ContentServer and ContentStore. Follow these steps to install the bezel on these units. You should mount the ContentServer or ContentStore on the rack prior to installing the bezel, and disk drives should already be inserted.

1. Connect the cable inside the bezel to the 4-pin connector on the right side of the front panel.
2. Fit the posts on the right side of the bezel into the holes in the rack ear on the right side of the chassis.
   The bezel cable should form a loop that fits inside the metal panel of the bezel.
3. Press in the release button on the left side of the bezel while pushing the left side of the bezel straight onto the chassis, and then release the button.
   The posts on the left side of the bezel will fit into the holes in the rack ear, securing the bezel to the chassis.

**IMPORTANT:** For optimum airflow, do not obstruct the air vents on the bezel.
Rack Mounting the ContentStore 5840

Racking Precautions for the ContentStore 5840

**CAUTION:** A fully configured ContentStore 5840 weighs up to 131kg (288lb). An unpopulated ContentStore 5840 weighs 46kg (101lb). Use appropriate lifting methods.

Before lifting the ContentStore 5840:

- Unplug all cords and cables from the ContentStore 5840.
- Make sure all disk drives from both drawers are removed, and the drawers are closed firmly and locked shut. For details, see *Opening and Closing a Drawer*.
- Additionally, you may wish to remove other modules from the chassis before lifting. For component removal and installation instructions, see the *Harmonic MediaGrid Component Replacement Guide*.

Note the following important points on handling:

- It is recommended that a minimum of three people lift the ContentStore 5840 using the lifting straps supplied with the ContentStore 5840.
- Do not lift the ContentStore 5840 by the handles on the power supply units, cooling modules or I/O modules. They are not designed to take the weight.
- Do not lift the ContentStore 5840 higher than 20U. Use mechanical assistance to lift above this height.
Rack System Safety

CAUTION: The ContentStore 5840 must only be mounted into a rack using the supplied rail kit. Due to its weight and length, the ContentStore 5840 must not be flange mounted.

CAUTION: Never move more than one ContentStore 5840 out of the rack at any one time: there is a danger of the rack falling over.

Note the following points on rack system safety:

- The ContentStore 5840 must be mounted in a rack before use.
- The rack must be capable of supporting the total weight of the installed ContentStore 5840(s). A fully populated ContentStore 5840 weighs up to 131kg (288lb). The design should incorporate stabilizing features suitable to prevent the rack from tipping or being pushed over during installation or in normal use.
- When loading a rack with the ContentStore 5840, fill the rack from the bottom up. When removing ContentStores, empty from the top down.
- The system must be operated with low pressure rear exhaust installation. The back pressure created by the rack doors and obstacles is not to exceed 5 pascals (0.5mm water gauge).
- The minimum open area for the rack doors is 70%.
- The rack design should take into consideration the maximum operating ambient temperature for the ContentStore 5840, which is 35°C.
- The rack must have a safe electrical distribution system. It must provide over-current protection for the ContentStore 5840 and must not be overloaded by the total number of ContentStores installed in the rack. When addressing these concerns, consideration should be given to the electrical power consumption rating shown on the nameplate.
- The electrical distribution system must provide a reliable ground for each ContentStore 5840, and for the rack.
- Each PSU in each ContentStore 5840 has an ground leakage current of 1.6mA. The design of the electrical distribution system must take into consideration the total ground leakage current from all the PSUs in all the ContentStores. The rack must be labeled with the words: “HIGH LEAKAGE CURRENT. Ground connection essential before connecting supply.”
- The rack must meet the safety requirements of UL 60950-1 and IEC 60950-1.

Electrical Safety

CAUTION: It is recommended that you fit and check a suitable anti-static wrist or ankle strap and observe all conventional ESD precautions when handling plug-in modules and components. Avoid contact with backplane components and module connectors, etc.

The ContentStore 5840 must only be operated from a power supply input voltage range of 200 to 240 VAC, 50 to 60 Hz.

A suitable power source with electrical overload protection must be provided in order to meet the requirements in the technical specification.

All power supply cords must have a safe electrical ground connection. Check the connection to ground of the ContentStore 5840 before you switch on the power supply.
**IMPORTANT:** The ContentStore 5840 must be grounded before applying power.

The plug on the power supply cord is used as the main disconnect device. Ensure that the socket outlets are located near the equipment and are easily accessible.

**CAUTION:** When powered by multiple AC sources, disconnect all supply power for complete isolation.

**CAUTION:** Do not remove covers from the ContentStore 5840 or any of the modules – there is a danger of electric shock inside. Do not attempt to disassemble the rear sub-chassis from the ContentStore 5840. Return any damaged components to your supplier for repair.

**CAUTION:** The PSUs contain double pole/neutral fusing. Ensure that your electrical installation can support this.

**IMPORTANT:** The optional RJ45 socket on the I/O module is for Ethernet connection only and must not be connected to a telecommunications network.

**Regional Safety**

- For North American use, the branch circuit must be rated for 20A.
- This equipment is suitable for connection to an IT power system (Norway).

**Operating Safety**

**IMPORTANT:** All rear modules are part of the fire ContentStore 5840 and must only be removed when a replacement can be immediately inserted.

**IMPORTANT:** The ContentStore 5840 will not receive sufficient airflow or cooling if it is operated with any of the rear modules missing. It is essential that every module bay is filled either with a module or a blank module.

Replace any defective module with a fully operational unit as soon as possible. Do not remove cooling modules, PSUs or I/O modules unless you have a replacement model of the correct ready for insertion.

**CAUTION:** To prevent overturning, drawer interlocks stop users from opening both drawers at the same time. Do not attempt to force open a drawer when the other drawer in the ContentStore 5840 is already open. In a rack containing more than one ContentStore 5840, do not open more than one drawer per rack at a time.

**CAUTION:** Operating temperatures inside the ContentStore 5840 drawers can reach up to 60°C. Take care when opening drawers and removing drive carriers.

**CAUTION:** Due to product acoustics it is recommended that users wear ear protection for any prolonged exposure.
Site Requirements

Before you begin, make sure the site where you intend to set up and use your storage system has the following:
- Standard power from an independent source or a rack power distribution unit with a UPS.
- Host computer with the correct firmware, BIOS and drivers. Contact your supplier for the correct software levels.

Before setting up your enclosure ensure you have the following:
- SAS host bus adapter (HBA).
- Mini-SAS to host cable.
- Power cord.
- Rack kit.

The accessory box contains the power cords and other ordered accessories.

Unpacking the System

Position the shipping case within 6 feet (2m) of the site where you intend to use your storage system.

Inspect the packaging for crushes, cuts, water damage or any other evidence of mishandling during transit. If there is any damage, photograph the packaging for future reference before opening.

Rack Mounting the System

**CAUTION:** It is recommended that you fit and check a suitable anti-static wrist or ankle strap and observe all conventional ESD precautions when handling plug-in modules and components. Avoid contact with backplane components and module connectors, etc.

**CAUTION:** An unpopulated enclosure can weigh up to 46kg (101lb). Do not try to lift it by yourself.

Due to the weight of the enclosure, install it without the drive carriers.

The adjustment range of the rail kit, from the inside of the front post to the inside of the rear post is 660mm - 840mm. This suits a one-meter deep rack within Rack Specification IEC 60297.

**NOTE:** A screwdriver with a Torx T20 tip is needed to lock and unlock the drawers.

To rack mount the ContentStore 5840:
1. To facilitate access, remove the door from the rack.
2. Ensure the pre-assembled rails are at their shortest length.
3. Locate the rail location pins inside the front of the rack and extend the length of the rail assembly to enable the rear location pins to locate. Ensure the pins are fully located in the square or round holes in the rack posts (see *Figure 2–2*).
Figure 2–2: Mounting the System into a Rack (left hand rail only shown for clarity)

4. Fully tighten all clamping screws and middle slide-locking screws.
5. Ensure the rear spacer clips (x4) are fitted tight to the edge of the rack post.
6. Slide the enclosure fully home on its rails.
7. Fasten the front of the enclosure using the enclosure fastening screws (x4) as shown in Figure 2–2.
8. Fix the rear of the enclosure to the hold down bracket with the rear enclosure fixing screws (x2).

**NOTE:** Use the long or short hold down bracket depending on the distance from the rack post to the enclosure hold down slot. Ensure the sliding nut is at the rear of the slot prior to fitting the bracket to the post, then slide the nut along the slot to enable the rear enclosure fastening screw to be fitted.

For rack depths where the rack posts are behind the enclosure hold down slots:
1. Swap the left and right hold down brackets.
2. Insert the long flange between the rack post and chassis side (see Figure 3–3).
3. The sliding nut head must always face away from the enclosure, whichever configuration is used.
Rack Mounting the Harmonic MediaGrid 4000 Series System

Figure 2–3: Rear Enclosure Mounting

**CAUTION:** Use only the power cords supplied.

**CAUTION:** Once the enclosure is installed in the rack, dispose of the lifting straps. Due to the difficulty in attaching the straps once the enclosure is installed in the rack, the straps are not suitable for removing the enclosure from the rack.

Continue to the following sections to open the drawers and install the drives.

**Opening and Closing a Drawer**

**CAUTION:** To prevent overturning, drawer interlocks stop users from opening both drawers at the same time. Do not attempt to force open a drawer when the other drawer in the enclosure is already open. In a rack containing more than one enclosure, do not open more than one drawer per rack at a time.

**CAUTION:** Operating temperatures inside the enclosure drawers can reach up to 60°C. Take care when opening drawers and removing drive carriers.

Note the following important points before opening a drawer:

- Opening a drawer does not interrupt the functioning of the system, and disk drives can be hot-swapped while the enclosure continues to operate. However, drawers must not be left open for longer than two minutes, otherwise airflow and cooling will be compromised.
- To reduce the possibility of toppling, only one drawer can be open at any one time.
- The drawer locks into place when opened all the way. To reduce pinching hazards, two latches must be released before the drawer can be pushed back in.
- Each drawer can be locked shut by turning both anti-tamper locks clockwise using a screwdriver with a Torx T20 bit.

**IMPORTANT:** During normal operation, drawers must be kept shut to ensure correct airflow and cooling.
To open a drawer:

1. Make sure the anti-tamper locks are not engaged. The red arrows on the locks will point inwards if the locks are disengaged (see Figure 2–4). Unlock them if necessary by rotating them counterclockwise using a screwdriver with a Torx T20 bit.

2. Push the drawer latches inward and hold them.
3. Pull the drawer all the way out until it locks open.

**IMPORTANT:** The drawer must not be left open for more than two minutes while the enclosure is powered.
To close a drawer:
1. Pull and hold both of the white latches on the sides of the drawer (see Figure 2–6).
2. Push the drawer in slightly.
3. Release the white latches and check they have returned to their original position.
4. Push the drawer all the way back into the enclosure, making sure it clicks home.

Installing Drives
1. Open one drawer, as described in Opening and Closing a Drawer.
2. Lower a disk drive into the slot, with the drive capacity label facing towards you, as shown in Figure 2–7.
3. Push the drive downwards and hold it down while sliding the drive carrier plate in the direction shown in Figure 2–7. This locks the drive in place.
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Rack Mounting the Harmonic MediaGrid 4000 Series System

4. Check that the release latch has returned to its locked position, as shown in Figure 2–8.

5. Repeat steps 2-4 for the remaining drive slots in that drawer.
6. Close the drawer using the instructions in Opening and Closing a Drawer.
7. Repeat steps 1-6 for the second drawer.

NOTE: The drawers must be populated with drives in whole rows at a time (there are three rows of 14 drives per drawer). The minimum number of drives in an enclosure is 14. The number of rows must not differ by more than one between top and bottom drawers. Populate drawers from the front to the rear of the enclosure.

Rack Mounting the ContentDirector 1000F/2000C and ContentBridge 2010F

The ContentDirector 1000F/2000C and ContentBridge 2010F (an optional system component) ship with the Intel AXXVRAIL Mounting Rail Kit.
**NOTE:** The figures in this section show a two-rack unit server; however, the same rack rails are used for the ContentDirector 1000F/2000C and ContentBridge 2010F.

1. Pull the blue release button (component F) to remove inner member (component D) from the slides.

![Diagram of AXXVRAIL mounting railside-mount](image)

2. Install the slides to the rack as follows:
   a. Align the brackets to the desired vertical position on the rack.
   b. Using the screws provided, fasten the rear brackets to the rear rack posts. Use two screws for each bracket.
   c. Fasten the front brackets to the front rack posts. Use one screw for each bracket and place it in the top-most hole.
Figure 2–10: Fastening slides to front rack posts

d. Move the ball retainer to the front of the rack.

3. Install the inner member (component D) to the chassis as follows:
   a. Align inner member key holes to the standoffs on the chassis.
   b. Move the inner member in the direction shown in the example below.

Figure 2–11: Installing chassis to fixed slides

4. Install the chassis to the fixed slides by pulling the release button in the inner member to release the lock and allow the chassis to close.
5. Pull the blue release button in the inner member to release the lock and allow the chassis to slide into the rack.
6. Install the bottom-most screw at the front to secure the chassis to the rack.

**Installing the bezel on the ContentDirector 1000F/2000C and ContentBridge 2010F**

Align the bezel in front of the chassis so that the Harmonic logo is positioned in the top left corner.

**CAUTION:** The front panel is susceptible to electrostatic discharge (ESD) when the bezel is removed. Wear the appropriate ESD protection.

1. Connect the USB cable inside the bezel to the right-hand USB port on the front panel.
2. Keeping the corners aligned, press the bezel straight onto the chassis.
   - The USB cable will form a loop that fits inside the metal panel of the bezel.
3. Hand-tighten the two captive thumb screws to secure the bezel in place.
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Rack Mounting the Harmonic MediaGrid 4000 Series System

Figure 2–13: Installing the bezel on the ContentDirector 1000F/2000C and ContentBridge 2010F

Rack Mounting the Network Switches

Refer to the product manuals provided with network switch for more information about rack mounting.

NOTE: If the network switches are not deep enough to be attached to the front rails, it is recommended that you attach the rear brackets just above the previous device’s brackets so the network switch rests on top of the device below it, as shown in Figure 2–14.
The following section provides instructions for connecting the Harmonic MediaGrid storage system components. The network cable colors used in the following sections are provided for example only. Other colors can be used instead as long as the connections correspond to the blue, white, and red network cables shown in this section.

**Connecting System Components: Overview**

1. Connect Harmonic MediaGrid system components to the network switches in the following order:
   a. ContentDirectors
      - Refer to Connecting ContentDirectors to the Network Switch.
   b. SystemManager
      - Refer to Connecting the SystemManager to the Network Switch.
   c. ContentServers
      - Refer to Connecting the ContentServer 4000 to the Network Switch.
   d. ContentBridges (optional component)
      - Refer to Connecting the High Bandwidth ContentBridge to the Network Switch, or if configuring a High Availability pair, refer to Connecting High Bandwidth ContentBridges in a High Availability (HA) Pair.

   **NOTE:** Once you have completed the network connections, group the cables and then secure them to the rear side rails.

2. Using SAS cables, connect each ContentStore to the ContentServer.
3. Connect the Harmonic MediaGrid network switch to the client network.
   - Refer to Connecting the ContentServer 4000 to the ContentStore 4240 or Connecting the ContentServer 4000 to the ContentStore 5840.

4. Connect power cables to each system component.
   - Refer to Connecting the Power Cables in a System with ContentServer 4000 Series.

**IMPORTANT:** After connecting power cables, do not power on the system. You must configure the network switches first. Refer to Chapter 4, System Configuration for instructions for configuring your Harmonic MediaGrid system.

**Network Switch Connections**

*Figure 2–15* provides an overview of network switch connections. Not all connections are shown. See the instructions following the illustration for each device’s specific port connections.

**IMPORTANT:** Make sure to use only Harmonic MediaGrid-qualified switches in your Harmonic MediaGrid system. To find out if a switch is Harmonic MediaGrid-qualified, contact your Harmonic representative.

**NOTE:** The switches shown in this section are example only. Your switch may vary from those shown.
Figure 2–15: Harmonic MediaGrid 4000 Series and Network Switch Connections
About BMC Connectivity

Each controller on the ContentServer contains a troubleshooting utility called the Baseboard Management Console (BMC), which can be accessed in the event of system failure. The BMC requires a 1 GbE connection from the BMC port on each controller on a ContentServer to the network switch.

Connecting ContentDirectors to the Network Switch

Follow these instructions for single-site Harmonic MediaGrid systems.

**IMPORTANT:** Ports 1-4 on switch modules C and D are reserved for ContentDirector private interface (ports 2 and 3) connections only.

1. Connect the ContentDirector private interfaces (ports 2 and 3) to the switch as follows:
   a. Connect port 2 on the first ContentDirector to port 1 on switch module D.
   b. Connect port 3 on the first ContentDirector to port 1 on switch module C.
2. Connect the ContentDirector public interfaces (ports 1 and 0) to the switch as follows:
   a. Connect port 1 on the first ContentDirector to port 5 on switch module C.
   b. Connect port 0 on the first ContentDirector to port 5 on switch module D.
3. Continue connecting any remaining ContentDirectors in the same manner, starting with port 2 on the switch for the private interfaces and port 6 on the switch for the public interfaces.

Connecting the SystemManager to the Network Switch

This section provides instructions for connecting the SystemManager to a 1 GbE network switch module. For details about the SystemManager platform included in your Harmonic MediaGrid system, refer to the *Harmonic SystemManager Installation Guide*.
Connecting the Harmonic MediaGrid 4000 System Components

Connecting the ContentServer 4000 to the Network Switch

1. Starting with Controller A, connect a red CAT-6 Ethernet cable to the BMC port. Connect the other end of the cable to an open port on the first 1 GbE switch module.
2. Using white 10 GbE SFP+ cables, connect NIC 4 and NIC 5 on Controller A to open ports on the first 10 GbE switch module.
3. Using white 10 GbE SFP+ cables, connect NIC 2 and NIC 3 on Controller A to open ports on the second 10 GbE switch module.
4. On Controller B, connect a red CAT-6 Ethernet cable to the BMC port. Connect the other end of the cable to an open port on the second 1 GbE switch module.
5. Using blue 10 GbE SFP+ cables, connect NIC 4 and NIC 5 on Controller B to open ports on the second 10 GbE switch module.
6. Using blue 10 GbE SFP+ cables, connect NIC 2 and NIC 3 on Controller B to open ports on the first 10 GbE switch module.
7. Continue connecting the remaining ContentServers in the same manner.

IMPORTANT: To ensure redundancy and proper failover in the event of a failure, you must connect each controller to a separate switch or switch module.

IMPORTANT: vDHCP must be disabled in the SystemManager application before connecting the SystemManager device to the 1 GbE network switch. Refer to "Disabling vDHCP" in the Harmonic SystemManager User Guide for instructions.
Connecting the High Bandwidth ContentBridge to the Network Switch

If your system will have two High Bandwidth Content Bridges in a High Availability (HA) pair, follow instructions in Connecting High Bandwidth Content Bridges in a High Availability (HA) Pair instead.

**NOTE:** The ContentBridge 2010F can be on either the Public VLAN or the client VLAN. However, if you wish to use the Configuration Assistant to configure the ContentBridge, it must be on the Public VLAN. If you are using a ContentBridge 1000B, it must be on the Public VLAN without exception.

**NOTE:** Both 10 GbE ports on the ContentBridge 2010F must be on the same VLAN and subnet.

To connect a High Bandwidth Content Bridge to the Harmonic MediaGrid Network Switch:

1. Connect 10 Gigabit Ethernet port 2 on first ContentBridge to the first available port on switch module A.
2. Connect 10 Gigabit Ethernet port 3 on first ContentBridge to the first available port on switch module B.
3. Continue connecting any remaining ContentBridges in the same manner.

To connect a High Bandwidth ContentBridge to the Customer Core Switch:

1. Connect the appropriate network cable (CX4 or MMF) to 10 GbE port 2 on the ContentBridge, then connect the other end of the cable to an available port on the customer core switch.

2. Connect the appropriate network cable (CX4 or MMF) to 10 GbE port 3 on the ContentBridge, then connect the other end of the cable to an available port on the customer core switch.

3. Connect the customer core switch to the Harmonic MediaGrid network switches. Refer to Connecting Network Switches to the Client Network: One-rack System or Connecting Network Switches to the Client Network: Two-rack System, depending on the system setup.

Figure 2–19: High Bandwidth ContentBridge and Customer Core Switch Connections

Connecting High Bandwidth ContentBridges in a High Availability (HA) Pair

This section provides instructions for connecting High Bandwidth ContentBridges in an HA pair to a network switch.

NOTE: The ContentBridge 2010F/2010 can be on either the Public VLAN or the client VLAN. However, if you wish to use the Configuration Assistant to configure the ContentBridges, they must be on the Public VLAN.

NOTE: Both 10 GbE ports on the ContentBridge 2010F must be on the same VLAN and subnet.

To connect two High Bandwidth ContentBridges in an HA pair to the network switch:

1. Connect the appropriate network cable (CX4 or MMF) to 10GbE port 2 on the first ContentBridge, then connect the other end of the cable to an available port on the customer core switch.
2. Connect the appropriate network cable (CX4 or MMF) to 10GbE port 3 on the first ContentBridge, then connect the other end of the cable to an available port on the customer core switch.

3. Connect the appropriate network cable (CX4 or MMF) to 10GbE port 2 on the second ContentBridge, then connect the other end of the cable to an available port on the customer core switch.

4. Connect the appropriate network cable (CX4 or MMF) to 10GbE port 3 on the second ContentBridge, then connect the other end of the cable to an available port on the customer core switch.

5. Connect a 1 GbE cable to the right-hand NIC (Eth 1) on the first ContentBridge, then connect the other end of the cable to the right-hand NIC (Eth 1) on the second ContentBridge.

6. Connect the customer core switch to the Harmonic MediaGrid network switches. Refer to Connecting Network Switches to the Client Network: One-rack System or Connecting Network Switches to the Client Network: Two-rack System, depending on the system setup.

For information on configuring the ContentBridges in an HA pair, refer to Configuring High Bandwidth ContentBridges in a High Availability (HA) Pair.

Figure 2–20: High Bandwidth ContentBridges connected in an HA pair to the network switch

Connecting the ContentServer 4000 to the ContentStore 4240

You can connect up to four ContentStore 4240 storage arrays to a single ContentServer 4000. Each ContentStore attaches directly to the ContentServer.
**NOTE:** When connecting the ContentServer to the ContentStore, be careful to not twist the SAS cables, bundle them with power cables, or inadvertently braid the cables together.

1. On Controller A on the ContentServer, connect a SAS cable to an open SAS port. Connect the other end of the cable to SAS-1 on the top expander module on the ContentStore 4240.
2. On Controller B of the ContentServer, connect a SAS cable to an open SAS port. Connect the other end of the cable to SAS-1 on the bottom expander module of the ContentStore 4240.
3. Continue to connect the remaining ContentStore nodes to the ContentServer in the same manner.

*Figure 2–21: Connecting the ContentServer 4000 to the ContentStore 4240*
Connecting the ContentServer 4000 to the ContentStore 5840

At this time, Harmonic supports connecting a single ContentStore 5840 to a ContentServer 4000.

**NOTE:** When connecting the ContentServer to the ContentStore, be careful to not twist the SAS cables, bundle them with power cables, or inadvertently braid the cables together.

1. Starting with Controller A on the ContentServer, connect a SAS cable to an open SAS port. Connect the other end of the cable to the right-hand SAS port on the left-hand I/O module of the ContentStore 5840.
2. On Controller B of the ContentServer, connect a SAS cable to an open SAS port. Connect the other end of the cable to the right-hand SAS port on the right-hand I/O module of the ContentStore 5840.

![Figure 2–22: Connecting the ContentServer 4000 to the ContentStore 5840](image)
Connecting Network Switches to the Client Network: One-rack System

This section provides instructions for connecting the network switches in a one-rack Harmonic MediaGrid system to the client network. Refer to Connecting Network Switches to the Client Network: Two-rack System for other connection options.

Refer to the following figure when connecting the network switches to the client network.

**NOTE:** The switches shown in Figure 2–23 are provided as examples only. Your switches may vary from the ones shown.

**IMPORTANT:** Make sure to use only Harmonic MediaGrid-qualified switches in your Harmonic MediaGrid system. To find out if a switch is Harmonic MediaGrid-qualified, contact your Harmonic representative.

![Figure 2–23: Network Switches and Client Network Connections](image)

To connect the network switches to the client network:

1. Connect CX4 cables to Port A2 and to Port A3 on the first switch. Push in the locking device on both ends of the CX4 cable to ensure the cable connector is locked in place. Connect the other end of each cable to the client network.

   **NOTE:** Use ports A1 and A4 on the switch for fiber optic-cable connections.

2. Connect CX4 cables to Port A2 and to Port A3 on the second switch. Push in the locking device on both ends of the CX4 cable to ensure the cable connector is locked in place. Connect the other end of each cable to the client network.

3. Continue with Connecting the Power Cables in a System with ContentServer 4000 Series to complete the hardware installation.

Connecting Network Switches to the Client Network: Two-rack System

This section provides instructions for interconnecting a two-rack Harmonic MediaGrid system.

**NOTE:** The switches shown in Figure 2–24 are provided as examples only. Your switches may vary from the ones shown.

**IMPORTANT:** Make sure to use only Harmonic MediaGrid-qualified switches in your Harmonic MediaGrid system. To find out if a switch is Harmonic MediaGrid-qualified, contact your Harmonic representative.
Figure 2–24: Network Switches and Client Network Connections

Connecting Components in Rack One
1. Connect CX4 cables to the two 10 GbE ports on the back of rack one’s first switch. Connect the other end of the cables to available 10GbE ports on rack two’s switch that connects to the client network.
2. Connect CX4 cables to the two 10 GbE ports on the back of rack one’s second switch. Connect the other end of the cables to available 10GbE ports on rack one’s switch that connects to the client network.
3. Connect the top network switch to the client network.

Connecting Components in Rack Two
1. Connect CX4 cables to the two 10GbE ports on the back of rack two’s first switch. Connect the other end of the cables to available 10GbE ports on rack two’s switch that connects to the client network.
2. Connect CX4 cables to the two 10 GbE ports on the back of rack two’s second switch. Connect the other end of the cables to available 10 GbE ports on the back of rack one’s switch that connects to the client network.
3. Connect the top network switch to the client network.
4. Continue with Connecting the Power Cables in a System with ContentServer 4000 Series to complete the hardware installation.

Connecting the Power Cables in a System with ContentServer 4000 Series

With all of the network cable connections completed, connect the power cables as detailed in the following order.

**IMPORTANT:** Do not turn on any equipment yet. Chapter 4, System Configuration includes instructions for powering on each Harmonic MediaGrid device.

1. The ContentServer and ContentStore 4000 series have power buttons on the front panel. The ContentStore 5840 has power switches on the rear panel. Ensure that all power switches are off. Do not plug the cords into power sources yet. To take advantage of the redundant power supplies, ensure that separate, isolated power sources are available for each PSU.
2. The SystemManager has a power connector on the back. Connect the power cable to the SystemManager power connector.

3. If one or more ContentBridges are part of the system, connect the power cable to the ContentBridge Power connector.

4. To take full advantage of the dual redundant power supplies on the ContentDirector, ensure that separate, isolated power sources are available. Connect the power cords to the two power connectors on each ContentDirector. Do not plug the cords into power sources yet.

5. Connect the power cords to the network switches’ power connectors. Do not plug the cords into power sources yet.

Next Steps

Refer to Chapter 4, System Configuration to set up the Harmonic MediaGrid system’s devices using the customer-specific configuration information.

Expanding a Harmonic MediaGrid 4000 Series System

Follow this procedure when you wish to connect an additional ContentStore to an existing Harmonic MediaGrid system while the system is powered on. You can connect up to four ContentStore 4240 nodes to the ContentServer 4000.

If you are expanding drive capacity in an existing ContentServer or ContentStore, follow the instructions in Drive Capacity Expansion in a Harmonic MediaGrid RAID System instead.

CAUTION: In order to add a ContentStore with the system powered on, you must power down the associated ContentServer controllers, one at a time, before you connect the SAS cable in each SAS domain.

IMPORTANT: On the ContentServer 4000, the top controller corresponds with Controller 0 in SystemManager, and the bottom controller corresponds with Controller 1.

1. Rack mount the new ContentStore by following the instructions in Rack mounting the ContentServer 4000 and ContentStore 4240.

2. Ensure that separate, isolated power sources are available for each power supply module, then connect the power cables to the new ContentStore and to their power sources.

IMPORTANT: Do not power on the ContentStore or connect any SAS cables at this time.

3. Using SystemManager, power down the top controller on the ContentServer 4000 as follows:
   a. From the Configuration tab, click Servers & Switches to access the Servers & Switches page.
   b. In the ContentServers/ContentStores section, click the Name of the ContentServer to which you are connecting the new ContentStore.
   c. From the Properties page, scroll to the ContentServer Controllers section and then click the Shutdown button for Controller 0.
   d. Click OK to confirm.

4. Connect one end of the SAS cable to an open SAS port on the top controller of the ContentServer, and then connect the other end of the cable to SAS-1 on the top expander module on the ContentStore.

5. Apply power to the new ContentStore by pressing the power button on the front panel.

6. Power on Controller 0 by pressing the power button on the front panel of the ContentServer. Note that the bottom controller, which is already powered on, will not be affected.
7. On the **ContentServer Properties** page in SystemManager, verify that the **Status** field for Controller 0 changes to **Connected**.

8. Power down the bottom controller by clicking the **Shutdown** button for Controller 1, and then click **OK** to confirm.

9. Connect one end of the SAS cable to an open SAS port on the bottom controller, and then connect the other end of the cable to SAS-1 on the bottom expander module on the ContentStore.

10. Power on Controller 1 by pressing the power button on the front panel of the ContentServer.

11. On the **ContentServer Properties** page in SystemManager, verify that the **Status** field for Controller 1 changes to **Connected**.

12. Add the new ContentStore to the associated group as follows:
   a. From the **Cluster Properties** page, click the associated **Group ID**.
   b. From the **Group Properties** page, select the device you wish to add to the group, and then click **Add Server(s) to this Group**.
   c. Click **OK** to confirm, and then click **Done**.

13. Navigate to the **ContentServer Properties** page and click the **Failback** button to balance the ContentServer controllers.
Chapter 3
System Installation with the ContentServer 3000 Series

This section provides step-by-step installation instructions for a Harmonic MediaGrid system with the ContentServer 3000 series. This section includes the following topics:

- Site Preparation
- Installation Overview
- Racking Precautions
- Rack Mounting the Harmonic MediaGrid 3000 Series System
- Connecting the Harmonic MediaGrid 3000 System Components
- Expanding a Harmonic MediaGrid 3000 Series System

Site Preparation

Note the following prerequisites for installation of your Harmonic MediaGrid System.

- Environmental
  Harmonic equipment is designed to operate in a clean, air-conditioned control room environment. Care must be taken to avoid temperature and humidity extremes.

- Power
  When connecting equipment, care must be taken to avoid power lines that are subject to noise and voltage spikes. Do not install units on a power circuit that is common to such equipment as air conditioners and refrigeration units. For optimum protection, AC noise filters and surge protectors are recommended if unstable power conditions are present.

- Site
  Harmonic MediaGrid equipment is designed for rack mounting. Be sure to read racking precautions before you begin unpacking system components.
  
  Be aware of the weight of the ContentServers and ContentStores so that you may safely move and lift devices.
  
  - An unpopulated ContentStore 5840 weighs approximately 46 kg (101 lb), and 131 kg (288 lb) with all disk drives installed.
  
  - A fully populated ContentServer 3000 and ContentStore 3160 each weighs approximately 34 kg (75 lb).

Required Components

The following components are required for a Harmonic MediaGrid system.

- One or more client computers. See the Harmonic MediaGrid Release Notes for your particular client platform for the latest supported client operating systems.

- A SystemManager platform including keyboard, monitor and mouse. The latest version of the SystemManager application should be installed on the SystemManager platform. See the Release Notes accompanying this release for the exact SystemManager application version required. See the Harmonic SystemManager Installation Guide for more information.
Shipping Container Components

When you receive each component of a Harmonic MediaGrid storage system, inspect each shipping container for signs of damage. Contact your local Harmonic representative and the carrier immediately if you suspect any damage has occurred during shipping. Check the contents of each box against the packing list to ensure that all parts are included. If any items are missing, contact your local Harmonic representative immediately.

Cables and Mounting Hardware

A rack mounting kit is provided with each Harmonic MediaGrid component, which provides the items needed to mount each component on a rack. Mounting instructions are also included. The type, quantity and length of the cables depends on the customer site and will likely differ for each separate installation.

**IMPORTANT:** CX4 cables have a limit of 15 meters. The cables must be factory terminated and ordered in appropriate lengths to meet specifications.

Installation Overview

Before you begin, ensure that the site is properly prepared, with adequate power, ventilation and rack space. Refer to Site Preparation for details.

**IMPORTANT:** Make sure to leave a space for the SystemManager keyboard/monitor tray. It is recommended that you mount the keyboard monitor and tray 71.12 cm (28.0 in.) off the floor. This height is ideal for using the SystemManager while seated or standing.

Here is an overview of the steps you will complete:

1. Read all rack mounting precautions.
   - Refer to Racking Precautions. If the ContentStore 5840 is also part of your system, refer to Racking Precautions for the ContentStore 5840 as well.
2. Rack the devices from the bottom of the rack in the following order:
   a. ContentStores, followed by ContentServer
      - If the ContentStore 5840 is part of your system, rack mount this server first. Refer to Rack Mounting the ContentStore 5840 and Rack Mounting the ContentServer 3000 and ContentStore 3160.
   b. SystemManager
      - Refer to the SystemManager Platform documentation for installation instructions.
   c. ContentBridge (optional), followed by ContentDirectors
      - Refer to Rack Mounting the ContentDirector 1000F/2000C and ContentBridge 2010F
   d. Network switches
      - Refer to Rack Mounting the Network Switches, or the product manual that came with your network switches.
3. Connect the network cables, SAS cables, and power cables. Refer to Connecting the Harmonic MediaGrid 3000 System Components.
Racking Precautions

**CAUTION:** Read the following precautions before racking the Harmonic MediaGrid system.

**IMPORTANT:** For precautions specific to the ContentStore 5840, see *Rack Mounting the ContentStore 5840*.

- Safe handling of this system requires at least TWO people. Harmonic recommends that you use THREE people to rack mount a system; two to lift and one to help guide the system onto the rack rails.
- When lifting the system, two people at either end should lift slowly with their feet spread out to distribute the weight. When lifting, always keep your back straight and lift with your legs.
- Ensure that the leveling jacks on the bottom of the rack are fully extended to the floor with the full weight of the rack resting on them.
- In single rack installation, stabilizers should be attached to the rack. In multiple rack installations, the racks should be coupled together.
- Load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- Always make sure the rack is stable before extending a component from the rack.
- You should extend only one component at a time—extending two or more simultaneously may cause the rack to become unstable.
- To eliminate any possibility of tipping over, ensure that the equipment rack is securely fastened to the floor or wall.

Rack Mounting the Harmonic MediaGrid 3000 Series System

The following steps provide an overview of installing each of the Harmonic MediaGrid components. A rack mounting kit is provided with each device, which includes the necessary hardware along with detailed mounting instructions. *For each device, always follow the instructions in the mounting kit and use the screws that are included with the mounting hardware.*

**IMPORTANT:** If the ContentStore 5840 is part of your system, rack mount this unit first. Refer to *Rack Mounting the ContentStore 5840* for instructions.

**NOTE:** Each device should be placed on the rack and then secured to the rails before mounting the next device.

Rack Mounting the ContentServer 3000 and ContentStore 3160

1. Start at the bottom of the rack with a ContentServer if this is the first device you are mounting.
2. Install the inner rack rails as follows:
   a. Extend the inner rail toward the front of the rail assembly as far as possible, then depress the locking tab to pull it completely out.
   b. Place the inner rail on the side of the chassis aligning the hooks of the chassis with the rail extension holes.
   c. Slide the extension toward the front of the chassis.
d. Secure the chassis to the rails with screws.
e. Repeat steps 1-3 for the other inner rail.

Figure 3–1: Installing the inner rack rails

3. Outer rails attach to the server rack and hold the server in place. The outer rails for the chassis extend between 30 inches and 33 inches. Install the outer rack rails as follows:
   a. Attach the right outer rail to the rack by inserting the hooks included on the rails into the holes provided on the rack. See Figure 3–2.
   b. Repeat these steps for the left outer rail.

Figure 3–2: Installing the outer rack rails

4. Install the chassis into a rack as follows:
   a. Confirm that the inner and outer rails are properly installed.
b. With two people holding the chassis level and a third guiding the chassis, line up the inner (chassis) rails with the front of the outer (rack) rails so that the chassis is square with the rack rails.

c. Slide the chassis rails into the rack rails, keeping the pressure even on both sides (you may have to depress the locking tabs when inserting). When the server has been pushed completely into the rack, you should hear the locking tabs “click” into position. See Figure 3–3.

![Figure 3–3: Installing the chassis into a rack](image)

d. Insert and tighten the thumbscrews that hold the front of the server to the rack.

**Installing the Bezel**

The bezel ships separately from the ContentServer and ContentStore. Follow these steps to install the bezel on these units. You should mount the ContentServer or ContentStore on the rack prior to installing the bezel, and disk drives should already be inserted.

1. Fit the two posts on the left side of the bezel into the holes in the rack ear on the left side of chassis.
2. Press in the release button on the right side of the bezel while pushing the right side of the bezel straight onto the chassis, and then release the button. The posts on the right side of the bezel will fit into the holes in the right-hand rack ear and secure the bezel on the chassis. See Figure 3–4.

![Figure 3–4](image)
Rack Mounting the ContentStore 5840

Racking Precautions

⚠️ **CAUTION:** A fully configured ContentStore 5840 weighs up to 131kg (288lb). An unpopulated ContentStore 5840 weighs 46kg (101lb). Use appropriate lifting methods.

Before lifting the ContentStore 5840:

- Unplug all cords and cables from the ContentStore 5840.
- Make sure all disk drives from both drawers are removed, and the drawers are closed firmly and locked shut. For details, see *Opening and Closing a Drawer*.
- Additionally, you may wish to remove other modules from the chassis before lifting. For component removal and installation instructions, see the *Harmonic MediaGrid Component Replacement Guide*.

Note the following important points on handling:

- It is recommended that a minimum of three people lift the ContentStore 5840 using the lifting straps supplied with the ContentStore 5840.
- Do not lift the ContentStore 5840 by the handles on the power supply units, cooling modules or I/O modules. They are not designed to take the weight.
- Do not lift the ContentStore 5840 higher than 20U. Use mechanical assistance to lift above this height.
Rack System Safety

CAUTION: The ContentStore 5840 must only be mounted into a rack using the supplied rail kit. Due to its weight and length, the ContentStore 5840 must not be flange mounted.

CAUTION: Never move more than one ContentStore 5840 out of the rack at any one time: there is a danger of the rack falling over.

Note the following points on rack system safety:

- The ContentStore 5840 must be mounted in a rack before use.
- The rack must be capable of supporting the total weight of the installed ContentStore 5840(s). A fully populated ContentStore 5840 weighs up to 131kg (288lb). The design should incorporate stabilizing features suitable to prevent the rack from tipping or being pushed over during installation or in normal use.
- When loading a rack with the ContentStore 5840, fill the rack from the bottom up. When removing ContentStores, empty from the top down.
- The system must be operated with low pressure rear exhaust installation. The back pressure created by the rack doors and obstacles is not to exceed 5 pascals (0.5mm water gauge).
- The minimum open area for the rack doors is 70%.
- The rack design should take into consideration the maximum operating ambient temperature for the ContentStore 5840, which is 35°C.
- The rack must have a safe electrical distribution system. It must provide over-current protection for the ContentStore 5840 and must not be overloaded by the total number of ContentStores installed in the rack. When addressing these concerns, consideration should be given to the electrical power consumption rating shown on the nameplate.
- The electrical distribution system must provide a reliable ground for each ContentStore 5840, and for the rack.
- Each PSU in each ContentStore 5840 has a ground leakage current of 1.6mA. The design of the electrical distribution system must take into consideration the total ground leakage current from all the PSUs in all the ContentStores. The rack must be labeled with the words: “HIGH LEAKAGE CURRENT. Ground connection essential before connecting supply.”
- The rack must meet the safety requirements of UL 60950-1 and IEC 60950-1.

Electrical Safety

CAUTION: It is recommended that you fit and check a suitable anti-static wrist or ankle strap and observe all conventional ESD precautions when handling plug-in modules and components. Avoid contact with backplane components and module connectors, etc.

The ContentStore 5840 must only be operated from a power supply input voltage range of 200 to 240 VAC, 50 to 60 Hz.

A suitable power source with electrical overload protection must be provided in order to meet the requirements in the technical specification.

All power supply cords must have a safe electrical ground connection. Check the connection to ground of the ContentStore 5840 before you switch on the power supply.
**IMPORTANT:** The ContentStore 5840 must be grounded before applying power.

The plug on the power supply cord is used as the main disconnect device. Ensure that the socket outlets are located near the equipment and are easily accessible.

**CAUTION:** When powered by multiple AC sources, disconnect all supply power for complete isolation.

**CAUTION:** Do not remove covers from the ContentStore 5840 or any of the modules – there is a danger of electric shock inside. Do not attempt to disassemble the rear sub-chassis from the ContentStore 5840. Return any damaged components to your supplier for repair.

**CAUTION:** The PSUs contain double pole/neutral fusing. Ensure that your electrical installation can support this.

**IMPORTANT:** The optional RJ45 socket on the I/O module is for Ethernet connection only and must not be connected to a telecommunications network.

### Regional Safety
- For North American use, the branch circuit must be rated for 20A.
- This equipment is suitable for connection to an IT power system (Norway).

### Operating Safety

**IMPORTANT:** All rear modules are part of the fire ContentStore 5840 and must only be removed when a replacement can be immediately inserted.

**IMPORTANT:** The ContentStore 5840 will not receive sufficient airflow or cooling if it is operated with any of the rear modules missing. It is essential that every module bay is filled either with a module or a blank module.

Replace any defective module with a fully operational unit as soon as possible. Do not remove cooling modules, PSUs or I/O modules unless you have a replacement model of the correct ready for insertion.

**CAUTION:** To prevent overturning, drawer interlocks stop users from opening both drawers at the same time. Do not attempt to force open a drawer when the other drawer in the ContentStore 5840 is already open. In a rack containing more than one ContentStore 5840, do not open more than one drawer per rack at a time.

**CAUTION:** Operating temperatures inside the ContentStore 5840 drawers can reach up to 60°C. Take care when opening drawers and removing drive carriers.

**CAUTION:** Due to product acoustics it is recommended that users wear ear protection for any prolonged exposure.
Site Requirements

Before you begin, make sure the site where you intend to set up and use your storage system has the following:

- Standard power from an independent source or a rack power distribution unit with a UPS.
- Host computer with the correct firmware, BIOS and drivers. Contact your supplier for the correct software levels.

Before setting up your enclosure ensure you have the following:

- SAS host bus adapter (HBA).
- Mini-SAS to host cable.
- Power cord.
- Rack kit.

The accessory box contains the power cords and other ordered accessories.

Unpacking the System

Position the shipping case within 6 feet (2m) of the site where you intend to use your storage system.

Inspect the packaging for crushes, cuts, water damage or any other evidence of mishandling during transit. If there is any damage, photograph the packaging for future reference before opening.

Rack Mounting the System

**CAUTION:** It is recommended that you fit and check a suitable anti-static wrist or ankle strap and observe all conventional ESD precautions when handling plug-in modules and components. Avoid contact with backplane components and module connectors, etc.

**CAUTION:** An unpopulated enclosure can weigh up to 46kg (101lb). Do not try to lift it by yourself.

Due to the weight of the enclosure, install it without the drive carriers.

The adjustment range of the rail kit, from the inside of the front post to the inside of the rear post is 660mm - 840mm. This suits a one-meter deep rack within Rack Specification IEC 60297.

**NOTE:** A screwdriver with a Torx T20 tip is needed to lock and unlock the drawers.

To rack mount the ContentStore 5840:

1. To facilitate access, remove the door from the rack.
2. Ensure the pre-assembled rails are at their shortest length.
3. Locate the rail location pins inside the front of the rack and extend the length of the rail assembly to enable the rear location pins to locate. Ensure the pins are fully located in the square or round holes in the rack posts (see Figure 3–5).
4. Fully tighten all clamping screws and middle slide-locking screws.
5. Ensure the rear spacer clips (x4) are fitted tight to the edge of the rack post.
6. Slide the enclosure fully home on its rails.
7. Fasten the front of the enclosure using the enclosure fastening screws (x4) as shown in Figure 3–5.
8. Fix the rear of the enclosure to the hold down bracket with the rear enclosure fixing screws (x2).

**NOTE:** Use the long or short hold down bracket depending on the distance from the rack post to the enclosure hold down slot. Ensure the sliding nut is at the rear of the slot prior to fitting the bracket to the post, then slide the nut along the slot to enable the rear enclosure fastening screw to be fitted.

For rack depths where the rack posts are behind the enclosure hold down slots:
1. Swap the left and right hold down brackets.
2. Insert the long flange between the rack post and chassis side (see Figure 3–3).
3. The sliding nut head must always face away from the enclosure, whichever configuration is used.
CAUTION: Use only the power cords supplied.

CAUTION: Once the enclosure is installed in the rack, dispose of the lifting straps. Due to the difficulty in attaching the straps once the enclosure is installed in the rack, the straps are not suitable for removing the enclosure from the rack.

Continue to the following sections to open the drawers and install the drives.

Opening and Closing a Drawer

CAUTION: To prevent overturning, drawer interlocks stop users from opening both drawers at the same time. Do not attempt to force open a drawer when the other drawer in the enclosure is already open. In a rack containing more than one enclosure, do not open more than one drawer per rack at a time.

CAUTION: Operating temperatures inside the enclosure drawers can reach up to 60°C. Take care when opening drawers and removing drive carriers.

Note the following important points before opening a drawer:

- Opening a drawer does not interrupt the functioning of the system, and disk drives can be hot-swapped while the enclosure continues to operate. However, drawers must not be left open for longer than two minutes, otherwise airflow and cooling will be compromised.
- To reduce the possibility of toppling, only one drawer can be open at any one time.
- The drawer locks into place when opened all the way. To reduce pinching hazards, two latches must be released before the drawer can be pushed back in.
- Each drawer can be locked shut by turning both anti-tamper locks clockwise using a screwdriver with a Torx T20 bit.

IMPORTANT: During normal operation, drawers must be kept shut to ensure correct airflow and cooling.
To open a drawer:

1. Make sure the anti-tamper locks are not engaged. The red arrows on the locks will point inwards if the locks are disengaged (see Figure 3–7). Unlock them if necessary by rotating them counterclockwise using a screwdriver with a Torx T20 bit.

Figure 3–7: Anti-tamper Locks (shown disengaged)

2. Push the drawer latches inward and hold them.
3. Pull the drawer all the way out until it locks open.

Figure 3–8: Opening the Bottom Drawer

**IMPORTANT:** The drawer must not be left open for more than two minutes while the enclosure is powered.
To close a drawer:
1. Pull and hold both of the white latches on the sides of the drawer (see Figure 3–9).
2. Push the drawer in slightly.
3. Release the white latches and check they have returned to their original position.
4. Push the drawer all the way back into the enclosure, making sure it clicks home.

Figure 3–9: Drawer latch

Installing Drives
1. Open one drawer, as described in Opening and Closing a Drawer.
2. Lower a disk drive into the slot, with the drive capacity label facing towards you, as shown in Figure 3–10.
3. Push the drive downwards and hold it down while sliding the drive carrier plate in the direction shown in Figure 3–10. This locks the drive in place.
Figure 3–10: Drive install

4. Check that the release latch has returned to its locked position, as shown in Figure 3–11.

Figure 3–11: Drive locked

5. Repeat steps 2-4 for the remaining drive slots in that drawer.
6. Close the drawer using the instructions in Opening and Closing a Drawer.
7. Repeat steps 1-6 for the second drawer.

**NOTE:** The drawers must be populated with drives in whole rows at a time (there are three rows of 14 drives per drawer). The minimum number of drives in an enclosure is 14. The number of rows must not differ by more than one between top and bottom drawers. Populate drawers from the front to the rear of the enclosure.
Rack Mounting the ContentDirector 1000F/2000C and ContentBridge 2010F

The ContentDirector 1000F/2000C and ContentBridge 2010F (an optional system component) ship with the Intel AXXVRAIL Mounting Rail Kit.

**NOTE:** The figures in this section show a two-rack unit server; however, the same rack rails are used for the ContentDirector 1000F/2000C and ContentBridge 2010F.

1. Pull the blue release button (component F) to remove inner member (component D) from the slides.

2. Install the slides to the rack as follows:
   a. Align the brackets to the desired vertical position on the rack.
   b. Using the screws provided, fasten the rear brackets to the rear rack posts. Use two screws for each bracket.
   c. Fasten the front brackets to the front rack posts. Use one screw for each bracket and place it in the top-most hole.
Rack Mounting the Harmonic MediaGrid 3000 Series System

3. Install the inner member (component D) to the chassis as follows:
   a. Align inner member key holes to the standoffs on the chassis.
   b. Move the inner member in the direction shown in the example below.

4. Install the chassis to the fixed slides by pulling the release button in the inner member to release the lock and allow the chassis to close.
5. Pull the blue release button in the inner member to release the lock and allow the chassis to slide into the rack.

6. Install the bottom-most screw at the front to secure the chassis to the rack.

Installing the bezel on the ContentDirector 1000F/2000C and ContentBridge 2010F

Align the bezel in front of the chassis so that the Harmonic logo is positioned in the top left corner.

**CAUTION:** The front panel is susceptible to electrostatic discharge (ESD) when the bezel is removed. Wear the appropriate ESD protection.

1. Connect the USB cable inside the bezel to the right-hand USB port on the front panel.
2. Keeping the corners aligned, press the bezel straight onto the chassis.
   
   The USB cable will form a loop that fits inside the metal panel of the bezel.
3. Hand-tighten the two captive thumb screws to secure the bezel in place.
Rack Mounting the Network Switches

**NOTE:** The network switches are not deep enough to be attached to the front rails. It is recommended that you attach the rear brackets just above the previous device’s brackets so the network switch rests on top of the device below it.

1. Unpack the network switch.
2. Unpack the rack mount kit that includes the two side mounting brackets. For all installation steps, always follow the instructions in the mounting kit and use the screws that are included with the mounting hardware.
3. Locate the screws included in the rack mount kit for the side brackets. Using a Phillips screwdriver, attach both side brackets to the switch. Use Figure 3–17 for reference.
4. With the side brackets attached to the switch, attach the side brackets to the cabinet’s rear rails.
5. Repeat the previous steps to install the remaining network switches.

Refer to the network switch product manuals provided with the Harmonic MediaGrid system for more information about rack mounting the switches.

Connecting the Harmonic MediaGrid 3000 System Components

The following section provides instructions for connecting the Harmonic MediaGrid storage system components. The network cable colors used in the following sections are provided for example only. Other colors can be used instead as long as the connections correspond to the blue, white, and red network cables shown.

Connecting System Components: Overview

1. Connect Harmonic MediaGrid system components to the network switches in the following order:
   a. ContentDirectors
      - Refer to Connecting the ContentDirectors to a Network Switch. Or, if configuring a stretch cluster, refer to Connecting ContentDirectors in a Stretch Cluster.
   b. SystemManager
      - Refer to Connecting the SystemManager to the Network Switch.
   c. ContentServers
      - Refer to Connecting the ContentServer 3000 to Network Switches.
   d. ContentBridges (optional component)
2. Using SAS cables, connect each ContentStore to the ContentServer.
   - Refer to Connecting the ContentServer 3000 to ContentStore(s) 3160 or Connecting the ContentServer 3000 to the ContentStore 5840.

3. Connect the Harmonic MediaGrid network switch to the client network.
   - Refer to Connecting Network Switches to the Client Network: One-rack System or Connecting Network Switches to the Client Network: Two-rack System, depending on the system setup.

4. Connect power cables to each system component.
   - Refer to Connecting the Power Cables in a System with ContentServer 3000 Series.

**IMPORTANT:** After connecting power cables, do not power on the system. You must configure the network switches first. Refer to Chapter 4, System Configuration for instructions for configuring your Harmonic MediaGrid system.

**Network Switch Connections**

*Figure 3–18 and Figure 3–19 provide an overview of network switch connections for a 10 GbE network and a 1 GbE network. Not all connections are shown. See the instructions following the illustration for each device’s specific port connections.*

**IMPORTANT:** Make sure to use only Harmonic MediaGrid-qualified switches in your Harmonic MediaGrid system. To find out if a switch is Harmonic MediaGrid-qualified, contact your Harmonic representative.

**NOTE:** The switches shown in this section are example only. Your switch may vary from those shown.
Connecting the Harmonic MediaGrid 3000 System Components

Figure 3–18: Harmonic MediaGrid and 10 GbE Network Switch Connections
Connecting the Harmonic MediaGrid 3000 System Components

Figure 3–19: Harmonic MediaGrid and 1 GbE Network Switch Connections
About BMC Connectivity

Each controller on the ContentServer contains a troubleshooting utility called the Baseboard Management Console (BMC), which can be accessed in the event of system failure. The BMC requires a 1 GbE connection from NIC 0 on each controller on a ContentServer to the network switch.

Connecting the ContentDirectors to a Network Switch

Follow these instructions for single-site Harmonic MediaGrid systems. If you are configuring a stretch cluster, follow instructions in Connecting ContentDirectors in a Stretch Cluster instead.

**IMPORTANT:** Ports 1-4 on switch modules C and D are reserved for ContentDirector private interface (ports 2 and 3) connections only.

1. Connect the ContentDirector private interfaces (ports 2 and 3) to the switch as follows:
   a. Connect port 2 on the first ContentDirector to port 1 on switch module D.
   b. Connect port 3 on the first ContentDirector to port 1 on switch module C.
2. Connect the ContentDirector public interfaces (ports 1 and 0) to the switch as follows:
   a. Connect port 1 on the first ContentDirector to port 5 on switch module C.
   b. Connect port 0 on the first ContentDirector to port 5 on switch module D.
3. Continue connecting any remaining ContentDirectors in the same manner, starting with port 2 on the switch for the private interfaces and port 6 on the switch for the public interfaces.

![Figure 3–20: Connecting ContentDirectors to the Network Switch](image)

Connecting ContentDirectors in a Stretch Cluster

**IMPORTANT:** Make sure to connect ContentDirectors as shown in Figure 3–21. Incorrectly connecting the ContentDirectors may result in problems with your Harmonic MediaGrid system.
Figure 3–21 shows a detail of the ContentDirector connections to network switches across two sites.

To connect ContentDirectors to network switches in a stretch cluster:

1. Starting with the ContentDirector at Site 1, connect a yellow fiber optic cable to NIC 3. Connect the other end of the cable to an open port on the first network switch module at Site 2. This will be used for Private VLAN 1.

2. Connect a black fiber optic cable to NIC 2 on the ContentDirector at Site 1. Connect the other end of the cable to an open port on the second network switch module at Site 1. This will be used for Private VLAN 2.

3. Connect a white Ethernet cable to NIC 0 on the ContentDirector at Site 1. Connect the other end of the cable to an open port on the first network switch module at Site 1. This will be used for the Public VLAN.

4. Connect a blue Ethernet cable to NIC 1 on the ContentDirector at Site 1. Connect the other end of the cable to an open port on the second network switch module at Site 1. This will also be used for the Public VLAN.

5. For the ContentDirector at Site 2, connect a yellow fiber optic cable to NIC 3. Connect the other end of the cable to an open port on the first network switch module at Site 2. This will be used for Private VLAN 1.

6. Connect a black fiber optic cable to NIC 2 on the ContentDirector at Site 2. Connect the other end of the cable to an open port on the second network switch module at Site 1. This will be used for Private VLAN 2.

7. Connect a white Ethernet cable to NIC 0 on the ContentDirector at Site 2. Connect the other end of the cable to an open port on the first network switch module at Site 2. This will be used for the Public VLAN.

8. Connect a blue Ethernet cable to NIC 1 on the ContentDirector at Site 2. Connect the other end of the cable to an open port on the second network switch module at Site 2. This will also be used for the Public VLAN.

For assistance with configuring a stretch cluster, contact Technical Support.
Connecting the SystemManager to the Network Switch

This section provides instructions for connecting the SystemManager to a 1 GbE network switch module. For details about the SystemManager platform included in your Harmonic MediaGrid system, refer to the Harmonic SystemManager Installation Guide.

**IMPORTANT:** vDHCP must be disabled in the SystemManager application before connecting the SystemManager device to the 1 GbE network switch. Refer to “Disabling vDHCP” in the Harmonic SystemManager User Guide for instructions.

To connect a SystemManager to a network switch:
1. Connect a CAT-6 Ethernet cable to port 1 on the SystemManager.
2. Connect the other end of the Ethernet cable to port 8 on switch module D.

![SystemManager and Network Switch Connection](image)

Connecting the ContentServer 3000 to Network Switches

The following sections provide instructions for connecting the ContentServer 3000 to network switches. Choose from the following:

- Connecting with 1 GbE Network Switches
- Connecting with 10 GbE Network Switches

Connecting with 1 GbE Network Switches

This section provides instructions for connecting the ContentServer 3000 with 1 GbE network switches. *Figure 3–23* shows the connections.
Connecting the Harmonic MediaGrid 3000 System Components

To connect the ContentServer to a network switch:

1. Starting with the left-hand controller, connect a red CAT-6 Ethernet cable to NIC 0. Connect the other end of the cable to an open port on the first 1 GbE switch module. This will serve as the BMC connection.

2. Using white CAT-6 Ethernet cables, connect two of the open NICs on the left-hand controller to open ports on the first 1 GbE switch module.

3. Using white CAT-6 Ethernet cables, connect the remaining three NICs on the left-hand controller to open ports on the second 1 GbE switch module.

4. On the right-hand controller, connect a red CAT-6 Ethernet cable to NIC 0. Connect the other end of the cable to an open port on the second 1 GbE switch module. This will serve as the BMC connection for this controller.

5. Using blue CAT-6 Ethernet cables, connect two of the open NICs on the right-hand controller to open ports on the second 1 GbE switch module.

6. Using blue CAT-6 Ethernet cables, connect the remaining three NICs on the right-hand controller to open ports on the first 1 GbE switch module.

7. Continue connecting the remaining ContentServers in the same manner.

Figure 3–23: ContentServer 3000 and 1 GbE Network Switch Connections
IMPORTANT: To ensure redundancy and proper failover in the event of a failure, you must connect each controller to a separate switch or switch module.

Connecting with 10 GbE Network Switches

This section provides instructions for connecting a ContentServer 3000 to 10 GbE network switches. Figure 3–24 shows the connections.

NOTE: The switch shown in Figure 3–24 is provided as an example only. Your switch may vary from the one shown.

Figure 3–24: ContentServer 3000 and 10 GbE Network Switch Connections

To connect the ContentServers to network switches:
1. Starting with the left-hand controller, connect a red CAT-6 Ethernet cable to NIC 0. Connect the other end of the cable to an open port on the first 1 GbE switch module. This will serve as the BMC connection.
2. Using a white 10 GbE SFP+ cable, connect one of the 10 GbE ports on the left-hand controller to an open port on the first 10 GbE switch module.
3. Using a white 10 GbE SFP+ cable, connect the remaining 10 GbE port on the left-hand controller to an open port on the second 10 GbE switch module.
4. On the right-hand controller, connect a red CAT-6 Ethernet cable to NIC 0. Connect the other end of the cable to an open port on the second 1 GbE switch module. This will serve as the BMC connection for this controller.
5. Using a blue 10 GbE SFP+ cable, connect one of the 10 GbE ports on the right-hand controller to an open port on the second 10 GbE switch module.
6. Using a blue 10 GbE SFP+ cable, connect the remaining 10 GbE port on the right-hand controller to an open port on the first 10 GbE switch module.
7. Continue connecting the remaining ContentServers in the same manner.

**IMPORTANT:** To ensure redundancy and proper failover in the event of a failure, you must connect each controller to a separate switch or switch module.

---

## Connecting the High Bandwidth ContentBridge to the Network Switch

If your system will have two High Bandwidth ContentBridges in a High Availability (HA) pair, follow instructions in *Connecting High Bandwidth ContentBridges in a High Availability (HA) Pair* instead.

**NOTE:** The ContentBridge 2010F can be on either the Public VLAN or the client VLAN. However, if you wish to use the Configuration Assistant to configure the ContentBridge, it must be on the Public VLAN. If you are using a ContentBridge 1000B, it must be on the Public VLAN without exception.

**NOTE:** Both 10 GbE ports on the ContentBridge 2010F must be on the same VLAN and subnet.

**To connect a High Bandwidth ContentBridge to the Harmonic MediaGrid Network Switch:**

1. Connect 10 Gigabit Ethernet port 2 on first ContentBridge to the first available port on switch module A.
2. Connect 10 Gigabit Ethernet port 3 on first ContentBridge to the first available port on switch module B.
3. Continue connecting any remaining ContentBridges in the same manner.

**To connect a High Bandwidth ContentBridge to the Customer Core Switch:**

1. Connect the appropriate network cable (CX4 or MMF) to 10 GbE port 2 on the ContentBridge, then connect the other end of the cable to an available port on the customer core switch.
2. Connect the appropriate network cable (CX4 or MMF) to 10 GbE port 3 on the ContentBridge, then connect the other end of the cable to an available port on the customer core switch.
3. Connect the customer core switch to the Harmonic MediaGrid network switches. Refer to *Connecting Network Switches to the Client Network: One-rack System* or *Connecting Network Switches to the Client Network: Two-rack System*, depending on the system setup.
Connecting High Bandwidth ContentBridges in a High Availability (HA) Pair

This section provides instructions for connecting High Bandwidth ContentBridges in an HA pair to a network switch.

**NOTE:** The ContentBridge 2010F/2010 can be on either the Public VLAN or the client VLAN. However, if you wish to use the Configuration Assistant to configure the ContentBridges, they must be on the Public VLAN.

**NOTE:** Both 10 GbE ports on the ContentBridge 2010F must be on the same VLAN and subnet.

**To connect two High Bandwidth ContentBridges in an HA pair to the network switch:**
1. Connect the appropriate network cable (CX4 or MMF) to 10GbE port 2 on the first ContentBridge, then connect the other end of the cable to an available port on the customer core switch.
2. Connect the appropriate network cable (CX4 or MMF) to 10GbE port 3 on the first ContentBridge, then connect the other end of the cable to an available port on the customer core switch.
3. Connect the appropriate network cable (CX4 or MMF) to 10GbE port 2 on the second ContentBridge, then connect the other end of the cable to an available port on the customer core switch.
4. Connect the appropriate network cable (CX4 or MMF) to 10GbE port 3 on the second ContentBridge, then connect the other end of the cable to an available port on the customer core switch.
5. Connect a 1 GbE cable to the right-hand NIC (Eth 1) on the first ContentBridge, then connect the other end of the cable to the right-hand NIC (Eth 1) on the second ContentBridge.
6. Connect the customer core switch to the Harmonic MediaGrid network switches. Refer to *Connecting Network Switches to the Client Network: One-rack System* or *Connecting Network Switches to the Client Network: Two-rack System*, depending on the system setup.
For information on configuring the ContentBridges in an HA pair, refer to *Configuring High Bandwidth ContentBridges in a High Availability (HA) Pair*.

**Figure 3–26: High Bandwidth ContentBridges connected in an HA pair to the network switch**

### Connecting the ContentBridge 1000B to the Network Switch

1. Complete these connections if one or more optional ContentBridges are part of the Harmonic MediaGrid system.
   a. Connect port 1 on the first ContentBridge to the first available port on switch module C.
   b. Connect port 0 on the first ContentBridge to the first available port on switch module D.
   c. Continue connecting any remaining ContentBridges in the same manner.

### Connecting the ContentServer 3000 to ContentStore(s) 3160

This section provides instructions for connecting the ContentServer 3000 to one or more ContentStore 3160 nodes. *Figure 3–27* shows the connections, including two ContentStore 3160 nodes.
To connect the ContentServer to multiple ContentStores:

1. Starting with the left-hand controller on the ContentServer, connect a SAS cable to the SAS port. Connect the other end of the cable to the left-hand SAS port on the left-hand controller of the first ContentStore.

   **NOTE:** Do not twist SAS cables or bundle them with power cables.

2. On the right-hand controller of the ContentServer, connect a SAS cable to the SAS port. Connect the other end of the cable to the left-hand SAS port on the right-hand controller of the first ContentStore.

3. Starting with the left-hand controller on the first ContentStore, connect a SAS cable to the open right-hand SAS port. Connect the other end of the cable to the left-hand SAS port on the left-hand controller of the second ContentStore.
4. On the right-hand controller of the first ContentStore, connect a SAS cable to the open right-hand SAS port. Connect the other end of the cable to the left-hand SAS port on the right-hand controller of the second ContentStore.

5. Continue connecting ContentStores together in this manner.

**NOTE:** A maximum of five ContentStores can be connected to one ContentServer.

---

**Connecting the ContentServer 3000 to the ContentStore 5840**

At this time, Harmonic supports connecting no more than one ContentStore 5840 to a ContentServer 3000. Use the following instructions and Figure 3–28 for reference. Use the SAS host bus adapters (HBAs) supplied with the ContentStore 5840 for connections.

**To connect the ContentServer 3000 to a ContentStore 5840:**

1. Starting with the left-hand controller on the ContentServer, connect a SAS cable to the SAS port. Connect the other end of the cable to the right-hand SAS port on the left-hand I/O module of the ContentStore 5840.

**NOTE:** Do not twist SAS cables or bundle them with power cables.

2. On the right-hand controller of the ContentServer, connect a SAS cable to the SAS port. Connect the other end of the cable to the right-hand SAS port on the right-hand I/O module of the ContentStore 5840.

---

*Figure 3–28: Connecting the ContentServer 3000 to ContentStore 5840*
Connecting Network Switches to the Client Network: One-rack System

This section provides instructions for connecting the network switches in a one-rack Harmonic MediaGrid system to the client network. Refer to Connecting Network Switches to the Client Network: Two-rack System for other connection options.

Refer to the following figure when connecting the network switches to the client network.

**NOTE:** The switches shown in Figure 3–29 are provided as examples only. Your switches may vary from the ones shown.

**IMPORTANT:** If you are supplying your own network switches, make sure to use only Harmonic MediaGrid-qualified switches in your Harmonic MediaGrid system. To find out if a switch is Harmonic MediaGrid-qualified, contact your Harmonic representative.

**Figure 3–29: Network Switches and Client Network Connections**

To connect the network switches to the client network:

1. Connect CX4 cables to Port A2 and to Port A3 on the first switch. Push in the locking device on both ends of the CX4 cable to ensure the cable connector is locked in place. Connect the other end of each cable to the client network.

   **NOTE:** Use ports A1 and A4 on the switch for fiber optic-cable connections.

2. Connect CX4 cables to Port A2 and to Port A3 on the second switch. Push in the locking device on both ends of the CX4 cable to ensure the cable connector is locked in place. Connect the other end of each cable to the client network.

3. Continue with Connecting the Power Cables in a System with ContentServer 3000 Series to complete the hardware installation.

Connecting Network Switches to the Client Network: Two-rack System

This section provides instructions for interconnecting a two-rack Harmonic MediaGrid system. Refer to the following figure when connecting the systems.

**NOTE:** The switches shown in Figure 3–30 are provided as examples only. Your switches may vary from the ones shown.
IMPORTANT: If you are supplying your own network switches, make sure to use only Harmonic MediaGrid-qualified switches in your Harmonic MediaGrid system. To find out if a switch is Harmonic MediaGrid-qualified, contact your Harmonic representative.

Figure 3–30: Network Switches and Client Network Connections

Connecting Components in Rack One

To connect the network switches to the client network:
1. Connect CX4 cables to the two 10 GbE ports on the back of rack one’s first switch. Connect the other end of the cables to available 10GbE ports on rack two’s switch that connects to the client network.
2. Connect CX4 cables to the two 10 GbE ports on the back of rack one’s second switch. Connect the other end of the cables to available 10 GbE ports on rack one’s switch that connects to the client network.
3. Connect the top network switch to the client network.

Connecting Components in Rack Two

To connect the network switches to the client network:
1. Connect CX4 cables to the two 10 GbE ports on the back of rack two’s first switch. Connect the other end of the cables to available 10GbE ports on rack two’s switch that connects to the client network.
2. Connect CX4 cables to the two 10 GbE ports on the back of rack two’s second switch. Connect the other end of the cables to available 10 GbE ports on the back of rack one’s switch that connects to the client network.
3. Connect the top network switch to the client network.
4. Continue with Connecting the Power Cables in a System with ContentServer 3000 Series to complete the hardware installation.

Connecting the Power Cables in a System with ContentServer 3000 Series

With all of the network cable connections completed, connect the power cables as detailed in the following order.
**Expanding a Harmonic MediaGrid 3000 Series System**

Follow this procedure when you wish to connect an additional ContentStore to an existing Harmonic MediaGrid while the system is powered on. You can connect up to five ContentStore 3160 nodes to the ContentServer 3000.

If you are expanding drive capacity in an existing ContentServer or ContentStore, follow the instructions in *Drive Capacity Expansion in a Harmonic MediaGrid RAID System* instead.

**CAUTION:** In order to add a ContentStore with the system powered on, you must power down the associated ContentServer controllers, one at time, while you connect the SAS cable in each SAS domain.

**IMPORTANT:** On the ContentServer 3000, when looking at the rear panel, the left-hand controller corresponds with Controller 0 in SystemManager, and the right-hand controller corresponds with Controller 1.

1. Rack mount the new ContentStore by following the instructions in *Rack Mounting the ContentServer 3000 and ContentStore 3160*.
2. Ensure that separate, isolated power sources are available for each power supply module, then connect the power cables to the new ContentStore and to their power sources.

**IMPORTANT:** Do not power on the ContentStore or connect any SAS cables at this time.

3. Using SystemManager, power down Controller 0 on the ContentServer as follows:
   a. From the Configuration tab, click Servers & Switches to access the Servers & Switches page.
   b. In the ContentServers/ContentStores section, click the Name of the ContentServer to which you are connecting the new ContentStore.
c. From the Properties page, scroll to the ContentServer Controllers section and then click the Shutdown button for Controller 0.

d. Click OK to confirm.

4. Connect one end of the SAS cable to the right-hand SAS port on the left-hand controller on the last ContentStore in the daisy chain, and then connect the other end of the cable to the left-hand SAS port on the left-hand controller on the new ContentStore. Refer to Figure 3–27 for an example.

5. Apply power to the new ContentStore by pressing the power button on the front panel.

6. Power on Controller 0 on the ContentServer by pressing the power button on the front panel. Note that the right-hand controller, which is already powered on, will not be affected.

7. On the ContentServer Properties page in SystemManager, verify that the Status field for Controller 0 changes to Connected.

8. Power down Controller 1 on the ContentServer by clicking the Shutdown button, and then click OK to confirm.

9. Connect one end of the SAS cable to the right-hand SAS port on the right-hand controller on the last ContentStore in the daisy chain, and then connect the other end of the cable to the left-hand SAS port on the right-hand controller on the new ContentStore.

10. Power on Controller 1 on the ContentServer by pressing the power button on the front panel.

11. On the ContentServer Properties page in SystemManager, verify that the Status field for Controller 1 changes to Connected.

12. Add the new ContentStore to the associated group as follows:
    a. From the Cluster Properties page, click the associated Group ID.
    b. From the Group Properties page, select the device you wish to add to the group, and then click Add Server(s) to this Group.
    c. Click OK to confirm, and then click Done.

13. Navigate to the ContentServer Properties page and click the Failback button to balance the ContentServer controllers.
Chapter 4
System Configuration

This section provides instructions for configuring the Harmonic MediaGrid 3000 or 4000 Series system after the devices have been physically connected. The following topics are included:

- About Harmonic MediaGrid Configuration
- Configuring the Network Switches
- Getting Started with the Harmonic MediaGrid Configuration Assistant
- Powering on a Harmonic MediaGrid System
- Running the Configuration Assistant
- Initializing Clusters
- Setting the Harmonic MediaGrid System Time
- Creating a Volume and a Group File System
- Creating a RAID Set
- Joining a Harmonic MediaGrid Cluster to a Windows Domain
- Joining a Harmonic MediaGrid Cluster to an Apple Open Directory Domain
- Verifying ContentServer and ContentDirector Services
- Managing Memory Usage by the File System Driver
- Configuring the Remote Media API on a ContentBridge
- Configuring a ContentBridge
- Adding a High Bandwidth ContentBridge to the Harmonic MediaGrid System
- Configuring High Bandwidth ContentBridges in a High Availability (HA) Pair
- Configuring a ContentServer

NOTE: Many of the Harmonic MediaGrid system configuration options covered in this chapter are applied by editing configuration files using the SystemManager application. You are directed to the Harmonic SystemManager User Guide for complete instructions when customizing these configuration files.

About Harmonic MediaGrid Configuration

Before configuring your Harmonic MediaGrid system, you must first configure your network switches. If you have purchased your switches from Harmonic then you may configure them by running a utility called the Network Configuration Assistant. For instructions on running the Network Configuration Assistant, continue to Configuring the Network Switches. If you did not purchase switches from Harmonic then contact Technical Support or your network administrator for assistance with configuring your network switches.

Once you have configured your network switches, continue to Getting Started with the Harmonic MediaGrid Configuration Assistant for instructions on running the Harmonic MediaGrid Configuration Assistant, the on-screen method for configuring a Harmonic MediaGrid system.
The Configuration Assistant is a Q&A script that prompts you for Harmonic MediaGrid information specific to your site. The Configuration Assistant files are located on the ContentDirectors. The information you provide is used to populate the Harmonic MediaGrid configuration files with the specific customer information.

**NOTE:** The procedures outlined in this section are written for qualified technical personnel, skilled at advanced networking procedures. If you have any questions, please consult with your facility’s network administrator or contact Technical Support.

## Configuring the Network Switches

Before configuring your Harmonic MediaGrid system, you must configure your network switches. If you are using 1GbE switches provided by Harmonic for an all-1GbE network, you can use the Network Configuration Assistant, a stand-alone utility, described in this section.

Note the following:

- The Network Configuration Assistant cannot be used for any non-Harmonic MediaGrid-qualified switches or for any 10GbE switches. For help with configuring those, contact Technical Support or your network administrator.
- The Network Configuration Assistant generates all switch configurations based upon a /24 (Class C) address-space. If you need any other address type, the IP/Netmask values must be modified manually after the configuration file is generated. For assistance, contact Technical Support or your network administrator.

The Network Configuration Assistant asks a number of configuration questions and uses the information to populate switch configuration files located on the ContentDirector. These files can then be copied to your switches.

Before you begin:

- Make sure you have reviewed the *Harmonic MediaGrid Installation Planning Guide* and completed the configuration worksheet included in that document before running the Network Configuration Assistant.
- Make sure the system is cabled completely.
- Make sure you have a USB drive on hand.

To run the Network Configuration Assistant:

1. Connect a monitor and keyboard to the first ContentDirector.
2. Log on to the ContentDirector using the following user name and password:
   - User name: ovnuser
   - Password: OVN@SvCaUsa
3. Enter the following at the command prompt:
   ```
cd /home/ovnuser/scripts/networking
   ```
4. Start the configuration script using the following command:
   ```
sudo ./Network_cfg
   ```

Use the information from the *Harmonic MediaGrid Installation Planning Guide* to complete the assistant. When complete, the switch configuration files will be copied to the USB drive and generated under the following directory: /home/ovnuser_scripts/legacy/configfiles.
Chapter 4 System Configuration

Configuring the Network Switches

Uploading Switch Configuration Files

Complete this section to configure the Harmonic-provided HP switches, beginning with Configuring Switch A. Refer to About Cisco Switches for information about configuring Cisco switches.

These instructions require the use of HyperTerminal, which is supplied with Microsoft Windows, to connect to the switches. For information on using HyperTerminal, you can refer to the Microsoft website at: http://technet.microsoft.com/en-us/library/cc784492(WS.10).aspx

Configuring Switch A

1. Insert the USB drive containing the configuration files to the SystemManager.
2. Connect a serial cable from the SystemManager to the serial port on the back of switch A.
3. Start HyperTerminal. From the Programs menu, click Accessories > Communications > HyperTerminal.
4. Connect to the switch using the following port settings:
   - Bits Per Second = 19200
   - Data Bits = 8
   - Parity = None
   - Stop Bits = 1
   - Flow Control = Xon / Xoff
5. Press the Enter key twice for the switch to respond (repeat if the switch does not respond). Copyright information displays when the switch responds.
6. Press the Enter key to reach the command prompt.
7. Enter the following command:
   ```
   copy xmodem startup-config
   ```
   The following prompt appears:
   “Device may be rebooted, do you want to continue [y/n]?”
8. Type “y”.
   The following prompt appears:
   “Press ‘Enter’ and start xmodem on your host…”
9. Press the Enter key.
10. Select Send File from the Transfer menu on the HyperTerminal menu bar. A Send File window appears.
11. Click the Browse button to locate the switch configuration files on the USB drive in one of the following directories: “configfiles/switches/HP3400” or “configfiles/switches/HP2900” or “configfiles/switches/HP5400” (depending on which switch you are configuring).
      Double-click the file “HP<model#>_subA1.cfg”, where <model#> is the switch model number (3400, 2900).
      If you are configuring an HP5400 switch, select the configuration file for the type of connections, as follows:
      - For the all-1GbE port connections (regardless of the number of ports), use the HP5400_all_1G.cfg file
      - For the CX4 10GbE connections (both four and eight) on the top row of the switch, use the HP5400_CX4.cfg file
      - For the fiber 10GbE connections (both four and eight) on the top row of the switch, use the HP5400_MMF.cfg file
NOTE: Contact Technical Support for configuration instructions if you are installing more than one HP5400 switch.

13. Verify that **Xmodem** is selected as the transfer protocol.
14. Click the **Send** button to send the file.

   The switch reboots and then closes the HyperTerminal connection.

**Configuring Switch B**

NOTE: If you are configuring an HP5400 switch, you can skip this section. The HP5400 combines switch A and switch B. Configuration was completed in the previous section.

**To configure switch B:**
1. Remove the serial cable from switch A.
2. Connect the serial cable to switch B.
3. Repeat the steps in **Configuring Switch A** above, using the file “HP<model#>_subB1.cfg” for **Step 12**.
4. If you are configuring a 1010 network switch (HP6400), repeat the steps in **Configuring Switch A** and **Configuring Switch B** using the HP6400 configuration files found in the HP6400 subdirectory (that is, “HP6400_subA1.cfg”, “HP6400_subB1.cfg”).

**About Cisco Switches**

The Network Configuration Assistant creates configuration files for the Cisco switches. Provide these configuration files to the Cisco switch administrator when configuring a Cisco switch. The files created by the Network Configuration Assistant work as generated once they are copied to the Cisco switch.

Note that uploading a configuration file to a Cisco switch is different from uploading files to HP switches. Once you have connected your laptop to the Cisco switch through the serial port, and enabled the configuration operation, you may copy and paste the configuration file into the session to configure the switch. There are other ways to upload configuration files to the Cisco switch; these methods may be used by the Cisco administrator if they so choose.

**Getting Started with the Harmonic MediaGrid Configuration Assistant**

The configuration assistant asks several questions, which it uses to determine your network settings. In addition, the assistant allows you to initialize clusters, create a RAID set and default file system, and set up authentication using Windows Active Directory.

Note that if you choose not to initialize the cluster, create a default RAID set and file system, or set up authentication through the configuration assistant, each of those procedures can be done at a later time.

Before beginning the Configuration Assistant:

- Make sure you have reviewed the *Harmonic MediaGrid Installation Planning Guide* and completed the configuration worksheet included in that document before starting the configuration assistant.
- Make sure the switches have been installed and configured. Refer to *Configuring the Network Switches*.
Make sure you have the following:

- Straight-through serial cable.
- Monitor and keyboard. The rack-mounted monitor and keyboard supplied with the SystemManager platform may be used. However, note that it must be connected to each ContentDirector and the SystemManager during the configuration.

**About Setting Up Windows Active Directory Authentication**

The Configuration Assistant now allows you to set up authentication for Windows Active Directory. If you decide to set up authentication for Active Directory at this time, you will need the following:

- The Active Directory “realm” for this Harmonic MediaGrid system
- The Active Directory “workgroup” for this Harmonic MediaGrid
- The “hostname” for the Active Directory server
- The Active Directory Server’s FQDN (Fully Qualified Domain Name)
- The IP address for the Active Directory server
- The user name and password for a valid user account with administrative privileges

**Avoiding IP Address Conflicts when Running the Configuration Assistant**

The Configuration Assistant assumes that the Harmonic MediaGrid subnets (private and public) do not contain any pre-existing devices within the final IP-addressing scheme.

---

**CAUTION:** To avoid IP address conflicts, do NOT connect or use SystemManager, or ANY third-party devices within the Harmonic MediaGrid subnets until after the Configuration Assistant has completed.

---

**About RAID Set Creation**

Before selecting the RAID set geometry for your system, make sure you have reviewed *About a Harmonic MediaGrid Stretch Cluster*. This will help you select the RAID set geometry that best serves your needs.

**Powering on a Harmonic MediaGrid System**

Make sure all of the Harmonic MediaGrid devices are connected before continuing. Refer to *Connecting the Harmonic MediaGrid 4000 System Components* or *Connecting the Harmonic MediaGrid 3000 System Components* for instructions.

1. Apply power to the **Network Switches** by plugging the power cords into power sources.
2. Apply power to the **SystemManager** by connecting the power cord to a power source. Press the Power button on the front of the SystemManager platform.

---

**NOTE:** If you have already configured the SystemManager with an IP address ending in “dot-10,” wait until after the Configuration Assistant is complete before powering on the SystemManager. For more information, refer to *Avoiding IP Address Conflicts when Running the Configuration Assistant*.

3. Apply power to the **ContentDirectors** by connecting both power cords to separate, isolated power sources. Press the Power button on the front control panel of each **ContentDirector**. The ContentDirectors take approximately five minutes to start. Wait for the power-on indicator to light before continuing.
4. Apply power to the **High Bandwidth ContentBridge 2010F** (if part of the system) by connecting both power cords to separate, isolated power sources. Press the power button on the front control panel. Wait for the power-on indicator to light before continuing.
5. Apply power to the **ContentBridge 1000** (if part of the system) by pressing the power switch on the back of the device.

6. Apply power to the ContentServers and ContentStores as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>ContentServer 4000</td>
<td>Connect the power cords to power sources. Press the Power button on the front panel.</td>
</tr>
<tr>
<td>ContentStore 4240</td>
<td>Connect the power cords to power sources. Press the Power button on the front panel.</td>
</tr>
<tr>
<td>ContentServer 3000</td>
<td>Connect the power cords to power sources. Press the Power button on the control panel on the front of the server.</td>
</tr>
<tr>
<td>ContentStore 3160</td>
<td>Connect the power cords to power sources. Press the Power button on the control panel on the front of each ContentStore.</td>
</tr>
<tr>
<td>ContentStore 5840</td>
<td>Connect the power cables to the power supplies and to power sources. Move all power supply switches to the “on” position.</td>
</tr>
</tbody>
</table>

**Running the Configuration Assistant**

The configuration assistant creates a directory structure in the `/omneon/sharedsys/configfiles` directory with the configuration parameters for all of the ContentDirectors.

The configuration script asks a series of questions requiring information specific to the customer site. Use the information from the *Harmonic MediaGrid Installation Planning Guide* to complete the answers. Note that the assistant will display suggested responses in brackets. During the assistant, you can use the up or down arrow keys to tab to previous responses.

Follow these steps to run the configuration assistant.

**IMPORTANT:** Make sure that the completed *Harmonic MediaGrid Installation Planning Guide* is available before continuing. Also make sure you have reviewed the information in *Getting Started with the Harmonic MediaGrid Configuration Assistant* before continuing.

To run the configuration assistant:

1. Connect a monitor and keyboard to the first ContentDirector in your Harmonic MediaGrid system.

**CAUTION:** Do not attempt to run the Configuration Assistant remotely (for example, via SSH). You must run the Configuration Assistant directly from the ContentDirector in order for it to successfully configure the system.

2. Log on to the ContentDirector using the following user name and password:
   - User name: ovnuser
   - Password: OVN@SvCaU$a

3. Run the discover command to verify that the configuration assistant will be able to detect all of the devices in your Harmonic MediaGrid system. Enter the following:
   ```bash
   sudo discover -c
   ```
Depending on the number of devices in your system, this process may take up to 10 minutes to detect all the devices. See Figure 4–1.

![Figure 4–1: Discover Devices](image)

Once all devices have been detected and are listed on screen, continue to the next step.

4. Enter the following to ensure all devices adopt the same date and time:
   ```bash
   sudo initconfig --datesync
   ```

5. Enter the following at the command prompt:
   ```bash
   cd /home/ovnuser/scripts
   ```

6. Start the configuration script using the following command:
   ```bash
   sudo ./autoconfig
   ```

**Notes on System Configuration:**

- The configuration assistant asks for the *maximum* number of devices you wish to allow in your system. If you select a number that is too low for future expansion, you may be forced to incur system down-time in order to reconfigure the system at a later time.

- If you wish to have High Bandwidth ContentBridges configured in High Availability (HA) pairs, make sure to specify number of ContentBridges for a cluster as +1 for every HA pair. For example, if you have two ContentBridges that you wish to be an HA pair, specify the maximum number of High Bandwidth ContentBridges as three.

- When entering the timezone, you can use the Tab key to select a region, and then double-click the Tab key to select from a list of options.

- A ContentBridge 1000B or High Bandwidth ContentBridge in the same subnet as the Harmonic MediaGrid cluster (Public VLAN) can be configured in Active Directory authentication mode with the Configuration Assistant.

**Notes on Active Directory Configuration for ContentBridges:**

If you wish to join a ContentBridge 1000B or High Bandwidth ContentBridge to a Windows 2003 or Windows 2008 Active Directory domain using the configuration assistant, please note the following:
If you wish to join a ContentBridge 1000B to an Active Directory domain, you must do so when configuring the Harmonic MediaGrid system with the configuration assistant. The High Bandwidth ContentBridge can be joined to an Active Directory domain either while configuring the Harmonic MediaGrid system or separately by following the steps in Joining a High Bandwidth ContentBridge to an Active Directory Domain Using the Configuration Assistant or Joining a High Bandwidth ContentBridge to an LDAP Domain.

When completing the configuration assistant, you must join the ContentDirectors to the Active Directory domain in order to join the ContentBridge 1000B or High Bandwidth ContentBridge. User names and passwords are not stored in clear text on the ContentBridge 1000B or High Bandwidth ContentBridge. When a ContentBridge 1000B or High Bandwidth ContentBridge is configured for Active Directory, “CB” mount points that provide access for individual users are NOT supported.

Notes on RAID set and File System Creation

If, for some reason, the RAID set creation utility or file system creation utility times out while attempting to create a RAID set or file system, contact Technical Support for assistance.

Note that the configuration assistant refers to a 2+1 RAID configuration as “Bandwidth Optimized,” and the 6+2 or 5+2 RAID configurations as “Capacity Optimized.”

Once the configuration assistant is complete, continue to the following section to verify startup processes.

Verifying Startup Processes

1. If not already, log on to the ContentDirector using the following credentials:
   - User name: ovnuser
   - Password: OVN@SvCaUsa

2. Type the following at the command prompt:
   ```
   sudo service omcld status
   ```

3. Enter the following password once again: OVN@SvCaUsa

   The processes have started if you see the following:
   ```
   mdsstartup (pid 22950) is running...
   oujfh is stopped
   ousd is stopped
   ssmd is stopped
   mdscore is stopped
   trapmond (pid 22947) is running...
   ```

4. Note that “pid” is a process ID number, which will vary. A few seconds after cluster initialization, the other processes (oujf, ouse, ssmd, mdscore) will start.

5. If the message displayed in the prior step is “mdsstartup is stopped”, type the command below to start the ContentDirector service:
   ```
   sudo service omcld start
   ```

If you did not initialize clusters as part of the configuration assistant, continue to the following section. If you already initialized clusters as part of the configuration assistant, continue to Setting the Harmonic MediaGrid System Time.
Initializing Clusters

**NOTE:** If you already initialized clusters as part of the configuration assistant, continue to Setting the Harmonic MediaGrid System Time.

Complete this procedure for all ContentDirectors.

**IMPORTANT:** The following steps must also be performed after replacing a ContentDirector.

### Initializing Clusters

Once the ContentDirector software is running for the first time, it must be initialized to a cluster. All ContentDirectors in one cluster must have the same Cluster ID. For more information about clusters, see Required Information for a Windows Domain Controller depending on your system.

Perform the following steps on each ContentDirector.

**To initialize the cluster(s):**

1. Make sure you are logged on to the ContentDirector with the following credentials:
   - **User name:** ovnuser
   - **Password:** OVN@SvCaUsa
2. Type the following at the command prompt:
   ```bash
   cd /home/ovnuser/scripts
   ```
3. Start the initialization script with the following command:
   ```bash
   sudo ./initialize
   ```
4. Follow the prompts to initialize the cluster(s).

   Output similar to the following should appear:
   ```plaintext
   Connecting to host "localhost", protocol "tcp", prog 0x20000004
   Initializing the cluster
   The cluster was initialized successfully
   ```

   The cluster ID should now be set on the ContentDirector, and the programs should begin to execute in sequence.

### Verifying Cluster Connectivity

1. Make sure that the ContentServers have been acquired by typing the following:
   ```bash
   sudo /opt/omclid/bin/ssmdiag -s
   ```

   You should output similar to the following:
   ```plaintext
   SSID=0 SN=S00007E6A1.0 MGRAID3000 10.4.252.12 10.4.252.15 GB=253/9264 SC=47229
   SSID=1 SN=J00007E6A2.0 MGRAID3000 10.4.252.13 10.4.252.16 GB=253/9264 SC=47241
   SSID=2 SN=S0000FE6B1.0 MGRAID3000 10.4.252.32 10.4.252.35 GB=253/9264 SC=45606
   SSID=3 SN=J0000FE6B2.0 MGRAID3000 10.4.252.33 10.4.252.36 GB=253/9264 SC=47188
   ```

2. Verify the output, by doing the following:
   a. Verify that the correct number of ContentServers have been discovered.
b. Verify that all the ContentServers have non-empty serial numbers in the SN=0XXXX column.

c. Verify that all the ContentServers have a non-zero pair of IP addresses. If a single IP address is all zeros (0.0.0.0), check the Ethernet connections on that ContentServer.

d. Verify that there are no “x”s in the left-most column of the listing. An x indicates that a ContentServer is not responding and is an error condition. If any ContentServer is marked with an “x”, check the physical connections to the ContentServer and that it is powered on. Reissue the “ssmdiag” command. Contact Technical Support for troubleshooting help if the “x” persists.

e. Verify that all ContentServers have 0GB allocated in the GB=0/XXXX column.

f. Verify that all ContentServers have 0 slices allocated in the SC=0 column.

g. If any ContentServers do not appear to be empty, contact Technical Support for instructions on clearing those ContentServers.

Setting the Harmonic MediaGrid System Time

**NOTE:** The procedure described in this section can only performed after you have run the Configuration Assistant.

Harmonic MediaGrid requires a common time reference for all of its components, which is important for file stamps and log messages. Complete the following process to set the system time and to synchronize the components. This command forces the system time to be set against an external NTP server.

Perform the following steps on each ContentDirector.

**To set Harmonic MediaGrid system time:**

1. Log on to the ContentDirector using the following credentials:
   - User name: ovnuser
   - Password: OVN@SvCaUsa

2. Enter the following at the command prompt:
   ```
   ntpdate -u IP_ADDRESS
   ```
   where **IP_ADDRESS** is the IP address of a valid NTP server (if none is available, the SystemManager).

Creating a Volume and a Group File System

**NOTE:** If you already created a volume and a group file system as part of the configuration assistant, you can continue to **Joining a Harmonic MediaGrid Cluster to a Windows Domain**.

Once the system is installed and configured, create a Volume and then organize the ContentServers into Groups. Use the SystemManager application to create the Volume and Groups. See “Creating or Deleting Volumes” and “Creating or Deleting Groups” in the **Harmonic SystemManager User Guide** for instructions on organizing the ContentServers.

Creating a RAID Set

**NOTE:** If you already created a RAID set as part of the configuration assistant, you can continue to **Joining a Harmonic MediaGrid Cluster to a Windows Domain**.
Use the SystemManager application to create the RAID set. See “MediaGrid RAID Configuration and Maintenance” in the Harmonic SystemManager User Guide for instructions on creating a RAID set.

### Joining a Harmonic MediaGrid Cluster to a Windows Domain

**NOTE:** If you already set up Active Directory authentication as part of the Configuration Assistant, you can continue to verifying ContentServer and ContentDirector Services.

Harmonic MediaGrid supports both Active Directory (AD) and Lightweight Directory Access Protocol (LDAP) for authentication and directory services. Follow the instructions in this section to join Harmonic MediaGrid to a Windows domain.

### Choosing the Best Authentication Method

Consult Table 4–1 to help you choose the best Windows authentication interface.

**Table 4–1: Choosing a Windows Authentication Interface**

<table>
<thead>
<tr>
<th>Authentication Type:</th>
<th>Active Directory (Samba)</th>
<th>Windows Domain or Active Directory Windows 2000 Server (Samba)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primarily for:</strong></td>
<td>Active Directory Windows Servers in simple configurations</td>
<td>Connecting Harmonic MediaGrid to older Windows servers</td>
</tr>
<tr>
<td><strong>Requirements:</strong></td>
<td>Active Directory on Windows Server 2008 and 2003</td>
<td>Windows Domain Controller or Active Directory on Windows Server 2000 only</td>
</tr>
</tbody>
</table>

Once you have decided on an authentication method, choose from the following procedures:

- Configuring for Active Directory
- Configuring for Windows Domain or Active Directory Windows Server 2000 Authentication


For Macintosh client computers, refer to Adding the Harmonic MediaGrid Devices to the Local DNS. For information on joining the Harmonic MediaGrid to Apple Open Directory, refer to Joining a Harmonic MediaGrid Cluster to an Apple Open Directory Domain.

### Configuring for Active Directory

Complete the following procedures to use the standard method of Active Directory authentication.

The Active Directory Domain name must be a Fully Qualified Domain Name (FQDN), which is a domain name containing three or four parts, (for example, “ahost.example.com”).

**NOTE:** The following steps must also be performed after replacing a ContentDirector.

**IMPORTANT:** The entries in this section are case-sensitive. The specific entries are in bold/italic text in the following sections and must be entered as shown, in either UPPERCASE or lowercase letters (using the actual names) to successfully join a Windows domain.
Before You Begin

You will need the following information before beginning:

- The ACTIVE_DIRECTORY_DOMAIN_NAME from the facility’s network domain administrator.
- The WINDOWS_NT_DOMAIN_NAME. This may often be the first word of the ACTIVE_DIRECTORY_DOMAIN_NAME.
- The IP address and the name of the Windows Active Directory controller machine. Replace the name in the steps below where you see “windows_domain_controller_name”.
- The Administrator account password on the Active Directory controller.

Note that a Windows Active Directory controller is also called a Windows Domain Controller.

NOTE: The following sections provide instructions for supporting one or more domain controllers. Entries for adding a secondary domain controller are identified as “optional.” Only complete the optional steps if you are adding a secondary domain controller. The optional entries can be added at any time (before or after the ContentDirector has joined the domain).

Creating a Kerberos Configuration File

1. From your SSH terminal, remove /etc/krb5.conf by entering the following command:
   ```bash
   sudo rm -f /etc/krb5.conf
   ```
2. Create a new file using the same file name (“krb5.conf”) and then add the following entries:
   ```ini
   [libdefaults]
   default_realm = ACTIVE_DIRECTORY_DOMAIN_NAME
   [realms]
   ACTIVE_DIRECTORY_DOMAIN_NAME = {
   kdc = windows_domain_controller_name.active_directory_domain_name
   kdc = secondary_domain_controller_name.active_directory_domain_name (optional)
   }
   [domain_realm]
   .kerberos.server = ACTIVE_DIRECTORY_DOMAIN_NAME
   ```

   NOTE: The ACTIVE_DIRECTORY_DOMAIN_NAME must be written in UPPERCASE letters.

Adding the Domain Controller Address

1. From your SSH terminal, edit /etc/hosts using the following command:
   ```bash
   sudo vi /etc/hosts
   ```
2. Add a line at the end to specify the Windows Active Directory controller’s IP address. Use the following format:
   ```plaintext
   IP address
   windows_domain_controller_name.active_directory_domain_name
   windows_domain_controller_name
   ```
3. Replace the IP address with the correct IP address of the Windows Active Directory controller.
   An example would look like the following:
   ```plaintext
   10.30.1.25 pdc1.facility2.company.tv pdc1
   10.30.1.26 pdc2.facility2.company.tv pdc2 (optional)
   ```
In this example the **windows domain controller name** is pdc1, and the **active directory domain name** is facility2.company.tv. The **secondary domain controller name** is pdc2.

**Adding a Workgroup and Realm Entry**

Workgroup and realm entries are needed to specify the Windows NT Domain name and the active Directory Domain name in the smb.conf file.

For example, if the Windows NT domain name is *Harmonic.local*, then the realm is *Harmonic*.

**To add a workgroup and realm entry:**

1. From your SSH terminal, edit `/etc/samba/smb.conf` using the following command:
   ```
   sudo vi /etc/samba/smb.conf
   ```
2. Change the default configuration values as follows:
   ```
   # Global parameters
   [global]
   workgroup = WINDOWS_NT_DOMAIN_NAME
   realm = ACTIVE_DIRECTORY_DOMAIN_NAME
   security = ADS
   password server =
   windows_domain_controller_name.active_directory_domain_name
   secondary_domain_controller_name.active_directory_domain_name
   (optional)
   encrypt passwords = yes
   preferred master = no
   server string = Omneon Content Director
   ```
3. Run the **testparm** test program (which verifies the correctness of the smb.conf file) once you have completed the entries. Type the following to run the testparm program:

   ```
   sudo testparm
   ```

   Notifications are returned if any errors are found.

**Joining a Windows Domain**

1. Type the following command to join the domain:
   ```
   sudo net ads join -U Administrator -S windows_domain_controller_name
   ```
   The command will ask for a password.

2. Enter the password for the Administrator user on the Windows Active Directory server. The following message displays if the password is accepted and the configuration files are correct:
   ```
   Joined 'CLD' to realm 'active_directory_domain_name'
   ```

**Starting the Winbind Service**

Complete the following at the command prompt to activate the winbind service, which enables ContentDirector and Active Directory communication.

**To start winbind:**

1. Type the following to start the service:
   ```
   sudo service winbind start
   ```

2. Then type the following so that the service starts each time the ContentDirectors start up:
   ```
   sudo chkconfig winbind on
   ```
Verifying Communication with the Domain Controller

1. After confirming that the winbind service is running, verify the connection and communication with the Domain Controller by typing the following:
   
   ```bash
   sudo wbinfo -u | less
   ```
   
   A list of users in the domain displays after a few seconds, for example:
   
   ```bash
   [ovnuser@clld-1 ~]$ sudo wbinfo -u | less
   SNV-ENG\eng-sysadmin
   SNV-ENG\guest
   SNV-ENG\support_388945a0
   SNV-ENG\snv-eng-dc1$
   SNV-ENG\krbtgt
   SNV-ENG\admin
   SNV-ENG\snv-eng-dc2$
   SNV-ENG\qa1
   SNV-ENG\qa2
   SNV-ENG\qa3
   SNV-ENG\qa4
   ```

2. Once this is verified, restart the `omcld` service so it can pick up the new domain configuration by typing the following:

   ```bash
   sudo service omcld restart
   ```

Configuring for Windows Domain or Active Directory Windows Server 2000 Authentication

Before You Begin

In addition to the following, refer to *Required Information for a Windows Domain Controller* for a complete list of expected customer-provided information to join Harmonic MediaGrid to a Windows domain.

You will need the following before beginning:

- Administrator privileges to complete the following steps. Contact the system administrator for site-specific information, including user names, domain names and passwords.
- The “Windows NT domain name” from the facility’s network domain administrator.
- The name of the Windows domain controller. Use it below in place of “domain controller name”.

The site-specific entries in the following procedures are shown in bold-italic text. The following steps must be performed on each ContentDirector.

Connecting to the ContentDirector

Use an SSH client, such as PuTTY, to connect to each ContentDirector.

To connect to the ContentDirector:

1. Start the SSH client.
2. In the **Host Name** box, enter the host name of the ContentDirector.
3. Select a login protocol from the protocol buttons. Select SSH for the login session.
4. Click the **Open** button to connect to the ContentDirector.

**Editing the Samba Configuration File**

**NOTE:** The following procedure is only required if you are joining a Windows NT domain.

To edit the file:
1. From your SSH terminal, open the following file using `vi` text editor:
   
   ```bash
   sudo vi /etc/samba/smb.conf
   ```

2. Make the following changes:
   
   ```
   - workgroup = Windows_NT_domain_name
   - password server = domain_controller_name
   - security = DOMAIN
   ```

3. Enter the following to join the Windows domain:
   
   ```bash
   sudo net rpc join --workgroup=Windows_NT_domain_name --server=domain_controller_name --user=_adminuser_
   ```

   You should see the following message:
   
   ```bash
   Joined domain name_of_domain.
   ```

4. Type the following two lines to complete the installation:
   
   ```bash
   sudo chkconfig winbind on
   sudo service winbind start
   ```

**Starting the Winbind Service**

Complete the following at the command prompt to activate the winbind service, which enables ContentDirector and Active Directory communication.

1. Type the following to start the service:
   
   ```bash
   sudo service winbind start
   ```

2. Then type the following so that the service starts each time the ContentDirectors start up:
   
   ```bash
   sudo chkconfig winbind on
   ```

**NOTE:** SystemManager provides winbind status (running or not) on the **ContentDirector Properties** page. See the *Harmonic SystemManager User Guide* for details.

**Verifying Communication with the Domain Controller**

1. After confirming that the winbind service is running, verify the connection and communication with the Domain Controller by typing the following:
   
   ```bash
   sudo wbinfo -u | less
   ```

   A list of users in the domain displays after a few seconds, for example:
   
   ```bash
   [ovnuser@cll-1 ~]$ sudo wbinfo -u | less
   SNV-ENG\eng-sysadmin
   SNV-ENG\guest
   SNV-ENG\support_388945a0
   SNV-ENG\snv-eng-dc1$
   SNV-ENG\krbtgt
   ```
SNV-ENG\admin
SNV-ENG\snv-eng-dc2$
SNV-ENG\qa1
SNV-ENG\qa2
SNV-ENG\qa3
SNV-ENG\qa4

2. Once this is verified, restart the `omcld` service so it can pick up the new domain configuration by typing the following:
   ```
sudo service omcld restart
   ```

**About Joining a High Bandwidth ContentBridge to an Active Directory Domain**

There are different methods for joining a ContentBridge 1000B or High Bandwidth ContentBridge to an Active Directory Domain. One method involves the configuration assistant and the other involves manually modifying configuration files. Choose from the following:

- **Joining a High Bandwidth ContentBridge to an Active Directory Domain Using the Configuration Assistant**
- **Joining a High Bandwidth ContentBridge to an Active Directory Domain Using the Manual Method**
- **Joining a ContentBridge 1000B to an Active Directory Domain Using the Manual Method**

**Joining a High Bandwidth ContentBridge to an Active Directory Domain Using the Configuration Assistant**

A High Bandwidth ContentBridge can be added to an Active Directory domain for Windows 2003 or Windows 2008. To add a single High Bandwidth ContentBridge to an Active Directory domain, run the configuration assistant in manual mode, which allows you to configure the ContentBridge without affecting other devices, and enter the necessary Active Directory domain information.

**NOTE:** When the High Bandwidth ContentBridge is configured for Active Directory, “CB” mount points that provide access for individual users are NOT supported and will need to be removed from the ContentBridge configuration file. Make sure to perform step 8 in the following procedure to remove those “CB” entries.

**Before you begin:**

- Make sure you have reviewed the *Harmonic MediaGrid Installation Planning Guide* and have a completed copy of the configuration worksheet included in that document on hand.
- Make sure you have a USB drive on hand.
- Make sure you have the following Active Directory information:
  - The Active Directory “realm” for this Harmonic MediaGrid system
  - The Active Directory “workgroup” for this Harmonic MediaGrid
  - The “hostname” for the Active Directory server
  - The Active Directory Server’s FQDN (Fully Qualified Domain Name)
  - The IP address for the Active Directory server
  - The user name and password for a valid user account with administrative privileges

**CAUTION:** Entering incorrect information in the Configuration Assistant could result in a loss of connection to the High Bandwidth ContentBridge. For assistance, contact Technical Support.
To add a High Bandwidth ContentBridge to an Active Directory Domain:

1. Connect a monitor and keyboard to the High Bandwidth ContentBridge you wish to add to the Active Directory domain.
2. Log on to the ContentBridge using the following user name and password:
   User name: ovnuser
   Password: OVN@SvCaUsa
3. Type the following command to set the FIRSTBOOT mode on the ContentBridge:
   
   ```
   sudo initconfig --setflag
   ```

   **NOTE:** In some cases, running this command can result in the following message:

   ```
   [root@hbcb1-1 ~]# initconfig --setflag
   Setting Firstboot flags (local)
   sh: /tftpboot/config/FIRSTBOOT: No such file or directory
   ```

   This message can be ignored. If you wish to verify that FIRSTBOOT mode was set, you can check that the following files are now available on the ContentBridge:

   ```
   /tmp/FIRSTBOOT
   /omneon/sharedsys/FIRSTBOOT
   ```

4. Type the following commands to run the configuration assistant:

   ```
   cd /home/ovnuser/scripts
   sudo ./autoconfig -m
   ```

   The configuration script asks a series of questions requiring information specific to the customer site. Use the information from the Harmonic MediaGrid Installation Planning Guide to complete the answers. Note that the assistant will display suggested responses in brackets. During the assistant, you can use the up or down arrow keys to tab to previous responses.

5. When prompted by the configuration assistant, insert a USB drive. The configuration assistant automatically copies the configuration information to the USB drive.

6. Type the following command to copy the configuration information to this High Bandwidth ContentBridge:

   ```
   sudo ./copyconfigs -m
   ```

7. When prompted to enter the ID of the ContentBridge in the specified range, select 0 as the ID.

8. Once copying is complete, remove the USB drive from the ContentBridge.

9. Type the following command to remove the ContentBridge from the FIRSTBOOT mode:

   ```
   sudo initconfig --rmflag
   ```

10. Type the following commands to join this High Bandwidth ContentBridge to the Active Directory domain and restart services:

    ```
    sudo service gateway stop
    sudo net ads join -U <administrator_username>%<administrator_password> -S <ActiveDirectory server FQDN> -
    sudo service gateway start
    ```

11. If you wish to add additional High Bandwidth ContentBridges to the Active Directory domain at this point, repeat the following steps on each additional High Bandwidth ContentBridge:

   **NOTE:** The total number of High Bandwidth ContentBridges selected for configuration must match the total number of ContentBridges selected when running the Configuration Assistant in step 4 above.
a. Insert the USB drive that contains the configuration information.
b. Log on to the ContentBridge using the credentials used in step 2 above.
c. Type: `sudo initconfig --setflag`
d. Type: `sudo ./copyconfigs -m`
e. Select the ID(s), starting from 1, in increasing order for each additional High Bandwidth ContentBridge.
f. Type: `sudo initconfig --rmflag`
g. Perform the commands in step 10 above to join the ContentBridge to the Active Directory domain and restart services.

12. As a final step, for each ContentBridge, you must remove any “CB” entries that provide access to individual users from the `/etc/gateway.conf` and `etc/passwd` files.
   a. Open `/etc/gateway.conf` and delete entries for individual users beginning with “CB”
   b. Open `etc/passwd` and delete entries for the same individual users (the entries do not contain “CB” in this file).
   c. Restart gateway services by running the following command: `sudo service gateway restart`

**NOTE:** In order to access the Harmonic MediaGrid, the individual users must be added to the Active Directory domain.

### About Changes to the Default Mount Point

When you configure the ContentBridge for Active Directory, the configuration assistant adds the following line:

```
NATIVE <Cluster IP or DNS name> <file system name>
```

For example:
```
NATIVE 10.4.102.200 testfs
```

This mount point can be modified directly in the configuration file. However, note that the cluster used in the NATIVE line must be configured to authenticate against the same Active Directory domain as the ContentBridge. For instructions on editing the configuration file, refer to “Editing the High Bandwidth ContentBridge Configuration File” in the Harmonic SystemManager User Guide.

### Verifying Communication with the Domain Controller

1. Use `wbinfo` to do a domain user lookup using the following command. This example shows a High Bandwidth ContentBridge with hostname `hbcb205` for test user `lqa1`:
   `[root@hbcb205 ~]# service winbind start
   [root@hbcb205 ~]# wbinfo -n lqa1
   [root@hbcb205 ~]# service winbind stop`  

   The expected result is:
   ```
   S-1-5-21-3782130030-2455357663-1162092550-2004 User (1)
   ```
   
   **NOTE:** Make sure that winbind service is stopped after testing connectivity with the domain server. If you do not stop the winbind service on the High Bandwidth ContentBridge, it will interfere with authentication when you attempt to access the Harmonic MediaGrid using CIFS.

2. If the High Bandwidth ContentBridge configuration file contains a valid NATIVE line and the Harmonic MediaGrid is mounted on the High Bandwidth ContentBridge, use `smbclient` on the High Bandwidth ContentBridge to connect to the local CIFS share.
The syntax for the `smbclient` command is

```
smbclient -U <username> -W <domain_name> \\localhost\<MediaGrid File System Name>
```

For example, for a High Bandwidth ContentBridge with hostname `hbcb205`:

```
[root@hbcb205 ~]# smbclient -U lqa2 -W SNV-ENG \\
```

The expected result is:

```
smb: >
```

At the prompt, you will be able to list the file system, and perform other operations.

NOTE: Make sure the Harmonic MediaGrid cluster is also configured with Active Directory.

NOTE: In order to access the Harmonic MediaGrid, the individual users must be added to the Active Directory domain.

Joining a High Bandwidth ContentBridge to an Active Directory Domain

Using the Manual Method

Follow the procedures in this section in order.

Configure Samba Settings on the High Bandwidth ContentBridge

To configure Samba settings:

1. Connect a monitor and keyboard to the High Bandwidth ContentBridge you wish to add to the Active Directory domain.
2. Log on to the High Bandwidth ContentBridge using the following user name and password:
   
   **User name:** ovnuser  
   **Password:** OVN@SvCaUsa

3. Type the following command to stop the smb service:
   ```
   sudo service smb stop
   ```
4. Update the following configuration file:
   ```
   /opt/omclb/conf/smb.conf
   ```
   Note the following settings:
   ```
   security = ADS  
   workgroup = <AD Workgroup>  
   realm = <AD Realm>  
   password server = <ADS Domain Controller FQDN>  
   add user script = /opt/omutils/bin/omadduser %u  
   winbind use default domain = no
   ```
   a. Replace `<AD Workgroup>` with the name of the ActiveDirectory Workgroup.
   b. Replace `<AD Realm>` with the name of the ActiveDirectory Realm.
   c. Replace `<ADS Domain Controller FQDN>` with the Fully Qualified Domain Name of the ActiveDirectory server.

5. Copy `/opt/omclb/conf/smb.conf` to `/etc/samba/smb.conf`.
6. Update the following configuration file: `/etc/krb5.conf`

   ```
   [libdefaults]  
   default_realm = <AD Realm in UPPERCASE>
   ```
Joining a Harmonic MediaGrid Cluster to a Windows Domain

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Joining a Harmonic MediaGrid Cluster to a Windows Domain

[realms]
<AD Realm in UPPERCASE> = {
  kdc = <ADS Domain Controller FQDN>
}

.kerberos_server = <AD Realm in UPPERCASE>

a. Replace instances of <AD Realm in UPPERCASE> with the name of the ActiveDirectory Realm in all uppercase letters.
b. Replace instance <ADS Domain Controller FQDN> with the Fully Qualified Domain Name of the ActiveDirectory server.

Join the High Bandwidth ContentBridge to the Active Directory Domain

1. Make sure you are logged on to the High Bandwidth ContentBridge, and then enter the following command:
   
   sudo net ads join -U<AD_Admin>%<password> -S <ADS_Domain_Controller_FQDN>

   NOTE: Upon joining the AD domain, the Samba server creates a local temporary database on the High Bandwidth ContentBridge at: /var/lib/samba/private/secrets.tdb.

2. As a final step, you must remove any “CB” entries that provide access to individual users from the /etc/gateway.conf and /etc/passwd files.
   a. Open /etc/gateway.conf and delete entries for individual users beginning with “CB.”
   b. Open /etc/passwd and delete entries for the same individual users (the entries do not contain “CB” in this file).

   NOTE: In order to access the Harmonic MediaGrid, the individual users must be added to the Active Directory domain.

3. Restart the gateway service. For example, for a High Bandwidth ContentBridge with hostname hbcb205:
   
   sudo service gateway restart

About Changes to the Default Mount Point

When you configure the High Bandwidth ContentBridge for Active Directory, the following line is added to the configuration file:

   NATIVE <Cluster IP or DNS name> <file system name>

For example:

   NATIVE 10.4.102.200 testfs

This mount point can be modified directly in the configuration file. However, note that the cluster used in the NATIVE line must be configured to authenticate against the same Active Directory domain as the ContentBridge. For instructions on editing the configuration file, refer to “Editing the High Bandwidth ContentBridge Configuration File” in the Harmonic SystemManager User Guide.

Verify Communication with the Domain Controller

Follow the steps described in Verifying Communication with the Domain Controller.
NOTE: Make sure the Harmonic MediaGrid cluster is also configured with Active Directory.

NOTE: In order to access the Harmonic MediaGrid, the individual users must be added to the Active Directory domain.

Joining a ContentBridge 1000B to an Active Directory Domain Using the Manual Method

NOTE: Configuring different ContentBridges in a Harmonic MediaGrid cluster with different directory access authentication protocols (for example, ADS, LDAP, and OpenDirectory) is not supported. The following set of steps will reset the authentication mechanism for all ContentBridges in the cluster.

Configure Samba Settings for the ContentBridge 1000B

1. Log on to the first ContentDirector in your system using the following user name and password:
   User name: ovnuser
   Password: OVN@SvCaUsa
2. Remove samba private files stored on the ContentDirector with the following command:
   ```bash
   sudo rm -f /tftpboot/config/gateway/secrets/*
   ```
3. Generate the file, `/tftpboot/config/gateway/smb.conf`, as shown in Figure 4–2.
Joining a Harmonic MediaGrid Cluster to a Windows Domain

Figure 4-2: Sample smb.conf file

This is the main Samba configuration file. You should read the
# smb.conf(5) manual page in order to understand the
# options listed
# here. Samba has a huge number of configurable options
# (perhaps too
# many!) most of which are not shown in this example
#
# Any line which starts with a ; (semi-colon) or a # (hash)
# is a comment and is ignored. In this example we will use
# a #
# for commentry and a ; for parts of the config file that
# you
# may wish to enable
#
# NOTE: Whenever you modify this file you should run the
# command "testparm"
# to check that you have not made any basic syntactic
# errors.
#
#======================= Global Settings==================
[global]
  log file = /var/log/samba/%m.log
  max log size = 50
  socket options = TCP_NODELAY SO_SNDBUF=32768
  SO_RCVBUF=32768
  server string = Omneon Content Bridge Samba Server
  security = user
  encrypt passwords = yes
  preferred master = no
  local master = no
  domain master = no
  printcap name = /etc/printcap
  load printers = no
  printing =

Modify the file as follows:

security = ADS
workgroup = <AD Workgroup>
realm = <AD Realm>
password server = <ADS Domain Controller FQDN>
add user script = /opt/omutils/bin/omadduser %u
winbind use default domain = no

a. Replace <AD Workgroup> with the name of the ActiveDirectory Workgroup.
b. Replace <AD Realm> with the name of the ActiveDirectory Realm.
c. Replace <ADS Domain Controller FQDN> with the Fully Qualified Domain Name of the ActiveDirectory server.

4. Generate the file, /tftpboot/config/gateway/krb5.conf, as shown in Figure 4–3.

```plaintext
[logging]
default = FILE:/var/log/krb5libs.log
dc = FILE:/var/log/krb5kdc.log
dc = FILE:/var/log/kadmind.log

[libdefaults]
default_realm = EXAMPLE.COM
dns_lookup_realm = false
dns_lookup_kdc = false
ticket_lifetime = 24h
forwardable = yes

[realms]
EXAMPLE.COM = {
    kdc = kerberos.example.com:88
    admin_server = kerberos.example.com:749
    default_domain = example.com
}

[domain_realm]
.example.com = EXAMPLE.COM
test.com = EXAMPLE.COM

[kdc]
profile = /var/kerberos/krb5kdc/kdc.conf

[appdefaults]
pam = {
    debug = false
    ticket_lifetime = 36000
    renew_lifetime = 36000
    forwardable = true
    krb4_convert = false
}
```

Figure 4–3: Sample krb5.conf file

Modify the file as follows:

```plaintext
[libdefaults]
default_realm = <AD Realm in UPPERCASE>

[realms]
<AD Realm in UPPERCASE> = {
    kdc = <ADS Domain Controller FQDN>
}
Joining a Harmonic MediaGrid Cluster to a Windows Domain

1. Log on to the ContentBridge 1000B using the following user name and password:
   
   User name: root
   Password: omneon

2. Stop smb service
   
   service smb stop

3. Remove samba private files on the ContentBridge 1000B:
   
   rm -f /var/lib/samba/private/*

4. Copy Samba configuration files from the ContentDirector generated in steps 3 and 4 in subsection above. You may be required to enter “sudo” when copying files over.
   
   a. Copy /tftpboot/config/gateway/smb.conf from the ContentDirector to /etc/samba/smb.conf on the ContentBridge.
   
   b. Copy /tftpboot/config/gateway/krb5.conf from the ContentDirector to /etc/krb5.conf on the ContentBridge.

5. Run the following command:
   
   net ads join -U<AD_Admin>%<password> -S <ADS_Domain_Controller_FQDN>

   NOTE: Upon joining the AD domain, the Samba server creates a local temporary database on the ContentBridge 1000B at: /var/lib/samba/private/secrets.tdb.

6. Remove any “CB” entries that provide access to individual users from the /etc/passwd file locally on the ContentBridge 1000B and <CLBHOSTNAME> file under /tftpboot/config/gateway on all ContentDirectors.

   Open /etc/passwd and delete entries for the same individual users (the entries do not contain “CB” in this file).

   NOTE: In order to access the Harmonic MediaGrid, the individual users must be added to the Active Directory domain.

7. Add the following line to the ContentBridge 1000B configuration file:
   
   NATIVE <Cluster IP or DNS name> <file system name>

   This can be done via SystemManager or by editing /tftpboot/config/gateway/<hostname> manually on ALL ContentDirectors (replace <hostname> with the hostname of the ContentBridge 1000B).

8. Restart the gateway service:
   
   service gateway restart

9. Repeat steps 1-8 for all remaining ContentBridges in the Harmonic MediaGrid cluster.
Verify Communication with the Domain Controller

Follow the steps described in *Verifying Communication with the Domain Controller*.

Adding the Harmonic MediaGrid Devices to the Local DNS

An entry for each of the Harmonic MediaGrid devices below must be added to the customer’s DNS for client access of the Harmonic MediaGrid system. This will result in the DNS providing a round-robin allocation of the IP addresses when requested.

Contact the customer network administrator to complete these procedures.

The following entries must be added to the local DNS:

- The **ContentDirector** names as well as the IP addresses of each *public* interface.
- The **ContentBridge** (if present in the system) name and IP address.
- The **SystemManager** name and IP address.
- The Harmonic MediaGrid name, which should be associated with the public IP addresses of all the ContentDirectors. This name is distinct from the individual names of the ContentDirectors.

The ContentDirectors work together in a manner similar to a cluster. Because of this clustering type of operation, clients can connect to any of the ContentDirectors. In order for this to happen, the customer’s DNS must have the IP addresses of each of the ContentDirectors added (with the same name). These address records (type A) should have a low TTL value (60 second range) due to caching considerations.

Note that each ContentDirector has two ports for client access, which means that there will be two address entries in the DNS for each ContentDirector. Since the DNS uses a cyclic round robin allocation technique, the address records should be in the DNS in the following order:

<table>
<thead>
<tr>
<th>Harmonic MediaGrid name</th>
<th>ContentDirector 1 name port 1 IP address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harmonic MediaGrid name</td>
<td>ContentDirector 2 name port 1 IP address</td>
</tr>
<tr>
<td>Harmonic MediaGrid name</td>
<td>ContentDirector 3 name port 1 IP address</td>
</tr>
<tr>
<td>Harmonic MediaGrid name</td>
<td>ContentDirector 1 name port 2 IP address</td>
</tr>
<tr>
<td>Harmonic MediaGrid name</td>
<td>ContentDirector 2 name port 2 IP address</td>
</tr>
<tr>
<td>Harmonic MediaGrid name</td>
<td>ContentDirector 3 name port 2 IP address</td>
</tr>
<tr>
<td>And so on for any additional ContentDirectors</td>
<td></td>
</tr>
<tr>
<td>ContentBridge 2 name port 1 IP address</td>
<td></td>
</tr>
<tr>
<td>ContentBridge 1 name port 2 IP address</td>
<td></td>
</tr>
<tr>
<td>ContentBridge 2 name port 2 IP address</td>
<td></td>
</tr>
<tr>
<td>And so on for any additional ContentBridges</td>
<td></td>
</tr>
<tr>
<td>SystemManager name IP address</td>
<td></td>
</tr>
</tbody>
</table>

It is also recommended that every DNS entry have a reverse DNS entry. The entries above associate an IP address with its host name (forward DNS entry). A reverse entry allows the identification of a host name from an IP address.
You can use the `nslookup` command to find an IP address associated with a host name, for example:

```
$ nslookup contentdirector-3
Server: mediagrid-3.company.local
Addresses: 10.30.3.200, 10.30.7.200
```

Refer to *Setting up Reverse DNS Lookups* to add reverse DNS entries.

### Setting up Reverse DNS Lookups

Follow these steps to configure reverse DNS entries for Harmonic MediaGrid devices on a Microsoft Windows-based DNS server. For other types of DNS servers, consult the appropriate documentation or Network Administrator to set up reverse DNS entries.

These instructions are an overview of setting up reverse DNS lookups. Refer to the appropriate Windows documentation for complete instructions.

**NOTE:** The following instructions apply only to a simple DNS/network configuration in which there is a single DNS server.

**To set up reverse DNS lookups:**

1. Log in to the console of your Microsoft Windows DNS computer. From the Manage Your Server window, click *Manage this DNS server*.
2. In the left panel of the DNS management window, click the *Reverse Lookup Zones* folder that is associated with the DNS server. There may already be reverse zones defined for the DNS server.
3. Right-click to select the *Reverse Lookup Zones* folder and then select *New Zone* from the menu. The New Zone Wizard displays.
4. Start the New Zone Wizard.
5. Select *Primary zone* as the Zone Type from the list of options.
6. On the Active Directory Zone Replication Scope screen, select the option *To all DNS servers in the Active Directory domain [YOUR DOMAIN].*
7. On the Reverse Lookup Zone Name screen, select the *Network ID* option and then enter the Harmonic MediaGrid subnet.
8. On the Dynamic Update screen, select the option *Allow both non-secure and secure dynamic updates.*
9. Finish the new Zone Wizard.
10. Display again the DNS management window and then expand the *Reverse Lookup Zones* folder to see the sub-entries. Verify that the newly created reverse zone is shown.

Repeat the steps above on each Harmonic MediaGrid subnet.

### Joining a Harmonic MediaGrid Cluster to a Lightweight Directory Access Protocol (LDAP) Domain

In addition to supporting Active Directory Services (ADS), Harmonic MediaGrid supports Lightweight Directory Access Protocol (LDAP). The LDAP protocol manages authentication when querying and modifying directory services running over TCP/IP.
It is not recommended that you switch between ADS and LDAP once an authentication method is chosen. Doing so requires resetting all Access Control Lists (ACLs), as the Security Identifiers (SIDs) differ between the two methods. Refer to Choosing the Best Authentication Method for information about authentication using Active Directory Services.

For information on joining a ContentBridge 1000B or High Bandwidth ContentBridge to an LDAP domain, refer to one of the following:

- Joining a High Bandwidth ContentBridge to an LDAP Domain.
- Joining a ContentBridge 1000B to an LDAP Domain

**IMPORTANT:** You must be familiar with setting up LDAP clients to complete these steps.

### Editing the LDAP Configuration File

A configuration file is present on the ContentDirectors, which can be edited to set up LDAP authentication. Complete the steps below to set up LDAP.

**NOTE:** You may also use the preferred Linux LDAP client configuration method prescribed by your Linux system administrator to set up LDAP.

To edit the file:

1. Open the `/etc/ldap.conf` file on both the primary and secondary ContentDirectors and edit the following lines:
   - a. Specify the LDAP server by changing “host 127.0.0.1” to the Fully Qualified Domain Name (FQDN) of the customer LDAP server, for example:
     ```
     ahost.example.com
     ```
   - Another way to specify the LDAP server is to provide a Uniform Resource Identifier (URI) with the server name. For example:
     ```
     uri ldap://example-ldap/
     ```
   - b. Change the entry “base dc=example,dc=com” to the distinguished name of the search base, which is the name that uniquely identifies an entry in the directory.
   - c. Edit the line “pam_password md5” to add the password encryption function crypt.
     - For Windows, edit as follows: `pam_password crypt`
     - For Apple Open Directory, edit as follows: `pam_password exop`

2. Save and close the `/etc/ldap.conf` file.

3. Open the `/omneon/config/mdscore-local` file on both the primary and secondary ContentDirectors and add the following line to the file to set the authentication method:

   ```
   auth_method = pam
   ```

4. Create a symbolic link between the two LDAP configuration files as follows:
   ```
   mv /etc/openldap/ldap.conf /etc/openldap/ldap.conf.old
   ln -s /etc/ldap.conf /etc/openldap/ldap.conf
   ```

5. Type the following to test the configuration:

   ```
   id admin
   ```
   where “admin” is a user who is only in ldap and not in the local `/etc/passwd` file.

   You should see the following if the configuration is set up properly:

   ```
   uid=5001(admin) gid=5001(admin) groups=5001(admin)
   ```
If you see the following output, LDAP is not configured properly, and you must trace the problem:

id: admin: No such user

6. Restart the omcld service by typing the following:

   service omcld restart

**Tracing an LDAP Problem**

Use the following procedure to look for the problem.

To trace an LDAP problem:
1. Check the LDAP entries to ensure that all information is entered correctly.
2. Check the LDAP error logs for any hints.
3. Compare the entries to a current database entry.
4. Check the UIDs and GIDs of the LDAP entries. These IDs must be greater than 500 for the ContentDirectors to recognize users and groups in the LDAP database.
5. Verify that the following attributes are present for users:
   - inetorgperson
   - posixAccount
6. Verify that the following attribute is present for groups:
   - posixgroup

**Joining a High Bandwidth ContentBridge to an LDAP Domain**

Follow the procedures in this section in order.

**NOTE:** In order to join a High Bandwidth ContentBridge to an LDAP domain, an LDAP or Open Directory server must already be configured to serve as Samba Primary Domain Controller for the LDAP or Open Directory domain.

**NOTE:** It is not recommended that you switch between ActiveDirectory and LDAP once an authentication method is chosen. Before continuing, make sure the High Bandwidth ContentBridge is not configured for ActiveDirectory.

**Creating a ContentBridge Account on the LDAP Server**

**NOTE:** This procedure is required for joining a High Bandwidth ContentBridge to an LDAP domain.

1. On the LDAP server, login as root.
2. Check whether the ContentBridge account with the hostname of the ContentBridge exists. For example, for a High Bandwidth ContentBridge with a hostname of hbc205:

   [root@eng-ldap ~]# /var/lib/samba/sbin/smbldap-usershow hbc205$
   user hbc205$ doesn't exist

**NOTE:** Make sure to add "$" at the end of the ContentBridge hostname.

3. Create a local user account with the host name of the ContentBridge. For example, for a High Bandwidth ContentBridge with hostname hbc205:

   [root@eng-ldap ~]# adduser hbc205
4. Create a Samba machine account with the hostname of the ContentBridge. You will need to provide the password for the user. For example, for a High Bandwidth ContentBridge with hostname hbcb205:

   [root@eng-ldap ~]# /var/lib/samba/sbin/smbldap-useradd -w -i hbcb205

5. Check if the account is created. For example, for a High Bandwidth ContentBridge with hostname hbcb205:

   [root@eng-ldap ~]# /var/lib/samba/sbin/smbldap-usershow hbcb205

\[NOTE:\] Configuring different ContentBridges in a Harmonic MediaGrid cluster with different directory access authentication protocols (for example, ADS, LDAP, and OpenDirectory) is not supported. The following set of steps will reset the authentication mechanism for all ContentBridges in the cluster.

### Configuring Samba Settings on the High Bandwidth ContentBridge

1. Connect a monitor and keyboard to the High Bandwidth ContentBridge.
2. Log on to the High Bandwidth ContentBridge using the following user name and password:

   User name: ovnuser
   Password: OVN@SvCaUsa

3. Stop smb service. For example, for a High Bandwidth ContentBridge with hostname hbcb205:

   [root@hbcb205 ~]# service smb stop

4. Update the following configuration file: `/opt/omclb/conf/smb.conf`

   Note the following settings:
   
   - `security = DOMAIN`
   - `workgroup = <domain_name>`
   - `password server = <ldap_FQDN>`
   - `add user script = /opt/omutils/bin/omadduser %u`

   a. Replace `domain_name` with the LDAP domain using the distinguished name of the search base in the LDAP server configuration, which is the name that uniquely identifies an entry in the directory.

   b. Replace `ldap_FQDN` with the Fully Qualified Domain Name of the LDAP server.

5. Copy `/opt/omclb/conf/smb.conf` to `/etc/samba/smb.conf`.

### Joining the High Bandwidth ContentBridge to the LDAP Domain

1. Make sure you are logged in to the High Bandwidth ContentBridge, and then enter the following command:

   net rpc join -U<ldap_admin>%<ldap_admin_password> -S <ldap_FQDN>

   The following example shows the expected result:

   Joined domain SNV-ENG.
   [root@hbcb205 ~]#
4. Add an entry for the LDAP server to `/etc/hosts` on the High Bandwidth ContentBridge. For example:

```
10.4.224.100   OmneonServer omneonserver.opendir.local
```

**Verifying Communication with the Domain Controller**

Follow the steps described in *Verifying Communication with the Domain Controller*.

**NOTE:** Make sure the Harmonic MediaGrid cluster is also configured with LDAP.

**NOTE:** In order to access the Harmonic MediaGrid, the individual users must be added to the LDAP domain.

### Joining a ContentBridge 1000B to an LDAP Domain

Follow the procedures in this section in order.

**NOTE:** In order to join a ContentBridge 1000B to an LDAP domain, an LDAP or Open Directory server must already be configured to serve as Samba Primary Domain Controller for the LDAP or Open Directory domain.

**NOTE:** It is not recommended that you switch between ActiveDirectory and LDAP once an authentication method is chosen. Before continuing, make sure the ContentBridge 1000B is not configured for ActiveDirectory.

**Creating a ContentBridge Account on the LDAP Server**

Follow the steps in *Creating a ContentBridge Account on the LDAP Server* in the previous section.

**NOTE:** This procedure is required for joining a ContentBridge 1000B to an LDAP domain.

**Configuring Samba Settings for the ContentBridge 1000B**

1. Log on to the first ContentDirector in your system using the following user name and password:

   - **User name:** ovnuser
   - **Password:** OVN@SvCaUsa

2. Remove samba private files stored on the ContentDirector with the following command:

   ```
   sudo rm -f /tftpboot/config/gateway/secrets/*
   ```

3. Generate the file, `/tftpboot/config/gateway/smb.conf`, as shown in *Figure 4–2*.

   Modify the file as follows:

   ```
   security = DOMAIN
   workgroup = <domain_name>
   password server = <ldap_FQDN>
   add user script = /opt/omutils/bin/omadduser %u
   ```

   a. Replace domain_name with the LDAP domain using the distinguished name of the search base in the LDAP server configuration, which is the name that uniquely identifies an entry in the directory.
b. Replace ldap_FQDN with the Fully Qualified Domain Name of the LDAP server.

4. Repeat steps 1-3 for all remaining ContentDirectors in the Harmonic MediaGrid cluster.

**Joining the ContentBridge 1000B to the LDAP Domain**

1. Log on to the ContentBridge using the following user name and password:
   - User name: root
   - Password: omneon

2. Stop smb service
   ```
   service smb stop
   ```

3. Remove samba private files on the ContentBridge:
   ```
   rm -f /var/lib/samba/private/*
   ```

4. Copy Samba configuration file from the ContentDirector generated in step 3 in subsection above. You may be required to enter “sudo” when copying files over.

   Copy `/tftpboot/config/gateway/smb.conf` from the ContentDirector to `/etc/samba/smb.conf` on the ContentBridge.

5. Run the following command:
   ```
   net rpc join -U<ldap_admin>%<ldap_admin_password> -S <ldap_FQDN>
   ```

**NOTE:** Upon joining the LDAP domain, the Samba server creates a local temporary database on the ContentBridge 1000B at: /var/lib/samba/private/secrets.tdb.

6. Remove any “CB” entries that provide access to individual users from the/etc/passwd file locally on the ContentBridge and `<CLBHOSTNAME>` file under /tftpboot/config/gateway on all ContentDirectors.

   Open `/etc/passwd` and delete entries for the same individual users (the entries do not contain “CB” in this file).

**NOTE:** In order to access the Harmonic MediaGrid, the individual users must be added to the LDAP domain.

7. Add the following line to the ContentBridge configuration file. This can be done via SystemManager or by editing `/tftpboot/config/gateway/<hostname>` manually on ALL ContentDirectors.
   ```
   NATIVE <Cluster IP or DNS name> <file system name>
   ```
   Replace `<hostname>` with the hostname of the ContentBridge.

8. Restart the gateway service:
   ```
   service gateway restart
   ```

9. Repeat steps 1-8 for all remaining ContentBridges in the Harmonic MediaGrid cluster.

**Verifying Communication with the Domain Controller**

Follow the steps described in **Verifying Communication with the Domain Controller**.

**NOTE:** Make sure the Harmonic MediaGrid cluster is also configured with LDAP.

**NOTE:** In order to access the Harmonic MediaGrid, the individual users must be added to the LDAP domain.
Joining a Harmonic MediaGrid Cluster to an Apple Open Directory Domain

Harmonic MediaGrid supports Apple Open Directory for authentication and directory services. If you have enabled LDAP Bind Authentication on your Mac OS X server, you can join the Harmonic MediaGrid to Apple Open Directory.

**IMPORTANT:** As of OS X Server 10.7, Apple discontinued support for Primary Domain Controller (PDC). With Harmonic MediaGrid version 3.5.2 and earlier, the High Bandwidth ContentBridge and ContentBridge 1000B require PDC support for directory services with Apple Open Directory. With Harmonic MediaGrid version 4.0 or later, PDC support is not required to connect a High Bandwidth ContentBridge to an Open Directory server (OS X 10.11 and later).

- Joining a High Bandwidth ContentBridge to an Open Directory Server with OS X 10.11 or Later
- Joining a High Bandwidth ContentBridge to an Open Directory Server with OS X 10.6.8 or Earlier
- Joining a ContentBridge 1000B to an Open Directory Server with OS X 10.6.8 or Earlier


**IMPORTANT:** You must be familiar with setting up LDAP clients to complete these steps.

To join the Harmonic MediaGrid to Apple Open Directory:
1. On the client computer, launch the Server utility.
2. From the left-hand column, select **Open Directory**.
3. Ensure that the dialog indicates Open Directory is **Master**, and verify that the name and IP address are correct. Refer to *Figure 4–4* for an example.

![Figure 4–4: Open Directory Server App version 5.1.5](image-url)
**NOTE:** If you are using an earlier version of OS X Server on the client computer, access the Open Directory settings through **Server Admin**. From the **Overview** tab, ensure that the Open Directory is set to **Open Directory Master**, and verify that the **LDAP Search Base** settings are correct. Refer to **Figure 4–5** for an example.

![Image of Server Admin showing Open Directory settings](image-url)

**Figure 4–5: Open Directory Server Admin**

4. On each ContentDirector, use SSH to edit the file `/etc/ldap.conf` as follows to set up LDAP authentication:
   a. Change the value for **HOST** to the IP address of the Open Directory Server.
   b. Change the entry `Base dc=example,dc=com` to the distinguished name of the search base, which is the name that uniquely identifies an entry in the directory.
   c. Edit the line `pam_password md5` as follows: `pam_password exop`.

   For the example shown in **Figure 4–4**, the values in `/etc/ldap.conf` should be as follows:
   ```
   HOST  10.2.2.252
   URI  ldap://10.2.2.252
   BASE  dc=mediagrid,dc=com
   pam_password  exop
   ```

5. Save and close `/etc/ldap.conf`.

6. Open Directory uses TCP and UDP ports 389 and 636. If there is a firewall, please ensure those two ports are opened in the firewall.

7. Open the `/omneon/config/mdscore-local` file on both the primary and secondary ContentDirectors and add the following lines:
   ```
   admin_group_name = "diradmin"
   auth_method = pam
   ```

   The following is an example of the mdscore-local file:
   ```
   #====================================================================
   # MDS coremain program local configuration file
   # Any options specified in here will override the same-named options in the #
   # main configuration file.
   #=====================================================================
   ```
#superuser_name = omneon
#superuser_password = usm

admin_group_name = "diradmin"
#admin_name = mgadmin
#admin_password = 1234
#auth_method = enh-ad
auth_method = pam

8. Create a symbolic link between the two LDAP configuration files as follows:

mv /etc/openldap/ldap.conf /etc/openldap/ldap.conf.old
ln -s /etc/ldap.conf /etc/openldap/ldap.conf

9. Type the following to test the configuration:

id diradmin

where “admin” is a user who is only in ldap and not in the local /etc/passwd file.

You should see the following if the configuration is set up properly:

uid=1000(diradmin) gid=20(games) groups=20(games),80(admin)

If you see the following output, LDAP is not configured properly, and you must trace the problem:

id: diradmin: No such user

10. Restart the omcld service by typing the following:

service omcld restart

11. Run mdsclientn as shown below to verify that you can authenticate successfully against any valid user account in the Open Directory:

/opt/omcld/bin/mdsclientn localhost
sess get-users
sess get-groups
sess auth [username] [password]

The following is a sample output from mdsclientn:

[root@mds3 ~]# /opt/omcld/bin/mdsclientn localhost
mdsclientn: built by lsasaki on 2010-May-28 03:18 (TOT)
Connecting to host "localhost", protocol "tcp", prog 0x20000003
New client is 0x1273b970
Connected to "localhost"
Opening default session...
Found 4 IP addresses
 10.2.4.204
 10.2.5.205
 10.2.3.204
 10.2.3.205
Retrieving keys
Retrieved keys successfully, mdslen=140, sslen=140
  sessionID   = 0x9279a20
  key         = 78 56 34 12 f0 de bc 9a 44 33 22 11 88 77 66 55
  currentTime = 2010/07/09 15:22:37
  idleTime    = 300 sec
*host 0      = 2@10.2.3.204/10.2.3.205 id=0xa9b0bff35b416be3  
host 1      = 4@10.2.3.200/10.2.3.201 id=0xbf0674cc8bd5456  
host 2      = 4@10.2.3.203/10.2.3.202 id=0x3e4a87f91ab5b43
Opened default session of 0x9279a20

=> sess get-users
nfsnobody: S-1-22-1-0-1-2--2
  diradmin: S-1-22-1-0-1-2-1000
  jeremy: S-1-22-1-0-1-2-5000
  peter: S-1-22-1-0-1-2-5001
  chew: S-1-22-1-0-1-2-5002
  percy: S-1-22-1-0-1-2-1025

=> sess get-groups
nfsnobody: S-1-22-2-3-4-5--2
  workgroup: S-1-22-2-3-4-5-1025

=> sess auth jeremy omneon
Authenticated successfully
Session id=0x9279a20, uservalid=1, admin=0, superuser=0, guest=0, cluster=0
  curTime  = 2010/07/09 15:22:58
  idleTime = 300 sec
  user     = "jeremy", sid=S-1-22-1-0-1-2-5000
  group    = "games", sid=S-1-22-2-3-4-5-20
=>

Editing LDAP Idle Time Limit on the ContentDirector

During authentication, the connection between the ContentDirector and Open Directory server might time out. This occurs when the LDAP idle time limit on the Open Directory server is less than the LDAP time limit on the ContentDirector. By default, the ContentDirector is set to 3600 seconds, while the Open Directory server is usually set to 300 seconds.

**NOTE:** The idle time limit on your ContentDirector may be different from the default value.

To prevent or correct the errors, you must change the idle time limit on the ContentDirector to a value lower than the idle time limit on the Open Directory server.

**To edit the LDAP idle time limit:**
1. First, determine the LDAP idle time limit on the Open Directory server:
   a. Open `/etc/openldap/slapd_macosxserver.conf` on the Open Directory server and find the `idletimeout` value.
2. Log on to the ContentDirector and do the following:
   a. Open `/etc/ldap.conf` and find the value for `idle_timelimit`.
   b. If this value is greater than the `idletimeout` value on the Open Directory server, change `idle_timelimit` to 100.
3. Repeat step 2 for each ContentDirector in your MediaGrid cluster.
Joining a High Bandwidth ContentBridge to an Open Directory Server with OS X 10.11 or Later

Follow the procedures in this section in order.

NOTE: This procedure requires Harmonic MediaGrid Server version 4.0 or later.

IMPORTANT: Before you can perform this procedure, you must install MediaGridOSXServer-omauthchk.dmg onto the Open Directory server. This file is available with the Harmonic MediaGrid software downloads on the Harmonic website.

NOTE: It is not necessary to manually create a ContentBridge account on the Apple Open Directory server.

Creating Passwordless SSH Access from the High Bandwidth ContentBridge to the Open Directory Server

1. Create a service account on the Open Directory server for running omauthchk.
   Harmonic recommends that you name the service account “omauthchk.”
2. Log in to the Open Directory server using the service account.
3. From the home directory, make an .ssh subdirectory, if needed, and then verify permissions and enter the .ssh directory. For example:
   ```
   mkdir -p .ssh
   chmod 700 .ssh
   cd .ssh
   ```
4. In the .ssh directory, generate private and public authentication keys and then press Enter twice to set up passwordless access. Suggested key names are as follows:
   - id_omauthchk
   - id_omauthchk.pub
   For example, ssh-keygen -f id_omauthchk
5. Append the public key to the authorized_keys file, as follows:
   ```
   chmod 644 authorized_keys (if present)
   cat id_omauthchk.pub >> authorized_keys
   chmod 444 authorized_keys
   ```
6. Connect a monitor and keyboard to the High Bandwidth ContentBridge, and then log in with the following user name and password:
   - User name: root
   - Password: omneon
7. From /opt/omclb/conf, connect interactively to the Open Directory server using SSH, as follows:
   ```
   ssh -l omauthchk <OD_server_IP_address>
   ```
8. Exit back to the High Bandwidth ContentBridge, and then securely copy the private key, as follows:
   ```
   scp omauthchk@<OD server>::.ssh/id_omauthchk /opt/omclb/conf/id_omauthchk
   ```
9. Verify passwordless SSH access, as follows:

```
ssh -l omauthchk -i /opt/omclb/conf/id_omauthchk <OD server> hostname
```

### Configuring omauthremote.conf

1. From the High Bandwidth ContentBridge, copy omauthremote.conf to /etc, as follows:

```
cp /opt/omclb/conf/omauthremote.conf /etc/omauthremote.conf
```

2. Add the following settings to /etc/omauthremote.conf:

   - `primary_server=<IP_address_or_hostname_of_OD_server>` *(required)*
   - If the service account name on the Open Directory server is not “omauthchk,” then you must also add the following:
     
     ```
     ssh_login=<service_account_name_used>
     ```

3. Verify that you have correctly configured access to the Open Directory server, as follows:

   ```
echo . | /opt/omclb/sbin/omauthremote
```

   The following shows the expected result:

   ```
omauthchk version <x.x>
```

### Configuring Samba Settings on the High Bandwidth ContentBridge

**IMPORTANT:** Before editing `/opt/omclb/conf/smb.conf`, Harmonic recommends that you first save a copy.

1. Ensure that the heartbeat service (for High Availability pairs only) and gateway service are stopped.

   ```
   service heartbeat stop
   service gateway stop
   ```

2. In `/opt/omclb/conf/smb.conf`, modify the following options:

   ```
   security = DOMAIN
   workgroup = <domain_name>
   encrypt passwords = yes
   add user script = /opt/omutils/bin/omadduser %u
   auth methods = script2
   auth_script2: script = /opt/omclb/sbin/omauthremote
   ntlm auth = no
   lanman auth = no
   ```

   The password server option is not needed.

   **IMPORTANT:** With OS X 10.11 and later, SMB signing on the High Bandwidth ContentBridge is not supported and by default is disabled. When editing `/opt/omclb/conf/smb.conf`, do not set `server signing` to “required” or “auto.” When editing `/etc/gateway.conf`, do not set `SERVER_SIGNING` to “mandatory” or “auto.”

3. Verify that `/etc/resolv.conf` is pointing to the correct nameserver and domain.

### Configuring gateway.conf

1. Configure `/etc/gateway.conf` for native access to the Harmonic MediaGrid, as follows:
NATIVE <Cluster_IP_address_or_DNS_name> <file system name>

Restarting gateway and heartbeat Services

- Enter the following command to restart gateway services:
  
  service gateway start

**IMPORTANT:** After restarting gateway services, test the output of /etc/samba/smb.conf by running testparm and verify that server signing is not set to "required" or "auto," or is not present.

- Enter the following command to restart heartbeat services (for High Availability pairs only):
  
  service heartbeat start

Verifying Communication Using smbclient

Enter one of the following commands to verify communication with the Open Directory server:

- From the client computer, type
  
  smbclient -U <username> -W <domain_name>\\<IP_address_of_HBCB>\<fs_share>

- From the High Bandwidth ContentBridge, type
  
  smbclient -U <username> -W <domain_name>\\localhost\<fs_share>

If successful, smbclient will respond with the following prompt:

  smb: >

**NOTE:** Make sure the Harmonic MediaGrid cluster is also configured with Apple Open Directory.

**NOTE:** Make sure that winbind service is stopped. If you do not stop the winbind service on the High Bandwidth ContentBridge, it will interfere with authentication when you attempt to access the Harmonic MediaGrid using CIFS.

**NOTE:** In order to access the Harmonic MediaGrid, the individual users must be added to the Apple Open Directory domain.

**NOTE:** If you have previously modified the following configuration files for use with a different directory service, and you are unable to join the High Bandwidth ContentBridge to the Open Directory server (OS X 10.11 or later), please contact Technical Support for assistance: /etc/nsswitch.conf, /etc/krb5.conf, /etc/ldap.conf.

Joining a High Bandwidth ContentBridge to an Open Directory Server with OS X 10.6.8 or Earlier

Follow the procedures in this section in order.

**NOTE:** In order to join a High Bandwidth ContentBridge to an Open Directory with OS X 10.6.8 or earlier, an LDAP or Open Directory server must already be configured to serve as Samba Primary Domain Controller for the LDAP or Open Directory domain.
NOTE: It is not necessary to manually create a ContentBridge account on the Apple Open Directory server.

Configuring Samba Settings on the High Bandwidth ContentBridge

1. Connect a monitor and keyboard to the High Bandwidth ContentBridge.
2. Log on to the ContentBridge using the following user name and password:
   
   User name: ovnuser
   
   Password: OVN@SvCaUsa

3. Type the following command to stop the smb service:
   
   service smb stop

4. Update the following configuration file: `/opt/omclb/conf/smb.conf`

   Note the following settings:
   
   security = DOMAIN
   
   workgroup = <domain_name>
   
   password server = <opendir_FQDN>
   
   add user script = /opt/omutils/bin/omadduser %u
   
   client ntlmv2 auth = yes

   - Replace **domain_name** with the OpenDirectory domain using the distinguished name of the search base in Open Directory server configuration, which is the name that uniquely identifies an entry in the directory.

   - Replace **opendir_FQDN** with the Fully Qualified Domain Name of the Apple Open Directory server.

5. Copy `/opt/omclb/conf/smb.conf` to `/etc/samba/smb.conf`.

Adding the Open Directory Server Address to Configuration Files

Add entries for the Open Directory server in two configuration files: `/etc/hosts` and `/etc/resolv.conf`. The first configuration file contains the IP address for the Open Directory Server, the fully qualified domain name and any aliases. The second configuration file contains the IP address of the Open Directory server which has been configured with a DNS record.

1. Add an entry for the Apple Open Directory server to `/etc/hosts` on the High Bandwidth ContentBridge:

   a. From your SSH terminal, type the following command:

      ```
      sudo vi /etc/hosts
      ```

   b. Add a line at the end to specify the Open Directory Server’s IP address. Use the following format:

      ```
      <IP address> <open_directory_server_FQDN> <open_directory_server_name>
      ```

      An example would look like the following:

      ```
      10.20.9.52 odserver.support.local odserver
      ```

2. Add an entry for the Apple Open Directory server to `/etc/resolv.conf`. Use the following format:

   ```
   <DNS name> <IP address>
   ```

   An example would look like the following:

   ```
   odserver 10.20.9.52
   ```
Joining the High Bandwidth ContentBridge to the Apple Open Directory Domain

1. Make sure you are logged in to the ContentBridge, and then enter the following command:
   ```bash
   net rpc join -U<opendir_admin>%<opendir_admin_password> -S <opendir_FQDN>
   ```
   The following example shows the expected result:
   ```bash
   Joined domain SNV-ENG.
   [root@hbcb205 ~]#
   ```

2. Remove any “CB” entries that provide access to individual users from the /etc/gateway.conf and /etc/passwd files.
   a. Open `/etc/gateway.conf` and delete entries for individual users beginning with “CB.”
   b. Open `/etc/passwd` and delete entries for the same individual users (the entries do not contain “CB” in this file).

3. Restart the gateway service. For example, for a High Bandwidth ContentBridge with hostname `hbcb205`:
   ```bash
   [root@hbcb205 ~]# service gateway restart
   ```

Verifying Communication with the Domain Controller

Follow the steps described in [Verifying Communication with the Domain Controller](#).

**NOTE:** Make sure the Harmonic MediaGrid cluster is also configured with Apple Open Directory.

**NOTE:** Make sure that winbind service is stopped. If you do not stop the winbind service on the High Bandwidth ContentBridge, it will interfere with authentication when you attempt to access the Harmonic MediaGrid using CIFS.

**NOTE:** In order to access the Harmonic MediaGrid, the individual users must be added to the Apple Open Directory domain.

Joining a ContentBridge 1000B to an Open Directory Server with OS X 10.6.8 or Earlier

**NOTE:** As of OS X Server 10.7, support for Primary Domain Controller (PDC) is no longer provided. The ContentBridge 1000B requires PDC support for directory service with Apple Open Directory.

**NOTE:** In order to join a ContentBridge 1000B to an Open Directory, an LDAP or Open Directory server must already be configured to serve as Samba Primary Domain Controller for the LDAP or Open Directory domain.

**NOTE:** It is not necessary to manually create a ContentBridge account on the Apple Open Directory server.

**NOTE:** Configuring different ContentBridges in a Harmonic MediaGrid cluster with different directory access authentication protocols (for example, ADS, LDAP, and OpenDirectory) is not supported. The following set of steps will reset the authentication mechanism for all ContentBridges in the cluster.
Configuring Samba Settings for the ContentBridge 1000B

1. Log on to the first ContentDirector in your system using the following user name and password:
   
   User name: ovnuser
   Password: OVN@SvCaUsa

2. Remove samba private files stored on the ContentDirector with the following command:
   
   `sudo rm -f /tftpboot/config/gateway/secrets/*`

3. Generate the file, `/tftpboot/config/gateway/smb.conf`, as shown in Figure 4–2.

   Modify the settings as follows:
   
   ```
   security = DOMAIN
   workgroup = <domain_name>
   password server = <opendir_FQDN>
   add user script = /opt/omutils/bin/omadduser %u
   client ntlmv2 auth = yes
   ```

   a. Replace domain_name with the OpenDirectory domain using the distinguished name of the search base in Open Directory server configuration, which is the name that uniquely identifies an entry in the directory.

   b. Replace opendir_FQDN with the Fully Qualified Domain Name of the Apple Open Directory server.

4. Repeat steps 1-3 for all remaining ContentDirectors in the Harmonic MediaGrid cluster.

Adding the Open Directory Server Address to Configuration Files

Follow the steps described in Adding the Open Directory Server Address to Configuration Files.

Joining the ContentBridge 1000B to the Apple Open Directory Domain

1. Log on to the ContentBridge using the following user name and password:

   User name: root
   Password: omneon

2. Stop smb service
   
   `service smb stop`

3. Remove samba private files on the ContentBridge:
   
   `rm -f /var/lib/samba/private/*`

4. Copy Samba configuration file from the ContentDirector generated in step 3 in subsection above. You may be required to enter “sudo” when copying files over.

   Copy `/tftpboot/config/gateway/smb.conf` from the ContentDirector to `/etc/samba/smb.conf` on the ContentBridge.

5. Run the following command:
   
   `net rpc join -U<opendir_admin>%<opendir_admin_password> -S <opendir_FQDN>`

   **NOTE:** Upon joining the OpenDirectory domain, the Samba server creates a local temporary database on the ContentBridge at: `/var/lib/samba/private/secrets.tdb`. 
6. Remove any “CB” entries that provide access to individual users from the /etc/passwd file locally on the ContentBridge and <CLBHOSTNAME> file under /tftpboot/config/gateway on all ContentDirectors.

Open /etc/passwd and delete entries for the same individual users (the entries do not contain “CB” in this file).

NOTE: In order to access the Harmonic MediaGrid, the individual users must be added to the Open Directory domain.

7. Add the following line to the ContentBridge configuration file. This can be done via SystemManager or by editing /tftpboot/config/gateway/<hostname> manually on ALL ContentDirectors.

NATIVE <Cluster IP or DNS name> <file system name>

Replace <hostname> with the hostname of the ContentBridge.

8. Restart the gateway service:

service gateway restart

9. Repeat steps 1-8 for all remaining ContentBridges in the Harmonic MediaGrid cluster.

Verifying Communication with the Domain Controller

Follow the steps described in Verifying Communication with the Domain Controller.

NOTE: Make sure the Harmonic MediaGrid cluster is also configured with Apple Open Directory.

NOTE: Make sure that winbind service is stopped. If you do not stop the winbind service on the ContentBridge, it will interfere with authentication when you attempt to access the Harmonic MediaGrid using CIFS.

NOTE: In order to access the Harmonic MediaGrid, the individual users must be added to the Apple Open Directory domain.

Verifying ContentServer and ContentDirector Services

Perform the following procedures to verify that the relevant services are running on the ContentServers and ContentDirectors.

Verifying DHCP Settings

Follow these procedures to verify the DHCP settings on both the Primary and Secondary ContentDirectors.

To verify DHCP settings:
1. Type the following at the command prompt:

   sudo /sbin/chkconfig --list dhcpd

   You will see output similar to the following if DHCP is configured to be on:
   dhcpd 0:off 1:off 2:on 3:on 4:on 5:on 6:off

   You will see output similar to the following if DHCP is configured to be off:
   dhcpd 0:off 1:off 2:off 3:off 4:off 5:off 6:off

2. Type the following if DHCP is OFF:
sudo /sbin/chkconfig dhcpd on

3. Type the following to synchronize the time between the ContentDirectors:
   `ntpdate -u IP_ADDRESS`
   
   *where* `IP_ADDRESS` *is the IP address of a valid NTP server (preferably the SystemManager).*

4. Type the following to apply the settings:
   `sudo service dhcpd restart`
   
   You should see output similar to the following:
   
   Internet Systems Consortium DHCP Server V3.0.2
   Copyright 2004 Internet Systems Consortium.
   All rights reserved.
   For info, please visit http://www.isc.org/sw/dhcp/

5. Type the following to verify that DHCP is running:
   `sudo service dhcpd status`
   
   You should see output similar to the following:
   
   Internet Systems Consortium DHCP Server V3.0.2
   Copyright 2004 Internet Systems Consortium.
   All rights reserved.
   For info, please visit http://www.isc.org/sw/dhcp/

   You should see output similar to the following:
   
   `sudo service dhcpd status`
   
   `dhcpd (pid 2365) is running...`
   
   *Note that the “pid” is a process ID number, which will vary.*

---

**NOTE:** SystemManager provides DHCP status (running or not), as well as failover mode on the ContentDirector Properties page. See the *Harmonic SystemManager User Guide* for details.

---

### Verifying ContentDirector and ContentServer Communication

This service ensures that the ContentDirectors are communicating with the ContentServers.

**To verify communication:**

1. Start the ContentDirector services by typing the following at the command prompt:
   
   `sudo service omcld start`

2. Wait a few seconds and then type the following:
   
   `ps -C ssmd`

   You should see a reply similar to the following, which verifies ssmd is running:
   
   ```
   PID TTY TIME CMD
   23361 ? 00:25:48 ssmd
   ```

### Verifying the Metadata Maintenance Service

The Metadata Maintenance Service maintains all of the file system metadata information, such as the names, directories, dates, permission, etc.

**To verify the service:**

1. Type the following at the command prompt:
   
   `ps -C mdscore`

   You should see a reply similar to the following:
   
   ```
   PID TTY TIME CMD
   23452 ? 00:14:39 mdscore
   ```

   If the service “mdscore” is not running, the times may not be synchronized between ContentDirectors.
2. To verify that the time and date are set on each ContentDirector, refer to Setting the Harmonic MediaGrid System Time for more information.

3. Also check each ContentDirector's actual current time by typing the following at the command prompt:
   date

4. If the times do not match, restart the services, and then repeat the steps above.

Verifying the mdscore Service Connection

1. Type the following at the command prompt to verify connection to the mdscore service:
   sudo /opt/omcldd/bin/mdscclientn localhost

   You should see a reply similar to the following if the connection is successful:
   mdsclientn: built on 2006-Jun-11 01:36 (USM_Branch_1_0)
   Connecting to host “localhost”, protocol “tcp”, prog 0x20000003
   New client is 0x56f8f0
   Connected to “localhost”
   Opening default session...
   Found 4 IP addresses
     192.168.0.200
     192.168.1.200
     10.31.6.200
     10.31.7.200
   Retrieving keys
   Retrieved keys successfully, mdslen=140, sslen=140
   sessionId = 0x7dafec9c
   key = 78 56 34 12 f0 de bc 9a 44 33 22 11 88 77 66 55
   currentTime = Tue Jun 13 10:42:17 2006
   idleTime = 300 sec
   *host 0 = 2@10.31.6.200/10.31.7.200 id=0x7cc464a9b4dea
   host 1 = 4@10.31.7.201/10.31.6.201 id=0xaae24951f4af6df
   Opened default session of 0x7dafec9c

   The connection is unsuccessful if, instead, you see the following reply:
   mdsclientn: built on 2006-Jun-11 01:36 (USM_Branch_1_0)
   Connecting to host “localhost”, protocol “tcp”, prog 0x20000003
   Unable to reconnect to “localhost”: RPC: Remote system error - Connection refused
   Unable to connect to “localhost”: RPC: Remote system error - Connection refused

2. If the connection is unsuccessful, wait 15 minutes and then try connecting again.

3. Type the following command to exit the mdsclientn program:
   exit

Verifying ContentServer Disk Space

Follow these steps to verify that each ContentServer has 100% space availability.

To verify space:

1. Using SystemManager, click the Servers icon on the Configuration tab to access the Servers List page.

2. Locate the Total Disk Space and Free Disk Space for each ContentServer.
The total Disk Space will vary according to your RAID configuration and drive type. Refer to *About a Harmonic MediaGrid Stretch Cluster* for a description of the supported configurations. The Free Disk Space should be 100%. Refer to the *Harmonic SystemManager User Guide* for more information.

**Verifying NFS Share is Exported by ContentBridge**

1. Type the following command using the client Linux machine:
   
   ```
   showmount -e (ContentBridge IP address or host name)
   ```

   You should see the following output (‘cb1.mediagrid.com’ is an example host name):

   ```
   Export list for cb1.mediagrid.com:
   /mnt/omfs/mds/csloh/omfs/fs0 0.0.0.0/0.0.0.0
   /mnt/omfs/mds/omneon/omfs/fs0 0.0.0.0/0.0.0.0
   ```

   The output from the command “showmount -e cb1.mediagrid.com” lists `/mnt/omfs/mds/omneon/omfs/fs0` as one of the NFS shares available from the ContentBridge.

   To mount the NFS share:

   Type the following using the Linux client machine:

   ```
   mount -t nfs cb1.mediagrid.com: /mnt/omfs/mds/omneon/omfs/fs0 /mnt
   ```

**Opening Network Ports to Enable Client Access**

Specific network ports must be open to enable client access to Harmonic MediaGrid. This is particularly important if any security measures, including firewalls, are in place.

Harmonic MediaGrid clients must connect to and communicate on TCP ports 10600-10604; UDP port 111 must be open as well. Note that these ports must be open for the entire subnet in which Harmonic MediaGrid is contained.

Contact the customer network administrator for assistance.

**Managing Memory Usage by the File System Driver**

The amount of memory allocated to memory buffers is controllable. Each client FSD (Linux, Windows, and Macintosh) allocates memory buffers to optimize performance. This allocation of memory takes memory away from application use. In general, the memory usage of the FSDs should be minimized unless an application requires a large number of simultaneous files to be open.

The following parameters are available to control memory usage by each FSD.

- **ReadAhead.** This parameter controls the number of slices that are fetched from the server ahead of where the application is currently reading. The default ReadAhead value is 2 slices (Mac FSD) or 3 slices (Windows or Linux FSD). Each slice can be 512KB, 1MB, 2MB, 4MB, or 8MB in size. Increasing the ReadAhead value can increase performance for some workflows *as long as the Cache Memory Limit is also appropriately increased*. When writing to a file, this parameter determines how many modified slices are allowed to be retained in cache before being flushed to the Harmonic MediaGrid server. Decreasing the ReadAhead value below the default can allow for more open files in a smaller cache, but may reduce the bandwidth performance for both read and write operations.

- **Cache Memory Limit.** The FSD allocates memory for buffering cache from a single pool, the cache memory limit. When the FSD exceeds this limit, it begins to free memory until its usage is below this number. This limit defaults to 200MB on Linux and Mac OS X. The size of this
limit on Windows changes dynamically based on the operating system version and physical RAM. The default value should be sufficient for clients with connectivity up to 1Gb/sec. Advanced users, depending on the workflow and the client’s bandwidth capabilities, might consider increasing this value.

**IMPORTANT:** The default value is sufficient for most workflows. If you are unsure of whether you should change it, please contact Harmonic Technical Support for assistance.

**NOTE:** The cache memory limit should not exceed 25% of the physical memory.

*Table 4–2* provides information on how changes to the ReadAhead parameter affect performance. For the currently supported range of readahead values, refer to the Harmonic MediaGrid Release Notes for your client FSD.

**Table 4–2: Performance Considerations**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Increase</th>
<th>Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>ReadAhead</td>
<td><strong>Pros</strong></td>
<td><strong>Pros</strong></td>
</tr>
<tr>
<td></td>
<td>- Increases read throughput</td>
<td>- Decreases memory usage</td>
</tr>
<tr>
<td></td>
<td>- Increases write throughput</td>
<td>- Decreases latency on random read</td>
</tr>
<tr>
<td></td>
<td><strong>Cons</strong></td>
<td><strong>Cons</strong></td>
</tr>
<tr>
<td></td>
<td>- Increases latency on random read</td>
<td>- Decreases read throughput</td>
</tr>
<tr>
<td></td>
<td>- Increases memory usage</td>
<td>- Decreases write throughput</td>
</tr>
</tbody>
</table>

**Calculating the Cache Memory Limit**

The total cache memory demand can be calculated as follows:

\[(1 + \text{ReadAhead}) \times \text{SliceSize} \times \text{Number of files open at once}\]

For example, if the ReadAhead value is 3 slices, the SliceSize is 2MB, and the expected number of open files at once is 50, the cache memory demand is 400MB \((1+3) \times 2 \times 50\).

**Additional Memory Usage Parameters for Linux Clients**

In addition to **ReadAhead** and **Cache Memory Limit**, the following three parameters can be used to manage memory usage on a Linux client:

- **Open File Limit.** This parameter controls the maximum number of simultaneously open files the Linux FSD supports. The default value is 1024. Increase this value as necessary to support an application’s requirements. Note that increasing this value can increase the amount of memory used by the Linux FSD. Increasing it too much may prevent an application from running due to memory starvation.

- **Pre-allocation Limit.** This parameter tells the Linux FSD to allocate all the buffer memory it will use at module load time. The default value is 1024 cache memory units (equivalent to 256MB). The allocation is done over a short period of time following startup. During operation, the FSD will not need to request any additional large allocations. This prevents sudden demands for memory, which occasionally cause the Linux kernel to panic. The gradual increase in memory usage at startup is expected and normal.
The Harmonic MediaGrid server cannot be mounted until the pre-allocations are completed. If a mount command is issued immediately after loading the omfs module, the command may fail with an error message indicating, “Some resources could not be allocated, try again later.” Reissue the mount command later. This message indicates that the omfs module has not completed allocation of memory after loading.

Reducing the pre-allocation value after memory has been allocated has no effect, as the Linux FSD will not release any memory it has acquired. Since the Linux FSD begins allocating memory as soon as the omfs module is loaded by the Linux kernel, trying to limit the amount of memory allocated to a value below 256MB using this method produces inconsistent results.

- **Allocation Limit**. On occasion, the FSD may need more cache memory than that which is specified in the Cache Memory Limit. For these instances, the Allocation Limit parameter is available. The default value, 5764 cache memory units (slightly more than 1 GB), is usually enough to accommodate these short-term needs.

### Setting Memory Usage Parameters on Macintosh Clients

**IMPORTANT:** The default value for the Cache Memory Limit is sufficient in most cases. If you are unsure of whether you should change it, please contact Technical Support for assistance.

1. Set the ReadAhead value using the Macintosh FSD Properties dialog.
   
   For instructions, refer to *Configuring User Mount Options* in this guide, or refer to the Macintosh FSD help system.

2. Set the Cache Memory Limit by typing the following command:
   ```
   sudo sysctl -w debug.omfs_cacheMaxMem = NNN
   ```
   
   where “NNN” is the number of megabytes.

### Setting Memory Usage Parameters on Windows Clients

Refer to *Setting Windows FSD Properties* in this guide to configure both the ReadAhead value and Cache Memory Limit. Instructions are also provided in the Windows FSD help system.

### Setting Memory Usage Parameters on Linux Clients

Follow these steps if you wish to change the memory usage parameters from their default values. Use the formula provided in *Calculating the Cache Memory Limit* to determine how much cache memory is needed.

**IMPORTANT:** The default value for the Cache Memory Limit is sufficient in most cases. If you are unsure of whether you should change it, please contact Technical Support for assistance.

Before you begin, you can check the current parameter settings by entering the following command:

```bash
sysctl omfs_cache_max_mem_MB omfs_cache_preAllocate omfs_cache_allocate_limit
```

**To set memory usage parameters on Linux clients:**

- Specify the maximum File Open Limit by entering the following command:
  ```
  mount -t omfs /mediagrid/filesys /mnt
  -o username=username,password=password,readahead=2,filelimit=N
  ```
  
  where N is equal to the maximum number of simultaneously open files.
Specifying the ReadAhead value by typing the following command:

```bash
mount -t omfs /mediagrid/filesys /mnt -o username=username,password=password,readahead=N
```

where N is equal to the number of slices.

- If necessary, modify the Cache Memory Limit by typing the following command:

```bash
echo NNN > /proc/sys/omfs_cache_max_mem_MB
```

where “NNN” is the amount of memory specified in megabytes.

- If necessary, modify the Pre-allocation Limit by entering the following command:

```bash
sysctl omfs_cache_pre_allocate=NNN
```

where “NNN” is the number of memory cache units (increments of 256KB).

- If necessary, modify the Allocation Limit by entering the following command:

```bash
sudo sysctl –w omfs_cache_allocate_limit=NNN
```

where “NNN” is the maximum number of cache memory units (increments of 256KB).

To enable the new settings to persist after future reboots, Harmonic recommends that you edit the same parameters in the `/etc/sysctl.conf` file:

```bash
omfs_cache_max_mem_MB = NNN
omfs_cache_pre_allocate = NNN
omfs_cache_allocate_limit = NNN
```

Increased memory allocations should take effect immediately. If the demand from other allocations is significant, however, a reboot may be needed.

## Configuring the Remote Media API on a ContentBridge

Follow these steps if you would like to initiate transfers of clips using the Remote Media API on a ContentBridge. You will need to edit the ContentBridge configuration file to enable this functionality.

The Remote Media API version can be selected by editing the `MEDIA_API_VERSION` parameter in the ContentBridge configuration file. For information on supported versions, refer to the `Harmonic MediaGrid Release Notes`. For information on editing the configuration file, refer to the `Editing the ContentBridge Configuration File` in the `Harmonic SystemManager User Guide`.

**To configure the remote Media API:**

1. Obtain copies of `ommcp.exe` and `ommedia.dll` from Harmonic.
2. Ensure that the ContentBridge is configured correctly. Following is an example setup:

   ```bash
   Spectrum Server hostname (or IP): om-spect Filesystem name /fs0
   Content Director hostname (or IP): om-cld Filesystem name /mg0
   Content Bridge hostname (or IP): 10.3.1.40 serial number: CLB01523
   ```

   **NOTE:** Short hostnames are supported in the ContentBridge configuration file if the hostname has the same domain name as the Harmonic MediaGrid system being configured. Otherwise, a fully qualified domain name (FQDN) must be specified in the configuration file if you wish to use hostnames. Note that remote ommcp’s will only work using the exact hostname or IP address specified in the configuration file.

3. Make sure that the desired mount type(s) is specified in the ContentBridge configuration boot file `/tftpboot/config/gateway/<serial number> across all ContentDirectors. Note that on a ContentBridge there are three different types of remote mounts utilized. “CB” (ContentBridge) mounts are used for configuring a ContentBridge to share out a file system from a specific
Harmonic MediaGrid cluster via CIFS, FTP, and NFS. The other two types of mount points are utilized only for the Remote Media API. They define remote systems that will be used to transfer media files. “MG” (Harmonic MediaGrid) mounts are for configuring remote Harmonic MediaGrid file systems. “CI” (CIFS) mounts are for configuring remote Spectrum servers, or other generic CIFS servers. The following shows the syntax for the configuration boot file:

```
MEDIA_API=YES
MG   hostname filesystem_name <username> <password>
CI   hostname share_name <username> <password>
```

Refer to Editing the ContentBridge Configuration File in the Harmonic SystemManager User Guide for more information.

**NOTE:** Username and password are required parameters for Harmonic MediaGrid (MG) mounts. Username and password are optional for CIFS (CI) mounts to Spectrum systems, or other servers that allow anonymous CIFS access. If a hostname is specified, a mount will be made, however, remote ommcp’s work solely on the hostname or IP address specified in the config file on the ContentDirectors. Multiple MG and CI mounts are allowed.

4. Once you have edited the configuration file, save it and reboot the ContentBridge.

5. Using a client such as PuTTY, start an SSH session to the ContentBridge and type the following command:

```
df
```

Sample output showing mount points created follows:

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>//om-spect/fs0</td>
<td>/mnt/om-spect/fs0</td>
</tr>
<tr>
<td>/om-cld/mg0</td>
<td>/mnt/om-cld/mg0</td>
</tr>
</tbody>
</table>

**NOTE:** Harmonic MediaGrid mounts have a single slash and CIFS/Spectrum mounts have double slashes under the file system column.

6. Type the following command:

```
service ommedia status
```

Your response should be similar to:

```
[root@CLB04130 ~]# service ommedia status ommedia_remote_svc (pid 4552) is running...
ommedia_mon.sh (pid 4549 4548) is running...
[root@CLB04130 ~]#
```

7. On any Windows XP PC, copy ommcp.exe and ommedia.dll to the same directory.

8. Open a DOS Command prompt and type the following single command line to transfer a clip from Spectrum (10.2.1.15) to Harmonic MediaGrid (10.3.1.100) via ContentBridge (10.3.1.40).

```
ommcp -in//om-spect/fs0/clip.dir/abc.mov -out//om-cld/mg0/clip.dir/abc.mov -host 10.3.1.40 -replace -progress
```

(Change IP addresses, host names, file system and clip names to match your configuration.)

9. As the transfer occurs, you will see the following transfer progress count, frame by frame, and also the transfer speed in frames per second (fps):

```
0 of 15000 frames copied (0.0 fps)
5 of 15000 frames copied (1.7 fps)
76 of 15000 frames copied (19.0 fps)
138 of 15000 frames copied (27.6 fps)
191 of 15000 frames copied (31.8 fps)
```
Configuring a ContentBridge

Only perform these steps if you add a ContentBridge to an already-configured Harmonic MediaGrid system.

The ContentBridge must have a fixed (static) IP address. It is recommended that you assign an IP address from the bottom of the dynamic range and that those addresses be removed from the range. The DHCP server must also recognize the MAC address of the ContentBridge and assign it a reserved IP address during startup. The ContentBridge MAC address is located on the outside of the unit.

Follow these steps to assign a static IP address to the ContentBridge. Additionally, a DNS entry must exist in the domain server for the ContentBridge. Use the following IP address range when assigning the addresses: xx.xx.xx.50-99.

In the following example, “CLB0F118” is the ContentBridge host name. Make sure that the hardware Ethernet addresses match the port numbers (eth0 or eth1) and the public network addresses.

To configure a ContentBridge:

1. Open the `/etc/dhcpd.conf` file for the primary ContentDirector by typing the following:
   ```
sudo vi /etc/dhcpd.conf
   ```
2. Add two entries for each ContentBridge, including the following information: domain-name-servers, domain-name, subnet-mask, routers, hardware Ethernet MAC address and fixed IP address. An entry is needed for each Ethernet port on the ContentBridge.
3. Type the following to synchronize the time between the ContentDirectors:
   ```
   ntpdate -u IP_ADDRESS
   ```
   where `IP_ADDRESS` is the IP address of a valid NTP server (preferably the SystemManager).
4. Enter the following commands after editing the file:
   ```
sudo service dhcpd configtest
sudo service dhcpd restart
   ```

Examples are shown below. Your site-specific entries will be different.

   # Gateway CLB0F118 eth0
   host CLB0F118-eth0 {
   option subnet-mask 255.255.255.0;
   option routers 172.16.1.1;
   filename “pxelinux.0”;
   hardware ethernet 00:11:11:9f:d6:05;
   fixed-address 172.16.1.99;
   }

   # Gateway CLB0F118 eth1
   host CLB0F118-eth1 {
   option subnet-mask 255.255.255.0;
   option routers 172.16.2.1;
   filename “pxelinux.0”;
   hardware ethernet 00:00:5a:72:8d:ee;
Adding a High Bandwidth ContentBridge to the Harmonic MediaGrid System

CAUTION: If you do not understand the procedures or recommendations described in this chapter, please consult with Technical Support before proceeding.

To add a High Bandwidth ContentBridge to the Harmonic MediaGrid system:
1. Connect a monitor and keyboard to the High Bandwidth ContentBridge you wish to add.
2. Log on to the High Bandwidth ContentBridge using the following user name and password:
   - User name: ovnuser
   - Password: OVN@SvCaUsa
3. Type the following command to set the FIRSTBOOT mode on the ContentBridge:
   ```bash
   sudo initconfig --setflag
   ```
   Note that, in some cases, running this command can result in the following message:
   ```bash
   [root@hbcb1-1 ~]# initconfig --setflag
   Setting Firstboot flags (local)
   sh: /tftpboot/config/FIRSTBOOT: No such file or directory
   ```
   This message can be ignored. If you wish to verify that FIRSTBOOT mode was set, you can check that the following files are now available on the ContentBridge:
   ```bash
   /tmp/FIRSTBOOT
   /omneon/sharedsys/FIRSTBOOT
   ```
4. Type the following commands to run the configuration assistant:
   ```bash
   cd /home/ovnuser/scripts
ds./autoconfig -m
   ```
5. The configuration script asks a series of questions requiring information specific to the customer site. Use the information from the Harmonic MediaGrid Installation Planning Guide specific to your Harmonic MediaGrid system to complete the answers. Note that the assistant will display suggested responses in brackets. During the assistant, you can use the up or down arrow keys to tab to previous responses.
   - The configuration assistant may provide a different IP address for the High Bandwidth ContentBridge than the one you wish to use. If so, when the configuration script asks you to confirm the system configuration, indicate NO. Then you can enter the desired IP address.
6. When prompted, insert a USB drive. The configuration assistant automatically copies the configuration information to the USB drive.
7. Type the following command to copy the configuration information to this High Bandwidth ContentBridge:
   ```bash
   sudo ./copyconfigs -m
   ```
8. When prompted to enter the ID of the High Bandwidth ContentBridge in the specified range, make sure to select the ID of the ContentBridge you are adding or replacing. If you are unsure of the correct ID, you may consider re-running the Configuration Assistant and manually setting the IP address of the High Bandwidth ContentBridge during the configuration.
9. Once copying is complete, remove the USB drive from the High Bandwidth ContentBridge.
10. Type the following command to remove the High Bandwidth ContentBridge from the FIRSTBOOT mode:
   
   ```
   sudo initconfig --rmflag
   ```

**ContentBridge Configuration Parameters**

A configuration file exists for all ContentBridges. The configuration file enables you to configure parameters to:

- Set up user access to files and directories
- Set up file transfers, including transfer of growing files
- Tune performance

See the *Harmonic SystemManager User Guide* for instructions on editing the ContentBridge configuration file.

**Enabling or Disabling CIFS Oplocks**

Disabling CIFS oplocks improves data integrity for highly concurrent applications that use file locking. The setting is disabled by default. This option only affects the operation of CIFS on a ContentBridge.

Set this parameter in the configuration file on all ContentDirectors in a cluster in `/tftpboot/config/config` or in the `/etc/gateway.conf` file for a high bandwidth ContentBridge. Add the following line to the configuration file to disable CIFS oplocks:

```
CIFS_OPLOCKS=NO
```

The acceptable options are “YES”, “NO”.
Configuring High Bandwidth Content Bridges in a High Availability (HA) Pair

With Harmonic MediaGrid 3.2 and later, you may configure two High Bandwidth Content Bridges (ContentBridge 2010C/2010D/2010E/2010F) in a high availability (HA) pair, in which one High Bandwidth ContentBridge is the “active” node and one is the “shadow” node. If the CIFS processes, FTP, network connectivity, or power fails on the “active” node, the “shadow” node then becomes "active" and takes over operations. Harmonic provides an HA Pair utility that you may run to create an HA pair configuration or remove one.

When you run the HA Pair utility, you must specify an IP address for each High Bandwidth ContentBridge, an additional IP address to be shared by both High Bandwidth Content Bridges in an HA pair, a private subnet for the HA pair to use, and indicate which High Bandwidth Content Bridge will be the preferred node. If both peers fail, in the event of recovery, the preferred node becomes the "active" node first in order to avoid conflicts resulting from two active nodes.

**NOTE:** If you are configuring large numbers of HA pairs, you may wish to use separate power sources for some “preferred” nodes to plan for possible power outages.

Note that a client must be connected to the shared IP address of a High Bandwidth ContentBridge in an HA pair in order to remain connected in the event of a failover.

**HA Pair Configuration Overview**

**To configure an HA pair:**

1. Make sure the High Bandwidth Content Bridges you wish to configure in an HA pair are running MediaGrid 3.2 or later. For instructions on upgrading, refer to *Upgrading Harmonic MediaGrid Firmware*.
2. Make sure the High Bandwidth Content Bridges you wish to configure in an HA pair are connected to each other via the eth1 NIC as described in *Connecting High Bandwidth Content Bridges in a High Availability (HA) Pair*.
3. Identify the necessary IP addresses for the High Bandwidth Content Bridges you wish to configure. This includes an additional IP address to be shared by both High Bandwidth Content Bridges in an HA pair, and a private subnet for the HA pair to use. For details, see *Identifying the IP Addresses for HA Pairs*.
4. To run the HA Pair utility, you may connect directly to either High Bandwidth Content Bridge in the pair, connect via SSH to one of the High Bandwidth Content Bridges in the pair, or connect via SSH to one of the Content Directors in your Harmonic MediaGrid system.
5. Run the HA Pair utility. See *Running the HA Pair Utility*.
6. Verify the HA Pair configuration by viewing the HA Pair in SystemManager. See *Viewing HA Paired High Bandwidth Content Bridges in SystemManager*.

**Identifying the IP Addresses for HA Pairs**

When you run the HA Pair utility, it asks you to specify the public (eth2) IP address for each High Bandwidth Content Bridge in the HA pair, the IP address that you wish to be shared by the two High Bandwidth Content Bridges in the pair, and a private subnet to be used by the HA pair.
To identify the existing (eth 2) IP address for a High Bandwidth ContentBridge:

View the High Bandwidth ContentBridge details in SystemManager. From the Configuration tab in SystemManager, click the Servers & Switches icon in the left-hand column and then scroll down to the High Bandwidth ContentBridges section of the page to view a list of High Bandwidth ContentBridges and their (eth 2) IP addresses.

To determine the shared IP address for an HA pair:

**CAUTION:** Please consult with Technical Support before proceeding.

1. Consult your network administrator to identify an available IP address.
2. Make sure no device in your Harmonic MediaGrid system is using the desired IP address. You may log in to the ContentDirector and run one of the following commands to find all the IP addresses in use:
   
   ```
   nmap -sP <network_address> <subnet_mask>
   or
   nmap -sP <network_address>/<subnet_prefix>
   ```
   
   If a device is using the desired IP address, shutdown that device.
3. Edit the DHCP configuration file on your ContentDirector to exclude DHCP from handing out the desired address. The following example shows a DHCP configuration file that has been edited to free up the IP addresses 10.4.250.125 and 10.4.250.126. This assumes you have made sure no devices are using these IP addresses as described in the previous step.

The following:

```bash
# 10.4.250.96/27 Public Network (single subnet configuration)
subnet 10.4.250.96 netmask 255.255.255.224 {
  option subnet-mask 255.255.255.224;
  option routers 10.4.250.97;
  pool {
    failover peer "Public";
    filename "pXELinux.0";
    range 10.4.250.105 10.4.250.126;
    next-server 10.4.250.101;
    deny dynamic bootp clients;
  }
}
```

Changes to:
4. When you run the HA Pair utility and specify the shared IP address for your HA pair, the HA pair utility statically assigns that IP address to the HA pair. See Running the HA Pair Utility.

To determine the private subnet for an HA pair:
The private subnet for an HA pair cannot be in use by any external client system. Because the private VLANs used by the ContentDirectors in your Harmonic MediaGrid system have the same requirements, Harmonic recommends that you specify the same subnet used by one of your ContentDirector private VLANs for your HA pair subnet.

If you choose to use a subnet outside your Harmonic MediaGrid system, make sure to modify your DHCP server to use the shared public address for your HA pair, rather than the public address for a stand-alone High Bandwidth ContentBridge.

Running the HA Pair Utility

IMPORTANT: Before running the HA Pair utility make sure you have read HA Pair Configuration Overview.

To run the HA pair utility:
1. Connect to one of your High Bandwidth ContentBridges directly or via SSH, or connect to one of the ContentDirectors in your Harmonic MediaGrid system via SSH.
2. Log on to the High Bandwidth ContentBridge or ContentDirector using the following user name and password:
   - User name: ovnuser
   - Password: OVN@SvCaUsa
3. Enter the following command:
   ```
   run /home/ovnuser/scripts/utils/hapair
   ```

   The HA pair utility provides the following options.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-h or --help</td>
<td>Displays a help message and exits.</td>
</tr>
<tr>
<td>--debug</td>
<td>Enables debug mode to test the configuration without enacting any system changes.</td>
</tr>
<tr>
<td>-f or --force</td>
<td>Specifies that the HA pairing mechanism should force the end nodes to re-configure regardless of their current state.</td>
</tr>
</tbody>
</table>
4. By default, the utility walks you through the process of creating an HA pair. The utility allows you to select which High Bandwidth ContentBridge will be the preferred node and which will be the other node.

5. Once the HA pair configuration is complete, you may view the status of the HA pair in SystemManager. See Viewing HA Paired High Bandwidth ContentBridges in SystemManager.

### Possible Uses for the HA Pair Utility

Other than creating an HA Pair, note the following additional uses for the HA Pair utility:

- **Changing the preferred node**: To change the preferred node in an HA pair, run the following:
  
  ```bash
  ./hapair --force --create
  ```

  When the HA Pair utility runs, specify a different preferred node.

- **To remove an HA pair configuration**: To remove an HA pair configuration, run the following:
  
  ```bash
  ./hapair --force --destroy
  ```

  When the HA Pair utility runs, specify the HA pair you wish to destroy. Note that destroying an HA pair does not affect the operation of either High Bandwidth ContentBridge that was previously paired.

- **Replacing a High Bandwidth ContentBridge in an HA pair**: To replace a High Bandwidth ContentBridge in an HA pair:
  
  - Remove the HA pair configuration for the High Bandwidth ContentBridge you wish to replace by running:
    
    ```bash
    ./hapair --force --destroy
    ```

    Note that in some cases, if the High Bandwidth ContentBridge you wish to replace is unaccessible, you may not be able to remove the HA pair configuration.

  - Remove the original High Bandwidth ContentBridge, install the new one, and configure it according to the instructions in “Replacing a High Bandwidth ContentBridge” in the Harmonic MediaGrid Component Replacement Guide.

  - Create a new HA pair by running the HA pair utility and entering the desired IP address for the new High Bandwidth ContentBridge.

### Viewing HA Paired High Bandwidth ContentBridges in SystemManager

Once you have configured an HA pair, you can view the status of each device in the pair using SystemManager. From the Configuration tab in SystemManager, click the Servers & Switches icon in the left-hand column and then scroll down to the High Bandwidth ContentBridges (in HA mode) section of the page. See Figure 4–6.
Figure 4–6: Viewing High Bandwidth ContentBridges in HA Mode in SystemManager

In addition to displaying the IP addresses and connection status, SystemManager shows which High Bandwidth ContentBridge is the “active,” which is the “shadow,” and which one is “preferred,” meaning it will become active first in the event of a failover.

Configuring a ContentServer

A configuration file exists for all ContentServers in a cluster. You can edit this file to enable certain settings and features, including the following:

- Add the IP address of the log host
- Set the ContentServers to reboot after a kernel panic
- Set the ContentServers to reboot if they stop working
- Set the amount of detail included in logs
- Enable/disable jumbo frames on ContentServers and ContentBridges
- Set the time zone

Using SystemManager, click the View/Edit ContentServer Config button on the Harmonic MediaGrid Cluster Properties page to edit the file. See the Harmonic SystemManager User Guide for complete instructions.

The file is located on the ContentDirector at: /tftpboot/config/config file.

Editing the Slice Size Configuration File

**CAUTION:** Do not edit the Slice Size configuration file unless instructed by Technical Support. Using a smaller-than-recommended slice size can result in an unexpected loss of disk space.

The following slice sizes are supported for individual audio and video files: 256 KB, 512 KB, 1 MB, 2 MB, 4 MB and 8 MB. Support of variable slice sizes allows more simultaneous file transfers and enables latency reduction in read operations.

Changing slice sizes is done by editing the Slice Size configuration file using the SystemManager application. See “Editing the Slice Size Configuration File” in the Harmonic SystemManager User Guide for instructions on setting slice sizes. This file also includes a buffer hint value, a reserved field that should always be 0 (zero).
Chapter 5
Installing the File System Driver

This section provides instructions for installing the file system driver. See the current Harmonic MediaGrid FSD release notes for the latest installation instructions.

About the Software

ContentDirector software is pre-installed prior to shipping, though may require an upgrade to the latest version. Refer to “Software Installation” in the Harmonic SystemManager Installation Guide to upgrade ContentDirectors with the latest version of software.

The following software installation tasks must be completed following hardware installation of the Harmonic MediaGrid components:

- Downloading the File System Driver
- Installing the Harmonic MediaGrid File System Driver for Windows
  or
- Installing the Harmonic MediaGrid File System Driver for Macintosh
  or
- Installing the Harmonic MediaGrid File System Driver for Linux

This section provides instructions for downloading and installing the File System Driver (FSD) for either Macintosh OS X, Intel x86-based Macintosh, or Microsoft Windows. The file system drivers are available for download from Harmonic’s support site. Refer to Downloading the File System Driver for instructions.

**IMPORTANT:** See the latest Harmonic MediaGrid Release Notes for your particular client platform before installing the file system driver, as there may be changes that are not reflected in this guide.

**NOTE:** It is recommended that you install the file system driver after configuring the Harmonic MediaGrid system.

**IMPORTANT:** Specific network ports must be open to enable client access to Harmonic MediaGrid. Refer to Opening Network Ports to Enable Client Access for instructions.

Before You Begin

Harmonic recommends that the desktop computer on which you install the Harmonic MediaGrid file system driver be protected by anti-virus software to guard against potential viruses. In addition, Harmonic recommends the use of Windows Update to install security patches available from Microsoft. Windows Update should be used to install critical updates only. Customers in larger IT installations may wish to make the desktop computer(s) a member of their Windows Domain to simplify installation of anti-virus updates and/or critical updates from Microsoft.

Harmonic recommends that you first install anti-virus software from a CD prior to installing the Harmonic MediaGrid file system driver.
System Requirements

See the Harmonic MediaGrid Release Notes for your particular client platform for the latest supported client operating systems.

Make sure that the system on which you install the file system driver meets the following requirements:

- 2 GHz or better dual-core CPU
- 2 GB RAM minimum
- 1-Gigabit Ethernet Port

Downloading the File System Driver

The Harmonic MediaGrid file system driver for your client platform must be downloaded from Harmonic software downloads website. Downloading the firmware for system components such as ContentServers is done using the SystemManager application and the SystemManager platform.

1. Contact Harmonic Technical Support for the software downloads website address and your login information.
2. Log in to the Harmonic software downloads website and then navigate to the Harmonic MediaGrid downloads section.
3. Double-click one of the following files, depending on your client platform:
   - Harmonic-MediaGrid-MacOSXFSD-v<version#>.dmg for the Macintosh OS X driver
   - Harmonic-MediaGrid-WinFSD-v<version#> for the Windows driver
   - Harmonic-MediaGrid-LinuxFSD-v<version#>.zip for the Linux driver
4. Enter the password provided by Harmonic Technical Support.
5. Open the file or save it to a location on the client platform.
   The installation files unpack into the current working directory, or a specified directory on the client computer.
6. Continue to the installation section that applies to your platform.

Installing the Harmonic MediaGrid File System Driver for Windows

Follow these instructions to install the Harmonic MediaGrid FSD for Windows. See the latest Harmonic MediaGrid Release Notes for the most up-to-date instructions and information on compatibility. Make sure you have downloaded the file system driver for your client platform before continuing. Refer to Downloading the File System Driver for instructions.

IMPORTANT: You must have administrator privileges to install the Harmonic MediaGrid FSD on Windows platforms.

NOTE: If you are upgrading from a prior release of the Windows FSD, Harmonic recommends that you uninstall the previous version.

Prior to installing the Harmonic MediaGrid FSD for Windows, make sure of the following:

- No application is running on the computer.
Chapter 5 Installing the File System Driver

Installing the Harmonic MediaGrid File System Driver for Macintosh

Follow these instructions to install the Harmonic MediaGrid FSD for Macintosh OS X. See the latest Harmonic MediaGrid Release Notes for the currently supported Macintosh operating systems. Make sure that you have downloaded the file system driver for your client platform before continuing. Refer to Downloading the File System Driver for instructions.

Prior to installing the Harmonic MediaGrid FSD for Macintosh, make sure of the following:

- No application is running on the computer.

To install the Harmonic MediaGrid File System Driver for Windows:

1. Log on to the system as administrator.
2. Navigate to the location of the WinFSD<version#>.msi file on the client platform.
3. Double-click the WinFSD<version#>.msi icon to begin the installation.
4. Follow the instructions to install the software on the client platform.
5. Restart the computer to complete the installation.

Make sure to upgrade Harmonic MediaGrid system components using the SystemManager application. See “Upgrading Harmonic MediaGrid Firmware” in the SystemManager User Guide for detailed information.

Refer to About Accessing a Harmonic MediaGrid System for instructions on mounting Harmonic MediaGrid file systems from a Windows PC.

Upgrading From a Prior Windows FSD Release

If you are upgrading the Windows FSD from a previous release, use the fsdsetup utility to perform the upgrade.

**NOTE:** Harmonic recommends that you uninstall the previous version before upgrading.

1. Navigate to the location of the Windows FSD files (from WinFSD<version#>.zip) that you downloaded from the Harmonic software downloads website.
2. Double-click fsdsetup.exe.
   
   The Harmonic MediaGrid Win FSD Setup dialog appears and displays the FSD version that it will install.
3. Click Install to begin the installation.
4. Restart your computer when prompted to complete the installation.

Uninstalling the Windows FSD

Uninstall the Windows FSD from the Windows Control Panel.

1. Select Start > Control Panel > Uninstall a Program.
2. Select the Omneon MediaGrid File System Driver, and then click Uninstall.
3. Restart your computer if instructed to do so.

Installing the Harmonic MediaGrid File System Driver for Macintosh

Follow these instructions to install the Harmonic MediaGrid FSD for Macintosh OS X. See the latest Harmonic MediaGrid Release Notes for the currently supported Macintosh operating systems. Make sure that you have downloaded the file system driver for your client platform before continuing. Refer to Downloading the File System Driver for instructions.

Prior to installing the Harmonic MediaGrid FSD for Macintosh, make sure of the following:

- No application is running on the computer.
All Harmonic MediaGrid mounted file systems are unmounted.

**NOTE:** The Mac FSD installation procedure requires administrator access.

**NOTE:** If you are running a pre-3.2 version of the Mac FSD, Harmonic recommends that you first un-install the previous version before installing new software.
To un-install, open a terminal window on the Macintosh and enter the following command:
```bash
sudo /usr/bin/omremoveomfs
```
Once the previous release has been uninstalled, proceed with installation of the new release.

**NOTE:** Beginning with version 3.5.1 of the Macintosh FSD, if you wish to un-install the application or revert to an earlier version, you must execute the omremoveomfs command from the /opt/omfs/bin directory, as follows:
```bash
sudo /opt/omfs/bin/omremoveomfs
```

**To install the Harmonic MediaGrid File System Driver for Macintosh:**

1. Double-click the Harmonic-MediaGrid-MacOSXFSD-v<version#>.dmg icon to open the installation package.
   An “Authenticate” dialog window will appear.
2. Enter the password for the release, provided by Harmonic Technical Support.
3. This will mount the “SMacOSXFSD” disk image on the desktop
4. Double-click the “SMacOSXFSD” disk mount. A window with three icons will appear.
5. Double-click the “MediaGridMacOSXFSD.pkg” installer package.
6. Follow the steps as instructed by the installer.

The file system driver is automatically loaded after rebooting the client system. Continue to **Modifying the OSX IP Stack on the Client** before mounting the Harmonic MediaGrid file system. Refer to **About Accessing a Harmonic MediaGrid System** for instructions on mounting Harmonic MediaGrid file systems from a Macintosh computer.

Make sure to upgrade Harmonic MediaGrid system components using the SystemManager application. See “Upgrading Harmonic MediaGrid Firmware” in the **SystemManager User Guide** for detailed information.

**Modifying the OSX IP Stack on the Client**

Before running a 3.2.x or later release of the Mac FSD, you must edit the /etc/sysctl.conf file on your Mac FSD client as follows:

1. Open the /etc/sysctl.conf file on the Mac FSD client. If the /etc/sysctl.conf file doesn't exist on your Mac FSD client you may need to create one.
2. Add the following settings:
   ```bash
   net.inet.tcp.delayed_ack=0
   ```
3. Restart the Mac FSD client for the change to take effect.
4. Verify the settings as follows:
   a. Open a terminal window, and enter the following:
      ```bash
      $ cat /etc/sysctl.conf
      ```
   b. Verify that the file shows the following settings:
      ```bash
      net.inet.tcp.delayed_ack=0
      ```
      If it does not show the setting above, continue to the next step.
c. Perform the following:
   $ sudo echo "net.inet.tcp.delayed_ack=0" >> /etc/sysctl.conf

d. Restart the client computer.

**Settings for OS X 10.9.5 or Later With Certain NICs**

**IMPORTANT:** There have been multiple issues with particular network interfaces and drivers with recent versions of the OS. Please consult the Harmonic MediaGrid Macintosh FSD Release Notes for recommended /etc/sysctl.conf settings. Also, check the manufacturer’s website and verify that the driver for the network interface is up-to-date.

If you are running OS X 10.9.5 or later and your Mac FSD client uses any of the following 1GbE NICs:

- Intel* 82574L (supported in OS X 10.10.x and later)
- Broadcom* 57762
- Broadcom* 57766-A1

edit the /etc/sysctl.conf file on your Mac FSD client as follows:

```bash
net.inet.tcp.delayed_ack=0
net.link.generic.system.sndq_maxlen=512
net.classq.sfb.allocation=100
```

Restart the Mac FSD client for the change to take effect.

You may want to apply these settings if you are using other 1GbE NICs and experience performance problems.

**Installing the Harmonic MediaGrid File System Driver for Linux**

Follow these instructions to install the Harmonic MediaGrid FSD for Linux. See the latest Harmonic MediaGrid Release Notes for the currently supported Linux operating systems. Make sure that you have downloaded the file system driver for your client platform before continuing. Refer to Downloading the File System Driver for instructions.

**Verifying the Kernel Version**

Prior to installing the Harmonic MediaGrid FSD for Linux, you need to verify the kernel version.

1. Unpack the downloaded Linux zip file.
2. Enter the password provided by Technical Support.
3. Select the rpm file that matches your distribution. See the list of distributions in the latest Harmonic MediaGrid Linux FSD Release Notes.
4. Use the “rpm –qip” command to view the rpm header, for example:
   ```bash
   rpm –qip MediaGridFSD-3.5.0.020070515_3.5.0.0_1.2142__FC4smp.x86_64.rpm
   ```
   The last line of the header contains the kernel version for which the FSD was built.
5. Verify that your current kernel matches the version displayed by using the following command:
   ```bash
   uname –r
   ```
   Do not continue if the kernel versions do not match. Contact Technical Support for more information.
Installing the Linux FSD for the First Time

Prior to installing the Harmonic MediaGrid FSD for Linux, make sure of the following:

- No application is running on the computer.
- All Harmonic MediaGrid file systems are unmounted, using the "umount" Linux command. If installing the Harmonic MediaGrid FSD for Linux from a network location, copy the installation file to a local directory before beginning the installation.
- Any prior releases of the Linux FSD are unloaded, by using the "rmmod" command:
  
  rmmod omfs

To install the Linux FSD for the first time:

1. Use one of the following commands to install the selected rpm file for the first time:
   - For RedHat Fedora, use the “rpm –i” command with the “--force” option. For example:
     
     # rpm –ivh --force MediaGridFSD-3.5.0.0-20070515_2.6.17_1.2142_FC4smp.x86_64.rpm
   - For Ubuntu or Debian use:
     
     dpkg --install --force-overwrite mediagridfsd_3.5.0.0-20140512-3.2.0-29-generic_amd64.deb

   The "--force-overwrite" option replaces the distro-provided omfs.ko module. See the note below.
   - For all other Linux operating systems you may use the “rpm –i” command by itself. For example:
     
     # rpm –ivh MediaGridFSD-3.5.0.0-20070515_2.6.17_1.2142_FC4smp.x86_64.rpm

2. Please capture the output of the above command in case a problem occurs.
3. Once you have installed the rpm file, restart your client computer.

**NOTE:** Fedora, SLES, Ubuntu, and Debian distributions provide an "omfs.ko" kernel driver module which conflicts with the Harmonic Mediagrid kernel driver module of the same name. In most cases, this is not automatically loaded or needed. However, you should ensure it is not already in use before replacing it (for example, the command "Ismod | grep omfs" can be used to determine if it is loaded into the kernel).

The Harmonic MediaGrid file system can now be mounted. Refer to About Accessing a Harmonic MediaGrid System for instructions on mounting Harmonic MediaGrid file systems from a Linux computer.

Installation Issues

If the rpm utility complains about a dependency mismatch, particularly about a kernel module, please check the kernel revision level on the computer against the kernel levels listed above against each distribution. There may be a mismatch between the kernel that the rpm is built for and the one on the machine. If this is the case, please contact Harmonic Technical Support for assistance or a revised rpm package.

Upgrading From a Prior Release

Before upgrading the Harmonic MediaGrid Linux FSD software, make sure that:

- No application is running on the computer.
All Harmonic MediaGrid file systems are unmounted, using the “umount” Linux command. If installing the Harmonic MediaGrid Linux FSD from a network location, always copy the installation file to a local directory before beginning the installation.

Any prior releases of the Linux FSD have been unloaded by using the “rmmod” command: 
```
rmmod omfs
```

**To upgrade from a prior release:**

1. Use one of the following commands (for example):
   - For RedHat, Fedora:
     ```
     # rpm -Uvh MediaGridFSD-3.5.0.0-20070308_2.6.17_1.2142_FC4smp.
     x86_64.rpm
     ```
   - For Ubuntu or Debian:
     ```
     # dpkg --install --force-overwrite mediagridfsd_3.5.0.0-20140512-
     3.5.0-29-generic_amd64.deb
     ```

2. Please capture the output of this command in case a problem occurs.

The Harmonic MediaGrid file system can now be mounted. Refer to *About Accessing a Harmonic MediaGrid System* for instructions on mounting Harmonic MediaGrid file systems from a Linux computer.

**Harmonic MediaGrid File System Driver for Spectrum**

See the *Harmonic SystemManager User Guide* for instructions on how to configure Harmonic MediaGrid for Spectrum.
Chapter 6
Accessing the Harmonic MediaGrid

This section provides instructions for accessing the Harmonic MediaGrid system. The following topics are included:

- About Accessing a Harmonic MediaGrid System
- Mounting a Harmonic MediaGrid File System Using Windows
- Mounting a Harmonic MediaGrid File System Using a Macintosh
- Mounting a Harmonic MediaGrid File System Using Linux
- Using Multiple Client Ethernet Ports
- Administrator Credentials and Security Permissions
- Managing File and Directory Permissions
- Setting up Soft Links
- Connecting Clients to Harmonic MediaGrid Using ContentBridge

About Accessing a Harmonic MediaGrid System

There are two basic methods for accessing the Harmonic MediaGrid system. The first method is to install the file system driver on a client computer and then map to the Harmonic MediaGrid from the client computer. The second method is to use a ContentBridge, which allows you to access the Harmonic MediaGrid via CIFS (Common Internet File System), FTP (File Transfer Protocol) or NFS (Network File System).

Choose from the following sections for instructions on accessing the Harmonic MediaGrid system:

- Mounting a Harmonic MediaGrid File System Using Windows
- Mounting a Harmonic MediaGrid File System Using a Macintosh
- Mounting a Harmonic MediaGrid File System Using Linux
- Connecting Clients to Harmonic MediaGrid Using ContentBridge

If the file system driver is not yet installed on your client computer, refer to Installing the File System Driver for instructions.

Mounting a Harmonic MediaGrid File System Using Windows

Follow these steps to mount the Harmonic MediaGrid file system from a Windows computer. These instructions assume you have installed the Harmonic MediaGrid File System Driver (FSD) for Windows. Refer to Connecting Clients to Harmonic MediaGrid Using ContentBridge for instructions on mounting a Harmonic MediaGrid file system without using the Harmonic MediaGrid FSD for Windows.

1. Click the Start button in Windows.
2. Right-click Computer and select Map network drive...
3. Enter or select the drive letter to map from the Map Network Drive screen.
4. Enter the Harmonic MediaGrid server name and the file system to mount using a standard UNC pathname, for example: \10.4.48.201\testsfs.
5. Click the Finish button.

Your computer attempts to map to Harmonic MediaGrid and the following login prompt appears.

6. Enter a valid, case-sensitive username and password.
7. Optionally, enter a domain.
8. If you would like all users of this client system to automatically connect to this Harmonic MediaGrid using these credentials, select Remember Password for this Computer.
   Future attempts to access the Harmonic MediaGrid will not require entry of a password.
9. If you would like only the logged in user to automatically connect, select Remember Password for this User.
   Future attempts by the current user to access the Harmonic MediaGrid will not require entry of a password.
10. Click OK.

You can now access the Harmonic MediaGrid file system on the specified drive. Any mapped drive for this computer through group policy script is available to all users (all sessions).

**NOTE:** If, after establishing a connection to the file system you wish to switch to a different user credential, you must log off the Windows session.

### Setting Windows FSD Properties

An icon is added to the Control Panel once the Windows FSD is installed, which allows you to set the ReadAhead values, enter user credentials, and set other application-specific features. Refer to *Installing the Harmonic MediaGrid File System Driver for Windows* if you have not installed the file system driver.

To set FSD parameters:

1. Mount the Harmonic MediaGrid file system following the instructions in *Mounting a Harmonic MediaGrid File System Using Windows*.
2. Select Control Panel from the Start menu.
3. Change the view to Large Icons or Small Icons in order to display Control Panel applets.
4. In the Control Panel, double-click the Harmonic MediaGrid icon to display the File System Driver Properties dialog:

![File System Driver Properties dialog](image)

5. Modify the settings under each tab as desired.

   For detailed information about each setting, refer to *Windows FSD Property Descriptions*. Or, click the Help button to access the Windows FSD Help system.

6. When you are finished, click Apply and then OK to exit the FSD Properties dialog.

**NOTE:** If you have modified the setting on the Network tab, you must restart your computer in order for the change to take effect. Changes to all other settings become effective when you click Apply.
Windows FSD Property Descriptions

Understand important information about each setting, including default, maximum, and minimum values (where applicable). You can also find this information in the Windows FSD Help system.

- **Performance Properties**
- **Sharing Preferences**
- **User Credentials**
- **Network Settings**
- **Logging Preferences**

**Performance Properties**

You may improve performance by adjusting these parameters to meet the requirements of your specific workload. For more information about memory usage parameters, refer to *Managing Memory Usage by the File System Driver*.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
<th>Valid Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Read Ahead Setting</strong></td>
<td>This setting specifies the amount of ReadAhead data (in slices) to be pre-fetched for each open/active file. The default value is 3 slices. You may also wish to increase <strong>Maximum Cache Size</strong> if you increase this setting.</td>
<td>0-50 slices</td>
</tr>
<tr>
<td><strong>Read Bandwidth Limit</strong></td>
<td>You may specify a read bandwidth limit for this client by entering the number of Megabytes per second (MB/s). By default, no limit is set (0 MB/s). Note: This setting applies to all mounts on the Win FSD client, including any existing mounts.</td>
<td>0-12500 MB/s</td>
</tr>
<tr>
<td><strong>Maximum Connections</strong></td>
<td>This is the maximum number of connections the FSD will make to the ContentDirector for metadata operations (not file transfers). Harmonic recommends that you leave the default value of 8 unless you plan to use an application that requires more than 8 threads to access metadata.</td>
<td>4-64 connections</td>
</tr>
</tbody>
</table>
Sharing Preferences

These settings may benefit workflows in which multiple clients are performing read/write operations on the same files.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
<th>Valid Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Cache Size</td>
<td>This setting allows you to limit the memory usage for caching file data in the Windows FSD. The default value for this parameter, 400 MB, is sufficient in most cases. If your workload requires many files to be read simultaneously, you may wish to increase this number. If you are unsure of whether you should increase or decrease it, please contact Harmonic Technical Support for assistance. The maximum allowable value for this setting is 25% of your system's RAM. This is calculated after RAM for other drivers (for example, graphics) has been allocated. Therefore, the maximum value enforced for this parameter may be smaller than 25% of the total system RAM.</td>
<td>100 MB - 25% of RAM</td>
</tr>
<tr>
<td>Optimize for nonlinear editing</td>
<td>This option can improve performance for specific workflows by altering the behavior of file reading in the FSD, and is particularly useful to non-linear editing applications. By default, this option is turned off. Leave this option unselected for all other applications (for example, archive or office applications).</td>
<td>N/A</td>
</tr>
</tbody>
</table>

User Credentials

Windows FSD stores a list of up to five user credentials for connecting to the Harmonic MediaGrid. If one set of credentials fails when connecting, another connection attempt is made using the next set of credentials on the list. If the Windows FSD is not able to connect after trying all saved credentials, then you will be prompted to log in.
NOTE: Make sure to enter the correct user credential information, including a valid domain, because this utility is unable to confirm your credential.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>New User Credentials</td>
<td>Note the following:</td>
</tr>
<tr>
<td></td>
<td>- If five credentials already exist, a newly entered credential replaces the oldest entry.</td>
</tr>
<tr>
<td></td>
<td>- When adding a new user credential, <strong>Domain</strong> is optional.</td>
</tr>
<tr>
<td></td>
<td>- You must log off the Windows session in order to switch to a different user credential as the Windows kernel may still keep the Harmonic MediaGrid session alive after disconnecting.</td>
</tr>
<tr>
<td>Remove All Saved Credentials</td>
<td>Click this button to remove the entire list of saved credentials.</td>
</tr>
<tr>
<td>Use saved credentials as first preference</td>
<td>Select this option if you would like to use the credentials saved in the Windows FSD, rather than your domain (logon) credentials, when connecting to the Harmonic MediaGrid.</td>
</tr>
</tbody>
</table>

**Network Settings**

If your computer has multiple Ethernet ports, Windows FSD allows you to configure which Ethernet port(s) to use for transferring file data to and from the Harmonic MediaGrid.

**IMPORTANT:** After modifying the network settings, you must restart your computer in order for a change to take effect.

**NOTE:** The network interface that will be used for meta-data (small message) communication between the client and the ContentDirector is selected by the underlying OS kernel. Any changes you make to this setting do not affect which interface is used for meta-data communication with the ContentDirector.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use system default interface</td>
<td>This option allows the operating system to determine which Ethernet port to use. It is the default setting, and must remain selected if the client computer has only one Ethernet port.</td>
</tr>
<tr>
<td>All available interfaces</td>
<td>If your system has multiple Ethernet ports with equal bandwidth capabilities, you may select this setting to enable all ports to communicate with the Harmonic MediaGrid.</td>
</tr>
<tr>
<td>Specific interfaces</td>
<td>This option allows you to specify one or more Ethernet interfaces for communication with the Harmonic MediaGrid. For example, if your computer has both a 1GbE NIC and a 10 GbE NIC, you might wish to specify the 10 GbE NIC for communication with the Harmonic MediaGrid. Separate multiple IP addresses with a colon.</td>
</tr>
</tbody>
</table>

**IMPORTANT:** The Windows FSD does not validate user-specified IP addresses. Double-check that you have correctly entered each IP address. Also, changes in system configuration can change the NIC and/or IP address configuration. It is important to re-verify the IP addresses after any configuration changes.
Logging Preferences

The Windows FSD logs all critical, error, and warning messages to disk. The default settings are sufficient in most cases; however, if necessary, Technical Support may ask you to increase the logging level or to change other logging parameters.

**NOTE:** If increasing the maximum log file size or log file count, please make sure there is enough local disk space to accommodate the setting, otherwise it will affect system performance.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logging Level</td>
<td>The default level is <strong>4 – Information</strong>. If you increase the logging level for troubleshooting, be sure to decrease the logging level after the problem has been resolved. Harmonic recommends that you do not set the logging level to <strong>0 – None</strong>, as no logging will occur.</td>
</tr>
<tr>
<td>Log file</td>
<td>Directs the output of the logs to a user-selected file. The default is C:\Program Files (x86)\Omneon\Omneon MediaGrid\Log\ommrx.log.</td>
</tr>
<tr>
<td>Maximum log file size</td>
<td>Allows you to configure the log file size (in MB). Once the log file reaches the specified value, a new log will be started, and the previous log file will be saved with a sequential number appended to the log file name. The default log file size is 32 MB.</td>
</tr>
<tr>
<td>Log file count</td>
<td>Allows you to specify the number of log files kept at one time in the system. The default is 32. Once the maximum log file count is reached, the oldest log file will be deleted when a new log file is created. The maximum value for this field is 500. IMPORTANT: Do not set the log file count to 0. This will prohibit logging on the client computer.</td>
</tr>
</tbody>
</table>

Automatically Mounting a File System

If you are running an application as a Windows Service, it may be desirable to mount the Harmonic MediaGrid file system without being prompted to enter a user name and password. If Windows is set up to reconnect a share after reboot, the user name and password prompt always displays.

Follow these steps to create a startup file that prevents the user name and password prompt from displaying. Complete this procedure before logging on to the Harmonic MediaGrid file system.

**To automatically mount a file system:**
1. Click the **Start** button on the Windows taskbar and then click **Run**.
2. Start the Group Policy management console by typing the following: `gpedit.msc`
   The following window opens.
Mounting a Harmonic MediaGrid File System Using Windows

3. In the left pane, navigate to Computer Configuration > Windows Settings > Scripts (Startup/Shutdown).

4. Double-click the Startup script in the right pane.

   The Startup Properties dialog box displays.

5. Click the Show Files button.

   The Startup folder displays.

6. Open a text editor, such as Notepad, to create a new startup script file.

7. Include the following line in this file:
   ```
   net use x: \mdsServerName\mdsFileSystemName /user:<username> <password>
   ```
   a. Replace <username> with the user name of the Harmonic MediaGrid file system.
   b. Replace <password> with the password of the Harmonic MediaGrid file system.
8. Save the file with the .bat filename extension (for example, “newstartup.bat”).
9. Close the Startup folder.
10. Click the Add button in the Startup Properties dialog box.

The Add a Script dialog box displays.

![Add a Script dialog box](image)

**Figure 6–5: Add a Script**

11. Click Browse and then add the script file you created.
12. Click OK.
13. Exit the Group Policy management console.

**Using OmCopy for Fast Copying**

The OmCopy feature in the Windows FSD allows you to copy files and directories faster than simply using Windows Explorer.

**To copy data using OmCopy:**
1. Select the file or directory you wish to copy.
2. Right-click to view the right-click menu options and select OmCopy, as shown in **Figure 6–6**.

![OmCopy feature](image)

**Figure 6–6: Using OmCopy**

3. Open the destination directory and move mouse to the background of the directory.
4. Right-click to open the right-click menu and select OmPaste, as shown in **Figure 6–6**.

   The OmCopy dialog box appears as the file or directory is being copied.

**Mounting the Harmonic MediaGrid from the ProMedia™ Origin Server**

The ProMedia Origin uses the Windows FSD to allow you to access files on the Harmonic MediaGrid system. Note that the parameters of the Windows FSD on the ProMedia Origin are already optimized for performance and do not require modification.
For instructions on configuring storage and mounting the Harmonic MediaGrid file system, refer to the ProMedia Origin User Guide.

Mounting a Harmonic MediaGrid File System Using a Macintosh

Follow these steps to mount the Harmonic MediaGrid file system from a Macintosh computer. These instructions assume that the latest Harmonic MediaGrid file system driver for Macintosh is installed. Refer to Connecting Clients to Harmonic MediaGrid Using ContentBridge for instructions on mounting a Harmonic MediaGrid file system without using the Harmonic MediaGrid FSD for Macintosh.

With version 3.4 and later, the Mac FSD provides two ways to connect to the Harmonic MediaGrid, via a User Mount, which includes security improvements, or via a System Level Mount, which is the same method provided in previous versions. To take advantage of security improvements, Harmonic recommends that you connect with a User Mount.

To connect with a User Mount, configure the options described in Configuring User Mount Options, and then continue to Connecting to the Harmonic MediaGrid File System.

To connect with a System Level Mount, refer to Connecting with a System Level Mount.

Configuring User Mount Options

1. Open the System Preferences window and click the Harmonic MediaGrid icon.

The following dialog box appears.

2. Configure the following mount options:
Network Settings

- **Use interface chosen by system**—selected by default, this option uses the default NIC on your Mac FSD client when connecting to the Harmonic MediaGrid system.

- **Use all available network interfaces**—select this option to use all available NICs on your Mac FSD client when connecting to the Harmonic MediaGrid system.

- **Use specified network interfaces**—select this option if you wish to specify the NICs on your Mac FSD client that will be used to connect to the Harmonic MediaGrid system. Enter each NIC name (for example, "en0"), separated by a colon, in the field provided.

Global Options

- **Limit read bandwidth to**—select this option if you wish to limit the total read bandwidth on your Mac FSD client. Type the number of Megabytes per second (MB/s) you wish to specify as the limit. Note that this setting applies to all Harmonic MediaGrid mounts from this Mac FSD client.

  **IMPORTANT:** The "limit read bandwidth" setting applies to all mounts on the Mac FSD client, including any existing mounts, user-level as well as system-level mounts.

Connection Options

- **Read ahead**—the amount of data to be pre-fetched for each open/active file. For most applications, a ReadAhead value of 2 (default value) is recommended. Refer to *Managing Memory Usage by the File System Driver* for more information.

- **Use case-insensitive file names**—select if you would like to set the file system to be case insensitive. By default, the Harmonic MediaGrid file system is case sensitive.

- **Deny delete/rename of open files**—this option prevents the deleting or renaming of files which are in active use (in the application "open" state) by this client. Note that this setting is only effective when it is applied to all clients accessing the Harmonic MediaGrid system.

- **Open files with exclusive write access**—this option provides exclusive write access for applications on the client. This means files cannot be opened for writing on another client system at the same time. They can, however, be opened on other clients in read mode. By default, this option is turned off.

- **Slow attribute refreshing**—select this option to improve the display time for large Harmonic MediaGrid directories in NLE workflows.

- **Use high read priority**—selected by default, this option provides low latency for read operations on the Harmonic MediaGrid file system.

About Importing and Exporting Mount Options

To be able to share these settings with other FSD clients, Mac FSD 3.5 and later allows you to export and import the FSD settings.

**IMPORTANT:** Do not edit the exported file, as it will cause a later import operation to fail.

**NOTE:** If you have specified which network interfaces the client should use for communication with the Harmonic MediaGrid, you may need to update the NIC names after importing settings on a different FSD client, as NIC names may vary across client systems.
Connecting to the Harmonic MediaGrid File System

When you have finished reviewing and configuring your mount options, you can connect to the Harmonic MediaGrid as described in Connecting to the Harmonic MediaGrid File System.

1. Launch a new Finder window, open the Go menu, and then click Connect to Server.

   ![Connect to Server dialog box]

2. In the Server Address field, type: omfs://<IP address of your Harmonic MediaGrid system>/<file system name>.

3. Click Connect. The Connect to Server dialog box appears.

4. Enter the name and password for your Harmonic MediaGrid file system. The domain information can be entered as username/domain.

5. Optionally, you may select the checkbox to add your Harmonic MediaGrid password to your keychain. Adding the password to your keychain allows you to configure your Mac FSD client to connect to Harmonic MediaGrid automatically upon log in, as described in the following section.

Configuring your Mac FSD Client to Connect Automatically

If you have added your Harmonic MediaGrid password to your keychain, you may configure the client to connect to the Harmonic MediaGrid automatically.

1. Open the System Preferences window, and click Users & Groups to open the Users & Groups dialog box.

2. From the Login Items window, click the + symbol, browse to the Harmonic MediaGrid system, and then click Add.

3. The Harmonic MediaGrid file system will appear in the Login Items window.
Figure 6–7: Configuring Automatic Connections

Connecting with a System Level Mount

The System Level Mount uses the same options provided in earlier releases of the Mac FSD.

1. Open the System Preferences window and click the Harmonic MediaGrid icon.
2. Click the System Level Mounts tab.
3. Click the + symbol to add a new mount.

The New systemwide connection dialog box appears.
4. Enter the following case-sensitive information in the appropriate fields:
   - **MediaGrid/Directory**: the name or network address of the Harmonic MediaGrid system and the name of the file system directory. Separate the two names with a forward slash.
   - **Finder Name**: the Finder name of the connected Harmonic MediaGrid. This name defaults to the directory entered above, but can be changed to whatever you choose.
   - **Connect As**: the user name for connecting to the Harmonic MediaGrid system.
   - **Password**: the password for connecting to the Harmonic MediaGrid system.

5. Configure any Network Settings or Connection Options (see Configuring User Mount Options).

6. Click **Add**. If the mount is successful, the mount details will appear in the "Current automatic system mounts" window.

From the System Level Mounts tab, you can use the minus (-) icon to remove a system level mount upon restart. To remove an active mount, follow the instructions in Unmounting the Harmonic MediaGrid File System.

To modify mount settings at any time, select the mount details, and then click the edit icon. Note that a restart is required.

**NOTE:** For a System Level mount, if you want the mount to remain after logging off, you must restart the client.
Unmounting the Harmonic MediaGrid File System

This procedure unmounts the active mount for both user-level and system-level mounts.
1. Open a Finder window, and then click the icon of the Harmonic MediaGrid volume.
2. From Finder, select File > Eject. Alternately, you can click the Command + E keys.
   The icon of the Harmonic MediaGrid file system disappears.

Displaying Connected Harmonic MediaGrid Systems on the Desktop

By default, connected network servers do not display on the Macintosh desktop using Macintosh OS X 10.5 and later.
1. Select Preferences from the Finder menu.
2. Click the General tab.
3. Under Show these items on the desktop, select Connected servers.

Accessing a Harmonic MediaGrid File System Using Final Cut Pro

Follow these steps to access the Harmonic MediaGrid file system from Final Cut Pro.

NOTE: These instructions apply to Macintosh OS X 10.5 and later.

1. Start Final Cut Pro.
2. Select Open from the File menu to display the Choose a File screen, shown below.

![Choose a File](image1)

Figure 6–8: Choose a File

3. Click Documents in the Finder sidebar.

![Finder Sidebar](image2)

Figure 6–9: Finder Sidebar
4. Click the **Documents** pop-up menu and then select the computer that is mounted to the Harmonic MediaGrid system.

5. Select the file system that contains the files.

### Mounting a Harmonic MediaGrid from a Macintosh in a Windows Domain that is not the Default

Macintosh client computers can mount a Harmonic MediaGrid system from a Windows domain, which is not the default using the command prompt.

If you haven’t created the mountpoint directory yet, you must do so before mounting the file system. You can do so using the `mkdir` command. For example, `mkdir /Volumes/mg-qa1`

To mount the file system:

- Type the following command to mount the Harmonic MediaGrid via a specific Windows domain from a Macintosh client:
  ```bash
  mount -t omfs -o username=<user>,password=<password>,domain=<domain> /volume/<fsname>
  ```

  The bold text above represents the user and infrastructure information specific to the customer. For example:
  ```bash
  mount -t omfs -o username=user1,password=user1password,domain=acme /Volumes/mg-qa1
  ```

### Additional Mount Options for Macintosh

The following file system mounting options are available using the Macintosh FSD.

The current values for each of the following mount options are logged in the Macintosh `system.log`, which can be viewed in the Console app or in the “/var/log/system.log” at the time of the Harmonic MediaGrid volume mount.

To learn optimal settings for post-production workflows, please refer to the latest version of the *Harmonic MediaGrid Macintosh FSD Release Notes*.

**IMPORTANT:** Do not modify any of the values in this table without first contacting Technical Support.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>username=abc</td>
<td>Specify the required user name. You are prompted for a user name if it is not specified.</td>
</tr>
<tr>
<td>password=abc</td>
<td>Specify the required password. You are prompted for a password if it is not specified.</td>
</tr>
<tr>
<td>domain=abc</td>
<td>Specify the Windows domain name (optional).</td>
</tr>
<tr>
<td>readahead=n</td>
<td>Specifies the amount of ReadAhead data (in slices) to be pre-fetched for each open/active file. Supported values are 0 through 50. The default is 2. Note: This option is associated with ReadAhead setting in the Mac FSD GUI.</td>
</tr>
</tbody>
</table>
### Table 6–1: Macintosh FSD Mount Options continued

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| `allnic/multinic` | Specify the use of *all* interfaces in the machine.  
                     Note: This option is associated with the Mac FSD GUI option, “Use all available network interfaces”. |
| `iflist=nic:nic`  | Specify a list of network interfaces, separated by a colon, “:”. For example, `iflist=en0:en1`.  
                     Note: This option is associated with the Mac FSD GUI option, “Use specified network interfaces”. |
| `attrcache=0 or 1`| Specify the maximum timeout for attribute cache in milliseconds.  
                     - A value of “0” (default) sets the timeout limit to 5000ms (5 seconds)  
                     - A value of “1” sets the timeout limit to 60000ms (60 sec). In addition, it increases the number of the application closed file handles that are cached in the Harmonic MediaGrid. |
| `readDataPriority=abc` | This option sets the priority for read operations on the Harmonic MediaGrid file system. Supported types are as shown below in increasing priority level, with the default being omTagPriorityRealTime:  
                     - omTagPriorityBackground  
                     - omTagPriorityLow  
                     - omTagPriorityNormal  
                     - omTagPriorityRealtime  
                     - omTagPrioritySystem  
                     Note: This option is associated with the “use High Read Priority” option in the Mac FSD GUI.  
                     ----- CAUTION: Changing these settings from the default can have adverse effects cluster-wide. ----- |
| `writeDataPriority=abc` | Specify write data priority. Supported types are as shown below in increasing priority level, with the default being omTagPriorityNormal:  
                     - omTagPriorityBackground  
                     - omTagPriorityLow  
                     - omTagPriorityNormal  
                     - omTagPriorityRealtime  
                     - omTagPrioritySystem  
                     ----- CAUTION: Changing these settings from the default can have adverse effects cluster-wide. ----- |
| `caseinsensitive` | Enable support for case insensitive namespace operations for client applications.  
                     Note: This option is associated with the Mac FSD GUI option, “Use case-insensitive file names”. |
| `handletimeout=n` | Specify the timeout in seconds for recycling cached read handles. The default is 300 seconds (5 minutes). |
### Viewing Quota Information from a Macintosh Client

To view quota information for a given Harmonic MediaGrid directory from a Macintosh client, use the `mgquota` utility provided by Harmonic. For details, see *Using the mgquota Utility for the Mac FSD*.

### Mounting a Harmonic MediaGrid File System Using Linux

Follow these steps to mount the Harmonic MediaGrid file system from a Linux computer. These instructions assume you have installed the Harmonic MediaGrid FSD for Linux. Refer to *Connecting Clients to Harmonic MediaGrid Using ContentBridge* for instructions on mounting a Harmonic MediaGrid file system without using the Harmonic MediaGrid FSD for Linux.

---

#### Table 6–1: Macintosh FSD Mount Options continued

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>noopendelete</code></td>
<td>This option prevents other clients from deleting or renaming files which are in active use (in the application “open” state) by this client. When listing this option in the mount command, it will affect all files open on the volume mount and no other client may remove or rename any of those files. By default, this option is turned off. Note: This is associated with the “Deny delete/rename of open files” option in the Mac FSD GUI.</td>
</tr>
</tbody>
</table>
| `singlewriter`         | This option provides exclusive write access for applications on the client. This means files cannot be opened *for writing* on another client system at the same time. They can, however, be opened on other clients in read mode. By default, this option is turned off. Note: This is associated with Mac FSD GUI option, “Open files with exclusive write access”.
| `maxdeferredclose=n`   | Specifies the maximum number of handles on a per mount basis. The default value is 64. Setting this to zero will result in the close system call blocking until data is flushed to the Harmonic MediaGrid. Setting this to zero will increase latency times when working with a large number of files. |
| `maxsmallfilesize=n`   | Hint to pre-open prediction code. The default value is 1048576. |
| `smallfilewindow=n`    | Hint to pre-open prediction code. The default value is 500. |
| `smallfilethreshold=n` | Hint to pre-open prediction code. The default value is 3. |
| `cachefilesize=n`      | Hint to pre-open prediction code. Specifies the maximum number of bytes to pre-read for a file. The default value is 20971520. |
| `maxpendingbulkclose=n`| Specifies the maximum number of handles for deferred close on a per driver basis. The default value is 128. Setting to zero may result in the close system call blocking until the handle is closed in the Harmonic MediaGrid. Setting this to zero will increase latency times when working with a large number of files. |
| `numberpreopen=n`      | Specifies the number of files to open in advance based on prediction logic. The default value is 8. |
To mount a Harmonic MediaGrid file system:

1. Use the type "omfs" in the mount command to access the Harmonic MediaGrid file system, for example:

   ```bash
   mount -t omfs /mediagrid/filesys /mnt -o username=username,password=password
   ```

   **NOTE:** This information is case-sensitive.

   This should automatically load the Linux FSD.

2. If the Linux FSD does not automatically load, type the following:

   ```bash
   modprobe omfs
   ```

### Additional Mount Options Using Linux

The following file system mounting options are available using the Linux FSD. For more information about memory usage parameters, refer to [Managing Memory Usage by the File System Driver](#).

**IMPORTANT:** With the exception of the first four options listed below ("username", "password", "domain", and "readahead"), do not modify any of the values in this table without first contacting Technical Support.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>username=xyz</td>
<td>Specify the required user name. You are prompted for a user name if it is not specified.</td>
</tr>
<tr>
<td>password=abc</td>
<td>Specify the required password. You are prompted for a password if it is not specified.</td>
</tr>
<tr>
<td>domain=abc</td>
<td>Specify the Windows domain name (optional).</td>
</tr>
<tr>
<td>readahead=n</td>
<td>Specifies the amount of ReadAhead data (in slices) to be pre-fetched for each open/active file. Supported values are 0 through 50. The default value is 3.</td>
</tr>
<tr>
<td>filelimit=m</td>
<td>Specify the maximum number of concurrently open files. Used to prevent the system from running out of memory. The default is 1024. m=0 yields no limit.</td>
</tr>
<tr>
<td>mode</td>
<td>Enable file permissions. This displays the proper file permissions when listing files and directories. It also enables the ability to set permissions using standard Linux commands (e.g., chmod). Enabling this option decreases the speed at which files and directories are listed.</td>
</tr>
<tr>
<td>exportfs</td>
<td>Allows a mounted file system to be shared using NFS.</td>
</tr>
</tbody>
</table>
| lock=abc    | Specify the lock type. The following types are supported: 
  - none = locking is off
  - adv (default) = advisory locking
  - mand = mandatory locking |
Table 6–2: Linux FSD Mount Options continued

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| readpri=abc| Specify read data priority. The following types are supported:  
- bg (lowest priority) = background  
- low = low  
- nr (default) = normal  
- rt = real  
- sys (highest priority) = system  

⚠️ **CAUTION:** Changing these settings from the default can have adverse effects cluster-wide.|
| writepri=abc| Specify write data priority. The following types are supported:  
- bg (lowest priority) = background  
- low = low  
- nr (default) = normal  
- rt = real  
- sys (highest priority) = system  

⚠️ **CAUTION:** Changing these settings from the default can have adverse effects cluster-wide.|
| iflist=abc:de| Specify the interface(s) used to transfer data. Refer to Enabling Multi-NIC Usage on Linux for details. |
| allnic     | Specify use of all system interfaces. Refer to Enabling Multi-NIC Usage on Linux for details.                                                       |
| noopendelete| This option prevents the deleting or renaming of files which are in active use (in the application “open” state) by this client. When listing this option in the mount command, it will affect all files open on the volume mount and no other client may remove or rename any of those files. |
| noflushonclose| This option prioritizes the file close operation and delays the transfer of modified data to the server (the transfer of data typically, but not always, occurs within a few seconds). This may be useful when you are writing to a large number of files, and other clients do not need immediate access to the files after you have closed them. |
| mdsconn=n  | Specify the maximum number of ContentDirector connections. Supported numbers are 8 >= n <= 32. The default is 8. Increasing the number may improve the performance of large numbers of metadata operations. |
| throughput  | This option improves Linux FSD throughput and sets the following values:  
- readahead is 16  
- mdsconn is equal to 16  
- number of cache write thread is 16  

singlewriter| This option provides exclusive write access for applications on the client. This means files cannot be opened for writing on another client system at the same time. They can, however, be opened on other clients in read mode. By default, this option is turned off. |
Computers with multiple Ethernet ports or NICs (Network Interface Card) can utilize all ports to access data on Harmonic MediaGrid. This increases bandwidth and reduces latency.

The Harmonic MediaGrid system must be mounted, as described previously, to enable multi-NIC usage. Use the following commands to enable multi-NIC support on a Linux system.

To enable multi-NIC usage:

1. To use specific interfaces, use the following mount option:
   ```shell
   iflist=a:b
   ```
   Where “a” is one interface to use, such as eth0, and “b” is another interface to use, such as eth1. Use a colon “:” to separate the list of interfaces.

2. To use all interfaces, use the following mount option:
   ```shell
   allnic
   ```
   This option uses all of the system’s Ethernet interfaces.

3. Add the following lines to the `/etc/sysctl.conf` file to prevent this behavior from defeating connection balancing:
   ```shell
   net.ipv4.conf.default.arp_ignore = 1
   net.ipv4.conf.default.arp_announce = 1
   ```

4. Restart the computer after making these additions.

### Table 6–2: Linux FSD Mount Options continued

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>maxdeferredclose</td>
<td>Specify the maximum number of handles on a per mount basis. The default value is 64. Setting this to zero will result in the close system call blocking until data is flushed to the Harmonic MediaGrid. Setting this to zero will increase latency times when working with a large number of files.</td>
</tr>
<tr>
<td>maxsmallfilesize</td>
<td>Hint to pre-open prediction code. The default value is 1048576.</td>
</tr>
<tr>
<td>smallfilewindow</td>
<td>Hint to pre-open prediction code. The default value is 500.</td>
</tr>
<tr>
<td>smallfilethreshold</td>
<td>Hint to pre-open prediction code. The default value is 3.</td>
</tr>
<tr>
<td>cachefilesize</td>
<td>Hint to pre-open prediction code. Specify the maximum number of bytes to pre-read for a file. The default value is 20971520.</td>
</tr>
<tr>
<td>maxpendingbulkclose</td>
<td>Specify the maximum number of handles for deferred close on a per driver basis. The default value is 128. Setting to zero may result in the close system call blocking until the handle is closed in the Harmonic MediaGrid. Setting this to zero will increase latency times when working with a large number of files.</td>
</tr>
<tr>
<td>numberpreopen</td>
<td>Specify the number of files to open in advance based on prediction logic. The default value is 8.</td>
</tr>
</tbody>
</table>
Mount Options for Post Production Workflows

With release 3.1 and later, Harmonic MediaGrid provides improved performance in post-production workflows. To take advantage of these improvements, use the following mount options:

```
noflushonclose, smallfilewindow=5000, maxsmallfilesize=50000000, readahead=12
```

For assistance with using these mount options, contact Technical Support.

Using Multiple Client Ethernet Ports

Computers with multiple Ethernet ports or NICs (Network Interface Card) can utilize all ports to access data on Harmonic MediaGrid. This increases bandwidth and reduces latency.

To utilize multi-NIC support, all of the computer’s Ethernet ports must be connected to the same Ethernet switch and must be allocated to the same IP subnet. Trunking or bonding must not be enabled. Do not enable the feature unless the above requirements are met, or inconsistent operation may result.

Refer to the following sections for instructions on enabling multi-NIC support for each operating system:

- **Windows**: Setting Windows FSD Properties
- **Macintosh**: Network Settings
- **Linux**: Enabling Multi-NIC Usage on Linux

Administrator Credentials and Security Permissions

Use the following user name and password when creating and mounting file systems and directories, setting up Access Control Lists (ACLs), and performing other administrative tasks:

- **User name**: mgadmin
- **Password**: 1234

Harmonic recommends that the “mgadmin” user own all top-level directories, including the root directory (named after the file system). Harmonic also recommends that specific domain users own the directories and files.

About Access Control Lists

Both the Harmonic ContentManager application and the Harmonic MediaGrid Windows FSD for Microsoft Windows Explorer allow you to create Access Control Lists (ACLs) to set user- and group-level security for the various Harmonic MediaGrid files and directories. These ACLs are stored on the ContentDirector. Once ACLs are created, when users attempt to access files, Harmonic MediaGrid checks access against the ACL for each file. ACLs provide security preferences for each individual Access Control Entry (ACE).

The Harmonic MediaGrid system receives user and group information from the Active Directory or LDAP server. It also uses the domain controller to authenticate the users. The ContentManager and the Harmonic MediaGrid Windows FSD access this user and group information when you use either of them to create ACLs. The ContentManager application and Harmonic MediaGrid Windows FSD also receive the ACLs when either mounts a Harmonic MediaGrid file system, and then they contact the ContentDirector to resolve user names.
For detailed information on using ContentManager, refer to the ContentManager User’s Guide. For information on using the Harmonic MediaGrid Windows FSD to manage file and directory permissions, refer to Managing File and Directory Permissions.

Linux and Macintosh File Permissions

The Linux and Macintosh file permissions are a subset of the Harmonic MediaGrid ACL interpretation. Three ACEs are used: owner user, owner group and other user.

One ACE is mapped for the owner permission. If the owner belongs to more than one group, the group at the top of the list is picked up and converted to owner group permission. The other user permission is mapped to the everyone group including the owner. The default Harmonic MediaGrid ACL is all access allowed. A newly created file or directory inherits the ACL from its parent directory.

There can be multiple mounts to Harmonic MediaGrid. The owner of the file/directory is the user who specified the Harmonic MediaGrid mount command. This user is not necessarily the user who logged on to the Linux workstation. The user is the local mount’s user if the FSD is used. If CIFS, NFS, or FTP is used, the user is the user who mounted the ContentBridge.

Harmonic MediaGrid handles permission enforcement. File/directory permission can be changed using the standard Linux chmod command. A changed permission affects three Harmonic MediaGrid entries: owner, first group to which the owner belongs, and the everyone group.

NOTE: The user and group name are incorrect when using the ls -l command because the user and group IDs are not set by the FSD.

Managing File and Directory Permissions

The Harmonic MediaGrid FSDs for Windows and Linux support reading and changing file permissions on the Harmonic MediaGrid file system.

Windows and Linux have different file permission models. It is recommended that only one operating system be used to manage file permissions to avoid confusing settings.

This section provides an overview of file permissions for both operating systems. See the documentation accompanying your operating system for more specific information on managing file permissions.

NOTE: The client computer must be logged in to the Harmonic MediaGrid file system to manage file permissions.

Viewing File and Directory Permissions on Windows

1. Right-click My Computer and then select Explore.
2. Right-click the Harmonic MediaGrid file system or directory within the file system and then select Properties.

The Properties dialog box displays.
Managing File and Directory Permissions

3. Click the MediaGrid tab, which shows the following information, depending on what is selected:
   - The version of the Harmonic MediaGrid file system driver installed.
   - The Path of the selected file or directory.
   - The ReadAhead value.
   - The current Replication factor. Type a new number and then click the Change button to apply a new number.
   - The Quota setting (if a directory is selected).
   - The Reservation setting (if a directory is selected).

Changing Security Permissions on Windows

Harmonic MediaGrid allows you to set user- and group-level security for the various Harmonic MediaGrid files and directories by using Access Control Lists (ACLs). The Harmonic MediaGrid system receives ACLs when it joins directory services. These ACLs are stored on the ContentDirectors.

**NOTE:** File permissions can also be set using the Harmonic ContentManager application. See the Harmonic ContentManager User's Guide for more information.

To change security permissions:
1. From the Harmonic MediaGrid Properties dialog box, click Security Permissions to display the ACL editor screen, an example of which is shown in Figure 6–11.
Figure 6–11: ACL on Harmonic MediaGrid

The full path of the selected file or directory is shown at the top of the dialog box, followed by the file/directory owner and user.

2. The **Group or User names** section contains the list of Access Control Entries (ACEs) for the file or directory. Complete this section as follows:
   - Click **Change Owner** to select a new owner from a list of users. You must have permission to change the owner.
   - Click **Add** to add a new user or group to the list of entries. The maximum number of entries is 64.
   - Click **Remove** to remove a user or group from the list of entries. Once an entry is removed, its default settings (inherited from its parent directory) are applied.
   - Click **Up** or **Down** to move an entry within the list. See “**About the Ordering of ACEs within an ACL**” in the **ContentManager User’s Guide** for information on how to order the entries.

3. The **Allowed/Deny Permissions** section shows the current permissions for the selected ACE. Complete these settings as follows:
   - First choose which type of action you want to apply (allow or deny) by selecting **Allow** or **Deny** from the drop-down box on the right. **Allow** provides the user control of the checked permissions; **Deny** prohibits the user control of the checked permissions.
   - Select the permissions by clicking the corresponding check box.
   - Click the **Apply** button to apply your settings and then click **OK** to confirm the changes that you made.

**Note the following ACL rules:**

- Permissions cannot be changed for inherited ACL entries.
- Duplicate ACL entries are not allowed within an ACL. A duplicate is an entry that has the same user or group with the same operation mode, such as Allow (or Inherit) or Deny.
- The same user/group can have one Allow (or Inherit) entry and one Deny entry.
Viewing File and Directory Permissions on Linux

File and directory permissions are visible using the “ls” command and can be modified using the “chmod” command. The standard commands apply for managing file permissions. As an example, however, you can remove read permissions for all users from a file or directory by issuing the following command:

```
chmod a-r <filename>
```

Changing File and Directory Permissions on Linux

By default the Harmonic MediaGrid Linux FSD does not reflect the Harmonic MediaGrid ACL security permissions for a file or directory on the Harmonic MediaGrid file system. To have the Linux FSD translate between Harmonic MediaGrid ACLs and Linux mode permission bits on files, use the –o mode option on the mount command line. For example:

```
mount -t omfs /mediagrid/filesys /mnt -o
username=user1,password=pass1,mode
```

With this capability enabled, file permission bits may be tested and manipulated through the normal Linux interfaces.

**NOTE:** Turning this capability on reduces performance related to directory access operations, such as directory listing.

Setting up Soft Links

A soft link is a symbolic link to another file or directory.

**To set up a soft link:**
1. Mount the file system.
2. Change to the directory for which you want to create a link, or provide the file or directory path.
3. Create the soft link using the following format:

   ```
   ln -s <existing file name> <new file name>
   ```

   For example to create a soft link to directory 1 from directory 2, you would enter the following:

   ```
   ln -s <directory 1> <directory 2>
   ```

   Soft links are visible using the Harmonic ContentManager application. See the *ContentManager User’s Guide* for details.

Connecting Clients to Harmonic MediaGrid Using ContentBridge

The ContentBridge provides standard interfaces to Harmonic MediaGrid for clients that do not have the Harmonic MediaGrid File System Driver (FSD) installed, or an FSD is not available. The supported protocols are CIFS (Common Internet File System), FTP (File Transfer Protocol) and NFS (Network File System). These protocols allow Windows, Macintosh and Linux clients to access media on Harmonic MediaGrid file systems.

Refer to the sections below for instructions on setting up clients to connect to Harmonic MediaGrid using the various protocols.
NOTE: Before accessing the Harmonic MediaGrid, you must edit the ContentBridge configuration file to support authentication and user access. See Editing the ContentBridge Configuration File in the Harmonic SystemManager User Guide after completing the following for details.

The Harmonic MediaGrid file system is exported using a “share name.” This share name is created using the Harmonic MediaGrid file system name and the account name used to access the file system, as specified in the ContentBridge configuration file. See Editing the ContentBridge Configuration File in the Harmonic SystemManager User Guide. The two are joined together with an underscore to create the share name:

<FS_NAME>_<USERNAME>

For example, if the ContentBridge configuration file contained the following line:

```
CB MG1  mgfs2  user3  passwd4
```

Then the share name would be “mgfs2_user3.”

In the following sections, replace <SHARE_NAME> with the appropriately constructed share name.

### Using FTP on a Windows Client

To use FTP:

1. Start an FTP application.
2. Enter the domain name of the ContentBridge.
3. Enter a valid user name and password.

The user name and password must exist in the ContentBridge configuration file. See Editing the ContentBridge Configuration File in the Harmonic SystemManager User Guide for more information. The user name and password must also be valid for the Harmonic MediaGrid system.

4. The FTP client is placed in a directory two levels above the actual Harmonic MediaGrid mount point. Change to the following directory to access the Harmonic MediaGrid files, where FS_NAME is the name of the file system:

```
/omfs/<FS_NAME>
```

NOTE: The maximum path length for any file in a Harmonic MediaGrid file system is 1025 characters (1024 + 1 for the NULL character).

### Using CIFS on a Windows Client

Follow these steps to access the Harmonic MediaGrid from a Windows client.

To use CIFS:

1. On the taskbar, click the Start menu and then click Run.
2. In the Open text box type the DNS name of the ContentBridge and the share name, preceded by two backslashes. For example:

```
\DNS name\SHARE_NAME
```

Enter a user name and password when prompted. The user name and password must be the same as those specified in the ContentBridge configuration file for the particular Harmonic MediaGrid file system.

### Using CIFS on a Macintosh Client

Follow these steps to access the Harmonic MediaGrid from a Macintosh client.

To use CIFS:
To use CIFS:
1. Select **Connect to Server** from the **Go** menu on the Apple Desktop.
2. Type the following:

```
    smb://<ContentBridge Fully Qualified Domain Name>
```

For example, if the ContentBridge’s fully qualified domain name is “clb01220.mediagrid.com”, enter “smb://clb01220.mediagrid.com”.
3. Enter the user name and password used to access the Harmonic MediaGrid system.
4. Select the volumes to mount.

Follow these instructions if you would rather access the Harmonic MediaGrid from a Macintosh client using the command line.

The following are two methods of accessing the Harmonic MediaGrid:

- This method requires the password to be specified in the command line:

```
    mount -t smbfs //username:password@<CLB>/<SHARE NAME> /PATH/TO/MOUNT/POINT
```

- This method allows for interactive mode (enter password when prompted):

```
    mount -t smbfs //username@<CLB>/<SHARE NAME> /PATH/TO/MOUNT/POINT
```

The user name and password used must be those specified in the ContentBridge configuration file used to export the particular Harmonic MediaGrid file system.

**Using CIFS on a Linux Client**

Follow these steps to access the Harmonic MediaGrid from a Linux client.

To use CIFS:
1. Type the following at the command prompt:

```
    mount -t cifs -o username=<USERNAME>\\<CLB>\<SHARE NAME> /PATH/TO/MOUNT/POINT
```

For example, you would enter the following to mount SHARE NAME “testfs_aau” on ContentBridge “domain name” onto mount point “/mnt/omfs” using username “aau”:

```
    mount -t cifs -o username=aau \\\domain name\testfs_aau /mnt/omfs
```

2. When prompted for a password, enter the password associated with the user name in the ContentBridge configuration file.

**Using NFS on a Linux Client**

Follow these steps to access the Harmonic MediaGrid from a Linux client.

To use NFS:
1. Type the following at the command prompt:

```
    mount -t nfs <CLB>:/mnt/omfs/<CLD>/<USER_NAME>/omfs/<FS_NAME> /PATH/TO/MOUNT/POINT
```

For example, you would enter the following to mount the file system “testfs” on ContentDirector “director” via ContentBridge “bridge” using username “aau” onto mount point “/mnt/omfs”:

```
    mount -t nfs bridge:/mnt/omfs/director/aau/omfs/testfs /mnt/omfs
```

You are not prompted for a user name or password.
Next Steps

See the *Harmonic SystemManager User Guide* for details about system operation and configuration procedures for Harmonic MediaGrid using the SystemManager application, including enabling NFS by editing the ContentBridge configuration file.
This section includes Harmonic MediaGrid power off procedures, setting switch and ContentDirector passwords, and software upgrade procedures. The following topics are included:

- Drive Capacity Expansion in a Harmonic MediaGrid RAID System
- Balancing the ContentServer Controllers
- Setting the ContentStore 5840 Identification Number
- Enabling Directories with More than 15 Levels
- Using mgcopy to Copy Files Between Harmonic MediaGrid Systems
- Using the mgquota Utility for the Mac FSD
- Upgrading Harmonic MediaGrid Firmware
- Powering Down a Harmonic MediaGrid System
- Powering On a Harmonic MediaGrid System
- Logging on to a ContentDirector
- Managing Network Switches
- Installing Harmonic MediaGrid and ContentDirector Software

Drive Capacity Expansion in a Harmonic MediaGrid RAID System

Expanding drive capacity in your Harmonic MediaGrid RAID system requires significant planning. An integral component of this process is shelf evacuation, which can take many hours, or even days, for each ContentServer or ContentStore involved. Please read the following sections carefully and plan accordingly.

NOTE: Capacity expansion requires Harmonic MediaGrid version 3.5 or later (on all components in your Harmonic MediaGrid system) and SystemManager 6.2.3 or later.

About Shelf Evacuation

In a Harmonic MediaGrid RAID system, a shelf is one ContentServer 3000 or 4000, one ContentStore 3160 or 4240, or one drawer in a ContentStore 5840. Shelf evacuation involves transferring data, one shelf at a time, to other shelves in the volume or, for stretch cluster configurations, to other shelves in the same group. This allows you to maintain uninterrupted access to data while expanding capacity, or while reconfiguring, replacing, or retiring a shelf.
The shelf being evacuated is automatically set to read-only mode. It can still service client read requests, however this capability will diminish as data is removed from the shelf after being copied to another shelf.

Note that, if the balancer is enabled when an evacuation begins, it will be suspended throughout the evacuation process and will resume once all shelves return to normal service. After capacity expansion, Harmonic recommends running the balancer on high priority in order to rebalance the system as quickly as possible.

### About Write Bandwidth During Shelf Evacuation

Although the Harmonic MediaGrid system can still service read and write requests during shelf evacuation, note that write bandwidth will be reduced both by the portion represented by the shelf being evacuated and by the overhead of copying slices to the other shelves.

During evacuation, you can set the priority level to either “normal” or “high”, depending on your write bandwidth requirements. When planning for capacity expansion, consider the impact that each priority level will have on the entire time needed for expansion.

<table>
<thead>
<tr>
<th>Priority Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>If the Harmonic MediaGrid cluster will be in use during the evacuation process (reads and writes are taking place), you should set the priority level to “normal”. Note that this setting increases the amount of time required to complete the evacuation.</td>
</tr>
<tr>
<td>High</td>
<td>If the Harmonic MediaGrid cluster will be idle during the evacuation process (reads or writes will not be taking place), then you can set the priority level to “high”. Note that this setting decreases the amount of time required to complete the evacuation.</td>
</tr>
</tbody>
</table>

### Reviewing Available Space

To prepare for capacity expansion, determine the amount of disk space that will be available in the volume or group after a shelf has been evacuated.

Free up as much space as possible! When expanding capacity in multiple shelves, data is repeatedly moved from one shelf to another. The less data there is to move, the faster the process will go.

**To determine the amount of free space after an evacuation:**

1. In SystemManager, navigate to the Cluster Properties page, and then click Shelf Evacuation Control/Status to open the Shelf Evacuation page for the cluster.
2. In the Total Disk Space column, find the shelf with the least amount of space. If each shelf has the same total disk space, look in the Free Space (%) column and find the shelf with the greatest amount of free space.
3. For the same shelf, note the "Estimated free space in group/volume after evacuation". The following table will help you determine if there is enough free space for evacuation:

<table>
<thead>
<tr>
<th>Color</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Sufficient space is available, even if the Harmonic MediaGrid cluster will be in use (reads or writes are taking place) during the evacuation.</td>
</tr>
<tr>
<td>Yellow</td>
<td>Sufficient space is available if the Harmonic MediaGrid cluster will have limited use during the evacuation.</td>
</tr>
<tr>
<td>Red</td>
<td>Sufficient space is available if the Harmonic MediaGrid cluster will be idle (no reads or writes are taking place) during the evacuation.</td>
</tr>
<tr>
<td>Dark Red</td>
<td>Insufficient space available; the Write Disable and Evacuate buttons are grayed out. You must free up space or add storage in order to proceed.</td>
</tr>
</tbody>
</table>

### About Setting Shelves to Read-Only Mode

**CAUTION:** Manually setting a ContentServer or ContentStore to read-only mode is intended to facilitate capacity expansion ONLY. Do not set a shelf as read-only for any other purpose.

By default, Harmonic MediaGrid distributes content that has been evacuated from one shelf equally across all remaining shelves in the volume or group. This has the advantage of maintaining maximum possible read bandwidth. However, it increases the total amount of time required for evacuation by moving data to the shelf that will be evacuated next.
To prevent data from migrating to the next shelf to be evacuated in the same volume or group, you can manually set this shelf to read-only. However, if any of the following is true, **DO NOT** configure the additional shelf as read-only:

- The volume, or each group in the stretch cluster, has fewer than 10 shelves.
- The system has less than 20% available disk space.
- You cannot tolerate further reduction in write bandwidth.

**IMPORTANT:** Harmonic recommends that you set no more than 2 shelves to read-only, which includes the shelf being evacuated, in a volume or group of 10 shelves.

If you find during the evacuation process that your users require more writable space than anticipated, you can return a shelf to read-write duty at any time.

After you have expanded drive capacity in the first or second shelf, the volume or group should have enough free space to support setting all of the unexpanded shelves to read-only during subsequent evacuations. Note that doing so concentrates the migrated content on the few remaining writable servers. This, in turn, reduces the effective read bandwidth for files that contain these slices. If the system is not in use, this will speed up the expansion process. However, it will take longer to balance the cluster after all shelves have been expanded.

### Expanding Drive Capacity in a Harmonic MediaGrid RAID System

Begin this procedure only after you have determined that your system has sufficient free space and you have planned accordingly.

1. In SystemManager, navigate to the **Cluster Properties** page, and then click **Shelf Evacuation Control/Status** to open the **Shelf Evacuation** page for the cluster.
2. From the **Priority** drop-down menu, select the priority level for evacuation:
   - **Normal**: Select if the Harmonic MediaGrid cluster will be in use (reads or writes are taking place) during shelf evacuation.
   - **High**: Select if the Harmonic MediaGrid cluster will be idle (no reads or writes are taking place) during shelf evacuation.

**NOTE:** You may change the priority level at any time during the evacuation.

3. If your system meets the criteria specified in *About Setting Shelves to Read-Only Mode*, you may set the first two shelves to be evacuated in the volume or group as read-only. If your system does not meet the criteria, skip this step.
   a. Select **Write Disable** for the shelf that will be evacuated first.
      
      When the confirmation dialog appears, click **OK**. The CS Status changes to “ReadOnly”.
   
   b. Select **Write Disable** for the shelf that will be evacuated next. For a stretch cluster configuration, select the next shelf that will be evacuated *in the same group*.
      
      When the confirmation dialog appears, click **OK**. The CS Status field changes to “ReadOnly” and SystemManager updates the “Estimated free space in group/volume after evacuation”.
   
   c. Note the updated estimated free space after evacuation and consider the anticipated load during the evacuation process:
      - If there is limited or insufficient free space, or you anticipate heavy load during the evacuation process, return the shelf to normal service by clicking **Write Enable**.
   
4. For the shelf you intend to evacuate first, select **Evacuate**.
When the confirmation message appears, click OK.

Within a short while, the Write Disable and Evacuate buttons change to Write Enable and Cancel Evacuation. The CS Status field changes to “Evacuating”, which also appears on the ContentServer/ContentStore Properties page and the Servers & Switches page).

Lastly, after a short delay, SystemManager shows an estimated time of completion. This estimate is based on the rate at which the Harmonic MediaGrid has copied slices so far, and the number of slices remaining, without regard to slice sizes. This estimate will change with increased/decreased load on the system or network, or with significant variation in the size of slices to be moved.

5. Monitor the progress of the evacuation.
   - If the evacuation appears to be stuck at 99% or 100%, this may mean the shelf has not yet reported that it is done deleting the last few slices that were copied to other shelves. Wait a few minutes for the CS Status to update.
   - When evacuation is complete, the CS Status changes to “Evacuated” and the following message appears:
     
     Data migration for <component name> has completed. The component may be retired.

   **NOTE:** After a shelf is evacuated, the value for “Free Space (%)” may be slightly less than 100. This is expected following a successful evacuation.

   - If an error occurs, refer to Possible Errors During Shelf Evacuation and follow the instructions for troubleshooting the particular error that occurred.
   - If necessary, you may cancel the evacuation by clicking Cancel Evacuation. Note that canceling an evacuation does not return the data that has already been transferred back to the original shelf.

   Following a cancellation, you must return the shelf to normal service (see Step 10) and rebalance the ContentServers and ContentStores in the cluster (see Step 12).

   - Proceed to Step 6 only after the evacuation has successfully completed.

6. Navigate to the Properties page and click Wink On to identify the physical ContentServer or ContentStore that was evacuated.

   **NOTE:** For the ContentStore 5840, be sure to navigate to the correct Properties page for the shelf (drawer) that was evacuated.

7. From the RAID Sets section of the Properties page, destroy all of the RAID sets for the shelf that was evacuated.

   For instructions, refer to “Destroying a RAID Set” in the Harmonic SystemManager User Guide.

8. For the shelf that was evacuated, replace the original drives with higher capacity drives.

   For instructions, refer to “Replacing a Hard Drive” in Chapter 1, “Replacing a ContentServer and Related Components”, or in Chapter 2, “Replacing a ContentStore and Related Components”, in the Harmonic MediaGrid Component Replacement Guide.

9. Using SystemManager, create new RAID sets for the shelf that was expanded.

   For instructions, refer to “Creating a RAID Set with Auto Create” or “Creating a RAID Set” in the Harmonic SystemManager User Guide.

10. From the Shelf Evacuation Control/Status page in SystemManager, click Write Enable for the shelf that was evacuated to return the shelf to normal service.
11. Repeat Step 3 through Step 10 to expand capacity in the remaining shelves, one at a time.

NOTE: For a stretch cluster configuration, alternate between groups with each shelf expansion. If you have write-disabled an additional shelf (Step 3), leave this shelf in read-only mode (if possible) while expanding a shelf in the other group.

12. Once all the shelves have been returned to normal service, in SystemManager navigate to the View/Edit Balancer Scheduling page for the cluster, and balance the ContentServers and ContentStores. Refer to “Enabling and Configuring Scheduled Balancing” in the Harmonic SystemManager User Guide.

Harmonic recommends that you select Start balancer(high) now to start the balancer immediately. If that is not possible, configure your balancing schedule to complete as quickly as possible.

Possible Errors During Shelf Evacuation

Some errors, such as network outages and shelf failover, may interfere with the shelf evacuation process. Check the View Alarms page for any errors that were generated during the evacuation.

If you see any of the following errors, check for network connectivity, shelf status (online/offline), and free space on the shelf:

- SSID=<SSID> Evacuation canceled due to excessive errors.
- SSID=<SSID> Evacuation canceled due to inaccessible server.
- Unable to migrate slice: <SID>. Evacuation canceled.
- Unable to migrate slice: <SID>. Evacuation of SSID=<SSID> canceled.

Once the Harmonic MediaGrid is stable, confirm that there is still sufficient space to evacuate the shelf. Return to Step 4 in the previous procedure.

If the error persists for the same slice ID, wait 10 minutes and try again.

In some cases, particularly on live systems, you may see the following error:

Data migration for ContentServer=<SSID> was not able to complete after X retries.

If this occurs, contact Harmonic Technical Support for help.

Balancing the ContentServer Controllers

Any time one controller on a ContentServer goes down, which may be during an upgrade or replacement, the active Slice Server processes on that controller, which manage ContentServers and ContentStores, fail over to the remaining controller. Once both controllers are up and running, Harmonic recommends that you balance the Slice Server processes across controllers to improve performance. This is done by using the Failback button on the ContentServer or ContentStore Properties page.

Harmonic recommends that you balance your ContentServer 3000 or 4000 at these times:

- Following a ContentServer upgrade.
- Following an expansion to your Harmonic MediaGrid system.
- Following a controller replacement.
Following a controller fail-over.

If the Managed ContentStores and ContentServers field on the ContentServer Properties page shows all, or a large majority, of ContentStores and ContentServers being managed by one controller (for example, five out of six).

If you fail to balance your ContentServer in the situations listed above, it may affect the performance of the ContentServer.

**NOTE:** Harmonic recommends that you schedule balancing during times when the system is not loaded. For example, this may be late at night. System performance may be affected while balancing is occurring.

### To balance the ContentServer 3000 or 4000:

1. Click the Servers & Switches icon on the Configuration tab to access the Servers & Switches page.
2. In the ContentServers/ContentStores section, click the Name hyperlink for the required ContentServer to access the Properties page.
3. Click the Failback button.

**NOTE:** You may also use the Failback button on any ContentStore being managed by the ContentServer you wish to balance.

4. Verify that all ContentStores and ContentServers appear in the Managed ContentStores and ContentServers field on the ContentServer Properties page. If they are not all listed, contact Technical Support for assistance.

After clicking Failback, you may observe on the ContentServer Properties page that some ContentStores or ContentServers in the Managed ContentStores and ContentServers field for one controller now appear under a different controller, in which case, balancing was successful.

### Setting the ContentStore 5840 Identification Number

The ContentStore 5840 ID number is not set before the first system power on. The display is set to “00” (flashing). The unit continues to power up even if the unit identification number is not set.

**To set the unit ID number:**

1. Press and hold the Input switch on the operator’s panel for five seconds (see Operator’s Panel to locate the input switch). The left-hand digit flashes.
2. Press and release the Input switch to increment the number until the required digit is reached.
3. Press and hold the Input switch for five seconds. The right-hand digit flashes.
4. Press and release the Input switch to increment the number until the required digit is reached.
5. Press and hold the Input switch for five seconds to finish setting the number. Values of “01” to “99” are valid.

### Enabling Directories with More than 15 Levels

With version 3.4 and later, you may enable your Harmonic MediaGrid file system to contain directories with more than 15 levels.

**CAUTION:** Before enabling this support, please note that moving to an earlier release after having created directories deeper than 15 levels is not supported. Harmonic recommends that you confirm your overall satisfaction with release 3.4 before enabling this feature.
CAUTION: All ContentDirectors in your system must be running release 3.4 before enabling deeper directories. The section What You Might See in an Inconsistent Cluster below gives an example of the anomalies you might experience if this requirement is not met.

CAUTION: The client FSD must be running 3.4 in order to use this feature. There are known issues with all file system drivers (Windows, Mac, and Linux) running version 3.3 or earlier when path names exceed 1000 bytes. Please keep file paths below this length until you have version 3.4 or later installed on your FSD clients.

CAUTION: If you do not understand the procedures or recommendations described in this section, please consult with Technical Support before proceeding.

To enable directories with more than 15 levels:

1. Make sure all ContentDirectors in your system are up and running.
2. Log in to one of the ContentDirectors as root, and use the “mdsclientn” command in a running cluster to add a config file, which enables deeper directories. See the following example:

   ```
   # echo 1 > /tmp/yes
   # /opt/omcld/bin/mdsclientn localhost
   mdsclientn: built by mgid-builds on 2014.... .......
   Opened default session of ......
   => session authenticate <username> <password>
   Authenticated successfully
   Session = .....;
   => configfile add /tmp/yes no_dir_depth_limit
   The add was successful (2 bytes)
   ```

Support for directories with more than 15 levels will be enabled on all members of the cluster, and will be automatically enabled on any members which are added to a running cluster later.

NOTE: Any ContentDirectors, which start up while the current cluster members are down will not receive the changes so Harmonic recommends first having all ContentDirectors running at this point.

Client applications will now be able to create directories whose depth is only limited by the overall path limit (1024 bytes, which will be fewer than 1024 characters for non-ASCII character sets).

The “configfile list” command may be used to check whether the file is present. See the following example:

```
=> configfile list
2 names were returned:
   clusteruid
   no_dir_depth_limit
```

Disabling Directories with More than 15 Levels

To disable deeper directories, remove the config file, which was added to enable it.

To disable directories with more than 15 levels:

1. Make sure all ContentDirectors in your system are up and running.
2. Log in to one of the ContentDirectors as root, and use the "mdsclientn" command to remove the config file. See the following example:

```bash
# /opt/omcld/bin/mdsclientn localhost
mdsclientn: built by mgrid-builds on 2014....
......
Opened default session of ......

=> session authenticate <username> <password>
Authenticated successfully
Session = ......

=> configfile delete no_dir_depth_limit
The file was deleted
```

In this disabled state, on systems with release 3.4 or later, directories of more than 15 levels and their contents can be accessed, and moved to shallow locations, but not created.

**What You Might See in an Inconsistent Cluster**

If the client accesses the storage through an updated ContentDirector (that is, with deeper directories enabled), it will be able to create directories with more than 15 levels on all ContentDirector nodes. However, if a client attempts to access those directories via a ContentDirector that has not been updated to enable deeper directories, you will see odd behavior. The following is an example:

```bash
[root@localhost d]# pwd
/tmp/omneon/d/d/d/d/d/d/d/d/d/d/d/d/d/d/d/d/d/d/d/d
[root@localhost d]# find .
.
./d
./d/d
[root@localhost d]# cd d/d
-bash: cd: d/d: No such file or directory
```

**Using mgcopy to Copy Files Between Harmonic MediaGrid Systems**

The mgcopy utility allows you to copy data quickly between Harmonic MediaGrid systems. This utility can be used any time you wish to back up data quickly.

**IMPORTANT:** mgcopy does not work with Harmonic MediaGrid systems running 3.0. It can perform copies only between systems running a 2.X version and 3.1 or later.

You can run mgcopy from the ContentDirector, or the Windows or Macintosh client FSD.

- To start mgcopy from the ContentDirector, log on to the ContentDirector and then type the following command:

  ```bash
  /opt/omcld/bin/mgcopy
  ```

- mgcopy is located on the client FSDs at the following locations:
  - For the Mac FSD:
    - `/usr/bin/mgcopy` (version 3.5 or earlier)
    - `/opt/omfs/bin/mgcopy` (version 3.5.1 or later)
  - For the Windows FSD: `C:\Program Files (x86)\Omneon\Omneon MediaGrid\mgcopy`
When opened, mgcopy presents a command line interface. Use the mgcopy command with additional values shown in Table 7–1 to perform a copy.

Note the following usage:

```
mgcopy [-s content director][-u user][-p password][-s2 content
director2][-u2 user2][-p2 password2][-d debuglevel][-copy
<deep|soft|across>][-srcfile src-file-name][-dstfile dst-file-name][-o]
[-c][-copyOwner][-copyAcl][-logfile file-name][-errorfile file-
name][-testRun][-noDataTransfer][-help]
```

NOTE: If you are using mgcopy to copy files that include hardlinks, and the files already exist in the destination path, make sure to use the overwrite option shown in Table 7–1.
### Table 7–1: mgcopy Values

<table>
<thead>
<tr>
<th>Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-s</td>
<td>ContentDirector name or IP address</td>
</tr>
<tr>
<td>-u</td>
<td>User name for the ContentDirector</td>
</tr>
<tr>
<td>-p</td>
<td>Password for the ContentDirector</td>
</tr>
<tr>
<td>-srcfile</td>
<td>Location of the source file to be copied</td>
</tr>
<tr>
<td>-dstfile</td>
<td>Location of the file to copy the source file to</td>
</tr>
<tr>
<td>-logfile</td>
<td>Location of the file, which lists the name of files/directories copied using the mgcopy utility</td>
</tr>
<tr>
<td>-errorfile</td>
<td>Location of the file, which lists the name of files/directories for which ACLs were not copied</td>
</tr>
<tr>
<td>-o</td>
<td>Overwrite</td>
</tr>
<tr>
<td>-c</td>
<td>Status of copy</td>
</tr>
<tr>
<td>-copyOwner</td>
<td>Preserve the owner at destination.</td>
</tr>
<tr>
<td>-copyAcl</td>
<td>Preserve the ACLs at destination</td>
</tr>
<tr>
<td>-noDataTransfer</td>
<td>Used with other options like copyAcl and copyOwner, but does not copy data at destination</td>
</tr>
<tr>
<td>-testRun</td>
<td>Do a test run of the command to see if the version of source and destination Harmonic MediaGrids are compatible with each other</td>
</tr>
<tr>
<td>-d</td>
<td>Debug level (default: 0)</td>
</tr>
<tr>
<td>-R</td>
<td>Copy recursively all the sub directories and files</td>
</tr>
<tr>
<td>-help</td>
<td>Display this help and exit</td>
</tr>
</tbody>
</table>
| -copy  | Specifies the type of copy. Here are the values for the copy option:  
  ■ deep: Deep copy within a cluster  
  ■ soft: Shallow copy within a cluster  
  ■ across: Deep copy across clusters  
  Provide the following credentials only if -copy = “across”  
  ■ -u2: User name of the destination ContentDirector  
  ■ -p2: Password for the destination ContentDirector  
  ■ -s2: Name or IP address of the destination ContentDirector |

Note the following examples:

```
mgcopy -s <server ip-addr> -u john -p password -copy deep -srcfile /fs/dir1/file1 -dstfile /fs/dir2/file2
```

```
mgcopy -s <server1 ip-addr> -u john -p password -copy across -s2 <server2 ip-addr> -u2 john2 -p2 password2 -srcfile /fs/dir1/f1 -dstfile /fs2/dir1/f2
```
Using the mgquota Utility for the Mac FSD

About the mgquota Utility

The mgquota utility is installed and run on a Mac FSD client and displays quota information for a given Harmonic MediaGrid directory. It does not allow you to set a quota; it merely reports the quota for the specified directory. For information on setting a quota, refer to the Harmonic ContentManager User’s Guide. The mgquota utility is compatible with the following releases:

- Harmonic MediaGrid Server 3.1 and later
- Harmonic MediaGrid Mac FSD 3.1 and later

Running mgquota

1. From the Macintosh desktop, under Applications, launch the Terminal application.
2. Query a directory by typing one of the following commands:
   - Pre-3.5.1 versions: `/usr/bin/mgquota /<Harmonic MediaGrid directory path>`
   - Version 3.5.1 and later: `/opt/omfs/bin/mgquota /<Harmonic MediaGrid directory path>`
   
   For example, `/opt/omfs/bin/mgquota /Volumes/mg-eng3/testfolder`
3. When prompted, enter your domain, user name, and password.

Upon successful authentication with Harmonic MediaGrid, mgquota will display the assigned quota and space used by the specified directory.

Upgrading Harmonic MediaGrid Firmware

To upgrade the Harmonic MediaGrid firmware, first upgrade the ContentDirectors, then the ContentServers, and then the ContentBridges. To avoid loss of service, upgrade the ContentDirectors one at a time, as described in the steps that follow. After all the ContentDirectors have been upgraded, you can then upgrade the ContentServers and ContentBridges.

To select a new Harmonic MediaGrid firmware version and install it on a ContentDirector:

1. From the left-hand column on the Home tab, click the Firmware Selection icon to display the Firmware Version Selection page as displayed in Figure 7–1.

![Figure 7–1: Firmware Version Selection](image-url)
2. In the **Harmonic MediaGrid** column, click the radio button for the desired firmware version. The red check mark indicates the selected version.

3. When the confirmation dialog appears, click **OK** to accept.

4. Click the **Upgrade Firmware** icon in the left-hand column to display the **Upgrade Firmware** page.

5. In the **ContentDirectors** section, click in the **Select** column to specify the ContentDirector you want to upgrade. **Figure 7–2** shows a partial view of the **Upgrade Firmware** page.

**NOTE:** To avoid loss of service, upgrade the ContentDirectors one at a time.

**Figure 7–2: Upgrade Firmware**

6. Click **Upgrade ContentDirectors** to start upgrading the firmware of the selected **ContentDirector**.

**IMPORTANT:** When upgrading and/or rebooting Harmonic MediaGrid units, do not upgrade or reboot two different unit types at the same time. Consult with your Harmonic Representative if you need assistance.

7. Wait for the Status column to show “Connected.”

8. Once the status of the first ContentDirector returns to “Connected,” upgrade the remaining ContentDirectors, one at a time, by repeating steps 5-7.

9. Clear or delete the alarms and monitor them for a few minutes to ensure that no new alarms are generated after the ContentDirectors are upgraded.

10. Restart the ContentDirectors in your system one by one by clicking **Reboot ContentDirector**.

**IMPORTANT:** When upgrading to version 3.4.x or later, after all ContentDirectors have restarted once, restart all ContentDirectors, except the last one in your system, a second time in the same order. This will enable the improved space reporting provided in 3.4.x and later.

11. Once the firmware has been downloaded to the **ContentDirectors**, return to the **ContentDirector** section of the **Upgrade Firmware** page to verify the version number for each unit that was upgraded.

12. Upgrade the firmware for the ContentServers in your system.
   
   a. In the **Controllers** section of the page, select one controller per ContentServer to upgrade by clicking in the **Select** column for the corresponding controller and then clicking **Upgrade Controllers**.

   **IMPORTANT:** Upgrading both controllers on a ContentServer at the same time will cause the system to be unavailable during reboot and is not recommended.
You can upgrade multiple controllers from different ContentServers in parallel by selecting one controller from each of the ContentServers you wish to upgrade.

b. Once the firmware has been downloaded to the controller(s), return to the Controllers section of the Upgrade Firmware page. Select each of the controllers that were upgraded and click Reboot Controllers. The updated firmware version displays when the reboot is complete.

c. Select the second controller for each of the ContentServers you are upgrading by clicking in the Select column for the corresponding controller and then clicking Upgrade Controllers.

d. Select each of the controllers that were upgraded and click Reboot Controllers. The updated firmware version displays when the reboot is complete.

e. Once you have upgraded both controllers on a ContentServer, Harmonic recommends that you balance the ContentServer. For details, refer to Balancing the ContentServer Controllers.

13. Upgrade the firmware for the ContentBridge or High Bandwidth ContentBridge in your system:

- For Content Bridges: in the Content Bridges section, click in the Select column to specify one or more units for upgrade, and then click Reboot Content Bridges to load the latest version of the firmware on each Content Bridge.

- For High Bandwidth Content Bridges: in the High Bandwidth Content Bridges section, select one or more units for upgrade, and then click Upgrade High Bandwidth Content Bridges.

NOTE: If you are upgrading from Harmonic MediaGrid version 3.1 or later, the High Bandwidth Content Bridge will restart automatically once the upgrade is complete. If you are upgrading from a version prior to 3.1 or later, you must manually restart the High Bandwidth Content Bridge. Make sure to wait at least 15 minutes after upgrading before you restart. To restart, click the link in the Name column to navigate to the Properties page, and then click Reboot.

This completes the firmware upgrade process for a Harmonic MediaGrid.

Powering Down a Harmonic MediaGrid System

IMPORTANT: The following instructions only apply for systems running both SystemManager version 5.10 or later and Harmonic MediaGrid version 2.1SR3 or later. If your version of SystemManager is earlier than 5.10 or if your version of Harmonic MediaGrid is earlier than 2.1SR3, refer to the version of the Harmonic MediaGrid Installation and Configuration Guide that accompanies your software.

Use the following steps to safely power down the Harmonic MediaGrid system. Only perform the following steps if directed by Technical Support. Refer to Powering On a Harmonic MediaGrid System for the procedures to power on a Harmonic MediaGrid system.

To power down a Harmonic MediaGrid system:

1. In SystemManager, click the Configuration tab and then click the Servers & Switches icon in the left-hand column to access the Servers & Switches page.

2. Click the link for the Cluster that you wish to shut down. The Cluster Properties page appears.

3. From the Cluster Properties page, in the Shutdown cluster section, click Shutdown all ContentDirectors in a Cluster (see Figure 7–3).
Figure 7–3: Shut down all ContentDirectors in a cluster

4. A confirmation message appears. Click OK.

5. Scroll down to the ContentDirectors section of the page. Make sure the Network Status of the ContentDirectors indicates Not Responding. Note that it may take a few minutes for the status to change, depending on the length of the discovery cycle and the status of other devices in your network.

6. Disconnect the power cords from the ContentDirectors.

Once the ContentDirectors are shut down, the Shutdown all ContentBridges in a Cluster button will be activated.

7. Click Shutdown all ContentBridges in a Cluster. When the confirmation message appears, click OK.

8. Scroll down to the ContentBridges section of the page. Make sure the Network Status of the ContentBridges indicates Not Responding. Note that it may take a few minutes for the status to change, depending on the length of the discovery cycle and the status of other devices in your network.

9. Disconnect the power cords from the ContentBridges.

Once the ContentBridges are shut down, the Shutdown all ContentServers in a Cluster button will be activated.

10. Click Shutdown all ContentServers in a Cluster. When the confirmation message appears, click OK.

11. Scroll down to the ContentServers/ContentStores section of the page. Make sure the Network Status of the ContentServers and ContentStores indicates Not Responding. Note that it may take a few minutes for the status to change, depending on the length of the discovery cycle and the status of other devices in your network.

12. Power down the ContentServers and ContentStores as follows:

   - **ContentServer 3000 (3U)**: Press the red power button on the control panel on the front of the server and hold for five seconds. Once the disk drive LEDs are off, disconnect the two power cords from the back of the server.

   - **ContentStore 3160 (3U)**: Press the red power button on the control panel on the front of the device and hold for five seconds. Once the disk drive LEDs are off, disconnect the two power cords from the back of the device.

   - **ContentServer 4000 (4U)**: Press the power button on the control panel and hold for four seconds. Once the disk drive LEDs are off, disconnect the two power cords from the back of the server.

   - **ContentStore 4240 (4U)**: Press the power button on the control panel and hold for four seconds. Once the disk drive LEDs are off, disconnect the two power cords from the back of the server.

   - **ContentStore 5840 (5U)**: Move all power supply switches to the “off” position. Once the front panel LEDs are off, disconnect the power cables from the power supplies.
13. From the SystemManager platform, click the **Start** button on the taskbar, and then click **Shut Down** to shut down the SystemManager platform. Disconnect the power cord if necessary.

14. Power down the Network Switches by disconnecting the power cords.

**Powering Down or Restarting a Single ContentDirector**

1. From the **Configuration** tab, click the **Servers & Switches** icon in the left-hand column to open the **Servers & Switches** page.

2. In the **ContentDirectors** section, click the name of the ContentDirector you wish to power down. The **ContentDirector Properties** page appears.

3. Click the **Shutdown** button located at the bottom of the General Properties section.

4. When the confirmation message appears, click **OK**.

5. Check the **Status** field to verify that it indicates **Not Responding**. Note that this may take a few minutes depending on the length of the discovery cycle and the status of other devices in your network.

6. Disconnect the power supply.

**To restart a single ContentDirector without removing the power supply:**

1. From the ContentDirector Properties page, click the **Reboot** button located at the bottom of the General Properties section.

2. When the confirmation message appears, click **OK**. The ContentDirector will restart.

3. Check the **Status** field to verify that it changes to **Not Responding**, and then returns to its previous state. Note that it may take a few minutes for the status to change, depending on the length of the discovery cycle and the status of other devices in your network.

**Powering Down or Restarting a Single ContentBridge**

**To power down a single ContentBridge:**

1. From the **Configuration** tab, click the **Servers & Switches** icon in the left-hand column to open the **Servers & Switches** page.

2. In the **ContentBridge** section, click the name of the ContentBridge you wish to power down. The **ContentBridge Properties** page appears.

3. Click the **Shutdown** button located at the bottom of the General Properties section.

4. When the confirmation message appears, click **OK**.

5. Check the **Status** field to verify that it indicates **Not Responding**. Note that it may take a few minutes for the status to change, depending on the length of the discovery cycle and the status of other devices in your network.

6. Disconnect the power supply.

**To restart a single ContentBridge without removing the power supply:**

1. From the ContentBridge Properties page, click the **Reboot** button located at the bottom of the General Properties section.

2. When the confirmation message appears, click **OK**. The ContentBridge will restart.

3. Check the **Status** field to verify that it changes to **Not Responding**, and then returns to its previous state. Note that it may take a few minutes for the status to change, depending on the length of the discovery cycle and the status of other devices in your network.
Powering Down a Single ContentServer

1. From the Configuration tab, click the Servers & Switches icon in the left-hand column to open the Servers & Switches page.
2. In the ContentServers/ContentStores section, click the name of the ContentServer you wish to power down. The ContentServer Properties page appears.
3. Click the Shutdown button located in the top section of the page.
4. When the confirmation message appears, click OK.
5. Check the Status field to verify that it indicates Not Responding. Note that it may take a few minutes for the status to change, depending on the length of the discovery cycle and the status of other devices in your network.
6. Physically power down the ContentServer as follows:
   - ContentServer 3000 (3U): Press the power button on the control panel and hold for five seconds.
   - ContentServer 4000 (4U): Press the power button on the control panel and hold for four seconds.
7. Once the disk drive LEDs are off, disconnect the two power cords from the back of the server.

Powering Down a Single ContentStore

1. From the Configuration tab, click the Servers & Switches icon in the left-hand column to open the Servers & Switches page.
2. In the ContentServers/ContentStores section, click the name of the ContentServer you wish to power down. The ContentStore Properties page appears.
3. Click the Shutdown button located in the top section of the page.
4. When the confirmation message appears, click OK.
5. Check the Status field to verify that it indicates Not Responding. Note that it may take a few minutes for the status to change, depending on the length of the discovery cycle and the status of other devices in your network.
6. Power down as follows:
   - ContentStore 3160 (3U): Press the red power button on the control panel on the front of the device and hold for five seconds. Once the disk drive LEDs are off, disconnect the two power cords from the back of the device.
   - ContentStore 4240 (4U): Press the power button on the control panel and hold for four seconds. Once the disk drive LEDs are off, disconnect the two power cords from the back of the device.
   - ContentStore 5840 (5U): Move all power supply switches to the “off” position. Once the front panel LEDs are off, disconnect the power cables from the power supplies.

Powering On a Harmonic MediaGrid System

Use the following steps to power on the devices in a Harmonic MediaGrid system.

**IMPORTANT:** The procedures must be followed in the order described below.

1. Apply power to the ContentDirectors by connecting both power cords to separate, isolated power sources.
2. Press the Power button on the front of each ContentDirector. The ContentDirectors take approximately five minutes to start. Wait for the power-on indicator to light before continuing.

3. Apply power to the ContentServers by connecting the power cords to power sources.

4. Turn on the ContentStores as follows:
   - **ContentStore 3160 and 4240**: connect the power cords to power sources, and then press the Power button on the control panel on the front of each ContentStore.
   - **ContentStore 5840**: connect the power cords to the power supplies and to power sources. Move all power supply switches to the “on” position.

6. Apply power to the SystemManager by connecting the power cord to a power source. Press the Power button on the front of the SystemManager.

7. Make sure all of the ContentServers are running and then apply power to the ContentBridge (if part of the system) as follows:
   - **High Bandwidth ContentBridge 2010F**: Press the power button on the control panel on the front of the device.
   - **ContentBridge 1000B**: Press the Power switch on the back of the device.

**NOTE:** Entries requiring this command are identified in this guide. Once the password is entered, you may complete “sudo” commands without a password for five minutes.

### Managing Network Switches

This section provides information about managing the network switches.

#### Changing the Default Network Switch User Name and Password

Each network switch is preset with the following user name and password:

- **User name**: Administrator
- **Password**: omneon
To change the default user name and password.
1. Connect to the switch using HyperTerminal.
2. Type the following at the command prompt to edit the configuration file and then press ENTER:
   ```
   HP ProCurve Switch 6400cl-6XG# config
   ```
3. Type the following to set the user name and then press Enter. Enter the user name you want to use, including the quotation marks:
   ```
   HP ProCurve Switch 6400cl-6XG(config)# password manager user-name "user name"
   ```
4. Type a password of up to 16 characters and then press Enter.
   ```
   New password for Manager: your password
   ```
5. Retype the password to confirm.
6. Type the following to save the configuration file:
   ```
   HP ProCurve Switch 6400cl-6XG(config)# write memory
   ```
7. Type the following and then press ENTER to exit HyperTerminal:
   ```
   HP ProCurve Switch 6400cl-6XG(config)# logout
   ```

   **NOTE:** If you happen to forget the user name and password, press the Clear button on the front of the switch to clear the current user name and password. Repeat the steps above to create a new user name and password.

Upgrading the Network Switches

The following procedures are completed prior to shipment of the network switches. Only perform these functions if directed by Technical Support.

**Upgrading the Network Switch Firmware**

1. Connect to the switch using HyperTerminal.
2. Type the following at the command prompt:
   ```
   copy xmodem flash
   ```
   You will see the following response:
   ```
   The Primary OS Image will be deleted, continue [y/n]?
   ```
3. Type “y” to continue. You will see the following response:
   ```
   Press ‘Enter’ and start XMODEM on your host...
   ```
4. Press **Enter** to continue.
5. Select **Send File** from the **Transfer** menu on the HyperTerminal menu bar.
   The Send File window appears.

   ![Figure 7–4: Send File](image)

   **NOTE:** Figure 7–4: Send File
6. Set the **Protocol** field to **Xmodem** and select the firmware file from the local machine.

7. Click the **Send** button to upgrade the firmware. The switch verifies the file once the transfer is complete.

8. Reboot the switch when the prompt appears to apply the new firmware.

**Saving the Configuration File**

1. While still connected to the switch using HyperTerminal, go to the Main Menu.

2. Select **Command Line (CLI)** from the Main Menu.

3. Type the following two lines at the command prompt:
   
   ```
   HP ProCurve Switch 3400cl-48G(config)# write memory
   HP ProCurve Switch 3400cl-48G(config)# copy startup-config xmodem pc
   ```

   The first command saves the configuration file in flash memory. The second command copies the configuration file.

4. Press Enter when prompted.

5. Select **Receive File** from the **Transfer** menu on the HyperTerminal menu bar. A Receive File window appears.

6. Select the folder in which the configuration file will reside.

7. Change the **Use receiving protocol** field to **Xmodem**.

8. Click the **Receive** button to download the configuration file.

9. Name the configuration file when prompted. You may want to use the serial number or the location of the switch for easy reference. (For example, use “switch1rack1” as part of the configuration file name.)

**Uploading the Configuration File**

1. While still connected to the switch using HyperTerminal, go to the Main Menu.

2. Select **Command Line (CLI)** from the Main Menu.

3. Type the following at the command prompt:
   
   ```
   HP ProCurve Switch 3400cl-48G(config)# copy xmodem startup-config
   ```

   You will see the following response:

   ```
   Device may be rebooted, do you want to continue [y/n]?
   ```

4. Type “y” to continue. You will see the following response:

   ```
   Press ‘Enter’ and start XMODEM on your host...
   ```

5. Press **Enter** to continue.

6. Select **Send File** from the **Transfer** menu on the HyperTerminal menu bar. A Send File window appears.
7. Type the name of the configuration file in the Filename text box or click the Browse button to search for the file.

8. Set the Protocol field to Xmodem.

9. Click the Send button to upload the configuration file. The switch reboots after the file is loaded.

Return to the Main Menu and then log out of HyperTerminal before removing the serial cable.

Installing Harmonic MediaGrid and ContentDirector Software

The Harmonic MediaGrid operating system software and the ContentDirector software are both pre-installed prior to shipment. Refer to the installation procedures below only if you are installing the software for the first time.

Before You Begin

Refer to the following sources to determine if you need to install software.

Harmonic MediaGrid Operating System Software

The Dell license agreement displays on the ContentDirector followed by a prompt to install an operating system if the Harmonic MediaGrid operating system software is not installed. The Harmonic MediaGrid operating system software is installed if the ContentDirector boots up in Linux. Refer to Installing the Harmonic MediaGrid Operating System Software.

Verifying ContentDirector Software

If the operating system is installed, follow these steps to check for the ContentDirector software.

To verify the software:

1. Attach a keyboard and monitor to the serial connector on the back of the ContentDirector.

2. Log on to the ContentDirector and then type the following command:

```bash
[cld ~] $ sudo rpm -q omneon_cld
```

If the software is installed, package information about the CLD services is displayed, along with the current version of the software, for example:

```
omneon_cld-1.1-200609014
```

The following displays if the ContentDirector software is not installed:

```
package omneon_cld not installed
```

Refer to Installing the ContentDirector Software.
Installing the Harmonic MediaGrid Operating System Software

Harmonic MediaGrid operating system software installation is completed prior to shipment. Only perform the following functions if directed by Technical Support. Repeat the software installation and configuration steps below for each ContentDirector.

To install the operating system software:

1. Make sure the disk drives are fully seated in the ContentDirectors and ContentServers.
2. Attach a keyboard and monitor to the serial connector on the back of the ContentDirector.
3. If the ContentDirector is currently powered on, hold down the Power button on the front panel for approximately 10 seconds to shut it down.
4. Once the ContentDirector is powered down, press the Power button to boot the ContentDirector.
5. Insert the “Harmonic MediaGrid OS DVD” into the DVD-ROM drive.

The Fedora Core4 Installation screen appears.

6. If the operating system installation does not begin, type the following at the command prompt, and then press Enter.
   
   boot: linux ks=cdrom:/ks.cfg

   After 30 seconds, the installer automatically partitions the hard drive and installs all necessary packages. Once complete, the DVD automatically ejects and the ContentDirector reboots.

   **NOTE:** It can take up to 15 minutes for the operating system installation to complete.

Installing the ContentDirector Platform Support Package

This package installs the software to support the latest ContentDirector hardware. Follow these steps when installing the complete ContentDirector software for the first time or if you need to reinstall the complete ContentDirector software.

To install the ContentDirector platform support package:

1. Insert the “Harmonic MediaGrid Platform Support Package” CD-ROM into the DVD drive.
2. Using an attached keyboard and monitor, log on to the ContentDirector as “ovnuser” using the password “OVN@SvCaUsa”. An example is shown below.

   Fedora Core release 4 (Stentz)
   Kernel 2.6.12 on an x86_64
   login: ovnuser
   Password:
   [ovnuser@cld ~]$ 

3. On the Linux command line, mount the CD-ROM onto the /mnt directory by typing the following:

   [ovnuser@cld ~]$ sudo mount /dev/cdrom /mnt/

   Ignore the “mounting read-only” warning message if it displays.

4. Change to the directory /mnt, as shown below:

   [ovnuser@cld ~]$ cd /mnt

5. Execute the installation script by typing the following:

   [ovnuser@cld mnt]$ sudo ./install_hw.sh

   A series of output lines display, showing the progress of the installation sequence.

6. Once the command prompt returns, eject the CD by typing the following commands:

   [ovnuser@cld ~]$ cd /
[ovnuser@cld ~]$ sudo eject

Continue with the remaining ContentDirector software installation procedures.

Installing the ContentDirector Software

ContentDirector software is pre-installed prior to shipping, though may require upgrading to the latest version. Refer to “Software Installation and Upgrades” in the Harmonic SystemManager User Guide to upgrade ContentDirectors with the latest version of software.

To install the ContentDirector software for the first time:

1. Insert the “Harmonic MediaGrid Software Installation” CD-ROM into the DVD drive.
2. Using the attached keyboard and monitor, log on to the ContentDirector as “ovnuser” using the password “OVN@SvCaUsa”. An example is shown below.
   
   Fedora Core release 4 (Stentz)
   Kernel 2.6.12 on an x86_64
   login: ovnuser
   Password:
   [ovnuser@cld ~]$

3. On the Linux command line, mount the CD-ROM onto the /mnt directory by typing the following:
   [ovnuser@cld ~]$ sudo mount /dev/cdrom /mnt/
   
   Ignore the “mounting read-only” warning message if it displays.

4. Change directory to /mnt, as shown below:
   [ovnuser@cld ~]$ cd /mnt

5. Execute the installation script by typing the following:
   [ovnuser@cld mnt]$ sudo ./install.sh
   
   A series of output lines display, showing the progress of the installation sequence.

6. Press ENTER.

7. Once the command prompt returns, reboot the ContentDirector by typing the following:
   [ovnuser@cld mnt]$ sudo reboot
   
   The ContentDirector reboots in approximately 5 minutes.
This chapter provides descriptions of the components used in a Harmonic MediaGrid system. For information on legacy hardware platforms, refer to Appendix A, *Legacy Hardware Platforms*.

The following topics are included:

- **ContentDirector 1000F and High Performance ContentDirector 2000C**
- **ContentBridge 2010F**
- **ContentServer 3000**
- **ContentServer 4000**
- **ContentStore 3160**
- **ContentStore 4240**
- **ContentStore 5840**
- **5406 Network Switch**
- **Power and Cooling Specifications**

**ContentDirector 1000F and High Performance ContentDirector 2000C**

The ContentDirector 1000F and the High Performance ContentDirector 2000C have the same front and rear panel components and same functionality. However, the High Performance ContentDirector 2000C includes additional memory and two solid state drives to increase performance.

**Front Panel Components**

*Figure 8–1* and *Table 8–1* detail the front panel of the ContentDirector 1000F and High Performance ContentDirector 2000C.
Chapter 8 Hardware Reference

ContentDirector 1000F and High Performance ContentDirector 2000C

Figure 8–1: ContentDirector Front Panel

Table 8–1: ContentDirector Front Panel Descriptions

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power indicator</td>
<td>A bright blue <strong>power indicator</strong> is provided across the top of the front panel. This indicator also provides a “wink” function, which allows you to identify a unit from the SystemManager application.</td>
</tr>
<tr>
<td>2. Air vents</td>
<td>Allows airflow through the unit. For optimum airflow, do not obstruct the air vents.</td>
</tr>
<tr>
<td>3. Status LEDs</td>
<td>An array of four <strong>status LEDs</strong> is provided on the front panel. See the following figure and table for descriptions of each status LED.</td>
</tr>
</tbody>
</table>

**System Status LEDs**

*Figure 8–2* and *Table 8–2* detail the four system status indicators on the front of the ContentDirector.

**Public NIC**

**Private NIC**

**SSD 0**

**SSD 1**

<table>
<thead>
<tr>
<th><strong>Public and Private NIC Indicator</strong></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>Both connections are good</td>
</tr>
<tr>
<td>Yellow</td>
<td>Public: NIC 0 connection failure</td>
</tr>
<tr>
<td></td>
<td>Private: NIC 2 connection failure</td>
</tr>
<tr>
<td>Magenta</td>
<td>Public: NIC 1 connection failure</td>
</tr>
<tr>
<td></td>
<td>Private: NIC 3 connection failure</td>
</tr>
<tr>
<td>Red</td>
<td>Both connections have failed</td>
</tr>
</tbody>
</table>

**SSD Indicators**

<table>
<thead>
<tr>
<th><strong>White</strong></th>
<th><strong>Drive online</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yellow</strong></td>
<td>Drive replacement warning</td>
</tr>
<tr>
<td><strong>Red</strong></td>
<td>Drive failure</td>
</tr>
</tbody>
</table>

Figure 8–2: ContentDirector Front Panel Indicators
Table 8–2: ContentDirector Indicator Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Color/State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public VLAN</td>
<td>White</td>
<td>Both connections are working normally.</td>
</tr>
<tr>
<td></td>
<td>Yellow</td>
<td>NIC 0 connection is non-functional.</td>
</tr>
<tr>
<td></td>
<td>Magenta</td>
<td>NIC 1 connection is non-functional.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Both connections are non-functional.</td>
</tr>
<tr>
<td>Private VLAN</td>
<td>White</td>
<td>Both connections are working normally.</td>
</tr>
<tr>
<td></td>
<td>Yellow</td>
<td>NIC 2 connection is non-functional.</td>
</tr>
<tr>
<td></td>
<td>Magenta</td>
<td>NIC 3 connection is non-functional.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Both connections are non-functional.</td>
</tr>
<tr>
<td>Solid State Drive 0</td>
<td>White</td>
<td>The drive is online.</td>
</tr>
<tr>
<td>Solid State Drive 1</td>
<td>Yellow</td>
<td>The drive needs to be replaced.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>The drive has failed.</td>
</tr>
</tbody>
</table>

Figure 8–3 and Table 8–3 detail the front panel view of a the ContentDirector 1000F and High Performance ContentDirector 2000C with the bezel removed. Note that your ContentDirector may differ somewhat from the one described below.

Figure 8–3: Front View of ContentDirector

Table 8–3: Front Panel Components

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. System label pull-out tab</td>
<td>Use to apply a product number and/or serial number label.</td>
</tr>
<tr>
<td>2. Optical drive</td>
<td>Use for software installation.</td>
</tr>
<tr>
<td>3. LCD panel</td>
<td>Displays system ID, status information, and system error messages. The LCD lights blue during normal system operation. The LCD lights amber when the system needs attention, and the LCD panel displays an error code followed by descriptive text.</td>
</tr>
</tbody>
</table>
## Indicator, Button, or Connector

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. LCD menu buttons</td>
<td>Allow you to navigate the LCD panel menu.</td>
</tr>
<tr>
<td>5. USB connectors</td>
<td>Use to connect the front bezel.</td>
</tr>
<tr>
<td>6. Control panel</td>
<td>Refer to Table 8–4 for a description of the buttons and indicator codes.</td>
</tr>
</tbody>
</table>

### ContentDirector 1000F

| 7. Hard drive 0                 | Refer to Table 8–6 for a description of the indicator codes. |
| 8. Hard drive 1                 |                                                        |

### High Performance ContentDirector 2000C

| 7. Solid-state drive 0          | Refer to Table 8–6 for a description of the indicator codes |
| 8. Solid-state drive 1          |                                                        |
### Control Panel Indicators

![ContentDirector Control Panel](image)

#### Table 8–4: Control Panel Indicators

<table>
<thead>
<tr>
<th>Button and/or Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. System ID button with integrated LED</td>
<td>The identification button can be used to locate a particular system within a rack. When this button is pressed, the ID LEDs on the front panel and on the back edge of the server board (viewable from the rear panel) flash until the button is pressed again.</td>
</tr>
<tr>
<td>2. Non-maskable interrupt (NMI) button (recessed, tool required for use)</td>
<td>The NMI button can be used to put the server into a halt state when diagnosing an issue. To prevent an accidental system halt, the physical button is located behind the Control Panel and is only accessible with the use of a small tipped tool.</td>
</tr>
<tr>
<td>3. NIC 0 Activity LED</td>
<td>When a network link is detected, the LED will turn on solid. The LED blinks when data is being sent or received over the network.</td>
</tr>
<tr>
<td>4. NIC 1 Activity LED</td>
<td></td>
</tr>
<tr>
<td>5. System cold reset button (recessed, tool required for use)</td>
<td>When pressed, this button initializes a hard system reset. To prevent an accidental reset, the physical button is located behind the Control Panel and is only accessible with the use of a small tipped tool.</td>
</tr>
<tr>
<td>6. System status LED</td>
<td>Shows the current health of the server system. A second system status LED is located on the back edge of the server board and is viewable from the rear panel. Both LEDs will show the same state. Refer to Table 8–5 for a description of each LED state.</td>
</tr>
<tr>
<td>7. Power/Sleep button with integrated LED</td>
<td>Toggles the system power on and off. The power-on indicator lights green when the system power is on. When the power-on indicator is off, this indicates that no power is supplied to the system.</td>
</tr>
<tr>
<td>8. Drive activity LED</td>
<td>Indicates drive activity.</td>
</tr>
</tbody>
</table>
System Status LEDs

Table 8–5: System Status LED Pattern

<table>
<thead>
<tr>
<th>Color</th>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td></td>
<td>System is off.</td>
</tr>
<tr>
<td>Green</td>
<td>solid on</td>
<td>System is on and its status is healthy.</td>
</tr>
<tr>
<td></td>
<td>blink</td>
<td>Non-critical warning: The system is operating in a redundant or degraded state but still functional. A loss of redundancy may have occurred, such as a power supply unit or fan.</td>
</tr>
<tr>
<td>Amber</td>
<td>blink</td>
<td>Non-fatal warning: The system is likely to fail, but is still working. A critical threshold may have been crossed, such as temperature or voltage, or a disk drive failure has occurred.</td>
</tr>
<tr>
<td></td>
<td>solid on</td>
<td>Fatal alarm: The system has failed or shut down.</td>
</tr>
</tbody>
</table>

Drive Status and Activity LEDs

Figure 8–5 and Table 8–6 describe the drive indicators and their functions.

<table>
<thead>
<tr>
<th>Drive Indicator</th>
<th>Indicator Pattern</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive Status</td>
<td>Off</td>
<td>No access and no fault</td>
</tr>
<tr>
<td></td>
<td>Steady amber</td>
<td>Hard drive fault has occurred</td>
</tr>
<tr>
<td></td>
<td>Blinks amber</td>
<td>RAID rebuild in progress</td>
</tr>
<tr>
<td>Drive Activity</td>
<td>Off</td>
<td>Power on with no drive activity, drive spun down or drive spinning up</td>
</tr>
<tr>
<td></td>
<td>Blinks on when processing a command</td>
<td>Power on with drive activity</td>
</tr>
</tbody>
</table>

IMPORTANT: Do not turn off power when replacing a drive. As soon as the new drive is inserted, the system will begin replicating the data from the other drives.
Rear Panel Components

Figure 8–6 and Table 8–7 describe the rear panel view of the ContentDirector 1000F and 2000C.

Figure 8–6: Rear View of ContentDirector

Table 8–7: Rear Panel Components

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power supply 1</td>
<td>Dual redundant power supplies provide power to the system.</td>
</tr>
<tr>
<td>2. Power supply 2</td>
<td></td>
</tr>
<tr>
<td>3. NIC 3 Connector</td>
<td>Use for Gigabit Ethernet connection to switch (private VLAN).</td>
</tr>
<tr>
<td>4. NIC 2 Connector</td>
<td></td>
</tr>
<tr>
<td>5. NIC 0 Connector</td>
<td>Use for Gigabit Ethernet connection to switch (public VLAN).</td>
</tr>
<tr>
<td>6. NIC 1 Connector</td>
<td></td>
</tr>
<tr>
<td>7. Video connector</td>
<td>Use to connect a monitor to the system (for maintenance only).</td>
</tr>
<tr>
<td>8. RJ-45 serial port</td>
<td>Serial cable is not provided.</td>
</tr>
<tr>
<td>9. USB ports (3)</td>
<td>Used for maintenance purposes only.</td>
</tr>
<tr>
<td>10. Diagnostic LEDs</td>
<td>For Service only.</td>
</tr>
<tr>
<td>11. System Status LED</td>
<td>Located on the back edge of the server board, this LED matches the state of the System Status LED on the front Control Panel. Refer to Table 8–5 for a description of each LED state.</td>
</tr>
<tr>
<td>12. System ID LED</td>
<td>Located on the back edge of the server board, this LED matches the state of the System ID LED on the front Control Panel. When that button is pushed, this LED flashes blue until the button is pressed again.</td>
</tr>
<tr>
<td>13. Baseboard Management Console (BMC) connector</td>
<td>Do not use.</td>
</tr>
</tbody>
</table>
Power Supply Indicator/Handle

*Figure 8–7* and *Table 8–8* describe the typical Redundant Power Supply Indicator/Handle and its functions.

![Power Supply Status Indicator](image)

**Figure 8–7: ContentDirector Power Supply Indicator/Handle**

**Table 8–8: Power Supply Indicator Pattern**

<table>
<thead>
<tr>
<th>Indicator Pattern</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not lit</td>
<td>AC power is not connected.</td>
</tr>
<tr>
<td>Steady green</td>
<td>A valid power source is connected to the power supply and the power supply is operational.</td>
</tr>
<tr>
<td>Blinks green (1Hz)</td>
<td>AC power is connected but operating in a cold redundant state.</td>
</tr>
<tr>
<td>Blinks green (2Hz)</td>
<td>Power supply firmware is updating.</td>
</tr>
<tr>
<td>Blinks amber</td>
<td>A problem with the power supply has occurred but the power supply is still functional.</td>
</tr>
<tr>
<td></td>
<td><strong>CAUTION:</strong> If two power supplies are used, they must be of the same type and have the same maximum output power.</td>
</tr>
<tr>
<td>Steady amber</td>
<td>A power supply failure has occurred, causing it to shut down.</td>
</tr>
</tbody>
</table>

**CAUTION:** When correcting a power supply mismatch, replace only the power supply with the flashing indicator. Swapping the opposite power supply to make a matched pair can result in an error condition and unexpected system shutdown. To change from a High Output configuration to a Low Output configuration or vice versa, you must power down the system.

**CAUTION:** AC power supplies support both 220 V and 110 V input voltages. When two identical power supplies receive different input voltages, they can output different wattages, and trigger a mismatch.

**ContentDirector NIC Indicators**

Each NIC on the rear panel has two indicators that provide information on connection status and speed. Refer to *Figure 8–8* and *Figure 8–9*.

**NOTE:** The indicator codes for NIC 0 and NIC 1 differ from the indicators codes for NIC 2 and NIC 3.
ContentBridge 2010F

The ContentBridge 2010F (also referred to as the High Bandwidth ContentBridge), an optional component, provides access to Harmonic MediaGrid for those client platforms that do not have the FSD installed or do not use the Harmonic MediaGrid API. The ContentBridge 2010F provides the highest throughput of the ContentBridge models.

Front Panel Components

*Figure 8–10 and Table 8–9* detail the front panel of the ContentBridge 2010F.
Figure 8–10: ContentBridge 2010F Front Panel Indicators

Table 8–9: ContentBridge 2010F Front Panel Descriptions

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power indicator</td>
<td>A bright blue <strong>power indicator</strong> is provided across the top of the front panel. This indicator also provides a “wink” function, which allows you to identify a unit from the SystemManager application.</td>
</tr>
<tr>
<td>2. Air vents</td>
<td>Allows airflow through the unit. For optimum airflow, do not obstruct the air vents.</td>
</tr>
<tr>
<td>3. Status LEDs</td>
<td>An array of four <strong>status LEDs</strong> is provided on the front panel. See the following figure and table for descriptions of each status LED.</td>
</tr>
</tbody>
</table>

System Status LEDs

*Figure 8–11* and *Table 8–10* detail the four system status indicators on the front of the ContentBridge 2010F.

Table 8–10: ContentBridge 2010F Front Panel Indicator Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Color/State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 GbE NIC</td>
<td>White</td>
<td>Both ports are working normally.</td>
</tr>
<tr>
<td></td>
<td>Yellow</td>
<td>10 GbE port 2 is non-functional.</td>
</tr>
<tr>
<td></td>
<td>Magenta</td>
<td>10 GbE port 3 is non-functional.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Both 10 GbE connections have failed.</td>
</tr>
</tbody>
</table>
Table 8–10: ContentBridge 2010F Front Panel Indicator Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Color/State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HA Pair</td>
<td>White</td>
<td>Indicates normal operation.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>A local failure has occurred.</td>
</tr>
<tr>
<td></td>
<td>Yellow</td>
<td>A peer failure has occurred.</td>
</tr>
<tr>
<td></td>
<td>Off/Blue</td>
<td>HA Pair has not been configured.</td>
</tr>
<tr>
<td>Hard Drive 0</td>
<td>White</td>
<td>Drive is online.</td>
</tr>
<tr>
<td>Hard Drive 1</td>
<td>Yellow</td>
<td>Drive replacement warning.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>A drive failure has occurred.</td>
</tr>
</tbody>
</table>

*Figure 8–12 and Table 8–11 detail the front panel view of a typical ContentBridge 2010F with the bezel removed. Note that your ContentBridge 2010F may differ somewhat from the one described below.*

![Figure 8–12: Front View of ContentBridge 2010F](image)

Table 8–11: ContentBridge 2010F Front Panel Components

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. System label pull-out tab</td>
<td>Use to apply a product number and/or serial number label.</td>
</tr>
<tr>
<td>2. Optical drive</td>
<td>Use for software installation.</td>
</tr>
<tr>
<td>3. LCD display</td>
<td>Displays system ID, status information, and system error messages. The LCD lights blue during normal system operation. The LCD lights amber when the system needs attention, and the LCD panel displays an error code followed by descriptive text.</td>
</tr>
<tr>
<td>4. LCD menu buttons</td>
<td>Allow you to navigate the control panel LCD menu.</td>
</tr>
<tr>
<td>5. USB connectors (2)</td>
<td>Use to connect the front bezel.</td>
</tr>
<tr>
<td>6. Control panel</td>
<td>Refer to <em>Figure 8–12</em> for a description of control panel buttons and indicators.</td>
</tr>
<tr>
<td>7. Solid state drive 0</td>
<td>Refer to <em>Table 8–14</em> for a description of the indicator codes.</td>
</tr>
<tr>
<td>8. Solid state drive 1</td>
<td></td>
</tr>
</tbody>
</table>
Control Panel Indicators

Figure 8–13 and Table 8–12 describe the Control Panel buttons and LED states.

Figure 8–13: Control Panel Indicators

Table 8–12: Control Panel Indicators

<table>
<thead>
<tr>
<th>Button and/or Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. System ID button with integrated LED</td>
<td>The identification button can be used to locate a particular system within a rack. When this button is pressed, the ID LEDs on the front panel and on the back edge of the server board (viewable from the rear panel) flash until the button is pressed again.</td>
</tr>
<tr>
<td>2. Non-maskable interrupt (NMI) button (recessed, tool required for use)</td>
<td>The NMI button can be used to put the server into a halt state when diagnosing an issue. To prevent an accidental system halt, the physical button is located behind the Control Panel and is only accessible with the use of a small tipped tool.</td>
</tr>
<tr>
<td>3. NIC 0 Activity LED</td>
<td>When a network link is detected, the LED will turn on solid. The LED blinks when data is being sent or received over the network.</td>
</tr>
<tr>
<td>4. NIC 1 Activity LED</td>
<td></td>
</tr>
<tr>
<td>5. System cold reset button (recessed, tool required for use)</td>
<td>When pressed, this button initializes a hard system reset. To prevent an accidental reset, the physical button is located behind the Control Panel and is only accessible with the use of a small tipped tool.</td>
</tr>
<tr>
<td>6. System status LED</td>
<td>Shows the current health of the server system. A second system status LED is located on the back edge of the server board and is viewable from the rear panel. Both LEDs will show the same state. Refer to Table 8–13 for a description of each LED state.</td>
</tr>
<tr>
<td>7. Power/Sleep button with integrated LED</td>
<td>Toggles the power on and off. The power-on indicator lights green when the system power is on. When the power-on indicator is off, this indicates that no power is supplied to the system.</td>
</tr>
<tr>
<td>8. Drive activity LED</td>
<td>Indicates drive activity.</td>
</tr>
</tbody>
</table>
System Status LEDs

Table 8–13: System Status LED Pattern

<table>
<thead>
<tr>
<th>Color</th>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>System is off.</td>
<td></td>
</tr>
<tr>
<td>Green</td>
<td>solid on</td>
<td>System is on and its status is healthy.</td>
</tr>
<tr>
<td></td>
<td>blink</td>
<td>Non-critical warning: The system is operating in a redundant or degraded state but still functional. A loss of redundancy may have occurred, such as a power supply unit or fan.</td>
</tr>
<tr>
<td>Amber</td>
<td>blink</td>
<td>Non-fatal warning: The system is likely to fail, but is still working. A critical threshold may have been crossed, such as temperature or voltage, or a disk drive failure has occurred.</td>
</tr>
<tr>
<td></td>
<td>solid on</td>
<td>Fatal alarm: The system has failed or shut down.</td>
</tr>
</tbody>
</table>

Drive Status and Activity Indicators

Figure 8–14 and Table 8–14 describe the typical hard drive indicators and their functions.

Drive-status Indicator (amber)

Drive-activity Indicator (green)

Figure 8–14: ContentBridge 2010F Hard Drive Indicators

Table 8–14: Drive–status Indicator Pattern (RAID Only)

<table>
<thead>
<tr>
<th>Drive Indicator</th>
<th>Indicator Pattern</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive Status</td>
<td>Off</td>
<td>No access and no fault</td>
</tr>
<tr>
<td></td>
<td>Steady amber</td>
<td>Hard drive fault has occurred</td>
</tr>
<tr>
<td></td>
<td>Blinks amber</td>
<td>RAID rebuild in progress</td>
</tr>
<tr>
<td>Drive Activity</td>
<td>Off</td>
<td>Power on with no drive activity, drive spun down or drive spinning up</td>
</tr>
<tr>
<td></td>
<td>Blinks on when processing a command</td>
<td>Power on with drive activity</td>
</tr>
</tbody>
</table>

IMPORTANT: Do not turn off power when replacing a drive. As soon as the new drive is inserted, the system will begin replicating the data from the other drives.
Rear Panel Components

Figure 8–15 and Table 8–15 describe the rear panel view of the ContentBridge 2010F.

Figure 8–15: Rear View of ContentBridge 2010F

Table 8–15: ContentBridge 2010F Rear Panel Components

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power supply 1</td>
<td>Dual redundant power supplies provide power to the system.</td>
</tr>
<tr>
<td>2. Power supply 2</td>
<td></td>
</tr>
<tr>
<td>3. 10 Gigabit Ethernet connector 3</td>
<td>Use to connect the ContentBridge 2010F to the network switch.</td>
</tr>
<tr>
<td>4. 10 Gigabit Ethernet connector 2</td>
<td>Use to connect the ContentBridge 2010F to the network switch. The Link light does not appear until the Configuration Assistant is completed for the ContentBridge. Refer to About Harmonic MediaGrid Configuration for more information.</td>
</tr>
<tr>
<td>5. Gigabit Ethernet connector 0</td>
<td>Use to connect two High Bandwidth ContentBridges in a high availability pair.</td>
</tr>
<tr>
<td>6. Gigabit Ethernet connector 1</td>
<td></td>
</tr>
<tr>
<td>7. Video connector</td>
<td>Use to connect a monitor to the system (for maintenance only).</td>
</tr>
<tr>
<td>8. RJ-45 serial port</td>
<td>Serial cable is not provided.</td>
</tr>
<tr>
<td>9. USB ports (3)</td>
<td>Used for maintenance purposes only.</td>
</tr>
<tr>
<td>10. Diagnostic LEDs</td>
<td>For Service only. LEDs are located on the back edge of the server board.</td>
</tr>
<tr>
<td>11. System Status LED</td>
<td>Located on the back edge of the server board, this LED matches the state of the System Status LED on the front Control Panel. Refer to Table 8–13 for a description of each LED state.</td>
</tr>
</tbody>
</table>
10 Gigabit Ethernet LEDs

*Figure 8–16* and *Table 8–16* describe the possible states of the 10 Gigabit Ethernet LEDs.

### 10 Gigabit Ethernet Indicator

<table>
<thead>
<tr>
<th>Indicator Pattern</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steady on</td>
<td>The NIC is connected to a valid network link.</td>
</tr>
<tr>
<td>Blinking</td>
<td>The NIC is connected and network data is being sent or received.</td>
</tr>
<tr>
<td>Green</td>
<td>Link speed is 10 Gbps.</td>
</tr>
<tr>
<td>Yellow</td>
<td>Link speed is 1 Gbps.</td>
</tr>
</tbody>
</table>

1 Gigabit Ethernet LEDs

The 1 Gigabit NIC has a link/activity LED and a speed LED. Refer to *Figure 8–17*.

### 1 Gigabit Ethernet LED Indicator Codes

- Green (blink) = activity
- Green (solid) = link
- Off = no link
- Green = 1 Gbps
- Yellow = 100 Mbps
- Off = No link
Power Supply LEDs

*Figure 8–18* and *Table 8–17* describe the Power Supply Indicator/Handle and its functions.

![Power Supply Status Indicator](image)

*Figure 8–18: Power Supply LEDs*

**Table 8–17: Power Supply Indicator Pattern**

<table>
<thead>
<tr>
<th>Indicator Pattern</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not lit</td>
<td>AC power is not connected.</td>
</tr>
<tr>
<td>Steady green</td>
<td>A valid power source is connected to the power supply and the power supply is operational.</td>
</tr>
<tr>
<td>Blinks green (1Hz)</td>
<td>AC power is connected but operating in a cold redundant state.</td>
</tr>
<tr>
<td>Blinks green (2Hz)</td>
<td>Power supply firmware is updating.</td>
</tr>
<tr>
<td>Blinks amber</td>
<td>A problem with the power supply has occurred but the power supply is still functional.</td>
</tr>
<tr>
<td></td>
<td><strong>CAUTION:</strong> If two power supplies are used, they must be of the same type and have the same maximum output power.</td>
</tr>
<tr>
<td>Steady amber</td>
<td>A power supply failure has occurred, causing it to shut down.</td>
</tr>
</tbody>
</table>

**ContentServer 3000**

The ContentServer 3000 presents data to clients, managing the actual data on the hard drives.

**Front Panel Components**

**Front Bezel**

*Figure 8–19* and *Table 8–18* describe the front bezel components of the ContentServer 3000.
Table 8–18: ContentServer 3000 Front Bezel Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power indicator</td>
<td>A bright blue <strong>power indicator</strong> is provided across the top of the front panel. This indicator also provides a “wink” function, which allows you to identify a unit from the SystemManager application.</td>
</tr>
<tr>
<td>2. Air vents</td>
<td>Allows airflow through the unit. For optimum airflow, do not obstruct the air vents.</td>
</tr>
</tbody>
</table>

**Front Panel**

*Figure 8–20 and Table 8–19* detail the front view of the ContentServer 3000 with the front bezel removed and all disk drives in place.
Table 8–19: ContentServer 3000 Front Panel Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Left Control Panel</td>
<td>The control panel included on the left side of the ContentServer 3000 provides system monitoring and control for the controller on the same side of the chassis. LEDs indicate system power, network (NIC) activity, system overheat and power supply failure for the controller on the left side.</td>
</tr>
<tr>
<td>2. Disk drives</td>
<td>The server contains 16 SATA or SAS disk drives, providing storage for the Harmonic MediaGrid. Drives are numbered from right to left when facing the front panel.</td>
</tr>
<tr>
<td>3. Power button and Right Control Panel</td>
<td>There is a single, shared power button located on the right control panel. Note the following behaviors when powering on/off with the shared power button:</td>
</tr>
<tr>
<td></td>
<td>■ When both nodes are powered on, depressing this button will power both nodes off.</td>
</tr>
<tr>
<td></td>
<td>■ When both nodes are powered off, pressing this button will power both nodes on.</td>
</tr>
<tr>
<td></td>
<td>■ If one node is powered on, pressing this button will power on a single node with no impact on the node that is already powered on.</td>
</tr>
<tr>
<td></td>
<td>■ Powering off with this button removes the main power but keeps standby power supplied to the system.</td>
</tr>
<tr>
<td></td>
<td>The control panel included on the right side of the ContentServer 3000 provides system monitoring and control for the controller on the same side of the chassis. LEDs indicate system power, network (NIC) activity, system overheat and power supply failure for the controller on the right side.</td>
</tr>
</tbody>
</table>

Control Panel LEDs

The two control panels located on the front of the chassis have LEDs, which provide you with critical information related to the node on the same side of the chassis as well as power supply information. *Figure 8–21* and *Table 8–20* provides descriptions of the control panel LEDs.
### Table 8–20: ContentServer 3000 Front Bezel LEDs

<table>
<thead>
<tr>
<th>Symbol</th>
<th>LED</th>
<th>Color/State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power</td>
<td>Solid</td>
<td>Indicates that power is being supplied to the power supply units</td>
</tr>
<tr>
<td>2</td>
<td>NIC 1</td>
<td>Flashing</td>
<td>Indicates network activity on the NIC 1 port</td>
</tr>
<tr>
<td>3</td>
<td>Power Fail</td>
<td>Solid</td>
<td>Indicates a power supply module has failed. Refer to the Harmonic MediaGrid Component Replacement Guide for details on replacing the power supply.</td>
</tr>
<tr>
<td>4</td>
<td>Heartbeat</td>
<td>Flashing</td>
<td>Indicates that power is being supplied to the server board</td>
</tr>
</tbody>
</table>
Disk Drive Status LEDs

Refer to Figure 8–22 and Table 8–21 for information on the Disk Drive Status LEDs. Refer to the Harmonic MediaGrid Component Replacement Guide for instructions on replacing a failed drive.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>LED</th>
<th>Color/State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>NIC 0</td>
<td>Flashing</td>
<td>Indicates network activity on the NIC 0 port</td>
</tr>
<tr>
<td>6</td>
<td>Overheat/ Fan Fail</td>
<td>Flashing</td>
<td>Indicates fan failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Solid</td>
<td>Overheat condition, which may be caused by cables obstructing the airflow in the system or the ambient room temperature being too warm. Check the routing of the cables and make sure all fans are present and operating normally. Also check to make sure that the chassis covers are installed.</td>
</tr>
</tbody>
</table>

Figure 8–22: Disk Drive Status LEDs

Table 8–21: Disk Drive Status LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>Color/State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Solid</td>
<td>Drive is powered on</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>No power is being provided to the drive</td>
</tr>
<tr>
<td></td>
<td>Blinking</td>
<td>Drive is in use.</td>
</tr>
</tbody>
</table>
### Rear Panel Components

The ContentServer 3000 includes two separate controllers, and two power supplies to provide redundancy in the case of a failure. *Figure 8–23* and *Table 8–22* describe the rear panel components of a ContentServer 3000.

<table>
<thead>
<tr>
<th>LED</th>
<th>Color/State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Solid</td>
<td>Drive is not being used by the ContentServer.</td>
</tr>
<tr>
<td></td>
<td>Rapid blink</td>
<td>Drive failed</td>
</tr>
<tr>
<td></td>
<td>Slow blink</td>
<td>Drive is being winked</td>
</tr>
<tr>
<td></td>
<td>Two rapid blinks then pause repeatedly</td>
<td>RAID set is being rebuilt, repaired, or is under maintenance</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Drive state is normal. Drive is being used by the ContentServer.</td>
</tr>
</tbody>
</table>
Figure 8–23: ContentServer 3000 Rear Panel

**IMPORTANT:** Note that, when facing the rear of the chassis, the controller on the left side of the chassis corresponds to Controller 0 in SystemManager, and the controller on the right side of the chassis corresponds to Controller 1 in SystemManager.
Table 8–22: ContentServer 3000 Rear Panel Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power supplies</td>
<td>Dual, redundant power supplies provide power to the system. For a description of the power supply LED states, refer to Power Supply LED.</td>
</tr>
<tr>
<td>2. NVRAM card LEDs</td>
<td>The NVRAM indicators provide information about the status of the NVRAM card. For details, refer to NVRAM Card LEDs.</td>
</tr>
<tr>
<td>3. Ethernet port: NIC 1</td>
<td>NIC 1 provides Gigabit Ethernet connectivity.</td>
</tr>
<tr>
<td>4. Ethernet port: NIC 0</td>
<td>NIC 0 provides Gigabit Ethernet connectivity as well as a connection for the Baseboard Management Console (BMC). For information about the BMC connection, refer to Connecting the ContentDirectors to a Network Switch.</td>
</tr>
<tr>
<td>5. System Heartbeat LED</td>
<td>Blinks to indicate power and normal functionality</td>
</tr>
<tr>
<td>6. BMC Heartbeat LED</td>
<td>Blinks to indicate that Baseboard Management Console (BMC) is functioning normally. The BMC is a troubleshooting utility, which can be accessed in the event of system failure.</td>
</tr>
<tr>
<td>7. KVM port</td>
<td>Allows you to connect a keyboard, video, and mouse switch.</td>
</tr>
<tr>
<td>8. SAS port</td>
<td>A Serial Attached SCSI port on each controller allows you to connect to multiple ContentStores.</td>
</tr>
</tbody>
</table>

CAUTION: With Harmonic MediaGrid 4.0, SAS cables are not hot-swappable. When replacing or removing a SAS cable, you must first power down the associated ContentServer controller using SystemManager, replace or re-connect the SAS cable, and then power on the ContentServer controller by pressing the power button on the front panel.

9. Optional Ethernet cards:  
   - Optional 2x10GbE Add in Card  
   - Optional 4x1 GbE Add-in Card  

An optional 10 Gigabit Ethernet card with two ports is available from Harmonic. For details on the LED states, refer to 10-Gigabit Ethernet Add-in Card LED.

An optional Gigabit Ethernet card with four ports is available from Harmonic. For details on the LED states, refer to Gigabit Ethernet Add-in Card LEDs.

Gigabit Ethernet Port (LAN1 and LAN2) LEDs

On each Ethernet port, the Activity LED flashes to indicate activity while the Link LED may be green, amber or off to indicate the speed of the connection. Refer to Figure 8–24 and Table 8–23 for descriptions of the GbE port status LEDs.
NVRAM Card LEDs

The NVRAM card LEDs provide information about the state of the NVRAM card. Refer to Figure 8–25 and Table 8–24 for details.

Table 8–23: ContentServer 3000 Gigabit Ethernet Port Status LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>LED State</th>
<th>NIC State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link (left)</td>
<td>Off</td>
<td>Power off, network cables unplugged</td>
</tr>
<tr>
<td></td>
<td>Green (solid)</td>
<td>Power off, network cables plugged in. Active connection at 100 Mb/s</td>
</tr>
<tr>
<td></td>
<td>Amber (solid)</td>
<td>Power on, network cables plugged in. Active connection at 1 Gb/s</td>
</tr>
<tr>
<td>Activity (right)</td>
<td>Off</td>
<td>Power off, network cables unplugged</td>
</tr>
<tr>
<td></td>
<td>Yellow (solid)</td>
<td>Power on, active connection</td>
</tr>
<tr>
<td></td>
<td>Yellow (blink)</td>
<td>Power on, network data being sent or received</td>
</tr>
</tbody>
</table>

Table 8–24: NVRAM Card Status LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>LED State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Restore</td>
<td>On</td>
<td>Data from the NVRAM is being restored to DRAM.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>No activity.</td>
</tr>
</tbody>
</table>
Table 8–24: NVRAM Card Status LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>LED State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Save</td>
<td>On</td>
<td>Save operation is in progress. LED turns on during power-down.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>No activity.</td>
</tr>
<tr>
<td>3. PCIe Link</td>
<td>On</td>
<td>PCIe communications link within the system is up. Turns on within 60 seconds after system power-up.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>PCIe link issue. Needs attention.</td>
</tr>
<tr>
<td>4. Charged</td>
<td>On</td>
<td>NVRAM capacitor is fully charged. LED turns on within 60 seconds after system power-up.</td>
</tr>
</tbody>
</table>

Gigabit Ethernet Add–in Card LEDs

On each Ethernet port, the left LED flashes green to indicate activity while the right LED may be green, yellow or off to indicate the speed of the connection. Refer to Figure 8–26 and Table 8–25 for descriptions of the status LEDs.

Table 8–25: Gigabit Ethernet Add–in Card status LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>LED State</th>
<th>NIC State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link (right)</td>
<td>Off</td>
<td>Power off, network cables unplugged</td>
</tr>
<tr>
<td></td>
<td>Green (solid)</td>
<td>Power off, network cables plugged in. Active connection at 100 Mb/s</td>
</tr>
<tr>
<td></td>
<td>Yellow (solid)</td>
<td>Power on, network cables plugged in. Active connection at 1 Gb/s</td>
</tr>
</tbody>
</table>

Figure 8–26: Gigabit Ethernet Add–in Card LEDs
10-Gigabit Ethernet Add-in Card LED

The two LEDs on the 10 Gigabit Ethernet add-in card indicate connection and network activity for the right and left connector respectively. See Figure 8–27 and Table 8–26 for details.

NOTE: The left LED is not readily visible when viewing the rear panel.

Table 8–25: Gigabit Ethernet Add-in Card status LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>LED State</th>
<th>NIC State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity (left)</td>
<td>Off</td>
<td>Power off, network cables unplugged</td>
</tr>
<tr>
<td></td>
<td>Green (solid)</td>
<td>Power on, active connection</td>
</tr>
<tr>
<td></td>
<td>Green (blink)</td>
<td>Power on, network data being sent or received</td>
</tr>
</tbody>
</table>

Table 8–26: 10 Gigabit Ethernet Add-in Card status LED

<table>
<thead>
<tr>
<th>LED State</th>
<th>NIC State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Power off, network cable unplugged</td>
</tr>
<tr>
<td>Green (solid)</td>
<td>Active connection at 10 Gb/s.</td>
</tr>
<tr>
<td>Green (blink)</td>
<td>Network data being sent or received.</td>
</tr>
</tbody>
</table>

Figure 8–27: 10 Gigabit Ethernet Add-in Card LEDs
Power Supply LED

A power supply LED is located directly beneath each AC power connector. Refer to Table 8–27 for a description of the power supply LED states.

Table 8–27: Power Supply LED Descriptions

<table>
<thead>
<tr>
<th>LED State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>AC power not connected</td>
</tr>
<tr>
<td>Green</td>
<td>System on</td>
</tr>
<tr>
<td>Amber</td>
<td>System is in power down state, or power cord has been removed.</td>
</tr>
</tbody>
</table>

ContentServer 4000

- Front Panel Components
- Rear Panel Components

Front Panel Components

The front panel contains hot-swappable disk drives, a power button, a connector for the bezel, and control panel with system status LEDs.

Figure 8–28: ContentServer 4000 Front Panel View

Table 8–28: ContentServer 4000 Front Panel Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bezel LED control connector</td>
<td>Powers the light bar on the bezel.</td>
</tr>
<tr>
<td>2. Power button</td>
<td>Depress this button to power both nodes on or off. Powering off with this button removes the main power but keeps standby power supplied to the system.</td>
</tr>
<tr>
<td>3. Control panel</td>
<td>Shows Operational State and Fault indicators for both Controller A and Controller B. For information about LED indicators, refer to Table 8–29.</td>
</tr>
</tbody>
</table>
Control Panel Indicators

The control panel contains operational state and fault LED indicators.

![Control Panel Indicators Diagram]

**Figure 8–29: ContentServer 4000 Control Panel LED Indicators**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational State</td>
<td>Green</td>
<td>System is powered on.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>System is powered off.</td>
</tr>
<tr>
<td>Fault</td>
<td>Yellow</td>
<td>A critical error has occurred.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>No critical errors have occurred.</td>
</tr>
</tbody>
</table>

**Table 8–29: ContentServer 4000 Control Panel LED Indicators**

Disk Drive Numbering

Drives are number 0-23, starting with the top left drive.

![Disk Drive Numbering Diagram]

**Figure 8–30: ContentServer 4000 Drive Numbering**
**Disk Drive LED Indicators**

Each drive has an activity LED and status LED. Note that, on the ContentServer 4000, the wink function activates the activity LED.

![Disk Drive LED Indicators](image)

**Figure 8–31: ContentServer 4000 Disk Drive LEDs**

**Table 8–30: Drive states and LED indicators**

<table>
<thead>
<tr>
<th>Drive State</th>
<th>Activity LED (Blue)</th>
<th>Status LED (Red)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive is powered on</td>
<td>Solid</td>
<td>Off</td>
</tr>
<tr>
<td>Drive activity</td>
<td>Blink</td>
<td>Off</td>
</tr>
<tr>
<td>RAID rebuild in progress</td>
<td>Blink</td>
<td>Slow blink (1 Hz)</td>
</tr>
<tr>
<td>Drive failure</td>
<td>Solid</td>
<td>Rapid blink (2 Hz)</td>
</tr>
<tr>
<td>Drive is being winked</td>
<td>Slow blink (1 Hz)</td>
<td>Off</td>
</tr>
</tbody>
</table>

**Rear Panel Components**

The ContentServer 4000 rear panel includes mini-SAS HD ports for connecting to multiple ContentStore nodes. Controller A corresponds with the upper module and Controller B corresponds with the bottom module.
Figure 8–32: ContentServer 4000 Rear Panel View

Table 8–31: ContentServer 4000 Rear Panel Components

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power supply 0</td>
<td>The ContentServer 4000 includes dual redundant power supplies.</td>
</tr>
<tr>
<td>2. Power supply 1</td>
<td></td>
</tr>
</tbody>
</table>
Table 8–31: ContentServer 4000 Rear Panel Components

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Serial port</td>
<td>Use to connect a serial device to the system.</td>
</tr>
<tr>
<td>4. VGA port</td>
<td>Use to connect a monitor to the system (for maintenance only).</td>
</tr>
<tr>
<td>5. BMC port</td>
<td>Baseboard Management Console port (used for troubleshooting purposes).</td>
</tr>
<tr>
<td>6. USB ports (2)</td>
<td>Used for maintenance purposes only.</td>
</tr>
<tr>
<td>7. Mini SAS HD connectors (4)</td>
<td>Used for connecting the ContentServer to ContentStores.</td>
</tr>
<tr>
<td></td>
<td><strong>CAUTION:</strong> With Harmonic MediaGrid 4.0, SAS cables are not hot-swappable. When replacing or removing a SAS cable, you must first power down the associated ContentServer controller using SystemManager, replace or re-connect the SAS cable, and then power on the ContentServer controller by pressing the power button on the front panel.</td>
</tr>
<tr>
<td>8. 10 GbE NIC ports (4)</td>
<td>Use for connecting the ContentServer to the network switch</td>
</tr>
<tr>
<td></td>
<td>■ Upper right: NIC 2</td>
</tr>
<tr>
<td></td>
<td>■ Lower right: NIC 3</td>
</tr>
<tr>
<td></td>
<td>■ Upper left: NIC 4</td>
</tr>
<tr>
<td></td>
<td>■ Lower left: NIC 5</td>
</tr>
</tbody>
</table>

10 GbE Port Indicator

The ContentServer 4000 contains two dual-port 10 GbE NIC cards. Each port has a single LED.

Figure 8–33: ContentServer 4000 10GbE Port LED
### Table 8–32: ContentServer 4000 10GbE Port LED

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Active connection at 10 Gb/s</td>
</tr>
<tr>
<td></td>
<td>Blink</td>
</tr>
<tr>
<td>Off</td>
<td>Power off (network cable unplugged)</td>
</tr>
</tbody>
</table>

### Power Supply Indicator

Each power supply module on the ContentServer 4000 has one LED indicator.

![ContentServer 4000 Power Supply LED](image)

### Table 8–33: ContentServer 4000 Power Supply LED

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>AC power is present and at least one controller is operating.</td>
</tr>
<tr>
<td>Red</td>
<td>AC power is present and one of the following is true:</td>
</tr>
<tr>
<td></td>
<td>• both controllers are stopped</td>
</tr>
<tr>
<td></td>
<td>• a fault has occurred in the power supply unit</td>
</tr>
</tbody>
</table>

### ContentStore 3160

The ContentStore 3160 presents data to the client, managing the actual data on the hard drives.

### Front Panel Components

#### Bezel

*Figure 8–35 and Table 8–34 describe the front bezel components of the ContentStore 3160.*
Figure 8–35: ContentStore 3160 Front Bezel

Table 8–34: ContentStore 3160 Front Bezel Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power indicator</td>
<td>A bright blue power indicator is provided across the top of the front panel.</td>
</tr>
<tr>
<td>2. Air vents</td>
<td>Allows airflow through the unit. For optimum airflow, do not obstruct the air vents.</td>
</tr>
</tbody>
</table>

Front Panel View

Figure 8–36 and Table 8–35 detail the front view of the ContentStore 3160 with the front bezel removed and all disk drives in place.
Table 8–35: ContentServer 3160 Front Panel Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Left Control Panel</td>
<td>The control panel included on the left side of the ContentServer 3000 provides system monitoring and control for the controller on the same side of the chassis. LEDs indicate system power, network (NIC) activity, system overheat and power supply failure for the controller on the left side.</td>
</tr>
<tr>
<td>2. Disk drives</td>
<td>The server contains 16 SATA or SAS disk drives, providing storage for the Harmonic MediaGrid. Drives are numbered from right to left when facing the front panel.</td>
</tr>
</tbody>
</table>
| 3. Power button and Right Control Panel | There is a single, shared power button located on the right control panel. Note the following behaviors when powering on/off with the shared power button:  
  ■ When both nodes are powered on, depressing this button will power both nodes off.  
  ■ When both nodes are powered off, pressing this button will power both nodes on.  
  ■ If one node is powered on, pressing this button will power on a single node with no impact on the node that is already powered on.  
  ■ Powering off with this button removes the main power but keeps standby power supplied to the system.  

The control panel included on the right side of the ContentServer 3000 provides system monitoring and control for the controller on the same side of the chassis. LEDs indicate system power, network (NIC) activity, system overheat and power supply failure for the controller on the right side. |
Control Panel LEDs

The two control panels located on the front of the chassis have LEDs, which provide you with critical information related to the node on the same side of the chassis as well as power supply information. Figure 8–37 and Table 8–36 provides descriptions of the control panel LEDs.

![Figure 8–37: ContentStore 3160 Control Panel LEDs](image)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>LED</th>
<th>Color/State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power</td>
<td>Solid</td>
<td>Indicates that power is being supplied to the power supply units</td>
</tr>
<tr>
<td>2</td>
<td>SAS-Out</td>
<td>Solid</td>
<td>Indicates that the SAS output port is connected.</td>
</tr>
<tr>
<td>3</td>
<td>Power Fail</td>
<td>Solid</td>
<td>Indicates a power supply module has failed. Refer to the Harmonic MediaGrid Component Replacement Guide for details on replacing the power supply.</td>
</tr>
</tbody>
</table>
### Disk Drive Status LEDs

Refer to Figure 8–38 and Table 8–37 for information on the Disk Drive Status LEDs. Refer to the Harmonic MediaGrid Component Replacement Guide for instructions on replacing a failed drive.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>LED</th>
<th>Color/State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Heartbeat</td>
<td>Flashing</td>
<td>Indicates that power is being supplied to the server board</td>
</tr>
<tr>
<td>5</td>
<td>SAS-In</td>
<td>Solid</td>
<td>Indicates that the SAS input port is connected.</td>
</tr>
<tr>
<td>6</td>
<td>Overheat/ Fan Fail</td>
<td>Flashing</td>
<td>Indicates fan failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Solid</td>
<td>Overheat condition, which may be caused by cables obstructing the airflow in the system or the ambient room temperature being too warm. Check the routing of the cables and make sure all fans are present and operating normally. You should also check to make sure that the chassis covers are installed. Finally, verify that the heatsinks are installed properly.</td>
</tr>
</tbody>
</table>

**Figure 8–38: Disk Drive Status LEDs**
Table 8–37: Disk Drive Status LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>Color/State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Solid</td>
<td>Drive is powered on</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>No power is being provided to the drive</td>
</tr>
<tr>
<td>Red</td>
<td>Solid</td>
<td>Drive is not being used by the ContentServer</td>
</tr>
<tr>
<td></td>
<td>Rapid blink</td>
<td>Drive failed</td>
</tr>
<tr>
<td></td>
<td>Slow blink</td>
<td>Drive is being winked</td>
</tr>
<tr>
<td></td>
<td>Two rapid blinks then pause repeatedly</td>
<td>RAID set is being rebuilt, repaired, or is under maintenance</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Drive state is normal. Drive is being used by the ContentServer.</td>
</tr>
</tbody>
</table>

Rear Panel Components

The ContentStore 3160 includes two separate controllers, and two power supplies to provide redundancy in the case of a failure. Figure 8–39 and Table 8–38 describe the rear panel components of a ContentStore 3160.

Table 8–38: ContentStore 3160 Rear Panel Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power supplies</td>
<td>Dual, redundant power supplies provide power to the system. For a description of the power supply LED states, refer to Power Supply LED</td>
</tr>
</tbody>
</table>
Power Supply LED

A power supply LED is located directly beneath each AC power connector. Refer to Table 8–39 for a description of the power supply LED states.

Table 8–39: Power Supply LED Descriptions

<table>
<thead>
<tr>
<th>LED State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>AC power not connected</td>
</tr>
<tr>
<td>Green</td>
<td>System on</td>
</tr>
<tr>
<td>Amber</td>
<td>System is in power down state, or power cord has been removed.</td>
</tr>
</tbody>
</table>

ContentStore 4240

The ContentStore 4240 is a 4-rack unit storage array which connects to the ContentServer 4000 via SAS cables. It contains 24 drives in 2 TB, 4 TB, or 6 TB capacity.

Front Panel Components

The following figure shows the front panel with the bezel removed.
Figure 8–40: ContentStore 4240 Front Panel

Table 8–40: ContentStore 4240 Front Panel Components

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power button</td>
<td>Depress this button to power both nodes on or off. Powering off with this button removes the main power but keeps standby power supplied to the system.</td>
</tr>
<tr>
<td>2. Control Panel</td>
<td>Displays power, temperature, fan, and system status LED indicators.</td>
</tr>
<tr>
<td>4. Bezel LED control connector</td>
<td>Powers the light bar on the bezel.</td>
</tr>
</tbody>
</table>
Chapter 8 Hardware Reference

Control Panel LED Indicators

![Control Panel LED Indicators Diagram]

Figure 8–41: ContentStore 4240 Control Panel

Table 8–41: ContentStore 4240 Control Panel LED Indicators

<table>
<thead>
<tr>
<th>LED</th>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Blue</td>
<td>Power is being supplied to both power supply units.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Power supply fault detected.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Power is off.</td>
</tr>
<tr>
<td>System Status</td>
<td>Off</td>
<td>System is operating normally.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>System fault detected.</td>
</tr>
<tr>
<td>Temperature</td>
<td>Off</td>
<td>Temperature is normal.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>System is overheating.</td>
</tr>
<tr>
<td>Fan</td>
<td>Off</td>
<td>Fans are operating normally.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Fan fault detected.</td>
</tr>
</tbody>
</table>

Disk Drive Numbering

Drives are number 0-23, starting with the top left drive.
Figure 8–42: ContentStore 4240 Drive Slot Numbers

Disk Drive LED Indicators

Each drive has an activity LED and status LED. Note that, on the ContentStore 4240, the wink function activates the activity LED.

Table 8–42: ContentStore 4240 Disk Drive LED Indicators

<table>
<thead>
<tr>
<th>Drive State</th>
<th>Activity LED</th>
<th>Status LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive is powered on</td>
<td>Solid</td>
<td>Off</td>
</tr>
<tr>
<td>Drive activity</td>
<td>Blink</td>
<td>Off</td>
</tr>
<tr>
<td>RAID rebuild in progress</td>
<td>Blink</td>
<td>Slow blink (1 Hz)</td>
</tr>
<tr>
<td>Drive failure</td>
<td>Solid</td>
<td>Rapid blink (2 Hz)</td>
</tr>
<tr>
<td>Drive is being winked</td>
<td>Slow blink (1 Hz)</td>
<td>Off</td>
</tr>
</tbody>
</table>
Rear Panel Components

**Figure 8–44: ContentStore 4240 Rear Panel**

**Table 8–43: ContentStore 4240 Rear Panel Components**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Serial port for remote power on/off</td>
<td>Do not use.</td>
</tr>
<tr>
<td>2. Expander modules</td>
<td>Provides SAS I/O ports. May be replaced in the event of a failure.</td>
</tr>
<tr>
<td></td>
<td><strong>CAUTION:</strong> With Harmonic MediaGrid 4.0, SAS cables are not hot-swappable. When replacing or removing a SAS cable, you must first power down the associated ContentServer controller using SystemManager, replace or re-connect the SAS cable, and then power on the ContentServer controller by pressing the power button on the front panel.</td>
</tr>
<tr>
<td>3. Power supply units</td>
<td>The ContentStore 4240 includes dual redundant power supplies.</td>
</tr>
<tr>
<td>4. Fan module</td>
<td>Four fan modules maintain all system components below their maximum temperature, assuming the ambient temperature is below 35°C.</td>
</tr>
<tr>
<td>5. SAS I/O ports</td>
<td>Used for connecting the ContentStore to the ContentServer.</td>
</tr>
<tr>
<td>6. Debug port</td>
<td>Unused.</td>
</tr>
<tr>
<td>7. Console port</td>
<td>Unused.</td>
</tr>
</tbody>
</table>
Power Supply Unit LED Indicators

![Diagram of LED Indicators]

Figure 8–45: ContentStore 4240 Power Supply Unit LED Indicators

Table 8–44: ContentStore 4240 Power Supply Unit LED Indicators

<table>
<thead>
<tr>
<th>PSU State</th>
<th>A/C LED</th>
<th>D/C LED</th>
<th>Warning LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSU normal, A/C present</td>
<td>Solid</td>
<td>Solid</td>
<td>Off</td>
</tr>
<tr>
<td>No A/C to PSU</td>
<td>Slow blink (1Hz)</td>
<td>Off</td>
<td>Solid</td>
</tr>
<tr>
<td>PSU warning</td>
<td>Solid</td>
<td>Off</td>
<td>Slow blink (1Hz)</td>
</tr>
<tr>
<td>PSU failure</td>
<td>Off</td>
<td>Off</td>
<td>Solid</td>
</tr>
<tr>
<td>No A/C input</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
</tbody>
</table>

ContentStore 5840

The ContentStore 5840 is a high capacity storage unit containing two drawers of 42 drives each (84 drives in total).
Front Panel Components

Front Panel View

Figure 8–46: ContentStore 5840 Front Panel Components

Table 8–45: ContentStore 5840 Front Panel Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Operator’s Panel</td>
<td>Displays the aggregated status of all the modules.</td>
</tr>
<tr>
<td>2 Drawer 2</td>
<td>The bottom drawer. Each drawer contains 42 drive slots.</td>
</tr>
<tr>
<td>3. Drawer LEDs</td>
<td>Displays status for an individual drawer.</td>
</tr>
<tr>
<td>4. Drawer Latch</td>
<td>Drawer latches on either side of the drawer are used to pull the drawer out.</td>
</tr>
<tr>
<td>5. Anti-tamper Lock</td>
<td>Each drawer can be locked shut by turning both anti-tamper locks clockwise using a screwdriver with a Torx T20 bit</td>
</tr>
<tr>
<td>6. Drawer 1</td>
<td>The top drawer. Each drawer contains 42 drive slots.</td>
</tr>
</tbody>
</table>

Drive Numbering

*Figure 8–47* shows drive numbering as viewed when looking down on open drawers.
Operator's Panel

The operator's panel on the front of the ContentStore 5840 displays the aggregated status of all the modules. See Figure 8–48 and Table 8–47 for reference.

---

**Table 8–46: Operator's Panel LEDs and Components**

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit ID Display</td>
<td>Usually shows the identification number (ID) for the ContentStore. When the wink state is on, this flashes “88” at a rate of approximately 1 Hz.</td>
</tr>
</tbody>
</table>
The drawer LEDs display status for individual drawers.

Table 8–46: Operator's Panel LEDs and Components continued

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Switch</td>
<td>Use to set the ContentStore ID number. See Setting the ContentStore 5840 Identification Number.</td>
</tr>
</tbody>
</table>
| Power On/Standby                   | □ Green: power is on.  
□ Amber: system is in standby.                                                                                                                                  |
| Module Fault                       | Amber indicates a fault in a PSU, cooling module or SBB I/O module. Check the drawer LEDs to see if a drive fault is indicated.                                                                                           |
| Logical Status                     | Amber indicates a fault from something such as a disk drive, a SAS cable, or an internal or external RAID controller. Check the drawer LEDs to see if a drive fault is indicated.                                   |
| Drawer 1/Drawer 2 Fault            | Amber indicates a fault in a drive, cable, or sideplane for the specified drawer                                                                                                                             |

Drawer LEDs

The drawer LEDs display status for individual drawers.

Figure 8–49: Drawer LEDs

Table 8–47: Operator’s Panel LEDs and Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sideplane OK/Power Good</td>
<td>Green if the sideplane card is working and there are no power problems.</td>
</tr>
</tbody>
</table>
Table 8–47: Operator’s Panel LEDs and Componentscontinued

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drawer Fault</td>
<td>Amber if a drawer component has failed. If a drive has failed, an amber LED will be lit on the failed drive, and the drive should be replaced (for details, see the Harmonic MediaGrid Component Replacement Guide). If the drives are OK, contact Harmonic Technical Support to identify the failure.</td>
</tr>
<tr>
<td>Logical Fault</td>
<td>Amber if there is a drive fault. Flashes amber if one or more arrays are in an affected state.</td>
</tr>
<tr>
<td>Cable Fault</td>
<td>Amber if the cabling between the drawer and the back of the enclosure has failed. Contact contact Harmonic Technical Support to resolve the problem.</td>
</tr>
<tr>
<td>Activity Bar Graph</td>
<td>Shows the amount of data I/O from zero segments lit (no I/O) to all six segments lit (maximum I/O).</td>
</tr>
</tbody>
</table>

**Disk Drive LED**

Each disk drive has a single amber drive fault LED as shown in Figure 8–50. When lit, this indicates a drive failure – the drive should be replaced as soon as possible. For details, see the Harmonic MediaGrid Component Replacement Guide.

![Image of Disk Drive LED](image-url)
## Rear Panel Components

### Rear Panel View

![Rear Panel View](image)

**Figure 8–51: Rear Panel View**

### Table 8–48: Rear Panel Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I/O Module (2)</td>
<td>Two I/O modules (6 Gb/s SAS EBOD) provide connectivity to the ContentServer 3000. The system can operate with one or two modules. If one of the modules fails in a two module system, the other module will continue to operate. If the ContentStore is run with a single module, the other I/O module bay must be filled with a blank module.</td>
</tr>
<tr>
<td></td>
<td><strong>CAUTION:</strong> With Harmonic MediaGrid 4.0, SAS cables are not hot-swappable. When replacing or removing a SAS cable, you must first power down the associated ContentServer controller using SystemManager, replace or re-connect the SAS cable, and then power on the ContentServer controller by pressing the power button on the front panel.</td>
</tr>
<tr>
<td>2. I/O Module Power and Fault LEDs</td>
<td>For a description of LED states, see <a href="#">I/O Module LEDs</a></td>
</tr>
<tr>
<td>3. For factory use only</td>
<td></td>
</tr>
<tr>
<td>4. External Host Port Activity LEDs</td>
<td>For a description of LED states, see <a href="#">I/O Module LEDs</a></td>
</tr>
<tr>
<td>5. SAS Connectors</td>
<td>Use the right-hand SAS connector on each I/O module to connect to the ContentServer.</td>
</tr>
</tbody>
</table>
### Table 8–48: Rear Panel Components continued

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Cooling Module Release Latch</td>
<td>Use when removing a cooling module, as described in the <em>Harmonic MediaGrid Component Replacement Guide</em>.</td>
</tr>
<tr>
<td>7. Cooling Module (5)</td>
<td>Five cooling modules at the rear of the enclosure maintain all system components below their maximum temperature, assuming the ambient temperature is below 35°C. Cooling modules can be hot-swapped while the enclosure is still running, assuming that only one module is removed at a time and the swap takes no longer than two minutes. For details, see the <em>Harmonic MediaGrid Component Replacement Guide</em>.</td>
</tr>
<tr>
<td>8. Cooling Module LEDs</td>
<td>For a description of LED states, see <em>Cooling Module LEDs</em>.</td>
</tr>
<tr>
<td>9. Power Supply Unit (PSU)</td>
<td>Dual PSUs provide redundant power for the system: if one PSU fails, the other will keep the system running while you replace the faulty module. For details, see the <em>Harmonic MediaGrid Component Replacement Guide</em>.</td>
</tr>
<tr>
<td>10. PSU Release Latch</td>
<td>Use when removing a PSU, as described in the <em>Harmonic MediaGrid Component Replacement Guide</em>.</td>
</tr>
<tr>
<td>11. PSU LEDs</td>
<td>For a description of LED states, see <em>Cooling Module LEDs</em>.</td>
</tr>
<tr>
<td>12. PSU Power Switch</td>
<td>Use to turn the ContentStore on or off.</td>
</tr>
</tbody>
</table>
### I/O Module LEDs

![Figure 8–52: I/O Module LEDs](image)

#### Table 8–49: I/O Module LED Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I/O Module OK</td>
<td>- Constant green: the I/O module is operating correctly.</td>
</tr>
<tr>
<td></td>
<td>- Flashing green: indicates an I/O module VPD error.</td>
</tr>
<tr>
<td>2. I/O Module Fault</td>
<td>Constant amber if the I/O module is faulty. For replacement instructions, see the Harmonic MediaGrid Component Replacement Guide.</td>
</tr>
<tr>
<td>3. External Host Port Activity</td>
<td>- Constant green: indicates that there is a host port connection but no activity.</td>
</tr>
<tr>
<td></td>
<td>- Flashing green: indicates that there is a host port connection, and data is being transferred.</td>
</tr>
</tbody>
</table>

### Power Supply Unit LEDs

![Figure 8–53: Power Supply Unit LEDs](image)

#### Table 8–50: Power Supply Unit LED Descriptions

<table>
<thead>
<tr>
<th>1. PSU Fail (Amber)</th>
<th>2. AC Fail (Amber)</th>
<th>3. Power (Green)</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>No power to either PSU.</td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>Off</td>
<td>PSU present, but not supplying power or PSU alert state (usually due to critical temperature.</td>
</tr>
<tr>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Main AC present, switch on. This PSU is providing power.</td>
</tr>
<tr>
<td>Off</td>
<td>Off</td>
<td>Flashing</td>
<td>AC power present, PSU in standby (other PSU is providing power.)</td>
</tr>
<tr>
<td>Flashing</td>
<td>Flashing</td>
<td>Off</td>
<td>PSU firmware download.</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>AC power missing, PSU in standby (other PSU is providing power.)</td>
</tr>
</tbody>
</table>
The 5406 Network Switch, a Harmonic-provided network switch, supports 1 GbE and 10 GbE (CX4) modules. *Figure 8–55, Figure 8–56, and Figure 8–57* show the front and rear views.

**NOTE:** The 5406 Network Switch may be used in a Harmonic MediaGrid 3000 Series system, but not in a 4000 Series system.

### Table 8–50: Power Supply Unit LED Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. PSU Fail (Amber)</td>
<td>Harmonic MediaGrid software has lost communication with the PSU.</td>
</tr>
<tr>
<td>2. AC Fail (Amber)</td>
<td></td>
</tr>
<tr>
<td>3. Power (Green)</td>
<td></td>
</tr>
</tbody>
</table>

### Table 8–51: Cooling Module LED Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Module OK</td>
<td>■ Constant green: indicates that the fan is working correctly.</td>
</tr>
<tr>
<td></td>
<td>■ Off: the fan has failed. For replacement instructions, see the <em>Harmonic MediaGrid Component Replacement Guide</em>.</td>
</tr>
<tr>
<td>2. Battery Fault</td>
<td>Not currently used.</td>
</tr>
<tr>
<td>3. Fan Fault</td>
<td>Amber indicates that a fan has failed.</td>
</tr>
</tbody>
</table>

### Cooling Module LEDs

*Figure 8–54: Cooling Module LEDs*

---

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Figure 8–55: Front View of 5406 Network Switch (10GbE and 1GbE Ports)

Figure 8–56: Front View of 5406 Network Switch (All-1GbE Ports)
For more information about the switches, including LED and port descriptions, refer to the documentation that ships with the product.

**IMPORTANT:** Hot swapping of the cl modules is not supported on the 1010 switches. A switch reset occurs if you install or remove modules after the switch has been powered on. Only install or remove modules during scheduled downtime.

**IMPORTANT:** The ContentServer 3000/4000 series cannot be connected directly to CX4 ports.

### Power and Cooling Specifications

Note the following power and cooling specifications for Harmonic MediaGrid devices.

**Table 8–52: Power and Cooling Specifications**

<table>
<thead>
<tr>
<th>Device</th>
<th>Input Power</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>ContentServer 1042B</td>
<td>100-240V, 60-50Hz</td>
<td>798 BTU/hr @ 234 W</td>
</tr>
<tr>
<td>ContentServer 2124A</td>
<td>100-240V, 60-50Hz</td>
<td>1433 BTU/hr @ 420 W</td>
</tr>
<tr>
<td>ContentBridge 1000B</td>
<td>100-240V, 60-50Hz</td>
<td>558 BTU/hr @ 164 W</td>
</tr>
<tr>
<td>ContentBridge 2010E</td>
<td>100-240V, 60-50Hz</td>
<td>797 BTU/hr @ 234 W</td>
</tr>
<tr>
<td>ContentBridge 2010F</td>
<td>100-240V, 60-50Hz</td>
<td>900 BTU/hr @ 264 W</td>
</tr>
<tr>
<td>ContentDirector 1000E and 2000B</td>
<td>100-240V, 60-50Hz</td>
<td>797 BTU/hr @ 234 W</td>
</tr>
<tr>
<td>ContentDirector 1000F and 2000C</td>
<td>100-240V, 60-50Hz</td>
<td>900 BTU/hr @ 264 W</td>
</tr>
<tr>
<td>ContentServer 3000</td>
<td>100-240V, 60-50Hz</td>
<td>2912 BTU/hr @ 854 W</td>
</tr>
<tr>
<td>ContentServer 4000</td>
<td>100-240V, 60-50Hz</td>
<td>3047 BTU/hr @ 893 W</td>
</tr>
</tbody>
</table>
### Power and Cooling Specifications

<table>
<thead>
<tr>
<th>Device</th>
<th>Input Power</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>ContentStore 3160</td>
<td>100-240V, 60-50Hz</td>
<td>718 BTU/hr @ 210 W</td>
</tr>
<tr>
<td>ContentStore 4240</td>
<td>100-240V, 60-50Hz</td>
<td>1436 BTU/hr @ 421 W</td>
</tr>
<tr>
<td>ContentStore 5840 with 6 TB drives</td>
<td>200-240, 60-50Hz</td>
<td>6261 BTU/hr @ 1835 W</td>
</tr>
<tr>
<td>ContentStore 5840 with 4 TB drives</td>
<td>200-240, 60-50Hz</td>
<td>6510 BTU/hr @ 1908 W</td>
</tr>
</tbody>
</table>
Chapter 9
Troubleshooting

This section provides some troubleshooting information for the Harmonic MediaGrid, including the following topics:

- Harmonic MediaGrid Log Files
- Verifying the DHCP Server Is Running on the ContentDirectors
- Checking Log Files for Errors
- Network Time Protocol (NTP)
- Troubleshooting on the ContentBridge
- Security with Microsoft Domain Controllers
- Understanding Device, USM, and SNMP Errors in SystemManager
- Troubleshooting the ContentStore 5840
- Troubleshooting a Component, Cluster, or Client Failure

**CAUTION:** If you do not understand the procedures or recommendations described in this chapter, please consult with Technical Support before proceeding.

### Harmonic MediaGrid Log Files

The Harmonic MediaGrid provides log files for all of the core services. Utilizing these logs will assist in determining the root cause of problems or assist engineering in determining problems in the code. The path to the log files is `/var/log/omneon/remote`.

Log files include:

- **ssmd**: SliceServer Manager
- **mdscore**: MetaData Server
- **startup**: Core Harmonic MediaGrid Services Startup and Shutdown
- **mdsckschedule**: Checkpoint Schedule
- **oujfh**: Provide at support/engineering request
- **ousd**: Social director
- **ssmgc**: SliceServer Manager Garbage Collector

The first three log files (ssmd, mdscore, and startup) are the most commonly utilized log files when troubleshooting Harmonic MediaGrid problems. The logs will rotate and be archived when they approach or reach 250MB depending upon the system check which is performed hourly. The files are archived with the format of `filename.1.gz`, `filename.2.gz`, etc. The exception to this is the remotelogs files. The archive depth is presently 13 files deep but can be configured to archive more files.

Harmonic MediaGrid breaks the log files out by IP address for each of the devices in the cluster. ContentServers have two log files so long as the IP interfaces are up and active.
Note that the information in log files is structured such that the information at the top of the file is the most current and supersedes anything below it. For example, there may be multiple lease entries for the same IP address, but the ones at the top of the file supersede the ones below it.

**Remotelogs directory listing:**
```
[root@CDL1 remote]# pwd
/var/log/omneon/remote
[root@CDL1 remote]# ll
```
```
total 59152
-rw------- 1 root root 8518 Jan 17 15:37 10.35.134.104.log
-rw------- 1 root root 3026816 Jan 17 15:28 10.35.134.111.log
-rw------- 1 root root 1457561 Jan 17 15:27 10.35.134.113.log
-rw------- 1 root root 49846 Jan 17 15:32 10.35.134.114.log
-rw------- 1 root root 1172860 Jan 8 16:01 10.35.134.114.log.1.gz
-rw------- 1 root root 3250421 Jan 8 15:01 10.35.134.114.log.2.gz
-rw------- 1 root root 3261527 Jan 8 14:01 10.35.134.114.log.3.gz
-rw------- 1 root root 3212298 Jan 8 13:01 10.35.134.114.log.4.gz
-rw------- 1 root root 3229006 Jan 8 12:01 10.35.134.114.log.5.gz
-rw------- 1 root root 1697018 Jan 17 15:15 10.35.134.115.log
-rw------- 1 root root 1642107 Jan 17 15:28 10.35.134.118.log
-rw------- 1 root root 1459076 Jan 17 15:28 10.35.134.120.log
-rw------- 1 root root 1605260 Jan 17 15:28 10.35.134.121.log
```
Log rotation for remotelog files is also based upon filesize as well and is set to 5MB. The archive depth is set to 5 files and is also configurable.

**Verifying the DHCP Server Is Running on the ContentDirectors**

The first two ContentDirectors in a Harmonic MediaGrid have DHCP servers running on them and they are configured as peers. This means that either of the ContentDirectors can respond to a DHCP request and the servers should communicate the IP address that they have assigned to a request to the other DHCP server. This communication between the DHCP servers ensures that the dhcp-leases files that reside on both ContentDirectors are synchronized and have the same information about client MAC address, etc.

The dhcp-leases file resides in the /var/lib/dhcp directory on the first two ContentDirectors and is a text file that can be viewed with the “cat,” “less,” or “more” commands.

Configuration parameters, including the address pools and reservations, are stored in the /etc/dhcpd.conf file. Other parameters in the dhcpd.conf file include lease-time, and ntp-servers for devices requesting an IP address. In the case of the Harmonic MediaGrid, ContentServers and ContentBridges are the devices that request IP addresses from the ContentDirectors. The ntp-server parameter in the dhcpd.conf file ideally points to the same NTP server as configured in ntp.com.

Two ways to confirm that DHCP is running are shown below. In both cases the process id is the same, and in example two, the process id existing is the only confirmation that the process is running.

**dhcpd status example 1:**
```
[root@CDL1 dhcp]# service dhcpd status
dhcpd (pid 3027) is running...
```
Checking Log Files for Errors

Looking for Startup Errors in the mdscore Log File

The number one cause of services not starting on ContentDirectors is that the times are not synchronized across ContentDirectors. Times must be synchronized so that journaling and sync files across the ContentDirectors have the same timestamps. The times must be within about 4/10ths (0.4sec) of a second or less for the services to run. Below is a portion of the mdscore log file that shows the error message for a ContentDirector, which does not have its time synchronized with another running ContentDirector.

omcld status error:

```
[root@CDL1 ~]# service omcld status
mdsstartup (pid 27118) is running...
oujfh (pid 27144) is running...
ousd (pid 27134) is running...
samd (pid 27153) is running...
mdscore dead but pid file exists ****
```
From 'mdscore' log file:

```
2000-12-12 00:00:07.918|D|outoktDropOut|[18..41cf] 1389332264079,
2000-12-12 00:00:07.91779
```
```
2000-12-12 00:00:07.918|D|outoktNotifyLiaisonOfExclusion|[18..41cf]
notifying liaison of exclusion
```
```
0000-12-12 00:00:07.918|D|outoktFree|(18) drop out
```
```
2000-12-12 00:00:07.918|D|outoktFree|(18) closing receive socket 22
```
```
2000-12-12 00:00:07.918|D|outoktFree|(18) closing send socket 31
```
```
2000-12-12 00:00:10.932|E|startFsCore|Unable to start core: MDS not time synch'ed ****
```
```
2000-12-12 00:00:10.932|E|main|Unable to initialize fs core: MDS not time synch'ed ****
```

Network Time Protocol (NTP)

Network Time Protocol, or NTP, is a way of updating the time on a computer to a known time reference. For the Harmonic MediaGrid this is essential because while all the computers in the cluster function as a system, they are still autonomous. To synchronize time between ContentDirectors, the ntp.conf file on all ContentDirectors in the Harmonic MediaGrid are configured to point to the same NTP reference, which is typically provided by the SystemManager but could also be a separate NTP server.

The NTP services that run on the ContentDirector are powerful and many utilities are provided for troubleshooting problems. A few useful commands and options can help resolve some NTP problems. One is the ntpdate command.

The two most important subcommands to the ntpdate command are the -q (for query) and the -u (for update). A time source can be queried to determine what the delta time is between the source being queried and current time on the computer where the command is being run.

```
ntpdate query example:
[root@CDL1 ~]# ntpdate -q 10.35.99.210
server 10.35.99.210, stratum 2, offset -110.121850, delay 0.02573
20 Jan 11:27:16 ntpdate[32306]: step time server 10.35.99.210 offset
-110.121850 sec
```

Synchronizing times on ContentDirectors is straightforward operation using a simple command. However, when the "omcld" service is restarted, if the ntp.conf file in the /etc directory is not properly configured for all ContentDirectors in the cluster, it is likely that one or more of the ContentDirectors will not start properly. The following examples show how to manually update time on a ContentDirector by synchronizing the time from one ContentDirector to another.

```
ntpdate update example:
[root@CDL1 ~]# ntpdate -u 10.35.134.201
20 Jan 10:19:37 ntpdate[29958]: step time server 10.35.99.100 offset
224239754.222613 sec
```

Note that because the "ntpdate -u XXX" command forces a jump in the system clock, it could also potentially cause problems for DHCPD and authentication. The primary way to avoid such problems is to have NTP configured properly, and have stable NTP servers that keep accurate time. In addition, when running the ntpdate command, ideally the affected services should not be running on the ContentDirector. This should minimize potential clock jumps if the ntpdate command is run against an active Content Director. The following procedure shows the recommended order of events:

1. `# service omcld stop`
2. `# service dhcpd stop`
3. # ntpdate -u XXX (where "XXX" is IP address of running ContentDirector)
4. # service dhcpcd start
5. # service omcld start

**ntpdate syslog message:**

```
[root@CDL1 log]# less /var/log/messages
Jan 20 11:47:18 CDL1 ntpd[3008]: time reset -0.553542 s
Jan 20 11:51:35 CDL1 ntpd[3008]: synchronized to LOCAL(0), stratum 10
Jan 20 11:52:40 CDL1 ntpd[3008]: synchronized to 10.35.135.201,
stratum 11
```

**Possible error message:**

'mdscore dead but pid file exists'

If all other services are running, then the likely cause is that time is not synchronized on ContentDirectors.

**Resolution:** ntpdate -u <time source>

ntpdate should be initiated on any ContentDirectors that are running first so that the time source is known. “ntpdate -u” can then be initiated on ContentDirectors that are receiving the above error message.

---

**Troubleshooting on the ContentBridge**

The ContentBridge provides access to the Harmonic MediaGrid for clients not running the FSD or clients that need to access the Harmonic MediaGrid via FTP.

**ContentBridge Mounts to the Harmonic MediaGrid**

The primary problem experienced with the ContentBridge occurs when the Harmonic MediaGrid file system has not been mounted. To determine that the file system has been mounted, use one or both of the following commands.

**Mount command on the ContentBridge**

```
[root@CLB01649 ~]# mount
/dev/ram0 on / type ext2 (rw)
/dev/proc on /proc type proc (rw)
/dev/sys on /sys type sysfs (rw)
/dev/devpts on /dev/pts type devpts (rw, gid=5, mode=620)
/dev/shm on /dev/shm type tmpfs (rw)
sunrpc on /var/lib/nfs/rpc_pipefs type rpc_pipefs (rw)
//10.35.99.180/SBOD on /mnt/10.35.99.180/SBOD type cifs (rw,mand)
/10.35.134.200/mg0 on /mnt/omfs/10.35.134.200/omneon/omfs/mg0 type omfs (rw,username=omneon,password=xxx)
```

**df command on the ContentBridge**

```
[root@CLB01649 ~]# df
Filesystem  1K-blocks  Used  Available  Use% Mounted on
/dev/ram0  249551  124082  125469  50% /
/dev/shm  1037296  0  1037296  10% /dev/shm
//10.35.99.180/SBOD  5161484288  2706030592  2455453696  53% /mnt/
10.35.99.180/SBOD
```
Note the line starting with /10.35.134.200/… This is the mount for the ContentBridge to the Harmonic MediaGrid. Depending on the gateway configuration file, there may be multiple mount points. The number of mount points will vary depending on the number of mount points defined in the gateway file for different users.

**ContentBridge Configuration Files**

The second most common problem on the ContentBridge is that the config file or the gateway file has not been configured correctly. These are the two configuration files that the ContentBridge uses. The first configuration file, the “config” file, is the same for all ContentBridges in the Harmonic MediaGrid. This file is located in the /tftpboot/config directory on the first two ContentDirectors in the Harmonic MediaGrid. To edit this file, use the SystemManager, which pushes the configuration file to all ContentDirectors ensuring that when the ContentBridge downloads this file from the ContentDirector, the configuration information is the same across ContentDirectors. Refer to “Editing the ContentBridge Configuration File” in the *Harmonic SystemManager User Guide* for instructions. The following is an example of this file.

**ContentServer and ContentBridge config file:**

```bash
[root@CLB01649 tmp]# cat config
LOGHOST=10.35.134.200
REBOOT_ON_PANIC=YES
SLICE_TIMEZONE=Etc/GMT+8
ENABLE_JUMBO_SERVER=NO
ENABLE_JUMBO_BRIDGE=NO
```

In addition to the config file on the first two ContentDirectors, there is a gateway file for each ContentBridge in the Harmonic MediaGrid. The file name for the gateway file is CLBnnnnn and is case sensitive. The five n’s reflect the last five digits of the serial number of the ContentBridge. Again, any changes to this gateway file must be done on both ContentDirectors in the /tftpboot/config/gateway directory.

When the CLBnnnnn file is downloaded to the gateway, it is stored in the /tmp directory with the file name gateway. This file can be examined using the “less,” “cat,” or “more” commands, or your preferred editor to ensure that the parameters in the file on the ContentBridge match the parameters on the ContentDirectors. The most common problem is that the changes to the gateway file are made on one ContentDirector but are never made on the file on the second ContentDirector.

The output below is a listing of the files on one of the ContentDirectors and shows the CLBnnnnn notation of the file name.

```
[root@CDL1 gateway]# ll
total 8
-rwxr-xr-x 1 root root 58 Jan 29 18:33 CLB01634
-rwxr-xr-x 1 root root 81 Jan 30 16:14 CLB01649
```

The next output sample is of the file contents being displayed using the “cat” command. These contents can be compared to the gateway file on the ContentBridge to indicate if the gateway file has been downloaded or that the latest changes should be downloaded by rebooting the ContentBridge.

```
[root@CDL1 gateway]# cat CLB01649
CB 10.35.134.200 mg0 omneon usm
MEDIA_API=YES
```
Chapter 9 Troubleshooting

Security with Microsoft Domain Controllers

ContentBridge Services

To determine if the necessary services are running on the ContentBridge, issue the following command.

```
[root@CLB01649 ~]# service gateway status
Gateway Network Monitor:
gateway_mon.sh (pid 2772) is running...
wdog_set is stopped

File Server Status:
ommedia_remote_svc is stopped
ommedia_mon.sh is stopped
vsftpd (pid 2725) is running...
smbd (pid 2735 2734) is running...
nmbd (pid 2737) is running...
afpd (pid 2769) is running...
```

You will also note that the current Harmonic MediaGrid mount is shown under “Mounted File Systems.”

Security with Microsoft Domain Controllers

Security and Microsoft Domains

Security for the Harmonic MediaGrid is achieved by joining a Windows Domain Controller/Active Directory for user authentication. The Domain Controller sends the positive or negative response to the authentication challenge back to the ContentDirectors. ContentManager allows you to set user and group-level security for the various Harmonic MediaGrid files and directories by using Access Control Lists (ACLs). In addition, the following commands for ContentDirectors and Windows should allow you to display security settings and perform security related operations.
Wbinfo Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>wbinfo -u</td>
<td>Displays users</td>
</tr>
<tr>
<td>wbinfo -g</td>
<td>Displays groups</td>
</tr>
<tr>
<td>wbinfo -authenticate=domain.name\username\password</td>
<td>Authenticate a user</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
</tr>
<tr>
<td></td>
<td>[root@cld1-1 ~]# wbinfo --authenticate=domain.name\username\password plaintext password authentication succeeded challenge/response password authentication succeeded</td>
</tr>
<tr>
<td>wbinfo -n</td>
<td>Look up SID of a specific user or group</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
</tr>
<tr>
<td></td>
<td>[root@cld1-1 ~]# wbinfo -n testuser1 S-1-5-21-3652892210-2598600654-3378788821-1148 User (1)</td>
</tr>
<tr>
<td>wbinfo -s</td>
<td>Look up name of a specific SID</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
</tr>
<tr>
<td></td>
<td>[root@cld1-1 ~]# wbinfo -s S-1-5-21-3652892210-2598600654-3378788821-1148 SNV-ENG\ testuser1 1 [root@cld1-1 ~]#</td>
</tr>
</tbody>
</table>

Net "use/view' Commands for Windows Systems

Note the following commands apply only to Microsoft Windows systems.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>net use</td>
<td>Displays current drive mappings</td>
</tr>
<tr>
<td>net use &lt;drive letter:&gt; / delete</td>
<td>Deletes drive mapping</td>
</tr>
<tr>
<td>net view</td>
<td>Displays a list of computers in a specified workgroup</td>
</tr>
<tr>
<td>net help /help</td>
<td>Connects or disconnects your computer from a shared resource or displays information about your connections. Usage Syntax: [devicename</td>
</tr>
</tbody>
</table>
Authenticating Domain User with mdsclientn or wbinfo commands

mdsclientn command:

```
/opt/omcld/bin/mdsclientn localhost
```

mdsclientn dialog output:

```
mdsclientn: built by lsasaki on 2007-Aug-29 14:08 (USM_Branch_2_0)
Connecting to host "localhost", protocol "tcp", prog 0x20000003
New client is 0x590910
Connected to "localhost"
Opening default session...
Found 4 IP addresses
  10.35.134.200
  10.35.135.200
  192.168.1.200
  192.168.2.200
Retrieving keys
Retrieved keys successfully, mdslen=140, sslen=140
  sessionID   = 0x6e0a75f8
  key         = 78 56 34 12 f0 de bc 9a 44 33 22 11 88 77 66 55
  currentTime = 2008/01/07 11:04:29
  idleTime    = 300 sec
*host 0      = 2@10.35.134.200/10.35.135.200 id=0xb0b7ca3c30102cf6
host 1      = 4@10.35.135.201/10.35.134.201 id=0xf7a5e9af3e76a9b
Opened default session of 0x6e0a75f8
=> sess auth ddoyle ddoyle snv-tac.local
Authenticated successfully
  Session id=0x6e0a75f8, uservalid=1, admin=0, superuser=0, guest=0,
  cluster=0
  curTime  = 2008/01/07 11:04:40
  idleTime = 300 sec
  user     = "ddoyle", sid=S-1-5-21-2926562709-1155807970-2578703657-1219
=>
```

wbinfo user authentication command

The following shows how wbinfo is used to authenticate a domain user. Note the \ between
domain name and user; these are required:

```
wbinfo --authenticate=snv-tac.local\ddoyle%ddoyle
plaintext password authentication succeeded
challenge/response password authentication succeeded
```

Log File for winbind

The output of a "net join" is captured into a file named 'log-wb[domain name]'. This log file can be
utilized to view failures of a join or to view success messages for the join. The following is an
example of one such log file:

```
less /var/log/samba/log.wb-SNV-TAC
```
Using Sessions to Determine a Client IP Address

If necessary, a session ID can be used to determine the IP address of a client. The session ID can be identified in the mdscore log file. Then, by searching the output of the command “cat /var/omneon/mdscore/sessions”, the client IP address associated with that session can be identified.

It is important to understand that the session ID can change or the client may not have an active connection to the Harmonic MediaGrid. Under these circumstances this process of identifying the client IP would not work.

Active Connections to the Harmonic MediaGrid: MDS Sessions

To determine what clients are connected to the Harmonic MediaGrid, the following command can be issued on any of the ContentDirectors. It will display each connection which includes IP information as well as duration and the User Session ID. This Session ID can be seen in the mdscore log files and all associated activity on the Harmonic MediaGrid.

The mdscore log file can be used to identify an active session ID and then associate that ID with an IP address by using the cat command to view the sessions file in the /var/omneon/mdscore directory. Commands like “more” and “less” will not work on this file directly.

cat of sessions:

```
cat /var/omneon/mdscore/sessions
```

sessions output:

```
*** 1/64 RPC sessions are in use
*** Sessions ***
There are 2 session(s)

Session ID 0x1e2a219c
  ref/close/dflt:   1/false/false
  clientrpcaddr:   10.35.134.98
  close:           0
  domain name:     (none)
  user vld/adm/god: omneon/true/true/true
  current   (real): 2008/01/08 10:24:22
  open time (real): 2008/01/04 08:16:08
  current   (mono): 358435
  lastacces   (mono): 358336 (delta 99)
  max idle time : 300 sec
  watchq count:   0
  user sid:       omsuperuser
  sid #0 :        omsuperuser

Session ID 0x46508681
  ref/close/dflt:   1/false/false
  clientrpcaddr:   10.35.134.98
  close:           0
  domain name:     (none)
  user vld/adm/god: omneon/true/true/true
  current   (real): 2008/01/08 10:24:22
```
open time (real): 2008/01/04 06:52:49
current (mono): 358435
lastacces (mono): 358435 (delta 0)
max idle time : 300 sec
watchq count: 1
	qID=0x2, waiting=1, nextWakeup=2008/01/08 10:24:24
user sid: omsuperuser
	sid #0 : omsuperuser

Understanding Device, USM, and SNMP Errors in SystemManager

In Figure 9–1, notice the following error text, Device: UP, USM: DOWN, and SNMP: UP.

Figure 9–1: Device: USM: SNMP error in SystemManager

The processes that are associated with each are described below.

ContentServer processes:

Device: UP/DOWN = omserver
USM: UP/DOWN = sliced
SNMP: UP/DOWN = snmpd

In the example shown in Figure 9–1, the sliced process was not running, which resulted in USM: Down.

Troubleshooting the ContentStore 5840

The following sections describe problems that can occur with your ContentStore 5840 and some possible solutions.
For all of the problems listed in Table 9–1, the module fault LED on the operator’s panel (see Operator’s Panel) will light amber to indicate a fault.

Table 9–1: Alarm Conditions

<table>
<thead>
<tr>
<th>Status</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSU alert – loss of DC power from a single PSU</td>
<td>Fault – loss of redundancy</td>
</tr>
<tr>
<td>Cooling module fan failure</td>
<td>Fault – loss of redundancy</td>
</tr>
<tr>
<td>I/O module detected - PSU fault</td>
<td>Fault</td>
</tr>
<tr>
<td>PSU removed</td>
<td>Configuration error</td>
</tr>
<tr>
<td>Enclosure configuration error (VPD)</td>
<td>Fault – critical</td>
</tr>
<tr>
<td>Low temperature warning</td>
<td>Warning</td>
</tr>
<tr>
<td>High temperature warning</td>
<td>Warning</td>
</tr>
<tr>
<td>Over-temperature alarm</td>
<td>Fault – critical</td>
</tr>
<tr>
<td>Under-temperature alarm</td>
<td>Fault – critical</td>
</tr>
<tr>
<td>I²C bus failure</td>
<td>Fault – loss of redundancy</td>
</tr>
<tr>
<td>Operator’s panel communication error (I²C)</td>
<td>Fault – critical</td>
</tr>
<tr>
<td>RAID error</td>
<td>Fault – critical</td>
</tr>
<tr>
<td>SBB I/O module fault</td>
<td>Fault – critical</td>
</tr>
<tr>
<td>SBB I/O module removed</td>
<td>Warning</td>
</tr>
<tr>
<td>Drive power control fault</td>
<td>Warning – no loss of drive power</td>
</tr>
<tr>
<td>Drive power control fault</td>
<td>Fault – critical: loss of drive power</td>
</tr>
<tr>
<td>Insufficient power available</td>
<td>Warning</td>
</tr>
</tbody>
</table>

Thermal Monitoring and Control

The ContentStore 5840 uses extensive thermal monitoring and takes a number of actions to ensure component temperatures are kept low and also to minimize acoustic noise. Air flow is from the front to the rear of the enclosure.
### Thermal Alarm

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cause</th>
<th>Action</th>
</tr>
</thead>
</table>
| If the ambient air is below 25 ° C and the fans are observed to increase in speed then some restriction on airflow may be causing additional internal temperature rise. **Note**: This is not a fault condition. | The first stage in the thermal control process is for the fans to automatically increase in speed when a thermal threshold is reached. This may be caused by higher ambient temperatures in the local environment and may be perfectly normal. **Note**: This threshold changes according to the number of drives and power supplies fitted. | - Check the installation for any airflow restrictions at either the front or rear of the enclosure. A minimum gap of 25 mm at the front and 50 mm at the rear is recommended.  
- Check for restrictions due to dust buildup. Clean as appropriate.  
- Check for excessive re-circulation of heated air from rear to the front. Use of the enclosure in a fully enclosed rack is not recommended.  
- Check that all blank modules are in place. Reduce the ambient temperature. |
| Operator’s panel module fault LED is amber.                            | The internal temperature has exceeded a pre-set threshold.           | - Check that the local ambient environment temperature is below the specification (see *Temperature and Humidity*).  
- Check the installation for any airflow restrictions at either the front or rear of the enclosure. A minimum gap of 25 mm at the front and 50 mm at the rear is recommended.  
- Check for restrictions due to dust buildup. Clean as appropriate.  
- Check for excessive re-circulation of heated air from rear to the front. Use of the enclosure in a fully enclosed rack is not recommended.  
- If possible shutdown the enclosure and investigate the problem before continuing. |
| Fan fail LED is lit on one or more cooling modules.                    |                                                                     |                                                                                                                                 |

**Thermal Alarm**

- Operator’s panel module fault LED is amber.
- Fan fail LED is lit on one or more cooling modules.
- The internal temperature has exceeded a pre-set threshold.
- Check that the local ambient environment temperature is below the specification (see *Temperature and Humidity*).
- Check the installation for any airflow restrictions at either the front or rear of the enclosure. A minimum gap of 25 mm at the front and 50 mm at the rear is recommended.
- Check for restrictions due to dust buildup. Clean as appropriate.
- Check for excessive re-circulation of heated air from rear to the front. Use of the enclosure in a fully enclosed rack is not recommended.
- If possible shutdown the enclosure and investigate the problem before continuing.
Temperature and Humidity

Table 9–2: Temperature and Humidity Limits

<table>
<thead>
<tr>
<th></th>
<th>Operating</th>
<th>Non-operating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range</td>
<td>5° C to 35° C</td>
<td>-40° C to 70° C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>20% rh to 80% rh</td>
<td>5% rh to 100% rh</td>
</tr>
<tr>
<td></td>
<td>non-condensing</td>
<td>non-condensing</td>
</tr>
<tr>
<td>Maximum wet bulb</td>
<td>28° C</td>
<td>29° C</td>
</tr>
<tr>
<td>temperature</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Troubleshooting a Component, Cluster, or Client Failure

In order to expedite diagnosis and remediation, please gather helpful information about your Harmonic MediaGrid system as well as your SystemManager platform when contacting Technical Support.

- Gathering Information about the SystemManager Client PC
- Gathering Information a Harmonic MediaGrid Component Failure
- Gathering Information about a Harmonic MediaGrid Cluster Failure
- Gathering Information about a Harmonic MediaGrid Client Failure

Gathering Information about the SystemManager Client PC

To help with diagnosis, Technical Support may ask you to provide information about the SystemManager client PC, including:

- SystemManager version
  You can find the version here: Help > Server Software.

- Windows operating system installed on the SystemManager client PC
  The run command winver shows the Windows operating system running on the client PC.

- Amount of memory installed on the SystemManager platform
  Open the System Properties dialog on the client PC to find the amount of memory installed.

- The SystemManager database file from the SystemManager platform or client PC
  This file is located on the SystemManager platform at D:\Omneon\Manager\omdb\manager.oda.

  Or, if you are using a client PC with a single C: partition, it will be in the same directory on the C: drive.

Gathering Information a Harmonic MediaGrid Component Failure

Navigate to the device Properties page in SystemManager to gather useful information about the device that is experiencing a component (such as a drive or power supply) failure. Refer to Viewing the Properties Page in SystemManager for instructions.

- Site location
- Firmware version
Troubleshooting a Component, Cluster, or Client Failure

- Device name and serial number
- Date and time of failure
- Description of failure

**Viewing the Properties Page in SystemManager**

The Properties page provides important information associated with the Harmonic MediaGrid device, such as current status, environmental data, and model and serial number.

1. From the Configuration tab, click the Harmonic MediaGrid Servers & Switches icon to access the Servers List page.
2. In the appropriate section, click the Name of the component you wish to access. The Properties page appears.
3. Scroll to the Environmental section to view voltage levels, temperatures, and fan speeds. If any reading is beyond the expected range, this may indicate a failed or failing component. Refer to the Harmonic SystemManager User Guide for more information about the properties shown in this section.
4. Scroll to the Events section and look for any yellow, orange, or red color-coded alarms.
5. If necessary, click the Wink button so that you can identify the affected device.
6. Make note of the device Name, Serial Number, and Firmware Version so that you can provide this information when contacting Technical Support.

**Gathering Information about a Harmonic MediaGrid Cluster Failure**

Technical Support will request the following information in order to diagnose a cluster failure:

- The name of the device that experienced the failure
- An error message and/or description of the symptom
- Other clients or systems this issue is affecting
- The appropriate log file (or remote access to the device)
  - The following three log files are used most often when troubleshooting. They are located on the ContentDirector at /var/log/omneon:
    - ssmd: SliceServer Manager
    - mdscore: MetaData Server
    - startup: Core Harmonic MediaGrid Services Startup and Shutdown

**Gathering Information about a Harmonic MediaGrid Client Failure**

Technical Support will request the following information in order to diagnose a client failure:

- The operating system running on the client computer
- Other applications in use
- The Harmonic MediaGrid FSD version
  - Refer to Determining the FSD Version for instructions.
- An error message, screen capture, or description of the symptom
- If the issue can be reproduced, provide the sequence of steps that will reproduce the problem
- Log files for the client FSD
  Refer to Collecting Client FSD Log Files for instructions.
- Log files for the ContentBridge FSD
  These can be found at /var/log/system.log and /var/log/kernel.log
- The time of the failure
  Check the corresponding SystemManager alarm to find the time of the failure.

Determining the FSD Version
Learn how to find the FSD version running on your Windows, Macintosh, or Linux machine.

To determine the FSD version on a Windows client:
1. From the Control Panel dialog, click Add/Remove Programs.
2. Locate the Harmonic MediaGrid File System Driver entry.
3. Click the link which says Click here for support information.
   The version is displayed.

To determine the FSD version on a Macintosh client:
1. From the File menu, select Find.
2. Click Applications in the Finder sidebar of the Searching "This Mac" window.
3. Double-click the Connect to MediaGrid icon.
   The Connect to Harmonic MediaGrid dialog box opens, where the version is displayed.

To determine the FSD version on a Linux client:
You can determine the FSD version by entering the following command:
tail /proc/sys/omfs*

Collecting Client FSD Log Files
To assist with troubleshooting, Technical Support may ask you to reproduce the problem and then collect log files from the client computers.
- Collecting Log Files on a Windows Client
- Collecting Log Files on a Macintosh Client
- Collecting Log Files on a Linux Client
- Collecting Log Messages on the ContentBridge

IMPORTANT: Do not collect log files unless directed to do so by Technical Support.

Collecting Log Files on a Windows Client
With version 3.5 and later, you can use the Windows File System Driver to configure logging parameters. By default, the logging level is set to 4 - Information.

For instructions on accessing the Windows File System Driver, refer to Setting Windows FSD Properties.
1. Using the Windows FSD, increase the logging level to 5 - Debug.
NOTE: For debug to take effect, the Harmonic MediaGrid system must be mounted.

2. Apply changes to any other parameters at the request of Technical Support.
3. Click **Apply** and then **OK**.
   The changes take effect immediately.
4. Reproduce the issue.
5. Collect all log files at the location specified in the **Log file** field.

After debugging is complete, be sure to decrease the logging level to the default setting.

**Collecting Log Files on a Macintosh Client**

For a Macintosh client, you must first enable logging on the client FSD, then reproduce the issue, before collecting log files.
1. Run the following command to ensure that the debug level is set to default:
   ```bash
   sudo sysctl -w debug.omfs=3
   ```
2. Reproduce the problem.
3. Collect the following log files:
   - `/var/log/system.log`
   - `/var/log/kernel.log`

**Collecting Log Files on a Linux Client**

On a Linux client, collect log messages at `/var/log/messages`.
Technical Support might also ask you to collect the currently configured Linux FSD parameters. To access them, enter the following command:

```
cat /proc/sys/omfs*
```

**Collecting Log Messages on the ContentBridge**

Log messages on the ContentBridge are located at `/var/log/omneon/remote/<IP address of ContentBridge>`.
Appendix A
Legacy Hardware Platforms

This section contains information about legacy Harmonic MediaGrid hardware components. For installation instructions with the following components refer to version 2.2.1.0 of this installation and configuration guide.

Choose from the following topics:

- ContentDirector 1000B/1000C/1000D and High Performance ContentDirector 2000
- ContentDirector 1000E and High Performance ContentDirector 2000B
- ContentBridge 1000
- ContentBridge 1000B
- ContentBridge 2010B/C/D (High Bandwidth)
- ContentBridge 2010E

ContentDirector 1000B/1000C/1000D and High Performance ContentDirector 2000

ContentDirectors manage and direct the overall operation of Harmonic MediaGrid. They enable clients to interact with the system by creating and presenting a single virtual file system constructed from Harmonic MediaGrid’s many individual ContentServer storage devices.

The ContentDirectors 1000B/000C/1000D and the High Performance ContentDirector 2000 have the same front and rear panel components and same functionality. However, the High Performance ContentDirector 2000 includes additional memory and a solid state drive to increase performance.

*Figure A–1* and *Table A–1* detail the front panel of the ContentDirector.

---

**Figure A–1: ContentDirector Front Panel**

**Table A–1: ContentDirector Front Panel Descriptions**

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power indicator</td>
<td>A bright blue <em>power indicator</em> is provided across the top of the front panel. This indicator also provides a “wink” function, which allows you to identify a unit from the SystemManager application.</td>
</tr>
</tbody>
</table>
Table A–1: ContentDirector Front Panel Descriptions

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Air vents</td>
<td>Allows airflow through the unit. For optimum airflow, do not obstruct the air vents.</td>
</tr>
<tr>
<td>3. Status LEDs</td>
<td>An array of six status LEDs is provided on the front panel. See the following figure and table for descriptions of each status LED.</td>
</tr>
</tbody>
</table>

Figure A–2 and Table A–2 detail the six system status indicators on the front of the ContentDirector.

Table A–2: ContentDirector Indicator Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Color/State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIC 0 Link</td>
<td>White</td>
<td>Ethernet communications OK</td>
</tr>
<tr>
<td>NIC 1 Link</td>
<td>Red</td>
<td>Ethernet communications problem</td>
</tr>
<tr>
<td>NIC 2 Link</td>
<td>White</td>
<td>Drive status OK</td>
</tr>
<tr>
<td>NIC 3 Link</td>
<td>Red</td>
<td>Drive error</td>
</tr>
<tr>
<td>Hard drive 0</td>
<td>White</td>
<td>Drive status OK</td>
</tr>
<tr>
<td>Hard drive 1</td>
<td>Red</td>
<td>Drive error</td>
</tr>
</tbody>
</table>

Figure A–3 and Table A–3 detail the front panel view of a the ContentDirector with the bezel removed. Note that your ContentDirector may differ somewhat from the one described below.

Figure A–3: Front View of ContentDirector
### Table A–3: ContentDirector Front Panel Components

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power-on indicator/button</td>
<td>The power button controls the DC power supply output to the system. The power-on indicator lights when the system power is on. When the power-on indicator is off, this indicates that no power is supplied to the system.</td>
</tr>
<tr>
<td>2. Video Connector</td>
<td>Connects a monitor to the system.</td>
</tr>
<tr>
<td>3. LCD menu buttons</td>
<td>Allows you to navigate the control panel LCD menu.</td>
</tr>
<tr>
<td>4. LCD display</td>
<td>Provides status information and system error messages. The LCD display lights during normal system operation. Both the systems management software and the identification buttons located on the front and back of the system can cause the LCD to flash blue to identify a particular system. The LCD display lights amber when the system needs attention due to a problem with power supplies, fans, system temperature or hard drives. <strong>Note</strong>: If the system is connected to AC power and an error has been detected, the LCD display lights amber regardless of whether the system has been powered on.</td>
</tr>
<tr>
<td>5. System identification button</td>
<td>Pressing this button will cause the Front LCD display and the system status indicator on the rear panel to blink.</td>
</tr>
<tr>
<td>6. USB connectors</td>
<td>Use to connect the front bezel.</td>
</tr>
<tr>
<td>7. Optical drive</td>
<td>Use for software installation.</td>
</tr>
<tr>
<td>8. Hard drive 0</td>
<td>Refer to Table A–4 for a description of the indicator codes.</td>
</tr>
<tr>
<td>9. Hard drive 1</td>
<td></td>
</tr>
<tr>
<td>10. Solid state drive</td>
<td>Available only in the High Performance ContentDirector 2000.</td>
</tr>
</tbody>
</table>

*Figure A–4 and Table A–4 describe the typical hard drive indicators and their functions.*

![Drive-status Indicator (green and amber)](image)

**Drive-status Indicator (green and amber)**

![Drive-activity Indicator (green)](image)

**Drive-activity Indicator (green)**

*Figure A–4: ContentDirector Hard Drive Indicators*
Table A–4: Drive-status Indicator Pattern (RAID Only)

<table>
<thead>
<tr>
<th>Drive-status Indicator Pattern</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blinks green two times per second</td>
<td>Identify drive/preparing for removal</td>
</tr>
<tr>
<td>Off</td>
<td>Drive ready for insertion or removal</td>
</tr>
<tr>
<td>Note: The drive-status indicator remains off until all hard drives are initialized after system power is applied. Drives are not ready for insertion or removal during this time.</td>
<td></td>
</tr>
<tr>
<td>Blinks green, amber, and off</td>
<td>Drive predicted failure</td>
</tr>
<tr>
<td>Blinks amber four times per second</td>
<td>Drive failed</td>
</tr>
<tr>
<td>Blinks green slowly</td>
<td>Drive rebuilding</td>
</tr>
<tr>
<td>Steady green</td>
<td>Drive online</td>
</tr>
<tr>
<td>Blinks green three seconds, amber three seconds, and off six seconds</td>
<td>Rebuild aborted</td>
</tr>
</tbody>
</table>

Figure A–5 and Table A–5 describe the rear panel view of the ContentDirector.

Figure A–5: Rear View of ContentDirector

Table A–5: ContentDirector Rear Panel Components

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Serial connector</td>
<td>Use to connect a serial device to the system</td>
</tr>
<tr>
<td>2. Video connector</td>
<td>Use to connect a monitor to the system (for maintenance only).</td>
</tr>
<tr>
<td>3. USB connectors (2)</td>
<td>Used for maintenance purposes only.</td>
</tr>
<tr>
<td>4. NIC 0 connector</td>
<td>Use for Gigabit Ethernet connection to switch.</td>
</tr>
<tr>
<td>5. NIC 1 connector</td>
<td>Use for Gigabit Ethernet connection to switch.</td>
</tr>
<tr>
<td>6. NIC 2 connector</td>
<td>Use for Gigabit Ethernet connection to switch.</td>
</tr>
<tr>
<td>Indicator, Button, or Connector</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>7. NIC 3 connector</td>
<td>Use for Gigabit Ethernet connection to switch.</td>
</tr>
<tr>
<td>8. System status indicator</td>
<td>Blinks when the front or back system identification button is pressed.</td>
</tr>
<tr>
<td>9. System identification button</td>
<td>Both the SystemManager application and the identification buttons on the front and back panels can be used to locate a particular system within a rack. When one of these buttons is pressed, the LCD display on the front of the device and the blue system status indicator on the back blink until one of the buttons is pressed again.</td>
</tr>
<tr>
<td>10. Power supply 1</td>
<td>Dual redundant power supplies provide power to the system.</td>
</tr>
<tr>
<td>11. Power supply 2</td>
<td></td>
</tr>
</tbody>
</table>

Figure A–6 and Table A–6 describe the typical Redundant Power Supply Indicator and its functions.

Figure A–6: ContentDirector Power Supply Indicator

Table A–6: Power Supply Indicator Pattern

<table>
<thead>
<tr>
<th>Indicator Pattern</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not lit</td>
<td>AC power is not connected.</td>
</tr>
<tr>
<td>Green</td>
<td>In standby mode, indicates that a valid AC source is connected to the power supply, and that the power supply is operational. When the system is on, it also indicates that the power supply is providing DC power to the system.</td>
</tr>
<tr>
<td>Amber</td>
<td>Indicates a problem with the power supply.</td>
</tr>
<tr>
<td>Alternating Green and Amber</td>
<td>When hot-adding a power supply, this indicates that the power supply is mismatched with the other power supply (a high output power supply and an Energy Smart power supply are installed in the same system). To correct this, replace the power supply that has the flashing indicator with a power supply that matches the capacity of the other installed power supply.</td>
</tr>
</tbody>
</table>
Each NIC on the rear panel has an indicator that provides information on network activity and link status. *Figure A–7,* and *Table A–8* detail the NIC indicators and the possible states of each.

![NIC Indicators](image)

1. Link indicator
2. Activity indicator

**Table A–7: ContentDirector NIC Indicators**

Note that the indicator codes for NIC 0 and NIC 1 differ from NIC 2 and NIC 3. Refer to *Table A–8.*

**Table A–8: NIC Indicator Codes**

<table>
<thead>
<tr>
<th>NIC 0 and NIC 1 Indicators</th>
<th>NIC 2 and NIC 3 Indicators</th>
<th>Connection Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link and activity indicators are off</td>
<td>Link indicator is amber</td>
<td>NIC is not connected.</td>
</tr>
<tr>
<td>Link indicator is green</td>
<td>Link indicator is amber</td>
<td>NIC is connected to a valid link on the network.</td>
</tr>
<tr>
<td>Link indicator is amber</td>
<td>Link indicator is green or blinking green</td>
<td>NIC is connected to a valid network link at 10/100 Mbps</td>
</tr>
<tr>
<td>Activity indicator is amber blinking</td>
<td>Activity indicator is green blinking</td>
<td>Data is being sent or received over the network.</td>
</tr>
</tbody>
</table>

**ContentDirector 1000E and High Performance ContentDirector 2000B**

ContentDirectors manage and direct the overall operation of Harmonic MediaGrid. They enable clients to interact with the system by creating and presenting a single virtual file system constructed from Harmonic MediaGrid's many individual ContentServer storage devices.

The ContentDirector 1000E and the High Performance ContentDirector 2000B have the same front and rear panel components and same functionality. However, the High Performance ContentDirector 2000B includes additional memory and a solid state drive to increase performance.

**Front Panel Components**

*Figure 9–2* and *Table 9–3* detail the front panel of the ContentDirector 1000E and High Performance ContentDirector 2000B.
Figure 9–2: ContentDirector Front Panel

Table 9–3: ContentDirector Front Panel Descriptions

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power indicator</td>
<td>A bright blue <strong>power indicator</strong> is provided across the top of the front panel. This indicator also provides a “wink” function, which allows you to identify a unit from the SystemManager application.</td>
</tr>
<tr>
<td>2. Air vents</td>
<td>Allows airflow through the unit. For optimum airflow, do not obstruct the air vents.</td>
</tr>
<tr>
<td>3. Status LEDs</td>
<td>An array of six <strong>status LEDs</strong> is provided on the front panel. See the following figure and table for descriptions of each status LED.</td>
</tr>
</tbody>
</table>

System Status LEDs

*Figure 9–3* and *Table 9–4* detail the six system status indicators on the front of the ContentDirector.

**NOTE:** The status indicators on the bezel for the High Performance ContentDirector 2000B do not display status for the solid state drive.

Figure 9–3: ContentDirector Front Panel Indicators
Table 9–4: ContentDirector Indicator Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Color/State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIC 0 Link</td>
<td>White</td>
<td>Ethernet communications OK</td>
</tr>
<tr>
<td>NIC 1 Link</td>
<td>Red</td>
<td>Ethernet communications problem</td>
</tr>
<tr>
<td>NIC 2 Link</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIC 3 Link</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hard drive 0</td>
<td>White</td>
<td>Drive status OK</td>
</tr>
<tr>
<td>Hard drive 1</td>
<td>Red</td>
<td>Drive error</td>
</tr>
</tbody>
</table>

Figure 9–4 and Table 9–5 detail the front panel view of a the ContentDirector 1000E and High Performance ContentDirector 2000B with the bezel removed. Note that your ContentDirector may differ somewhat from the one described below.

![Figure 9–4: Front View of ContentDirector](image)

Table 9–5: Front Panel Components

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power-on indicator/button</td>
<td>The power button controls the DC power supply output to the system. The power-on indicator lights when the system power is on. When the power-on indicator is off, this indicates that no power is supplied to the system.</td>
</tr>
<tr>
<td>2. System identification button</td>
<td>The identification buttons on the front and back panels can be used to locate a particular system within a rack. When one of these buttons is pressed, the ID buttons on the front and rear panels flash until one of the buttons is pressed again. Press to toggle the system ID on and off.</td>
</tr>
<tr>
<td>3. Video connector</td>
<td>Connects a monitor to the system.</td>
</tr>
<tr>
<td>4. LCD menu buttons</td>
<td>Allows you to navigate the control panel LCD menu.</td>
</tr>
</tbody>
</table>
### Drive Status LEDs

*Figure 9–5* and *Table 9–6* describe the drive indicators and their functions.

#### Drive-status Indicator (green and amber)

#### Drive-activity Indicator (green)

#### Table 9–6: Drive-status Indicator Pattern (RAID Only)

<table>
<thead>
<tr>
<th>Drive-status Indicator Pattern</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blinks green two times per second</td>
<td>Identify drive/preparing for removal</td>
</tr>
<tr>
<td>Off</td>
<td>Drive ready for insertion or removal</td>
</tr>
<tr>
<td>Note: The drive-status indicator remains off until all hard drives are initialized after system power is applied. Drives are not ready for insertion or removal during this time.</td>
<td></td>
</tr>
<tr>
<td>Blinks green, amber, and off</td>
<td>Drive predicted failure</td>
</tr>
<tr>
<td>Blinks amber four times per second</td>
<td>Drive failed</td>
</tr>
<tr>
<td>Blinks green slowly</td>
<td>Drive rebuilding</td>
</tr>
<tr>
<td>Steady green</td>
<td>Drive online</td>
</tr>
<tr>
<td>Blinks green three seconds, amber three seconds, and off six seconds</td>
<td>Rebuild aborted</td>
</tr>
</tbody>
</table>
Rear Panel Components

*Figure 9–6 and Table 9–7* describe the rear panel view of the ContentDirector 1000E and 2000B.

![Rear View of ContentDirector](image)

**Table 9–7: Rear panel components**

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. NIC 3 connector</td>
<td>Use for Gigabit Ethernet connection to switch.</td>
</tr>
<tr>
<td>2. NIC 2 connector</td>
<td>Use for Gigabit Ethernet connection to switch.</td>
</tr>
<tr>
<td>3. Serial connector</td>
<td>Use to connect a serial device to the system.</td>
</tr>
<tr>
<td>4. Video connector</td>
<td>Use to connect a monitor to the system (for maintenance only).</td>
</tr>
<tr>
<td>5. NIC 0 connector</td>
<td>Use for Gigabit Ethernet connection to switch.</td>
</tr>
<tr>
<td>6. NIC 1 connector</td>
<td>Use for Gigabit Ethernet connection to switch.</td>
</tr>
<tr>
<td>7. USB connectors (2)</td>
<td>Used for maintenance purposes only.</td>
</tr>
<tr>
<td>8. System identification button</td>
<td>Both the SystemManager application and the system identification buttons on the front and back panels can be used to locate a particular system within a rack. When one of these buttons is pressed, the ID buttons on the front and rear panels flash until one of the buttons is pressed again.</td>
</tr>
<tr>
<td>9. Power supply 1</td>
<td>Dual redundant power supplies provide power to the system.</td>
</tr>
<tr>
<td>10. Power supply 2</td>
<td></td>
</tr>
</tbody>
</table>

**Power Supply Indicator/Handle**

*Figure 9–7 and Table 9–8* describe the typical Redundant Power Supply Indicator/Handle and its functions.
Table 9–8: Power Supply Indicator Pattern

<table>
<thead>
<tr>
<th>Indicator Pattern</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not lit</td>
<td>AC power is not connected.</td>
</tr>
<tr>
<td>Green</td>
<td>The handle indicator lights green indicating that a valid power source is connected to the power supply and that the power supply is operational.</td>
</tr>
<tr>
<td>Flashing Amber</td>
<td>Indicates a problem with the power supply.</td>
</tr>
<tr>
<td></td>
<td>- <strong>CAUTION</strong>: When correcting a power supply mismatch, replace only the power supply with the flashing indicator. Swapping the opposite power supply to make a matched pair can result in an error condition and unexpected system shutdown. To change from a High Output configuration to a Low Output configuration or vice versa, you must power down the system.</td>
</tr>
<tr>
<td></td>
<td>- <strong>CAUTION</strong>: AC power supplies support both 220 V and 110 V input voltages. When two identical power supplies receive different input voltages, they can output different wattages, and trigger a mismatch.</td>
</tr>
<tr>
<td></td>
<td>- <strong>CAUTION</strong>: If two power supplies are used, they must be of the same type and have the same maximum output power.</td>
</tr>
<tr>
<td>Flashing Green</td>
<td>When hot-adding a power supply, this indicates that the power supply is mismatched with the other power supply (in terms of efficiency, feature set, health status, and supported voltage). Replace the power supply that has the flashing indicator with a power supply that matches the capacity of the other installed power supply.</td>
</tr>
</tbody>
</table>

**ContentDirector NIC Indicators**

Each NIC on the rear panel has an indicator that provides information on network activity and link status. *Figure A–7*, and *Table 9–9* detail the NIC indicators and the possible states of each.
Figure 9–8: ContentDirector NIC Indicators

Note that the indicator codes for NIC 0 and NIC 1 differ from NIC 2 and NIC 3. Refer to Table 9–9.

Table 9–9: NIC Indicator Codes

<table>
<thead>
<tr>
<th>NIC 0 and NIC 1 Indicators</th>
<th>NIC 2 and NIC 3 Indicators</th>
<th>Connection Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link and activity indicators are off</td>
<td>NIC is not connected.</td>
<td></td>
</tr>
<tr>
<td>Link indicator is green</td>
<td>Link indicator is amber</td>
<td>NIC is connected to a valid link on the network.</td>
</tr>
<tr>
<td>Link indicator is amber</td>
<td>Link indicator is green or blinking green</td>
<td>NIC is connected to a valid network link at 10/100 Mbps</td>
</tr>
<tr>
<td>Activity indicator is amber blinking</td>
<td>Activity indicator is green blinking</td>
<td>Data is being sent or received over the network.</td>
</tr>
</tbody>
</table>

ContentBridge 1000

The ContentBridge 1000, which is an optional Harmonic MediaGrid system component, provides access to the Harmonic MediaGrid for those client platforms that do not have the File System Driver (FSD) installed or do not use the Harmonic MediaGrid API.

Front Panel Components

*Figure A–7 and Table A–9* detail the front bezel view of a typical ContentBridge 1000.
Table A–9: ContentBridge 1000 Front Panel Descriptions

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power indicator</td>
<td>A bright blue <strong>power indicator</strong> is provided across the top of the front panel. This indicator also provides a “wink” function for identification purposes.</td>
</tr>
<tr>
<td>2. Air vents</td>
<td>Allows airflow through the unit. For optimum airflow, do not obstruct the air vents.</td>
</tr>
</tbody>
</table>
| 3. Status LEDs                | The top two LEDs indicate network traffic:  
  - White (blinking every 30 seconds)—indicates that the ContentBridge is working normally; has network connectivity.  
  - Blue (winking)—Indicates that the ContentBridge cannot download its configuration file from the ContentDirector. The possible reasons include the following:  
    - No IP address from ContentDirector  
    - Cannot find the tftp server on ContentDirector  
    - Unable to contact ContentDirector  
    Refer to **Verifying DHCP Settings** to check DHCP status.  
  - Red (blinking every 30 seconds)—indicates that the system is unable to reach default router on interface(s).  
  - Red (winking)—indicates that the ContentBridge is unable to download its configuration files and unable to reach the default router on interface(s).  
  The bottom four LEDs are unused in a ContentBridge.  
  **Note:** Blinking is a quick on and off state; winking spans a longer period (1.5 seconds). |

Rear Panel Components

*Figure A–8 and Table A–10* describe the rear panel view of a typical ContentBridge 1000.
Table A–10: ContentBridge 1000 Rear Panel Descriptions

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Reset button</td>
<td>Restarts an unresponsive ContentBridge. Use only when directed by Technical Support.</td>
</tr>
<tr>
<td>2. Soft Power button</td>
<td>Use to control the motherboard power-on status, independent of the physical power switch on the rear panel of the ContentBridge. This may be used to power up the ContentBridge if it is still unresponsive after turning on the physical power switch. Use only when directed by Technical Support. Pressing this button during normal operation may cause loss of data.</td>
</tr>
<tr>
<td>3. Wink LED</td>
<td>Blinks on when the unit is “winked” from the SystemManager application.</td>
</tr>
<tr>
<td>4. Unused in a ContentBridge</td>
<td></td>
</tr>
<tr>
<td>5. Gigabit Ethernet port 0</td>
<td>Use for system communication and interfacing with selected applications. Refer to Table A–11 for a description of each LED state.</td>
</tr>
<tr>
<td>6. Gigabit Ethernet port 1</td>
<td></td>
</tr>
<tr>
<td>7. Unit fan</td>
<td>Circulates air through the unit. Do not obstruct.</td>
</tr>
<tr>
<td>8. Power switch</td>
<td>Use to turn the unit ON or OFF.</td>
</tr>
</tbody>
</table>

Table A–11 provides descriptions of the Ethernet port status LEDs.

Table A–11: ContentBridge 1000 Ethernet Port Status

<table>
<thead>
<tr>
<th>LED Color</th>
<th>LED State</th>
<th>NIC State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green/amber (left)</td>
<td>Off</td>
<td>10 Mbps</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>100 Mbps</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>1000 Mbps</td>
</tr>
<tr>
<td>Green (right)</td>
<td>On</td>
<td>Active connection</td>
</tr>
<tr>
<td></td>
<td>Blinking</td>
<td>Transmit/receive activity</td>
</tr>
</tbody>
</table>
**ContentBridge 1000B**

The ContentBridge 1000B, an optional Harmonic MediaGrid system component, provides access to Harmonic MediaGrid for those client platforms that do not have the FSD installed or do not use the Harmonic MediaGrid API.

**Front Panel Components**

*Figure A–9 and Table A–12* detail the front panel of the ContentBridge 1000B.

![ContentBridge 1000B Front Panel](image)

*Figure A–9: ContentBridge 1000B Front Panel*

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power indicator</td>
<td>A bright blue <em>power indicator</em> is provided across the top of the front panel. This indicator also provides a “wink” function, which allows you to identify a unit from the SystemManager application.</td>
</tr>
<tr>
<td>2. Air vents</td>
<td>Allows airflow through the unit. For optimum airflow, do not obstruct the air vents.</td>
</tr>
<tr>
<td>3. Status LEDs</td>
<td>An array of six <em>status LEDs</em> is provided on the front panel. See the following figure and table for descriptions of each status LED.</td>
</tr>
</tbody>
</table>

**System Status LEDs**

*Figure A–10 and Table A–13* detail the six system status indicators on the front of ContentBridge 1000B.
Appendix A Legacy Hardware Platforms

Figure A–10: ContentBridge 1000B Status LEDs

Table A–13: ContentBridge 1000B Status LED Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Color/State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet Port 0</td>
<td>White (Solid) Online</td>
<td>Online</td>
</tr>
<tr>
<td>and Ethernet Port 1</td>
<td>White (Blink) Active network port</td>
<td>Indicates active network port</td>
</tr>
<tr>
<td></td>
<td>Blue (Blink) ContentBridge cannot download its configuration file from ContentDirector</td>
<td>ContentBridge cannot download its configuration file from ContentDirector</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Indicates Ethernet link problem</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Power off</td>
</tr>
</tbody>
</table>

Rear Panel Components

Figure A–11 and Table A–14 detail the rear panel view of the ContentBridge 1000B.

Figure A–11: Rear View of ContentBridge 1000B
Table A–14: ContentBridge 1000B Rear Panel Descriptions

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Reset button</td>
<td>Restarts an unresponsive ContentBridge. Use only when directed by Technical Support. Pressing this button during normal operation may cause loss of data.</td>
</tr>
<tr>
<td>2. Soft Power button</td>
<td>Used to control the motherboard power-on status, independent of the physical power switch on the rear panel of the ContentBridge. This may be used to power on the ContentBridge if it is still unresponsive after turning on the physical power switch. Use only when directed by Technical Support. Pressing this button during normal operation may cause loss of data.</td>
</tr>
<tr>
<td>3. Wink LED</td>
<td>Blinks on when the unit has been “winked” from the SystemManager application.</td>
</tr>
<tr>
<td>4. Gigabit Ethernet port 0</td>
<td>Use these Gigabit Ethernet ports for system communication and interfacing with selected applications. Refer to the following table for a description of each LED state.</td>
</tr>
<tr>
<td>5. Gigabit Ethernet port 1</td>
<td></td>
</tr>
<tr>
<td>6. Unit fan</td>
<td>Circulates air throughout the unit. Do not obstruct.</td>
</tr>
<tr>
<td>7. 50/60 Hz power</td>
<td>Use to provide power to the unit.</td>
</tr>
<tr>
<td>8. Power switch</td>
<td>Use to turn the unit ON or OFF.</td>
</tr>
</tbody>
</table>

Gigabit Ethernet Port LEDs

*Figure A–12* and *Table A–15* provide descriptions of the GbE port status LEDs.

![Gigabit Ethernet Port Status LEDs Diagram](image)

<table>
<thead>
<tr>
<th>LED</th>
<th>LED State</th>
<th>NIC State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link (left)</td>
<td>Off</td>
<td>Power off, network cables unplugged</td>
</tr>
<tr>
<td></td>
<td>Green (solid)</td>
<td>Power off, network cables plugged in. Active connection at 100 Mb/s</td>
</tr>
<tr>
<td></td>
<td>Amber (solid)</td>
<td>Power on, network cables plugged in. Active connection at 1 Gb/s</td>
</tr>
</tbody>
</table>
Appendix A Legacy Hardware Platforms

ContentBridge 2010B/C/D (High Bandwidth)

The ContentBridge 2010B/C/D (also referred to as the High Bandwidth ContentBridge), an optional component, provides access to Harmonic MediaGrid for those client platforms that do not have the FSD installed or do not use the Harmonic MediaGrid API. The High Bandwidth ContentBridge provides the highest throughput of the ContentBridge models. Note the ContentBridge 2010D includes 1TB drives and the 2010C includes 250 GB drives.

The ContentBridge 2010B/C/D have the same front and rear panel components and same functionality.

Front Panel Components

*Figure A–13* and *Table A–16* detail the front panel of the ContentBridge 2010B/C/D.

<table>
<thead>
<tr>
<th>LED</th>
<th>LED State</th>
<th>NIC State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity (right)</td>
<td>Off</td>
<td>Power off, network cables unplugged</td>
</tr>
<tr>
<td>Yellow (solid)</td>
<td></td>
<td>Power on, active connection</td>
</tr>
<tr>
<td>Yellow (blink)</td>
<td></td>
<td>Power on, network data being sent or received</td>
</tr>
</tbody>
</table>

**Table A–15: ContentBridge 1000B Gigabit Ethernet Port Status LEDs**

**Figure A–13: ContentBridge 2010B/C/D Front Panel**

**Table A–16: ContentBridge 2010B/C/D Front Panel Descriptions**

1. Power indicator
   - A bright blue *power indicator* is provided across the top of the front panel. This indicator also provides a “wink” function, which allows you to identify a unit from the SystemManager application.

2. Air vents
   - Allows airflow through the unit. For optimum airflow, do not obstruct the air vents.

3. Status LEDs
   - An array of six *status LEDs* is provided on the front panel. See the following figure and table for descriptions of each status LED.
System Status LEDs

_Figure A–14_ and _Table A–17_ detail the six system status indicators on the front of ContentBridge 2010B/C/D.

_Figure A–14: ContentBridge 2010B/C/D Front Panel Indicators

_Table A–17: ContentBridge 2010B/C/D Indicator Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Color/State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10GigE port</td>
<td>Yellow</td>
<td>Indicates the power is on.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Indicates a non-functional network connection.</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>Indicates the port is active (requires good Ethernet link status).</td>
</tr>
<tr>
<td>Drive 0 status</td>
<td>Yellow</td>
<td>Indicates Drive 0 is powered on.</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>Indicates disk status OK.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Indicates disk warning or error.</td>
</tr>
<tr>
<td>Drive 1 status</td>
<td>Yellow</td>
<td>Indicates Drive 1 is powered on.</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>Indicates disk status OK.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Indicates disk warning or error.</td>
</tr>
<tr>
<td>Unused ports (turn off after power on)</td>
<td>Yellow</td>
<td>Indicates the power is on.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Indicates system boot complete.</td>
</tr>
</tbody>
</table>

_Figure A–15_ and _Table A–18_ detail the front panel view of a typical ContentBridge 2010B/C/D with the bezel removed. Note that your ContentBridge may differ somewhat from the one described below.
Table A–18: ContentBridge 2010B/C/D Front panel components

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power-on indicator/button</td>
<td>The power button controls the DC power supply output to the system. The power-on indicator lights when the system power is on. When the power-on indicator is off, this indicates that no power is supplied to the system.</td>
</tr>
<tr>
<td>2. Video Connector</td>
<td>Connects a monitor to the system.</td>
</tr>
<tr>
<td>3. LCD menu buttons</td>
<td>Allows you to navigate the control panel LCD menu.</td>
</tr>
<tr>
<td>4. LCD display</td>
<td>Provides status information and system error messages. The LCD display lights during normal system operation. Both the systems management software and the identification buttons located on the front and back of the system can cause the LCD to flash blue to identify a particular system. The LCD display lights amber when the system needs attention due to a problem with power supplies, fans, system temperature or hard drives. <strong>Note</strong>: If the system is connected to AC power and an error has been detected, the LCD display lights amber regardless of whether the system has been powered on.</td>
</tr>
<tr>
<td>5. System identification button</td>
<td>Pressing this button will cause the Front LCD display and the system status indicator on the rear panel to blink.</td>
</tr>
<tr>
<td>6. USB connectors</td>
<td>Use to connect the front bezel.</td>
</tr>
<tr>
<td>7. Optical drive</td>
<td>Use for software installation.</td>
</tr>
<tr>
<td>8. Hard drive 0</td>
<td>Refer to Table A–19 for a description of the indicator codes.</td>
</tr>
<tr>
<td>9. Hard drive 1</td>
<td></td>
</tr>
</tbody>
</table>

*Figure A–15: Front View of ContentBridge 2010B/C/D*

*Figure A–16 and Table A–19 describe the typical hard drive indicators and their functions.*
Figure A–16: ContentBridge 2010B/C/D Hard Drive Indicators

Table A–19: ContentBridge 2010B/C/D Drive-status Indicator Pattern (RAID Only)

<table>
<thead>
<tr>
<th>Drive-status Indicator Pattern</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blinks green two times per second</td>
<td></td>
</tr>
<tr>
<td>Off</td>
<td>Identify drive/preparing for removal</td>
</tr>
<tr>
<td></td>
<td>Drive ready for insertion or removal</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong>: The drive-status indicator remains off until all hard drives are initialized after system power is applied. Drives are not ready for insertion or removal during this time.</td>
</tr>
<tr>
<td>Blinks green, amber, and off</td>
<td>Drive predicted failure</td>
</tr>
<tr>
<td>Blinks amber four times per second</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drive failed</td>
</tr>
<tr>
<td>Blinks green slowly</td>
<td>Drive rebuilding</td>
</tr>
<tr>
<td>Steady green</td>
<td>Drive online</td>
</tr>
<tr>
<td>Blinks green three seconds, amber three seconds, and off six seconds</td>
<td>Rebuild aborted</td>
</tr>
</tbody>
</table>

Rear Panel Components

*Figure A–17* and *Table A–20* describe the rear panel view of the ContentBridge 2010B/C/D.

Figure A–17: Rear View of ContentBridge 2010B/C/D

Table A–20: ContentBridge 2010B/C/D Rear panel components

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Serial connector</td>
<td>Use to connect a serial device to the system</td>
</tr>
</tbody>
</table>
Table A–20: ContentBridge 2010B/C/D Rear panel components continued

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Video connector</td>
<td>Use to connect a monitor to the system (for maintenance only).</td>
</tr>
<tr>
<td>3. USB connectors (2)</td>
<td>Used for maintenance purposes only.</td>
</tr>
<tr>
<td>4. Gigabit Ethernet ports</td>
<td>Unused</td>
</tr>
<tr>
<td>5. 10 Gigabit Ethernet LEDs</td>
<td>The LEDs show the state of the 10 Gigabit Ethernet connector. For a description of the LEDs and possible states, refer to Figure A–18 and Table A–21.</td>
</tr>
<tr>
<td>6. 10 Gigabit Ethernet connector</td>
<td>Use to connect the ContentBridge to the customer network switch. The Link light does not appear until the Configuration Assistant is completed for the ContentBridge. Refer to About Harmonic MediaGrid Configuration for more information.</td>
</tr>
<tr>
<td>7. System status indicator</td>
<td>Blinks when the front or back system identification button is pressed.</td>
</tr>
<tr>
<td>8. System identification button</td>
<td>Both the SystemManager application and the identification buttons on the front and back panels can be used to locate a particular system within a rack. When one of these buttons is pressed, the LCD display on the front of the device and the blue system status indicator on the back blink until one of the buttons is pressed again.</td>
</tr>
<tr>
<td>10. Power supply 1</td>
<td>Dual redundant power supplies provide power to the system.</td>
</tr>
<tr>
<td>11. Power supply 2</td>
<td></td>
</tr>
</tbody>
</table>

10 Gigabit Ethernet LEDs

Figure A–18 and Table A–21 describe the possible states of the 10 Gigabit Ethernet LEDs.
Table A–21: 10 Gigabit Ethernet LED Pattern

<table>
<thead>
<tr>
<th>Indicator Pattern</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Power off or network cables unplugged</td>
</tr>
<tr>
<td>Green</td>
<td>Port enabled and receiving link indication</td>
</tr>
<tr>
<td>Yellow (two short blinks)</td>
<td>Network activity occurring</td>
</tr>
<tr>
<td>Yellow (solid, continuous blinking)</td>
<td>Some abnormal condition</td>
</tr>
</tbody>
</table>

Power Supply LEDs

*Figure A–19* and *Table A–22* describe the typical Power Supply Indicator and its functions.

![Power supply status indicator]

**Figure A–19: ContentBridge 2010B/C/D Power Supply Indicators**

Table A–22: Power Supply Indicator Pattern

<table>
<thead>
<tr>
<th>Indicator Pattern</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not lit</td>
<td>AC power is not connected.</td>
</tr>
<tr>
<td>Green</td>
<td>In standby mode, indicates that a valid AC source is connected to the power supply, and that the power supply is operational. When the system is on, it also indicates that the power supply is providing DC power to the system.</td>
</tr>
<tr>
<td>Amber</td>
<td>Indicates a problem with the power supply.</td>
</tr>
<tr>
<td>Alternating Green and Amber</td>
<td>When hot-adding a power supply, this indicates that the power supply is mismatched with the other power supply (a high output power supply and an Energy Smart power supply are installed in the same system). To correct this, replace the power supply that has the flashing indicator with a power supply that matches the capacity of the other installed power supply.</td>
</tr>
</tbody>
</table>

**IMPORTANT:** Do not turn off power when replacing a drive. As soon as the new drive is inserted, the system will begin replicating the data from the other drives.
ContentBridge 2010E

The ContentBridge 2010E (also referred to as the High Bandwidth ContentBridge), an optional component, provides access to Harmonic MediaGrid for those client platforms that do not have the FSD installed or do not use the Harmonic MediaGrid API.

Front Panel Components

*Figure 9–9 and Table 9–10* detail the front panel of the ContentBridge 2010E.

![Figure 9–9: ContentBridge 2010E Front Panel](image)

**Table 9–10: ContentBridge 2010E Front Panel Descriptions**

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power indicator</td>
<td>A bright blue <strong>power indicator</strong> is provided across the top of the front panel. This indicator also provides a “wink” function, which allows you to identify a unit from the SystemManager application.</td>
</tr>
<tr>
<td>2. Air vents</td>
<td>Allows airflow through the unit. For optimum airflow, do not obstruct the air vents.</td>
</tr>
<tr>
<td>3. Status LEDs</td>
<td>An array of six <strong>status LEDs</strong> is provided on the front panel. See the following figure and table for descriptions of each status LED.</td>
</tr>
</tbody>
</table>
System Status LEDs

*Figure 9–10* and *Table 9–11* detail the six system status indicators on the front of ContentBridge 2010E.

**Figure 9–10: ContentBridge 2010E Front Panel Indicators**

**Table 9–11: ContentBridge 2010E Indicator Descriptions**

<table>
<thead>
<tr>
<th>LED</th>
<th>Color/State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10GigE port</td>
<td>Yellow</td>
<td>Indicates the power is on.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Indicates a non-functional network connection.</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>Indicates the port is active (requires good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ethernet link status).</td>
</tr>
<tr>
<td>Drive 0 status</td>
<td>Yellow</td>
<td>Indicates Drive 0 is powered on.</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>Indicates disk status OK.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Indicates disk warning or error.</td>
</tr>
<tr>
<td>Drive 1 status</td>
<td>Yellow</td>
<td>Indicates Drive 1 is powered on.</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>Indicates disk status OK.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Indicates disk warning or error.</td>
</tr>
<tr>
<td>Unused ports (turn off</td>
<td>Yellow</td>
<td>Indicates the power is on.</td>
</tr>
<tr>
<td>after power on)</td>
<td>Off</td>
<td>Indicates system boot complete.</td>
</tr>
</tbody>
</table>

*Figure 9–11* and *Table 9–12* detail the front panel view of a typical ContentBridge 2010E with the bezel removed. Note that your ContentBridge may differ somewhat from the one described below.
Table 9–12: ContentBridge 2010E Front Panel Components

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power-on indicator/button</td>
<td>The power button controls the DC power supply output to the system. The power-on indicator lights when the system power is on. When the power-on indicator is off, this indicates that no power is supplied to the system.</td>
</tr>
<tr>
<td>2. System identification button</td>
<td>The identification buttons on the front and back panels can be used to locate a particular system within a rack. When one of these buttons is pressed, the ID buttons on the front and rear panels flash until one of the buttons is pressed again. Press to toggle the system ID on and off.</td>
</tr>
<tr>
<td>3. Video Connector</td>
<td>Connects a monitor to the system.</td>
</tr>
<tr>
<td>4. LCD menu buttons</td>
<td>Allows you to navigate the control panel LCD menu.</td>
</tr>
<tr>
<td>5. LCD display</td>
<td>Displays system ID, status information, and system error messages. The LCD lights blue during normal system operation. The LCD lights amber when the system needs attention, and the LCD panel displays an error code followed by descriptive text.</td>
</tr>
<tr>
<td>6. USB connectors</td>
<td>Use to connect the front bezel.</td>
</tr>
<tr>
<td>7. Optical drive</td>
<td>Use for software installation.</td>
</tr>
<tr>
<td>8. Hard drive 0</td>
<td>Refer to Table 9–13 for a description of the indicator codes.</td>
</tr>
<tr>
<td>9. Hard drive 1</td>
<td></td>
</tr>
</tbody>
</table>

Figure 9–11: Front View of ContentBridge 2010E

Figure 9–12 and Table 9–13 describe the typical hard drive indicators and their functions.
Appendix A Legacy Hardware Platforms

Figure 9–12: ContentBridge 2010E Hard Drive Indicators

Table 9–13: Drive-status Indicator Pattern (RAID Only)

<table>
<thead>
<tr>
<th>Drive-status Indicator Pattern</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blinks green two times per second</td>
<td>Identify drive/preparing for removal</td>
</tr>
<tr>
<td>Off</td>
<td>Drive ready for insertion or removal</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong>: The drive-status indicator remains off until all hard drives are initialized after system power is applied. Drives are not ready for insertion or removal during this time.</td>
</tr>
<tr>
<td>Blinks green, amber, and off</td>
<td>Drive predicted failure</td>
</tr>
<tr>
<td>Blinks amber four times per second</td>
<td>Drive failed</td>
</tr>
<tr>
<td>Blinks green slowly</td>
<td>Drive rebuilding</td>
</tr>
<tr>
<td>Steady green</td>
<td>Drive online</td>
</tr>
<tr>
<td>Blinks green three seconds, amber three seconds, and off six seconds</td>
<td>Rebuild aborted</td>
</tr>
</tbody>
</table>

**IMPORTANT**: Do not turn off power when replacing a drive. As soon as the new drive is inserted, the system will begin replicating the data from the other drives.

Rear Panel Components

*Figure 9–13* and *Table A–20* describe the rear panel view of the ContentBridge 2010E.
Table 9–14: ContentBridge 2010E Rear Panel Components

<table>
<thead>
<tr>
<th>Indicator, Button, or Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Serial connector</td>
<td>Use to connect a serial device to the system</td>
</tr>
<tr>
<td>2. Video connector</td>
<td>Use to connect a monitor to the system (for maintenance only).</td>
</tr>
<tr>
<td>3. 10 Gigabit Ethernet LEDs</td>
<td>The LEDs show the state of the 10 Gigabit Ethernet connector. For a description of the LEDs and possible states, refer to Figure 9–14 and Table 9–15.</td>
</tr>
<tr>
<td>4. 10 Gigabit Ethernet connector</td>
<td>Use to connect the ContentBridge to the customer network switch. The Link light does not appear until the Configuration Assistant is completed for the ContentBridge. Refer to About Harmonic MediaGrid Configuration for more information.</td>
</tr>
<tr>
<td>5. Gigabit Ethernet ports</td>
<td>NIC 0 (left) and NIC 1 (right)</td>
</tr>
<tr>
<td>6. USB connectors (2)</td>
<td>Used for maintenance purposes only.</td>
</tr>
<tr>
<td>7. System identification button/indicator</td>
<td>Both the SystemManager application and the system identification buttons on the front and back panels can be used to locate a particular system within a rack. When one of these buttons is pressed, the ID buttons on the front and rear panels blink until one of the buttons is pressed again.</td>
</tr>
<tr>
<td>8. Power supply 1</td>
<td>Dual redundant power supplies provide power to the system.</td>
</tr>
<tr>
<td>9. Power supply 2</td>
<td>Dual redundant power supplies provide power to the system.</td>
</tr>
</tbody>
</table>

10 Gigabit Ethernet LEDs

*Figure 9–14 and Table 9–15* describe the possible states of the 10 Gigabit Ethernet LEDs.
Figure 9–14: 10 Gigabit Ethernet LEDs

Table 9–15: 10 Gigabit Ethernet LED Pattern

<table>
<thead>
<tr>
<th>Indicator Pattern</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Power off or network cables unplugged</td>
</tr>
<tr>
<td>Green</td>
<td>Port enabled and receiving link indication</td>
</tr>
<tr>
<td>Yellow (two short blinks)</td>
<td>Network activity occurring</td>
</tr>
<tr>
<td>Yellow (solid, continuous blinking)</td>
<td>Some abnormal condition</td>
</tr>
</tbody>
</table>

Power Supply LEDs

*Figure 9–15* and *Table 9–16* describe the Power Supply Indicator/Handle and its functions.

Table 9–16: Power Supply Indicator Pattern

<table>
<thead>
<tr>
<th>Indicator Pattern</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not lit</td>
<td>AC power is not connected.</td>
</tr>
<tr>
<td>Green</td>
<td>The handle indicator lights green indicating that a valid power source is connected to the power supply and that the power supply is operational.</td>
</tr>
<tr>
<td>Indicator Pattern</td>
<td>Condition</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Flashing Amber</td>
<td>Indicates a problem with the power supply.</td>
</tr>
<tr>
<td></td>
<td>- <strong>CAUTION</strong>: When correcting a power supply mismatch, replace only the power supply with the flashing indicator. Swapping the opposite power supply to make a matched pair can result in an error condition and unexpected system shutdown. To change from a High Output configuration to a Low Output configuration or vice versa, you must power down the system.</td>
</tr>
<tr>
<td></td>
<td>- <strong>CAUTION</strong>: AC power supplies support both 220 V and 110 V input voltages. When two identical power supplies receive different input voltages, they can output different wattages, and trigger a mismatch.</td>
</tr>
<tr>
<td></td>
<td>- <strong>CAUTION</strong>: If two power supplies are used, they must be of the same type and have the same maximum output power.</td>
</tr>
<tr>
<td>Flashing Green</td>
<td>When hot-adding a power supply, this indicates that the power supply is mismatched with the other power supply (in terms of efficiency, feature set, health status, and supported voltage). Replace the power supply that has the flashing indicator with a power supply that matches the capacity of the other installed power supply.</td>
</tr>
</tbody>
</table>
Appendix B
ContentDirector Limits

This section contains information about limitations of each model of ContentDirector, including the following topics:

- **Overview**
- **Capacity Specifications**
- **Resource Limits**
- **Capacity Planning**
- **Monitoring Resource Consumption**

⚠ **CAUTION:** If you do not understand the procedures or recommendations described in this chapter, please consult with Technical Support before proceeding.

**Overview**

Harmonic MediaGrid release 3.1 introduced enforced limits on file system capacities in ContentDirectors in order to provide graceful handling when limits are reached as well as advanced notification via SystemManager alerts as limits are approached. ContentDirector limits are fixed based upon the hardware model and set automatically during installation of or upgrade to Harmonic MediaGrid release 3.1 and later.

This section provides an explanation of the implementation of ContentDirector limits in Harmonic MediaGrid 3.1 and later as well as information needed to plan the capacity and monitor resource consumption of Harmonic MediaGrid system.

**Capacity Specifications and Resource Limits**

Note the following distinction between “capacity specifications” and “resource limits.”

- **Capacity Specifications** are useful for choosing the model of ContentDirector needed for a system and for estimating the capacity of the system. The specifications included in this section have been made using conservative and realistic assumptions regarding things like the distribution of file name lengths, average numbers of files per directory, number of concurrently open files, number and length of ACLs, etc.

- **Resource Limits** are tied to the resources needed (memory, disk, internal data structures, etc.) under the actual workload. Resource limits are enforced upon actual usage and it is most useful to monitor actual resource consumption.

**Capacity Specifications**

In terms of capacity, Harmonic MediaGrid systems are specified by:

- **Storage capacity:** the amount of usable data that can be stored.

- **File count:** the number of files that can be stored in the file system. In Harmonic MediaGrid this includes regular files and symlinks but not hard links.

- **Directory count:** the number of directories that can be stored in the file system.
Appendix B ContentDirector Limits

Capacity Specifications

- **Node count**: the number of named nodes in the file system, including regular files, directories, symlinks, and hard links.
- **Slice count**: the number of slices used to hold user file data.

Table B–1 shows the capacity specifications for Harmonic MediaGrid ContentDirectors.

Table B–1: Capacity Specifications for ContentDirectors

<table>
<thead>
<tr>
<th>ContentDirector Type</th>
<th>Max File Count Recommended* (Files + Symlinks)</th>
<th>Max Node Count Supported (Files + Directories + Links)</th>
<th>Directory Count Supported</th>
<th>Slice Count Supported</th>
<th>Storage Size Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>ContentDirector 1000B (8 GB RAM)</td>
<td>1 million</td>
<td>4 million</td>
<td>240,000</td>
<td>125 million</td>
<td>250 TB</td>
</tr>
<tr>
<td>ContentDirector 1000C (12 GB RAM)</td>
<td>1 million</td>
<td>10 million</td>
<td>600,000</td>
<td>250 million</td>
<td>500 TB</td>
</tr>
<tr>
<td>ContentDirector 1000D/1000E/1000F (16 GB RAM)</td>
<td>1 million</td>
<td>10 million</td>
<td>600,000</td>
<td>500 million</td>
<td>1 PB</td>
</tr>
<tr>
<td>High-Performance ContentDirector 2000C (64 GB RAM)</td>
<td>50 million</td>
<td>50 million</td>
<td>1.5 million</td>
<td>2 billion</td>
<td>4 PB</td>
</tr>
</tbody>
</table>

* Standard ContentDirectors with file counts greater than 1 million are supported when upgraded to Harmonic MediaGrid 3.1 or later provided that the other limits are met. However, load and restart times will increase as file counts increase beyond the recommended limit. To improve load and restart times with file counts beyond the recommended limit, upgrade to the High-Performance ContentDirector.

Table B–2: Additional Specifications for ContentDirectors

<table>
<thead>
<tr>
<th>ContentDirector Type</th>
<th>Max files within a directory</th>
<th>Max subdirectories within a directory</th>
<th>Max connections to Harmonic MediaGrid server from FSD/ContentBridges</th>
<th>Max File name length</th>
<th>Max directory name length</th>
<th>Max hardlinks to file</th>
</tr>
</thead>
<tbody>
<tr>
<td>ContentDirector 1000 series</td>
<td>100,000 optimally (250,000 max)</td>
<td>30,000</td>
<td>1000</td>
<td>254</td>
<td>249</td>
<td>1024</td>
</tr>
<tr>
<td>High-Performance ContentDirector</td>
<td>100,000 optimally (250,000 max)</td>
<td>30,000</td>
<td>1000</td>
<td>254</td>
<td>249</td>
<td>1024</td>
</tr>
</tbody>
</table>
Resource Limits

Harmonic MediaGrid 3.1 or later manages resources in three different resource pools:

- **FileTable Nodes**
- **SliceTable Slices**
- **Dynamic Memory Pools**

Note that with 3.1 or later, Harmonic MediaGrid does not restrict file counts to the limits described in this section but does generate alerts as described in *Monitoring Resource Consumption*. If a new file or directory fits within the number of FileTable nodes and there is room for the resources needed within the dynamic memory pools, then new files and directories can be created.

**FileTable Nodes**

FileTable node resources are used for named object in the files system including files, directories, hard links, and symlinks. In Harmonic MediaGrid 3.1 or later, typical named objects with modestly long names and ACLs take 1 node per object.

**NOTE:** In Harmonic MediaGrid 3.1 or later, directories typically consume 1 node plus additional data structures allocated from the dynamic memory pools. This is different than earlier releases where directories consumed more FileTable space.

**SliceTable Slices**

Harmonic MediaGrid 3.1 or later manages the size of its SliceTable in terms of the count of distinct slices. In systems using replication, the SliceTable only counts 1 for all copies of a slice.

**Dynamic Memory Pools**

Harmonic MediaGrid ContentDirector software makes use of a number of internal data structures. These are dynamically allocated from separate pools of memory. The total amount of memory across all pools is limited and the total amount used determines when to send generate a SystemManager alarm.

Both the total memory across all pools and the usage of each pool is reported periodically in the mdscore log.

**Resource Limits**

The Harmonic MediaGrid 3.1 or later factory settings for resource limits are determined to provide enough resources to reach the *Capacity Specifications* under the same conservative assumptions.

*Table B–3* shows the Harmonic MediaGrid 3.1 or later factory settings for resource limits for each type of ContentDirector.
Table B–3: Resource Limit Settings

<table>
<thead>
<tr>
<th>ContentDirector Type</th>
<th>Max Node Count Supported</th>
<th>Slice Count</th>
<th>Dynamic Memory Pools (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ContentDirector 1000B (8GB RAM)</td>
<td>4 million</td>
<td>125 million</td>
<td>1 GB</td>
</tr>
<tr>
<td>ContentDirector 1000C (12GB RAM)</td>
<td>10 million</td>
<td>250 million</td>
<td>2 GB</td>
</tr>
<tr>
<td>ContentDirector 1000D/1000E/1000F (16GB RAM)</td>
<td>10 million</td>
<td>500 million</td>
<td>2 GB</td>
</tr>
<tr>
<td>High-Performance ContentDirector 2000C (64GB RAM)</td>
<td>50 million</td>
<td>2 billion</td>
<td>6 GB</td>
</tr>
</tbody>
</table>

Capacity Planning

The Capacity Specifications in this chapter can be used for rough capacity planning. For detailed capacity planning, work with your Harmonic representative to examine the anticipated workload, estimate the resource consumption of each type of resource, and use the resource limit settings for your model of ContentDirector to determine maximum capacity in workload-specific terms.

When calculating resource consumption based upon workload, note the following guidelines:

- Under typical circumstances each file, directory, symlink, and hard link will fit in 1 node. Files with long file names, large ACLs, or File User Data may consume more than one node.
- Slice count can be determined by estimating the length and slice size of files. Note that the limit settings are probably high enough not to be an issue.
- The number of files, directories, and symlinks (not hard links) will affect service load time and restart time. Estimate the number as part of planning for whether you need to consider upgrading to a High-Performance ContentDirector.
- In Harmonic MediaGrid 3.1 or later, the largest uses of dynamic memory are:
  - Dynamic per-node structure (namebind)
  - Directories
  - Open files
  - UID hash
- Accordingly, dynamic memory usage can be estimated as follows:
  - For each node (directory, file, hardlink, or symlink), 48 bytes for namebind.
  - For directories (in addition to 48 bytes for namebind):
    - 2136 bytes each for directories with up to 1100 entries
    - 5720 bytes each for directories with up to 9000 entries
    - 68 KB each for directories with more than 9000 entries
  - Estimate a fixed 240 MB for up to 128K open files and the UID hash.
Monitoring Resource Consumption

Monitoring via SystemManager

If your ContentDirector reaches 90% or 100% of the recommended file count limit, SystemManager will provide a “Warning” alert indicating that you must delete files or consider upgrading to a High-Performance ContentDirector, otherwise restart times will increase as file count increases.

SystemManager will also provide alerts when the ContentDirector reaches 90% of the recommended limit for FileTable nodes, SliceTable slice count, or Dynamic memory pool usage.

Monitoring via Log Files

You can monitor resource consumption from the mdscore log. At each mdscore sync, the current resource consumption is shown. You can access the mdscore log at /var/log/omneon/mdscore.

Note the following:

- The FT “total entries” value is not necessarily the maximum. See Table B–1 for a description of the limits.
- “Max memory allowed” refers to the total dynamic memory pool and excludes FT entries (that is, nodes).
- For each pool, “Total Allocated” is represented in bytes and “Available” is represented in units of data structure instances.

Figure B–1 shows an example of an mdscore log file.
<table>
<thead>
<tr>
<th>Pool</th>
<th>Total</th>
<th>Allocated</th>
<th>Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>FileHandles</td>
<td>98304</td>
<td>1024</td>
<td></td>
</tr>
<tr>
<td>FileDescriptors</td>
<td>1930809856</td>
<td>275</td>
<td></td>
</tr>
<tr>
<td>SliceIdsList</td>
<td>546072</td>
<td>1024</td>
<td></td>
</tr>
<tr>
<td>FileDataPages</td>
<td>514850816</td>
<td>274</td>
<td></td>
</tr>
<tr>
<td>FileLock</td>
<td>98304</td>
<td>1024</td>
<td></td>
</tr>
<tr>
<td>FileIOvec0</td>
<td>64487424</td>
<td>1299</td>
<td></td>
</tr>
<tr>
<td>FileIOvec1</td>
<td>524288</td>
<td>512</td>
<td></td>
</tr>
<tr>
<td>FileIOvec2</td>
<td>262144</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>FileIOvec3</td>
<td>4194304</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>FileShortNames</td>
<td>11108352</td>
<td>1362</td>
<td></td>
</tr>
<tr>
<td>FileMediumNames</td>
<td>1966880</td>
<td>699</td>
<td></td>
</tr>
<tr>
<td>FileLargeNames</td>
<td>98304</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FileMagnumNames</td>
<td>65536</td>
<td>256</td>
<td></td>
</tr>
<tr>
<td>NameBind</td>
<td>319291392</td>
<td>15495</td>
<td></td>
</tr>
<tr>
<td>DirSpec</td>
<td>160800896</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>DirHashSmall</td>
<td>257245488</td>
<td>855</td>
<td></td>
</tr>
<tr>
<td>DirHashMedium</td>
<td>2621440</td>
<td>69</td>
<td></td>
</tr>
<tr>
<td>DirHashLarge</td>
<td>262144</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>DirIterator</td>
<td>8192</td>
<td>512</td>
<td></td>
</tr>
<tr>
<td>SliceCache</td>
<td>524288</td>
<td>1024</td>
<td></td>
</tr>
</tbody>
</table>

Figure B–1: mdscore log file
Harmonic Global Service and Support has many Technical Assistance Centers (TAC) located globally, but virtually co-located where our customers can obtain technical assistance or request on-site visits from the Regional Field Service Management team. The TAC operates a Follow-The-Sun support model to provide Global Technical Support anytime, anywhere, through a single case management and virtual telephone system. Depending on time of day, anywhere in the world, we will receive and address your calls or emails in one of our global support centers. The Follow-the-Sun model greatly benefits our customers by providing continuous problem resolution and escalation of issues around the clock.

Report an issue online at:
http://harmonicinc.com/webform/report-issue-online

Table A–1: Technical Support Phone Numbers and Email Addresses

<table>
<thead>
<tr>
<th>Region</th>
<th>Telephone Technical Support</th>
<th>E-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Americas</td>
<td>888.673.4896 (888.MPEG.TWO) or +1.408.490.6477</td>
<td><a href="mailto:support@harmonicinc.com">support@harmonicinc.com</a></td>
</tr>
<tr>
<td>Europe, Middle East,</td>
<td>+44.1252.555.450</td>
<td><a href="mailto:emeasupport@harmonicinc.com">emeasupport@harmonicinc.com</a></td>
</tr>
<tr>
<td>and Africa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>+91.120.498.3199</td>
<td><a href="mailto:apacsupport@harmonicinc.com">apacsupport@harmonicinc.com</a></td>
</tr>
<tr>
<td>Russia</td>
<td>+7.495.926.4608</td>
<td><a href="mailto:rusupport@harmonicinc.com">rusupport@harmonicinc.com</a></td>
</tr>
<tr>
<td>Mainland China</td>
<td>+86.10.6569.5580</td>
<td><a href="mailto:chinasupport@harmonicinc.com">chinasupport@harmonicinc.com</a></td>
</tr>
<tr>
<td>Japan</td>
<td>+81.3.5565.6737</td>
<td><a href="mailto:japansupport@harmonicinc.com">japansupport@harmonicinc.com</a></td>
</tr>
<tr>
<td>Asia Pacific – Other</td>
<td>+852.3184.0045 or 65.6542.0050</td>
<td><a href="mailto:apacsupport@harmonicinc.com">apacsupport@harmonicinc.com</a></td>
</tr>
<tr>
<td>Territories</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Harmonic Inc. support website is:
http://www.harmonicinc.com/content/technical-support

The Harmonic Inc. software download locations are:

<table>
<thead>
<tr>
<th>All Harmonic software except Cable Edge software</th>
<th>Software updates are available from the Harmonic website. Contact Harmonic Technical Support for login information.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable Edge software</td>
<td>ftp://ftp.harmonicinc.com</td>
</tr>
</tbody>
</table>
The Harmonic Inc. corporate address is:

Harmonic Inc.
4300 North First St.
San Jose, CA 95134, U.S.A.
Attn: Customer Support

The corporate telephone numbers for Harmonic Inc. are:

Tel. 1.800.788.1330 (inside the U.S.)
Tel. +1.408.542.2500 (outside the U.S.)
Fax.+1.408.542.2511
Appendix B
Safety and Regulatory Compliance Information

Legal Disclaimer: Information in this document is provided in connection with Harmonic products. Unless otherwise agreed in writing Harmonic products are not designed nor intended for any application in which the failure of the product could cause personal injury or death.

NOTE: The information in this appendix may apply to purchased products only.

Important Safety Instructions

This section provides important safety guidelines for operators and service personnel. Specific warnings and cautions are found throughout the guide where they apply, but may not appear here. Please read and follow the important safety information, noting especially those instructions related to risk of fire, electric shock or injury to persons. You must adhere to the guidelines in this document to ensure and maintain compliance with existing product certifications and approvals. In this document, we use “product,” “equipment,” and “unit” interchangeably.

This equipment generates, uses, and can radiate radio frequency energy. It may cause harmful interference to radio communications if it is not installed and used in accordance with the instructions in this manual. Operation of this equipment in a residential area is likely to cause harmful interference. If this occurs, the user will be required to correct the interference at his or her own expense.

In event of conflict between the information in this document and information provided with the product or on our website for a particular product, this product documentation takes precedence.

Safety Symbols & Translated Safety, Warning & Caution Instructions (English)

To avoid personal injury or property damage, before you begin installing or replacing the product, read, observe, and adhere to all the following safety instructions and information. Harmonic products and/or product packaging may be marked with the safety symbols used throughout this document, when it is necessary to alert operators, users, and service providers to pertinent safety instructions in the manuals.
<table>
<thead>
<tr>
<th>Mark</th>
<th>Notes</th>
</tr>
</thead>
</table>
| ![Warning Symbol] | **Installing or Replacing the Product Unit Warning**  
- Only trained and qualified service personnel should be allowed to install, replace, or service this unit (refer AS/NZS 3260 Clause 1.2.14.3 Service Personnel).  
- Read the installation instructions before connecting the system to the power source.  
- When installing or replacing the unit, always make the ground connection first and disconnect it last.  
- Installation of the unit must comply with local and national electrical codes.  
- This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of special tool, lock and key or other means of security.  
- Use only specified replacement parts.  
- Do not use this unit in or near water. Disconnect all AC power before installing any options or servicing the unit unless instructed to do so by this manual. |
| ![Warning Symbol] | **Rack Mount Warning**  
- To prevent bodily injury when mounting or servicing this unit in a rack, special precautions must be taken to ensure your safety and stability of system:  
  - Conform to local occupational health and safety requirements when moving and lifting the equipment.  
  - Ensure that mounting of the unit by mechanical loading tools should not induce hazardous conditions.  
  - To avoid risk of potential electric shock, a proper safety ground must be implemented for the rack and each piece of equipment installed on it. |
| ![Warning Symbol] | **Chassis Warning**  
- Before connecting or disconnecting ground or power wires to the chassis, ensure that power is removed from the DC circuit.  
- To prevent personal injury or damage to the chassis, lift the unit only by using handles that are an integral part of the chassis, or by holding the chassis underneath its lower edge.  
- Any instructions in this guide that require opening the chassis or removing a board should be performed by qualified service personnel only.  
- Slots and openings in the chassis are provided for ventilation. Do not block them. Leave the back of the frame clear for air exhaust cooling and to allow room for cabling - a minimum of 6 inches (15.24 cm) of clearance is recommended. |
<table>
<thead>
<tr>
<th>Mark</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Warning</strong></td>
<td><strong>Electric Shock Warning</strong>&lt;br&gt;■ This unit might have more than one power cord. To reduce the risk of electric shock, disconnect the two power supply cords before servicing the unit.&lt;br&gt;■ Before working on a chassis or working near power supplies, unplug the power cord on AC units.&lt;br&gt;■ Do not work on the system or connect or disconnect cables during periods of lightning activity.&lt;br&gt;■ This unit is grounded through the power cord grounding conductor. To avoid electric shock, plug the power cord into a properly wired receptacle before connecting the product input or outputs.&lt;br&gt;■ Route power cords and other cables so that they are not likely to be damaged. Disconnect power input to unit before cleaning. Do not use liquid or aerosol cleaners; use only a damp cloth to clean chassis.&lt;br&gt;■ Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on. Do not insert anything into either of the system's two power supply cavities with power connected&lt;br&gt;■ Never install an AC power module and a DC power module in the same chassis.&lt;br&gt;■ Do not wear hand jewelry or watch when troubleshooting high current circuits, such as the power supplies.&lt;br&gt;■ To avoid fire hazard, use only the specified correct type voltage and current ratings as referenced in the appropriate parts list for this unit. Always refer fuse replacement to qualified service personnel.&lt;br&gt;■ This unit relies on the building’s installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 15A U.S. (240 VAC, 10A international) is used on the phase conductors (all current-carrying conductors).&lt;br&gt;■ To avoid electrocution ensure that the rack has been correctly grounded before switching on the unit. When removing the unit remove the grounding connection only after the unit is switched off and unplugged.</td>
</tr>
<tr>
<td><strong>Caution</strong></td>
<td><strong>Electrostatic Discharge (ESD) Caution</strong>&lt;br&gt;■ Follow static precaution at all times when handling this unit.&lt;br&gt;■ Always wear an ESD-preventive wrist or ankle strap when handling electronic components. Connect one end of the strap to an ESD jack or an unpainted metal component on the system&lt;br&gt;■ Handle cards by the faceplates and edges only; avoid touching the printed circuit board and connector pins.&lt;br&gt;■ Place any removed component on an antistatic surface or in a static shielding bag.&lt;br&gt;■ Avoid contact between the cards and clothing.&lt;br&gt;■ Periodically check the resistance value of the antistatic strap. Recommended value is between 1 and 10 mega-ohms (Mohms).</td>
</tr>
<tr>
<td>Mark</td>
<td>Notes</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>Laser Radiation Warning</td>
<td>Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Never operate a unit with a broken fibre or with a separated fiber connector.</td>
</tr>
<tr>
<td>Warning</td>
<td>Lithium Battery Handling Safety Instructions</td>
</tr>
<tr>
<td></td>
<td>■ CALIFORNIA PERCHLORATE ADVISORY: Some lithium batteries may contain perchlorate material. The following advisory is provided: &quot;Perchlorate Material - special handling may apply, see: <a href="http://www.dtsc.ca.gov/hazardous_waste/perchlorate/">www.dtsc.ca.gov/hazardous_waste/perchlorate/</a> for information&quot;.</td>
</tr>
<tr>
<td>Warning</td>
<td>■ Risk of explosion if battery is replaced incorrectly or with an incorrect type</td>
</tr>
<tr>
<td></td>
<td>■ Dispose of used batteries according to the manufacturer’s instructions</td>
</tr>
<tr>
<td></td>
<td>■ There are no user-serviceable batteries inside Harmonic products. Refer to Harmonic qualified personnel only to service the replaceable batteries</td>
</tr>
</tbody>
</table>

Symboles de sécurité et traduits de sécurité, d'avertissement et Attention Instructions (français)

Pour éviter des blessures ou des dommages matériels, avant de commencer l'installation ou le remplacement du produit, lire, observer, et de respecter toutes les instructions et informations de sécurité suivantes. Produits harmoniques et / ou l'emballage du produit peuvent être marqués avec les symboles de sécurité utilisés dans le présent document, lorsque cela est nécessaire pour alerter les opérateurs, les utilisateurs et les fournisseurs de services de consignes de sécurité pertinentes dans les manuels.
<table>
<thead>
<tr>
<th>Mark</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Installation ou remplacement de l'unité de produit Avertissement</td>
</tr>
<tr>
<td></td>
<td>- Il est vivement recommandé de confier l'installation, le remplacement et la maintenance de ces équipements à des personnels qualifiés et expérimentés. (voir AS / NZS 3260 article 1.2.14.3 du personnel de service).</td>
</tr>
<tr>
<td></td>
<td>- Avant de brancher le système sur la source d'alimentation, consulter les directives d'installation.</td>
</tr>
<tr>
<td></td>
<td>- Lors de l'installation ou le remplacement de l'appareil, la mise à la terre doit toujours être connectée en premier et déconnectée en dernier.</td>
</tr>
<tr>
<td></td>
<td>- L'équipement doit être installé conformément aux normes électriques nationales et locales.</td>
</tr>
<tr>
<td></td>
<td>- Cet appareil est à installer dans des zones d'accès réservé. Ces dernières sont des zones auxquelles seul le personnel de service peut accéder en utilisant un outil spécial, un mécanisme de verrouillage et une clé, ou tout autre moyen de sécurité.</td>
</tr>
<tr>
<td></td>
<td>- Utilisez uniquement des pièces de rechange spécifiées.</td>
</tr>
<tr>
<td></td>
<td>- Ne pas utiliser ce produit dans l'eau ni à proximité de l'eau. Débrancher toutes les prises d'alimentation secteur avant d'installer des options ou d'effectuer l'entretien de l'unité, à moins d'instructions contraires dans le présent manuel.</td>
</tr>
<tr>
<td></td>
<td>Rack Monture Avertissement</td>
</tr>
<tr>
<td></td>
<td>Pour éviter les blessures corporelles lors du montage ou l'entretien de cet appareil dans un rack, des précautions particulières doivent être prises pour assurer votre sécurité et la stabilité du système:</td>
</tr>
<tr>
<td></td>
<td>- Conformez-vous aux exigences de médecine du travail et de sécurité lorsque vous déplacez et soulevez le matériel.</td>
</tr>
<tr>
<td></td>
<td>- Assurez-vous que le montage de l'appareil par des outils de chargement mécaniques ne doit pas induire des conditions dangereuses.</td>
</tr>
<tr>
<td></td>
<td>- Pour éviter tout risque d'électrocution, le rack et chaque élément de l'équipement installé dans le rack doivent être correctement reliés à la terre.</td>
</tr>
<tr>
<td></td>
<td>Châssis Avertissement</td>
</tr>
<tr>
<td></td>
<td>- Avant de connecter ou de déconnecter les câbles d'alimentation (pôles et terre) du châssis, vérifiez que le circuit de courant continu est hors tension.</td>
</tr>
<tr>
<td></td>
<td>- Pour éviter toute blessure ou des dommages au châssis, soulevez l'unité uniquement par les poignées du châssis lui-même ou en portant celui-ci par le bord inférieur.</td>
</tr>
<tr>
<td></td>
<td>- Toutes les opérations du présent guide nécessitant l'ouverture du châssis ou le retrait d'une carte doivent être uniquement effectuées par du personnel d'entretien qualifié.</td>
</tr>
<tr>
<td></td>
<td>- Le châssis est muni de fentes et d'ouvertures d'aération. Ne pas les bloquer. Dégager l’arrière du cadre pour permettre le refroidissement de l’évacuation d’air et laisser de la place au câblage; un dégagement d’au moins 15.24 cm (6 po) est recommandé.</td>
</tr>
</tbody>
</table>
### Choc électrique Avertissement

- Il est possible que cette unité soit munie de plusieurs cordons d'alimentation. Pour éviter les risques d'électrocution, débrancher les deux cordons d'alimentation avant de réparer l'unité.
- Avant de travailler sur un châssis ou à proximité d'une alimentation électrique, débrancher le cordon d'alimentation des unités en courant alternatif.
- Ne pas travailler sur le système ni brancher ou débrancher les câbles pendant un orage.
- Ce unité est mis à la terre par le conducteur de protection intégré au cordon d'alimentation. Pour éviter les chocs électriques, brancher le cordon d'alimentation dans une prise correctement cable avant de raccorder les entrées ou sorties du unité.
- Installer les cordons d'alimentation et autres cables de sorte qu'ils ne risquent pas d'être endommagés. Couper l'alimentation avant nettoyage. Ne pas utiliser de nettoyant liquide ou en aérosol; utiliser seulement un linge humide.
- Des courants électriques dangereux circulent dans cet appareil. Afin d'éviter les lessures, ne pas toucher les connexions et composants exposés lorsque l'appareil est sous tension. Ne rien insérer dans l'une ou l'autre des cavités des prises de courant du système lorsque l'appareil est sous tension.
- N'installez jamais un module d'alimentation AC et un module d'alimentation DC dans le même châssis.
- Ne pas porter de bijoux aux mains ni de montre durant le dépannage des circuits à haute tension, comme les transformateurs.
- Pour prévenir les risques d'incendie, n'utiliser que le type, la tension et le courant nominal spécifiés dans la nomenclature des pièces de ce unité. Toujours confier le remplacement des fusibles à du personnel d'entretien qualifié.
- Pour ce qui est de la protection contre les courts-circuits (surtension), ce produit dépend de l'installation électrique du local. Vérifier qu'un fusible ou qu'un disjoncteur de 120 V alt., 15 A U.S. maximum (240 V alt., 10 A international) est utilisé sur les conducteurs de phase (conducteurs de charge).
- Pour éviter l'électrocution, assurez-vous que le rack a bien été mis à la terre avant de mettre l'unité en marche. Lors du retrait de l'unité, retirer le raccordement de terre seulement après avoir mis l'unité à l'arrêt et l'avoir débranchée.
<table>
<thead>
<tr>
<th>Mark</th>
<th>Sicherheit Symbole und übersetzt Sicherheit, Achtung &amp; Vorsicht Anleitung (Deutsch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention</td>
<td>Les décharges électrostatiques (ESD) Attention</td>
</tr>
<tr>
<td></td>
<td>- Respecter systématiquement les precautions relatives aux charges électrostatiques durant la manipulation de cet unité.</td>
</tr>
<tr>
<td></td>
<td>- Portez toujours un poignet ou la cheville bracelet antistatique préventive lors de la manipulation des composants électroniques. Branchez une extrémité de la sangle à une prise ESD ou d’un composant métallique non peinte sur le système.</td>
</tr>
<tr>
<td></td>
<td>- Manipulez les cartes en les faces avant et les bords seulement; éviter de toucher la carte de circuit imprimé et les broches du connecteur.</td>
</tr>
<tr>
<td></td>
<td>- Placer un composant retiré sur une surface antistatique ou dans un sac de protection statique.</td>
</tr>
<tr>
<td></td>
<td>- Éviter tout contact entre les cartes et les vêtements.</td>
</tr>
<tr>
<td></td>
<td>- Vérifier périodiquement la valeur de résistance de la sangle antistatique. Valeur recommandée est comprise entre 1 et 10 mega-ohms (Mohms).</td>
</tr>
<tr>
<td>Avertissement</td>
<td>Rayonnement laser Attention</td>
</tr>
<tr>
<td></td>
<td>- Rayonnement laser invisible peut être émis à partir de fibres ou les connecteurs débranchés. Ne pas regarder en faisceaux ou regarder directement avec des instruments optiques. Ne jamais faire fonctionner une unité en cas de bris d’une fibre ou de séparation d’un connecteur de fibre.</td>
</tr>
<tr>
<td>Avertissement</td>
<td>Batterie au lithium Manipulation instructions de sécurité</td>
</tr>
<tr>
<td></td>
<td>- Perchlorate pour la Californie Consultatif: Certaines batteries au lithium, peuvent contenir du perchlorate. le texte qui suit consultatif est prévu: &quot;Présence de perchlorate - une manipulation spéciale peut s’appliquer, voir: <a href="http://www.dtsc.ca.gov/hazardous">www.dtsc.ca.gov/hazardous</a> waste/perchlorate/ for information&quot;.</td>
</tr>
<tr>
<td>Attention</td>
<td>Il y a danger d’explosion si la batterie est remplacée de manière incorrecte ou par une batterie de type incorrect.</td>
</tr>
<tr>
<td></td>
<td>- Mettre au rebut les batteries usagées conformément aux instructions du fabricant.</td>
</tr>
<tr>
<td></td>
<td>- Les batteries des produits Harmonic ne peuvent pas être réparées ni entretenues par l’utilisateur. Ne confier l’entretien des batteries remplaçables qu’à du personnel compétent de Harmonic.</td>
</tr>
</tbody>
</table>
### Installation oder den Austausch des Produkts Einheit Warnung

- Das Installieren, Ersetzen oder Bedienen dieser Ausrüstung sollte nur geschultem, qualifiziertem Personal gestattet worden (siehe AS / NZS 3260 Clause 1.2.14.3 Servicepersonal)
- Lesen Sie die Installationsanweisungen, bevor Sie das System an die Stromquelle anschließen.
- Der Erdanschluß muß bei der Installation der Einheit immer zuerst hergestellt und zuletzt abgetrennt werden.
- Die Installation der Geräte muss den Sicherheitsstandards entsprechen.
- Verwenden Sie nur die angegebenen Ersatzteile

### Rack-Montage-Warnung

Zur Vermeidung von Körperverletzung beim Anbringen oder Warten dieser Einheit in einem Gestell müssen Sie besondere Vorkehrungen treffen, um sicherzustellen, daß das System stabil bleibt:

- Entsprechen den lokalen Arbeitsschutzanforderungen beim Bewegen und Heben der Ausrüstung.
- Stellen Sie sicher, dass die Montage des Gerätes durch mechanische Belastung Werkzeuge sollten nicht gefährlichen Bedingungen zu induzieren.
- Um das Risiko von möglichen elektrischen Schlag zu vermeiden, muss mit einer angemessenen Erdung für Rack und jedes Gerät installiert ist implementiert werden.

### Chassis Warnung

- Gleichstrom-Unterbrechung Bevor Sie Erdungs- oder Stromkabel an das Chassis anschließen oder von ihm abtrennen, ist sicherzustellen, daß der Gleichstrom-Stromkreis unterbrochen ist.
- Um Verletzungen und Beschädigung des Chassis zu vermeiden, sollten Sie das Chassis nicht an den Henkeln auf den Elementen (wie z.B. Stromanschlüsse, Kühlungen oder Karten) heben oder kippen; oder indem Sie es unterhalb der Unterkante packen.
- Alle Hinweise in diesem Handbuch, die das Öffnen benötigen Sie das Gehäuse oder das Entfernen eines Board sollte nur von qualifiziertem Fachpersonal durchgeführt werden.

<table>
<thead>
<tr>
<th>Mark</th>
<th>Notes</th>
</tr>
</thead>
</table>
| ![Warnung] | **Installation oder den Austausch des Produkts Einheit Warnung**  
- Das Installieren, Ersetzen oder Bedienen dieser Ausrüstung sollte nur geschultem, qualifiziertem Personal gestattet worden (siehe AS / NZS 3260 Clause 1.2.14.3 Servicepersonal)  
- Lesen Sie die Installationsanweisungen, bevor Sie das System an die Stromquelle anschließen.  
- Der Erdanschluß muß bei der Installation der Einheit immer zuerst hergestellt und zuletzt abgetrennt werden.  
- Die Installation der Geräte muss den Sicherheitsstandards entsprechen.  
- Verwenden Sie nur die angegebenen Ersatzteile  
| ![Warnung] | **Rack-Montage-Warnung**  
Zur Vermeidung von Körperverletzung beim Anbringen oder Warten dieser Einheit in einem Gestell müssen Sie besondere Vorkehrungen treffen, um sicherzustellen, daß das System stabil bleibt:  
- Entsprechen den lokalen Arbeitsschutzanforderungen beim Bewegen und Heben der Ausrüstung.  
- Stellen Sie sicher, dass die Montage des Gerätes durch mechanische Belastung Werkzeuge sollten nicht gefährlichen Bedingungen zu induzieren.  
- Um das Risiko von möglichen elektrischen Schlag zu vermeiden, muss mit einer angemessenen Erdung für Rack und jedes Gerät installiert ist implementiert werden. |
| ![Warnung] | **Chassis Warnung**  
- Gleichstrom-Unterbrechung Bevor Sie Erdungs- oder Stromkabel an das Chassis anschließen oder von ihm abtrennen, ist sicherzustellen, daß der Gleichstrom-Stromkreis unterbrochen ist.  
- Um Verletzungen und Beschädigung des Chassis zu vermeiden, sollten Sie das Chassis nicht an den Henkeln auf den Elementen (wie z.B. Stromanschlüsse, Kühlungen oder Karten) heben oder kippen; oder indem Sie es unterhalb der Unterkante packen.  
- Alle Hinweise in diesem Handbuch, die das Öffnen benötigen Sie das Gehäuse oder das Entfernen eines Board sollte nur von qualifiziertem Fachpersonal durchgeführt werden.  
<table>
<thead>
<tr>
<th>Mark</th>
<th>Elektroschock-Warnung</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diese Einheit hat möglicherweise mehr als ein Netzkabel. Zur Verringerung der Stromschlaggefahr trennen Sie beide Netzgerätekabel ab, bevor Sie die Einheit warten.</td>
</tr>
<tr>
<td></td>
<td>Vor der Arbeit an einem Chassis für Arbeiten in der Nähe Stromversorgung, ziehen Sie das Netzkabel mit Netzeinheiten.</td>
</tr>
<tr>
<td></td>
<td>Arbeiten Sie nicht am System und schließen Sie keine Kabel an bzw. trennen Sie keine ab, wenn es gewittert.</td>
</tr>
<tr>
<td></td>
<td>Dieses Gerät ist über das Netzkabel Erdungsleiter geerdet. Um einen Stromschlag zu vermeiden, stecken Sie das Netzkabel in eine Steckdose richtig verdrahtet, bevor Sie das Produkt Eingang oder Ausgänge.</td>
</tr>
<tr>
<td></td>
<td>Verlegen Sie Netzkabel und andere Kabel, so dass sie wahrscheinlich nicht beschädigt werden. Trennen Eingangsleistung Einheit vor der Reinigung. Verwenden Sie keine flüssigen oder Aerosolreiniger; nur mit einem feuchten Tuch zu reinigen Chassis.</td>
</tr>
<tr>
<td></td>
<td>Ein Wechselstromsmodul und ein Gleichstrommodul dürfen niemals in demselben Chassis installiert werden.</td>
</tr>
<tr>
<td></td>
<td>Tragen Sie keine Hand Schmuck oder schauen Sie bei der Fehlersuche hohen Stromkreise, wie beispielsweise die Stromversorgung.</td>
</tr>
<tr>
<td></td>
<td>Um die Brandgefahr zu vermeiden, verwenden Sie nur den genannten richtige Art von Spannung und Strom Ratings als in der entsprechenden Stückliste für diese Einheit verwiesen. Beziehen sich immer auf Austausch der Sicherung von qualifiziertem Fachpersonal.</td>
</tr>
<tr>
<td></td>
<td>Um einen Stromschlag zu vermeiden, sicherzustellen, dass die Zahnsange wurde korrekt vor dem Einschalten des Gerätes geerdet. Beim Entfernen der Einheit entfernen Sie die Masseverbindung nur, nachdem das Gerät ausgeschaltet und der Netzstecker gezogen.</td>
</tr>
</tbody>
</table>
Site Preparation Instructions

NOTE: Only trained and qualified service personnel (as defined in IEC 60950 and AS/NZS 3260) should install, replace, or service the equipment. Install the system in accordance with the U.S. National Electric Code if you are in the United States.

1. Preparing & Choosing a Site for Installation
   - To ensure normal system operation, plan your site configuration and prepare the site before installation.
   - Install the unit in a restricted access area.

Table:

<table>
<thead>
<tr>
<th>Mark</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>❗️</td>
<td>Elektrostatische Entladung (ESD) Vorsicht</td>
</tr>
<tr>
<td>❗️</td>
<td>Folgen Sie statische vorsorglich zu jeder Zeit beim Umgang mit diesem Gerät.</td>
</tr>
<tr>
<td>❗️</td>
<td>Hand Karten nur durch die Faceplates und Kanten; Berühren Sie die bedruckte Leiterplatte und Steckerstifte.</td>
</tr>
<tr>
<td>❗️</td>
<td>Legen Sie alle entfernten Komponenten auf eine antistatische Oberfläche oder in einem Statik-Beutel.</td>
</tr>
<tr>
<td>❗️</td>
<td>Kontakt zwischen den Karten und Kleidung vermeiden.</td>
</tr>
<tr>
<td>❗️</td>
<td>Den Widerstandswert der gegen statische Gurt in regelmäßigen Abständen überprüfen. Empfohlener Wert ist zwischen 1 und 10 Mega-Ohm (MOhm).</td>
</tr>
<tr>
<td>👤</td>
<td>Laserstrahlungen Warnung.</td>
</tr>
<tr>
<td>🚨</td>
<td>Lithium-Batterie Handhabung Sicherheitshinweise</td>
</tr>
<tr>
<td>🚨</td>
<td>Bei Einsetzen einer falschen Batterie besteht Explosionsgefahr</td>
</tr>
<tr>
<td>🚨</td>
<td>Entsorgen Sie die benutzten Batterien nach den Anweisungen des Herstellers.</td>
</tr>
<tr>
<td>🚨</td>
<td>Es gibt keine zu wartenden Akkus im Harmonic Produkte. Siehe Harmonic qualifiziertes Personal, um die austauschbare Batterien Service</td>
</tr>
</tbody>
</table>
Appendix B Safety and Regulatory Compliance

Site Preparation Instructions

1. Site Selection
   - Choose a site with a dry, clean, well-ventilated and air-conditioned area.
   - Choose a site that maintains an ambient temperature of 32 to 104°F (0 to 40°C)

2. Creating a Safe Environment
   - Connect AC-powered systems to grounded power outlets or as per local regulations.
   - Do not move or ship equipment unless it is correctly packed in its original wrapping and shipping containers.
   - Only allow Harmonic trained personnel to undertake equipment service and maintenance. Do not permit unqualified personnel to operate the unit.
   - Wear ear protection when working near an NSG Pro platform for a longer period of time.

3. Rack Mounting the Unit
   - Install the system in an open rack whenever possible. If installation in an enclosed rack is unavoidable, ensure that the rack has adequate ventilation.
   - Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips). This unit should be mounted at the bottom of the rack if it is the only unit in the rack.
   - When mounting this unit in the partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
   - If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.
   - The rack must be anchored to an immovable support to prevent it from tipping when the unit is mounted on it. The rack must be installed according to the rack manufacturer’s instructions.
   - Disconnect all power and external cables before lifting the unit. Depending on the weight of the unit, more than one person might be required to lift it.

4. Power Considerations
   a. AC Power
      - Adding to the system a UPS (Uninterrupted Power Supply) and an AVR (Automated Voltage Regulator) is highly recommended.
      - Installing the main power supply by a qualified electrician, according to power authority regulations. Make sure all powering are wired with an earth leakage, according to local regulations.
      - It is recommended to install the encoder within 1.5m (approximately 5 feet) from an easily accessible grounded AC outlet.
      - When the encoder is rack-mounted, ensure that the rack is correctly grounded.
   b. DC Power
      - Ensure a suitable overcurrent device is in-line between the equipment and the power source.
      - Connect DC-input power supplies only to a DC power source that complies with the safety extra-low voltage (SELV) requirements in the UL60950-1, CAN/CSA-C22.2 No. 60950-1-03, AS/NZS 60950-1, EN/IEC 60825-1, 21 CFR 1040, EN 60950-1, and IEC 60950-1 standards.
      - Ensure that power is removed from the DC circuit before installing or removing power supplies.

5. Handling Fiber Channel Cables
   - Always read and comply with the handling instructions on the shipping container.
   - Follow all ESD precautions and approved fiber cleaning procedures.
The fiber is made of a very pure, expensive glass and should be treated with great care. Handle fibers only in areas that are very clean and do not contain sharp objects.

- Wear finger cots or gloves as dirt and oils can damage the fiber and contaminate connectors.
- Do not allow kinks or knots to develop in the fiber. If tangles occur, carefully work out the tangles avoiding pulling or bending the fibre beyond its bend radius.
- Always use the correct tools for stripping and cleaving the fiber. It will save time and reduce breakage caused by scratches.
- If you must secure a bundle of fiber cables together, avoid plastic and metal tie wraps; secure with velcro instead.

6. Disposing of the Unit
- Dispose of the unit and its components (including batteries) as specified by all national laws and regulations.

Product End-of-Life Disassembly Instructions

For disassembly instructions, please call the technical support in order to remove components requiring selective treatment, as defined by the EU WEEE Directive (2012/19/EU). See Contacting the Technical Assistance Center.

Product Disassembly Process
1. Disassemble equipment at a dedicated area only, gather the needed tools for disassembly.
2. Remove covers, housing, etc.
3. Remove and separate sub-assemblies (i.e. cables, metals, displays, fans, etc.).
4. Separate hazardous materials from the remainder of the material.
   a. Sort hazardous materials into their different types (i.e., batteries, hazardous liquids, hazardous solids, fiberglass, etc.).
   b. Proceed with hazardous waste management processes only.
5. Identify re-usable materials/sub-assemblies and separate these from the rest of the material.
6. Identify and separate recyclable materials as per below examples:
   a. Scrap material to be sent to smelter(s).
   b. E-waste such as displays, CPU’s, cables and wires, hard drives, keyboards, etc.
   c. Metals such as steel, brass, and aluminum.
   d. Plastics such as fan casings, housings, covers, etc.
   e. Fiber optics and plastic tubing not containing electrical or data wiring.

Safety Rules (English)
Recycler personnel are to wear personal protective equipment including proper eye protection, proper hand protection, and proper breathing protection if needed.

Recycler personnel shall be experienced with using the proper tools required for disassembling equipment. Untrained personnel shall not disassemble Harmonic products. Unfamiliarity with tools can cause damage and injury.

Règles de sécurité (French)
Le personnel du recyleur doit porter de l’équipement de protection individuelle, y compris des lunettes, des gants et un masque de protection appropriés au besoin.
Le personnel du recycleur doit avoir de l'expérience des outils de démontage de l'appareil. Les produits Harmonic ne doivent pas être démontés par du personnel non qualifié. Une mauvaise connaissance des outils peut causer des dommages et des blessures.

**EU Manufacturer's Declaration of Conformity**

This equipment is in compliance with the essential requirements and other provisions of Directives 73/23/EEC and 89/336/EEC as amended by Directive 93/68/EEC.

**NOTE:** For specifics, about which standards have been applied, refer to the Declaration of Conformity of the product on Harmonic website at [Product Regulatory Compliance](http://www.harmonicinc.com) or contact Harmonic Compliance Team at regulatory.compliance@harmonicinc.com

**Electromagnetic Compatibility Notices – Class A**

a. **FCC Verification Statement (USA)**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case users will be required to correct the interference at their own expense.

Connections between the Harmonic equipment and other equipment must be made in a manner that is consistent with maintaining compliance with FCC radio frequency emission limits. Modifications to this equipment not expressly approved by Harmonic may void the authority granted to the user by the FCC to operate this equipment and you may be required to correct any interference to radio or television communications at your own expense.

b. **ICES–003 Statement (Canada)**

**English:** This Class A digital apparatus complies with Canadian ICES-003.

**French:** Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

c. **CE Declaration of Conformity (European Union)**

This product has been tested in accordance too, and complies with the Low Voltage Directive (2014/30/EU) and EMC Directive (2014/35/EU). The product has been marked with the CE Mark to illustrate its compliance.
d. VCCI Class A Warning (Japan)

この装置は、情報処理装置等電波障害自主規制協議会（V C C I）の基準に基づくクラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

English translation of the notice above:
This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI) from Information Technology Equipment. If this equipment is used in a domestic environment, it may cause radio interference. When such trouble occurs, the user may be required to take corrective actions.

e. BSMI EMC Notice (Taiwan)

警告使用者：
這是甲類的資訊產品，在居住的環境中使用時，
可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策

English translation of the notice above:
This is a Class A Information Product, when used in residential environment, it may cause radio frequency interference, under such circumstances, the user may be requested to take appropriate counter measures.

f. Class A Warning (Korea)

주의 A급 기기 이 기기는 업무용으로 전자파 적합 등록을 한 기기이 오니 판매자 또는 사용자는 이 점을 주의하시기 바라며 만약 잘못 판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

English translation of the notice above:
This is a Class A device and is registered for EMC requirements for industrial use. The seller or buyer should be aware of this. If this was sold or purchased by mistake, it should be replaced with a residential-use type.

g. Class A Statement (China)

中华人民共和国“A类”警告声明

声明

此为A级产品，在生活环境种，该产品可能会造成无线电干扰，在这种情况下，可能需要用户对其采取切实可行的措施。

English translation of the notice above:
When labeled with the CCC marking, the product meets the applicable safety and EMC requirements for China. This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

h. Class A Warning – CISPR 22 (AS/NZS)

Warning (English)

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Attention (French)

Il s’agit d’un produit de classe A. Dans un environnement local, ce produit peut entraîner des perturbations radioélectriques, auquel cas l’utilisateur devra éventuellement prendre des mesures adéquates.

Product Regulatory Compliance

Harmonic products are typically tested to the latest safety and electromagnetic compatibility (EMC) specifications and test methods, and are marked with one or more of the following regulatory/certification markings. Some of the certification markings will vary depending on what certifier was used to obtain a certification.

Please visit Harmonic Product Regulatory Compliance page to view information on applied safety & EMC standards and regulatory marks on Harmonic products. You can also email us at regulatory.compliance@harmonicinc.com for assistance on regulatory compliance for Harmonic products.

Product Regulatory Compliance Markings

Table B–1: Regulatory Compliance Markings

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Testing Standard/Specification</th>
<th>Certification Type</th>
<th>Regulatory Mark Name</th>
<th>Product Marketing</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA/Canada</td>
<td>FCC CFR 47 Part 15, Class A ICES-003: Issue 5, 2012; Class A</td>
<td>EMC</td>
<td>FCC Class A Statement</td>
<td></td>
</tr>
</tbody>
</table>

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
## Table B–1: Regulatory Compliance Markings

<table>
<thead>
<tr>
<th>Country/ Region</th>
<th>Testing Standard/ Specification</th>
<th>Certification Type</th>
<th>Regulatory Mark Name</th>
<th>Product Marketing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>EN 60950-1; EN60825-1 (for laser)</td>
<td>Safety</td>
<td>GS</td>
<td><img src="image" alt="GS" /></td>
</tr>
<tr>
<td>Mexico</td>
<td>NOM-019-SCFI-1998</td>
<td>Safety</td>
<td>NOM</td>
<td><img src="image" alt="NOM" /></td>
</tr>
<tr>
<td>Taiwan</td>
<td>CNS 14336-1:2010 CNS 13438:2006; Class A</td>
<td>Safety and EMC</td>
<td>BSMI Certification (RPC Number &amp; Class A Warning)</td>
<td><img src="image" alt="BSMI" /></td>
</tr>
<tr>
<td>Japan</td>
<td>VCCI V-3/2013.04; CISPR 22:2008, Class A</td>
<td>EMC</td>
<td>VCCI</td>
<td><img src="image" alt="VCCI" /></td>
</tr>
<tr>
<td>Australia and New Zealand</td>
<td>AS/NZS CISPR22:2009+A1:2010; Class A</td>
<td>Safety</td>
<td>C-Tick</td>
<td><img src="image" alt="C-Tick" /></td>
</tr>
<tr>
<td>Korea</td>
<td>KN22 Class A and KN 24</td>
<td>EMC</td>
<td>KC</td>
<td><img src="image" alt="KC" /></td>
</tr>
</tbody>
</table>
Appendix B Safety and Regulatory Compliance Information

Harmonic manufactures high quality and innovative IT and telecommunications equipment, video delivery infrastructure solutions and services for its customers worldwide. Harmonic is committed to providing our customers with safe and environmentally friendly products that are compliant with all relevant regulations, customer specifications, and environmental legislation, including the directives described below.

**EU RoHS**

In July 2006, the European Union’s (EU) Directive (2002/95/EC) on the Restriction of the use of certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment (EEE) went into effect, and in July, 2011, the European Union’s RoHS Recast Directive (2011/65/EU) also known as RoHS II entered into force.

Harmonic understands the environmental risks associated with the substances covered by the RoHS Directive and has committed to eliminating or reducing the use of these, as well as other environmentally sensitive substances in our products. Harmonic also continues to comply with the requirements under RoHS II.

For more information, please visit EU RoHS directive page at official EU website.


**Restricted Substance Statement**

Harmonic products contain less than the permitted limits for the six restricted substances except where exemptions published in the RoHS2 Directive are applicable. This statement is based on vendor-supplied analysis or material certifications, and/or lab test results of the component raw materials used in the manufacture of Harmonic products.

\[
\begin{array}{|c|c|}
\hline
\text{Restricted Substance} & \text{Permitted Limit}\ast \\
\hline
\text{Cadmium (Cd)} & \leq 0.01\% \\
\text{Lead (Pb)} & \leq 0.1\% \\
\text{Chromium (VI) (Cr (VI))} & \leq 0.1\% \\
\text{Mercury (Hg)} & \leq 0.1\% \\
\hline
\end{array}
\]

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Appendix B Safety and Regulatory Compliance

Table B–2: Restricted Substances

<table>
<thead>
<tr>
<th>Restricted Substance</th>
<th>Permitted Limit*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polybrominated biphenyls (PBBs)</td>
<td>≤ 0.1%</td>
</tr>
<tr>
<td>Polybrominated diphenyl ether (PBDE)</td>
<td>≤ 0.1%</td>
</tr>
</tbody>
</table>

*Homogeneous material definition as per the EU Directive.

EU REACH


Harmonic supports the basic aim of REACH in improving the protection of human health and environment through the better and earlier identification of intrinsic properties of chemical substances. Harmonic products are considered “articles” under REACH; therefore, we are required to provide recipients of our products with information on Substance of Very High Concern (SVHC) present in concentration above 0.1% (w/w).

Substances in our products are not intended to be released under normal or reasonably foreseeable conditions of use; therefore, the registration requirement in REACH Article 7(1) does not apply to our products.

For more information, please visit REACH regulation page at official EU website.

http://ec.europa.eu/environment/chemicals/reach/reach_en.htm

China RoHS

China’s regulation on restriction of the use of certain hazardous substances commonly (China RoHS), is applicable to all Electronic and Information Products (EIPs) and parts sold in China after March 01, 2007. China RoHS regulation restricts the use of the same six substances as the European Union’s ROHS, but has requirements for product labeling and regulated substance information disclosure.

Harmonic complies with China RoHS Phase I for labeling and information disclosure requirements and continues to monitor new developments in China RoHS Phase II towards substance restriction and certification program.

For more information, please visit China RoHS regulation page at official US export website.

http://www.export.gov/china/doingbizinchina/
China RoHS Disclosure Report

Below table shows the presence of hazardous substances, or elements in Harmonic products, if the part is present.

This table shows those components where hazardous substances may be found in Harmonic products based on, among other things, material content information provided by third party suppliers. These components may or may not be part of the product.

The Environmental Protective Use Period for Harmonic products is 20 years unless displayed otherwise on the product. The EUP period is valid only when the products are operated or stored as per the conditions specified in the product manual.

<table>
<thead>
<tr>
<th>部件名称 (Part name)</th>
<th>有毒有害物质或元素 (Hazardous Substance)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>铅 (PB)</td>
</tr>
<tr>
<td>印刷线路板 (Printed Circuit Assemblies)</td>
<td>X</td>
</tr>
<tr>
<td>机械组件 (Mechanical Subassemblies)</td>
<td>X</td>
</tr>
<tr>
<td>光学组件 (Optical Subassemblies)</td>
<td>X</td>
</tr>
<tr>
<td>电源 (Power Supplies)</td>
<td>X</td>
</tr>
<tr>
<td>缆线 / 线束 (Cables, harnesses)</td>
<td>X</td>
</tr>
<tr>
<td>屏幕 / 显示器 (Screens, Monitors)</td>
<td>X</td>
</tr>
<tr>
<td>金属零件 (Metal Parts)</td>
<td>X</td>
</tr>
<tr>
<td>塑料 / 发泡材料 (Plastics, foams)</td>
<td>O</td>
</tr>
<tr>
<td>电池 (Batteries)</td>
<td>O</td>
</tr>
</tbody>
</table>

O: 表示在该部件的所有均质材料中，此类有毒有害物质的含量均小于 SJ/T11363-2006 标准所规定的限量。

X: 表示至少在该部件的某一均质材料中，此类有毒有害物质的含量超出 SJ/T11363-2006 标准规定的限量。
Other RoHS and REACH type Regulations
Harmonic will comply with RoHS and REACH type regulations evolving in other countries, if they become relevant to our products or in markets where we sell our products.

Waste Electrical and Electronic Equipment (WEEE)
European Parliament and the Council of the European Union’s WEEE Directive (2002/96/EC) came into force on August, 2005 and, were more recently amended in July, 2012. This directive encourages the reuse, recycling, and recovery of WEEE and to improve the environmental performance of all operators involved in the life cycle of electrical and electronic equipment, especially those dealing with WEEE. Harmonic ensures that all requirements for registration, reporting, design and data tracking are complied with to meet the objectives of the WEEE directive.

For more information, please visit WEEE directive page at official EU website.


Battery Directive
In September 2006, the European Union’s Directive 2006/66/EC (Battery Directive) came into force with an aim to prohibit the sale of batteries and accumulators containing hazardous substances and to set rules and promote collection, treatment, recycling and disposal of waste batteries and accumulators. This directive applies to spent batteries collected together with WEEE and requires their removal and separate collection. Once removed from WEEE, spent batteries are governed by the Battery Directive. Harmonic uses lithium batteries in its products and our responsibility under the Battery Directive is taken care of under our WEEE Take-Back program.

For more information, please visit Batteries and Accumulators directive page at official EU website.

http://ec.europa.eu/environment/waste/batteries/

Harmonic is committed to manufacturing environmentally safe products for the community, and will make reasonable efforts and required adjustments to its practices, if necessary, to comply with various environmental directives and industry initiatives on the elimination of hazardous substances, labeling, marking, certification and registration as required in markets where we sell our products.

Download Harmonic’s Environmental Compliance Statement at the following location:


WEEE Take-Back Request Program
In order to assist EU member states to preserve, protect and improve the quality of the environment, protect human health and utilize natural resources prudently and rationally, Harmonic strives to recycle in compliance with the WEEE Directive any of its products that cannot be re-used.

Harmonic’s customers should:
- Not discard equipment in household or office garbage
- Arrange proper recycling of unneeded equipment. For the take-back of Harmonic equipment, customers must:
  - Collect the information required to complete Harmonic’s WEEE Take-Back Request form

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- Arrange proper recycling of unneeded equipment. For the take-back of Harmonic equipment, customers must:
  - Collect the information required to complete Harmonic’s WEEE Take-Back Request form
Appendix B Safety and Regulatory Compliance Information

Compliance with additional country specific environmental, safety and EMC standards:

- Complete and submit the online WEEE Take-Back Request form. Please note that forms must be fully completed in order to prevent process delays
- Receive instant online confirmation indicating the reference number
- Receive the End of Life (EOL) asset return authorization number and instruction for EOL asset return

- Not ship EOL product to Harmonic without a Harmonic-provided EOL asset return authorization number

The crossed-out wheeled bin symbol on a Harmonic-branded commercial product indicates that the product should not be disposed of along with municipal waste, but invites our customers to return the product to us under Harmonic’s WEEE Take-Back program for product disposal.

Harmonic will pay for the cost of shipping and will provide a Certificate of Recycling or a Certificate of Destruction upon request. For more information on collection, reuse and recycling or to initiate the WEEE take-back process, please complete the form at http://www.harmonicinc.com/webform/weee-takeback-request or contact Harmonic Technical Assistance Center (TAC) or email RMA team at rma.emea@harmonicinc.com.

Compliance with additional country specific environmental, safety and EMC standards:

In addition to above listed standards and compliance regulations, Harmonic products may also be compliant with other country specific environmental, safety and EMC requirements. Please contact Harmonic Compliance Team at regulatory.compliance@harmonicinc.com or your local sales representative for more information about compliance with particular country or standard.