Interplay® Central Services

Version 1.8 Installation & Configuration Guide

ICS Version: 1.8
Document Version: 1.0.1

Important Information

This document provides instructions to install and configure Avid Interplay Central Services (ICS) version 1.8 for use with Interplay Central 1.8, Sphere (latest plug-in for Media Composer 6.5.x and 7.0.x and corresponding NewsCutter versions), and Interplay MAM 4.3.x.

For the latest information on the Interplay Central Services, see the documentation available from the Interplay Central Services page of the Avid Knowledge Base. Updates are occasionally issued after initial release.

http://avid.force.com/pkb/articles/en_US/readme/Avid-Interplay-Central-Services-Version-1-8-Documentation

> ***Important**: Search the Avid Knowledge Base ICS 1.8 web page for the most up-to-date **ICS 1.8 Installation and Configuration Guide**, which contains the latest information that might have become available after this document was published.*
>
> ***Note**: For information on upgrading to ICS 1.8 from an earlier release, see the* ICS 1.8 Upgrading Guide*, available from the Avid Knowledge Base ICS 1.8 web page.*

Revision History

Date Revised	Version	Changes Made
March 24, 2014	1.0	First publication
July 30, 2014	1.0.1	New section "***Verifying the hosts file Contents***". Updated "***Adding Host Names and IP Addresses to the hosts File***". Removed redundant editing of *rc.local* file from "***Mounting the GlusterFS Volumes in Linux***".

About ICS 1.8

Please see the ***Interplay Central Services 1.8 ReadMe*** and any ReadMe documents pertaining to the solution(s) by which ICS is used.

Contents

Part I: Introduction & Overview

Welcome

Welcome to the ***ICS Installation and Configuration Guide***. This document will guide you through the installation and set up of the Interplay Central Services (ICS) software components. It provides step by step instructions to visually verify the hardware setup, install Linux and the ICS software, and configure the software systems that will make use of ICS. It also provides detailed steps for optional activities, for example: setting up a cluster of ICS servers, or configuring for an iPad-only deployment.

> ***Note**: Beginning with version 1.6, the term "Interplay Central Services" replaces "Interplay Common Services." In addition, the term "Interplay Central Playback Service" replaces "Interplay Common Playback Service."*

ICS is a set of software services running under the Linux operating system. ICS serves layouts for applications, provides user authentication, manages system configuration settings, and provides proxy-based playback of video assets over the network to web-based and mobile clients.

ICS supports several different Avid Integrated Media Enterprise (IME) solutions, including Interplay Central, and Interplay Sphere, and Interplay MAM. ICS installs on its own set of servers, distinct from the IME solution it is supporting. Multiple ICS servers can be clustered together to obtain one or more of high-availability, load balancing and scalability.

> ***Note**: Refer to the "How to Buy Hardware for Interplay Central Services" guide for detailed information on hardware specifications and deployment options. The guide is available on the Avid Knowledge Base ICS 1.8 web page.*

The installation and configuration steps vary depending on the deployment model, target hardware, and optional steps. For example, installations on qualified HP servers can use an express process involving a USB key and the supplied Red Hat Enterprise Linux kickstart (*ks.cfg*) file. Kickstart files are commonly used in Linux installs to automatically answer questions for hardware known in advance. On non-HP servers you must install Red Hat Enterprise Linux manually.

> ***Note**: All decisions pertaining to hardware, deployment model, optional activities (such as setting up a cluster), network connections (GigE vs 10GigE), must be made before beginning the installation. If these decisions have not been taken, or, to verify a non-HP server, please consult an Avid representative.*

Red Hat Enterprise Linux — sometimes just called Red Hat, but referred to in this guide as RHEL — is a commercially supported, open source version of the popular Linux operating system. No matter what the deployment model and target hardware, the installation of RHEL is mandatory.

> ***Note**: ICS requires **RHEL 6.3**. Do not install any OS updates, patches. Do not upgrade to RHEL 6.4 or higher. Do not run the Linux* yum *update command.*

For more information on Red Hat see "***Working with Linux***" on page 24. RHEL licensing and support options are covered in the "***How to Buy Hardware for Interplay Central Services***" guide, available on the Avid Knowledge Base ICS 1.8 web page.

***Note**: Clock setting and synchronization play an important role in some ICS deployments. For a discussion of the issues associated with clock synchronization and using a time server to set the system clock, see "**Clock Synchronization in Linux**" on page 29.*

About this Guide

This guide provides all the instructions you need to set up ICS 1.8. The installation and configuration is complex and can be difficult, particularly if you are unfamiliar with Linux.

The following tips will ensure a smooth installation:

- Read the whole guide, thoroughly and all the way through, before beginning the installation process.
- Gather all the information required to perform the install before you start. Waiting until the information is called for by an installation step will result in considerable delays.
- For a list of required information, see "**Appendix L: Installation Pre-Flight Checklist**" on page 210.
- Complete all the relevant sections in the pre-flight checklist for your deployment.

Licensing and Additional Installation Information

Licenses must be installed on an iNEWS server, an Interplay Production server, or both. No licenses are installed on the Interplay Central Services server.

For Interplay Production, the license types are J (Interplay Production Base license) and G (Advance license).

- Base license: Can connect to only one system type: iNEWS or Interplay Production. Access is limited to specific panes.
- Advance license: Can connect to both system types: iNEWS and Interplay Production, with access to all panes.

***Note**: Please refer to the "*Interplay Central Administration Guide*" for licensing details, such as the panes and features made available by each license type. The guide is available with other Interplay Central v1.8 documentation on the Avid Knowledge Base:*

http://avid.force.com/pkb/articles/en_US/readme/Avid-Interplay-Central-Version-1-8-1-8-Documentation

Front End License Configuration

You specify the type of license for each Interplay Central role in the Details tab of the Users layout. For more information, see "*Interplay Central Client Licensing*" in the *Avid Interplay Central Administration Guide*.

Delivery of Licenses on Back-End Systems

An iNEWS client license or an Interplay Central mobile license for a specified number of clients is sent to the customer through email along with specific installation instructions. However, to ensure proper licensed integration between Interplay Central and iNEWS, additional modification to system files in the iNEWS database is also required.

For more information see "***Appendix J: Configuring iNEWS for Integration with Interplay Central***" on page 201.

An Interplay Production license for a specified number of clients is supplied to the customer on a USB flash drive as a file with the extension *nxn*.

For more information, see "***Appendix I: Installing the Interplay Production License for Interplay Central***" on page 200.

Installing the iPhone and iPad Apps

The Avid Central mobile application is a native user interface designed to run on the Apple iPad touch-screen tablet and the Apple iPhone touch-screen phone, and enable direct, secure access to your station's iNEWS newsroom computer system.

For installation information, see "***Appendix K: Installing and Configuring the Avid Central Mobile Application for the iPad or iPhone***" on page 205.

Intended Audiences and Prerequisites

This guide is aimed at the person responsible for performing a fresh install of ICS, or upgrading or maintaining an existing ICS installation. It can also be used by someone creating a cluster of ICS nodes out of a non-clustered setup. In particular, the following audiences have been identified:

- **Avid Professional Services**: Avid personnel whose responsibilities include installing and upgrading the ICS system, on-site at a customer' facility.
- **Avid Channel Partners and Resellers**: Selected organizations qualified by Avid to educate, market, sell, install, integrate and provide support for the Avid product line, including ICS.
- **In-House Installers:** Clients with a sophisticated in-house IT department that has expertise in systems integration and Linux (including networking, port-bonding, etc.). This kind of person might be called on to add a new server to an already established cluster of ICS servers, for example.

Basic Installation Skills

The following skills are needed to perform the basic installation:

- **Windows**: Format a USB key, unzip files, etc.
- **Server**: Access to the physical server, booting/rebooting, interrupting startup screens to enter BIOS and other utilities, navigating and altering BIOS, setting up RAIDs.
- **Network Interface Cards (NICs)**: Identify a NIC, knowledge of which NIC interface is being used.
- **Linux (install)**: Previous experience installing Linux is preferred but not essential, knowledge of manually installing RPM files will be helpful.
- **Linux (general)**: Work with Linux directories (cd, mkdir, ls), create volumes, mount/unmount directories, volumes and devices (e.g. USB key), verify the status of a Linux service.
- **Linux (file editing)**: Use the Linux text editor (vi) to open/create files, add/delete text, save/close files, etc.
- **Networking**: An understanding of network topologies and Ethernet protocols (TCP/IP), using *ping* command, verify/change a NIC card Ethernet interface (i.e. *eth0*).
- **System Clocks**: Setting the system clock in BIOS and in Linux. For a discussion of system clock options, see "***Clock Synchronization***" *on page* 29.

Clustering Skills

The following skills are desirable for setting up a cluster of ICS nodes:

- **Gluster**: Familiarity with Gluster, as it is used to create a shared pool of storage, including starting/stopping Gluster services, creating shared storage pools, creating GlusterFS volumes, etc.
- **Networking**: A basic understanding of unicast or multicast and IP networking. An advanced understanding of networking in Linux would be helpful, but is not essential, since all instructions are provided.

Interplay MAM Skills

The following skills are desirable or setting up ICS for Interplay MAM (port bonding optional):

- **Port Bonding (general)**: Knowledge of theory and practice of port bonding (also called link aggregation).
- **Port Bonding (Linux)**: Understanding contents and purpose of Linux **network-scripts** directory, editing interface configuration (ifcfg-ethN) files, restarting network services.

  ***Note**: Port bonding is an option that is exclusive to Interplay MAM installations. Do not perform port bonding when performing any other kind of install.*

- **Interplay MAM configuration**: Ability to work as administrator in Interplay MAM.

Deployment Options

ICS is a collection of software services designed to support a number of Avid enterprise solutions and deployment options. Since each deployment scenario has different hardware and software configuration requirements (and playback characteristics), it will be helpful to have a high-level overview of the deployment of interest before proceeding.

As noted, the installation follows one of these basic deployment models:

- **ICS for Interplay Central**
  - **iNEWS only**
  - **Interplay Production only**
  - **iNEWS and Interplay Production**
- **ICS for Interplay Sphere**
- **ICS for Interplay Central and Interplay Sphere (Shared ICS)**
- **ICS for Interplay MAM**

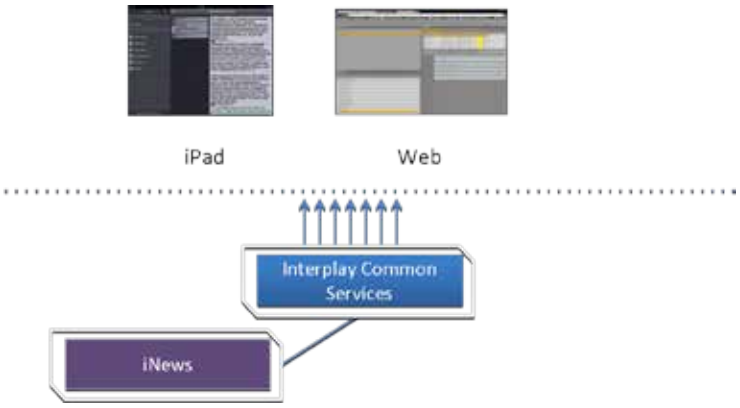
This section provides an overview of each of these deployments.

For a detailed technical summary of deployment options, see "***Appendix B: Table of Deployment Options and Requirements*** on page 150".

Interplay Central – iNEWS Only

One of the most straightforward deployments is ICS for Interplay Central in an iNEWS-only environment; that is, with connections to iNEWS but no connection to Interplay Production. In this deployment ICS provides the ability to browse and edit iNEWS content (queues, stories) from a remote web client. The ability to browse, play and edit associated video requires Interplay Production and is not provided by the iNEWS-only deployment.

Interplay Central for iNEWS:



The iNEWS-only deployment typically requires a RAID 1 (mirrored RAID) for the Linux operating system. Since ICS is not providing playback of any video assets, there is no need for caching, so the media cache volume referred to in this guide is not required. Typically, a single ICS server is sufficient. Two ICS servers configured as a cluster provide high-availability.

> ***Note**: The iNEWS-only deployment can be on smaller, less expensive server hardware. Refer to the "How to Buy Hardware for Interplay Central Services" guide for detailed information on hardware specifications and deployment options. The guide is available on the Avid Knowledge Base ICS 1.8 web page.*

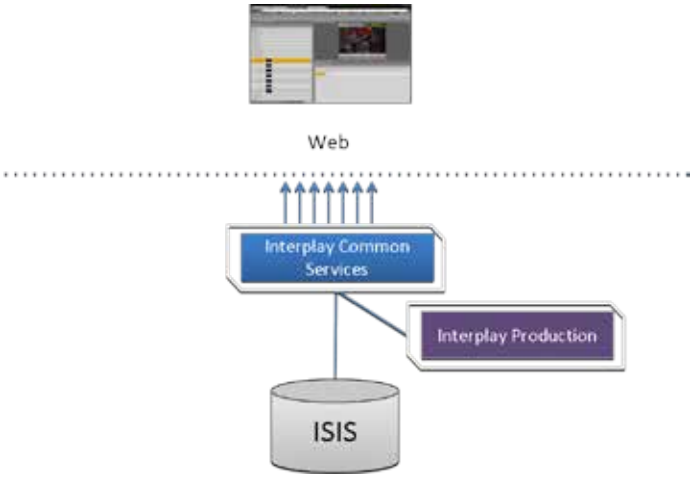
Deployment Summary:

- Browse and edit iNEWS content
- RAID 1 required
- Media cache volume not required
- Clustering yields high-availability

Interplay Central – Interplay Production Only

ICS for Interplay Central with Interplay Production has connections to Interplay Production only. In this deployment ICS serves layouts for applications, provides user authentication, manages system configuration settings, and provides proxy-based playback of video assets over the network to web-based and mobile clients. ICS decodes the source format and streams images and sound to the remote web-based Interplay Central client.

Interplay Central for Interplay Production:



This deployment typically requires two HDs configured as a RAID 1 (mirrored RAID) for the Linux operating system. No iOS devices implies no special caching requirements; however, Multicam requires a media drive. You can configure two or more ICS servers as a cluster to obtain high-availability and load balancing.

Deployment Summary:

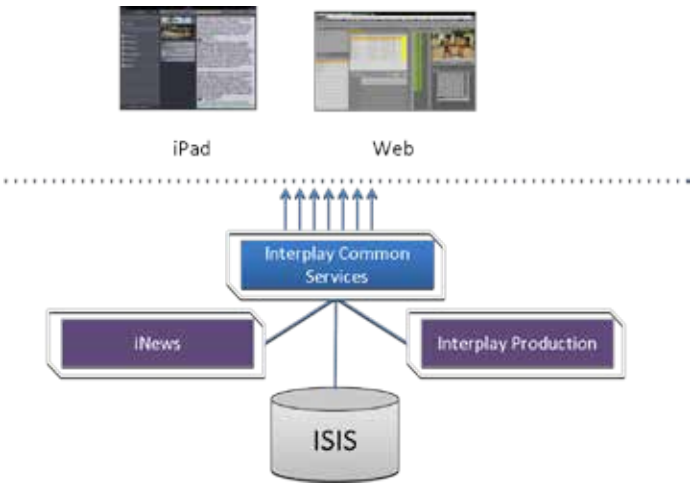
- Browse and play video assets
- RAID 1 required
- Media cache volume required
    - RAID 5, or
    - RAID 1, or
    - Single HD
- Clustering yields high-availability and load-balancing

Interplay Central – iNEWS and Interplay Production

ICS for Interplay Central with iNEWS and Interplay Production has both iNEWS connectivity and Interplay Production connectivity. Similarly to the iNEWS-only deployment, this provides the ability to browse and edit iNEWS content (queues, stories) from a remote web client. Interplay Production connectivity provides the ability to browse, play and edit associated video.

In this deployment ICS serves layouts for applications, provides user authentication, manages system configuration settings, and provides proxy-based playback of video assets over the network to web-based and mobile clients. ICS decodes ISIS source formats and streams images and sound to the remote web-based Interplay Central client.

Interplay Central with iNEWS and Interplay Production:



This deployment typically requires two HDs configured as a RAID 1 (mirrored RAID) for the Linux operating system. In a configuration where the iOS application is used, the ICS server should also have a media cache volume. Multicam also requires a media cache volume. You can configure two or more ICS servers as a cluster to obtain high-availability and load balancing.

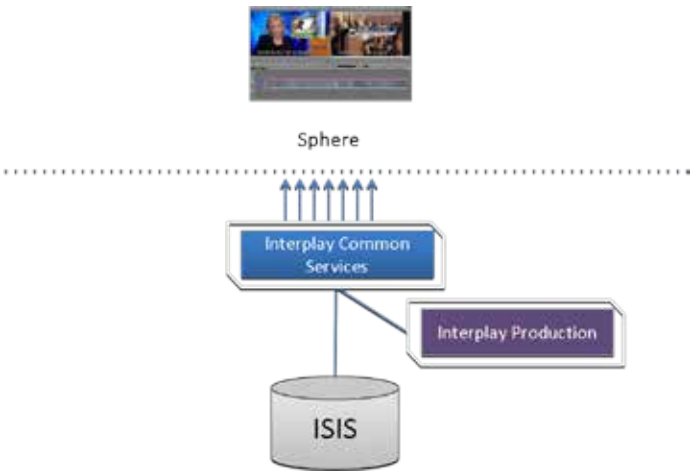
Deployment Summary:

- Browse and edit iNEWS content
- Browse and play the associated video assets
- RAID 1 required
- Media cache volume required
    - RAID 5, or
    - RAID 1, or
    - Single HD
- Clustering yields high-availability and load-balancing

Interplay Sphere Only

ICS for Interplay Sphere provides playback of different format video assets registered by Interplay Production and residing on an ISIS. ICS decodes the source format and streams images and sound to the remote Interplay Sphere enabled Media Composer or NewsCutter.

Interplay Sphere:



This deployment typically requires two HDs configured as a RAID 1 (mirrored RAID) for the Linux operating system. A media cache is also required. In its most basic form, the Interplay Sphere deployment is a single ICS server. You can configure two or more ICS servers as a cluster to obtain high-availability and load balancing.

Deployment Summary:

- Browse and play the video assets for Sphere enabled Media Composer and/or NewsCutter
- RAID 1 required
- Media cache volume required

- RAID 5, or
- RAID 1, or
- Single HD

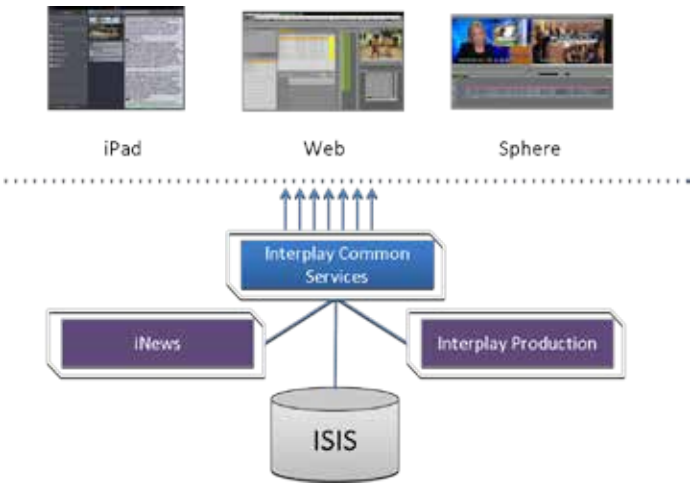
- Clustering yields high-availability and load-balancing

Both Interplay Central and Interplay Sphere (Shared ICS)

Interplay Central and Interplay Sphere can easily share the same ICS server(s). In this deployment, ICS serves layouts for applications, provides user authentication, and manages system configuration settings. ICS also provides proxy-base playback over the network of different format video assets registered by Interplay Production and residing on an ISIS. ICS decodes the source format and streams images and sound to the remote web-based Interplay Central and/or Interplay Sphere clients.

This is the most sophisticated deployment model, since other elements can also be present, such as iNEWS with corresponding iOS device applications.

Interplay Central and Interplay Sphere (Shared ICS):



This deployment typically requires a RAID 1 (mirrored RAID) for the Linux operating system. In a configuration with iOS devices (as with iNEWS), the ICS server should also have a media cache volume. If iOS devices are not deployed, it has no media cache volume requirements; however, multicam requires a media cache volume. You can configure two or more ICS servers as a cluster to obtain high-availability and load balancing.

Deployment Summary:

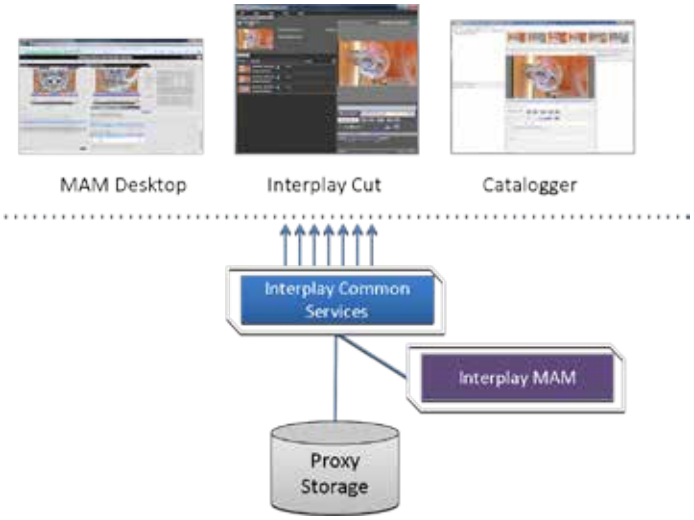
- Browse and play video assets
- Browse and play video assets
  for Sphere enabled Media Composer and/or NewsCutter
- RAID 1 required

- Media cache volume required
    - RAID 5, or
    - RAID 1, or
    - Single HD
- Clustering yields high-availability and load-balancing

Interplay MAM

In an Interplay MAM deployment, ICS provides playback of video assets registered as a browse proxies by Interplay MAM. The registered browse proxies can reside on standard filesystem storage, or proprietary storage that provides a standard system gateway. The Interplay MAM deployment presents two main options – setting up a media cache volume, and port bonding to improve throughput.

Interplay MAM:



This deployment typically requires a RAID 1 (mirrored RAID) for the Linux operating system. Under some circumstances – see "***Caching in ICS*** on page 22 – the ICS server should also have a media cache volume. You can configure two or more ICS servers as a cluster to obtain high-availability and load balancing.

Deployment Summary:

- Browse and play video assets
- RAID 1 required
- Media cache volume might be required
    - RAID 5, or
    - RAID 1, or
    - Single HD
- Clustering yields high-availability and load-balancing

Port Bonding in Interplay MAM

Port bonding (also called *link aggregation*) is an OS-level technique for combining multiple Ethernet ports into a group, making them appear and behave as a single port. Ethernet ports correspond to the physical connectors in a NIC card where network cables are plugged in. Bonded ports retain their individual cable connections to the network router or switch. However, they are seen by the network as a single port.

Port bonding must be configured in "round-robin" mode. In this mode, Ethernet packets are automatically sent, in turn, to each of the bonded ports, reducing bottlenecks and increasing the available bandwidth. For example, bonding two ports together in round-robin increases bandwidth by approximately 50% (some efficiency is lost due to overhead).

In MAM deployments of ICS, port bonding improves playback performance when multiple clients are making requests of the ICS server simultaneously. With port bonding, more concurrent playback requests can be sustained by a single server, especially for file-based playback. File-based playback is a playback method for which a single port-bonded ICS server can support thousands of requests.

For instructions on port bonding see "***Appendix C: Configuring Port Bonding for Interplay MAM (Optional)***" on page 152.

Port Requirements

The following table lists the ICS port requirements for the client-side applications (the browser-based Interplay Central application and mobile applications). Ports 80 and 443 are required for the HTTP(S) traffic. In addition, the Adobe Flash Player (running inside the browser) requires ports 843 and 5000.

For more information see the *ICS Security Architecture and Analysis* document.

Component	Port	Protocol and Direction	Usage
Interplay Central Web application	80	TCP inbound	Interplay Central Playback Service (ICPS) HTTP calls
	443	Secure TCP Inbound	IPC HTTPS calls
	843	TCP Inbound	Serving Flash Player socket policy files
	5000	TCP Inbound	Playback service (loading assets, serving JPEG images, and audio, etc.). Output flow to client serving inbound request.
Interplay Central mobile applications	80	TCP Inbound	ICPS HTTP calls
	443	Secure TCP Inbound	ICPS HTTPS calls

The following table lists the server-side port requirements. For more information see the *ICS Security Architecture and Analysis* document.

Service Name	Port
Interplay Central	80, 443
ICPS	843 (Flash), 80, 5000, 26000
ICS	8000 (optional Admin UI), 8183 (bus cluster info)
ISIS	5000 – 5399 (UPD and TCP)
RabbitMQ	5672 (AMQP), 15672 (Management UI/API)
MongoDB	27017
PostgreSQL	53087
System	22, ICMP, 111, 24007, 24008, 24009-(24009 + number of bricks across all volumes for gluster). If you will be using NFS, open additional ports 38465-(38465 + number of Gluster servers). Some MAM configuration might require additional NFS ports (111, 2049 tcp & udp) or CIFS (137,138 udp and 137,139 tcp). Other filesystems will have to be checked individually (Isilon, Harmonic Omneon, etc.).

Caching in ICS

In its work to provide proxy-based playback of video assets over a network, ICS generates temporary files in certain workflows. For example, ICS deployed for Interplay MAM typically generates a multitude of temporary files as it converts proxies from their native MAM formats into formats compatible with the player. The ICS multicam feature introduced in ICS 1.5 produces numerous temporary files. By default, ICS caches temporary files on the system drive. Better performance is achieved by allocating a dedicated media cache volume (separate from the system drive) for the temporary files. In a cluster setup, an open-source software solution called Gluster is also used.

> ***Note**: All Interplay Central deployments making use of multicam require a dedicated volume for media caching. Gluster is also required, for file replication between clustered caches.*

> ***Note**: This document provides instructions for creating a media cache volume as a RAID 5 using multiple disks in the server enclosure. However, other configurations are possible, including two drives in a RAID 1 configuration, or a single drive. For details, see the "**How to Buy Hardware for Interplay Central Services**" guide.*

The Dedicated Caching Volume

All ICS servers require a RAID 1 that mirrors the operating system across two HD drives. Some deployments also require a media cache volume consisting of the remaining disks in the

enclosure, used exclusively for ICS file caching. In a RAID 5 volume (recommended), the disk controller automatically distributes (stripes) data across all the disks in the RAID 5, yielding increased performance and redundancy.

In an ICS server cluster the media cache volume is taken one step further. An open source software solution called *Gluster* is used to replicate the contents of the media cache volumes across each server in the cluster. In this way, each ICS server in the cluster can make use of file data already transcoded and cached by the others.

> ***Note**: All Interplay Central deployments making use of multicam require a dedicated media cache volume for caching. Gluster is also required, for file replication between clustered caches.*

Caching for Interplay MAM

For caching, it is important to understand how MAM browse proxies get from proxy storage to the MAM desktop. For each playback request, ICS does one of the following:

- **File-based playback (native)**: When MAM proxies are in a format that an Adobe Flash-based player can play natively, ICS serves the proxy file as-is to the remote web-based client. Adobe Flash-based players natively play MP4-wrapped h.264/aac or FLV. This is the least CPU-intensive playback mode.
- **File-based playback (alternate)**: When file-based playback requests are made of proxy formats that cannot be played natively by an Adobe Flash-based player, ICS transcodes the proxy into FLV, which is stored in the ICS file cache on the media cache volume. This is then served to the remote web-based client. ICS regularly scans the media cache, and, when necessary, the least-requested files are purged.

  The above playback method has a one-time CPU hit on initial playback request for each asset, but is subsequently very light because the same cached file is served.
- **Frame-based playback**: This playback mode is the same one used by Interplay Central, and is required in MAM for “growing file” workflows and variable-speed playback. In this case ICS decodes the proxy and streams images and audio to the remote web-based client frame-by-frame. This is the most CPU-intensive playback mode.

ICS for Interplay MAM requires a dedicated media cache volume when registered browse proxies include formats that cannot be natively loaded in the Adobe Flash player. For example, if MAM registered browse proxies are MPEG-1, Sony XDCAM, MXF or WMV, a media cache volume are needed in ICS. This guide includes instructions for setting up a RAID level 5 cache.

Caching for iOS Devices in Interplay Central

In an Interplay Central deployment where an iOS application is used, the ICS server should have a dedicated media cache volume.

Caching for Sphere

Interplay Sphere caches the video and audio it receives locally on the editor (Media Composer and/or NewsCutter). With the introduction of multicam support for Sphere (in ICS 1.5) there

is also a dedicated media cache volume requirement for Sphere. This is a result of server-side caching of the multicam "grid" of proxy images. Sphere continues to cache video and audio locally.

Working with Linux

As noted, RHEL is a commercially supported, open source version of the Linux operating system. If you have run DOS commands in Windows or have used the Mac terminal window, the Linux environment will be familiar to you. While many aspects of the ICS installation are automated, much of it requires entering commands and editing files using the Linux command-line.

> ***Note**: RHEL is not free, and Avid does not redistribute it or include it as part of the ICS installation. RHEL licensing and support options are covered in the "**How to Buy Hardware for Interplay Central Services**" guide.*

Installing Linux

Installations on qualified HP servers can use an express process involving a USB key and the supplied RHEL kickstart (*ks.cfg*) file. Kickstart files are commonly used in Linux installs to automate the OS installation. A kickstart file automatically answers questions posed by the Linux installer, for hardware known in advance.

Since RHEL is a licensable product, redistribution by Avid is not possible. However, the ICS installation package includes a Windows executable (ISO2USB) for creating a bootable USB drive from a RHEL installation DVD or image (.iso) file. We use ISO2USB to prepare the USB drive to install the ICS components too.

> ***Note**: The USB key and kickstart file shortcuts apply only to ICS installations performed on qualified HP hardware. For non-HP hardware, see "*Appendix A: Installing ICS on Non-HP Hardware*" on page 148.*

Linux Concepts

Once RHEL is installed you can begin the work of setting up the server for ICS. This involves simple actions such as verifying the system time. It also involves more complex actions, such as verifying and modifying hardware settings related to networking, and editing files. Depending on the deployment, you may also be required to create logical volumes, configure port bonding, and perform other advanced actions.

Advance knowledge of the following Linux concepts will be helpful:

- ***root* user**: The *root* user (sometimes called the "super" user) is the Linux user with highest privileges. All steps in the installation are performed as *root*.
- **mounting**: Linux does not recognize HDs or removable devices such as USB keys unless they are formally *mounted*.
- **files and directories**: In Linux, everything is a file or a directory.

Key Linux Directories

Like other file systems, the Linux filesystem is represented as a hierarchical tree. In Linux directories are reserved for particular purposes. The following table presents some of the key Linux directories encountered during the ICS installation and configuration:

Directory	Description
/	The root of the filesystem.
/dev	Contains device files, including those identifying HD partitions, USB and CD drives, and so on. For example, sda1 represents the first partition (1) of the first hard disk (a).
/etc	Contains Linux system configuration files, including the filesystem table, fstab, which tells the operating system what volumes to mount at mount at boot-time.
/etc/udev/rules.d	Contains rules used by the Linux device manager, including network script files where persistent names are assigned to network interfaces. In Linux, every network interface has a unique name. If a NIC card has four connection "ports", for example, they might be named *eth0* through *eth3*.
/etc/sysconfig/network-scripts	Contains, amongst other things, files providing Linux with boot-time network configuration information, including which NIC interfaces to bring up.
/media	Contains the mount points for detachable storage, such as USB keys. In Linux, volumes and removable storage must be mounted before they can be accessed.
/opt	Contains add-on application packages that are not a native part of Linux, including the ICS components.
/usr	Contains user binaries, including some ICS components.
/tmp	The directory for temporary files.
/var	Contains data files that change in size (variable data), including the ICS server log files.

Linux Command Line

The Linux command line is a powerful tool that lets you perform simple and powerful actions alike with equal speed and ease. For example, entering the Linux list command, *ls*, at the root directory produces results similar to the following.

```
# ls

/bin     /boot    /dev     /etc
/lib     /media   /mnt     /opt
/sbin    /srv     /tmp     /usr
```

```
/var
```

In the above command, the pound sign (#) indicates the presence of the Linux command prompt. You do not type a dollar sign. Linux commands, paths, and file names are case-sensitive.

The following table presents a few of the more commonly used Linux commands.

Command	Description
ls	Lists directory contents. Use the –l option (hyphen lower-case L) for a detailed listing.
cd	Changes directories.
cat	Outputs the contents of the named file to the screen.
clear	Clears screen.
cp	Copies files and directories.
<tab>	Auto-completes the command based on contents of the command line and directory contents. For example, typing cd and the beginning of a directory name, then pressing the tab key fills in the remaining letters in the name.
| | more	"Pipes" the output from one command to the input of another. For example, to view the output of a command one screen at a time, pipe into the more command, as in: ls | more
dmesg	Displays messages from the Linux kernel buffer. Useful to see if a device (such as USB key) mounted correctly.
find	Searches for files. For example, the following use of the *find* command searches for <filename> on all local filesystems (avoiding network mounts): find / -mount -name <filename>
grep	Searches for the named regular expression. Often used in conjunction with the pipe command, as in: ps | grep avid
lvdisplay	Displays information about logical volumes.
man	Presents help (the "manual page") for the named command.
mkdir	Creates a new directory.
mount umount	Mounts and unmounts an external device to a directory. A device must be mounted before its contents can be accessed.

Command	Description
ps	Lists the running processes.
passwd	Changes the password for the logged-in user.
scp	Securely copies files between machines (across an ssh connection).
service	Runs an initialization script. e.g. service avid-all
tail	Shows you the last 10 (or *n*) lines in a file. e.g. tail <filename> tail -50 <filename> tail –f <filename> The "-f" option keeps the *tail* command outputting appended data as the file grows. Useful for monitoring log files.
udevadm	Requests device events from the Linux kernel. Can be used to replay device events and create/update the 70-persistent-net.rules file. e.g. udevadm trigger --action=add
vi	Starts a vi editing session.

Linux Text Editor (vi)

Linux features a powerful text editor called *vi*. To invoke vi, type the *vi* command followed by the target file at the command prompt.

```
$ vi <filename>
```

Vi operates in one of two modes, *insert* mode and *command* mode. Insert mode lets you perform text edits – insertion, deletion, etc. Command mode acts upon the file as a whole – for example, to save it or to quit without saving.

- Press the "i" (as in *Indigo*) key to switch to insert mode.
- Press the colon (":") key to switch to command mode.

The following table presents a few of the more useful vi commands.

Key Press		Description
Command Mode		
	:	Prefix to commands in command mode
	:wq	Write file and quit vi (in command mode)

Key Press		Description
	:q!	Quit without writing (in command mode)
Insert Mode		
	i	Insert text before the cursor, until you press <Esc>
	I	Insert text at beginning of current line
	a	Insert text after the cursor
	A	Insert text at end of current line
	<Esc>	Turn off Insert mode and switch to command mode.
	w	Next word
	b	Previous word
	Shift-g	Move cursor to last line of the file
	D	Delete remainder of line
	x	Delete character under the cursor
	dd	Delete current line
	yy	"Yank" (copy) a whole line in command mode.
	p	Paste the yanked line in command mode.

For a series of short and helpful vi tutorials, see:

http://www.unix-manuals.com/tutorials/vi/vi-in-10-1.html

Linux Usage Tips

The following table presents tips that will make it easier to work in RHEL.

Tip	Description
Getting Help	For help with Linux commands, the Linux System Manual ("man" pages) are easily available by typing the man command followed by the item of interest. For example, for help with the ls command, type: `man ls`
Searching within a *man* page	To search for a string within a Linux *man* page, type the forward slash ("/") followed by the string of interest. This can be helpful for finding a parameter of interest in a long *man* entry.
"command not found" error	A common experience for users new to the Linux command line is to receive a "command not found" after invoking a command or script that is definitely in the current directory. Linux has a PATH variable, but for reasons of security, the current directory — "." in Linux — is not included in it by default.

Tip	Description
	Thus, to execute a command or script in a directory that is unknown to the PATH variable you must enter the full path to the script from the *root* directory ("/") or from the directory containing the script using dot-slash ("./") notation, which tells Linux the command you are looking for is in the current directory.
cat	Prints the contents of a file to the command line.
| more	Piping ("|") the output of a command through the *more* command breaks up the output into screen-sized chunks. For example to view the contents of a large directory one screen at a time, type the following: `ls | more`
less	Similar to the *cat* command, but automatically breaks up the output in to screen-sized chunks, with navigation. Useful for navigating large amounts of text on screen at a time. For example: `less <filename>`

Volumes in Linux

For those more familiar with Windows, the steps to creating usable volume in Linux are similar to preparing a new HD for use in Windows.

In Windows, you initialize the disk, create a partition, and assign it a drive letter. You must then format the disk, specify its file system, its allocation unit size, and assign it a volume label.

In Linux, you must also initialize the disk (this takes place during RHEL installation) and create a partition. You also format the disk and specify its file system and sector size. Volume labels do not apply, but have a parallel in the Linux device names (for example /dev/hda or /dev/hdb in the case of HDs).

Linux builds up to a usable volume in a series of "layers", each building upon the previous. From lowest to highest they are physical volumes, volume groups, logical volumes. The filesystem is built on top of the logical volume.

Clock Synchronization in Linux

The basic mechanism for clock synchronization under Linux is the Network Time Protocol (NTP) daemon, *ntpd*, which can be used to automatically maintain synchronization of the system clock with a specified time server. The time server might be a master clock within a firewall, or one of the numerous time-servers based on an atomic clock and available via the internet. For reasons of security, it ought to be a Linux NTP server (or compatible solution) within the corporate firewall.

It is particularly important when setting up a cluster of ICS nodes that each node should have precisely the same time.

Clock synchronization is covered in "***Synching the System Clock***" on page 70.

Time Zones in RHEL

Like most operating systems, RHEL needs to know the time zone in which it is operating. In RHEL this is set by assigning geographic information and/or a specific time zone. For example the following are all valid time zone specifications in RHEL:

- America/EST
- America/Los_Angeles
- Australia/Sydney
- Brazil/East
- Europe/Amsterdam

The installation script automatically sets the time zone to Eastern Standard Time. You will have the opportunity to set the time zone to something more appropriate when you boot RHEL for the first time.

RAIDs in ICS

RAID stands for redundant array of inexpensive (or independent) disks. RAIDs are used in ICS to provide data redundancy and for efficiency in caching large amounts of data across multiple disks. On supported HP servers, you implement these RAIDs at the level of the HP disk controller, using the HP RAID configuration BIOS utility.

ICS makes use of the following RAID types:

- **RAID 1**: All ICS implementations require a RAID 1 (mirror) for the system (OS) drive. This RAID provides redundancy in the event of HD failure.
- **RAID 5**: Certain deployments also require additional disks configured as a RAID 5 (data striping with parity blocks) for caching file data. This RAID provides redundancy and increased performance.

  ***Note**: This document provides instructions for creating a media cache volume as a RAID 5 using multiple disks in the server enclosure. However, other configurations are possible, including two drives in a RAID 1 configuration, or a single drive. For details, see the "**How to Buy Hardware for Interplay Central Services**" guide.*

The following deployments typically benefit from the configuration of a media cache volume:

- **Interplay MAM**: Interplay MAM deployments require a media cache volume when registered browse proxies include formats that cannot be natively loaded by the Adobe Flash-based player. That is, for non MP4 h.264 browse proxies (such MPEG-1, Sony XDCAM, MXF, and WMV), media on proxy storage is transcoded to FLV and stored.

- **Interplay Central**: Interplay Central installations deploying the iNEWS iOS (Apple mobile operating system) app require a media cache volume. In this case, media on the ISIS are transcoded to MPEG-TS (MPEG-2 transport stream), and stored.

With regards to particular servers:

- **HP DL360**: The HP DL360 may have up to 8 drives present. Configure two as RAID 1 for the system drive. The additional drives (up to 6), if present, can be configured as a RAID 5 volume for caching per deployment requirements.
- **Other Servers**: Other servers will have different hard drive capacities. Configure two drives as RAID 1 for the system drive and the remaining drives as a RAID 5 volume for caching.

Introduction to Clustering

Redundancy and scale for ICS is obtained by setting up a cluster of two or more servers. Within the cluster, requests for media are automatically distributed to the available servers. An ICS server cluster provides the following:

- **Redundancy/High-availability**. If any node in the cluster fails, connections to that node will automatically be redirected to another node.
- **Scale/Load balancing**. All incoming playback connections are routed to a cluster IP address, and are subsequently distributed evenly to the nodes in the cluster.
- **Replicated Cache**: The media transcoded by one node in the cluster is automatically replicated in the other nodes. If another node receives the same playback request, the media is immediately available without the need to re-transcode.
- **Cluster monitoring**. You can monitor the status of the cluster by entering a command. If a node fails (or if any other serious problem is detected by the cluster monitoring service), an e-mail is automatically sent to one or more e-mail addresses.

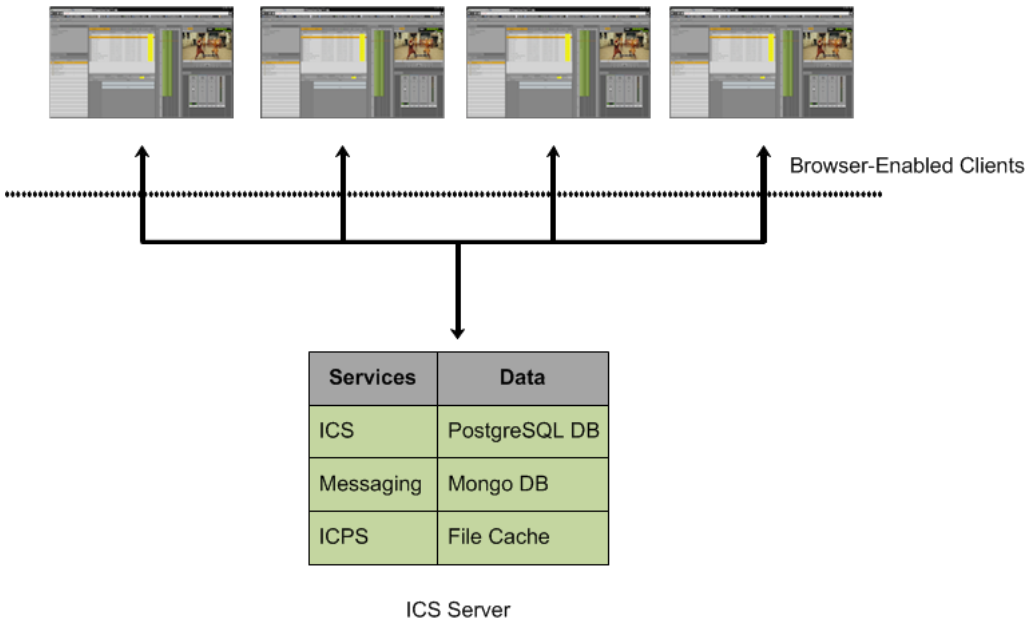
Generally speaking, clusters consist of nodes with identical hardware profiles. However, this is not required. You can use different hardware profiles for the servers in a cluster.

> ***Note**: For detailed information on how ICS servers operate in a cluster, see the "ICS 1.8 Service and Server Clustering Overview" guide.*

Single Server Deployment

In a single server deployment, all ICS services and the ICPS playback service run on the same server. This server also holds the ICS database and the dedicated media cache volume.

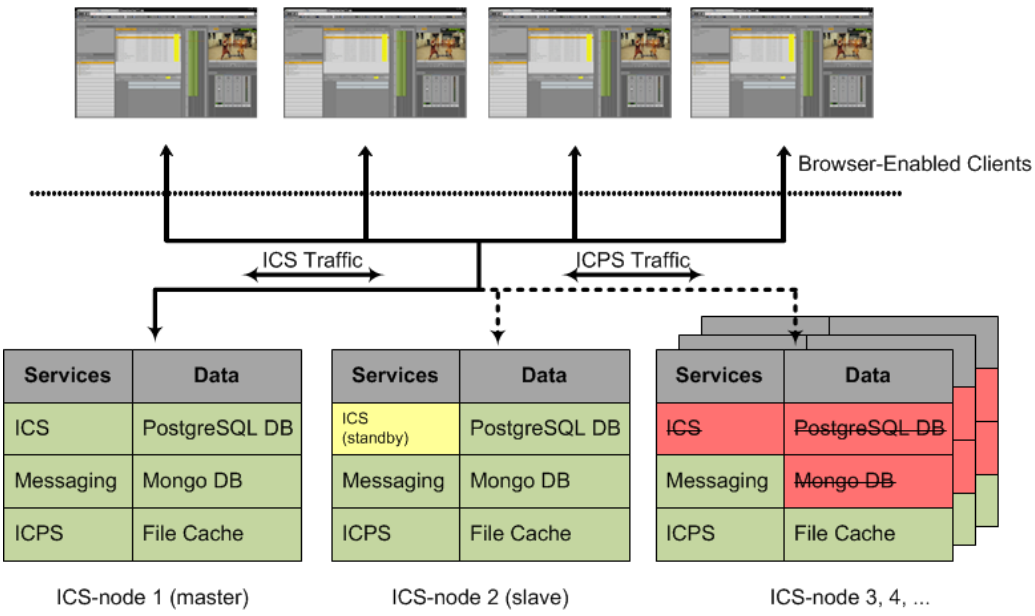
The following diagram illustrates a typical single-server deployment.



Cluster Deployment

In a cluster deployment, there is one master-slave pair of nodes (providing high-availability and failover), and additional nodes supporting transcoding (for scale and load-balancing). In a cluster, all ICS traffic is routed to the master node. Player requests, handled by the ICPS playback service, are distributed by the master to all available nodes. Key ICS services and databases are replicated on the slave node, which is ready to assume the role of master at any time. Other nodes perform transcoding, but do not participate in failovers; that is, they do not take on the role of master or slave.

The following diagram illustrates a typical cluster deployment.



Multicast vs Unicast

Network communication can be of three basic types: unicast, multicast and broadcast. Unicast is a one-to-one connection between client and server, with data transmitted to a single IP address. Multicast transmits to a set of hosts configured as members of a multicast group, and relies on multicast enabled routers to replicate and forward the data. Broadcasting submits data to an entire subnetwork.

ICS clustering supports both unicast and multicast. The default configuration, as set up by the cluster installation script (and covered in the body of this guide) is for multicast. For facilities lacking multicast enabled routers, you will need to configure clustering for unicast. Unicast configuration effort is covered in "***Appendix H: Unicast Support in Clustering*** on page 197.

Working with Gluster

Recall that the ICS server transcodes media from the format in which it is stored on the ISIS (or standard filesystem storage) into an alternate delivery format, such as an FLV or MPEG-2 Transport Stream.

In a deployment with a single ICS server, the ICS server maintains a cache where it keeps recently-transcoded media. In the event that the same media is requested by the web client again, the ICS server delivers the cached media, avoiding the need to re-transcode.

In an ICS cluster, the cache maintained by each ICS server is replicated across the others. Each ICS server sees and has access to all the media transcoded by the others. When one ICS server transcodes media, the other ICS servers can also make use of it, without re-transcoding.

The replication process is set up and maintained by Gluster, an open source software solution for creating shared filesystems. In ICS, Gluster manages data replication using its own highly efficient network protocol.

For more information on Gluster, see: http://www.gluster.org.

> ***Note**: The correct functioning of the cluster cache requires that the clocks on each server in the cluster are set to the same time. This is done in "Setting the System Clock and Disabling HP Power Saving Mode" on page 51.*

PART II: INSTALLING & CONFIGURING

Installation Workflow

The following table describes each of the main installation steps.

If you are setting up a server cluster, be sure to read "***Clustering Workflow***" on page 101 too.

Step	Task	Time Est.
1	**Appendix L: Installation Pre-Flight Checklist**	1–2 hr *varies*
	Make sure you have all the information related to the server hardware (including disk drives and NIC cards in the enclosure), network topography, IP addresses, etc., required to perform installation.	
2	**Before You Begin**	*varies*
	A quick check to make sure you have everything in place for an efficient and successful installation.	
3	**Obtaining the Software**	*varies*
	If you are missing any software, this section tells you how to obtain it.	
4	**Preparing the ICS Installation USB Key**	1 hr
	In this procedure, you create the USB key you will use to install the ICS software. Note: This step is for HP servers only. For non-HP installations, refer to the guidelines in "***Appendix A: Installing ICS on Non-HP Hardware***" on page 148.	
5	**Installing the Network Interface Cards**	30 min
	This step explains the slots where the NIC cards should be placed to simplify the software installation and configuration, and what connections need to be made.	
6	**Setting the System Clock and Disabling HP Power Saving Mode**	15 min
	Before installing the Operating System, you must make a few changes in the BIOS.	
7	**Setting Up the RAID Level 1 Mirrored System Drives**	5 min
	You make use of two of the server's hard disks to create a mirrored RAID disk array for the operating system. This is done in the BIOS.	
8	**Setting Up the RAID Level 5 Cache Drives**	5 min
	In this step you create a RAID 5 disk array for the file cache used by ICS to store proxies.† Note: This step is required only if your Interplay MAM deployment requires a file cache, or you are deploying iOS devices in Interplay Central.†	

Step	Task	Time Est.
9	**Installing RHEL and the ICS Software**	20 min
	In this step you install RHEL and ICS on the RAID 1 disk array.	
10	**Booting RHEL for the First Time**	10 min
	Like most operating systems, the first time you boot RHEL you need to set some system information. It is minimal, in the case of RHEL.	
11	**Editing the Network Connection**	15 min
	In this step you make sure the physical interface used to connect the ICS server to the network is called *eth0*.	
12	**Synching the System Clock**	5 min
	With the network connections established and verified, you can set up the system to synchronize its clock with a Linux Network Time Protocol (NTP) server.	
13	**Creating the File Cache on the RAID**	15 min
	Here, you tell ICS to use the RAID 5 disk array for its file cache. Note: This step is required for all deployments using the ICS multicam feature. It is also required for certain Interplay MAM deployment, or if you are deploying iOS devices in Interplay Central.†	
14	**Appendix C: Configuring Port Bonding for Interplay MAM (Optional)**	20 min
	Configure multiple network interfaces to appear to the network as a single IP address for higher throughput. Note: This step is optional.	
15	**Configuring ICS for Interplay MAM**	5 min
	Configure ICS to mount the file systems on which Interplay MAM browse proxies reside. Configure Interplay MAM to use the ICS server or server cluster	
16	**Installing the Interplay Central Distribution Service**	5 min
	Install and configure the Interplay service that coordinates jobs with Avid Media Services. This step is performed on a Windows machine in the Media Services network. Note: ICDS is only required for Interplay Central, and requires Interplay Production.	
17	**Configuring ICS for Interplay Central and/or Interplay Sphere**	10 min
	Perform the needed configuration steps so ICS and its built-in player can communicate with Interplay Production and the ISIS client(s). Once configured, you can verify video playback.	

Step	Task	Time Est.
18	**Replicating the Cluster File Caches**	30 min
	If you are creating a cluster of ICS nodes, we recommend that you replicate (mirror) the RAID 5 file cache volume across each server in the cluster. Note: This step is required only if your Interplay MAM deployment requires a file cache, or you are deploying iOS devices in Interplay Central.†	
19	**Setting up the Server Cluster**	2-3 hr
	Installing ICS on more than one server and create a server cluster provides numerous benefits, including high-availability and failover protection. Note: Setting up a server cluster can be a requirement, depending on the details of your deployment model.	
20	**Post-Installation Steps**	5 min
	Presents monitoring and logging requirements, and a technique for verifying that cluster failover performs as expected.	
	†Interplay Central installations deploying the iNEWS iOS (Apple mobile operating system) app require a RAID 5 cache volume. In this case, media on the ISIS are transcoded to MPEG-TS (MPEG-2 transport stream), and stored. In an iNEWS-only deployment —that is, with connections to iNEWS but no connection to Interplay Production, hence no video playback — no RAID 5 is required Interplay MAM deployments require a RAID 5 cache volume when registered browse proxies include formats that cannot be natively loaded by the Adobe Flash-based player. That is, for non MP4 h.264 browse proxies (such MPEG-1, Sony XDCAM, MXF, and WMV), media on proxy storage is transcoded to FLV and stored.	

Before You Begin

Make sure you have everything in place to ensure an efficient and successful installation. Do not proceed with the installation if something is missing.

Make Sure the Host Solutions Are Installed and Running

The host system(s) for the deployment must already be installed, set up, and running, for example:

- iNEWS
- Interplay Production
- Sphere-enabled Media Composer or NewsCutter
- Interplay MAM
- ISIS

Make Sure You Have the Following Items

The following items are needed for the installation:

- ICS server(s), physically connected to the network and/or ISIS
- ICS installation package (Interplay_Central_Services_<*version*>_Linux.zip)
- RHEL installation image (.iso) file or DVD media
- Gluster RPM packages (optional)
- Interplay Central Distribution Service (Interplay Central only)
- 16GB USB key (for installations on supported HP hardware)
- Windows XP/Vista/7 laptop or desktop computer with an Internet connection and a supported web browser (e.g. Google Chrome)

For Interplay Production deployments using send to playback (STP), the following software is also required (and should be installed before proceeding):

- Interplay STP Encode

  Note: *Interplay STP Encode is only required for send-to-playback that includes XDCAM workflows.*

- Interplay Transcode

If you are missing software, please see "***Obtaining the Software***" on page 43.

Note: It is particularly important that the server(s) on which you are installing the ICS software should be physically installed in the engineering environment, and the appropriate ISIS and/or the house network connection(s) should be known to you.

You also require access to the ICS server console(s):

- Directly by connecting a monitor and keyboard to the server, or via a KVM (keyboard, video and mouse) device. Direct access is needed for the initial setup and Linux install, but is a hindrance in later stages of the install, when it is preferable to open multiple windows at the same time.
- Indirectly (optional) using SSH from another machine's command prompt or shell, for ICS software installation and configuration. On Windows, Putty.exe is a good option: http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html

Make Sure You Can Answer the Following Questions

If you do not know the answers to all of the following questions, review the hardware specifications in your possession, the deployment model you are pursuing and the environment into which ICS is being installed, before proceeding.

- What kind of server? **HP** or **Other**.
  - ICS supports Interplay Central and Sphere on HP hardware only.
  - ICS supports Interplay MAM on both HP and non-HP hardware.
  - ICS supports deployments that do not require video playback on both HP and non-HP hardware. An iNEWS-only deployment with connections to iNEWS but no connection to Interplay Production in a non-video deployment.

  For non-HP hardware, see "***Appendix A: Installing ICS on Non-HP Hardware*** on page 148 before proceeding.

- What kind of install? **Interplay Central** or **Interplay Sphere** or **Interplay MAM**.

  While the installation steps are very similar for Interplay Central and Interplay Sphere and Interplay MAM, the configuration steps are different. For Interplay MAM, refer to the Interplay MAM configuration guide.

- What kind of server setup? **Single** or **Cluster**.

  A server cluster provides high-availability and load-balancing. The OS and ICS install identically on each server in the cluster, but additional steps are required to configure the servers as a cluster. Further, some configuration steps are not needed on the non-master nodes.

- Do I need a **RAID 1? Yes.**

  Yes. All ICS servers require a RAID 1 that mirrors the operating system across two HD drives.

¨ Do I need a dedicated media cache volume (e.g. **RAID 5)**? **Yes** or **No**.

Almost all Interplay Central deployments require a dedicated media cache volume, for the multicam caching requirements. This includes Sphere deployments. The single exception is the iNEWS-only deployment. However, if the iNEWS iOS application is used, a dedicated media cache volume is required.

In addition, some Interplay MAM generate a great number of temporary files as ICS converts proxies from their native MAM formats into formats compatible with player. Those MAM deployments require a dedicated media cache volume.

For details, see "***Caching in ICS***" on page 22.

Note*: This document provides instructions for creating a media cache volume as a RAID 5 using multiple disks in the server enclosure. However, other configurations are possible, including two drives in a RAID 1 configuration, or a single drive. For details, see the "**How to Buy Hardware for Interplay Central Services**" guide.*

¨ **Static** or **Dynamic** IP addresses?
All network interface ports and bonded ports (optional) require IP addresses. While these can be dynamically assigned (via DHCP) or static, static IP addresses are recommended. Work with your network administrator to make the correct determination. Static IP addresses are the only option for clustering.

¨ Does the **Interplay MAM** installation require **port bonding**? **Yes** or **No**.

Normally, on a server with multiple network interfaces (i.e. Ethernet connectors), each interface has its own IP address. However, ICS servers in Interplay MAM can benefit from *port bonding*, in which several network interfaces appear as a single IP address.

Port bonding is an optional installation feature for Interplay MAM deployments only. For more information:

- "***Port Bonding in Interplay MAM***" on page 21.
- "***Appendix C: Configuring Port Bonding for Interplay MAM (Optional)***" on page 152.

¨ Is this a shared ICS setup? **Interplay Central** *and* **Interplay Sphere**?

An ICS server or cluster can serve Interplay Central and Interplay Sphere simultaneously. In this case, simply install an ICS server or ICS server cluster as indicated in this document.

¨ A **Multicast** or **Unicast** Network? (Clustering only)

ICS clusters support both unicast and multicast network communication. This body of this guide provides instructions for configuring a cluster in a multicast environment. However, multicast requires multicast enabled routers. If your network does not support multicasting, follow the instruction in the body of this guide, then perform the additional configuration steps required for unicast. See "***Appendix H: Unicast Support in Clustering***" on page 197.

¨ Are you deploying the **Interplay Central iNEWS iOS** app? **Yes** or **No**.

For Interplay Central installations deploying the iNEWS app for iOS (Apple mobile operating system) devices (such as an iPhone or iPad), a dedicated media cache volume (e.g. RAID 5) is required for server-side caching. In an iNEWS-only deployment —that is, with connections to iNEWS but no connection to Interplay Production, hence no video playback — no dedicated media cache volume is required.

¨ What kind of **clock setting/synchronization** is required?

Clock setting and synchronization play an important role in some deployments, particularly when creating a cluster. For a discussion, see "***Clock Synchronization in Linux***" on page 29.

Make Sure You Have All the Information You Need

During the ICS installation procedures, you are required to enter a great deal of information pertaining to the ICS servers, network settings, IP addresses, system administrator email addresses, and so on. It is important to gather this information before you begin. Waiting until the information is called for by an installation step will result in considerable delays.

For a list of information required to perform the install, see "***Appendix L: Installation Pre-Flight Checklist***" on page 210.

Make Sure You Change the Default Passwords

For reasons of security it is strongly recommended that you change the default administrator-level passwords at the first opportunity. The RHEL installation script sets up a default login password for the *root* user (the Linux user with administrator privileges). Similarly, Interplay Central is supplied with a default user name and password for the administrator.

- **RHEL**: Change the *root* password when you boot into Linux for the first time.
- **Interplay Central**: Change the *Administrator* default password the first time you log in to the Interplay Central UI.

Before you begin obtain the new passwords from the customer where the system is being installed.

Obtaining the Software

Note: *For version information see the ICS 1.8 ReadMe.*

To perform the installation, the following software is required

- **ICS Installation Packages (required)**: A zip file containing Windows and Linux software needed for the installation.
- **RHEL (required)**: The operating system installed on the server. An installation image (.iso) file or DVD media is required.
- **Gluster (optional)**: An open source software package used to mirror the file caches in a server cluster.

Interplay Central deployments (excluding iNEWS-only deployments) require the following software:

- **Interplay Central Distribution Service (ICDS)**: This Interplay service coordinates jobs with Avid Media Services for sequence mixdowns and send-to-playback.

Deployments of Interplay Central for Interplay Production using send to playback (STP) require the following software:

- **Interplay STP Encode:** This service exports and encodes Long GOP media, then passes the media to the Transfer Engine for a send-to-playback operation. The STP Encode service supports various XDCAM media formats. Required for XDCAM workflows only.
- **Interplay Transcode**: The Interplay Transcode service mixes down audio for script sequences and checks the sequence into the Interplay Engine. No video mixdown is required when sending a script sequence to a playback device.

Note: *ICDS, Interplay STP Encode and Interplay Transcode are required for Interplay Central deployments only (but not iNEWS-only Interplay Central deployments).*

Interplay Transcode is required when configuring Interplay Central to connect to an Interplay Production Engine.

Interplay STP Encode is only required for send-to-playback that includes XDCAM workflows.

Obtaining the ICS Installation Package

On a Windows machine with an internet connection, log in to your Avid Download Center account (or Avid Master Account) and download the ICS installation package from the Download Center (DLC).

The ICS installation package is a ZIP file with a name of the form:

Interplay_Central_Services_<*version*>_LInux.zip

For example:

Interplay_Central_Services_1.8_Linux.zip

Note: *If the ICS installation package is not available via the DLC, please contact your Avid representative to obtain it.*

The ZIP file contains the following:

Item	Description
ICS_installer_<version>.tar.gz	The ICS Server Installation package. This compressed *tar* file contains numerous files, including the following useful shell script: ics_version.sh It outputs version/build information for the following processes: · UMS - User Management Services · IPC - Interplay Central · ICPS - Interplay Central Playback Services · ICPS Manager - Interplay Central Playback Services Manager (player-to-server connection manager) · ACS - Avid Common Services ("the bus") · ICS - Interplay Central Services installer Once ICS is installed, a symlink is created and you can simply type the following to execute the script: ics_version The Interplay Central version/build number is needed, for example, when configuring iNEWS. See "*Appendix J: Configuring iNEWS for Integration with Interplay Central*" on page 201.
iso2usb.exe iso2usb.patch iso2usb_LICENSE.html iso2usb_README.rtf	Used in creating the ICS installation USB key.
ks.cfg ks_upgrade.cfg	The Linux kickstart files for fresh installations and for upgrade installations.
system-backup.sh	Prepares for an upgrade by backing up important data, including system settings, network settings, the Jetty keystore and application.properties file, and the UMS database.
to-install	List of packages (used internally).

Obtaining Red Hat Enterprise Linux

Log in to your Red Hat Network account and download the DVD image (.iso) file or purchase a DVD. Either format can be used for the ICS installation.

Note: *At the time of this document's publication, the RHEL 6.3 ISOs were available by choosing* **Red Hat Enterprise Linux Server (v. 6 for 64-bit x86_64)** *from the Downloads page, then expanding the "View ISO Images for Older Releases" at the bottom of that page. RHEL 6.3 downloads do not appear in the main downloads list. RHEL 6.4 is not supported.*

Note*: ICS requires* ***RHEL 6.3****. Do not install any OS updates or patches. Do not upgrade to RHEL 6.4 or higher.*

Obtaining Gluster

Navigate to the download directory at gluster.org containing the GlusterFS version supported by ICS:

http://download.gluster.org/pub/gluster/glusterfs/3.3/3.3.1/RHEL/epel-6Server/x86_64

Download following packages:

- glusterfs-3.3.1-1.el6.x86_64.rpm
- glusterfs-fuse-3.3.1-1.el6.x86_64.rpm
- glusterfs-server-3.3.1-1.el6.x86_64.rpm
- glusterfs-geo-replication-3.3.1-1.el6.x86_64.rpm

Note*: If the specified version of Gluster is no longer available, contact your Avid representative.*

Obtaining Additional Packages

The following software packages can be obtained at the Download Center for Avid Video Products, via your Download Center account (or Avid Master Account).

- **ICDS**: The Interplay Central Distribution Service (ICDS) package is found in the list of Avid Interplay Central packages: http://esd.avid.com/ProductInformation.aspx?id=84.

  Note*: The Interplay Central Distribution Service (ICDS) is available from the Interplay Servers installation media. Open the Installers folder at the top level, open the CentralDistributionService folder, double-click setup.exe and follow the installation instructions.*

- **Interplay STP Encode Provider**: *The Interplay STP Encode Provider installer is supplied as part of the Interplay Production installer package*.
- **Interplay STP Encode Provider patch**: The *Interplay STP Encode Provider patch* is found in the list of Avid Interplay patches: http://esd.avid.com/ProductInformation.aspx?id=76.
- **Interplay Transcode Provider**: *The Interplay Transcode Provider installer is supplied as part of the Interplay Production installer package*.
- **Interplay Transcode Provider patch**: The Transcode patch is found in the list of Avid Interplay patches: http://esd.avid.com/ProductInformation.aspx?id=76.

As noted, the above software is required for Interplay Central deployments only (excluding iNEWS-only Interplay Central deployments). It is not required for Interplay MAM deployments.

> ***Note**: As of ICS 1.5 and Interplay Production 3.0 the Interplay STP Encode and Interplay Transcode patches are not required. However, the patches are required when configuring Interplay Central to connect to an earlier version of the Interplay Production engine (e.g. Interplay Production 2.3–2.7).*

Preparing the ICS Installation USB Key

Installing ICS requires a bootable USB key containing all the files required for installing ICS, including RHEL. In this step you prepare the USB key.

For this procedure you require the following items:

- The ICS installation package Interplay_Central_Services_<*version*>_Linux.zip
- RHEL installation image (.iso) file or DVD media

  ***Note:** Only RHEL 6.3 OS is supported. Do not install patches, updates, or upgrade to RHEL 6.4.*

- A 16GB USB key

  ***Note:** There have been problems with some USB keys. If the server does not boot from the USB key, or fails to complete the boot, try using a USB key from another manufacturer, or a larger sized key.*

- A Windows XP/Vista/7 laptop or desktop computer

Follow this procedure only if you are installing ICS software components on a supported HP server.

Transferring ICS and Linux to the USB Key

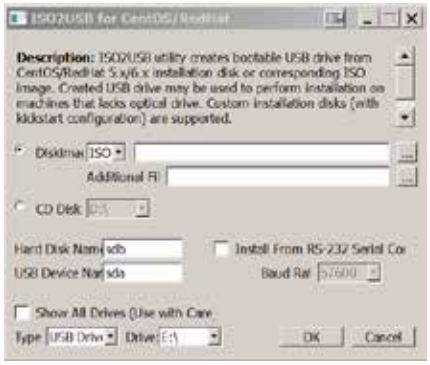
Due to licensing restrictions, Avid is not able to redistribute the RHEL installation media. You must download the RHEL installation image (*.iso*) file from Red Hat directly—or get it from the RHEL Installation DVD that came with your ICS server.

> ***Note:** Make sure the RHEL image (.iso) file is accessible locally (preferable) or over the network from your computer. You should complete this procedure with only the USB key you're preparing inserted in the server. If you have more than one USB key inserted, make sure you choose the right one when performing this procedure.*
>
> ***Note**: You must not simply drag and drop files onto the USB key. Use the ISO2USB utility to create USB key, as instructed here.*

To prepare the ICS Installation USB key:

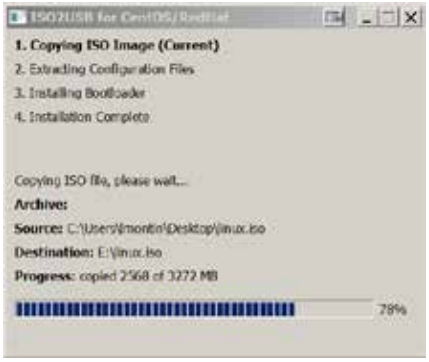
1. Log into a Windows laptop or desktop.
2. Format the USB key as a FAT32 volume.

3. Extract the contents of the Interplay_Central_Services_<*version*>_Linux.zip (e.g. **Interplay_Central_Services_1.8_Linux.zip**) file to the desktop (or your preferred destination directory).
4. Browse into the newly created Interplay_Central_Services_<*version*>_Linux folder.
5. Double-click *iso2usb.exe* to launch the application.



6. Choose the Diskimage radio button then browse to the RHEL image (.iso) file (named rhel-server-6.3-x86_64-dvd or similar).
7. Verify the Hard Disk Name and USB Device Name are correct:
   - Hard Disk Name: sdb
   - USB Device Name: sda

   ***Note**: These values have changed since RHEL 6.0, where the hard disk name was sda and the USB device name was sdb.*
8. In the "Additional Files" field browse to the Interplay_Central_Services_<*version*>_Linux folder on the desktop (or wherever you expanded it to) and then select the directory name.
9. Click OK in the main dialog.
10. A process begins to copy the RHEL image (*.iso)* file and the ICS installation files to the USB key.



The process takes 10-20 minutes. Once complete, the USB key has everything it needs for a complete RHEL and ICS installation.

> ***Note:*** *Copying the RHEL image (.iso) file to the USB key is a one-time process. To install ICS to more than one server, or to re-install ICS, you do not need to repeat these steps.*

To prepare for mirroring cluster file caches, proceed to "***Copying Gluster to the USB Key***" on page 48.

Otherwise, proceed to "***Installing the Network Interface Cards***" on page 49.

Copying Gluster to the USB Key

To prepare for mirroring the file caches in a cluster setup, copy the GlusterFS RPMs you downloaded earlier to the USB key.

> ***Note:*** *This step is only for those setting up a cluster of ICS servers in an Interplay MAM deployment or an Interplay Central deployment that includes the iNEWS app for iOS devices. If you think you might set up a cluster in the future, perform this step now to ensure availability of compatible Gluster software.*

For this procedure you require the following items:

- An 8GB USB key
- glusterfs-3.3.1-1.x86_64.rpm
- glusterfs-fuse-3.3.1-1.el6.x86_64.rpm
- glusterfs-server-3.3.1-1.el6.x86_64.rpm
- glusterfs-geo-replication-3.3.1-1.el6.x86_64.rpm
- A Windows XP/Vista/7 laptop or desktop computer

It is recommended that you copy the files to the ICS installation USB key. (Advanced Linux users may wish to create a network share to install these components instead.)

To add GlusterFS to the ICS Installation USB key:

1. Log into the Windows laptop or desktop where you saved the Gluster RPM packages.
2. Create a directory called ***Gluster*** at the root level on the USB key.
3. Copy the RPM packages to the new directory.

Proceed to "***Installing the Network Interface Cards***" on page 49.

Installing the Network Interface Cards

As already noted, for Interplay Central and Interplay Sphere, ICS provides a number of services, including playback of video assets registered by Interplay Production and residing on an ISIS. ICS decodes the source format and streams images and sound to the remote web-based Interplay Central and/or Interplay Sphere clients.

For an Interplay Central and/or Interplay Sphere installation, the ICS server(s) must be installed and connected to an ISIS via a Zone 1 (direct), Zone 2 (through a switch) or Zone 3 (recommended) connection. In this case you must use a GigE or 10GigE network interface.

For Interplay MAM, ICS provides playback of video assets registered as browse proxies by Interplay MAM. The connection required depends on where the browse proxies are stored. For non-ISIS storage, a connection to the network can be made using one of the server's built-in network interfaces. No additional NIC is required. However, if the browse proxies reside on an ISIS, the connection to the ISIS must be over a Zone 1, Zone 2, or Zone 3 (recommended) connection, using a GigE or 10GigE network interface.

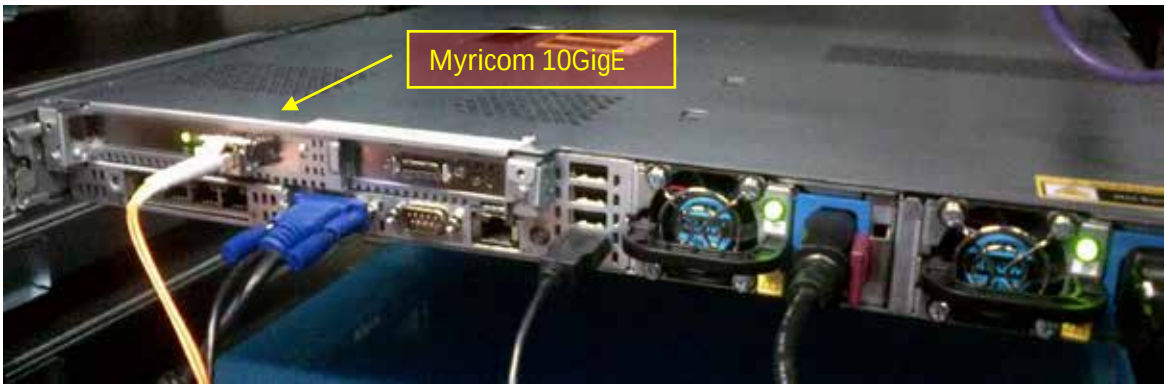
iNEWS-only deployments do not require any ISIS connection, and can make use of the server's built-in network interfaces.

> ***Note**: Refer to the "How to Buy Hardware for Interplay Central Services" guide for detailed information on hardware specifications and deployment options. The guide is available on the Avid Knowledge Base ICS 1.8 web page.*

Connecting to ISIS Proxy Storage

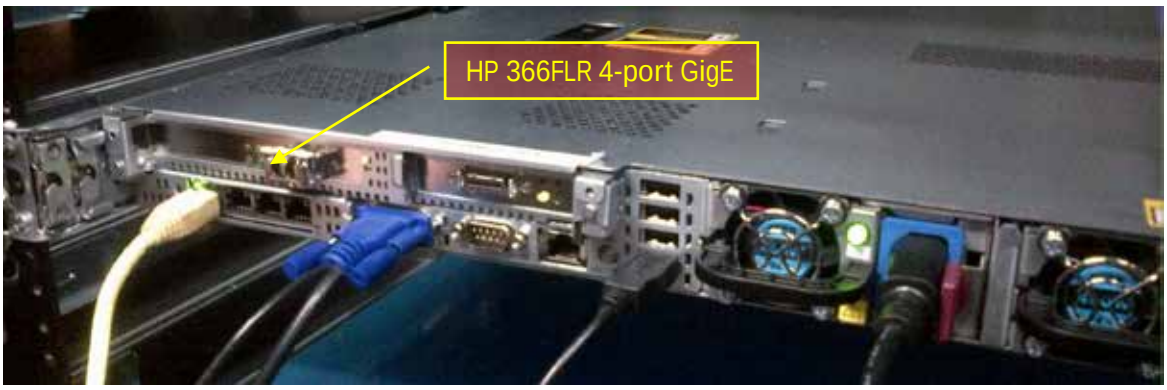
The HP DL360 G8 has a full height PCI slot in the upper left corner. Use this slot for either the Myricom 10GigE or the HP NC365T 4-port GigE NIC. The "built-in" Ethernet ports can also be used, if the server is provisioned with the HP 366FLR 4-port GigE NIC.

HP DL360 backplane (indicating Myricom 10GigE):



HP DL360 backplane (indicating HP NC365T 4-Port GigE):

HP DL360 backplane (indicating HP 366FLR 4-port GigE):



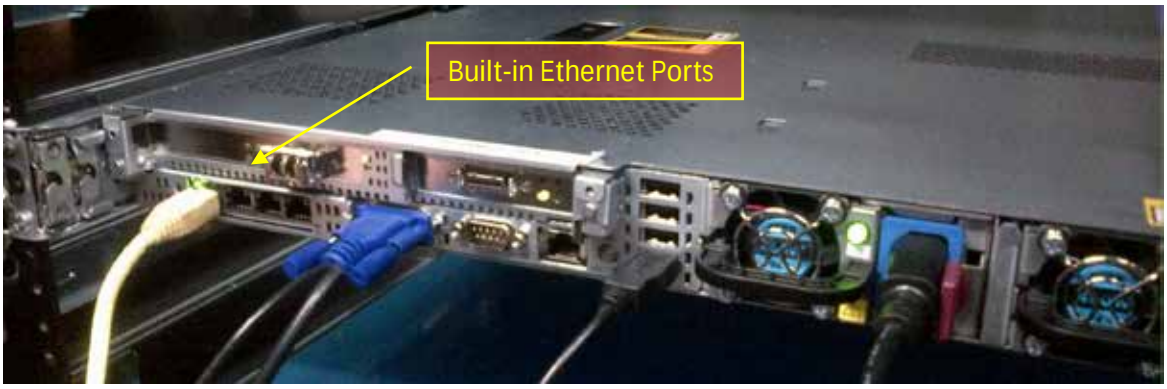
Proceed to "***Setting the System Clock and Disabling HP Power Saving Mode***" on page "51".

Connecting to non-ISIS Proxy Storage

Interplay MAM deployments where browse proxies reside on non-ISIS storage do not require additional NIC cards. They make use of the Ethernet ports built in to the HP server. Visually verify that one of the built-in ports is connected to the network. For a 10GigE connection to non-ISIS storage, use a 10GigE NIC of your choosing.

> ***Note**: If MAM browse proxies reside on an ISIS, the connection to the ISIS must be over a Zone 1, Zone 2, or Zone 3 (recommended) connection, using a GigE or 10GigE network interface.*

HP DL360 backplane (showing built-in Ethernet ports):



***Note**: This applies to Interplay MAM deployments only.*

Proceed to "***Setting the System Clock and Disabling HP Power Saving Mode***" on page "51".

Setting the System Clock and Disabling HP Power Saving Mode

To ensure the smooth installation of RHEL and ICS, the system clock must be set. When setting up an ICS node cluster, setting the system clocks accurately is particularly important.

HP servers are frequently shipped with BIOS settings set to Power-Saving mode. ICS is makes intensive use of the server's CPUs and memory, especially when under heavy load. You will get much better performance by ensuring that the server is set to operate at Maximum Performance.

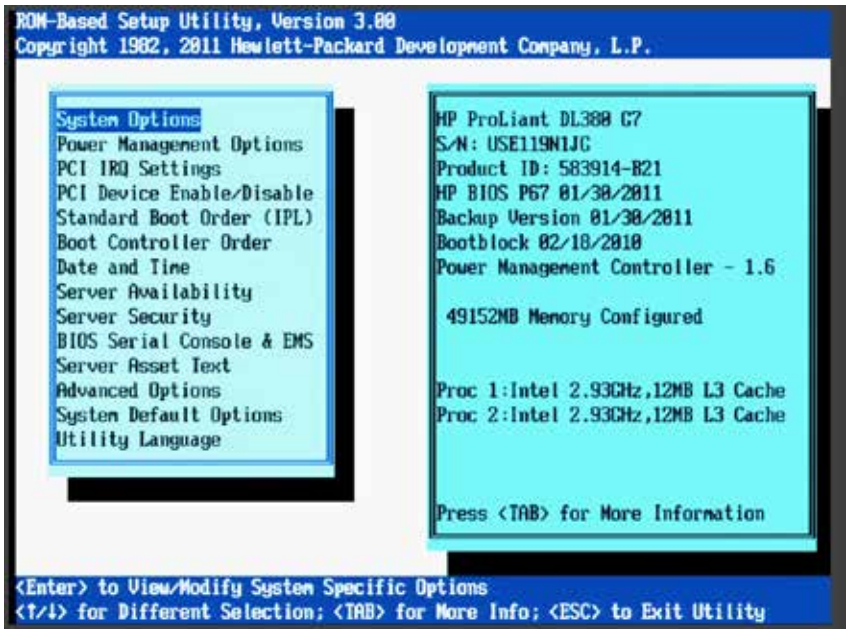
***Note:** While setting the system clock and power saving mode can be done after the installation process, we recommend making the change immediately.*

To start the server and access the BIOS:

1. Power up the server.
2. When the console displays the option to enter the Setup menu, press **F9**.

   The BIOS responds by indicating F9 was pressed.

   The ROM-Based Setup Utility appears after a few moments.



3. Choose ***Date and Time*** and press **Enter**.

   Date and Time options appear.

   Set the date (mm-dd-yyyy) and time (hh:mm:ss).

4. Press **Enter** to save the changes and return to the Setup Utility menu.
5. Choose ***Power Management Options***.

   Power Management options appear.

6. Choose ***HP Power Profile***.

   Power Profile options appear.

7. Choose ***Maximum Performance***.

   You are returned to the HP Power Management options menu.

8. Press **Esc** to return to main menu.
9. Exit the Setup utility **Esc** and press **F10** to save.

   The server reboots with new options.

Proceed to "***Setting Up the RAID Level 1 Mirrored System Drives***" on page 52.

Setting Up the RAID Level 1 Mirrored System Drives

In this step you configure two of the HD drives in the server enclosure as a RAID Level 1 – a mirrored RAID – where the RHEL and ICS software will be installed. This is done using the Option ROM Configuration for Arrays utility, in the HP server's BIOS.

> ***Note:*** *If the list of available disks does not appear as expected, it may be that a RAID has already been created. Deleting a RAID destroys all the data it contains, so verify it is safe to do so first.*

To set up the mirrored disks for the operating system:

1. Reboot the server and press any key (**spacebar** recommended) when prompted to display the HP ProLiant "Option ROM" messages.

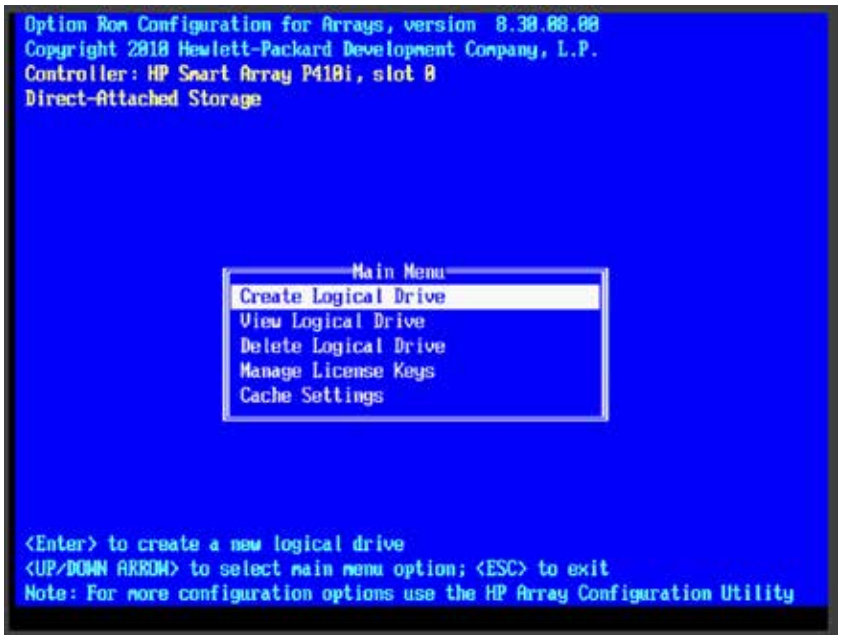
   ***Note**: Do not press **F9** or **F11**. Press any key other than **F9** or **F11** (**spacebar** recommended).*

   Detailed messages now appear as the server boots up.

2. As soon as you see the prompt to enter the Option ROM Configuration for Arrays utility, press **F8**.

   ***Note**: The prompt to press **F8** can flash by quite quickly. If you miss it, reboot and try again.*

3. From the Main Menu, select ***Create Logical Drive***.



4. Select the following two HD drives in ***Available Physical Drives***:
   - Box 1 Bay 1
   - Box 1 Bay 2
5. Deselect all the other available HD drives (if any).
6. Ensure RAID 1 is selected in ***RAID Configurations***.

   ***Note**: In older firmware versions, the choice presented may be RAID 1+0. Since you are only using two HD drives, this is identical to a RAID 1.*

7. Ensure Disable (4GB maximum) is selected in ***Maximum Boot*** partition:
8. Ensure nothing is selected in ***Parity Group Count***.
9. Ensure nothing is selected in ***Spare***.
10. Press **Enter** to create the logical drive.

A message appears summarizing the RAID 1 setup.

11. Press **F8** to save the configuration.

    A message appears confirming the configuration has been saved.

12. Press **Enter** to finalize the RAID 1 setup.

***Note**: Do not press the **Escape** key to exit, since this reboots the server. Wait until you have set up the RAID 5 cache drives (optional) or have inserted the USB key.*

Proceed to "***Setting Up the RAID Level 5 Cache Drives***" on page 54 (if applicable).

Otherwise, insert the USB key and proceed to "***Installing RHEL and the ICS Software*****"** on page 56.

Setting Up the RAID Level 5 Cache Drives

In this step you configure the remaining HD drives in the server enclosure as a RAID Level 5. In a RAID 5 data is automatically distributed across all the disks in the RAID for increased performance and redundancy. This is done using the Option ROM Configuration for Arrays utility, in the HP server's BIOS.

***Note:** If the list of available disks does not appear as expected, it may be that a RAID has already been created. Deleting a RAID destroys all the data it contains, so verify it is safe to do so first.*

***Note**: This document provides instructions for creating a media cache volume as a RAID 5 using multiple disks in the server enclosure. However, other configurations are possible, including two drives in a RAID 1 configuration, or a single drive. For details, see the "**How to Buy Hardware for Interplay Central Services**" guide.*

To set up the remaining disks as the ICS cache:

1. If you are arriving to this procedure from setting up the RAID 1 mirrored system drives, proceed to Step 3, below.

   Otherwise, reboot the server and press any key when prompted (**spacebar** recommended) to display the HP ProLiant "Option ROM" messages.

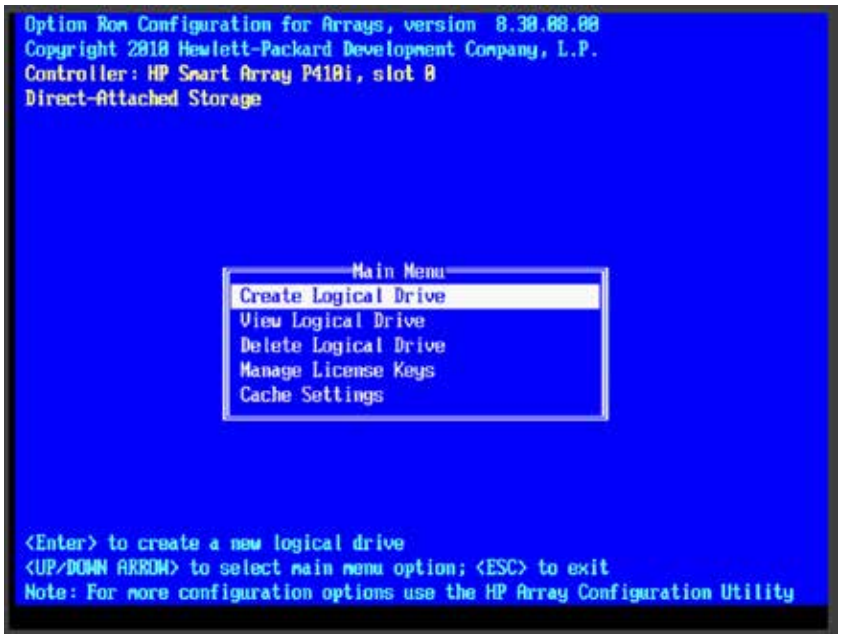
   ***Note**: Do not press **F9** or **F11**. Press any key other than **F9** or **F11** (**spacebar** recommended).*

   Detailed messages now appear as the server boots up.

2. As soon as you see the prompt to enter the Option ROM Configuration for Arrays utility, press **F8**.

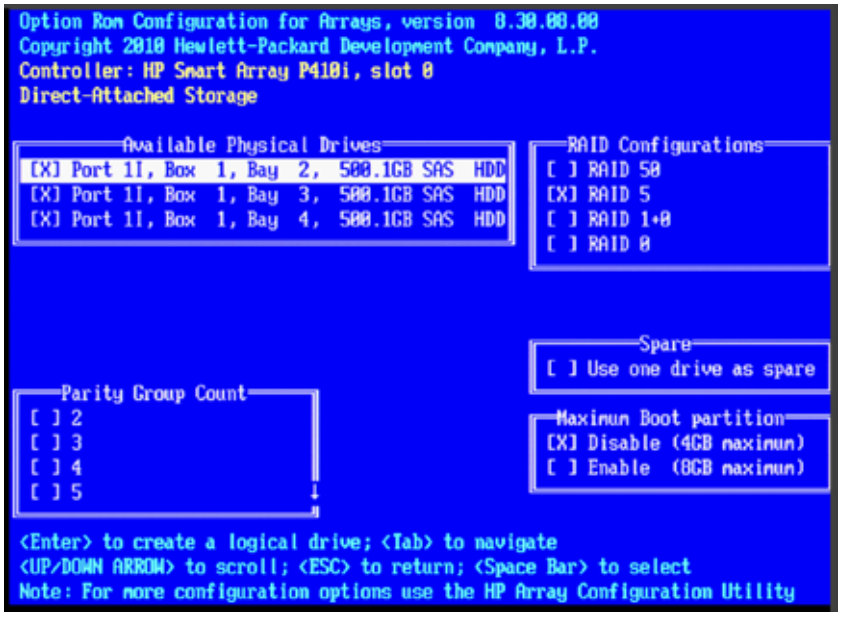
   ***Note**: The prompt to press **F8** can flash by very quickly. If you miss it, reboot and try again.*

3. From the Main Menu, select ***Create Logical Drive.***



4. Ensure the HD drives to be included in the RAID 5 are selected in ***Available Physical Drives***:
    - Box 2 Bays 3-8 (typical configuration)
5. Ensure RAID 5 is selected in ***RAID Configurations***.
6. Ensure Disable (4GB maximum) is selected in ***Maximum Boot*** partition.
7. Ensure nothing is selected in ***Parity Group Count***.
8. Ensure nothing is selected in ***Spare***.

   The following screen snapshot shows a RAID 5 consisting of three HD drives in Box 1. The use of three HDs in RAID 5 is a non-standard configuration, shown here for illustration purposes only.



9. Press **Enter** to create the logical drive.

   A message appears summarizing the RAID 5 setup.

10. Press **F8** to save the configuration.

    A message appears confirming the configuration has been saved.

11. Press **Enter** to finalize the RAID 5.

Note: Do not press the **Escape** key to exit, since this reboots the server.

Proceed to "***Installing RHEL and the ICS Software***" on page 56.

Installing RHEL and the ICS Software

Use the ICS installation USB key prepared earlier to install ICS on an HP server. It accelerates the process by installing the RHEL operating system and ICS software components at the same time. To initiate the process, you simply reboot the server with the USB key inserted.

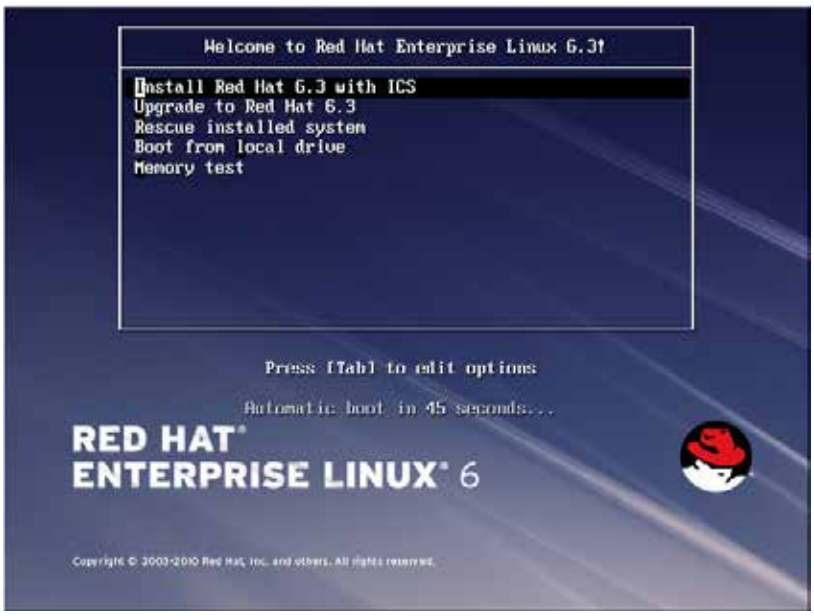
> ***Caution**: If you are in the process of upgrading from ICS 1.4.x or earlier, it is a fresh install, and will overwrite your current ICS settings and databases.*
>
> *Before proceeding with the upgrade, back up your current settings:*
>
> - ***Database**: The ICS settings and database using the backup script (system-backup.sh) provided. See "Backing up the ICS Settings" on page 127.*
> - ***SSL Private Key(s)**: If you deployment makes use of CA-signed certificates, back up private(s), regardless of the upgrade path.*
> - ***Corosync Configuration File**: If you configured ICS 1.4.x for unicast, you made changes to the corosync configuration (corosync.conf) file. The installation script overwrites this file. To preserve your changes, back up the file before beginning the upgrade, and restore it after.*
>
> ***Note**: For workflow details on upgrading to ICS 1.8 from an earlier release, see the ICS 1.8 Upgrading Guide, available from the Avid Knowledge Base ICS 1.8 web page.*

To boot the server from the USB key and run the installer:

1. Before rebooting the server ensure the USB key is inserted.

   > ***Note**: If you have just created the RAID 1 or RAID 5, press the **Escape** key to exit the Option ROM configuration menu to proceed to the boot menu, and boot from there.*
   >
   > ***Note:** For HP installs, an error message may appear: "[Firmware Bug]: the BIOS has corrupted hw-PMU resources". You can ignore this error. For more information, see: http://h20000.www2.hp.com/bizsupport/TechSupport/Document.jsp?objectID=c03265132.*

2. Wait for the RHEL Welcome screen to appear.



This screen welcomes you to the installation process and presents different installation options.

***Note**: It has been reported that under some circumstances the installation bypasses the RHEL Welcome screen. This will not affect the install process. The correct installation choice is always selected by default.*

3. Select "Install Red Hat with ICS" to install a new ICS and press **Enter**.

   ***Note:** If you are upgrading your system, do not use the "Upgrade" option. For upgrading instructions, see the "ICS 1.8 Upgrading Guide".*

   The RHEL and ICS packages are installed—this takes about 20 minutes.

   ***Note:** Installations on supported HP hardware automatically makes use of a "kickstart" (ks.cfg) file to accelerate RHEL installation. Normally, the kickstart file operates silently and invisibly without the need for intervention.*

   ```
   Unable to download kickstart file
   ```

   If you see the above message, it indicates the partition where the Linux installation program expects to find the kickstart file (sda) is already in use. The most likely cause is a KVM with "virtual media" capability reserving the sda partition to facilitate the mapping of removable drives to the attached server.

   To resolve the issue, disable the virtual media capability. Alternately, unplug the KVM and connect to the server directly using an external monitor and USB keyboard.

4. If you just created the RAIDs a warning screen appears indicating a device (i.e. the RAIDs) needs to be reinitialized. This is normal. Select Re-Initialize or Re-Initialize All as needed.

5. When the installation process is complete, you are prompted to reboot. ***DO NOT REBOOT before removing the USB key.***

   If you reboot without removing the USB key the server will reboot from the USB key again and re-launch the installer.

   Note: *If you pressed* ***Enter*** *by mistake, remove the USB key as quickly as possible (before the system boots up again). If this is not possible, you need to perform the installation again.*

Proceed to "***Booting RHEL for the First Time***" on page 58.

Booting RHEL for the First Time

Like most operating systems, when you boot RHEL for the first time, you need to set up a few items. In RHEL a "first boot" causes the RHEL Configuration screen to appear, providing access to system set-up menus.

Note: *You can re-enter the first boot set-up menus at any time by typing "setup" (without quotes) at the Linux command prompt.*

Note: *Some ICS software components depend on the language for RHEL being set to English. This is done automatically by the ICS installation scripts. Do not change the input language afterwards.*

The procedures in this section make use of the following information you entered in "***Appendix L: Installation Pre-Flight Checklist***" on page 210:

- Default *root* password
- New Linux *root* password.

Note: *Please contact your Avid representative for the default root password.*

Booting from the System Drive

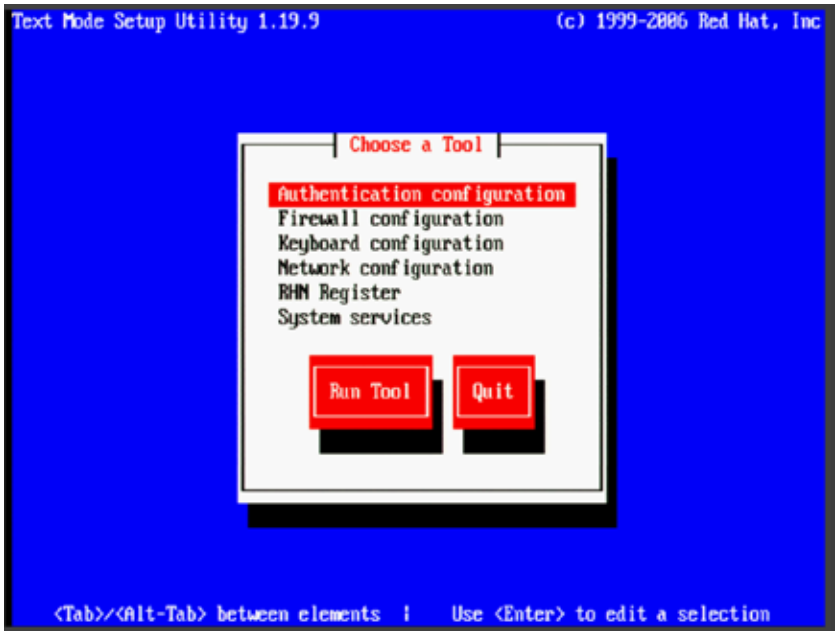
When installing RHEL and ICS you booted from the ICS Installation USB key. This time you boot from the system drive where the OS and software were installed.

To boot the server from the system drive for the first time:

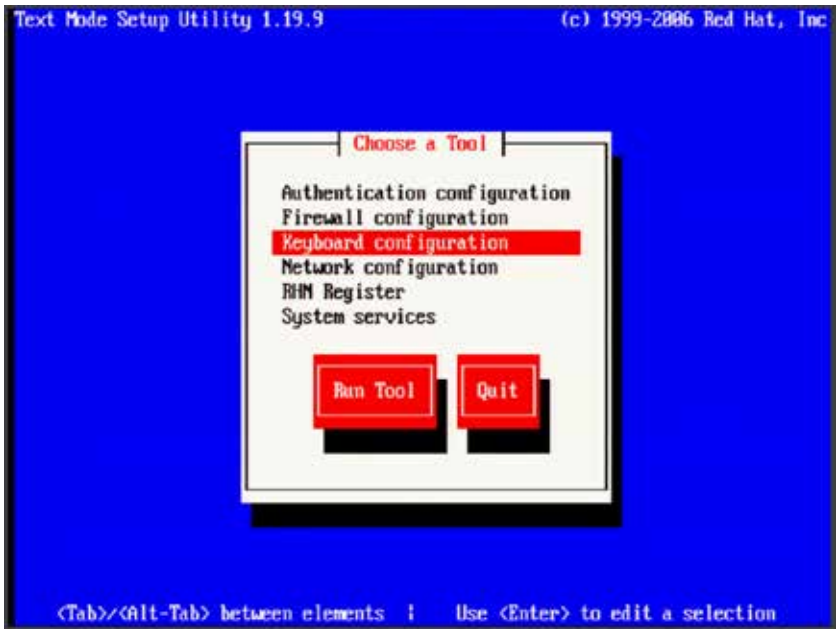
> ***Note:*** *If the USB key is still in the server, remove it.*

1. Press **Enter** in the post-installation dialog.

   Rebooting the server triggers a first-time boot up from the system drive. The RHEL Configuration screen appears.



2. From the Choose a Tool menu, select Keyboard Configuration. Press **Enter.**



3. Choose the Language option for your keyboard.
4. Focus the OK button. Press **Enter**.
5. From the Choose a Tool menu, select Quit. Press **Enter.**
6. Log in a the Linux prompt

   Default user name: root

   default password: _____

   Note: *Please contact your Avid representative for the default root password.*

You can re-enter the first boot set-up menus at any time by typing "setup" (without quotes) at the Linux command prompt.

Proceed to "***Changing the root Password***" below.

Changing the *root* Password

For reasons of security it is strongly suggested that you change the password for the *root* user.

To change the root password:

1. While logged in as the *root* user type the Linux change password command:

   passwd

2. Follow the prompts to change the password**.**

   Use a strong password that is in accordance with the customer's password enforcement policies.

Proceed to "***Verifying the Date and Time***" below.

Verifying the Date and Time

Although you set the time and date in the BIOS in an earlier step, it is worth verifying that it is still set correctly before proceeding. Linux takes ownership of the BIOS time and date setting, and may have altered it during the install.

To verify the date and time:

1. If you have not already done so log in.

   Log in as the *root* user (i.e. username = *root*).

   Note: *Please contact your Avid representative for the default root password.*

2. To check the date type **`date`** and press enter.

   The date is displayed.

3. If the date is incorrect, change it. For example, for September 2nd, 2012, at 11:03 a.m. enter:

   ```
   date 090211032012
   ```

The required format is `MMDDHHmmYYYY`. (Month-Date-Hour-Minute-Year)

4. When you press enter the reset date is displayed:

   ```
   Sun Sep 2 11:03:00 EDT 2012
   ```

Proceed to "***Setting the Time Zone***" below.

Setting the Time Zone

The installation script sets the location to Montreal and the time zone to Eastern Standard Time. Please customize your setup by setting the location more appropriately. In this step you edit the RHEL file that controls how the operating system interprets values in the system clock.

> ***Note:*** *This step requires the use of* vi*, the command-line text editor supplied with RHEL. For an introduction to* vi*, see "Working with Linux" on page 24.*

To set the time zone:

1. Using Linux commands, list the contents of the directory containing RHEL time zone information:

   ```
   ls /usr/share/zoneinfo
   ```

   A list of time zone regions is presented. For example, US time zones are located under /usr/share/zoneinfo/America (replicates IANA time zone database) and /usr/share/zoneinfo/US (standard US timezones), European time zones are in /usr/share/zoneinfo/Europe, and so on.

2. Locate the time zone of interest in the subdirectories of /usr/share/zoneinfo (e.g. US/Eastern) and take note of it for the next steps.

3. Using Linux commands, navigate to the directory containing the clock file read by RHEL at boot-time:

   ```
   cd /etc/sysconfig
   ```

4. List the contents of the directory:

   ```
   ls -l
   ```

5. Using the Linux text editor *vi*, open the *clock* file for editing:

   ```
   vi clock
   ```

6. Locate the ZONE information, and replace "America/Montreal" with the appropriate information, for example:

   ```
   ZONE="America/Los_Angeles"
   ```

   Navigate using the arrow keys, then press **A** (append) and replace the information.

7. Save and exit the clock file by typing the following command from within the *vi* editing session:

   ```
   <Esc>:wq
   ```

8. That is, tap the **Escape** key, then the colon, then type wq and press **Return**.

   The file is saved and you are returned to the Linux prompt.

9. Create the symbolic link RHEL needs to make use of the new time zone information:

   ```
   ln –sf /usr/share/zoneinfo/<yourzone> /etc/localtime
   ```

   In the above command, <*yourzone*> is the path you entered in the clock file (e.g. America/Los_Angeles).

10. Verify the settings using the date command:

    ```
    date
    ```

    The local time and time zone should now be shown.

Proceed to "***Editing the Network Connections***" on page 62.

Editing the Network Connections

Under the Linux operating system, every physical network connector, called an *interface* in Linux, has a name. By default, when installing RHEL, the installer scans the NIC cards in the machine and labels the interfaces it finds, in the order it finds them. In this step, you verify that the interface you want ICS to use has the name **eth0**. If not, you rename the interface.

> ***Note:*** *This step requires the use of* vi*, the command-line text editor supplied with RHEL. For an introduction to* vi*, see "Working with Linux" on page 24.*

The procedures in this section make use of the following information:

- NIC cards present in the enclosure
- NIC card used to connect the server to the network
- Whether your facility uses static or dynamic IP addressing
- Whether you are setting up a cluster of ICS server nodes
- Facility network settings (static IP address, netmask, default gateway IP, etc., as applicable)
- Server name

> ***Note:*** *You collected the above information in "Appendix L: Installation Pre-Flight Checklist" on page 210.*

Identifying NIC Interfaces by Sight

RHEL provides a simple means for visually identifying the NIC ports on a server, whether they are active or not. The *ethtool* command can be used cause ports to blink for a pre-determined amount of time.

To visually identify a NIC Interface:

1. Use the Linux *ethtool* command, identify the port currently named *eth0* by causing it to blink for 60 seconds:

   ```
   ethtool --identify  eth0 60
   ```

   Note the use of a double-dash. In Linux, a single- or double-dash distinguishes *options* from *arguments*. A double-dash often precedes a *word* (i.e. human readable) option.

   The system responds by causing the adapter to blink on the *eth0* port.

2. If needed, repeat the above to identify other ports.

Proceed to "***Verifying the NIC Interface Name***" below.

Verifying the NIC Interface Name

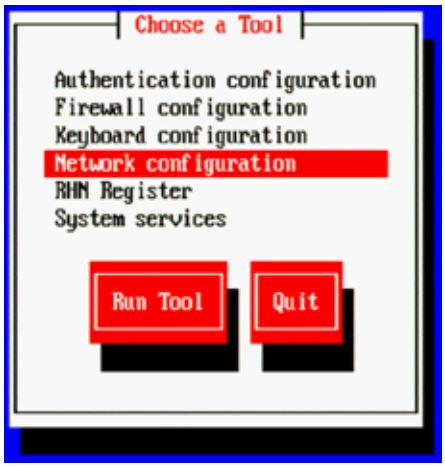
In this step you verify the NIC interface you are using to connect to the network is correctly named *eth0*.

To verify the NIC interface name:

1. Enter the RHEL Configuration screens by typing the following at the command prompt:

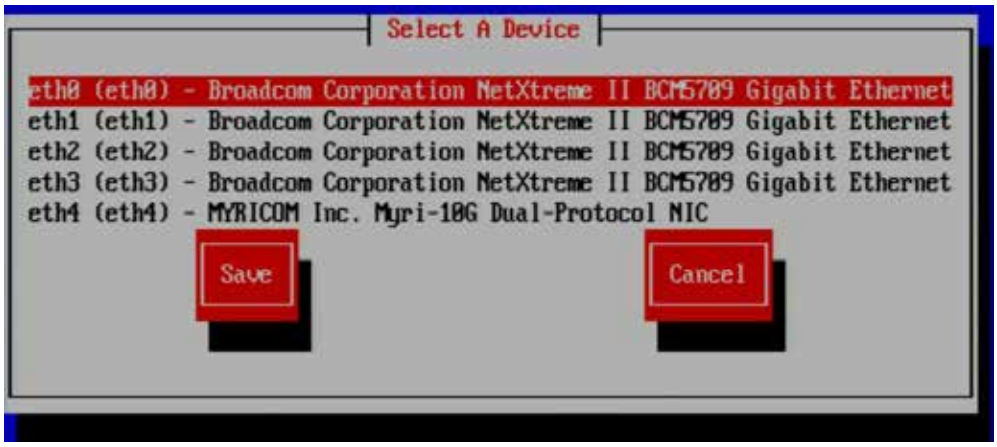
   ```
   setup
   ```

2. From the Choose a Tool menu, select Network Configuration. Press **Enter**.



3. From the Network Configuration menu, select Device Configuration. Press **Enter**.

   A list of NIC cards contained in the server enclosure appears.



4. Use the arrow keys to locate the NIC card used to connect to the network. Press **Enter** to view its details.
5. Note the name assigned to the NIC card interface of interest (e.g. eth0, eth1, eth*n*) and record it here: _____
6. Perform the action required at each menu (Quit, Exit, etc.) to return to the Linux prompt.

If the selected NIC card interface is named *eth0* proceed to "***Configuring the Hostname and Static Network Route*** on page 66.

If the selected NIC card's interface is not named *eth0*, proceed to "***Swapping NIC Interface Names***" below.

Swapping NIC Interface Names

If you discover the NIC interface you are using to connect to the network is not named *eth0*, you must rename it. You must also rename the NIC interface currently using the name. To make these changes permanent you must edit the network script file where Linux stores NIC interface names.

1. Using Linux commands, navigate to the directory containing the network script file where persistent names are assigned to network interfaces:

   ```
   cd   /etc/udev/rules.d
   ```

2. List the files in the directory to see if 70-persistent-net.rules exists:

   ```
   ls –l
   ```

   Note: *One a server with just one NIC card installed, the file will not be present.*

3. If needed, create the file:

   ```
   udevadm trigger –action=add
   ```

4. Using the Linux text editor, *vi*, open the 70-persistent-net.rules file for editing:

   ```
   vi  70-persistent-net.rules
   ```

5. Locate the lines corresponding to the NIC card you want to name eth0 and the one already using the name.

   Use the arrow keys on the keyboard to navigate the file.

6. Press the A key to append to the end of the line:

   `NAME="eth0"`

7. Change **NAME="ethX"** (e.g. *eth1*, *eth2*, etc.) to the following:

   `NAME="eth0"`

8. Locate the line corresponding to the NIC card that was already using the name eth0 and rename it:

   `NAME="ethX"`

   where "X" is the number you removed in step 5 (e.g. *eth1*, *eth2*, etc.); that is, swap the names.

9. Save and exit the 70-persistent-net.rules file by typing the following command from within the vi editing session:

   `<Esc>:wq`

   That is, tap the Escape key, then the colon, then type wq and press **Return**.

   You are returned to the Linux prompt.

Proceed to "***Removing the MAC Address Hardware References***" below.

Removing the MAC Address Hardware References

Even though you renamed a NIC interface to *eth0* and made the changes permanent by editing the network script file, there is one more step. In this step you remove the hardware references – generally known as MAC addresses – from the affected NIC interface configuration files.

Recall that every NIC card is assigned a unique hardware identifier -- called a MAC address -- by the manufacturer. The MAC address uniquely identifies the NIC card hardware, and is permanently stored in the NIC card's firmware. When Linux scans for NICs, it obtains this hardware identifier and writes it to an interface configuration file. Further, the Linux installation scripts create an interface configuration file (e.g. ifcfg-eth0, ifcfg-eth1, etc.) for each NIC interface found. For example, a NIC card with four network interfaces will have four interface configuration files.

For each card where you renamed a NIC interface, you must edit the corresponding interface configuration file -- that was already created by Linux -- and remove the hardware identifier. Otherwise, Linux will override the changes you made earlier and reassign the old interface names the next time it boots (or you restart the Linux network services).

To remove the hardware references from the interface configuration file:

> ***Note****: This procedure must be performed twice – once for each of the NIC interfaces you renamed.*

1. Using Linux commands, navigate to the directory containing the network scripts files:

   ```
   cd /etc/sysconfig/network-scripts
   ```

2. List the contents of the directory:

   ```
   ls –l
   ```

3. Using the Linux text editor, *vi*, open the interface configuration file for one of the renamed interfaces (e.g. ifcfg-eth0):

   ```
   vi  ifcfg-eth0
   ```

   In Linux, each NIC interface has its own configuration file.

4. Locate the line containing the hardware identifier. It has the following form:

   ```
   HWADDR = 00:00:00:00:00:00
   ```

   In Linux, each NIC interface has its own configuration file.

5. Remove the whole line.

6. Save and exit the file by typing the following command from within the *vi* editing session:

   ```
   <Esc>:wq
   ```

   That is, tap the **Escape** key, then the colon, then type wq and press **Return**.

   You are returned to the Linux prompt.

7. Repeat the above steps for the other NIC interface you renamed (e.g. *ethX*).

8. Once you have finished removing the hardware references for both the renamed NIC interfaces, reboot the server to restart the network services and make the effects permanent:

   ```
   reboot
   ```

   Note: *You must reboot, rather than simply restarting network services, since you changed the contents of the /etc/udev/rules.d file, in the previous procedure.*

Proceed to "***Configuring the Hostname and Static Network Route***" below.

Configuring the Hostname and Static Network Route

Now that the NIC interface you will use to connect the ICS server to the network has been named *eth0*, you are ready to configure the server to make the connection. This is done using the RHEL configuration facility.

This procedure make us of the facility network settings information you entered in "***Appendix L: Installation Pre-Flight Checklist***" on page 210.

To configure the hostname and static network route for eth0:

1. Enter the RHEL Configuration screens by typing the following at the command prompt:

   ```
   setup
   ```

2. From the ***Choose a Tool*** menu, select ***Network Configuration***. Press **Enter**.
3. From the ***Network Configuration*** menu, select ***Device Configuration***. Press **Enter**.

   A list of NIC cards contained in the server enclosure appears.
4. Use the arrow keys to locate the NIC card and interface named **eth0**. Press **Enter** to view its details
5. Ensure the following information is correctly set:
   - Default name: *eth0*
   - Default device: *eth0*
   - DHCP is disabled (**Spacebar** to disable)
6. Disabling the Dynamic Host Configuration Protocol (DHCP) allows you to enter the following static network route information:
   - Facility Static IP address
   - Facility Netmask
   - Default Gateway IP
   - Primary DNS server
   - Secondary DNS server
7. Select OK. Press **Enter**.

   You are returned to the list of NIC cards in the enclosure.
8. Select Save. Press **Enter**.
9. From the ***Choose a Tool*** menu, select ***DNS Configuration***. Press **Enter**.
10. Give the machine a name (host name) and enter its DNS information:
    - Enter the hostname: <machine name>
      (e.g. **ics-dl360-1**)
    - DNS entries from step 6
    - If you are using a static IP addresses (recommended), enter the DNS search path domain
    - If you are using DHCP, leave the DNS search path domain blank.

    Note*: The host name indicated above is the host name only (e.g.* ***ics-dl360-1)****,that is, the name of the machine. Do not use the fully qualified domain name (e.g.* ***ics-dl360-1.mydomain.com*** *or* ***ics-dl360-1.mydomain.local)****.*
11. Select Save & Quit. Press **Enter**.
12. Select Quit. Press **Enter**.

    You may be prompted to login to the server.
13. Verify the DNS Server information has been stored in the RHEL resolver configuration (resolv.conf) file:

```
cat /etc/resolv.conf
```

The information you entered for the DNS search path and DNS servers should be present in the file.

14. Deleted any backup resolver configuration (resolv.conf.save) file that might have been automatically created by the OS:

```
rm /etc/resolv.conf.save
```

***Note**: Due to a caveat in Linux, if you do not delete the* resolv.conf.save *file, when you reboot, Linux overwrites the changes you just made.*

15. Remove the USB key (if it is still in the server) and reboot the server:

```
reboot
```

Proceed to "**Verifying the *hosts* file Contents**" below.

Verifying the *hosts* file Contents

The *hosts* file is used by the operating system to map hostnames to IP addresses. It allows network transactions on the computer to resolve the right targets on the network when the instructions carry a human readable host name (e.g. **ics-dl360-1**) rather than an IP address (e.g. **192.XXX.XXX.XXX**).

By default the *hosts* file on a computer resolves the machine's own IP address to *localhost*. In this step, you verify the content of the *hosts* file, and remove any extra entries, if present. In addition, since the active *hosts* file can be reset to its default configuration when a server fails or is rebooted you also verify the system default *hosts* file.

The active *hosts* file is located here:

```
/etc/hosts
```

The system default *hosts* file (if present) is located here:

```
/etc/sysconfig/networking/profiles/default/hosts
```

***Note**:* You can edit the file /etc/hosts while the system is up and running without disrupting user activity.

To verify the *hosts* file:

1. Open the active hosts (/etc/hosts) file for editing.

```
vi /etc/hosts
```

It should look similar to the following:

```
127.0.0.1  localhost localhost.localdomain localhost4 localhost4.localdomain4
::1        localhost localhost.localdomain localhost6 localhost6.localdomain6
```

The entries shown above map the default localhost IP address (127.0.0.1) to various forms of *localhost*, for both ipv4 and ipv6 systems.

2. In some cases, the entries incorrectly includes an explicit call-out of the computer's own host name (e.g. **ics-node-1**).

   For example, a machine named *ics-node-1* might have additional entries as shown below (in bold):

```
127.0.0.1  localhost localhost.localdomain localhost4 localhost4.localdomain4
ics-node-1
::1        localhost localhost.localdomain localhost6 localhost6.localdomain6
ics-node-1
```

3. If the computer's own host name is present (e.g. **ics-node-1**), remove it:

```
127.0.0.1  localhost localhost.localdomain localhost4 localhost4.localdomain4
::1        localhost localhost.localdomain localhost6 localhost6.localdomain6
```

4. Save and exit the file (<*Esc*>:*wq*).
5. Perform the same actions for the system default *hosts* file:

   ```
   vi /etc/sysconfig/networking/profiles/default/hosts
   ```

Proceed to "***Verifying Network and DNS Connectivity***" below.

Verifying Network and DNS Connectivity

Before continuing, take a moment to verify that network connectivity is now established.

To verify network connectivity:

On any other network connected machine, use the Linux ping command to reach the host in question:

```
ping –c 4 <hostname>
```

For example:

```
r
ping –c 4 ics-dl360-1
```

The system responds by outputting its efforts to reach the specified host, and the results. For example, output similar to the following indicates success:

```
PING ics-dl360-1.fqdn.com (172.XXX.XXX.XXX) 56(88) bytes of data
64 bytes from ics-dl360-1.fqdn.com (172.XXX.XXX.XXX):
64 bytes from ics-dl360-1.fqdn.com (172.XXX.XXX.XXX):
64 bytes from ics-dl360-1.fqdn.com (172.XXX.XXX.XXX):
64 bytes from ics-dl360-1.fqdn.com (172.XXX.XXX.XXX):
```

A summary of the results is also presented.

Proceed to "***Synching the System Clock***" below.

Synching the System Clock

In this step you set the Network Time Protocol (NTP) daemon to automatically synchronize the system clock with an NTP time server every 30 minutes. This is done by creating a job for the Linux *cron* utility. The *cron* job runs the NTP daemon, *ntpd*.

> ***Note**: Setting up* ntpd *to run as a service at startup is also a possibility. However, some consider it a security risk to run* ntpd *in "continuous" mode. The technique shown here keeps the system clock synchronized while minimizing exposure to risk by causing* ntpd *to exit after it fetches the correct time.*
>
> ***Note**: The use of the* iburst *option within the* cron *job is not recommended. It produces very rapid time shifts and can lead to synchronization problems with other nodes, the ISIS, and so on.*

This procedure makes use of the following information:

- ¨ In-House NTP server: _____

To synchronize the system clock:

1. Verify that the NTP server of interest is reachable by querying it:

   ```
   ntpdate -q <server_address>
   ```

2. Edit the NTP configuration (ntp.conf) file using a text editor (such as *vi*):

   ```
   vi /etc/ntp.conf
   ```

3. Add a line for the NTP server. For example, if the address of the NTP server is ntp.myhost.com, add the following line:

   ```
   server ntp.myhost.com
   ```

   You can supply the IP address instead (e.g. 192.XXX.XXX.XXX)

4. Comment out any out-of-house servers that may already be present, for security. For example:

   ```
   # server 0.rhel.pool.ntp.org
   # server 1.rhel.pool.ntp.org
   # server 2.rhel.pool.ntp.org
   ```

5. Save and exit the file.

   ```
   <Esc>:wq
   ```

6. Set up a *cron* job by editing (or creating) a file containing instructions for *cron*:

   ```
   vi /etc/cron.d/ntpd
   ```

7. Add a line with the instructions for *cron*:

   ```
   30 * * * * root /usr/sbin/ntpd -q -u ntp:ntp
   ```

   The command above instructs *cron* to:

   - Run the *cron* job every 30 minutes as *root*
   - The job is /usr/sbin/ntpd
   - The -q switch tells *ntpd* to exit after it sets the system clock
   - The -u switch tells Linux to run the job as user *ntp*, in user group *ntp*

8. Save and exit the file.

   ```
   <Esc>:wq
   ```

9. Set the system clock now by running the NTP daemon:

   ```
   /usr/sbin/ntpd -q -u ntp:ntp
   ```

   The system responds with a message similar to the following:

   ```
   ntpd: time set +9.677029s
   ```

   The NTP daemon *sets* the time when there are large changes, and *slews* (slowly adjusts) the time for small changes (significantly less than a second).

10. Verify the system time and date:

    ```
    date
    ```

    The system responds with a message similar to the following:

    ```
    Wed Jun  5 14:53:17 EDT 2013
    ```

Proceed to "***Creating the File Cache on the RAID***" below.

Creating the File Cache on the RAID

In an earlier step you created a RAID 5 for the cache using the "arrays" utility built-in to the HP server's BIOS. In this step you finalize caching. First, you partition the RAID. Next you create a logical volume for the RAID and mount the ICS cache on it.

For a discussion of caching, see "***Caching in ICS***" on page 22.

For a discussion of RAIDs, see "***RAIDs in ICS***" on page 30.

Partitioning the RAID

In this procedure you partition the RAID and write the new partition table entry to disk using the GNU *parted* disk partitioning utility.

The enclosure contains two devices of interest, the system disk (**/dev/sda**) and the RAID (**/dev/sdb**). Partitioning the system disk was performed automatically by the RHEL installer. You only need to partition the RAID, as indicated in this section.

> ***Note**: Starting with RHEL 6.3, Red Hat creates a GPT volume when the ICS installation scripts initialize the cache volume during OS installation. GPT volumes must be handled using the GNU* parted *utility (rather than the Linux* fdisk *utility).*

To partition the RAID:

1. Use the GNU *parted* utility to ensure the RAID 5 HD device exists:

   ```
   parted –l
   ```

   ***Note**: Note the command take a lower-case "L" (not a numerical "one").*

   ***Note**: The Linux "fdisk -l" command can also be used to list the devices. However, it returns the following warning:*

   ```
   WARNING: GPT (GUID Partition Table) detected on '/dev/sdb'! The
   util fdisk doesn't support GPT. Use GNU Parted.
   ```

2. Find the free space on the /dev/sdb device:

   ```
   parted /dev/sdb p free
   ```

   Information similar to the following is displayed:

   ```
   Model: HP LOGICAL VOLUME (scsi)
   Disk /dev/sdb: 2500GB
   Sector size (logical/physical): 512B/512B
   Partition Table: gpt

   Number  Start   End     Size    File system  Name  Flags
           17.4kB  2500GB  2500GB  Free Space
   ```

3. Create a primary partition on the RAID 5 using all the available space (2500 GB in the sample output provided above):

   ```
   parted -a optimal /dev/sdb mkpart primary ext2 0% 2500GB
   ```

The system might respond with the following message:

```
Information: You may need to update /etc/fstab
```

The message can be ignored. You will update *fstab* when you create the logical volume and mount the cache for the new partition.

4. Set the partition to type *logical volume*, and it's state to *on*.

   ```
   parted /dev/sdb set 1 lvm on
   ```

5. Run the parted utility again to view your changes:

   ```
   parted -l
   ```

Creating the Logical Volume and Mounting the Cache

In this procedure you work with the newly partitioned RAID 5 using the Linux Logical Volume Manager (LVM). The hierarchy of volumes in Linux is as follows: physical volume, volume group and logical volume.

To create the logical volume and mount the cache:

1. Create the physical volume:

   ```
   pvcreate --metadatasize=64k /dev/sdb1
   ```

   Note the name of the physical volume (/dev/sdb1) takes a 1 (one).

   LVM feedback indicates the successful creation of the physical volume.

2. Create a volume group, **vg_ics_cache**, containing the physical volume **/dev/sdb1**:

   ```
   vgcreate -s 256k -M 2 vg_ics_cache /dev/sdb1
   ```

   LVM feedback indicates the successful creation of the volume group.

3. Before creating the logical volume, obtain a value for the volume group's physical extents:

   ```
   vgdisplay  vg_ics_cache
   ```

   A list of properties for the volume groups appear, including the physical extents (Free PE). Physical extents are the chunks of disk space that make up a logical volume.

   Sample output is shown below:

   ```
   --- Volume group ---
     VG Name               vg_ics_cache
     System ID
     Format                lvm2
     Metadata Areas        1
     Metadata Sequence No  2
     VG Access             read/write
     VG Status             resizable
     MAX LV                0
     Cur LV                1
   ```

```
Open LV               1
Max PV                0
Cur PV                1
Act PV                1
VG Size               1.09 TiB
PE Size               256.00 KiB
Total PE              4578332
Alloc PE / Size       0 / 0
Free  PE / Size       4578332 / 1.09 TiB
VG UUID               cyWpGZ-s3PG-8UqH-4TBl-rvBA-33oJ-3uZt0u
```

Use the "Free PE" value to create a logical volume occupying the entire volume group (below).

4. Create the logical volume, **lv_ics_cache**, containing the volume group **vg_ics_cache**:

   ```
   lvcreate -l <Free_PEs> -r 1024 -n lv_ics_cache vg_ics_cache
   ```

   In the above command, replace `<Free_PEs>` with the value obtained in the previous step.

   Note the first switch in *lvcreate* is lower case "L".

   LVM feedback indicates the successful creation of the logical volume. Note that Linux may override the sector size you specified. That is OK.

5. Create a filesystem on the logical volume (i.e. format it):

   ```
   mkfs.ext4 /dev/vg_ics_cache/lv_ics_cache
   ```

   Note in the above command you specify logical volume by its Linux block device name (/dev/<volume_group>/<logical_volume>).

   As in other operating systems, formatting in RHEL is a slow operation. Please be patient.

   Feedback similar to the following indicates success:

   ```
   This filesystem will be automatically checked every 38 mounts or
   180 days, whichever comes first.  Use tune2fs -c or -i to override.
   ```

6. Navigate to the directory containing the filesystem table:

   ```
   cd /etc
   ```

7. Open the filesystem table file, **fstab**, for editing:

   ```
   vi fstab
   ```

8. Add an entry at the end of the file:

   ```
   /dev/mapper/vg_ics_cache-lv_ics_cache /cache ext4 rw 0 0
   ```

   This automates the mapping of the logical volume to a file system directory (/cache in this case).

9. Save and exit the file by typing the following command from within the *vi* editing session:

   ```
   <Esc>:wq
   ```

That is, tap the **Escape** key, then the colon, then type wq and press **Return**.

You are returned to the Linux prompt.

10. Mount the volume:

    ```
    mount /dev/mapper/vg_ics_cache-lv_ics_cache /cache
    ```

    Alternately, since you added an entry to fstab, you ought to be able to mount the cache as follows:

    ```
    mount /cache
    ```

    ***Note**: If you receive an error indicating the mount point* /cache *does not exist, create the cache manually and issue the* mount *command again:*

    ```
    mkdir /cache
    mount /dev/mapper/vg_ics_cache-lv_ics_cache /cache
    ```

11. Verify that **/cache** has been mounted correctly:

    ```
    df –h
    ```

    The following information is displayed about the cache: size, used, available, user % and mount point (mounted on), similar to the following:

    ```
    Filesystem            Size  Used Avail Use% Mounted on
    /dev/mapper/vg_ics_cache-lv_ics_cache
                           29G  585M   27G   3% /cache
    ```

12. Verify that **/cache** has the correct ownership and read-write-exec settings:

    ```
    ls -la /cache
    ```

    Information is displayed about the cache ownership, similar to the following:

    ```
    drwxr-xr-x   5 maxmin maxmin 4096 Mar 22 10:02 .
    ```

13. If the ownership is of **/cache** is not set to user *maxmin*, change its ownership:

    ```
    chown  maxmin:maxmin /cache
    ```

14. If the **/cache** directory does not have its read-write-exec settings are not *rwx* for *owner*, *group*, *other*, change the permissions:

    ```
    chmod  0777 /cache
    ```

15. Verify that **/cache** now has the correct ownership, read-write-exec settings, and *setgid* special permission:

    ```
    ls -la /cache
    ```

    Updated information is displayed, which ought to be similar to the following:

```
drwxrwxrwx  5 maxmin maxmin 4096 Mar 22 10:04 .
```

***Note**: User* maxmin *owns the ICS process that writes to the cache. Avid processes will create subdirectories in /cache, on an as-needed basis.*

Proceed to one of the following:

- "***Appendix C: Configuring Port Bonding for Interplay MAM (Optional)*** on page 152.
- "***Installing the Interplay Central Distribution Service*** on page 76.
- "***Configuring ICS for Interplay MAM*** on page 78.
- "***Configuring ICS for Interplay Central and/or Interplay Sphere*** on page 80.

Installing the Interplay Central Distribution Service

The Interplay Central Distribution Service (ICDS) is an Interplay service that coordinates jobs with Avid Media Services for send to playback (STP). You can install it on a server that is already hosting an Interplay Production component (such as an Interplay Transcode server) or on a separate server in the Interplay Production workgroup.

You can install ICDS on two or more servers. Multiple ICDS servers provide a high-availability configuration and failover capability in case one server fails. For more information about ICDS, ICDS failover, and STP, see the *Avid Interplay Central Administration Guide*.

***Note**: ICDS is not required for Interplay MAM, iNEWS-only or Sphere-only deployments.*

Determining Where to Install ICDS

ICDS can be installed on any server currently configured in an Interplay Production workgroup except for servers hosting the following components:

- Media Services Engine (port conflict)
- Interplay Engine (should not have Avid Service Framework installed)
- Interplay Archive Engine (should not have Avid Service Framework installed)

ICDS can also be installed on a separate server.

Hardware requirements: ICDS is a lightweight application. It requires a minimum 512 MB RAM and approximately 380 MB of hard drive space. It requires port 8080 for normal http communication and port 8443 for http security protocol.

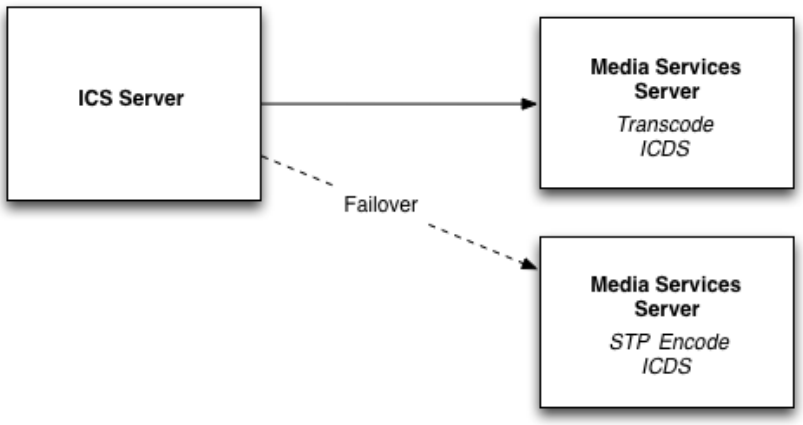
Software requirements: ICDS requires the following:

- Windows 7
- Avid Service Framework (ASF)
- ISIS client software

If you install ICDS on a server that is already hosting an Interplay Production component, ASF and the ISIS client should already be installed. If you install ICDS on a separate server, you need to install ASF and ISIS client software. See "***Before You Begin***", below.

Example

The following illustration shows ICDS installed on a server running Media Services Transcode and another instance installed on a server running STP Encode. The ICS server communicates with one instance of ICDS, in this case the one running on the Media Services Transcode server. In case this server goes down, the ICS server can communicate with the ICDS instance on the STP Encode server.



Before You Begin

Make sure you have the following item:

- Interplay Central Distribution Service installation program

  The program is available from the Avid Download Center (DLC) with the Avid Interplay Central packages.

If you are installing ICDS on its own server, you also need the following items:

- ASF installation program. Use the version that matches the Interplay Production configuration.

  ICDS is a 32-bit application, so you can install either the 32-bit version of ASF or the 64-bit version (if the machine is a 64-bit machine). To ensure that a 32-bit application can see the 64-bit ASF, open the Workgroup Properties tool and connect to the Lookup service. See the *Avid Interplay ReadMe* for details.

- Avid ISIS client installation program. Use the version that matches the Interplay Production configuration.

Configure access for the following:

- Port 8080 for normal http communication and port 8443 for http security protocol

To install the Interplay Central Distribution Service:

1. If you are installing ICDS on its own server, install ASF and the Avid ISIS client software.
2. Copy the unzipped CentralDistributionService installer folder to the server on which you are installing ICDS.

   ***Note**: The Interplay Central Distribution Service (ICDS) is also available from the Interplay Servers installation media. Open the Installers folder at the top level, open the CentralDistributionService folder, double-click setup.exe and follow the installation instructions.*

3. Open the installer folder and double-click setup.exe.

   The welcome screen of the installer is displayed.
4. Click Next.
5. Accept the license agreement and click Next.
6. Accept the default installation location, or click Change to install to a different folder.
7. Click Next.
8. Click Install to begin the installation.

   The installation should take only a few minutes.
9. When the installation is completed, click Finish.

   The Interplay Central Distribution Service is automatically started as a Windows service.

Proceed to "***Configuring ICS for Interplay Central and/or Interplay Sphere***" on page 80.

Configuring ICS for Interplay MAM

For ICS to play Interplay MAM media, the filesystem containing the MAM proxies must be mounted on the ICS servers. The mounting is done at the level of the OS using standard Linux command for mounting volumes (*mount*). To automate the mounting of the MAM filesystem, create an entry in /etc/fstab.

In the Interplay Central UI, you must create a special user for use by Interplay MAM. To see information in the Interplay Central Load Balancer page, you must also configure the ICPS Player.

> ***Note**: Some proprietary storage solutions may require that you install and configure proprietary filesystem drivers or client software. Consult the documentation for the storage solution to be used by the Interplay MAM system.*

To determine the correct path to be mounted, examine the path associated with the MAM essence pool to which ICS is being given access. This is found in the Interplay MAM

Administrator interface under the Essence Management Configuration tab. Look for the "MORPHEUS" entry and tease out the path information. It is likely that ICS has been given access to more than one MAM essence pool. Be sure to mount all the associated filesystems.

> ***Note**: Configuration must also take place on the Interplay MAM side, to set up permissions for ICS to access MAM storage, to point Interplay MAM to the ICS server or server cluster, etc. For instructions on this aspect of setup and configuration, please refer to the Interplay MAM documentation.*
>
> ***Note**: This step can be performed at any time during the installation.*

To create an Interplay Central user for Interplay MAM:

1. With the server up and running, log in to Interplay Central as an administrator level-user.

   See "***Logging into Interplay Central***" on page 84.

2. Select **Users** from the Layout selector.
3. Create a special role for the MAM user by clicking on the Create Role button in the Roles pane.
4. Click the **Create Role** button.
5. In the Details pane, type the properties for the new role:
   - Role name (e.g. **MAM**)
   - Advance License
   - Do not assign the MAM role any layouts
6. Click Apply to save your changes.

   The new MAM role is added to the Roles pane.
7. Create a MAM user by clicking the **Create User** button.
8. In the Details pane, type the properties for the new user:
   - User name (e.g. **MAM**)
   - Password
   - Uncheck "User must change password at next sign-in"
   - Check "User cannot change password
9. Drag the MAM *role* from Roles pane to the Role section of the Details pane for the new user.
10. Click **Save** to save your changes.

    The new MAM user is added to the User Tree, as a top-level user.
11. Ensure Interplay MAM is configured to make use of the assigned user name and password.

For more information on creating users and roles, see the "*Interplay Central Administration Guide*".

Proceed to "***Clustering Workflow***" on page 101 (optional).

Configuring the ICPS Player to take advantage of load balancer reporting:

This procedure makes use of the following information:

- ICS server hostname (e.g. **ics-dl360-1**)

1. Log in to Interplay Central as a user with administrator privileges.

   See "***Logging into Interplay Central***" on page 84.
2. Select **System Settings** from the Layout selector.
3. In the Settings pane, click **Player**.
4. Enter the ICS server hostname (e.g. **ics-dl360-1**).
5. Click Apply to save your changes.

   Now you can monitor load balancing on the Load Balancer page. For more information, see "***Monitoring Load Balancing***" on page 136.

Proceed to "***Clustering Workflow***" on page 101 (optional).

Configuring ICS for Interplay Central and/or Interplay Sphere

Now that you have installed the operating system, ICS software components, and ICDS software (Interplay Central only), you are ready to configure the ICS server.

As an independent ISIS client, ICS has its own connection to ISIS, and uses a separate set of ISIS credentials to read media assets for playback and to write audio assets for voice-over recorded by Interplay Central end-users.

To configure ICS for Interplay Sphere you log into Interplay Central using a web browser.

> ***Note**: If you are setting up a cluster, only the master node requires configuration. You do not need to configure any other nodes. The slave node obtains its settings from the master node via the clustering mechanisms. The other nodes participate in load-balancing only, and do not require configuring separately.*

Configuring Workflow

The following table describes each of the main configuring steps.

Step	Task	Time Est.
1	**Before You Begin**	*varies*

Step	Task	Time Est.
	Make sure you have everything you need to perform the configuration.	
2	**Configuring the Interplay Central UI**	1 min
	Streamline the UI by removing support for the Avid IME solutions you won't be using.	
3	**Logging into Interplay Central**	1 min
	Log in to Interplay Central for the first time.	
4	**Changing the Administrator Password**	1 min
	For security it is highly recommended you change the administrator password.	
5	**Configuring Interplay Production Settings**	1 min
	In this step you tell ICS where it can find the Interplay Production server, and the Interplay Central Distribution Service.	
6	**Configuring ICPS for Interplay**	1 min
	ICPS communicates directly with Interplay Production. In this step you provide the user name and password used by ICPS for Interplay Production, and other information it needs.	
7	**Configuring the ICPS Player for Interplay Central**	1 min
	In this step you tell ICPS where to find the Interplay Central server.	
8	**Configuring the ISIS Connection(s)**	
	ICS communicates with the ISIS system directly. In this step, you specify the type of connection (Zone 1, Zone 2, Zone 3), and the network-level connection information. A Zone 3 connection is recommended.	
9	**Mounting the ISIS System(s)**	1 min
	In this step you mount the ISIS so the system can gain access to media.	
10	**Verifying the ISIS Mount**	1 min
	A validation step to make sure all the ISIS and its workgroups are accessible.	
11	**Verifying Video Playback**	1 min
	Playing some video is a simple technique for verifying the success of the configuration.	
12	**Configuring Wi-Fi Only Encoding for Facility-Based iOS Devices (optional)**	1 min
	When Wi-Fi is the only connection used, you can improve the encoding capacity of the ICS server by reducing the number of streams automatically encoded.	

Step	Task	Time Est.
13	Configure Unicast Support in Clustering	5 min
	ICS clustering supports both unicast and multicast. For facilities lacking multicast enabled routers, you will need to configure the cluster for unicast. See "***Appendix H: Unicast Support in Clustering***" on page 197.	

Before You Begin

Make sure you have the following items:

- Windows XP/Vista/7 laptop or desktop computer
- Network connection
- Web browser supported by Interplay Central.

The procedures in this section make use of the following information:

- Host name of the ICS server (e.g. **ics-dl360-1**))
  or
  Static IP address of the ICS cluster (e.g.: **192.XXX.XXX.XXX**)
- New Interplay Central *Administrator* password.
- Knowledge of whether or not MOS plug-ins are used (iNEWS workflows)
- Knowledge of whether the facility routers support multicast.
- Interplay Workgroup name
- Lookup server hostname(s)
- Knowledge of whether multi-resolution workflows are being used
- ISIS hostname(s)
- ISIS user name and password reserved for ICS (e.g. **ics-interplay**)

  ***Note**: For multi-ISIS setups, ensure the same user credentials have been created for ICS across all ISIS storage systems.*

- Knowledge of the ICS connection(s):
  - Zone 1 (direct connection)
  - Zone 2 (layer 1 network switch)
  - Zone 3 (layer 2 network switch -- recommended)

  Note**: The host names indicated above are host names only (e.g. **ics-dl360-1)**,that is, the name of the machine. Do not use the fully qualified domain names (e.g. **ics-dl360-1.mydomain.com** or **ics-dl360-1.mydomain.local)

When the ICS connection to ISIS is Zone 3 the following information is also needed:

- Network Device name(s) used by connection (e.g. eth1, eth2)
- Network Device name(s) ignored by connection (e.g. eth1, eth2)
- Zone 3 NIC bandwidth (GigE vs 10GigE)
- ISIS System Director(s) IP address(es)

Note: *You collected the above information in "Appendix L: Installation Pre-Flight Checklist" on page 210.*

Proceed to "***Configuring the Interplay Central UI***" below.

Configuring the Interplay Central UI

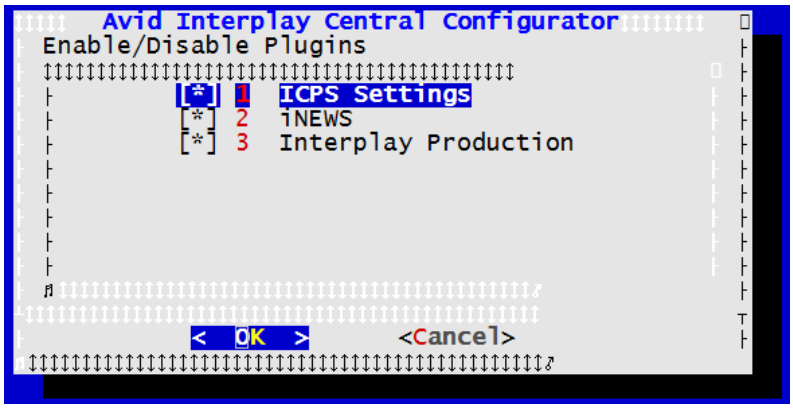
By default, the Interplay Central UI contains functionality for all the IME solutions it supports. You can easily remove support for functions that are not needed.

To configure the Interplay Central UI:

1. Start the configurator by typing the following at the Linux prompt:

   ```
   /opt/avid/avid-interplay-central/configurator
   ```

   The configuration UI appears.



   Note*: Interplay Pulse appears in the configurator UI if it has been installed on the system (via a separate installer).*

2. Select the appropriate application profile settings.

   The following table outlines typical settings by deployment type:

	ICPS Settings	Interplay Production	iNEWS	Pulse
Interplay Central & Pulse	ON	ON	ON	ON

	ICPS Settings	Interplay Production	iNEWS	Pulse
Standard Interplay Central	ON	ON	ON	OFF
Interplay Production Only	ON	ON	OFF	OFF
Interplay Sphere	ON	ON	OFF	OFF
Interplay MAM	ON	OFF	OFF	OFF
iNEWS Only	OFF	OFF	ON	OFF

For example, for an iNEWS-only deployment without video playback, you would enable iNEWS and disable ICPS Settings and Interplay Production.

Note what each selection controls:

- **ICPS Settings**: Toggles the ICPS group in the System Settings layout. This group provides access to the Load Balancer, Playback Service and Player settings details pages.
- **Interplay Production**: Toggles the Interplay Production settings group.
- **iNEWS**: Toggles the iNEWS settings group.
- **Pulse**: Toggles the Interplay Pulse layout.

3. Use the **Up** and **Down** arrow keys to move between the options, **Left** and **Right** arrow keys to move between OK and Cancel, **SPACEBAR** to toggle the asterisks, and press **Enter** to confirm.
   - Asterisk = enabled
   - No Asterisk = disabled

   Now when you launch Interplay Central, the UI will be correctly configured for your deployment.

Proceed to "***Logging into Interplay Central***" below.

Logging into Interplay Central

ICS servers are configured using the Interplay Central System Settings. You need access to the ICS server(s) you are configuring, and you need to launch a web browser. Before configuring Interplay Central or Interplay Sphere, you should change the ICS administrator's account password.

> ***Note**: If you are setting up a cluster, only the master node requires configuration. You do not need to configure any other nodes. The slave node obtains its settings from the master node via the clustering mechanisms. The other nodes participate in load-balancing only, and do not require configuring separately.*

When you sign in to Interplay Central for the first time (in this procedure) you are prompted to sign in to an iNEWS server, an Interplay Production system, or both.

This procedure makes use of the following information:

- Interplay Central *Administrator* password.
- Host name of the ICS server (e.g. **ics-dl360-1**))
- iNEWS Server hostname
- iNEWS user name and password
- Interplay Production user name and password.

To log into Interplay Central for the first time:

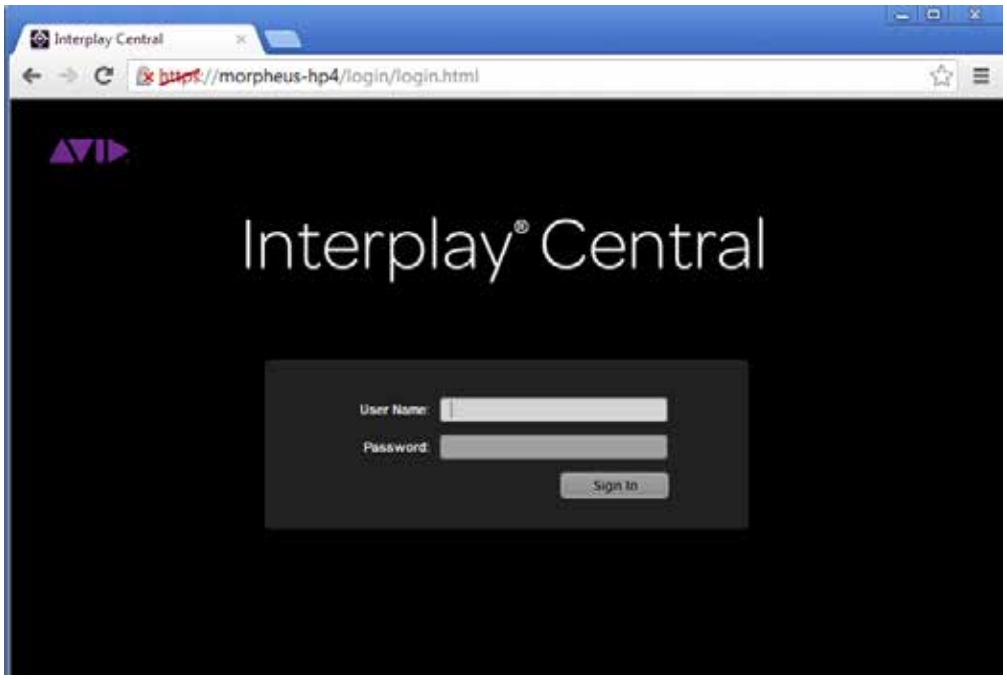
1. Launch a web browser supported by Interplay Central.

   For example, Google Chrome, IE (with Google Chrome Frame plug-in), or Safari (on Mac OS).

2. Enter the URL of the ICS server In the address bar:

   - *https://<hostname>* where *<hostname>* is the host name of the ICS server

   The Interplay Central sign-in screen appears.



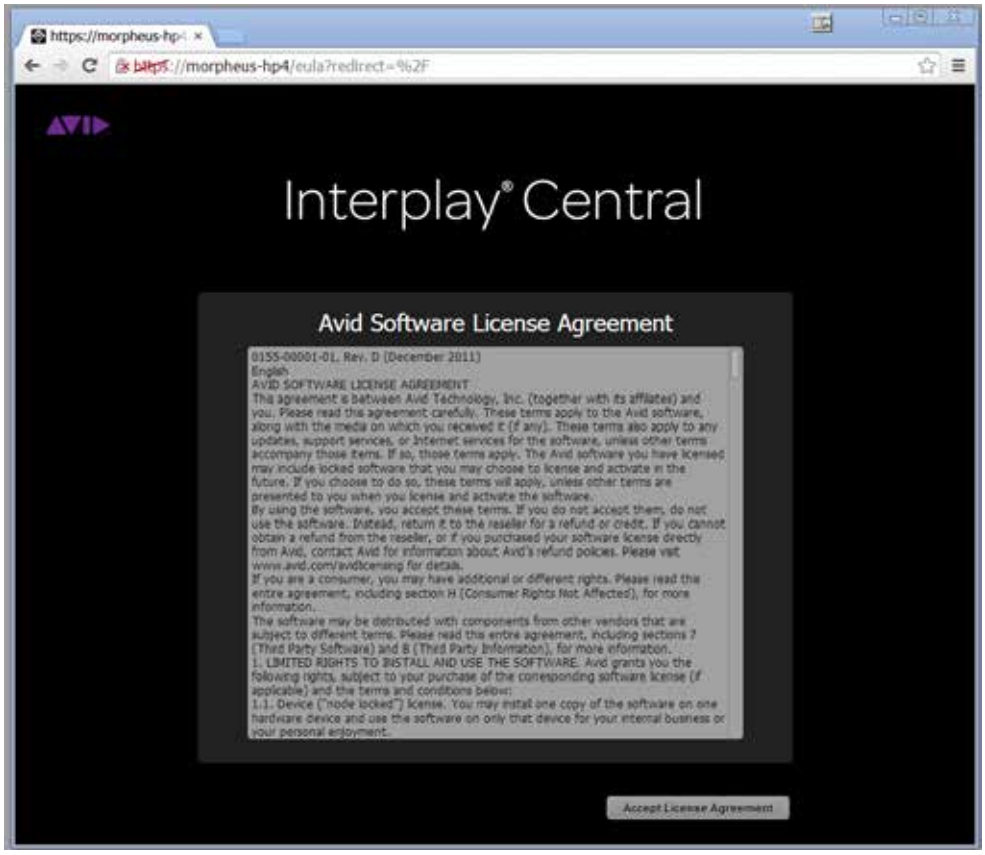
***Note**: In place of the sign-in screen, you might see a warning indicating the site's security certificate is not trusted. For the purposes of installing and configuring, proceed anyway. For information on configuring a trusted certificate, see "Appendix D: Handling SSL Certificates" on page 155.*

3. Sign in using the default *administrator* credentials (case-sensitive):

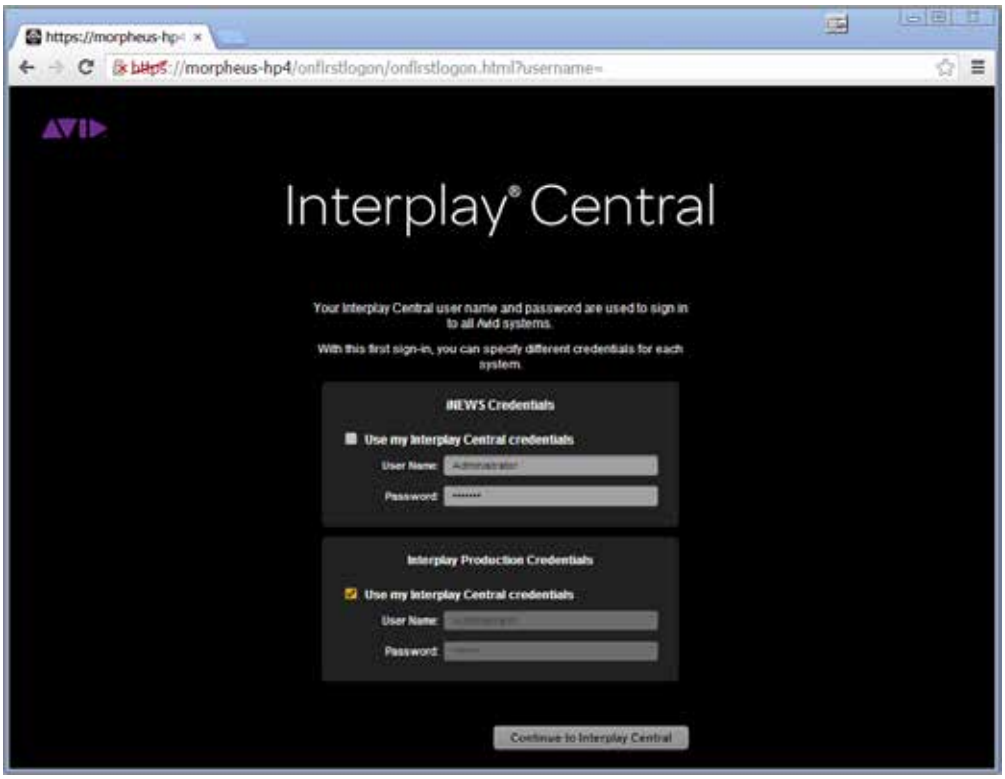
   · User name: Administrator

   Signing in takes you to an Interplay Central layout.

4. The first time any user signs in, the Avid Software License Agreement is presented. Click the **Accept License Agreement** button to proceed.



5. You are also asked to enter iNEWS and Interplay Production credentials:

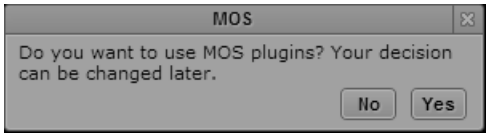


If you created iNEWS and Interplay Production users called *Administrator* with the default Interplay Central *Administrator* password, you can check "Use my Interplay Central Credentials".

Otherwise, enter the user names and passwords for the iNEWS system, and the Interplay Production system.

***Note**: If the security settings for one of these systems is inaccurate, you will see a warning message that states that the application is unable to authorize the sign-in name or password. This will be the case for any iNEWS credentials entered, since you have not yet specified the iNEWs server to be used. If you receive a warning, click the link provided and verify your security settings.*

6. If you are using a Chrome browser, the first time you sign in to Interplay Central a dialog box asks if you want to use MOS plug-ins.



MOS plug-ins are used in certain iNEWS workflows.

***Note**: Selecting "yes" installs only the container needed for Active X controls. To make use of MOS plug-ins you need to install additional software as described in "Appendix F: Installing the Chrome Extension for Interplay Central MOS Plug-Ins" on page 192.*

Proceed to "***Changing the Administrator Password***" below.

Changing the Administrator Password

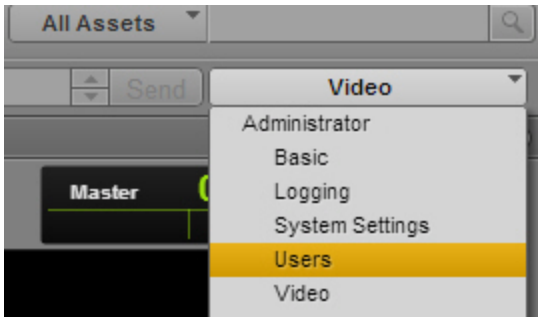
For reasons of security it is strongly suggested that you change the password for the *Administrator* user.

This procedure makes use of the following information:

- Interplay Central *Administrator* password.

To change the Administrator password:

1. While logged in as the *Administrator* user, select **Users** from the Layout selector.



2. Expand the list of administrators in the User Tree and locate the Administrator user.
3. Double-click the **Administrator** user to view its details.
4. Click the Change Password button in the Details pane, and enter a new password for the Administrator user.

   Use a strong password that is in accordance with the client's password enforcement policies.

5. Click OK update the password information.

   A message appears indicating that the password was successfully changed.

Proceed to "***Configuring iNEWS Settings***" below.

Configuring iNEWS Settings

If you did not configure the iNEWS server settings upon signing in, you can do so now.

This procedure makes use of the following information:

- iNEWS server hostname

To configure iNEWS settings:

1. Select **System Settings** from the Layout selector.
2. In the Settings pane, click **iNEWS**.
3. Configure the **iNEWS Server**.
    a. **Hostname**: The computer name of the server that hosts the iNEWS database. If the computer name includes a suffix such as *-a*, do not include it. Not including the suffix allows for load balancing and failover.
4. Configure the **Pagination**.
    a. **Maximum Number**: The maximum number of items listed in the Queue/Story pane or the Project/Story pane. To view more items beyond the number displayed, users can click the Show More Results button.
5. Click Apply to save your changes.

Proceed to "***Configuring Interplay Production Settings***" below.

Configuring Interplay Production Settings

ICS communicates with Interplay Production directly. In this procedure you tell ICS which Interplay Production server it will use, and configure ICS with the user credentials and workgroup properties it needs to interact with Interplay Production.

Interplay Central and Interplay Sphere end-users log in with their own credentials and use their own Interplay credentials to browse media assets. However, ICS itself uses a separate set of Interplay credentials to resolve playback requests and check-in voice-over assets recorded by Interplay Central users.

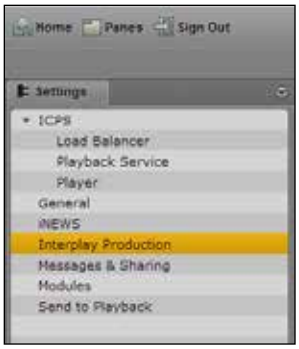
This procedure makes use of the following information:

- Interplay Production server (Interplay Engine) hostname
- Interplay Central Distribution Service – Service URL (e.g. **https://<*server*>:<*port*>**)

Note**: The host name indicated above is the host name only (e.g. **ip-mtl-1)**,that is, it is the name of the machine. **Do not use** the fully qualified domain name (e.g. **ip-mtl-1.mydomain.com** or **ip-mtl-1.mydomain.local). It can also be the IP address.

To configure Interplay Production settings:

1. Select System Settings from the Layout selector.
2. In the Settings pane, click **Interplay Production**.



3. Configure **Interplay Production** credentials:

    a. Enter the Interplay Production server (the Interplay engine) hostname or IP address. If you have an Interplay Engine cluster, specify the virtual server, not an individual server.

    b. Enter the Service URL of the Interplay Central Distribution Service (e.g **https://<*server*>:<*port*>**). You can enter a hostname or IP address for the server.

    If your Interplay workgroup is configured for multiple ICDS servers, specify the multiple URLs separated by a comma and a space. The first server listed is the active ICDS server. Multiple ICDS servers provide a failover capability. For more information on failover for multiple ICDS servers, or other system settings, click the Pane Menu button and select Help or see the *Avid Interplay Central Administration Guide.*

4. Click Apply to save your changes.

Proceed to "***Configuring ICPS for Interplay***" below.

Configuring ICPS for Interplay

Now that ICS can communicate with Interplay Production, you can configure the user name and password used by the Interplay Central Playback Service (ICPS) to log into the Interplay Production server. ICPS is one of the software services that runs on the ICS server. ICPS is responsible for the compression and playback of video and audio media on Internet-connected clients. It requires its own set of user credentials.

This procedure makes use of the following information:

- Interplay Production user name and password reserved for ICS (e.g. **ics-interplay**). This needs to be created in the Interplay Production workgroup to which you are connecting.
- High Availability Group (HAG) availability in Interplay Production.
- Media Indexer host name
- Interplay Workgroup name
- Lookup server hostname(s)
- Knowledge of whether multi-resolution workflows are being used

***Note**: The host names indicated above is the host name only (e.g. **mi-mtl-1)**,that is, it is the name of the machine. **Do not use** the fully qualified domain name (e.g. **mi-mtl-1.mydomain.com** or **mi-mtl-1.mydomain.local).** It can also be the IP address.*

To configure ICPS for Interplay:

1. Select System Settings from the Layout selector.
2. In the Settings pane, click **Playback Service**.
3. Configure the **Player Settings**:
    a. **Save Failed AAF**: Check this box to automatically save AAF files that do not parse properly to a dedicated folder. Helpful for troubleshooting.
4. Configure the **Interplay Workgroup Properties**:
    a. **User**: Enter the name of the Interplay Production user reserved for ICS.
    b. **Password**: Enter the password for that user.
    c. **Connect to HAG**: Check this box to connect to an Interplay Production Media Indexer High Availability Group (HAG). The HAG must already be configured in Interplay Production.

        ***Note**: Interplay Central connects to the primary node of the HAG only. It does not participate in HAG redundancy.*

        Checking the **Connect to HAG** box grays-out the MI Host field. Any entry in the field is still available, should you decide to connect to a MI Host directly in the future, by unchecking the box.
    d. **MI Host**: Enter the Media Indexer (MI) host.

        ***Note**: The host name indicated above is the host name only (e.g. **mi-mtl-1)**,that is, it is the name of the machine. **Do not use** the fully qualified domain name (e.g. **mi-mtl-1.mydomain.com** or **mi-mtl-1.mydomain.local).** It can also be the IP address.*

        ***Note**: For a Media Indexer connected to a High Availability Group (HAG), enter the host name of the active Media Indexer.*

    e. **Workgroup Name**. This is case-sensitive. Use the same case as defined in the Interplay engine.
    f. **Lookup Servers**: Enter the host name(s) for the Lookup server(s).
5. **Enable Dynamic Relink**: For multi-resolution workflows, select Enable Dynamic Relink.
6. Click Apply to save your changes.

Proceed to "***Configuring the ICPS Player***" below.

Configuring the ICPS Player

The ICPS Player communicates directly with the ICS server to obtain media for playback, using the credentials of the logged-in user for validation. In this step you tell the ICPS Player where to find the ICS server.

This procedure makes use of the following information:

- ICS server hostname (e.g. **ics-dl360-1**)
- ICS cluster static IP address address (e.g. **192.XXX.XXX.XXX**) or host name (e.g **ics-cluster**)

***Note**: If you are in the process of setting up the first server in a cluster, do not enter the cluster IP address or cluster host name yet. Enter the information for the first server. You will switch to the cluster information later.*

***Note**: In previous releases the ICPS Player required a separate user name and password to connect to the ICS server. As of ICS 1.8, this is no longer the case. The Player uses the credentials of the user logged in to connect to the ICS server.*

To configure the ICPS Player:

1. Select System Settings from the Layout selector.
2. In the Settings pane, click **Player**.
3. Enter the ICS server hostname (e.g. **ics-dl360-1**).
4. Click Apply to save your changes.

Proceed to "***Configuring the ICPS Player for Interplay Sphere***" below.

Configuring the ICPS Player for Interplay Sphere

In this step you provide user credentials for Interplay Sphere.

This procedure makes use of the following information:

- User name and password reserved for the Sphere user (e.g. **sphere**)

To configure the ICPS Player for Sphere:

1. Select **System Settings** from the Layout selector.
2. In the Settings pane, click **Player**.
3. Enter the user name and password reserved for Sphere (e.g. **sphere**).
4. Click Apply to save your changes.

   The **Sphere Playback User** is created, and automatically assigned a special "Sphere User" role. You can see the new user and role by selecting **Users** from the Layout selector.

5. Be sure to configure Sphere itself to make use of the user name and password entered above.

   For instructions on configuring Sphere, see the *Avid Interplay Sphere Installation and Configuration Guide*.

To delete the ICPS Player for Sphere:

- You are advised to delete the Sphere Playback User from the **Player** settings pane in the System Settings Layout (rather than in the Users layout)

Proceed to "***Configuring the ISIS Connection(s)***" below.

Configuring the ISIS Connection(s)

ICS is an ISIS client, maintaining its own connection to an ISIS system. Normally, only one active network connection is needed on the ICS server for this purpose. The single GigE or 10GigE connection functions for:

- Communication with the ISIS
- Playback of compressed media generated on the ICS server over the network

Multiple connections are possible. When you maintain other active connections on the ICS server, you must indicate which network connections are reserved for ISIS, and which are used for other network activity.

This procedure make use of the following information:

- Knowledge of the ISIS connection(s):
  - Zone 1 (direct connection)
  - Zone 2 (layer 2 network switch)
  - Zone 3 (layer 3 network switch -- recommended)
- Connection bandwidth (GigE vs 10GigE)
- Name(s) of the NIC interfaces used to connect to ISIS (e.g. *eth0*)
- Name(s) of the NIC interfaces used for other network activity

To configure the ISIS connection:

1. Select System Settings from the Layout selector.
2. In the Settings pane click **Playback Service**.
3. For a Zone 3 (recommended) connection, put a checkmark in Enable Remote Host.

   For a Zone 1 or Zone 2 connection leave Enable Remote Host unchecked.
4. Select the NIC interface bandwidth (e.g. GigE, 10GigE).

5. For an ICS server with more than one active connection:
    a. In the Use Network Device field, enter the network interface name(s) used to connect to the ISIS system, separated by commas.
    b. In the Ignore Network Device field, enter the network interface name(s) to be ignored by ICS.

    For an ICS server with only one active network connection (e.g. *eth0*) you can leave the fields blank.
6. Click Apply.

    The information is sent to the ICS server, triggering a reconfiguration that may take a few moments.

Proceed to "***Mounting the ISIS System(s)***" below.

Mounting the ISIS System(s)

Now that you have specified what NIC interface connection(s) are used to reach the ISIS, you can mount the ISIS system(s). ICS communicates with ISIS storage directly. It uses a separate set of ISIS credentials from the end-user to read media assets for playback and to write audio assets for voice-over recorded by Interplay Central end-users.

In this procedure you configure ICS with the user credentials it needs to connect to the ISIS system(s). In some network configuration scenarios, additional settings are required.

This procedure make use of the following information:

- ISIS Virtual Host Name(s)
- ISIS user name and password reserved for ICS (e.g. **ics-interplay**)

  ***Note**: For multi-ISIS setups, ensure the same user credentials have been created for ICS across all ISIS storage systems.*
- Knowledge of the ICS connection(s) to the ISIS:
    - Zone 1 (direct connection)
    - Zone 2 (layer 2 network switch)
    - Zone 3 (layer 3 network switch -- recommended)

***Note**: The host name indicated above is the host name only (e.g. **isis-mtl-1)**,that is, it is the name of the machine. **Do not use** the fully qualified domain name (e.g. **isis-mtl-1.mydomain.com** or **isis-mtl-1.mydomain.local).** It can also be the IP address.*

When the ICS connection to the ISIS is Zone 3 the following information is also needed:

- ISIS System Director IP address(es)

To mount the ISIS system(s):

1. Select System Settings from the Layout selector.
2. In the Settings pane click **Playback Service**.
3. Click the plus (+) button to add the ISIS as a storage location.

   A New File System dialog appears.
4. In the dialog, enter a nickname (label) to refer to the ISIS, indicate its type (ISIS), then click **OK**.

   A new storage location is added to the list for the ISIS.

   Since you have not yet configured ICS with user credentials for it, the status is *disconnected*.
5. Specify the necessary configuration details for the ISIS:
   a. Virtual Host Name
   b. User name
   c. Password

   ***Note**: The host name indicated above is the host name only (e.g. **isis-mtl-1)**,that is, it is the name of the machine. **Do not use** the fully qualified domain name (e.g. **isis-mtl-1.mydomain.com** or **isis-mtl-1.mydomain.local).** It can also be the IP address.*
6. For a Zone 3 connection, enter list of IP addresses for the ISIS System Director. Separate each entry by a semi-colon, no spaces.
7. Click Apply.

   The status changes to Connected.
8. Repeat the above for each additional ISIS (Zone 2 and Zone 3 only).

Proceed to "***Verifying the ISIS Mount***" below.

Verifying the ISIS Mount

Although the validity of the ISIS mount was authenticated in the previous procedure when the status of the storage changed to "Connected", it is also possible to verify the ISIS is mounted at the command line, using the following Linux commands:

- service avid-isis status
- mount -t fuse.avidfos
- df -h

Further, you can explore the ISIS workspaces by navigating them as a Linux filesystem directories.

To verify the ISIS mount(s):

1. Verify the status of the avid-isis service:

   ```
   service avid-isis status
   ```

   The system responds with output showing the ISIS mounts, similar to the following:

   ```
   ISIS mount: morphisis1 /mnt/ICS_Avid_Isis/morphisis1 fuse.avidfos
   rw,nosuid,nodev,relatime,user_id=0,group_id=0,default_permissions
   ,allow_other 0 0
   ```

   The output above indicates an ISIS called *morphisis1* mounted at /isis/morphisis1. "Fuse" is the RHEL filesystem type reserved for third-party filesystems.

2. You can use the Linux mount command directly to display all mounted filesystems of type fuse.avidfos (the ISIS filesystem)

   ```
   mount -t fuse.avidfos
   ```

   The system responds with output showing the ISIS mounts, similar to the following:

   ```
   morphisis1 on /mnt/ICS_Avid_Isis/morphisis1 type fuse.avidfos
   (rw,nosuid,nodev,allow_other,default_permissions)
   ```

3. The Linux *df* command displays disk usage information for all the mounted filesystems:

   ```
   df -h
   ```

   The system responds with output similar to the following:

   ```
   Filesystem            Size  Used Avail Use% Mounted on
   /dev/mapper/vg_icps-lv_cache
                         527G  6.3G  494G   2% /
   tmpfs                  24G     0   24G   0% /dev/shm
   /dev/sda1             485M   33M  428M   8% /boot
   morphisis1             15T  5.7T  8.9T  40% /mnt/ICS_Avid_Isis/morphisis1
   /dev/sdb1             7.3G  5.5G  1.9G  75% /media/usb
   ```

4. Finally, you can explore the mounted ISIS and its workspaces by navigating it as you would any Linux filesystem.

   For example, for the sample output shown above, to view the workspaces available to the ICPS player, list the contents of the mounted ISIS:

   ```
   ls /mnt/ICS_Avid_Isis/morphisis1
   ```

Proceed to "***Verifying Video Playback***" below.

Verifying Video Playback

Playing some video is a simple technique for verifying that the configuration has had the desired effect.

To verify video playback:

1. Select Story from the Layout selector.
2. In the Launch pane select one of the mounted systems by double-clicking it.

3. Navigate the filesystem hierarchy and select a clip.
4. Double-click the clip to load it into the player.
5. Experiment with the player controls to play and scrub the clip.

Proceed to ***"Configuring Wi-Fi Only Encoding for Facility-Based iOS Devices"*** below (optional).

Or, proceed to "*Clustering Workflow*" on page 101 (optional).

Or, proceed to "*Post-Installation Steps*" on page 125.

Configuring Wi-Fi Only Encoding for Facility-Based iOS Devices

By default, ICS servers encode three different media streams for Interplay Central applications detected on iOS devices -- for Wi-Fi, 3G, and Edge connections. For Wi-Fi only facilities, it is recommended that you disable the 3G and Edge streams, to improve the encoding capacity of the ICS server.

To disable 3G and Edge streams:

1. Log in as *root* and edit the following file using a text editor (such as *vi*):
   `/usr/maxt/maxedit/share/MPEGPresets/MPEG2TS.mpegpreset`
2. In each of the [Edge] and [3G] areas, set the `active` parameter to `active=0`.
3. Save and close the file.

Proceed to "*Clustering Workflow*" on page 101 (optional).

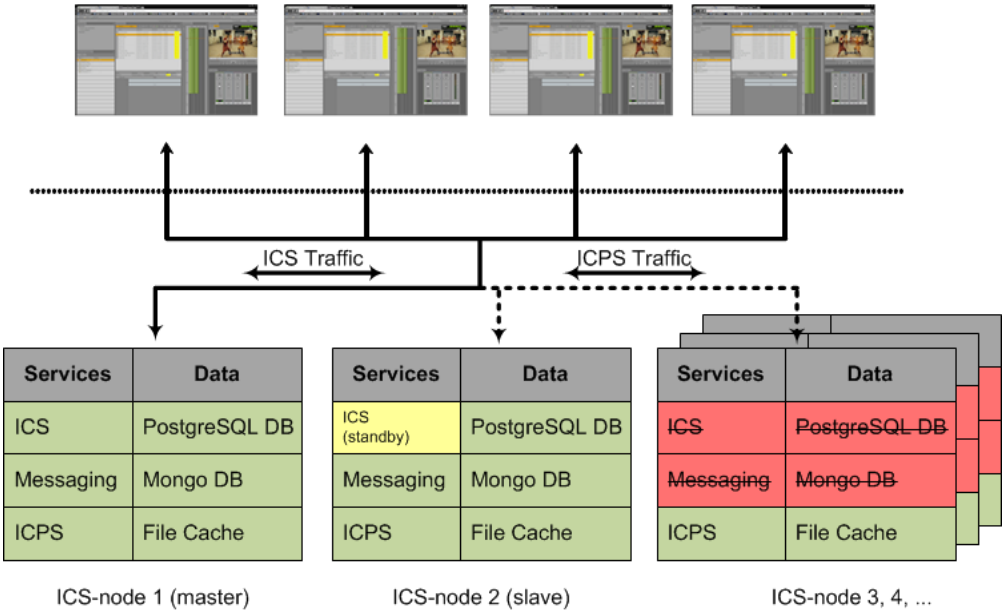
Or, proceed to "*Post-Installation Steps*" on page 125.

PART III: CLUSTERING

***Note**: For detailed information on how ICS servers operate in a cluster, see the* "ICS 1.8 Service and Server Clustering Overview" *guide.*

Setting up the Server Cluster

Clustering adds high-availability, load-balancing and scale to ICS. To set up a cluster, each server in the cluster must have RHEL and ICS installed. One server must also be fully configured for the deployment of interest. The other servers need only RHEL and ICS installed. A typical cluster is shown in the following illustration:



The following table lists the additional software components that are installed during cluster setup and are required for clustering:

Software	Functioning	ICS-node 1	ICS-node 2	ICS-node 3	ICS-node n
Corosync	Cluster Engine Data Bus	ON	ON	ON	ON
Pacemaker	Cluster Management & Service Failover	ON	ON	ON	ON
GlusterFS	File Cache Mirroring	ON	ON	ON	ON
DRBD	Database Volume Mirroring	ON	ON	OFF	OFF

Note the following:

- Corosync and Pacemaker work in tandem to detect server and application failures, and allocate resources for failover scenarios.
- Gluster mirrors media cached on an individual RAID 5 drive to all other RAID 5 drives in the cluster.
- DRBD mirrors the ICS databases on two servers in a master-slave configuration. This provides redundancy in case of a server failure

The following table lists some of the more important services involved in clustering, and where they run:

Services			ICS-node 1	ICS-node 2	ICS-node 3	ICS-node n
ICS	Middleware	IPC	ON	OFF	OFF	OFF
	User Mgmt	UMS	ON	OFF	OFF	OFF
	Configuration	ACS	ON	OFF	OFF	OFF
	Messaging	ACS	ON	ON	ON	ON
Playback Service		ICPS	ON	ON	ON	ON

Note the following:

- All ICS services run on the Master node in the cluster.
- Most ICS services are off on the Slave node but start automatically during a failover.
- On all other nodes, the ICS services never run.
- The Playback service (ICPS) runs on all nodes for Performance Scalability (load balancing supports many concurrent clients and/or large media requests) and High Availability (the service is always available).

***Note**: Clustering in ICS makes use of the* corosync *clustering engine and infrastructure. The infrastructure includes a cluster resource monitor utility,* crm_mon*, that displays the state of the cluster. We recommend you maintain a separate terminal window where you can use the utility to view results as you build the cluster. If you are working from a terminal attached directly to the server, simply run* crm_mon *periodically to view the results of your clustering operations.*

The procedures in this section make use of the following information you entered in "***Appendix L: Installation Pre-Flight Checklist*** on page 210:

- The static IP address allocated for the cluster
- IP address that is always available (e.g. network router)
- Email addresses of network administrators
- Interplay MAM Port bonding IP address (if applicable)
- Port bonding interface name (if applicable, e.g. *bond0*)
- Device name for each NIC interface used in port bonding (e.g. eth0, eth1, etc.)

***Note:** For Interplay MAM deployments using port bonding, bond the ports before setting up the cluster. See "*Appendix C: Configuring Port Bonding for Interplay MAM (Optional)*" on page 152.*

Clustering Workflow

Clustering requires that you set up one server completely before creating a cluster. That is, set up ICS on a server as if you were performing a non-clustered installation. Once that is done, you can set up the other ICS servers and add them to the cluster.

The following table outlines the clustering installation workflow:

> ***Note**: If you are setting up a cluster, only the master node requires configuring. You do not need to configure any other nodes. The slave node obtains its settings from the master node via the clustering mechanisms. The other nodes participate in load-balancing only, and do not require configuring separately.*

Step	Task	Time Est.
1	**Setting up and Configuring a Single ICS Server**	2–3 hr
	If you have not already done so, set up a fully operational ICS server. See "***Installation Workflow***" on page 36. This includes establishing the network and storage connections, setting up the RAID 1 and RAID 5 (if required), installing RHEL and ICS, ICDS (Interplay Central only), etc. Importantly, it also includes all the configuration steps for the IME solution of choice (Interplay Central, Interplay Sphere, Interplay MAM), and verifying video playback.	
2	**Installing RHEL and ICS on the Other Servers in the Cluster**	1 hr
	Perform the same setup and installation steps outlined above, with the exception of configuring the server for the IME solution. These other servers in the cluster will inherit the settings of the master server, once they are added to the cluster. You do not need to configure the other ICS servers in the cluster.	
3	**Configuring the Hosts File and Name Services File**	5 mins
	Configure the /etc/hosts file and nsswitch.conf file for optimal cluster performance.	
4	**Setting Up DRBD**	5 min
	Initiate replication of the ICS PostgreSQL database. DRBD runs on the master and slave node, but not any others.	
5	**Starting the Cluster Services**	5 min
	Start the cluster services on the fully set up ICS server (the master node).	
6	**Joining the Cluster**	10 min

Step	Task	Time Est.
	Connect to the master node — the fully operational node — from the other ICS nodes.	
7	**Replicating the Cluster File Caches**	20 min
	Set up Gluster to mirror the caches, so each server in the cluster can easily use material transcoded by the others. This step is only required if your ICS nodes make use of a dedicated media cache volume (e.g. RAID 5).	
8	**Reconfiguring the ICPS Player for Interplay Central in a Cluster**	5 min
	Reconfigure the ICPS player to point to the cluster IP address or host name, so the master node can determine which node serves the video.	
9	**Post-Installation Steps**	5 min
	Verify the cluster is working and intended.	

Proceed to "*Replicating the Cluster File Caches*" on page 112.

Before You Begin

Ensure you have everything you need to set up clustering. Make sure of the following:

- RHEL and ICS software components are installed on all servers in the cluster
- All servers are on the network and are assigned IP addresses
- You have an assigned cluster IP address (distinct from the servers in the cluster)
- If your network already uses multicast, IT must issue you a multicast address to avoid potential conflicts. If your network does not use multicast, the cluster can safely use a default multicast address.
- If your network is not multicast-ready, you can configure clustering for a unicast environment. See "*Appendix H: Unicast Support in Clustering*" on page 197.

Configuring the Hosts File and Name Services File

The *hosts* file is used by the operating system to map hostnames to IP addresses. It allows network transactions on the computer to resolve the right targets on the network when the instructions carry a human readable host name (e.g. **ics-dl360-1**) rather than an IP address (e.g. **192.XXX.XXX.XXX**).

Although there are other means of resolving IP addresses from host names, the *hosts* file can be accessed directly and more quickly by the computer on which the file resides. If the host name is not defined in the *hosts* file the OS will use other means to resolve it to an IP address, such as a Domain Name System (DNS) server.

In this section, you edit the h*osts* file residing at the following path:

```
/etc/hosts
```

You also edit the *default* hosts file, at the following location:

```
/etc/sysconfig/networking/profiles/default/hosts
```

In addition, you optimize the lookup service order by editing the Name Service Switch file in this location:

```
/etc/nsswitch.conf
```

Adding Host Names and IP Addresses to the *hosts* File

In this step you add entries to the *hosts* file so Linux can quickly resolve host names to IP addresses, for all nodes in the cluster.

In addition, since the active *hosts* file can be reset to its default configuration when a server fails or is rebooted you must also edit the default *hosts* file.

> ***Note**: You can edit the file /etc/hosts while the system is up and running without disrupting user activity.*

To add host names and IP addresses to the *hosts* file:

1. Open the active hosts (/etc/hosts) file for editing.

   ```
   vi /etc/hosts
   ```

   It should look similar to the following:

```
127.0.0.1  localhost localhost.localdomain localhost4 localhost4.localdomain4
::1        localhost localhost.localdomain localhost6 localhost6.localdomain6
```

2. Added entries that resolve host names to IP addresses for all cluster nodes (including the local host).

   For a four node cluster, for example, you would add four lines similar to the following:

```
127.0.0.1 localhost  localhost.localdomain  localhost4  localhost4.localdomain4
::1       localhost  localhost.localdomain  localhost6  localhost6.localdomain6
10.106.131.41    ics-node-1.csglobal.lab    ics-node-1
10.106.131.42    ics-node-2.csglobal.lab    ics-node-2
10.106.131.43    ics-node-3.csglobal.lab    ics-node-3
10.106.131.44    ics-node-4.csglobal.lab    ics-node-4
```

...where *ics-node1*, *ics-node2*, *ics-node3*, and *ics-node4* are the host names of the four nodes in the cluster.

3. Save and exit the file.

   ***Note**: It is a good idea to declare the nodes in the hosts file in order of latency, ascending. Run a *ping* command to each node and add the lines to the file in order of the *ping* return. For example, if *node-2* returns a ping after 30ms and *node-3* after 20ms, put in the line for node-3 before node-2.*

4. Edit the default *hosts* file to match:

   ```
   vi /etc/sysconfig/networking/profiles/default/hosts
   ```

Optimizing the Lookup Service Order: Editing the Name Service Switch File

As noted, Linux can look up host names and IP addresses in different places. For example, it can resolve a host name to an IP address by looking up the */etc/hosts* file or a DNS server. Editing */etc/hosts* files to map host names and IP addresses for an entire network of computers can be tedious and is prone to error. Using a DNS server is a more efficient way in many cases. However, the lookup process that uses a DNS server is vulnerable to network latency and occasionally timeouts.

In an ICS cluster, it is very important to minimize the time to the lookup servers. As a result using the local */etc/hosts* file is preferred. It is therefore important to configure all ICS nodes in a cluster to *first* try to resolve host names to IP addresses using the *hosts* file, and if a specific host name is not declared in that file, *then* refer to a DNS.

To optimize the lookup service order:

6. Open the Name Service Switch (/etc/nsswitch.conf) file for editing and look for the section (about halfway into the file) that looks similar to the following:

   ```
   #hosts:     db files nisplus nis dns
   hosts:      files dns
   ```

7. Make sure in the second *hosts* line that *files* (in bold, above) appears in the line before *dns*.

8. Save and exit the file.

Proceed to "***Setting Up DRBD***" below.

Setting Up DRBD

In a clustered configuration, ICS uses the open source Distributed Replicated Block Device (DRBD) storage system software to replicate its PostgreSQL database across all nodes in the cluster. In this step, you set up DRBD and initialize the replication using the command provided.

> ***Note**: DRBD runs on a master node and a non-master node only, even in a cluster with more than two nodes.*
>
> ***Note**: This procedure assumes a 20 GB partition exists on the RAID 1 mirrored system drive (**/dev/sda**). If you are installing ICS on supported HP hardware using the USB key, the required partition (**/dev/sda2**) was automatically created. If you are installing ICS for Interplay MAM on non-HP hardware, see "Appendix A: Installing ICS on Non-HP Hardware" on page 148 for details.*

Explanation (do not type this example)

This procedure uses the *drbd_setup* command:

drbd_setup
[primary_host="<hostname>"] [secondary_host="<hostname>"]
{[primary_ip="<ip>"] [secondary_ip="<ip >"]}
{[primary_disk="<device>"] [secondary_disk="<device>"]}

where:

primary_host: Host name (e.g. **ics-dl360-1**) of the machine to serve as master node for DRBD.

secondary_host: Host name (e.g. **ics-dl360-2**) of the non-master machine (the machine to serve as fail-over for DRBD).

primary_ip: Optional. IP address (e.g. **192.XXX.XXX.XXX**) of the primary host. Helpful when host *primary_host* specified does not resolve.

secondary_ip: Optional. IP address (e.g. **192.XXX.XXX.XXX**) of the secondary host. Helpful when *secondary_host* does not resolve.

primary_disk: Optional. Name of the disk device reserved for DRBD on the primary machine (**/dev/sda2** by default).

secondary_disk: Optional. Name of the disk device reserved for DRBD on the primary machine (**/dev/sda2** by default).

***Note**: The* primary_disk *and* secondary_disk *parameters are provided for special cases in which the partitions reserved for DRBD are in a non-standard location. In most cases, the /dev/sda2 values supplied by default will be sufficient.*

***Note**: The DRBD setup script is case-sensitive. The host names you enter must exactly match those defined for the master and non-master.*

For the *man* page for the *drbd_setup* command, run the command at the Linux prompt without specifying any parameters:

```
/opt/avid/cluster/bin/drbd_setup
```

To set up DRBD:

***Note**: Before beginning this procedure, please note the following:*

- *The DRBD setup script is case-sensitive. The host names you enter must exactly match those defined for the master and non-master.*
- *To check the spelling and capitalization of a host, use the Linux hostname command.*
- *In addition, make sure the host name returned by the hostname command is not a "fully qualified domain name" (FQDN). DRBD requires the standard "short" host name (e.g. ics-dl360), not the FQDN (e.g ics-dl360.mydoman.com).*
- *Once started (in this procedure) DRBD needs to remain running until you start the cluster services on the master and slave using the setup-cluster script in "**Starting the Cluster Services**" on page 108 and "**Joining the Cluster**" on page 111. Once the cluster is formed, Pacemaker manages DRBD from then on.*

1. On the fully operational node to serve as master log in as *root*.
2. Change to the directory containing the *drbd_setup* script:

   ```
   cd /opt/avid/cluster/bin
   ```

3. Run the *drbd_setup* script:

   ```
   ./drbd_setup primary_host="<hostname of master machine>"
   secondary_host="<hostname of non-master machine>"
   ```

   In the command above, the "./" tells Linux to look for the script in the current directory.

   ***Note**: If an error message indicates the IP addresses cannot be identified using the host names provided, provide IP addresses as well as host names for the primary and secondary hosts:*

   ```
   ./drbd_setup primary_host="<hostname of master machine>"
   secondary_host="<hostname of non-master machine>"
   primary_ip="<ip of master machine>"
   secondary_ip="<ip of non-master machine>"
   ```

4. You might receive an error message indicating the bus is not running and/or a path does not exist, similar to the following:

   ```
   - error: bus is not running
   - error: Given --path is not exist:
   ```

   These errors can be ignored.

5. You may also receive the following message:

```
Found some data
==> This might destroy existing data! <==

Do you want to proceed?
[need to type 'yes' to confirm]
```

This indicates the DRBD setup script has found the 20GB partition set aside for it and is about to take ownership of it.

6. Type “yes” at the prompt to continue with the setup.

   The system responds, and waits for the other DRBD node, with output similar to the following:

```
Writing meta data...
initializing activity log
NOT initializing bitmap
New drbd meta data block successfully created.
success
Waiting for secondary node ...
```

7. Run the same command on the secondary host (non-master node).

   The system responds with output similar to the following (on the master node only)

```
Secondary node found
Node initialized with role: Primary
Stopping postgresql-9.1 service: [  OK  ]
mke2fs 1.41.12 (17-May-2010)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
128000 inodes, 511975 blocks
25598 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=524288000
16 block groups
32768 blocks per group, 32768 fragments per group
8000 inodes per group
Superblock backups stored on blocks:
32768, 98304, 163840, 229376, 294912

Writing inode tables:  0/16 1/16 2/16 3/16 4/16 5/16 6/16 7/16 8/16
9/1610/1611/1612/1613/1614/1615/16 done
Creating journal (8192 blocks): done
Writing superblocks and filesystem accounting information: done

This filesystem will be automatically checked every 23 mounts or
180 days, whichever comes first.  Use tune2fs -c or -i to override.
partition mounted at  /mnt/drbd
Starting postgresql-9.1 service: [  OK  ]
```

> ***Note**: A fail message may appear when the drbd_setup script tries to start postgres. This is normal.*

Finally, information indicating synchronization is underway appears in the output, similar to the following (on the master node only). The synchronization process can take some time, since DRBD replicates at the block level.

```
Node synchronization started
5% synchronized
…
55% synchronized
97% synchronized
Node synchronization finished
```

8. Wait until node synchronization is completed before proceeding to the next step.

Proceed to "***Starting the Cluster Services***" below.

Starting the Cluster Services

Now that you have set up DRBD, you are ready to start and configure the cluster services. Scripts have been provided that simplify this process.

Before you can join all the ICS servers together in a cluster, you must start the cluster services on one machine. This is done on the one node you have fully installed and configured — the fully operational ICS server — using scripts provided.

***Note**: If you are working remotely using a remote shell session, this is a good moment to open a separate terminal window where you can run the cluster resource manager utility,* crm_mon*. Otherwise, run the utility now and then in the same terminal where you are doing your work.*

***Note**: Recall that DRBD runs on two nodes only: the master node, and one non-master node. If your cluster has more than two nodes, use the special form of the setup-cluster command to exclude the non-DRBD nodes from starting the PostgreSQL database. The special form of the setup-cluster command is indicated in the procedure below.*

To set up the master node in the cluster:

1. On the fully operational node do one of the following commands:

   ***Note**: In the instructions below, be sure to substitute the actual interface name you are putting to use (eth0 recommended) in the appropriate places.*

   - On a network that has no other multicast activity, use the default multicast address by issuing the following command:

     ```
     /opt/avid/cluster/bin/cluster setup-corosync
     --corosync-bind-iface=eth0
     --rabbitmq_master=<master>
     ```

   - <*master*> is the master node (e.g. **ics-dl360-1**). This should be the same as the DRBD master node specified earlier.

- On a network with other multicast activity, use the following command:

```
/opt/avid/cluster/bin/cluster setup-corosync
--corosync-bind-iface=eth0
--corosync-mcast-addr="<multicast address>"
--rabbitmq_master=<master>
```

- <*multicast address*> is the multicast address that IT provided for the cluster (e.g. **239.XXX.XXX.XXX**).

***Note**: The "default" multicast address used for ICS clustering is 239.192.1.1. This is set by the* setup-corosync *script, if you do not specify one. If an ICS cluster already exists, and your new cluster will co-exist alongside it (in a test setting, for example), use a different multicast address for the new cluster (e.g. 239.192.1.2).*

***Note**: For port bonding, assign the name of the port bonding interface instead (e.g.* bond0*).*

Messages appear echoing the Corosync network binding process. The Avid UMS service is temporarily shut down. A message appears indicating the Corosync cluster engine has successfully started.

The following is sample output:

```
bind_iface=eth0 bind_network=xxx.xx.xx.x mcast_addr=xxx.xx.x.x
.
.
.
Shutting down UMS                                          [  OK  ]
2012-11-19 15:39:36.477 -0500 - info: Done. System is up-to-date.
generic – stop                                             [  OK  ]
boot – stop                                                [  OK  ]
Starting Corosync Cluster Engine (corosync):               [  OK  ]
Starting Pacemaker Cluster Manager:                        [  OK  ]
```

2. If you are using the recommended interface name (*eth0*), enter the following command:

```
/opt/avid/cluster/bin/cluster setup-cluster
--cluster_ip="<cluster IP address>"
--pingable_ip="<router IP address>"
--admin_email="<comma separated e-mail list>"
--drbd_exclude="<comma separated list of non-DRBD nodes>"
```

- `<cluster IP address>` is the IP address provided by IT for the cluster (e.g.: 192.XXX.XXX.XXX)
- `<router IP address>` is an IP address that will always be available on the network -- for example, the IP address of a network router
- `<comma separated e-mail list>` is a comma separated list of e-mail addresses to which cluster status notifications are automatically sent

***Note**: At least one cluster administrator email address is mandatory (though not validated by the system). To change the email address later, see "Changing the Cluster Administrator Email Address" on page 141.*

- `<comma separated list of non-DRBD nodes>` is a comma separated list of the non-DRBD nodes in the cluster (e.g. "ics-dl360-3,ics-dl360-4"). This parameter prevents the non-DRBD nodes from running PostgreSQL.

3. Otherwise, if you are not using the recommended interface name, enter the following command instead:

```
/opt/avid/cluster/bin/cluster setup-cluster
--cluster_ip="<cluster IP address>"
--pingable_ip="<router IP address>"
--cluster_ip_iface="<interface_name>"
--admin_email="<comma separated e-mail list>"
--drbd_exclude="<comma separated list of non-DRBD nodes>"
```

   - `<interface_name>` is the name of the NIC interface being used by the cluster (shown in bold above).

4. Error messages appear indicating missing resources and attributes.

   For example:

```
ERROR: resource <resource name> does not exist
Error: performing operation: The object/attribute does not exist
```

   These can be ignored.

5. Warning, error and info messages may also appear, similar to the following:

```
WARNING: 125: AvidConnectivityMon: specified timeout 20s for
start is smaller than the advised 60
ERROR: 125: rsc-options: attribute admin-email does not exist
INFO: 125: commit forced
```

   These can be ignored.

6. Finally, the cluster configuration file is output to screen.

   It identifies the node name, and various internal configuration information.

7. You can view the contents of the configuration file, at any time, by typing:

```
crm configure show
```

8. If necessary, press **Q** to get back to the Linux command line prompt.

9. Restart the following services so they register correctly on the newly created instance of the message bus:

```
service acs-ctrl-messenger restart
service avid-aaf-gen restart
service avid-mpd restart
```

***Note**: Restarting the Interplay Pulse (avid-mpd) service is only needed if Interplay Pulse (separate installer) is installed on the system.*

10. Now that the clustering services are up and running on the master node, start the cluster monitoring tool to view progress as you add the other nodes to the cluster:

    ```
    crm_mon
    ```

Proceed to "***Joining the Cluster***" below.

Joining the Cluster

With the clustering services up and running on the master node – the fully configured ICS server – add the other servers to the cluster.

To add other servers to the cluster:

1. On each of the non-master servers in the cluster, do one of the following commands:

   ***Note**: In the instructions below, be sure to substitute the actual interface name you are putting to use (eth0 recommended) in the appropriate places.*

   - On a network that has no other multicast activity, use the default multicast address with the following command:

     ```
     /opt/avid/cluster/bin/cluster setup-corosync
     --corosync-bind-iface=eth0
     --rabbitmq_master=<master>
     ```

     - <*master*> is the master node (e.g. **ics-dl360-1**). This should be the same as the DRBD master node specified earlier.

   - On a network with other multicast activity, use the following command:

     ```
     /opt/avid/cluster/bin/cluster setup-corosync
     --corosync-bind-iface=eth0
     --corosync-mcast-addr="<multicast address>"
     --rabbitmq_master=<master>
     ```

     <*multicast address*> is the multicast address that IT provided for the cluster (e.g. **239.XXX.XXX.XXX**).

   ***Note**: For port bonding, assign the value of the port bonding interface instead (e.g.* bond0*).*

   As in the previous step, messages appear echoing the Corosync network binding process. The Avid UMS service is temporarily shut down. A message appears indicating the Corosync cluster engine has successfully started.

   The following is sample output:

   ```
   bind_iface=eth0 bind_network=xxx.xx.xx.x mcast_addr=xxx.xx.x.x

   Shutting down UMS                                          [  OK  ]
   2012-11-19 15:48:57.891 -0500 - info: Done. System is up-to-date.
   generic – stop                                             [  OK  ]
   boot – stop                                                [  OK  ]
   Starting Corosync Cluster Engine (corosync):               [  OK  ]
   ```

2. Restart the following services so they register correctly on the newly created instance of the message bus:

```
service acs-ctrl-messenger restart
service avid-aaf-gen restart
service avid-mpd restart
```

***Note**: Restarting the Interplay Pulse (avid-mpd) service is only needed if Interplay Pulse (separate installer) is installed on the system.*

Proceed to "***Replicating the Cluster File Caches***" on page 112.

Replicating the Cluster File Caches

Before you set up a server cluster you should enable the automatic replication of cluster file caches between all servers. This is done using Gluster, an open source software solution for creating shared filesystems. In ICS it is used to automate replication of the dedicated media cache volumes (e.g. RAID 5) across all ICS servers in the cluster.

Recall that the ICS server transcodes media from the format in which it is stored on the ISIS (or Standard FS storage) into an alternate delivery format. Further, in certain deployments you are required to set up a RAID 5 volume where ICS caches these temporary files:

- Interplay MAM deployments require a RAID 5 cache volume when registered browse proxies include formats that cannot be natively loaded by the Adobe Flash-based player. That is, for non MP4 h.264 browse proxies (such MPEG-1, Sony XDCAM, MXF, and WMV), media on proxy storage is transcoded to FLV and stored.
- Interplay Central installations deploying the iNEWS iOS (Apple mobile operating system) app require a RAID 5 cache volume. In this case, media on the ISIS are transcoded to MPEG-TS (MPEG-2 transport stream) and stored.

In a deployment with a single ICS server, the ICS server maintains a cache where it stores recently-transcoded media. In the event that the same media is requested again, the ICS server can deliver the cached media, without the need to re-transcode it. In a cluster, the contents of the RAID 5 volumes are replicated across all the nodes, giving each server access to all the transcoded media.

***Note**: The correct functioning of cache replication requires that the clocks on each server in the cluster are set to the same time. This was performed in "Synching the System Clock" on page 70.*

Before You Begin

The procedures in this section require the following:

- The 8GB ICS Installation USB key containing the Gluster RPMs

If you did not prepare the USB key, return to "***Copying Gluster to the USB Key***" on page 48 before continuing.

The procedures in this section make us of the following information you entered in "***Appendix L: Installation Pre-Flight Checklist***" on page 210:

- Machine name (host name) of each server in the cluster (e.g. ics-dl360-1, ics-dl380-1)

***Note**: The host name indicated above is the host name only (e.g. **ics-dl360-1)**,that is, it is the name of the machine. **Do not use** the fully qualified domain name (e.g. **ics-dl360-1.mydomain.com** or **ics-dl360-1.mydomain.local).** It can also be the IP address.*

Proceed to "***Mounting the USB Key***" below.

Mounting the USB Key

Before you can gain access to the Gluster RPM files on the ICS Installation USB key, you must *mount* the USB key on the ICS server where they will be installed. Mounting is a Linux operation that makes a device available to the Linux operating system. In Linux, all hardware devices (USB keys, CD drives, HDs) must be mounted before they can be used.

To mount the USB key as a device:

1. On each server in the cluster, Insert the USB key into the ICS server.

   ***Note**: Advanced Linux users may prefer to mount the USB key as a network share to install the Gluster components on each server more easily.*

2. Verify the name of the device using the *dmesg* command:

   ```
   dmesg
   ```

   Linux information relating to hardware appears on the screen.

   Information for the USB key will appear near the end of the output, near the list of SCSI devices. The name of the USB key is found inside square brackets (e.g. sdc). This is the name you use to mount the key.

3. Create a mount point for the USB key:

   ```
   mkdir  /media/usb
   ```

4. Mount the USB key at the mount point you just created:

   ```
   mount  /dev/sdc1  /media/usb
   ```

   Note the name of the USB key, sdc (in this case), takes a 1 (one) in the *mount* command. This simply indicates a partition exists on the USB key. Formatting the USB key in Windows, earlier, created the partition.

   The USB key is now mounted and available for use.

5. Verify the USB key has been mounted:

   ```
   df -h
   ```

   Information is displayed about all mounted filesystems and devices, and should include information about the USB key, similar to the following (other output has been omitted, for clarity):

   ```
   Filesystem            Size  Used Avail Use% Mounted on
   /dev/sdc1             7.5G  4.5G  3.0G  61% /media/usb
   ```

Proceed to "***Installing Gluster***" below.

Installing Gluster

Once the ICS Installation USB key is mounted on the Linux server, you can install Gluster. In this step, you both install the Gluster RPMs and create the folders where the caches will be located.

> ***Caution****: As a safety precaution, once you are finished installing Gluster, unmount and remove the USB key from the server before proceeding. If you re-boot with the server with the USB key still in place, RHEL will be re-installed and all your work will be lost.*

To install the software and create the cache folders:

1. On each server in the cluster, install the Gluster packages using the Linux *rpm* command. Install them in the following order:

   ```
   rpm -Uvh /media/usb/Gluster/glusterfs-3.3.1-1.el6.x86_64.rpm
   rpm -Uvh /media/usb/Gluster/glusterfs-fuse-3.3.1-1.el6.x86_64.rpm
   rpm –Uvh /media/usb/Gluster/glusterfs-server-3.3.1-1.el6.x86_64.rpm
   rpm -Uvh /media/usb/Gluster/glusterfs-geo-replication-3.3.1-
   1.el6.x86_64.rpm
   ```

2. Ensure Gluster daemon, *glusterd*, is running:

   ```
   service  glusterd  status
   ```

3. If not, start it:

   ```
   service  glusterd  start
   ```

4. Create the physical folders where the original data will reside:

   ```
   mkdir -p /cache/gluster/gluster_data_download
   mkdir -p /cache/gluster/gluster_data_fl_cache
   mkdir -p /cache/gluster/gluster_data_metadata
   mkdir –p /cache/gluster/gluster_data_multicam
   ```

Proceed to "***Unmounting and Removing the USB Key***" below.

Unmounting and Removing the USB Key

As a safety precaution, once you have installed Gluster, unmount and remove the USB key from the server before proceeding. If you re-boot with the server with the USB key still in place, RHEL will be re-installed and all your work will be lost.

To unmount the USB key:

1. Ensure you are not currently on the USB key by changing directories:

   ```
   cd
   ```

   ***Note**: In Linux the cd command without any arguments takes you directly to the user's* home *directory. If you are logged in as* root*, it takes you to the /*root *directory. You must be off the USB key to unmount it.*

2. Unmount the USB key:

   ```
   umount  /media/usb
   ```

   The USB key is now available for use in another server.

   If you receive an error message that the USB device is busy, it typically indicates the Linux ISO on the USB key was automounted. Verify what is mounted using the *df -h* command and/or the *mount* command. Then, dismount the Linux ISO first, followed by the USB device:

   ```
   umount /sysinstall
   umount /media/usb
   ```

   Alternatively, unmount the USB key using the "lazy" ("-l") option:

   ```
   umount –l /media/usb
   ```

   Linux unmounts the filesystem, even when in use.

3. Remove the USB key from the server.

   Removing the USB key prevents accidental rebooting and re-imaging of the system disk.

Proceed to "***Creating the Trusted Storage Pool***" below.

Creating the Trusted Storage Pool

With Gluster installed and running on each ICS server in the cluster, you can create the trusted storage pool. This is done by using the *probe* command:

```
gluster  peer  probe  <hostname>
```

The command adds <hostname> to the trusted storage pool. It must be issued once for each server in the cluster, though not for the one from which it is being issued.

Example (do not type this example)

To illustrate the command, consider an ICS server cluster consisting of three servers, **ics-dl360-1**, **ics-dl360-2** and **ics-dl360-3**.

To create the GlusterFS trusted storage pool from **ics-dl360-1**, you would issue the following commands:

```
gluster  peer  probe  ics-dl360-2
gluster  peer  probe  ics-dl360-3
```

This procedure requires the following information:

- Machine name (host name) of each server in the cluster (e.g. ics-dl360-1, ics-dl360-2)

To create the trusted storage pool:

***Note**: Perform this procedure just once, on any server in the cluster. It doesn't matter which one.*

1. On any server in the cluster, ensure network connectivity by issuing the Linux *ping* command for the server(s) you want to join the pool:

   ```
   ping <hostname>
   ```

   For example, *ping ics-dl360-2*.

   Linux responds by indicating the success or failure of the connection attempt.

   ***Note**: Press Ctrl+C to stop the ping command.*

2. Form the trusted storage pool using the gluster *probe* command:

   ```
   gluster  peer  probe  <hostname2>
   gluster  peer  probe  <hostname3>
   ```

   ***Note**: Only probe the other servers in the cluster, not the server from which you are entering the probe commands.*

   For each successful "join", the system responds as follows:

   ```
   Probe successful
   ```

3. Verify peer status.

   ```
   gluster  peer  status
   ```

   The system responds by indicating the number of peers, their host names and connection status, plus other information.

Proceed to "***Configuring the GlusterFS Volumes***" below.

Configuring the GlusterFS Volumes

Gluster uses its own file system, *GlusterFS*, which includes its own notion of volumes. GlusterFS volumes consist of underlying directories from the trusted storage pools. When you create a GlusterFS volume, you also configure its behavior. In ICS we make use of Gluster's ability to automatically distribute and replicate data (mirror) across the trusted storage.

Explanation (do not type this example)

In this procedure, you create GlusterFS volumes for the physical cache folders already created:

```
/cache/gluster/gluster_data_download
/cache/gluster/gluster_data_fl_cache
/cache/gluster/gluster_data_metadata
/cache/gluster/gluster_data_multicam
```

This is done using the gluster *volume create* command, specifying the name of the GlusterFS volume and the underlying directory assets it consists of:

```
gluster volume create gluster-cache replica <N> transport tcp
<hostname1>:/gluster_mirror_data/
<hostname2>:/gluster_mirror_data/
```

continuing, in the same line, for each host name, up to:

```
<hostnameN>:/gluster_mirror_data/
```

Where <*N*> is the total number of nodes used.

And <*hostname1*> through <*hostnameN*> are the machine names (host names) of the nodes in the cluster.

The procedure in this section makes use of the following information:

- Machine name (host name) of each server in the cluster (e.g. ics-dl360-1, ics-dl380-1)
- The number of servers in the cluster

Example (do not type this example)

To illustrate the command, consider an ICS server cluster consisting of three servers, **ics-dl360-1**, **ics-dl360-2** and **ics-dl360-3**. Further, suppose you want to replicate a directory called **/cache**.

To create a GlusterFS volume called *gluster-cache* consisting of the **/cache** directories from each server in the cluster, you would issue the following command:

```
gluster volume create gluster-cache replica 3 transport tcp
ics-dl360-1:/cache
ics-dl360-2:/cache
ics-dl360-3:/cache
```

To create and start the GlusterFS volumes:

> ***Note**: Perform this procedure just once, on any server in the cluster. It doesn't matter which one.*

1. Create a GlusterFS volume called **gl-cache-dl** consisting of the **/cache/gluster/gluster_data_download** folders:

   ```
   gluster volume create gl-cache-dl replica <N> transport tcp
   <hostname1>:/cache/gluster/gluster_data_download
   <hostname2>:/cache/gluster/gluster_data_download
   ```

   continuing, in the same line, for each host name, up to:

   ```
   <hostnameN>:/cache/gluster/gluster_data_download
   ```

   Where <*N*> is the total number of nodes used.

   And <*hostname1*> through <*hostnameN*> are the machine names (host names) of the nodes in the cluster.

2. Create a GlusterFS volume called **gl-cache-fl** consisting of the **/cache/gluster/gluster_data_fl_cache** folders:

   ```
   gluster volume create gl-cache-fl replica <N> transport tcp
   <hostname1>:/cache/gluster/gluster_data_fl_cache
   <hostname2>:/cache/gluster/gluster_data_fl_cache
   ```

   continuing, in the same line, for each host name, up to:

   ```
   <hostnameN>:/cache/gluster/gluster_data_fl_cache
   ```

3. Create a GlusterFS volume called **gl-cache-md** consisting of the **/cache/gluster/gluster_data_metadata** folders:

   ```
   gluster volume create gl-cache-md replica <N> transport tcp
   <hostname1>:/cache/gluster/gluster_data_metadata
   <hostname2>:/cache/gluster/gluster_data_metadata
   ```

   continuing, in the same line, for each host name, up to:

   ```
   <hostnameN>:/cache/gluster/gluster_data_metadata
   ```

4. Create a GlusterFS volume called **gl-cache-mcam** consisting of the **/cache/gluster/gluster_data_multicam** folders:

   ```
   gluster volume create gl-cache-mcam replica <N> transport tcp
   <hostname1>:/cache/gluster/gluster_data_multicam
   <hostname2>:/cache/gluster/gluster_data_multicam
   ```

   continuing, in the same line, for each host name, up to:

   ```
   <hostnameN>:/cache/gluster/gluster_data_multicam
   ```

5. Start the GlusterFS volumes.

This step only needs to be done once, on the server where the GlusterFS volume was created:

```
gluster volume start gl-cache-dl
gluster volume start gl-cache-fl
gluster volume start gl-cache-md
gluster volume start gl-cache-mcam
```

Proceed to "***Making Cache Directories and Changing Ownership***" below.

Making Cache Directories and Changing Ownership

With the GlusterFS volumes now created and Gluster service running, you can configure the local cache on each server in the cluster.

To mount the GlusterFS volumes in Linux:

> ***Note**: Perform this procedure on each server in the cluster.*

1. On each server in the cluster create the following cache folders:

```
mkdir /cache/download
mkdir /cache/fl_cache
mkdir /cache/metadata
mkdir /cache/mob-fetch
mkdir /cache/render
mkdir /cache/spooler
```

> ***Note**: If you are creating a cluster for a system that has already been set up and run, the above folders already exist.*

2. Change ownership of the following directories:

```
chown  maxmin:maxmin /cache/download
chown  maxmin:maxmin /cache/fl_cache
```

3. Set the group ID bit for the following two directories. This ensures new files written to the directories are owned by the group of the parent directory — *maxmin*, in this case — rather than by the process writing the files:

```
chmod 2777 /cache/download
chmod 2777 /cache/fl_cache
```

> ***Note:** Setting the* setgid *special permission bit ensures files (and subdirectories) newly created in the directory inherit the group affiliation of the directory (maxmin), rather than inheriting it from the user/shell doing the writing. The* setgid *special permission — the "2" in the above* chmod *command — is especially important for deployments where the iOS application is used.*

4. Verify the success of the operations:

```
ls -la /cache/download
ls –la /cache/fl_cache
```

Updated information is displayed, which ought to be similar to the following:

```
drwxrwsrwx  2 maxmin maxmin 4096 Feb 28 10:15 download
drwxrwsrwx  2 maxmin maxmin 4096 Feb 28 10:15 fl_cache
```

The “s” in the *group* position indicates a special permission has been applied.

5. Change permissions on the following directories:

```
chmod 0777 /cache/metadata
chmod 0777 /cache/spooler
chmod 0777 /cache/mob-fetch
```

4. Verify the success of all the changes:

```
ls -la /cache
```

Output similar to the following ought to be presented:

```
drwxrwxrwx   9 maxmin maxmin 4096 Feb 26 10:13 .
drwxr-xr-x  33 root   root   4096 Feb 26 13:34 ..
drwxrwsrwx   2 maxmin maxmin 4096 Feb 24 20:04 download
drwxrwsrwx   5 maxmin maxmin 4096 Feb 24 20:03 fl_cache
drwxrwxrwx   6 maxmin maxmin 4096 Feb 24 16:04 metadata
drwxrwxrwx  55 root   root   4096 Feb 26 13:50 mob-fetch
drwxrwxrwx   2 maxmin maxmin 4096 Feb 20 10:04 render
drwxrwxrwx   9 root   root   4096 Feb 25 14:05 spooler
```

Note that in the output above the dot (“.”) directory represents the current directory, that is, /cache.

5. Navigate to the directory used by Linux to organize scripts run by the RHEL *init* program:

```
cd /etc/rc.d
```

6. Open the *local run command* (rc.local) file for editing:

```
vi rc.local
```

The rc.local file contains commands to be run at the end of the boot cycle, but before Linux displays the command prompt.

7. Add the following lines:

```
/bin/mount /cache/download
/bin/mount /cache/fl_cache
/bin/mount /cache/metadata
/bin/mount /cache/render
/bin/mount /cache/spooler
/bin/mount /cache/mob-fetch

/sbin/service avid-all restart
```

The above lines mount the cache at the end of the boot cycle, when the network services are up. Restarting the *avid-all* service ensures the backend services have access to the newly mounted caches.

8. Save and exit the file:

   ```
   <Esc>:wq
   ```

Proceed to "***Mounting the GlusterFS Volumes in Linux***" below.

Mounting the GlusterFS Volumes in Linux

With the GlusterFS volumes now created and Gluster service running, you can configure the local cache on each server in the cluster.

To mount the GlusterFS volumes in Linux:

> ***Note**: Perform this procedure on each server in the cluster.*

1. Give the *maxmin:maxmin* user access to the following two folders (original *data* folders, not the *cache* folders created in the procedure above):

   ```
   chown  maxmin:maxmin /cache/gluster/gluster_data_download
   chown  maxmin:maxmin /cache/gluster/gluster_data_fl_cache
   ```

   > ***Note**: There is no need to change ownership of the metadata folder.*

   > ***Note**: If you are creating a cluster for a system that has already been set up and run, the ownership has already been changed.*

2. Mount the folders using the Linux *mount* command, specifying the type as *glusterfs*:

   ```
   mount -t glusterfs  <hostname>:/gl-cache-dl /cache/download
   mount -t glusterfs  <hostname>:/gl-cache-fl /cache/fl_cache
   mount -t glusterfs  <hostname>:/gl-cache-md /cache/metadata
   mount -t glusterfs  <hostname>:/gl-cache-mcam /cache/render
   ```

   Where <hostname> is the name of the server you are working on (e.g. ics-dl360-1).

9. Verify that caches have been mounted correctly:

   ```
   df –h
   ```

   The following information is displayed about the caches: size, used, available, user % and mount point (mounted on).

10. Navigate to the directory containing the filesystem table:

    ```
    cd /etc
    ```

11. Open the filesystem table file, **fstab**, for editing:

    ```
    vi fstab
    ```

12. Navigate to the end of the file and add the following three lines (**A** to append):

```
<hostname>:/gl-cache-dl  /cache/download  glusterfs  defaults,noauto 0 0
<hostname>:/gl-cache-fl  /cache/fl_cache  glusterfs  defaults,noauto 0 0
<hostname>:/gl-cache-md  /cache/metadata  glusterfs  defaults,noauto 0 0
<hostname>:/gl-cache-mcam  /cache/render  glusterfs  defaults,noauto 0 0
```

Where <*hostname*> is the name of the server you are working on (e.g. ics-dl360-1).

These lines automate the mounting of the GlusterFS volumes to the folders used by ICS for caching (/cache/download, /cache/fl_cache, /cache/metadata and /cache/render).

13. Save and exit the file by typing the following command from within the *vi* editing session:

    `<Esc>:wq`

    That is, tap the **Escape** key, then the colon, then type wq and press **Return**.

Proceed to "***Testing the Cache***" below.

Testing the Cache

It is a good idea to test that Gluster is replicating the caches correctly.

Test the cache setup by writing a file to one of the GlusterFS cache folders (e.g. */cache/download*) on one server and verify it appears on the other servers.

For example, the following Linux command creates a file called *toto.txt* in /cache/download:

```
touch  /cache/download/toto.txt
touch  /cache/render/sample.txt
```

Proceed to "***Ensuring Gluster is On at Boot***" on page 122.

Ensuring Gluster is On at Boot

You must ensure that the Gluster service starts at boot.

To ensure Gluster is on at boot:

> ***Note****: Perform this once on each server in the cluster.*

1. Check the Gluster service configuration:

   `chkconfig --list glusterd`

   This command returns the current Gluster service configuration. It likely looks like this:

   `glusterd  0:off 1:off 2:off 3:off 4:off 5:off 6:off`

   But it should look like this:

   `glusterd  0:off 1:off 2:on 3:on 4:on 5:on 6:off`

2. If all 6 run levels are off, type the following

   `chkconfig glusterd on`

   You can verify that run levels 2-5 are now on by repeating the command in the previous step.

Proceed to "***Reconfiguring the ICPS Player for Interplay Central in a Cluster***" below.

Reconfiguring the ICPS Player for Interplay Central in a Cluster

Recall that when you set up a single server to completion, it involved numerous configuration tasks performed via the Interplay Central UI. In "***Configuring the ICPS Player for Interplay Central***" on page 92 you pointed the ICPS player to the server that would handle its playback requests (e.g. **ics-dl360-1**). That was fine for a single-server deployment, but it is insufficient for a cluster setup. In a cluster setup, video playback is distributed to all nodes in the cluster, for load-balancing.

In a cluster setup, you must point the ICPS player to the *cluster* IP address (e.g. **192.XXX.XXX.XXX**) or host name (e.g **ics-cluster**). If not, video will be served by the server named earlier, and only that server. In a cluster, you want the master node to determine which node serves the video. In a cluster, the master node holds the cluster host name and IP address.

In this step you change configuration settings to tell the ICPS player where to find the *cluster*.

> ***Note**: If you make any other configuration changes (e.g. add/remove an ISIS, change the Media Indexer host name) be sure to propagate the information to the other nodes in the cluster. See "*Reconfiguring Interplay Central Settings in a Cluster*" on page 142.*

This procedure makes use of the following information:

- Interplay Central *Administrator* password
- ICS cluster static IP address (e.g. **192.XXX.XXX.XXX**) or host name (e.g **ics-cluster**)

To configure ICPS for Interplay Central:

1. Launch a web browser supported by Interplay Central.
2. Enter the URL of the cluster In the address bar and sign in to Interplay Central as *Administrator*:
   - Enter *https://<cluster-IP>* where *<cluster-IP>* is the static IP address you provisioned for the ICS cluster
   - Or, enter *https://<cluster-host>* where *<cluster-host>* is the host name associated with the cluster IP address.
   - User name (case sensitive): *Administrator*
3. Select System Settings from the Layout selector.
4. In the Settings pane, click **Player**.
5. Enter the ICS cluster IP address (e.g. **192.XXX.XXX.XXX**).
6. Leave the Sphere Playback User user name and password as-is (e.g. **sphere**).
7. Click Apply to save your changes.

Proceed to "***Post-Installation Steps***" on page 125.

PART IV: POST-INSTALLATION

Post-Installation Steps

The procedures in this section are helpful in verifying the success of the installation, and in preparing for post-installation management.

Determining the Installed ICS Version

You can verify the version/build numbers of the ICS installed services. To verify the version numbers, connect to the ICS server console as the *root* user and type:

```
ics_version
```

...then press **Enter**.

Service version numbers are returned as follows:

```
UMS          Version: 1.8.x.x
IPC          Version: 1.8.x.x
ICPS         Version: 1.8.x.x
ICPS Manager Version: 1.8.x.x
ACS          Version: 1.8.x.x
ICS installer: 1.8 (Build XX)
Created on <installer creation date>
```

***Note**: For precise version numbers for this release, see the* ICS 1.8 ReadMe.

Verifying Cache Directory Permissions

As part of the installation (or upgrading) process, you created a number of cache directories, changing ownership and setting their permissions. In this section, you verify the permissions are set correctly.

To verify cache directory permissions:

1. Verify the ownership and permissions for of all cache directories:

   ```
   ls -la /cache
   ```

   Output similar to the following ought to be presented:

   ```
   drwxrwxrwx   9 maxmin maxmin 4096 Feb 26 10:13 .
   drwxr-xr-x  33 root   root   4096 Feb 26 13:34 ..
   drwxrwsrwx   2 maxmin maxmin 4096 Feb 24 20:04 download
   drwxrwsrwx   5 maxmin maxmin 4096 Feb 24 20:03 fl_cache
   drwxrwxrwx   6 maxmin maxmin 4096 Feb 24 16:04 metadata
   drwxrwxrwx  55 root   root   4096 Feb 26 13:50 mob-fetch
   drwxrwxrwx   2 maxmin maxmin 4096 Feb 20 10:04 render
   drwxrwxrwx   9 root   root   4096 Feb 25 14:05 spooler
   ```

   Note that in the output above the dot (“.”) directory represents the current directory, that is, /cache.

2. The following directories must be owned by user *maxmin*:

```
/cache
/cache/download
/cache/fl_cache
/cache/metadata
/cache/render
```

3. The following directories must have the SGID special bit set:

```
/cache/download
/cache/fl_cache
```

4. If the ownership and permissions are not set correctly, refer to the instructions in "***Making Cache Directories and Changing Ownership*** on page 119.

Securing the System

For reasons of security, it is strongly recommended you perform the following password changes (if you have not done so already):

- Change the RHEL *root* user password

  See "***Changing the root Password*** on page 60

- Change the Interplay Central *Administrator* password

  See "***Changing the Administrator Password*** on page 88.

Enabling and Securing the Player Demonstration Web Page

The player demonstration web page (*http://<host-domain>/player/index.html*) is a powerful tool for verification and troubleshooting. However, since it is accessible by way of an unrestricted URL, it is not installed by default (as of ICS 1.6). You must install it explicitly, using the Linux *rpm* command.

> ***Note**: The player demonstration web page is accessible by way of an unrestricted URL. This may be considered a security concern at customer sites. Moving or renaming its index.html file will prevent loading of the page. When not in use, move the player demonstration index.html file to a folder not accessible through http, such as the* root *user home directory (/*root*). The* root *user home directory is visible only to the* root *user. This is not to be confused with the* root *directory (/), which is visible to all users.*

To install/uninstall the player demonstration web page:

1. Log in to the master node as *root*.

   For help identifying the master node, see "***Observing Failover in the Cluster*** on page 137.

2. Determine the name of the *maxcut-devel* RPM file containing the player demonstration web page:

```
ls /opt/avid/Packages/
```

3. Manually install the *maxcut-dev*el RPM:

   ```
   rpm -ivh /opt/avid/Packages/maxcut-devel-<version>-
   <build>.x86_64.rpm
   ```

   Recall that tapping the tab key invokes the Linux autocomplete functionality and ensures accuracy when typing long file names.

   Some feedback appears indicating the success of the installation.

4. To verify the package has been installed:

   ```
   rpm –qa | grep max
   ```

5. Log in to the slave node as *root* and repeat the process.

6. To launch the player demo web page by opening a browser and navigating to the following URL:

   http://<*host-domain*>/player/index.html

   Where <*host-domain*> is the host name or FQDN of the node where you installed the player demonstration page. For a cluster, enter the virtual host name of the cluster instead.

7. To erase/remove the package (should you wish to uninstall):

   ```
   rpm –e maxcut-devel
   ```

To move the player demonstration web page to a secure location:

```
mv /var/www/html/player/index.html  /root
```

Backing up the ICS System Settings and the ICS Database

With the Interplay Central or Interplay MAM server or server cluster set up and running, consider this an excellent moment to back up the system settings. In the event you need to re-image the server, or upgrade ICS, having a backup of the settings is invaluable.

The *system-backup* script provided for this task backs up important files and directories, including NIC card settings, DNS settings, and so on. In addition, the script calls the *avid-db* command, which dumps and backs up the contents of the ICS database. The ICS database contains ACS (Avid Common Services, “the bus”), UMS (User Management Services) and ICPS (Interplay Central Playback Services) data. It collects all this information and backs it up to the USB key itself.

> ***Note**: In a cluster, the ICS database is replicated across the master and slave node, but it is only mounted on the master. Thus, the ICS database is only available for dumping and backup on the master node.*
>
> *If you are backing up multiple nodes in a cluster, rename the backup file for each node before proceeding to the next node. If you do not rename the backup file obtained from the master*

node, it will be overwritten by the backup from a non-master node and the contents of the ICS database will be lost (including user information).

The following table lists the files and directories backed up and restored by the *system-backup* script.

***Note**: RHEL user names and passwords (such as the* root *user) are not backed up or restored by the* system-backup *script. After an upgrade, for example, logging in as "*root*" requires the default password. For the default* root *user password, contact your Avid representative.*

Directory/File	Description
/etc/sysconfig/*	Network settings
/etc/fstab (restored in /root)	Filesystem settings
/etc/resolv.conf	DNS config file
/etc/ntp.conf	Network Time Protocol config file
/etc/snmp/snmpd.conf	Simple Network Management Protocol (network monitor)
/usr/maxt/maxedit/etc/*	Maxedit settings (used by ICPS)
/etc/udev/rules.d/70-persistent-net.rules	NIC card settings
/usr/maxt/maxedit/share/MPEGPresets/MPEG2TS.mpegpreset	Defines encoding for iOS playback
/etc/localtime	Time zone info
/etc/sudoers	List of users with sudo privileges
/opt/avid/etc/avid/avid-interplay-central/ssl/jetty.keystore /opt/avid/etc/avid/avid-interplay-central/config/application.properties	Jetty keystore and SSL certificates and usage passwords.
Pacemaker configuration (restored as /root/pcmk.conf)	Pacemaker configuration
/etc/corosync/corosync.conf	Corosync config file
/etc/drbd.d/r0.res	DRDB config file
ICS database	ICS database, including user information.
RHEL user names and passwords.	Not backed up.

To back up the system settings and ICS database:

1. Mount the USB key containing the *system-backup* script.

   See "***Mounting the USB Key***" on page 113.

2. Change to the mount point. For example:

   ```
   cd /media/usb
   ```

3. Back up the ICS settings and database using the backup script.

   ```
   ./system-backup.sh –b
   ```

   A backup file is written to the USB key:

   ```
   /media/usb/sys-backup/ics_setup_files.tar.gz
   ```

   Since the system-backup script also calls the *avid-db* command, a backup of the ICS database is also written to the following directory (on the ICS server):

   ```
   /var/lib/avid/db/dumps
   ```

   The backup file on the server has a name has the following form:

   ```
   ALL-YYYYMMDD_HHMMSSZ.sql.gz.cr
   ```

   ***Note**: Note the time stamp appended to the file name uses the Universal Time Code (UTC), not the local time.*

   The following message indicates success:

   ```
   Backup setup successful!
   ```

4. Rename the backup file using the Linux *mv* command. For example:

   ```
   mv sys-backup sys-backup-<nodename>
   ```

   The above command renames the directory containing the backup file just created. The backup file itself (*ics_setup_files.tar.gz*) remains unchanged inside the directory.

   ***Note**: Renaming the backup file is particularly important if you are backing up multiple nodes in a cluster. Only the master node backup contains a complete set of backup information. If you do not rename the master node backup file, it will be overwritten by the backup from a non-master node.*

5. Unmount the USB key.

   See "***Unmounting and Removing the USB Key***" on page 115.

To restore the system settings and ICS database:

1. Mount the USB key containing the *system-backup* script.

   See "***Mounting the USB Key***" on page 113.

2. Change to the mount point. For example:

   ```
   cd /media/usb
   ```

3. If you renamed the backup file, restore it to the original name.

   ```
   mv sys-backup-<nodename> sys-backup
   ```

4. Restore the ICS settings and database using the backup script.

   ```
   ./system-backup.sh –r
   ```

   You are asked to confirm the restoration of the ICS database:

   ```
   Would you like to restore the database now? (y/n)
   ```

5. Type “y” (without the quotes) to confirm the action.

   You are asked to confirm the shutting down of the Avid services:

   ```
   All Avid services will be shut down before performing a database
   restore operation.
   Would you like to continue? [yes/no]
   ```

6. Type “yes” (spelled out in full, without the quotes) to confirm the action.

   ***Note**: Be careful when typing your response to this question. Typing anything other than “yes” results in the script exiting without restoring the ICS database. Other items are restored, but not the ICS database.*

   Services are shut down, the ICS database is restored, and services are restarted.

   The ICS database service is stopped, and you are prompted to restore the database.

   The following message indicates success:

   ```
   Restoration done!
   Your old fstab settings were saved in /root/fstab
   Please remove the USB key and reboot the server.
   ```

   ***Note**: The filesystem table (*fstab*) file contains information to automate mounting volumes at boot time. It is not restored automatically.*

7. Once the settings are restored, unmount and remove the USB key.

   See “***Unmounting and Removing the USB Key***” on page 115.

Monitoring Services and Resources

The following table provides a list of essential services that need to be running for Interplay Central 1.8. The state of each of these services can be verified by typing the following command into the IPC server command line:

```
service <servicename> status
```

If the service is not active, it can be restarted by using the following command:

```
service <servicename> restart
```

The table also includes cluster resources managed by Pacemaker. As noted, resources are collections of services grouped together for oversight by Pacemaker. Pacemaker sees and manages resources, not individual services. The state of a cluster resource can be verified by typing the following command:

```
crm resource <resource> status
```

Service/Resource	Description
	All Nodes
avid-ics	A utility script (not a service) that can be used to verify the status of all the major ICS services. Verifies the status of the following services: - avid-all - avid-interplay-central - acs-ctrl-messenger - acs-ctrl-core - avid-ums The utility script enables you to *stop*, *start* and view the *status* of all the services it encapsulates at once: avid-ics status avid-ics stop avid-ics start Note that the utility script cannot be invoked like a true service. The form "*service avid-ics status*" will not work.
avid-all	Encapsulates all ICPS back-end services: - avid-config - avid-isis - avid-fps - avid-jips - avid-spooler - avid-edit
pacemaker	Cluster Management and Service Failover Management
corosync	Cluster Engine Data Bus
glusterd	GlusterFS daemon responsible for cache replication

Service/Resource	Description
rabbitmq-server	Messaging broker/queue for ACS (the message bus). Maintains its own cluster functionality to deliver high-availability.
avid-aaf-gen	AAF Generator service, the service responsible for saving sequences. To reduce bottlenecks when the system is under heavy load, five instances of this service run concurrently, by default. Installed on all nodes but only used on the master or slave node, depending on where the IPC Core service (avid-interplay-central) is running. This service is not managed by Pacemaker, therefore you should check its status regularly, and restart it if any instance has failed. See "***Monitoring the AAF Generator Service***" on page 133.
acs-ctrl-messenger	The services related to the IPC end-user messaging feature: · "messenger" service (handles delivery of user messages) · "mail" service (handles mail-forwarding feature) This service registers itself on the message bus. All instances are available for handling requests, which are received by way of the message bus via a round-robin-type distribution system. This service operates independently, and is not managed by Pacemaker.
avid-mpd	Interplay Pulse services. Operates similarly to the acs-ctrl-messenger service described above. This service is only available when Interplay Pulse (separate installer) is installed on the system.
Master Node Only	
avid-interplay-central	IPC Core service

Service/Resource	Description
acs-ctrl-core	Essential bus services needed for the overall platform to work: · "boot" service (provides registry services to bus services) · "attributes" services (provides system configuration of IPC) · "federation" service (initializes multi-zone configurations) If acs-ctrl-core is not running, services such as acs-ctrl-messenger will not function.
avid-ums	User Management Service
postgresql-9.1	PostgreSQL database for user management and attributes data
mongod	Mongo database for central messaging service (acc-ctrl-messenger) data , ACS message bus (acs-ctrl-core) registry
Cluster Resources Managed by Pacemaker/Corosync†	
drbd_postgres	Encapsulates: - drbd - postgresql-9.1
AvidIPC	Encapsulates: - avid-interplay-central
AvidUMS	Encapsulates: - avid-ums
AvidACS	Encapsulates: - acs-ctrl-core
†Pacemaker and Corosync manage numerous other cluster resources. This table lists the most important ones.	

***Note**: All available services can be found in /etc/init.d*

Monitoring the AAF Generator Service

The AAF Generator service (*avid-aaf-gen*) is responsible for saving sequences. To reduce the possibility of bottlenecks when many users attempt to save sequences at the same time, multiple instances of the service run simultaneously (by default, five). As a result, Interplay

Central has the ability to save multiple sequences concurrently, significantly reducing overall wait-times under heavy load.

In a cluster deployment, this service is installed and running on all nodes. However, it is only involved in saving sequences on the node where the IPC core service (avid-interplay-central) is currently running.

The service is not managed by Pacemaker. It is therefore important to regularly verify its status. If one or more instances of it have failed, restart the service. An instance can fail, for example, if an invalid AAF is used within a sequence. If all instances fail, responsibility for saving transfers to the Interplay Central core service (*avid-interplay-central*), and bottlenecks can arise.

Logs are stored in **/var/log/avid/avid-aaf-gen/log_xxx**.

To verify the status and/or stop the AAF Generator service:

1. Log in to both the master and slave nodes as *root*.

   Though the AAF Generator service is active in saving sequences only on the master node, you should verify its status on the slave node too, to prepare for any failover.

2. Verify the status of the AAF Generator service:

   ```
   service avid-aaf-gen status
   ```

   The system outputs the status of each instance, similar to the following:

   ```
   avid-aaf-gen_1 process is running                    [  OK  ]
   avid-aaf-gen_2 process is running                    [  OK  ]
   avid-aaf-gen_3 process is running                    [  OK  ]
   avid-aaf-gen_4 process is running                    [  OK  ]
   avid-aaf-gen_5 process is running                    [  OK  ]
   ```

   An error would look like this:

   ```
   avid-aaf-gen_1 process is not running                [WARNING]
   ```

3. In the event of an error, restart the service as follows:

   ```
   service avid-aaf-gen restart
   ```

   Output similar to the following indicates the service has restarted correctly:

   ```
   Starting process avid-aaf-gen_1 - Stat: 0            [  OK  ]
   Starting process avid-aaf-gen_2 - Stat: 0            [  OK  ]
   Starting process avid-aaf-gen_3 - Stat: 0            [  OK  ]
   Starting process avid-aaf-gen_4 - Stat: 0            [  OK  ]
   Starting process avid-aaf-gen_5 - Stat: 0            [  OK  ]
   ```

4. If you need to stop the service this must be done in two steps. First, configure 0 instances of the service (there are 5 by default):

   ```
   echo 0 > /opt/avid/avid-aaf-gen/DEFAULT_NUM_PROCESSES
   ```

5. With zero instances configured, you can stop the service normally:

   ```
   service avid-aaf-gen-stop
   ```

To restart the service, reset the number of instances to the default (5) then restart it in the usual way.

Monitoring ICS High-Availability

If you have configured a highly-available and load-balanced ICS cluster, see the following commands to monitor the cluster for problems and if necessary, resolve them.

If the following procedure does not resolve problems with the ICS cluster, please contact an Avid representative.

To monitor the status of the cluster:

Enter the following command as root.

```
crm_mon -f
```

This returns the status of services on all nodes. Error messages may appear. A properly running cluster of 2 nodes named *burl-ics1* and *burl-ics2* will return something like the following:

```
============
Last updated: Tue Oct 29 13:17:56 2013
Last change: Mon Oct 28 17:37:30 2013 via cibadmin on burl-ics1
Stack: openais
Current DC: burl-ics1 - partition with quorum
Version: 1.1.7-6.el6-148fccfd5985c5590cc601123c6c16e966b85d14
2 Nodes configured, 2 expected votes
14 Resources configured.
============

Online: [ burl-ics1 burl-ics2 ]

 Clone Set: AvidConnectivityMonEverywhere [AvidConnectivityMon]
     Started: [ burl-ics1 burl-ics2 ]
AvidClusterMon  (lsb:avid-monitor):     Started burl-ics1
MongoDB (lsb:mongod):   Started burl-ics1
 Resource Group: postgres
   postgres_fs   (ocf::heartbeat:Filesystem):   Started burl-ics1
   AvidClusterIP   (ocf::heartbeat:IPaddr2):    Started burl-ics1
   pgsqlDB   (ocf::avid:pgsql_Avid): Started burl-ics1
 Master/Slave Set: ms_drbd_postgres [drbd_postgres]
     Masters: [ burl-ics1 ]
     Slaves: [ burl-ics2 ]
 Clone Set: AvidAllEverywhere [AvidAll]
     Started: [ burl-ics1 burl-ics2 ]
AvidIPC (lsb:avid-interplay-central):   Started burl-ics1
AvidUMS (lsb:avid-ums): Started burl-ics1
AvidACS (lsb:acs-ctrl-core):    Started burl-ics1

Migration summary:
* Node burl-ics1:
* Node burl-ics2:
```

Note the line identifying the master node:

- AvidClusterIP

This is the node you will put into standby mode to observe failover (**burl-ics1** in the above example).

Note that the master node always runs the following services:

- AvidIPC (avid-interplay-central)
- AvidUMS (avid-ums)
- AvidACS (acs-ctrl-core)

In the bullet list above, the actual service name, as it would appear at the Linux command line, is shown in parentheses.

***Note**: The prefix lsb shown in the cluster resource monitor indicates the named service conforms to the Linux Standard Base project, meaning these services support standard Linux commands for scripts (e.g. start, stop, restart).*

- If you see errors in the `crm_mon` report about services not running, enter the following (as *root*):

  ```
  /opt/avid/cluster/bin/cluster rsc-start
  ```

- If you see fail counts listed (in the Migration Summary area), reset them following the instructions in "***Observing Failover in the Cluster***" below.

Monitoring Load Balancing

Incoming playback requests are routed to the cluster IP address, then distributed evenly throughout the cluster. Load balancing is automatic, supports many concurrent clients simultaneously. The load balancing daemon/service, xmd, runs multiple instances on each node in the cluster.

***Note**: To monitor load balancing in an Interplay MAM deployment, you must specify a server hostname in the Player section of the ICPS settings. See "Configuring ICS for Interplay MAM" on page 78.*

To monitor load-balancing:

1. Sign in to Interplay Central using the default *Administrator* credentials (case-sensitive):
   - User name: Administrator
2. Select **System Settings** from the Layout selector.
3. In the Settings pane, click **Load Balancer**.

   The nodes involved in load balancing appear in the details pane.

   The following table explains the information:

Service	Description
Service	The *xmd* service is the playback service responsible for delivering video from the ICS server to the player embedded in the web

Service	Description
	browser.
User	*Reserved for future use.*
Host	The IP address of the client machine (and end-user) to which video is being served.
Session ID	The session ID associated with the playback session.
Session Start	The time (MM.DD.YYYY HH:SS) at which the player embedded in the browser connected to the ICS server.
Session End	The time at which the session was terminated.

Observing Failover in the Cluster

You can verify the cluster is working as expected by putting the master node into standby mode and observing the failover. You can then bring the node back up and observe as it rejoins the cluster.

Note that a node failure count is retained by the system, and should be reset after a failover. This is somewhat critical, as the threshold for failures is two (2), the default for all services except AvidAll. The cluster will failover automatically when the threshold is reached. Using the cleanup command will reset the failure count.

To monitor failover in the cluster:

1. Log in to any node in the cluster as *root* and open the cluster resource monitoring utility:

   ```
   crm_mon
   ```

   This returns the status of all cluster-related services on all nodes, with output similar to the following example using two nodes (e.g. **burl-ics1** & **burl-ics2**).

   ```
   ============
   Last updated: Tue Oct 29 13:17:56 2013
   Last change: Mon Oct 28 17:37:30 2013 via cibadmin on burl-ics1
   Stack: openais
   Current DC: burl-ics1 - partition with quorum
   Version: 1.1.7-6.el6-148fccfd5985c5590cc601123c6c16e966b85d14
   2 Nodes configured, 2 expected votes
   14 Resources configured.
   ============

   Online: [ burl-ics1 burl-ics2 ]

    Clone Set: AvidConnectivityMonEverywhere [AvidConnectivityMon]
        Started: [ burl-ics1 burl-ics2 ]
   AvidClusterMon  (lsb:avid-monitor):     Started burl-ics1
   MongoDB (lsb:mongod):   Started burl-ics1
   ```

```
 Resource Group: postgres
   postgres_fs   (ocf::heartbeat:Filesystem):   Started burl-ics1
   AvidClusterIP   (ocf::heartbeat:IPaddr2):    Started burl-ics1
   pgsqlDB   (ocf::avid:pgsql_Avid): Started burl-ics1
 Master/Slave Set: ms_drbd_postgres [drbd_postgres]
     Masters: [ burl-ics1 ]
     Slaves: [ burl-ics2 ]
 Clone Set: AvidAllEverywhere [AvidAll]
     Started: [ burl-ics1 burl-ics2 ]
AvidIPC (lsb:avid-interplay-central):   Started burl-ics1
AvidUMS (lsb:avid-ums): Started burl-ics1
AvidACS (lsb:acs-ctrl-core):    Started burl-ics1
```

2. Note the line identifying the master node:

   · AvidClusterIP

   This is the node you will put into standby mode to observe failover (**burl-ics1** in the above example).

   Note that the master node always runs the following services:

   · AvidIPC (avid-interplay-central)

   · AvidUMS (avid-ums)

   · AvidACS (acs-ctrl-core)

   In the bullet list above, the actual service name, as it would appear at the Linux command line, is shown in parentheses.

   ***Note**: The prefix lsb shown in the cluster resource monitor indicates the named service conforms to the Linux Standard Base project, meaning these services support standard Linux commands for scripts (e.g. start, stop, restart).*

3. In a separate terminal session log in to any node as *root* and bring the master node into standby mode:

   ```
   crm node standby <master node name>
   ```

   In the above command, replace <master node name> with the name of the master node (e.g. **morpheus-hp1**).

4. Observe the failover in the *crm_mon* utility within the other terminal session as the master node is reassigned to one of the remaining nodes and the associated services are brought up on the new master.

   Note too that any active Interplay Central client windows will receive a message indicating the need to log back in. Playback might be briefly affected.

5. Bring the standby node back online:

   ```
   crm node online <original master node name>
   ```

6. Observe in the *crm_mon* window as the offline node is brought back up and rejoins the cluster.

To reset the fail count:

1. Verify the cluster fail counts:

   ```
   crm_mon -f
   ```

   The fail count for each node is displayed, similar to the following:

   ```
   Migration summary:
   * Node burl-ics1:
     AvidIPC: migration-threshold=2 fail-count=1
     AvidAll:0: migration-threshold=1000000 fail-count=58
   * Node burl-ics2:
     AvidAll:2: migration-threshold=1000000 fail-count=77
   ```

2. Run the cluster resource manager *cleanup* command to reset any observed failure counts:

   ```
   crm resource cleanup <rsc> [<node>]
   ```

   - <rsc> is the resource name of interest: AvidIPC, AvidUMS, AvidACS, pgsqlDB (or another)
   - <node> (optional) is the node of interest. Omitting the node cleans up the resource on all nodes.

     *Note: If you receive an "object/attribute does not exist" error message, it indicates the resource is active on more than one node. Repeat the command using the group name for the resource (the "everywhere" form). For example, for the **AvidAll** resource, use **AvidAllEverywhere**. For **AvidConnectivityMon**, use **AvidConnectivityMonEverywhere**.*

     Note: You can address the services contained in the postgres resource group (postgres_fs, AvidClusterIP and pgsqlDB) individually, or as a group.

   For example, to reset the fail count for AvidALL resource, issue the following command:

   ```
   crm resource cleanup AvidAllEverywhere
   ```

3. Run crm_mon again to observe the results:

   ```
   crm_mon -f
   ```

   It should report a clean slate with no failures:

   ```
   Migration summary:
   * Node burl-ics1:
   * Node burl-ics2:
   ```

Testing the Cluster Email Service

The cluster automatically sends email notifications to the administrator email address. This requires that the Linux *postfix* email service is running on the master node (and slave node, for failovers). In this section you verify that the *postfix* service is operating as expected.

To test the cluster email service:

1. Verify the email service is running:

   ```
   service postfix status
   ```

2. The system should respond with the following:

   ```
   master (pid XXXX) is running...
   ```

3. If it is not running:

   a. Check the *postfix* service run-level configuration:

   ```
   chkconfig –-list postfix
   ```

   The configuration returned should look like this (run levels 2–5 *on*):

   ```
   postfix 0:off 1:off 2:on 3:on 4:on 5:on 6:off
   ```

   b. To enable run levels 2–5, type the following:

   ```
   chkconfig postfix on
   ```

   c. Start the service:

   ```
   service postfix start
   ```

4. Compose and send Linux *mail* command:

   ```
   mail –v <email address>
   ```

   The system responds by opening an email shell and prompting your for a subject line:

   ```
   Subject:
   ```

5. Enter a subject line and press **Return**:

   The system responds by moving the cursor into the body of the email.

   Type a line or two of text, as desired.

   Note: *If the* ***Backspace*** *key types "^H" rather than deleting, exit the email shell by typing Ctrl-c (twice). Next, type the following at the Linux command line, and try again (do not type the quotation marks: "stty erase ^H".*

6. Type Ctrl-d to exit the email shell and send the email.

   The system responds with the following:

   ```
   Mail Delivery Status Report will be mailed to <root>.
   ```

7. Check the in-box of the addressee for the email.

Changing the Cluster Administrator Email Address

When you set up the cluster, you provided an administrator email address where the system sends emails related to cluster performance. You can change the email address (or add others) at any time using the Corosync-Pacemaker command-line interface for configuration and management, *crm*.

For more information on the *crm* tool, type the following at the Linux prompt:

```
man crm
```

To change the cluster administrator email address:

> ***Note:*** *Please be careful when editing the cluster configuration settings. Incorrect settings will break the cluster.*

1. Load the *crm* configuration file into the Linux vi editor:

   ```
   crm configure edit
   ```

   > ***Note:*** *Due to a bug in the Cluster Resource Manager, you must enter "crm configure edit" in one line. You cannot enter the Cluster Resource Manager in steps (that is crm -> configure -> edit). If you do, the changes are not saved.*

2. Scroll to the bottom of the file, or jump to it directly (*Shift-g*).
3. Locate the line indicating the cluster administrator email address, for example:

   ```
   admin-email="email_A@temp.net"
   ```

4. Edit the admin-email string as desired, for example.

   ```
   admin-email="email_A@temp.net,email_B@temp.net"
   ```

5. Save and exit the file (<Esc> :wq).

   The system responds by writing the updated configuration file to a temporary location and outputting an error message similar to the following:

   ```
   "/tmp/tmpjve4D9" 72L, 3258C written
   ERROR: rsc-options: attribute admin-email does not exist
   Do you still want to commit?
   ```

6. Type *yes* to commit your changes.
7. Verify the changes have been made by displaying the Cluster Resource Manager configuration information:

   ```
   crm configure show
   ```

   Look for the "admin-email" entry, near the bottom of the file.

8. Press Q to exit.
9. The new email address(es) are now active.

Reconfiguring Interplay Central Settings in a Cluster

If you reconfigure Interplay Central settings via the Interplay Central UI, for example, to add/remove an ISIS, note that the new settings are retained by the master node only. You must update the non-master nodes using the avid-all service.
On each non-master node, log in as root and run the following command:

```
service avid-all reconfigure
```

Taking a Cluster Node Off-Line Temporarily

If you need to take a node offline make sure to let your users know that playback may stop. In the best case, the client will automatically re-connect to one of the remaining available nodes, though it may take several seconds. In the worst case, the end-user be required to log in to Interplay Central again, in which case playback will be stopped.

To take a cluster node off-line temporarily, log in as root on any node and issue the following command:

```
crm node standby <node name>
```

In the above command, replace <node name> with the name of the node to be brought off-line.

Permanently Removing a Node from a Cluster

Permanently removing a node from a cluster takes the following main steps:

1. Bringing the cluster into maintenance mode
2. Unmounting the GlusterFS volumes
3. Recreating the GlusterFS volumes, without the eliminated node
4. Reconfigure the cluster, and bring the cluster back up.

For guidelines, see "***Adding a New Node to a Cluster***" below.

> ***Note:*** *Even after performing the above steps, a "node offline" message may remain in the cluster monitoring tool (*crm_mon*). To eliminate the "ghost" node, delete node from the cluster using the following command:*
>
> *crm node delete <node>*

Adding a New Node to a Cluster

To add a node to an cluster you must take down the cluster and rebuild it. It consists of the following main steps:

1. Preparing the new node
2. Bringing the cluster into maintenance mode
3. Unmounting the GlusterFS volumes
4. Recreating the GlusterFS volumes, including the new node

5. Reconfiguring the cluster, including the new node and bring the cluster back up

To prepare the new node:

To prepare the new node, install RHEL and ICS. There is no need to configure it for IME solution. Like the other nodes, the new one will acquire configuration settings from the master node. See "*Clustering Workflow*" on page 101.

To bring the cluster into maintenance node:

Put each node in the cluster into standby mode (maintenance mode) using the *crm* utility:

```
crm node standby <node name>
```

In the above command, replace < node name> with the name of each node, in turn.

To unmount the GlusterFS volumes:

In this step you dismantle GlusterFS (the Gluster filesystem). This must be done so Gluster will recognize the new node, later. If you leave traces of the old GlusterFS behind, gluster will refuse to integrate the new node.

1. On each server in the cluster, unmount the GlusterFS volumes from the Linux filesystem:

```
umount /cache/download
umount /cache/fl_cache
umount /cache/metadata
```

2. One any server in the cluster, stop the GlusterFS volumes:

```
gluster volume stop gl-cache-dl
gluster volume stop gl-cache-fl
gluster volume stop gl-cache-md
```

3. One any server in the cluster, delete the GlusterFS volumes:

```
gluster volume delete gl-cache-dl
gluster volume delete gl-cache-fl
gluster volume delete gl-cache-md
```

4. On each server in the cluster, remove the Linux extended attributes for the **/cache** directories:

```
setfattr -x trusted.glusterfs.volume-id /cache/gluster/gluster_data_download
setfattr -x trusted.glusterfs.volume-id /cache/gluster/gluster_data_metadata
setfattr -x trusted.glusterfs.volume-id /cache/gluster/gluster_data_fl_cache
setfattr -x trusted.gfid /cache/gluster/gluster_data_download
setfattr -x trusted.gfid /cache/gluster/gluster_data_metadata
setfattr -x trusted.gfid /cache/gluster/gluster_data_fl_cache
```

5. Remove the hidden files used by Gluster:

```
rm -rf /cache/gluster/gluster_data_download/.glusterfs
rm -rf /cache/gluster/gluster_data_metadata/.glusterfs
rm -rf /cache/gluster/gluster_data_fl_cache/.glusterfs
```

To re-create the GlusterFS filesystem and include the new node:

In this step you set up Gluster from scratch, this time including the new node. For the most part, you can follow the instructions in "***Replicating the Cluster File Caches***" on page 112 exactly as they are written.

Note the following points:

1. Install Gluster and create cache directories as instructed on the new server only.

   The other nodes already have Gluster and the cache directories.
2. Create the trusted storage pool as instructed.
3. Configure and start the GlusterFS volumes as instructed.
4. Mount the GlusterFS volumes in Linux as instructed.

   You will receive appropriate error messages for some steps, where the work has already been done on all but the new node (such as creating **/cache** subdirectories).

   Similarly, the filesystem table (**/etc/fstab**) does not need to be altered for the old nodes, just the new one.
5. Test the cache as instructed.
6. Ensure Gluster is on at boot for the new node.

   It is already set to be on at boot on the old nodes.

To bring the cluster back up with the new node:

In this step, you run the *setup-cluster* script on an existing master or slave node, as you did when originally setting up the cluster, excluding the new node from DRBD. Next, you join the new node to the cluster.

1. On either the master or slave node, run the *setup-cluster* script.

   For details on the form of the command, see "***Starting the Cluster Services***" on page 108.

   Be sure to exclude the new node (and all other load-balancing-only nodes) from DRBD.
2. On the new node, run the *setup-corosync* script.

   Observes as the new node joins the cluster.

   Follow the instructions in "***Joining the Cluster***" on page 111.
3. Bring the other nodes out of maintenance (standby) mode:

   ```
   crm node online <node name>
   ```

Note the following points:

1. Do not set up DRBD again.

It is already set up on the master-slave pair, and does not run on any other nodes.

2. The node where you run the *setup-cluster* script becomes the master, but it must be run on either the master or slave node from the old cluster.

Retrieving ICS Logs

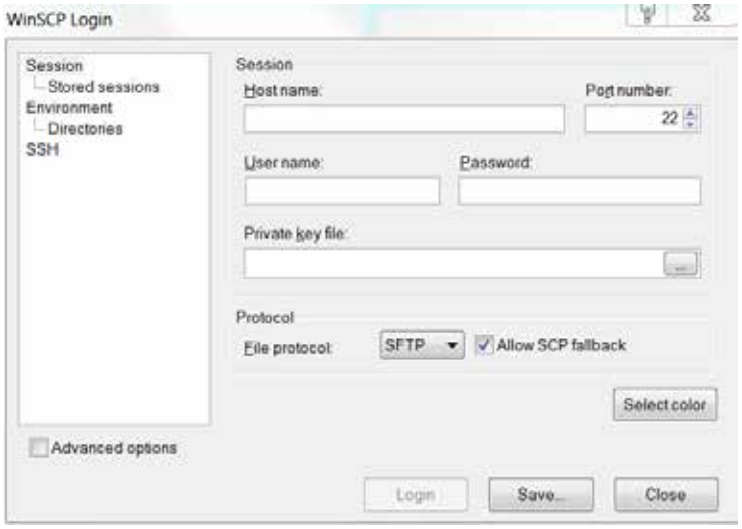
This step is not required at installation, but as you use Interplay Central you may encounter performance problems or playback failure. You should report these occurrences to an Avid representative. Avid may ask you to retrieve system and component logs from your ICS server(s). ICS logs reside in the following directory:

```
/var/log/avid
```

The simplest way to retrieve logs residing on a Linux machine is using an application that supports SCP/SFTP such as WinSCP (Windows) or muCommander (MacOS).

To retrieve ICS logs using an SCP/SFTP client:

1. Launch the SCP/SFTP client (WinSCP shown) and enter the session information.



- Hostname:

  http://<hostname> where *<hostname>* is either the ICS host name (if you only have a single server)

  Or, *http://<cluster-IP>* where *<cluster-IP>* is the IP address you provisioned for the ICS cluster

- User name: root
- Password: _____

Note: *Note that you changed the root password during the installation process.*

Note: *Please contact your Avid representative for the default root password.*

2. Once connected, navigate to the directory where the logs are stored:

   `/var/log/avid`

3. Use the SCP/SFTP client's built-in functionality to retrieve the logs.

   The logs can be quite big and may take some time to transfer.

Log Cycling

Like other Linux logs, the ICS server logs are stored under the /var/log directory, in /var/log/avid. Logs are automatically rotated on a daily basis as specified in /etc/logrotate.conf.

Using SNMP Monitoring on the ICPS Server

The Avid System Monitor application and ICS server can be configured to collect information from the ICS server. This allows you to monitor the status of mandatory ICS services and display graphs for activities such as CPU usage, network usage, and system memory usage. The following items are graphed over time in the Avid System Monitor web page interface:

- Average CPU load
- Number of CPU interrupts per second
- System uptime
- Swap space (disk space reserved for memory when RAM is fully loaded)
- System memory usage
- CPU usage

Contact your Avid representative for information about Avid System Monitor. A qualified Avid support representative can upgrade an Avid System Monitor system to work with ICS.

Migrating the ICP Database from Windows to Linux

See "***Appendix E: Migrating the UMS Database with the User Management Utilities*** Tool" on page 189.

Backing up and Restoring the ICS Database

The ICS database is automatically backed up on a daily basis, but you can use the same tool it uses, *avid-db*, to back up and restore the database (plus perform other operations) at any time. The avid-db command has the following format:

```
/opt/avid/bin/avid-db <parameter-list> <command> [ <args>... ]
```

For example, to back up the contents of the ICS database to /opt/avid/share/avid/db/dumps:

```
/opt/avid/bin/avid-db --dump-base=/opt/avid/share/avid/db/dumps dumpall
```

For a list of all the parameters and arguments, issue the following:

```
/opt/avid/bin/avid-db help
```

> ***Note**: Restoring the ICS database in cluster has special requirements. Due to the automatic restarting of halted services in a cluster, you cannot use the* avid-db restore *command by itself. Follow the procedure as outlined below.*

To restore the ICS database in a cluster:

1. Log in to the master and slave nodes as *root*.

   For help identifying nodes, see "***Observing Failover in the Cluster***" on page 137.

2. Stop pacemaker on both nodes:

   ```
   service pacemaker stop
   ```

3. Start DRBD on both nodes:

   ```
   service drbd start
   ```

4. Make the master node the DRBD *primary* (on the master node):

   ```
   drbdadm primary r0
   ```

5. Mount the DRBD drive on the master node:

   ```
   mount /dev/drbd1 /mnt/drbd
   ```

6. Start the PostGres database on the master node:

   ```
   service postgresql-9.1 start
   ```

7. Restore the ICS database on the master node:

   ```
   /opt/avid/bin/avid-db --drop-db="no" restoreall
   ```

   Once the ICS database has been restored you can begin handing control back to pacemaker in the steps below.

8. Stop PostGres on the master node:

   ```
   service postgresql-9.1 stop
   ```

9. Unmount the DRBD drive on the master node:

   ```
   umount /mnt/drbd
   ```

10. Stop DRBD on both nodes:

    ```
    service drbd stop
    ```

11. Restart Pacemaker (which restarts all needed services) on both nodes, master node first, slave node second:

    ```
    service pacemaker start
    ```

Appendix A: Installing ICS on Non-HP Hardware

For the most part the steps provided in the main body of this guide for installing and configuring ICS on supported HP hardware are easily generalized to non-HP hardware. There are two main differences.

> ***Note**: This section provides tips for installing RHEL and ICS for Interplay MAM on non-HP hardware. ICS supports Interplay Central and Sphere on HP Hardware only. ICS supports Interplay MAM on both HP and non-HP hardware.*

The first main difference is the express installation using a USB key cannot be followed on a non-HP install. That is, you must install RHEL and ICS as separate steps. In addition, there is no guarantee the supplied RHEL "kickstart" (ks.cfg) file will work on non-HP hardware. However, you can examine its contents and mimic them during a manual installation, or create a kickstart file for your own hardware. A kickstart file is a Linux convenience that speeds up installation by automatically answering some questions for hardware that is known in advance. However, creating a kickstart file is not necessary.

Second, as of the ICS 1.4 release, three partitions are required on the (mirrored) system drive. The first is the boot partition (/boot). The second partition is used by the DRBD (Distributed Replicated Block Device) storage system. ICS uses DRBD to replicate its PostgreSQL database, in a clustered configuration. The third is the system partition (/).

On HP hardware, the kickstart file on the USB key creates the second partition on the OS drive automatically. On non-HP machines you must create it manually. After the second partition has been created the steps for setting up DRBD are the same on both HP and non-HP machines.

> ***Note**: The second partition on the system drive is required only for cluster deployments. However, it is recommended you create it even for a single ICS server deployment, to keep open the possibility of clustering.*

Non-HP Installation Notes

The following notes pertain to the main installation steps for non-HP hardware:

1. Set Up the Non-HP Server Hardware
    - Create a RAID 1 (mirror) for the system disk using the hardware BIOS utilities.
    - Set the system clock before installing RHEL, if possible; otherwise, set it at the appropriate stage in the RHEL installation process.
2. Install RHEL manually.
    - Select BASIC SERVER during the RHEL installation process.
    - When prompted to create storage, create two partitions on the OS drive. One partition is for RHEL. The other ones is used by DRBD. The DRBD partition should be 20GB in size.

Note: *Some ICS software components depend on the language for RHEL being set to English. Please select English as the language of installation. Do not change the input language afterwards.*

3. Install ICS.
   - Mount the RHEL DVD under */sysinstall* (this is where the install script looks for it):

     ```
     mount  /dev/sdX /sysinstall
     ```

     In the above command, substitute the optical drive device name for sdX (e.g. sr0)

     Note*: RHEL will automatically create an alias for the optical drive on /CDROM. Thus the following mount command can also be used:*

     ```
     mount  /CDROM /sysinstall
     ```

   - Unpack the ICS installer file:

     ```
     tar –zxovf ICS_installer_v1.8.tar.gz
     ```

   - Change directories to the *ICS_installer_v1.8* folder and run the installation script:

     ```
     ./install.sh
     ```

4. Set up the cluster (optional), configure ICS for MAM, etc., as instructed in the main body of this guide.

Appendix B: Table of Deployment Options and Requirements

The following table summarizes the requirements for each deployment.

		Interplay Central					Interplay Sphere	Interplay Central & Interplay Sphere (Shared ICS)	Interplay MAM
		High Avail.	Load Bal.	iNEWS	Interplay Production	iNEWS and Interplay Production			
HARDWARE	**ICS Server (RHEL 6.3)**	●	●	HP DL360 DL380 G7/G8	HP DL360 DL380 G7/G8	HP DL360 DL380 G7/G8	HP DL360 DL380 G7/G8	HP DL360 DL380 G7/G8	Any Vendor
	RAID 1 System Disk	●		●	●	●	●	●	●
	RAID 5 File Cache / Gluster	●	●		1.5 iOS, Multicam	1.4 iOS 1.5 iOS, Multicam	1.5 Multicam	1.4 iOS 1.5 iOS, Multicam	MPEG-1, XDCAM, WMV, MXF proxies
	Additional NIC	●			GigE,10GigE	GigE,10GigE	GigE,10GigE	GigE,10GigE	10GigE
	Port Bonding	●							●
	ISIS 2000/5000/7000	●			●	●	●	●	Supported, but unlikely
	Proxy Storage	●							●
	ICDS Server (Windows 7) ICDS may be installed on certain existing Interplay servers	●			●	●		●	
CLIENTS	**iOS App**			●	1.5	●		●	
	Web Client			●	●	●		●	
	Sphere-enabled Media Composer, NewsCutter						●	●	
	MAM Desktop								●
	Interplay Cut								●
	Catalogger								●
RV IC	**Middleware (IPC)**	●		●	●	●		●	

	Interplay Central					Interplay Sphere	Interplay Central & Interplay Sphere (Shared ICS)	Interplay MAM
	High Avail.	Load Bal.	iNEWS	Interplay Production	iNEWS and Interplay Production			
User Management (UMS)	•		•	•	•		•	
Configuration (ACS)	•		•	•	•	•	•	•
Messaging (ACS)	•		1.5	1.5	1.5	1.5 (also non-Sphere MC)	1.5 (also non-Sphere MC)	
Playback (ICPS)	•	•		•	•	•	•	•
Frame-based Playback	•			•	•	•	•	•
File-based Playback	•	•		iOS	iOS		iOS	•

High-availability (redundancy) is provided by two servers operating in a master/slave configuration.

Load-balancing refers to video playback and is provided by a cluster of two or more servers. Video playback is provided by the ICPS service (“Playback (ICPS)” in the table above), and is designed to run on all servers in the cluster such that playback sessions are distributed, or load-balanced, across all servers. Because of this, adding servers to a cluster accommodates increased capacity.

Appendix C: Configuring Port Bonding for Interplay MAM (Optional)

In MAM deployments of ICS, port bonding improves playback performance when multiple clients are making requests of the ICS server simultaneously. With port bonding, more concurrent playback requests can be sustained by a single server, especially for file-based playback.

Port bonding is only possible for Interplay MAM deployments. It does not apply to Interplay Central and/or Interplay Sphere deployments. Interplay Central and Interplay Sphere cannot make use of port bonding.

The procedures in this section make use of information you entered in "***Appendix L: Installation Pre-Flight Checklist***" on page 210:

- Device name for each NIC Ethernet port used in port bonding (e.g. eth0, eth1, etc.)
- Port bonding IP address
- Port bonding interface name (e.g. bond0)

For a discussion of port bonding, see "***Port Bonding in Interplay MAM***" on page 20.

Verifying the Ethernet Ports

Before bonding the ports together, verify the ports you allocated exist using the RHEL set-up menus.

To verify the Ethernet ports for port bonding:

1. Enter the RHEL set-up menus by typing setup at the command prompt:

   ```
   setup
   ```

   The setup screen appears.
2. From the Choose a Tool menu, select the Network Configuration option. Press **Enter**.
3. Choose the Device Configuration option. Press **Enter**.

   A list of network interface ports appears.
4. Verify that the ports you designated for port bonding are available.
5. Exit the set-up menus without making any changes by pressing Cancel and Quit.

Proceed to "***Configuring the Port Bonding***" below.

Configuring the Port Bonding

Configuring port bonding requires that you modify the contents of the interface configuration (*ifcfg-ethX*) file for each port you are bonding together, create a new interface configuration file for the bond group, and restart the network services.

To configure port bonding for Interplay MAM:

1. Navigate to the directory containing the interface configuration files (the `/etc/sysconfig/network-scripts` directory).

   ```
   cd /etc/sysconfig/network-scripts
   ```

2. List the directory contents to view the files.

   ```
   ls
   ```

3. Using the Linux editor *vi*, open the interface configuration file for the first interface to be included in the port bond (e.g. ifcfg-eth0):

   ```
   vi ifcfg-eth0
   ```

4. When you open it for editing, the file should look something like this:

   ```
   DEVICE=eth0
   NM_CONTROLLED=yes
   ONBOOT=yes
   DHCP_HOSTNAME=$HOSTNAME
   BOOTPROTO=static
   TYPE=Ethernet
   USERCTL=no
   PEERDNS=yes
   IPV6INIT=no
   ```

5. Add port bonding configuration information for the device by inserting the following line (shown in bold):

   ```
   DEVICE=eth0
   NM_CONTROLLED=yes
   ONBOOT=yes
   MASTER=bond0
   DHCP_HOSTNAME=$HOSTNAME
   BOOTPROTO=static
   TYPE=Ethernet
   USERCTL=no
   PEERDNS=yes
   IPV6INIT=no
   ```

   - `DEVICE=eth0` specifies the name of the physical Ethernet interface device. This line will be different for each device. It must correspond to the name of the file itself (e.g. ifcfg-eth0).
   - `MASTER=bond0` specifies the name of the port bonding interface. This must be the same in each network script file in the port bonded group.

- `ONBOOT=yes` must be set to “yes” so Linux brings up the port at boot time.

6. Save and exit the file by typing the following command from within the vi editing session:

   `<Esc> :wq`

   That is, press the **Escape** key, then the colon, then type wq and press **Return**.

   You are returned to the Linux prompt.

7. Perform the above steps for each interface to be included in the port bond (e.g. eth1, eth2, etc.)

8. Create a port bonding network script file in the same directory. Use vi to create the file:

   `vi ifcfg-bond0`

   `ifcfg-bond0` is the name of the port-bonding group (e.g. `ifcfg-bond0`).

9. Add the following lines to the newly created file:

```
DEVICE=bond0
ONBOOT=yes
BOOTPROTO=static
USERCTL=no
BONDING_OPTS="mode=0"
```

   - `DEVICE=bond0` specifies the name of the port bonding group interface. It must correspond to the name of the file itself.
   - `BOOTPROTO=static` lets you assign IP address of the device explicitly (recommended), or allow the OS to assign of the IP address device dynamically. Can be *static* (recommended) or *dhcp* (system assigned).
   - If you assign the IP addresses statically you are also required to have `IPADDR` and `NETMASK` entries.
   - `BONDING_OPTS="mode=0"` specifies the type of port bonding (`mode=0` specifies round-robin).

10. Save and exit the file by typing the following command from within the vi editing session:

    `<Esc> :wq`

11. Restart the network service (as *root*):

    `/etc/init.d/network restart`

Appendix D: Handling SSL Certificates

For security Interplay Central uses the Secure Sockets Layer (SSL) for its server-to-browser connections. This is indicated by https:// in the browser address bar, rather than the usual http://. (Some browsers also show a locked padlock icon for an SSL connection.) SSL enables the secure transmission of information between web servers and web browsers. It is a web-based security protocol with the following important features:

- All data (web pages, etc.) passing between the server and browser is encrypted in such a way that even if interception takes place the risk of decryption is virtually nil.
- SSL establishes a relationship of trust between the browser -- and the person doing the browsing -- and the server. That is to say, the browser making the connection understands it has connected to the correct site, and not a fraudulent one posing as the site.
- Any tampering with the data transmitted via an SSL connection is immediately detectable by both parties.

To operate correctly, SSL relies on a properly configured digital *certificate*, which the server passes to the browser when it tries to access a secure web page. Amongst other things, the certificate contains the "name" of the server for which the certificate has been issued, an encoded signature unique to the domain, the domain's public key, and the validity period of the certificate itself. If the certificate has been digitally signed by a Certificate Authority (CA), it also contains the CA's name and signature. In addition to establishing a relationship of trust, the certificate allows the server and browser to negotiate the encryption algorithm and encryption key used for the browsing session.

Built-In Browser Functionality

Web browsers have functionality built-in for handling SSL certificates, negotiating the secure connection with the server, encrypting and decrypting data, and so on. When the browser "recognizes" the SSL certificate, all this takes place seamlessly and requires no user intervention. However, if the browser detects something unusual in the certificate, it issues a warning such as the following (issued by Google Chrome):

This appendix presents the basic issues surrounding SSL certificates. It explains why browsers issue "certificate not trusted" and other SSL warnings, and presents three approaches to handling them:

- Ignoring the warnings
- Generating a new self-signed certificate and adding it to the browser's Trusted Root Certification Authorities Store
- Purchasing a CA-signed certificate from a trusted Certificate Authority (CA) and adding it to the ICS server's keystore.

SAN Certificates

If you decide to purchase a certificate/signature from a CA, or are yourself a CA, we recommend you obtain or authorize a Subject AIternative Name (SAN) certificate. SAN certificates can have a number of associated host names, domain names, IP addresses, etc., all within the same certificate.

A SAN certificate containing all the names associated with Interplay Central will eliminate the possibility of "name mismatch" warnings. Name mismatch warnings arise when the name in the browser (e.g. **ics-dl360-1**) does not match the "issued to" name contained in the SSL certificate (e.g. **ics-dl360-1.mydomain.com**). To avoid browser name-mismatch complaints, the URL typed into the browser and the address contained in the certificate must match. A SAN certificate can easily contain the server host name, IP address, and/or FQDN you might use to access Interplay Central.

SAN certificates are particularly valuable when you have a sophisticated network, complex topology, subnets, use browser redirects, or simply wish to give users different ways to connect to Interplay Central. It could arise that some users must connect to Interplay Central using the FQDN (e.g. **https://ics-dl360-1.mydomain.com**). Others might only need to use the shorter host name (e.g. **https://ics-dl360-1**). In this scenario, both names must be in the certificate if both user types are to avoid name mismatch errors.

Understanding the "Certificate Not Trusted" Warning

During the installation process, the first time the Jetty web server starts it automatically generates an SSL certificate, which ICS then sends to browsers when they connect. This is known as a "self-signed" certificate, since it is generated/signed *and* used by the same server, rather than signed by a recognized CA. The certificate is perfectly legitimate; however, it will cause most browsers to issue a warning each time a user connects to the Interplay Central sign-in page, for two main reasons.

First, browsers only accept certificates signed by recognized CA's without complaint. Self-signed certificates are a breach in the established "chain of trust" that starts with a recognized CA, whose own root level digital certificates are installed by default with all web browsers. Since self-signed certificates are neither signed by a CA nor pre-installed with browsers, they are flagged as untrusted.

Second, as noted, some browsers may in addition complain of a name mismatch. This is because the URL used to connect to the ICS server (e.g. **http://ics-dl360**) contains a name that does not match the "issued to" name contained in the certificate. In manually generated certificates, the

"issued to" name is most commonly the Fully Qualified Domain Name (FQDN) (e.g. **ics-dl360-1.mydomain.com**), permitting access the most complex network topologies. In the case of the self-signed certificate generated by Jetty during the install, the "issued to" name is usually a variation on *localhost (e.g.* **localhost.mydomain.com** or simply **localhost**).

Recall that you named the ICS server during the first installation steps. However, by this time, Jetty has already generated the SSL certificate using *localhost*. Thus, the self-signed SSL certificate automatically created during the installation process is perfectly valid, but will nevertheless flag browser warnings.

Eliminating the Certificate not Trusted and Name Mismatch Warnings

With the cause of the "certificate not trusted" and name mismatch warnings understood, it can be seen that ignoring the warnings is always a possibility. However, the first and simplest approach to permanently eliminating warnings is to generate a new certificate and configure the browser — the operating system, in fact — to trust it. Telling the browser to trust the certificate eliminates the "certificate not trusted" warning. Generating a new certificate eliminates the most common name-mismatch issues that can arise even after the browser trusts the certificate.

Generating a new SSL certificate is uncomplicated, and all browsers can be configured to accept self-signed SSL certificates as trusted. The Jetty web server used by Interplay Central for its SSL connections can automatically generate a new self-signed certificate containing the renamed server. For cluster setups, you can generate a certificate "manually", specifying the cluster FQDN, hostname, or IP address, as desired.

***Note**: The self-signed certificate automatically generated by Jetty cannot be used for a cluster of servers. In the case of a cluster, you must generate a self-signed certificate manually. In addition, since any node in the cluster can take on the role of master, you must also install the new certificate on each server in the cluster.*

The second approach to eliminating the warning is to purchase and install an SSL certificate from a trusted Certificate Authority. Certificate Authorities — such as VeriSign, Thawte, Digicert, Comodo, GoDaddy, GlobalSign, etc. — are entities entitled to issue root certificates in the name of applicants. They are responsible for carefully authenticating individual certificate requests. The SSL certificate issued by a CA contains the CA's own signature. Certificates issued by a CA are, generally speaking, automatically trusted by browsers.

The pros and cons of each approach are presented in the following table:

Method	Description	
Ignoring the warning	Ignore the warning and proceed to the Interplay Central sign-in page.	
	Pros: · No configuration required	Cons: · Users might be reluctant to proceed to an "untrusted" site · Depending on the browser, MOS plug-ins might not work if the certificate is not trusted

Method	Description	
Configuring Browsers	Generate a new certificate, and use the browser's built-in means for permanently accepting the self-signed certificates as trusted.	
	Pros: · Relatively straightforward · Free	Cons: · Browser acceptance must be performed client-side, for each machine · Alternately, distribute the certificate to client computers from your Windows domain controller using a Group Policy Object (GPO)
Purchasing a CA Certificate	Purchase a certificate from a recognized CA and install it on the ICS server.	
	Pros: · Performed server-side, once · Browsers automatically accept	Cons: · More complex · Not free · Delays between issuing the certificate request and receiving the certificate · Obtaining the correct certificate type can be a challenge · Requires a deeper understanding of certificate issues and network topology

In a facility where all connections to Interplay Central will be made using a limited number of browsers and browser types, it is probably easiest to regenerate the self-signed certificate and configure each user's browser to accept it. In a situation where connections will occur from across a complex network topology using a variety of browsers, obtaining a certificate issued from a trusted CA makes more sense.

***Note**: You can streamline the acceptance of a self-signed certificate by pushing it to client computers using a Windows Group Policy Object (GPO) that contains the certificate. This is done via a Windows domain controller, by applying a new Group Policy to the domain where the user and computer accounts of interest reside. Using a GPO, all computers in the domain receive and accept the self-signed certificate automatically. Since the steps vary depending on the domain controller used by your facility, details of the procedure are beyond the scope of this document. For more information, consult the documentation that came with the Windows server hosting your domain controller.*

Generating a Self-Signed Certificate for a Single Server

As noted, during the installation process you gave the ICS server a name (e.g. **ics-dl360-1**) via the RHEL Network Configuration menu. However, the self-signed certificate created by Jetty was automatically generated prior to that stage, and contains a variation of "*localhost*" in the "issued to" field. As a result, most browsers will flag an SSL certificate name mismatch. This will happen even after you tell the browser to trust the self-signed certificate.

To eliminate the “name mismatch” error, you must first generate a new certificate, containing the correct ICS server name. Once generated, you eliminate the “untrusted” warning by configuring the browsers to trust the self-signed certificate.

In this step, you take advantage of the following Interplay Central feature. If the *avid-interplay-central* service starts up and discovers there is no keystore, it creates one, automatically populating it with a self-signed certificate. (The keystore is the file where Jetty stores SSL certificates and the public-private key pairs used during the encryption process.) Since the ICS server is now named, the new certificate automatically picks up the new name (e.g. **ics-dl360-1** or **ics-dl360-1.mydomain.com**).

***Note**: Jetty picks up the name from the DNS Search Path entry in the server’s Linux resolve.conf file. This value was set by you in “Configuring the Hostname and Static Network Route” on page 44.*

***Note**: Once you generate the new certificate and install the certificate in the Trusted Certificate Store, users may need to enter the Fully Qualified Domain Name (FQDN) into the browser address bar, to avoid name-mismatch warnings.*

***Note**: This procedure in this section only applies to a single-server installation. If you have set up a cluster, refer to the instructions in “Generating a Self-Signed Certificate for a Server Cluster” on page 160 instead.*

To generate a new self-signed certificate for a single server:

1. Log in to the ICS server as *root* and navigate to the directory containing the Jetty keystore:

   ```
   cd /opt/avid/etc/avid/avid-interplay-central/ssl
   ```

2. Verify the status of the avid-interplay-central service:

   ```
   service avid-interplay-central status
   ```

   The system responds that Avid Interplay Central is running.

3. Stop the service:

   ```
   service avid-interplay-central stop
   ```

   The system responds that Avid Interplay Central has been stopped.

4. Delete the Jetty keystore (which contains the current self-signed SSL certificate):

   ```
   rm jetty.keystore
   ```

   You are asked to confirm the deletion.

5. Start the avid-interplay-central service (which also restarts the Jetty web server):

   ```
   service avid-interplay-central start
   ```

   The system responds that the Avid Interplay Central process has been started. The new keystore and SSL certificate are created automatically by Jetty.

6. Verify the new Jetty keystore has been created:

   ```
   ls -l
   ```

The system lists the contents of the directory, including the following file:

```
jetty.keystore
```

Now that you have eliminated potential name-mismatch browser SSL warnings, you must configure each browser to trust the certificate. This is done by installing the certificate into the OS-level Trusted Root Certification Authorities store.

Proceed to one or more of the following:

- "***Configuring Google Chrome (Windows)*** on page 178.
- "***Configuring Internet Explorer (Windows)*** on page 182.
- "***Configuring Safari (Mac OS)*** on page 186.

Generating a Self-Signed Certificate for a Server Cluster

Recall that you address a cluster using the host name (e.g. **ics-cluster**) or IP address (e.g. **192.XXX.XXX.XXX**) allocated for it by the IT department. In any event, this means that in a cluster setup, the address entered into the browser is unrelated to the IP addresses (or names) of the servers inside the cluster.

However, the SSL certificate that is automatically generated by Jetty picks up the FQDN of the machine on which it is generated. It does not pick up the cluster name (or IP address). Further, for each node in the cluster Jetty will generate a certificate with a different embedded FQDN.

***Note**: Jetty picks up the FQDN from the DNS Search Path entry in the server's Linux resolve.conf file. This value was set by you in "Configuring the Hostname and Static Network Route" on page 66.*

As a result of the different SSL certificates served by the cluster, each with different "issued to" values, name mismatches will be repeatedly flagged by the browser. This will be the case even if the certificate is otherwise trusted. Thus, using automatically generated SSL certificates in a cluster setup is not possible. To eliminate the name mismatch warning, you generate a new self-signed certificate for each server in the cluster, specifying its contents explicitly. In particular, you specify the FQDN of the cluster itself, not the individual servers within the cluster.

In this procedure you use the Java *keytool* utility to generate a new self-signed certificate with contents set explicitly. The utility also generates the private-public key pair associated with a certificate, and the keystore where they are all stored. You also update the Interplay Central application properties file so it can make use of the new certificate.

Making use of a self-signed certificate in a cluster consists of the following main steps:

1. Identifying the master and non-master nodes.

   Make changes to the non-master nodes first and the master node last.

2. Generating the new self-signed certificate for the cluster.

   In this step you generate a new SSL certificate and keystore, for each non-master node in the cluster.

***Note**: To save time and ensure accuracy, consider creating the Jetty keystore once only, and copying the updated keystore to each machine in the cluster using the Linux secure copy (scp) command.*

3. Add certificate usage passwords to the Interplay Central Application Properties file.

   Since both the SSL certificate and the keystore itself are password-protected, in this step you update the Interplay Central Application Properties (application.properties) file with the new passwords. Interplay Central needs the passwords so it can serve the SSL certificates.

   ***Note**: Similarly to the above step, consider modifying the Interplay Central application properties file once only, and copying the updated file to each machine in the cluster using the Linux scp command.*

4. Update the master node and restart it.

   With the updated Jetty keystores and Application Properties files in place on the non-master nodes, you can update the master nodes and restart the AvidIPC resource so it picks up the changes.

5. Trigger a failover to verify the success of the procedures

   In this step, you verify the certificates were installed correctly by triggering a failover in the cluster. As a best-practice, you ought to trigger failovers until each node in the cluster has taken on the role of master. This will ensures configuration changes were successful on each node.

   ***Note**: The AvidIPS resource/avid-interplay-central service will not start up correctly if there is an SSL configuration error.*

Before You Begin

The procedures in this section requires the following:

- The name associated with the static IP address allocated for the cluster (e.g. **ics-cluster**).

To identify the master and non-master nodes:

1. Log in to any node in the cluster as *root* and open the cluster resource monitoring utility:

   ```
   crm_mon
   ```

   This returns the status of all cluster-related services on all nodes, with output similar to the following example using two nodes (e.g. **burl-ics2** & **burl-ics2**).

   ```
   ============
   Last updated: Tue Oct 29 13:17:56 2013
   Last change: Mon Oct 28 17:37:30 2013 via cibadmin on burl-ics1
   Stack: openais
   Current DC: burl-ics1 - partition with quorum
   Version: 1.1.7-6.el6-148fccfd5985c5590cc601123c6c16e966b85d14
   2 Nodes configured, 2 expected votes
   14 Resources configured.
   ```

```
============

Online: [ burl-ics1 burl-ics2 ]

 Clone Set: AvidConnectivityMonEverywhere [AvidConnectivityMon]
     Started: [ burl-ics1 burl-ics2 ]
AvidClusterMon  (lsb:avid-monitor):     Started burl-ics1
MongoDB (lsb:mongod):   Started burl-ics1
 Resource Group: postgres
   postgres_fs   (ocf::heartbeat:Filesystem):   Started burl-ics1
   AvidClusterIP   (ocf::heartbeat:IPaddr2):    Started burl-ics1
   pgsqlDB   (ocf::avid:pgsql_Avid): Started burl-ics1
 Master/Slave Set: ms_drbd_postgres [drbd_postgres]
     Masters: [ burl-ics1 ]
     Slaves: [ burl-ics2 ]
 Clone Set: AvidAllEverywhere [AvidAll]
     Started: [ burl-ics1 burl-ics2 ]
AvidIPC (lsb:avid-interplay-central):   Started burl-ics1
AvidUMS (lsb:avid-ums): Started burl-ics1
AvidACS (lsb:acs-ctrl-core):    Started burl-ics1
```

2. Note the line identifying the master node:

   · AvidClusterIP

   You will update the master node last.

   Note that the master node also always runs the following resources (the corresponding services are shown in parentheses):

   · AvidIPC (avid-interplay-central)

   · AvidUMS (avid-ums)

   · AvidACS (acs-ctrl-core)

   Once you update the master node, you will restart its AvidIPC resource (that controls the **avid-interplay-central** service) so it makes use of the updated Jetty keystore.

To generate a new self-signed certificate for the cluster:

1. On any non-master node in the cluster log in as the *root* user.
2. Use the Linux *ping* command to obtain the FQDN of the cluster:

   ```
   ping <cluster_name>
   ```

   Where <*cluster_name*> is the name associated with the static IP address allocated for the cluster.

   Record the FQDN returned for use below to generate the new certificate. You can also use the “short name”, that is, the <cluster_name> if you prefer.

3. Change to a writable directory, for example, */tmp*.

```
cd /tmp
```

4. Begin the process of generating a new self-signed certificate and inserting it into the Jetty keystore:

   ```
   keytool -keystore jetty.keystore -alias jetty -genkey -keyalg RSA
   -storepass <password> -keypass <password> -validity 10950
   ```

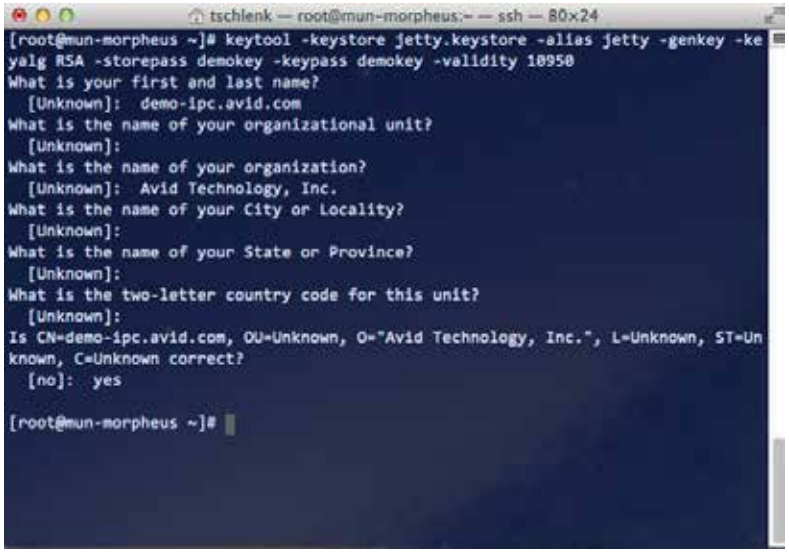
   For simplicity, it is suggested you use the same password for both *storepass* and *keypass*.

   Take note of the password used. You will need it to update the application properties file, below. Otherwise, Interplay Central cannot make use of the new certificate.

   The meaning of each parameter is presented in the following table:

Parameter	Description
-keystore	The path and name of the keystore file. The default name of the file is jetty.keystore (recommended). You can use a different name and/or path for your keystore, but you must then change settings in the Interplay Central application properties (application.properties) file.
-keysize	The length of the public-private key pairs generated. Optional for self-signed certificates. However, since December 2010, most CAs require a key length (-keysize) of 2048 bits.
-alias	A human-readable identifier for the certificate within the key store. Keystores can hold multiple certificates. A simple alias makes the certificate easy to refer to in any subsequent operations.
-genkey	The option to generate a new certificate and public-private key pair.
-keyalg	The SSL algorithm used for the certificate. The default is RSA. You can use a different algorithm, but you must then change the settings in the application.properties file.
-storepass	A password protecting the certificate within the keystore.
-keypass	A password protecting the keystore itself.
-validity	A validity period for the certificate. The default validity period is 30 years (365x30=10950).

5. A series of questions appears, used by Jetty to populate the certificate. This information is visible when end-users examine the certificate using a browser.



6. Answer the questions.

   ***Note**: For a self-signed certificate, only the first answer indicating the FQDN (e.g. icps-cluster.mydomain.com) or short name (e.g. icps-cluster) is required.*

   The following table provides details on the questions and answers.

Question	Answer
What is your first and last name? Mandatory.	Enter the fully qualified domain name (FQDN) of the cluster (e.g. **icps-cluster.mydomain.com**). This can also be the short name for the cluster (e.g. **icps-cluster**). This is the short name or FQDN of the cluster itself, obtained in step 2, above. It is not the short name or FQDN of the individual server within the cluster. This is the name end-users will enter into the browser address bar to connect to Interplay Central. **Note**: Recall that when you configured the cluster you made use of the IP address allocated by the IT department for the cluster. Now it is the short name or FQDN that is required.
What is the name of your organizational unit?	The department within your company issuing the request (e.g. IT). Optional.

What is the name of your organization?	The legal name of your company (e.g. Avid Technology Inc.). Optional.
What is the name of your City or Locality?	The city or jurisdiction where you are located. Optional.
What is the name of your State or Province?	State, province, department, prefecture, etc. Optional.
What is the two-letter country code for this unit?	The ISO country code. Optional.

7. Confirm your responses by typing *yes* to complete the creation of the new keystore and self-signed certificate.
8. Copy the new Jetty keystore containing the freshly generated self-signed certificate to its final location:

   ```
   cp jetty.keystore
   /opt/avid/etc/avid/avid-interplay-central/ssl/jetty.keystore
   ```

   You will be prompted to overwrite the exiting keystore. Type “y” to overwrite.
9. Repeat the above steps on the other non-master servers in the cluster.

   Use the same password on each server.

   ***Note**: To save time and ensure accuracy, consider creating the Jetty keystore once only, and copying the updated keystore to each non-master machine in the cluster using the Linux secure copy (scp) command: scp [path to source file] root@[host]:[target directory].*

   For example:

   ```
   scp /opt/avid/etc/avid/avid-interplay-central/ssl/jetty.keystore
   root@server2:/opt/avid/etc/avid/avid-interplay-central/ssl/
   ```

To add certificate usage passwords to the Interplay Central Application Properties file:

In this procedure you obtain obfuscated (disguised) passwords from Jetty and add them to the Interplay Central application properties file. This allows Interplay Central to make use of the SSL certificate.

Be sure to add two (2) passwords to the Application Properties file (similar to the following):

```
system.org.ops4j.pax.web.ssl.password=OBF\:1c3x1mf71jnb1sov1jk71mbf1c35
system.org.ops4j.pax.web.ssl.keypassword=OBF\:1c3x1mf71jnb1sov1jk71mbf1c35
```

***Note**: Plain-text passwords can also be used. For reasons of security it is recommended you use obfuscated passwords instead.*

1. On any non-master node in the cluster log in as the *root* user.
2. Obtain an obfuscated string for the password(s) used to create the keystore and certificate in the previous procedure:

```
java -cp /opt/avid/avid-interplay-central/lib/org.eclipse.jetty.jetty-
util.jar org.eclipse.jetty.util.security.Password <password>
```

   Where <*password*> is the password you used to protect the certificate within the keystore.

   The system responds by outputting the password, the obfuscated password string (OBF:) and its MD5 hash value (MD5:).

   The following represents sample output. It is the string following OBF that is needed ("XXXXXX" indicates the password you entered is echoed to the command line in plain-text):

```
XXXXXX
OBF:1c3x1mf71jnb1sov1jk71mbf1c35
MD5:4c88dafcf38a9b90b1e32efe798f95f0
```

3. If you used a different password to protect the Jetty keystore itself, repeat the step for the second password.
4. Edit (or create) the Interplay Central application properties file using a text editor such as *vi*:

```
vi /opt/avid/etc/avid/avid-interplay-central/config/application.properties
```

   ***Note**: In most cases, this Application Properties file will not exist. Create the file using vi and add the lines indicated in the steps below.*

   ***Note**: You can examine the contents of the default file in the following directory: /opt/avid/avid-interplay-central/config. However, do not make your changes in that file, since it will be overwritten any time you upgrade ICS. Make your changes in the file you create in the /opt/avid/etc/avid/avid-interplay-central/config, as indicated in this step.*

   ***Note**: If you use the default file as a model, the one you create should only contain the values you wish to override.*

5. Locate (or add) the entry for the password used to protect the certificate (sometimes referred to as the *export* password):

```
system.org.ops4j.pax.web.ssl.password=OBF\:1c3x1mf71jnb1sov1jk71mbf1c35
```

   Replace obfuscated string (shown in bold, above) with the one you generated.

   ***Note**: Those upgrading from ICS 1.2 or below (i.e. from a Windows server to a Linux server) please note the following difference in Linux syntax. If you are re-using the obfuscated string from the Windows server, be sure to add the Linux "escape" character ("\") in front of the colon in the entry for the password.*

   A plain text entry would like the following:

```
system.org.ops4j.pax.web.ssl.password=visible password
```

   ***Note**: For reasons of security it is recommended you use obfuscated passwords.*

6. Locate (or add) the entry for the password used to protect the Jetty keystore:

```
system.org.ops4j.pax.web.ssl.keypassword=OBF\:1c3x1mf71jnb1sov1jk71mbf1c35
```

Replace obfuscated string (shown in bold, above) with the one you generated.

7. Save and exit the file:

   ```
   <Esc>:wq
   ```

8. Repeat the above steps on the other non-master servers in the cluster.

   ***Note**: To save time and ensure accuracy, consider editing/creating the Application Properties file once only, then copying it to each machine in the cluster using the Linux secure copy (scp) command. For example: scp [path to source file] root@[host]:[target directory].*

   For example:

   ```
   scp /opt/avid/etc/avid/avid-interplay-central/config/application.properties
   root@server2:/opt/avid/etc/avid/avid-interplay-central/config/
   ```

To update the master node keystore and Application Properties file and restart the node:

1. Log in to the master node as *root*.
2. Navigate to the directory containing the Jetty keystore:

   ```
   cd /opt/avid/etc/avid/avid-interplay-central/ssl
   ```

3. Securely copy the Jetty keystore from any non-master node to the master node:

   ```
   scp root@[host]:/opt/avid/etc/avid/avid-interplay-
   central/ssl/jetty.keystore ./
   ```

   In the command above, substitute the name of a non-master node for the [host] parameter (e.g. **morpheus-hp2**). Do not type the square brackets. The “dot slash” in the above command indicates the current directory.

   You will be prompted to overwrite the existing keystore. Type “y” to overwrite.

4. Navigate to the directory containing the Application Properties file:

   ```
   cd /opt/avid/etc/avid/avid-interplay-central/config
   ```

5. Securely copy the Application Properties file from any non-master node to the master node:

   ```
   scp root@[host]:/opt/avid/etc/avid/avid-interplay-
   central/config/application.properties ./
   ```

   You will be prompted to overwrite the existing file. Type “y” to overwrite.

6. Restart the AvidIPC resource (that controls the **avid-interplay-central** service) so Interplay Central picks up the new passwords:

   ```
   crm resource restart AvidIPC
   ```

   Once the resource restarts, the master node can begin serving the new certificate.

To trigger a failover and verify the success of the steps:

- For instructions on triggering a failover, see "***Observing Failover in the Cluster***" on page 137.
- The success of the steps to generate a self-signed certificate for a server cluster is seen when a new master node is assigned to the cluster, and comes up without generating any error messages that pertain to the Jetty keystore. That is, the new master node reads the keystore without complaint.
- There are no obvious error messages when there is a problem with the Jetty keystore configuration. The AvidIPC resource (avid-interplay-central service) simply fails to start.
- If a node does not start up correctly, verify the configuration of the keystore and Application Properties file.

Now that you have eliminated the name-mismatch warnings, you must configure each browser to trust the certificate. This is done by installing the certificate into the OS-level Trusted Root Certification Authorities store.

Proceed to one or more of the following:

- "***Configuring Google Chrome (Windows)***" on page *178.*
- "***Configuring Internet Explorer (Windows)***" on page *182*.
- "***Configuring Safari (Mac OS)***" on page *186*.

Obtaining a Trusted CA-signed Certificate

SSL certificates obtained and signed by a CA are automatically trusted by browsers. No warnings appear when a connection is made to a secure web page, nor do you need to add them to the Trusted Root Certification Authorities store (since the CA's root certificate is already there).

Note*: Standard SSL certificates secure a single host name, IP address or FQDN. SAN certificates can contain secure multiple servers and contain name variations, and is the recommended certificate. For details, see "SAN Certificates" on page 156.*

This procedure requires the following information:

- Two-letter ISO country code (e.g. US, CA, DE)
- State, Province, Prefecture, etc. (spelled out – no abbreviations)
- City, locality or jurisdiction (e.g. Paris)
- Organization Name (e.g. Avid Technology)
- Organizational Unit (e.g. IT)
- Common Name: host name, IP address, or FQDN (e.g. **icps-cluster.mydomain.com**) of the ICS server or cluster

  Note*: Some CAs will not issue a CA-signed certificate for a simple host name. However, host names can be added to SAN certificates.*
- Email Address: Contact email address (optional)

- Challenge password (optional)
- Optional Company Name (optional)

To obtain a trusted CA-signed certificate:

The process for obtaining a certificate varies with each CA, but always involves generating a Certificate Signing Request (CSR), and installing the new signed certificate into the keystore. The steps are summarized below.

1. Log in as *root* and change directories to a secure location:

   ```
   cd /root
   ```

   ***Note**: The* root *user home directory (/root) is visible only to the* root *user. This is not to be confused with the root directory (/), which is visible to all users.*

2. Generate a CSR and private key using *openssl*.

   ```
   openssl req -out jetty.csr -new -newkey rsa:2048 -nodes -keyout
   jettyPrivateKey.key
   ```

   ***Note**: Since December 2010, most CAs require a key length of 2048 bits, as shown in the above example. Fewer bits are considered insecure, and may be rejected by the CA.*

   Answer the questions as prompted. Your responses are inserted into the CSR, and will appear in the CA-signed SSL certificate. The details are visible to end-users when they view certificate details in a browser.

   The *openssl req* command produces two files, *jetty.csr* and *JettyPrivateKey.key*.

   - **jetty.csr**: This is the CSR you will submit to the CA. It contains the information you entered, and a public key. It does not contain your private key.
   - **jettyPrivateKey.key**: This is your enterprise's private key for the certificate just created.

   ***Note**: Keep the private key in a safe place (such as the root user home directory, /root). You will need it later to add the CA-signed key to the keystore.*

   ***Note**: Although your private key will be stored in the in the Jetty keystore, Jetty does not provide a means for extracting the key. Should you lose your private key, use a third-party too, such as jksExportKey, to extract it from the Jetty keystore.*

   The CSR (jetty.csr) file has contents similar to the following:

   ```
   -----BEGIN NEW CERTIFICATE REQUEST-----
   XXXCuTCCAaECAQAwdDELMAkGA1UEBhMCQ0ExDzANBgNVBAgTBlF1ZWJlYzERMA8GA1UEBxMITW9u
   dHJlYWwxDTALBgNVBAoTBEF2aWQxCzAJBgNVBAsTAlFBMSUwIwYDVQQDExxoYS1pY3BzLTAyLmds
   b2JhbC5hdmlkd3cuY29tMIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAjoSSGeAskozI
   G454aQ6RK3qOKix4gYapEAGgzJ+f+6LN/j0U5sIznW2F5RG047ChMiMdENVK2v4jlI1RtHozD4Yd
   RO/xHVBejmP+SDAhtfNcXX2ThZYzGbHWm7mcxOnyXH5vU0KVWaWfz9K3Oh1FPwEgI6T4sb1TBY7h
   F8r7uObeoUbXnaXObGHJnSzlX/PC3YcsHPPI4BFAmK/6oQpgUbnN+L7y7oBCIBwv5tY3Z16q9vgy
   V9H8NpEIEkh9anJXWlo13aGeMYa0yM4g2cRsiBGAPRkmvx2lYUBf5TOcSk9mFZAZRudK1j5+mCtY
   VljC9q5cZzL0IZ52U+kbW1IrRwIDAQAtT7bwDQYJKoZIhvcNAQEFBQADggEBAEObhmbSxAPwfyD7
   jO6uR6R/1oN2fu29bxx9yTMBS8OeiLb1NcSaBAPxxcZaaHnmXeKIzh0ReHXt4GUNXGOL2HYVKjLa
   OFqY9mhUgrEdIIEbbpXtOI41qzdQqP/CCv5j6fx8M5gdCVZghtk0+G+MME92e4YSib9Ghs+WVXCj
   1uwzr4VwlpsaSAvGpNhLV6wTHgeYcGoKOi6gycdTNPIySc+KDGfZFVCAeg6nDqkanjvYUKInPByC
   s3cD8B+ZxvHSIzRf4mbPSOm596XxpiaiJUEYo9jNWZjgdGJghlI2SKryjkWG8wJMWjDBGaHzcXXX
   ET/c/veHF0c2XNjFSU/hHEA=
   ```

```
-----END NEW CERTIFICATE REQUEST-----
```

The private key (jettyPrivateKey.key) file is structured similarly.

3. Before submitting the CSR to your CA, validate its contents using one of the many online CSR validation tools.

   Generally, this involves cutting and pasting the contents of the CSR file into a web browser and viewing the parsed results. To ensure the CSR complies with your CA's requirements, use their CSR validation tool, if possible.

4. To check your CSR immediately, use the following openssl command:

   ```
   openssl req -text -noout -verify -in jetty.csr
   ```

   The system should respond with an "OK" and a structured dump of the CSR contents.

5. Doublecheck the validity of the private key you created:

   ```
   openssl rsa -in jettyPrivateKey.key -check
   ```

   The system should respond with an "OK" and a structured dump of the private key contents.

6. Submit the CSR to your CA, and take receipt of the CA-signed Certificate.

   The CA will provide you with a PEM (.pem) file. Also known as a concatenated certificate container file, this file contains the CA-signed certificate. Its contents resemble the following (abbreviated for convenience):

   ```
   -----BEGIN CERTIFICATE-----
   XXXXfDCCBGSgAwIBAgIQfju3hLvGVKvSuNZ37MOUqDANBgkqhkiG9w0BAQUFADCB
   jDELMAkGA1UEBhMCVVMxFzAVBgNVBAoTDlZlcmlTaWduLCBJbmMuMTAwLgYDVQQL
   EydGb3IgVGVzdCBQdXJwb3NlcyBPbmx5LiAgTm8gYXNzdXJhbmNlcy4xMjAwBgNV
   BAMTKVZlcmlTaWduIFRyaWFsIFNlY3VyZSBTZXJ2ZXIgUm9vdCBDQSAtIEcyMB4X
   DTA5MDQwMTAwMDAwMFoXDTE5MDMzMTIzNTk1OVowgcsxCzAJBgNVBAYTAlVTMRcw
   FQYDVQQKEw5WZXJpU2lnbiwgSW5jLjEwMC4GA1UECxMnRm9yIFRlc3QgUHVycG9z
   ZXMgT25seS4gIE5vIGFzc3VyYW5jZXMuMUIwQAYDVQQLEzlUZXJtcyBvZiB1c2Ug
   CCsGAQUFBwEMsdfEwX6FdoFswWTBXMFUWCWltYWdL2dpZjAhMB8wBwYFKw4DAhoE
   FI/l0xqGrI2Oa8PPgGrUSBgsexkuMCUWI2h0dHA6Ly9sb2dvLnZlcmlzaWduLmNv
   bS92c2xvZ28uZ2lmMB0GA1UdDfjdsBQoFxOKvdaitdwGLLe2jtoQZmBu5TAfBgNV
   HSMEGDAWgBRIGeeSb5KdNGOZwPCZyNaljIx/ZTANBgkqhkiG9w0BAQUFAAOCAQEA
   NgvA9cj2h5yFC2SJMmE8a9trUmjnorZWO/Ifmdf5ADuQuf+k8arodHpdSeq/f2Gj
   wDIo3oYL2bT/66tw46Kx3Q/Z02pp7YW+BRvKejBYXN9FJxsXEkPKpz4SRvSQLl5Y
   Bst7q03nK0lZQ4/LE+hufgvx08JdqGd4o4cOvZ6o4MQaMgX/0lwNjC+4PWuKfmrK
   mr+RhpSkc72cEEO9//XsYesTMetY3nOuqXAQqiH4lz3KAzqNgohXXcF8W1F3ytTT
   q1yWbMkJonRpXbE3U0rWI33ywiS7LAk8n4dR8tNoqqIrP6sDtvolx9/+qTPWGnYy
   tV0P/hcJt5CbqE7008EnPQ==
   -----END CERTIFICATE-----
   ```

   The PEM file and CA-signed certificate it contains is a public documents. It does not contain any private information and does not need to be stored securely. However, it is recommended you keep it in a safe place such as the *root* user home directory (/root).

7. To verify the contents of the PEM file in human-readable form:

   ```
   openssl x509 -in blah.crt.pem -noout -text
   ```

   Technical information for the certificate include the issuer (e.g VeriSign, Thawte, Digicert), the certificate's validity, public key, and the information you supplied in the CSR.

Adding a CA-Signed Certificate to a Single Server

Once you have obtained an SSL certificate that has been signed by a recognized Certificate Authority (CA) you can add it to the ICS server Jetty keystore. This is a two-step process:

1. Combine the PEM (.pem) file with your private key (.key) file.

   The PEM file and private key files must be combined into a password-protected Public-Key Cryptography Standards (.pkcs12) file . This is the format required by the Jetty keystore. In this step you also import the file into the keystore.

2. Add certificate usage passwords to the Interplay Central Application Properties file.

   In order to make use of the CA-signed certificate, Interplay Central must be supplied with the passwords that a) protect the certificate, and b) protect the keystore itself.

The procedures require that you have the following files:

- **PEM (.pem) file**: The file containing the CA-signed certificate.
- **Key (.key) file**: The file containing the private used to generate the CSR.

The procedures require that you create the following passwords:

- Export Password:_____

  Required when you use *openssl* to combine the key file and PEM file into a PKCS file. This password protects the PKCS file. It also protects the certificate once it is inside the keystore.

  In another procedure, you will add this password to the Interplay Central Application Properties file, so it can be used by Interplay Central to serve (i.e. export) the certificate from the keystore.

- Destination Keystore Password:_____

  Required when you use *keytool* to create the Jetty keystore.

  Similarly, in another procedure you will add this password to the Interplay Central Application Properties file, so it can be used by Interplay Central to gain access to the keystore.

  ***Note**: For simplicity, it is recommended you use the same password for both entries.*

The procedures require that you have the following passwords in your possession:

- Import Password: _____

  This is the password you used to combine the key file and PEM file into a PKCS file, (“Export Password”) above. It is required when you use *openssl* to verify the PKCS file was created correctly.

- PEM Pass phrase: _____

  This is the password used to create the PEM file in the previous procedure.

- Source Keystore Password: _____

This is the password you used to combine the key file and PEM file into a PKCS file, ("Export Password") above. It is required when you use *keytool* to create the Jetty keystore.

Adding a trusted certificate to the ICS server keystore:

1. Log in to the ICS server as the *root* user.
2. Change to the directory containing the private key you generated to obtain the CSR:

   ```
   cd /root
   ```

3. Back up the Jetty keystore:

   ```
   cp /opt/avid/etc/avid/avid-interplay-central/ssl/jetty.keystore
   /tmp/jetty.keystore.bak
   ```

   ***Note**: Do not back up the keystore to the /ssl directory. Jetty reads all files in the keystore directory. Unnecessary files can result in errors.*

4. Copy the PEM (.pem) file (e.g. jetty.pem) received from the CA to your current directory.
5. Combine the PEM file and private key into a single Public-Key Cryptography Standards (.pkcs12) file:

   ```
   openssl pkcs12 -inkey <privatekeyfile>.key -in <certificatefile>.pem
   -export -out jetty.pkcs12
   ```

   ***Note**: The key file you specify in the above command must be the same one that was used to generate the CSR.*

6. Enter and verify an export password as prompted.

   Take note of the export password for the next step.

7. Doublecheck the PKCS file was created correctly:

   ```
   openssl pkcs12 -info -in jetty.pkcs12
   ```

   Enter an "import password" as prompted. This is the password you used to create the PKCS file in the step above.

   A structured dump of the PKCS file is displayed. Verify its contents, including the "issuer" values.

8. At the end of the dump, you are prompted to enter the PEM password/passphrase. Enter the password used to create the private key, to obtain an encrypted output of the private key.
9. Create the Jetty keystore, and import the file you created into it:

   ```
   keytool -importkeystore -srckeystore jetty.pkcs12 -srcstoretype
   PKCS12 -destkeystore jetty.keystore
   ```

   At the prompts provide a destination password for the Jetty keystore, and enter the export password (source keystore password) used in the previous step.

   For simplicity, it is suggested you use the same password for both.

10. Before proceeding, verify the contents of the keystore:

    ```
    keytool –list –keystore jetty.keystore
    ```

    At the prompt enter the keystore password (the “Destination Keystore Password” , above).

    The contents of the keystore are displayed, in a structured form, similar to the following:

    ```
    Keystore type: JKS
    Keystore provider: SUN

    Your keystore contains 1 entry

    1, Apr 5, 2013, PrivateKeyEntry,
    Certificate fingerprint (MD5):
    3C:35:2F:D5:40:8F:CF:18:4C:9A:BE:F1:9C:15:2C:D3
    ```

    Take note of the MD5 fingerprint. You can use it later when browsing to Interplay Central, to verify the correct certificate is being served.

11. Stop the Avid Interplay Central service:

    ```
    service avid-interplay-central stop
    ```

    For a cluster, use the following command instead (on the master node only):

    ```
    crm resource stop AvidIPC
    ```

    > ***Note**: In a cluster the avid-interplay-central service runs on the master node only, where it is controlled by the AvidIPC resource. There is nothing to stop on the non-master nodes.*

12. Copy the new Jetty keystore containing the CA certificate to its final location:

    ```
    cp jetty.keystore
    /opt/avid/etc/avid/avid-interplay-central/ssl/jetty.keystore
    ```

13. For a cluster, use the Linux *scp* command to copy the keystore to the other non-master nodes in the cluster:

    ```
    scp jetty.keystore
    root@[host]:/opt/avid/etc/avid/avid-interplay-
    central/ssl/jetty.keystore
    ```

14. For a cluster, use the Linux *md5sum* command to check that the jetty.keystore files are identical on each node.

    ```
    md5sum jetty.keystore
    ```

Before restarting the Interplay Central services (or updating the master node, for a cluster), add the certificate usage passwords to the properties file, below.

Adding certificate usage passwords to the Interplay Central Application Properties file:

In this procedure you obtain obfuscated passwords from Jetty and add them to the Interplay Central application properties file. This allows Interplay Central to make use of the SSL certificate.

Be sure to add two (2) passwords to the application properties file (similar to the following):

```
system.org.ops4j.pax.web.ssl.password=OBF\:1c3x1mf71jnb1sov1jk71mbf1c35
system.org.ops4j.pax.web.ssl.keypassword=OBF\:1c3x1mf71jnb1sov1jk71mbf1c35
```

***Note**: Plain-text passwords can also be used. For reasons of security it is recommended you use obfuscated passwords instead.*

1. Log in to the ICS server as the *root* user.
2. Obtain an obfuscated string for the password used to create the *jetty.pkcs12* file in the previous procedure:

```
java -cp /opt/avid/avid-interplay-central/lib/org.eclipse.jetty.jetty-
util.jar org.eclipse.jetty.util.security.Password <Export_Password>
```

   Where <*Export_Password*> is the password you specified when creating the *jetty.pks12* file.

   The system responds by outputting the Interplay Central administrator name, the obfuscated password string (OBF:) and the MD5 hash value (MD5:).

   The following represents sample output. It is the string following OBF that is needed ("XXXXXXX" represents the clear-text password):

```
XXXXXXX
OBF:1c3x1mf71jnb1sov1jk71mbf1c35
MD5:4c88dafcf38a9b90b1e32efe798f95f0
```

3. If you used a different password to create the Jetty keystore ("Destination Keystore Password"), repeat the step for the second password.
4. Change to the directory containing the custom Application Properties file:

```
cd /opt/avid/etc/avid/avid-interplay-central/config
```

5. Edit the Interplay Central application properties file using a text editor such as *vi*:

```
vi application.properties
```

   ***Note**: In most cases, this Application Properties file will not exist. Create the file using vi and add the lines indicated in the steps below.*

6. Locate (or add) the entry for the Export Password:

```
system.org.ops4j.pax.web.ssl.password=OBF\:1c3x1mf71jnb1sov1jk71mbf1c35
```

   Replace obfuscated string (shown in bold, above) with the one you generated.

   ***Note**: Those upgrading from ICS 1.2 or below (i.e. from a Windows server to a Linux server) please note the following difference in Linux syntax. If you are re-using the obfuscated string from the Windows server, be sure to add the Linux "escape" character ("\") in front of the colon in the entry for the obfuscated password.*

A plain text entry would look like the following:

```
system.org.ops4j.pax.web.ssl.password=visible password
```

7. Locate (or add) the entry for the Destination Keystore password:

   ```
   system.org.ops4j.pax.web.ssl.keypassword=OBF\:1c3x1mf71jnb1sov1jk71mbf1c35
   ```

   Replace obfuscated string (shown in bold, above) with the one you generated to create the Jetty keystore.

8. Save and exit the file:

   ```
   <Esc>:wq
   ```

9. For a cluster, use the Linux *scp* command to copy the Application Properties file to the other non-master nodes in the cluster:

   ```
   scp application.properties
   root@[host]:/opt/avid/etc/avid/avid-interplay-
   central/config/application.properties
   ```

10. For a cluster, use the Linux *md5sum* command to check that the jetty.keystore files are identical on each node:

    ```
    md5sum application.properties
    ```

11. Restart Interplay Central:

    ```
    service avid-interplay-central start
    ```

    For a cluster, update the master node Jetty keystore and Application Properties file first. See "***Adding a CA-Signed Certificate to a Server Cluster***" on page 176.

    Once Interplay Central has restarted, it serves the trusted certificate for its HTTPS connections.

Restoring the original Jetty keystore and Interplay Central configuration file:

In the event that you are dissatisfied with the results of the CA-signed certificate, restore the original settings following this procedure.

1. Stop the Avid Interplay Central service:

   ```
   service avid-interplay-central stop
   ```

   For a cluster, use the following commands instead (on the master node):

   ```
   service pacemaker stop
   service corosync stop
   ```

2. Overwrite the Jetty keystore you created with the original:

   ```
   cp /tmp/jetty.keystore.bak  /opt/avid/etc/avid/avid-interplay-
   central/ssl/jetty.keystore
   ```

3. Delete the modified Interplay Central properties file:

   ```
   rm /opt/avid/etc/avid/avid-interplay-central/config/application.properties
   ```

4. Restart the Avid Interplay Central service:

   ```
   service avid-interplay-central start
   ```

   For a cluster, use the following command instead (on the node you took offline, above):

   ```
   service corosync restart
   ```

Adding a CA-Signed Certificate to a Server Cluster

Making use of a CA-signed certificate in a cluster consists of the following main steps:

1. Identifying the master and non-master nodes.

   Make changes to the non-master nodes first and the master node last.

   For instructions on identifying the master and non-master nodes, see "***Observing Failover in the Cluster***" on page 137.

2. Importing the CA-signed signed certificate.

   In this step you combine the private key (.key) file and the PEM (.pem) file, then import it into the keystore, for each non-master node in the cluster.

   Note*: To save time and ensure accuracy, consider performing this operation once only, and copying the updated keystore to each machine in the cluster using the Linux secure copy (scp) command.*

   For instructions, see "***Adding a CA-Signed Certificate to a Single Server***" on page 171.

3. Add certificate usage passwords to the Interplay Central Application Properties file.

   Since both the SSL certificate and the keystore itself are password-protected, in this step you update the Interplay Central Application Properties (application.properties) file with the new passwords. Interplay Central needs the passwords so it can serve the SSL certificates. This is also done for each non-master node in the cluster.

   Note*: Similarly to the above step, consider modifying the Interplay Central application properties file once only, and copying the updated file to each machine in the cluster using the Linux scp command.*

   For instructions, see "***Adding a CA-Signed Certificate to a Single Server***" on page 171.

4. Update the master node and restart it.

   With the updated Jetty keystores and Application Properties files in place on the non-master nodes, you can update the same files on the master node. To do so, you temporarily remove the node from the cluster by putting it into standby mode.

   See the procedure below.

5. Trigger a failover to verify the success of the procedures

   In this step, you verify the certificates were installed correctly by triggering a failover in the cluster. That is, you verify that a new master node can read the keystore without complaint.

As a best-practice, you ought to trigger failovers until each node in the cluster has taken on the role of master. This will ensures configuration changes were successful on each node.

For instructions on triggering a failover, see "***Observing Failover in the Cluster***" on page 137.

To update the master node keystore and Application Properties file and restart the node:

1. Log in to the master node as *root*.
2. Put the master node into standby mode:

   ```
   crm node standby <node_name>
   ```

   This command triggers a failover in the cluster, causing the named node to lose its status as master. Another node becomes master.
3. Navigate to the directory containing the Jetty keystore:

   ```
   cd /opt/avid/etc/avid/avid-interplay-central/ssl
   ```

4. Securely copy the Jetty keystore from any other node to the current (standby) node:

   ```
   scp root@[host]:/opt/avid/etc/avid/avid-interplay-
   central/ssl/jetty.keystore ./
   ```

   In the command above, substitute the name of the node you are copying from for the [host] parameter (e.g. **morpheus-hp2**). Do not type the square brackets. The "dot slash" in the above command indicates the current directory.

   You will be prompted to overwrite the existing keystore. Type "y" to overwrite.
5. Navigate to the directory containing the Application Properties file:

   ```
   cd /opt/avid/etc/avid/avid-interplay-central/config/application.properties
   ```

6. Securely copy the Application Properties file from any other node to the current (standby) node:

   ```
   scp root@[host]:/opt/avid/etc/avid/avid-interplay-
   central/config/application.properties ./
   ```

   You will be prompted to overwrite the existing file. Type "y" to overwrite.
7. Bring the current node back online, adding it back into the cluster:

   ```
   crm node online <node_name>
   ```

   The node is added back into the cluster, as a regular node. That is, it is no longer master. However, the next time this node takes that role, it will serve the new certificate.

Configuring Google Chrome (Windows)

Trusting a self-signed certificate in Google Chrome is a two-step process. First, you export the certificate from the browser. Next, you import the certificate into the Trusted Root Certification Authorities store. Both these procedures are performed via Chrome menus.

To export the certificate from the browser:

1. Launch Google Chrome and enter the URL of the ICS server or cluster in the address bar.
   - http://<*FQDN*>, where <*FQDN*> is the Fully Qualified Domain Name of the ICS server cluster
   - http://<hostname>, where <hostname> is the short name of the ICS server cluster

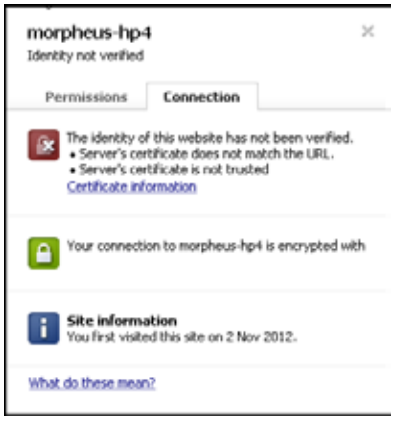
   What you enter in the address bar depends on the name you used to generate the self-signed certificate.

   Note that you are automatically redirected to the secure (SSL) connection.

   A warning appears indicating a problem with the SSL certificate.

2. Click on the “Proceed anyway” button.
3. Click on the padlock icon in the Chrome address bar.

   Details pertaining to the warning appear in a pop-up.



4. Click on the Certificate Information link.
5. A dialog pertaining to the SSL certificate appears.
6. In the Certificate dialog, click on the Details tab, then the Copy to File button.

This starts the Certificate Export wizard.

7. Follow the prompts in the wizard to export the certificate from the browser, saving it in a convenient temporary location, such as the local desktop.

Once you have exported the certificate, you can use the browser to add it to the Trusted Root Certification Authorities store, as described below.

To add the certificate to the trusted certificates store:

1. Click on Google Chrome Customize icon on right edge of the address bar.

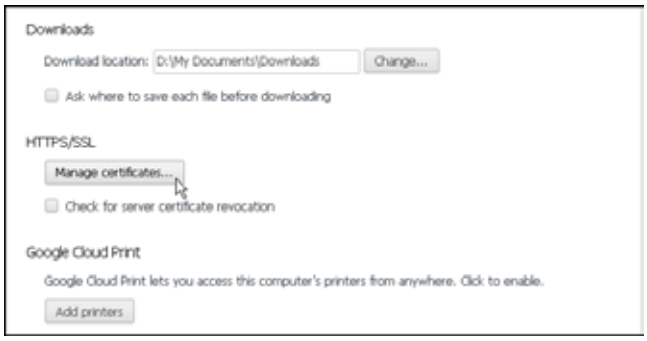
   A dropdown customization menu appears.

2. Choose Settings from the dropdown menu.

   The Chrome Settings page appears.

3. Click on the “Show advanced settings” link.

   The page expands to show more settings.



4. Click on the Manage Certificates button in the HTTPS/SSL category.

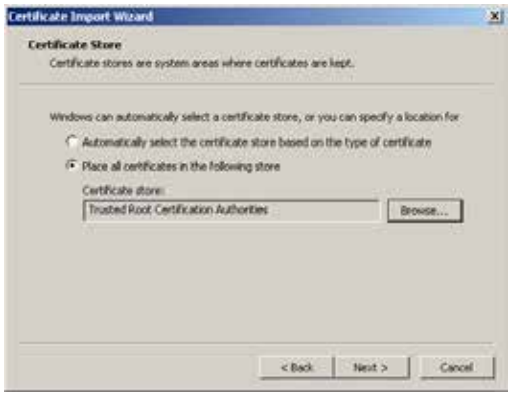
5. A Certificates dialog appears showing certificates arranged by category.

6. In the Certificates dialog, click the Import button.

   The Windows Certificate Import Wizard appears.

7. Click Next to continue, and in the File to Import dialog, click the Browse button to locate your certificate, and click Next.
8. In the dialog that appears, select “Place all certificates in the following store”. Browse to the “Trusted Root Certification Authorities” store and click OK to select the store.

9. The storage location you selected appears in the wizard.



***Note**: Be sure to place the certificate into the Trusted Root Certification Authorities store.*

10. Click Next, then Finish.

11. A final security warning dialog appears, asking you to confirm installation of the certificate. Click Yes.

A confirmation dialog appears indicting success.

12. Restart Chrome and enter the FQDN of the ICS server or cluster in the address bar.

    The browser loads Interplay Central without issuing certificate warnings.

Configuring Internet Explorer (Windows)

Internet Explorer provides an efficient mechanism for adding self-signed (or otherwise untrusted) certificates to the Trusted Root Certification Authorities store.

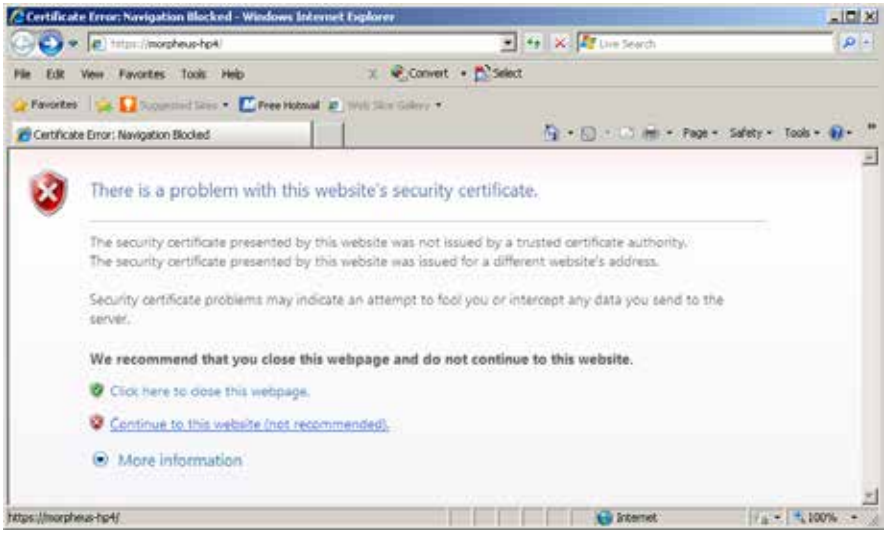
To add a certificate to the trusted certificates store:

1. Launch Internet Explorer and enter the URL of the ICS server or cluster in the address bar.
   - http://<*FQDN*>, where <*FQDN*> is the Fully Qualified Domain Name of the ICS server cluster
   - http://<hostname>, where <hostname> is the short name of the ICS server cluster

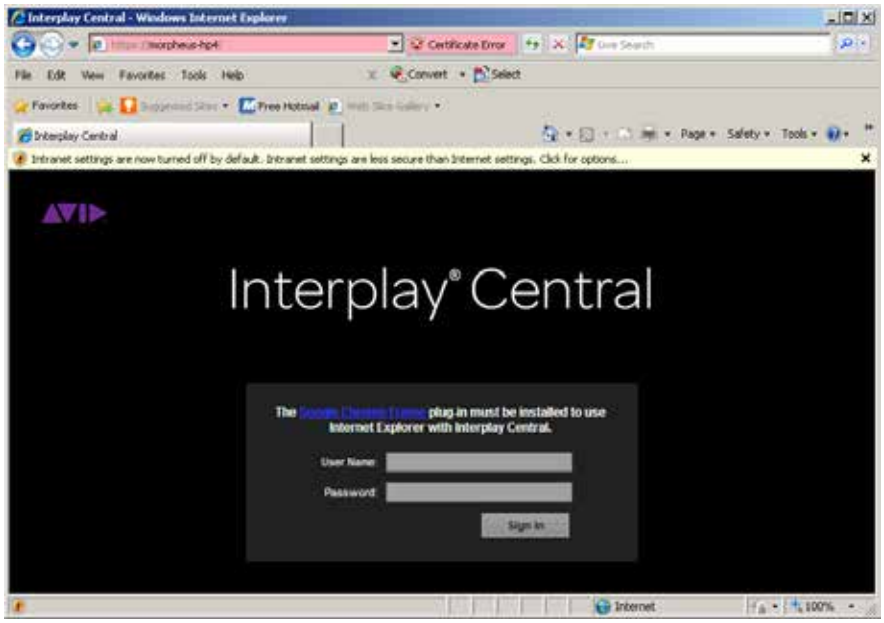
   What you enter in the address bar depends on the name you used to generate the self-signed certificate.

   Note that you are automatically redirected to the secure (SSL) connection.

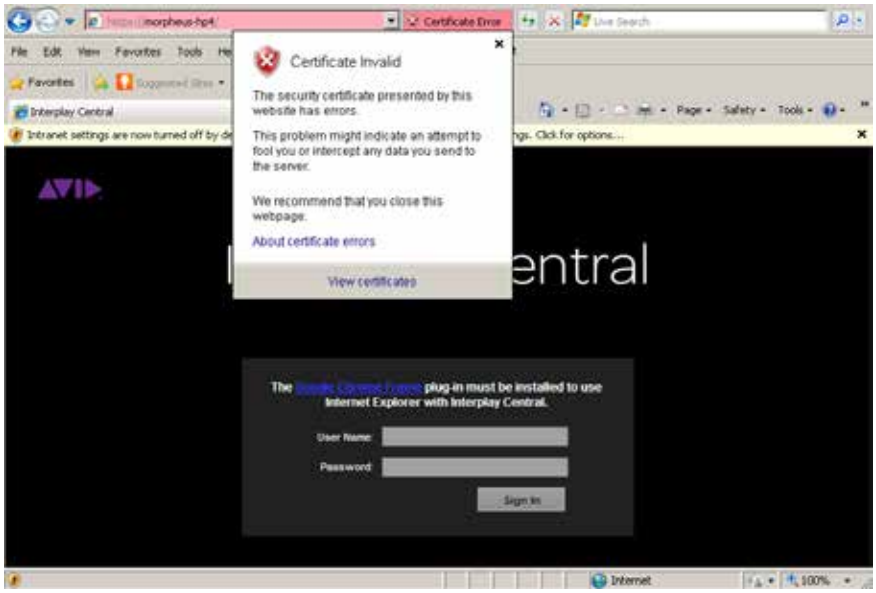
A warning appears indicating a problem with the SSL certificate.



2. Click on the “Continue to this website” link.
3. Click on the Certificate Error button in the address bar.



4. In the Certificate Invalid popup dialog, click on the View Certificates link.



Details relating to the certificate are presented in a certificate dialog:

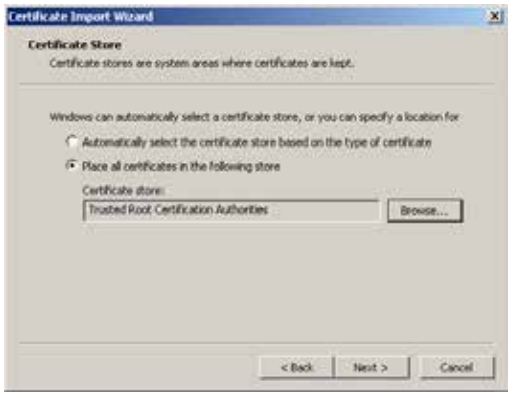
If you do not see the Install Certificate button, close IE, then right-click its icon and select Run as Administrator.

5. In the Certificate Dialog, click on the Install Certificate... button.

   The Windows Certificate Import Wizard appears.

6. Click Next to continue, and in the dialog that appears, select “Place all certificates in the following store”. Browse to the “Trusted Root Certification Authorities” store and click OK to select the store.

The storage location you selected appears in the wizard.



***Note**: Be sure to place the certificate into the Trusted Root Certification Authorities store.*

7. Click Next, then Finish.

8. A final security warning dialog appears, asking you to confirm installation of the certificate. Click Yes.

The Certificate Import Wizard indicates success.

9. Restart Internet Explorer and enter the FQDN of the ICS server or cluster in the address bar.

   The browser loads Interplay Central without issuing certificate warnings.

Configuring Safari (Mac OS)

In Mac OS, you must add the self-signed certificate to the Mac OS system keychain. This is easily done via the Safari browser itself.

To add a certificate to the trusted certificates store:

1. Launch Safari and enter the URL of the ICS server or cluster in the address bar.

   - http://<*FQDN*> where <*FQDN*> is the Fully Qualified Domain Name of the ICS server or cluster.
   - http://<*FQDN*>, where <*FQDN*> is the Fully Qualified Domain Name of the ICS server cluster
   - http://<hostname>, where <hostname> is the short name of the ICS server cluster

   What you enter in the address bar depends on the name you used to generate the self-signed certificate.

   Note that you are automatically redirected to the secure (SSL) connection.

   A warning appears indicating a problem with the SSL certificate.

2. Click the Show Certificate button to display details about the certificate.

3. Put a checkmark in the “Always trust” checkbox and click Continue.

4. Enter the Administrator password and click OK.

   The self-signed certificate is added to the Mac OS system keychain and the browser continues to the log-in page without further complaint.

5. To view the certificate, use the Mac OS Keychain Access utility.

Launching the Windows Import SSL Certificate Directly

The procedures in this appendix have made use of the browser menus for importing SSL certificates. However, the certificate import wizard launched from the browsers (Windows) is an OS-level wizard. You can launch it directly from the Windows control panel. If you will be installing the self-signed certificate into the Trusted Root Certification Authorities store on numerous machines or devices, it may be faster to do so by launching the wizard directly.

To launch the Windows Import SSL Certificate wizard:

1. Open the Windows Control Panel.
2. Choose Internet Options.
3. In the Internet Properties dialog that appears, click the Certificates button on the Content tab.

4. The wizard for importing certificates is launched.

The Interplay Central Application Properties File

The following table summarizes the entries in the Interplay Central application properties file that are related to SSL certificates. Interplay Central makes use of these values to send SSL certificates to browsers.

Keys	Description
system.org.osgi.service.ssl.password	The password protecting the certificate within the keystore. Must match the value given for the *-storepass* parameter when you generate the new certificate. Clear text or Jetty obfuscated (recommended).
system.org.osgi.service.ssl.keypassword	The password protecting the keystore itself. Must match the value given for *-keypass* when you generated the new keystore. Clear text or Jetty obfuscated (recommended).
system.org.osgi.service.ssl.algorithm	The encryption algorithm. Must match the value given for *-keyalg* when you generated the new keystore. Default is RSA.
system.org.osgi.service.https.keystore.path	The path and name of the key store file. Must match the value given for *-keystore* when you generated the new keystore. The path is relative to the standard SSL folder used for storing the key store file.

Appendix E: Migrating the UMS Database with the User Management Utilities Tool

Some ICS upgrade paths require that you migrate your existing Windows-based User Management Services (UMS) database to the new Linux-based ICS server. For example, updating from Interplay Central 1.2.x to Interplay Central 1.3 (or higher) involves the decommissioning and/or repurposing of the Windows server where middleware and UMS ran under Interplay Central 1.2.x. To preserve the UMS database, you must migrate it from the Windows sever to the Linux server.

Migrating the Windows UMS database to the new Linux ICS server is a straightforward process performed using the User Management Utilities tool provided for the task. It consists of two main steps:

1. Migrate the Database

   In the first step, you copy the Windows UMS database from the Windows machine to the RHEL server. Once there, you use the migration tool to migrate its contents into the new Linux system.

2. Migrate the System Settings

   In this step, you extract the system settings from the updated Linux UMS database and export them into the Avid Common Service (ACS) bus.

Note: The initial installation of UMS on the Linux server creates a default user name and password. After you migrate the database from Windows, the default user name and password change on Linux. The default user name and password are replaced by those used for the existing Windows database that you have migrated.

Note: If you are migrating a cluster, you only need to perform the procedures in this appendix once, on the master node. Perform them after you have set up the fully operational ICS server, but before you install RHEL and ICS on the other servers in the cluster. In this way, the clustering software itself will take care of replicating the UMS database across all nodes in the cluster.

Note: You need to log in to the Linux server as root to complete the procedures in this section.

To migrate the database:

In this procedure you copy the UMS database from the Windows machine to the Linux server, and migrate its contents into the Linux UMS database.

1. On the Windows server that is home to your current database, open the Windows Task Manager by pressing Ctrl-Shift-Esc.
2. The Windows Task Manager appears.
3. Locate the Interplay Central User Management service on the Services tab, right-click it and select Stop Service.
4. Verify there is no database lock (database.lock.db) file in the UMS database directory:

```
C:\ProgramData\Avid\Avid Interplay Central User Management
Service\db
```

If the database lock file is present, wait for the UMS to stop completely and for the lock file to be removed.

Note: Attempting to migrate a locked database can result in data corruption.

5. Copy the UMS database (database.h2.db) file from the Windows server to an available directory on the new RHEL server (e.g. /tmp).

   The Windows database file is located here:

   ```
   C:\ProgramData\Avid\Avid Interplay Central User Management
   Service\db\database.h2.db
   ```

   Caution: Do not rename the database file.

6. On the RHEL server, ensure the ICS UMS is running by typing the following at the Linux command prompt:

   ```
   service avid-ums status
   ```

   Output similar to the following should appear:

   ```
   avid-ums (pid xxxxx) is running...
   ```

7. Start the database migration by typing the following at the Linux command prompt:

   ```
   avid-ums-admin-tool -mdb [admin-password] [h2-DB-path] [postgres-
   superuser-name] [postgres-superuser-password]
   ```

   For example:

   ```
   avid-ums-admin-tool -mdb xxxxx /tmp/database.h2.db postgres
   ```

   Note the following:

   - [admin-password]: This is the *root* password.
   - [postgres-superuser-password]: Leave this field blank.

   An error message informs you if you type an incorrect path for your database file.

   A message informs you when the UMS database migration is complete

   ```
   Migration is successfully done.
   ```

To migrate the system settings:

In this procedure you extract the system settings from the freshly updated Linux UMS database, and export them export them into the Avid Common Service (ACS) bus.

Note: Only the system settings are migrated to the ACS bus. User settings remain in the UMS database.

- Type the following command at the Linux command prompt:

  ```
  avid-ums-admin-tool -ms [acs-bus-url] [ums-admin-password]
  ```

  For example:

  ```
  avid-ums-admin-tool -ms localhost:61616 xxxxx
  ```

  In the above example, the default ACS bus URL and port is used (localhost:61616).

  A message informs you when the settings migration completes:

  ```
  Migration completed successfully.
  ```

  If you receive an error such as the following, it indicates the incorrect host/port was specified in the avid-ums-admin-tool command:

  ```
  ERROR: Cloud bus error: Bus access factory is not available
  ```

Appendix F: Installing the Chrome Extension for Interplay Central MOS Plug-Ins

Interplay Central provides support for MOS Active-X plug-ins. For example, Deko Select is a plug-in for a newsroom computer system's interface that allows a user, such as a reporter, to drag and drop graphic templates directly into the story, as well as alter replaceable text or graphics in the selected template. You can also use the Avid Deko Select plug-in to add graphics to the video for a story sequence. Other plug-ins are available through third-party manufacturers.

These plug-ins are specific to iNEWS workflows, and they are available only in Rundown and Story layouts.

Note: The ICS installation program installs only the container needed for Active X controls. You need to install additional software as described in the following sections.

Setting Up Your Browser

The Chrome browser requires an extension that lets you use MOS plug-ins. The first time you sign in to Interplay Central, a dialog box asks if you want to use MOS plug-ins.

- If you click *yes*, an installer is downloaded from the Interplay Central Services server. Allow pop-ups from the Interplay Central Services server if you are informed that a pop-up was blocked, and then refresh the page. Double-click the .exe file to install the program.

  After installation is complete, you must close Chrome and then reopen it for the extension to be accessible by Interplay Central. Recent Chrome versions disable third-party plug-ins. Make sure that Chrome Tools > Extensions displays Enabled next to the Avid ActiveX extension.

- If you click *no*, and later want to use plug-ins, enable MOS as described below. The next time you sign in or refresh the application, a blank window opens and the installer is downloaded. Click the .exe file to install the extension.

Active X plug-ins are not supported in the Safari browser.

Enabling MOS

To use the plug-ins for a user you need to enable MOS in Interplay Central. Select Home > User Settings > MOS and then select "MOS enabled."

Installing Plug-Ins

For procedures on how to install plug-ins, see the documentation for the plug-in.

After installation and configuration, plug-ins are listed at the bottom of the Panes menu.

Uninstalling the Chrome Extension

If you need to uninstall the Chrome Extension, use the Windows Control Panel. **Do not use the Chrome Extensions page**.

1. Click Start and select Control Panel.
2. Click Programs and Features.
3. Right-click Avid interplay Central MOS plugin and select Uninstall. Click Yes and follow the prompts.

For more information about MOS plug-ins, see the *Avid Interplay Central User's Guide* or the Avid Interplay Central Help.

Appendix G: Enabling Interplay Central MOS Plug-Ins in IE9

The instructions in this appendix were produced for Internet Explorer 9.0.8112.16421 using Google Chrome Frame 65.169.107 on Windows 7 x86_64 SP1. Updates to any of these applications may change the steps below, including the order in which you perform them.

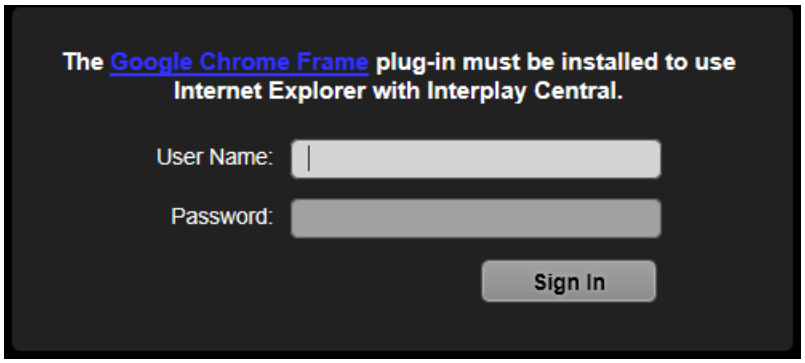
Once you complete the procedure, the Avid ActiveX container is available in IE9. When a MOS-enabled user logs in, a list of their installed ActiveX plug-ins appears at the bottom of the Panes menu. Opening a plug-in will create a new tab. (Press F5 if the tab is empty when loaded.) The tab can be dragged out of Internet Explorer, permitting drag and drop into the IPC page.

To enable Interplay Central MOS plug-ins in IE:

1. Launch Internet Explorer and enter the URL of the ICS server (or cluster) in the address bar (e.g. https://<hostname>).

   Bypass the certificate warning, if one is present.

   The Interplay Central sign-in page informs you that the Google Chrome Frame is required.

2. Install Google Chrome Frame using the link on the sign in page.

   ***Note**: Google Chrome Frame must be installed as an administrator user. The Avid ActiveX container also requires administrator elevation.*

3. A dialog should appear indicating the ChromeFrame BHO add-on from Google Inc is ready for use. Select Enable in that dialog.

4. Navigate once again to ICS server or cluster (e.g. https://<*hostname*>) and log in as a user for whom MOS plug-ins are enabled.

   ***Note**: To enable MOS for the logged in user, in Interplay Central, select Home -> User Settings -> MOS and then select "MOS enabled"*

5. Download and run setup.exe as prompted.

   If your receive a "This webpage is not available" message, refresh with F5, and then say Yes to proceed.

   Follow the instructions appearing in the Avid Interplay Central MOS plugin installation wizard, and accept the defaults to install the extension.

6. Close and re-open Internet Explorer. Navigate to Interplay Central and log in as the same user. Do not download setup.exe again. Sign out of Interplay Central and close IE.

   This step forces Chrome Frame to register the Avid extension.

7. In Windows Explorer, navigate to the following directory:

   `C:\Users\<username>\AppData\Local\Google\Chrome Frame\User Data\iexplorer\Default`

8. Open the “Preferences” file in Notepad.

9. Locate the “**known_disabled**” key and delete the line.

   ```
   "known_disabled": [ "lmcebpepkojaapaoliodbjagahkpedph" ],
   ```

10. Search for the term "**ActiveX**" to find the "Avid MOS ActiveX Chrome Extension" object, and modify the “state” value from 0 to 1.

    ```
    "state": 1,
    ```

11. Save and close the Preferences file.

12. Once again, Launch IE, navigate to the ICS server or cluster (e.g. https://<*hostname*>), and log in as the user for whom MOS plug-ins are enabled.

    Installed ActiveX plug-ins are now visible in Interplay Central, on the Panes menu.

Sample ActiveX Object in the Preferences File

For reference, the full ActiveX object after completion of the procedure is included below. Some values may be different for your particular installation.

```
         "lmcebpepkojaapaoliodbjagahkpedph": {
            "ack_prompt_count": 1,
            "active_permissions": {
               "api": [ "plugin" ]
            },
            "creation_flags": 1,
            "from_bookmark": false,
            "from_webstore": false,
            "initial_keybindings_set": true,
            "install_time": "13029963342661257",
            "location": 3,
            "manifest": {
               "description": "Avid MOS ActiveX Chrome Extension",
               "key":
"MIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQCa6DtGBLy26p0nWU7mfBTutgDZpGZw0t
a30LRo1Av6J1LUgL3AxJu5BP4TJxlXXbIKd0H2X6oLgKU3GIw5+r1YKK8BKVfgjpSanEWzg
vWsbjXcnH4XVF8thXYvutkTj5telkhFmOba1UG0zauqMqpnWus9ADGyMGBUIPsTlLhXDwID
AQAB",
               "manifest_version": 2,
               "name": "Avid MOS ActiveX hosting plugin",
               "plugins": [ {
                  "path": "npchmos.dll",
                  "public": true
               } ],
               "version": "1.0.1.10"
            },
```

```
    "path": "lmcebpepkojaapaoliodbjagahkpedph\\1.0.1.10_0",
    "state": 1,
    "was_installed_by_default": false
},
```

Appendix H: Unicast Support in Clustering

ICS clustering supports both unicast and multicast. The default configuration, as set up by the cluster installation script (and covered in the body of this guide) is for multicast. In facilities where the routers do not support multicast (i.e. are not multicast enabled) you must configure the cluster for unicast.

Configuring a cluster for unicast requires altering the contents of the corosync configuration (corosync.conf) file. The file is found here: /etc/corosync/corosync.conf.

By default, the corosync configuration file looks something like this:

```
totem {
        version: 2
        secauth: off
        threads: 0
        interface {
                ringnumber: 0
                bindnetaddr: 10.16.35.0
                mcastaddr: 226.95.1.1
                mcastport: 5405
        }
}
```

The changes needed are indicated below:

```
totem {
        version: 2
        secauth: off
        threads: 0
        interface {
            member {
                memberaddr: 10.16.35.101
            }
            member {
                memberaddr: 10.16.35.102
            }
            ringnumber: 0
            bindnetaddr: 10.16.35.0
            mcastport: 5405
        }
        transport: udpu
}
```

As illustrated by the example above, the following configuration changes are required:

1. Remove **mcastaddr** from the file (leave **mcastport**).
2. Add the new transport (that indicates unicast): **udpu**.
3. Create a **member{}** section for each node in the cluster, following the example, but replacing the values for **memberaddr** with the IP address of your own cluster nodes.

To configure unicast support in clustering:

***Note**: If you are working remotely using a KVM, this is a good moment to open a separate terminal window where you can run the cluster resource manager utility,* crm_mon*. Otherwise, run the utility now and then in the same terminal where you are doing your work.*

***Note**: Recall that DRBD runs on two nodes only: the master node, and one non-master node. If your cluster has more than two nodes, be sure to substitute the special form of the setup-cluster command to exclude the non-DRBD nodes from starting the PostgreSQL database. The special form of the setup-cluster command is indicated in "Starting the Cluster Services" on page 108.*

1. On each node in the cluster, run the **setup-corosync** command following the instructions in the body of this guide.

   The most commonly used form of the command is provided below (for reference):

   ```
   /opt/avid/cluster/bin/cluster setup-corosync
   --corosync-bind-iface=eth0
   --rabbitmq_master=<master>
   ```

   - <*master*> is the master node (e.g. **ics-dl360-1**). This should be the same as the DRBD master node specified earlier.

   See "***Starting the Cluster Services*** on page 108 for details (and the appropriate form of the *setup-corsync* command).

2. Stop the *pacemaker* services (used by *corosync*):

   ```
   service pacemaker stop
   ```

3. Stop the clustering services via *corosync*:

   ```
   service corosync stop
   ```

4. Edit the corosync configuration file:

   ```
   vi /etc/corosync/corosync.conf
   ```

   - Remove **mcastaddr** and **mcastport** from the file.
   - Add the new transport (that indicates unicast): **udpu**.
   - Create a **member{}** section for each node in the cluster, following the example, but replacing the values for **memberaddr** with the IP addresses of your own cluster nodes.

5. Restart *corosync* on the node:

   ```
   service corosync start
   ```

6. Restart the *pacemaker* service on the node:

   ```
   service pacemaker start
   ```

7. Once you have completed the above instructions on each node in the cluster, run the **setup-cluster** command *on the DRBD master node only*, following the instructions in the body of this guide.

   - To identify the master node, run the Cluster Resource Monitor (*crm_mon)* command from any node. The node with the **AvidClusterIP** resource is the master node. For details on identifying the master node, see "***Observing Failover in the Cluster***" on page 137.
   - The most commonly used form of the *setup-cluster* command is provided below (for reference):

     ```
     /opt/avid/cluster/bin/cluster setup-cluster
     --cluster_ip="<cluster IP address>"
     --pingable_ip="<router IP address>"
     --admin_email="<comma separated e-mail list>"
     --drbd_exclude="<comma separated list of non-DRBD nodes>"
     ```

   See "***Starting the Cluster Services***" on page 108 for details (and the appropriate form of the *setup-cluster* command).

   ***Note**: The final step in the procedure above (setup-cluster) is run on the DRBD master node only.*

Appendix I: Installing the Interplay Production License for Interplay Central

The Avid Interplay Administrator is a client application that can be installed on any computer in your network and then used to manage either the Interplay Engine or the Interplay Archive Engine. You can use the Licenses view of the Interplay Administrator to install the Interplay Production license needed for integration with Interplay Central. For more information about this application, see the "*Avid Interplay Engine and Avid Interplay Archive Engine Administrator's Guide*".

To install the Interplay Production license for Interplay Central:

1. Start and log in to the Interplay Administrator.
2. Make a folder for the license file on the root directory (C:\) of the Interplay Central middleware server. For example:

   ```
   C:\Interplay_Licenses
   ```

3. Insert the USB flash drive into any USB port.

   If the USB flash drive does not automatically display:

   a. Double-click the computer icon on the desktop.

   b. Double-click the USB flash drive icon to open it.

4. Copy the license file (*.nxn) into the new folder you created.
5. In the Server section of the Interplay Administrator window, click the Licenses icon.
6. Click the Import License button.
7. Select the file and click Open. The type of licenses (J or G) are displayed in the License Types area.

Appendix J: Configuring iNEWS for Integration with Interplay Central

Before you can connect to an iNEWS newsroom computer system from an Interplay Central workstation, you must edit two system files in iNEWS so that iNEWS recognizes Interplay Central as a properly licensed device.

The files to edit are:

- SYSTEM.CLIENT.VERSIONS
- SYSTEM.CLIENT.WINDOWS

***Note**: Additional files must be edited to ensure proper licensing for iNEWS integration with the Interplay Central mobile application. For more information, see "*Appendix K: Installing and Configuring the Avid Central Mobile Application for the iPad or iPhone*" on page 205.*

Verifying Interplay Central Licenses on iNEWS

Before you can use Interplay Central to connect to any back-end system, such as an iNEWS newsroom computer system, you must ensure iNEWS is configured with the proper number of Interplay Central devices authorized to connect to the system based on the purchased licenses. You can view iNEWS licensing limits from the iNEWS console.

To display iNEWS licensing limits, at the console, type:

```
t NRCS-A$ status license
```

A message similar to the following will appear on your screen:

```
A is ONLINE and has been CONFIGURED. ID is INWS.
System is AB. Master is A.
Disk status is OK. The database is OPEN.
Site Key.............. : 009999
CPUs.................. : 3
Workstation addresses : 3000
Workstation resources : 1000
COM resources........ : 5
Web Access resources. : 2
Web Client resources. : 10
Web API resources.... : 5
Wire Server resources : 8
Instinct resources... : 10
Mobile devices allowed: 2000
Community Sessions... : allowed.
```

The three lines to pay attention to are:

- Workstation addresses—indicates how many IP and/or MAC addresses can be specified in the SYSTEM.CLIENT.WINDOWS story. This story may be deleted from the iNEWS

database if Workstation addresses shows a “site” license and IP-specific restriction is not wanted.

- Workstation resources—the number of clients that can simultaneously connect to iNEWS, including iNEWS workstations, Interplay Central workstations, Apple iPad tablets, and Apple iPhone devices.
- Mobile devices allowed—the number of mobile devices that can simultaneously connect to iNEWS.

***Note**: Any time the iNEWS newsroom computer system is configured, your licensing information is checked. An error message appears in iNEWS if the configuration file defines more devices than are licensed.*

To change license allowances:

- Contact an Avid sales representative.

Editing SYSTEM.CLIENT.VERSIONS

Some steps in the following procedure are conducted at the iNEWS console in superuser mode. For more information, see “*The iNEWS Console*” chapter in the “*iNEWS Installation and Configuration Guide*”.

To edit the SYSTEM.CLIENT.VERSIONS story in iNEWS:

1. Sign in to an iNEWS workstation as a system administrator, or any user account with write access to the System directory.
2. Navigate to SYSTEM.CLIENT.VERSIONS and open the first story in that queue.
3. On a new line, add the version of the Interplay Central service that will run on the Interplay Central middleware server. You must use a four-segment build number. For example, for version Interplay Central version 1.8.0, type: 1.8.0.xx (where “xx” are the final digits).

   ***Note**: To verify the version/build numbers for ICS, connect to an ICS server as the* root *user and type* ics_version *at the command prompt.*

   ***Note**: Installing an ICS hot fix update results in a mismatch between the build numbers returned by the* ics_version *command and the build number of the ICS iNEWS JAR file used in iNEWS validation. If you install an ICS hot fix update, do not automatically change the value already set in* **SYSTEM.CLIENT.VERSIONS**.

   *To verify the correctness of the value, refer to the Interplay Central Modules pane. In Interplay Central, select System Settings from the Layout selector. In the Settings pane, click Modules. Locate the entry for “**com.avid.central.iNews**”. It is the version number associated with this entry that must be used in* **SYSTEM.CLIENT.VERSIONS**.
4. Save the story.

5. Reconfigure the system. From the iNEWS console:
    a. Select the master computer, which is typically server A.
    b. Enter superuser mode, using the correct password.

       The dollar sign ($) at the end of the console's server prompt will change to a pound sign (#).
    c. Take the system offline by typing:

       ```
       NRCS-A# offline
       ```
    d. Reconfigure the system by typing:

       ```
       NRCS-A# configure
       ```
    e. When the prompt reappears, bring the system back online by typing:

       ```
       NRCS-A# online
       ```
    f. Press **Ctrl+D** to leave superuser mode.

       The pound sign (#) at the end of the console's server prompt will change back to a dollar sign ($).

Editing SYSTEM.CLIENT.WINDOWS

The following procedure only applies to sites that are not using a "site" license as Workstation addresses in iNEWS. You can review your site license information from the iNEWS console. For more information, see "***Verifying Interplay Central Licenses on iNEWS***" above.

Some steps in the following procedure are conducted at the iNEWS console in superuser mode. For more information, see "*The iNEWS Console*" chapter in the "*iNEWS Installation and Configuration Guide*".

To edit the SYSTEM.CLIENT.WINDOWS story in iNEWS:

1. Sign in to an iNEWS workstation as a system administrator, or any user account with write access to the System directory.
2. Navigate to SYSTEM.CLIENT.WINDOWS and open the first story in that queue.
3. Add the IP address of the Interplay Central middleware server to a new line. Use a semicolon to add helpful commentary for future reference to the end of the line.

   For instance, type:

   ```
   125.1.100.5 ;Interplay Central middleware server
   ```

   If there are multiple middleware (Web application) servers, you will need to add the IP address for each one on individual lines in the story.

   ***Note**: You do not need to add to SYSTEM.CLIENT.WINDOWS the IP addresses of any Interplay Central client computers or devices.*

4. Save the story.
5. Reconfigure the system. From the iNEWS console:
    a. Select the master computer, which is typically server A.
    b. Enter superuser mode, using the correct password.

       The dollar sign ($) at the end of the console's server prompt will change to a pound sign (#).
    c. Take the system offline by typing:

       ```
       NRCS-A# offline
       ```

    d. Reconfigure the system by typing:

       ```
       NRCS-A# configure
       ```

    e. When the prompt reappears, bring the system back online by typing:

       ```
       NRCS-A# online
       ```

    f. Press **Ctrl+D** to leave superuser mode.

       The pound sign (#) at the end of the console's server prompt will change back to a dollar sign ($).

Appendix K: Installing and Configuring the Avid Central Mobile Application for the iPad or iPhone

The Avid Central mobile application is a native user interface designed to run on the Apple iPad touch-screen tablet and the Apple iPhone touch-screen phone, and enable direct, secure access to your station's iNEWS newsroom computer system.

You can use the Avid Central mobile application to view and approve news stories, navigate the news directory, play video sequences associated with stories and view a show's scripts in presenter mode (iPad only) while signed in to your station's iNEWS newsroom computer system.

This appendix describes the installation and configuration verification procedures necessary for the Avid Central mobile application.

There are various connection options available when using the Avid Central mobile application:

- Wi-Fi
- Carrier-specific cellular service— for example, 3G or 4G

***Note**: The application automatically selects the first available connection from the list of options according to the priority shown in the list.*

Before You Begin

Before you can use the Avid Central mobile application with an iNEWS newsroom computer system, you need to verify some important information and install the application on the device(s).

Ensure the following tasks are completed.

¨ Confirm that iNEWS is properly configured for licensed integration with the Avid Central mobile application.

See "***Appendix J: Configuring iNEWS for Integration with Interplay Central***" on page 201.

¨ Install Avid Central on the device(s).

See "***Installing Avid Central on the iPad or iPhone***", below.

iNEWS Configuration for iPad and iPhone Integration

Before you can connect to an iNEWS newsroom computer system from a device running the Avid Central mobile application, you must view and, if necessary, edit two system files in iNEWS so that iNEWS recognizes the Avid Central mobile application as a properly licensed device.

The files to check are:

- SYSTEM.CLIENT.VERSIONS
- iNEWS configuration file

Editing SYSTEM.CLIENT.VERSIONS

You use the iNEWS console in superuser mode, for some steps in the following procedure. For more information, see "*The iNEWS Console*" chapter in the "*iNEWS Installation and Configuration Guide*".

1. Sign in to an iNEWS workstation as a system administrator, or any user account with write access to the System directory.
2. Navigate to SYSTEM.CLIENT.VERSIONS and open the first story in that queue.
3. Confirm that the Interplay Central server version appears as a line in the story.
4. If the version is correct, then close the story. You do not need to complete the rest of the steps in this procedure.
5. If the version does not appear, on a new line, add the version of the Interplay Central service that will run on the Interplay Central middleware server. You must use a four-segment build number. For example, for version Interplay Central version 1.8.0, type: 1.8.0.xx (where "xx" are the final digits).

   ***Note**: To verify the version/build numbers for ICS, connect to an ICS server as the* root *user and type* ics_version *at the command prompt.*

   ***Note**: Installing an ICS hot fix update results in a mismatch between the build numbers returned by the* ics_version *command and the build number of the ICS iNEWS JAR file used in iNEWS validation. If you install an ICS hot fix update, do not automatically change the value already set in* **SYSTEM.CLIENT.VERSIONS**.

   *To verify the correctness of the value, refer to the Interplay Central Modules pane. In Interplay Central, select System Settings from the Layout selector. In the Settings pane, click Modules. Locate the entry for "**com.avid.central.iNews**". It is the version number associated with this entry that must be used in* **SYSTEM.CLIENT.VERSIONS**.
6. Save the story.
7. Reconfigure the system. From the iNEWS console:
   a. Select the master computer, which is typically server A.
   b. Enter superuser mode, using the correct password.

      The dollar sign ($) at the end of the console's server prompt will change to a pound sign (#).
   c. Take the system offline by typing:

      ```
      NRCS-A# offline
      ```
   d. Reconfigure the system by typing:

      ```
      NRCS-A# configure
      ```
   e. When the prompt reappears, bring the system back online by typing:

      ```
      NRCS-A# online
      ```
   f. Press **Ctrl+D** to leave superuser mode.

The pound sign (#) at the end of the console's server prompt will change back to a dollar sign ($).

Adding iPad and iPhone Devices to the iNEWS Configuration File

The configuration file (/site/config) lists all devices, servers, and resources configured to run on your iNEWS newsroom computer system and how they are connected. If a mobile device does not appear in the configuration file, you cannot use it with the iNEWS newsroom computer system.

The Avid Central mobile application uses the same G (inws) sessions in the configuration file as other Interplay Central Web clients or as iNEWS workstations. You need to confirm that there are enough sessions configured to handle simultaneous connections from these types of devices available to users at your site.

***Note**: You need to edit the configuration file only if there are not enough sessions.*

If you need to edit the configuration file, see "*The iNEWS Console*" and "*System Configuration*" chapters in the "*iNEWS Installation and Configuration Guide*". Also, some steps require use of *ed*, the line editor. If you do not know how to use the line editor to modify lines in the file, see "*The Line Editor, ed*" in the "*iNEWS Installation and Configuration Guide*".

To edit /site/config for the Avid Central mobile application:

1. Select all servers.

   ***Caution**: Whenever you make changes to any iNEWS site file, such as the configuration file, you must select all servers in your system at the console. Unlike database stories, site files are not automatically mirrored from one computer's disk to another.*

2. Type the following and press Enter:

   ```
   ed /site/config
   ```

   The editor displays a numerical value indicating the file size expressed as the number of characters, including spaces and returns.

   The configuration file has two major sections: the host section and the device section. For the Avid Central mobile integration, you must edit both.

3. In the host section, add a resource list entry, using the following format.

   ```
   reslist <device # or range> ; <comments>
   ```

   For example:

   ```
   reslist 2001:2005 ;iNEWS and IPC sessions
   ```

   ***Note**: For dual or triple server systems, the configuration file has multiple host sections to define which server handles which devices under various circumstances. You should add resource list entries to each host section.*

4. In the INWS sessions section, add a resource line for the devices, using the following format:

   ```
   inws <device # or range> - gnews <device name> ;<comment>
   ```

   For example:

   ```
   inws 2001:2005 - gnews –
   ```

5. Type **w** to write (save) your changes to disk.

   ***Caution**: Do not use an uppercase W in this step. Uppercase W appends the file you edit to the existing file. The resulting file might be unreadable and lead to problems with running your iNEWS system.*

6. Type **q** to quit the line editor.
7. (Optional) Use the configure command to test your configuration changes, using the following syntax:

   ```
   configure /site/config <system> <computer>
   ```

   For example:

   ```
   configure /site/config ab a
   ```

   When the prompt reappears, the configuration file has been checked. If the system detects any errors, it displays appropriate “bad configuration” messages.

8. Reconfigure the system. From the iNEWS console:
   a. Select the master computer, which is typically server A.
   b. Enter superuser mode, using the correct password.

      The dollar sign ($) at the end of the console’s server prompt changes to a pound sign (#).

   c. Take the system offline by typing: NRCS-A# offline
   d. Reconfigure the system by typing: NRCS-A# configure
   e. When the prompt reappears, bring the system back online by typing: NRCS-A# online
   f. Press Ctrl+D to leave superuser mode.

      The pound sign (#) at the end of the console’s server prompt changes back to a dollar sign ($).

Installing Avid Central on the iPad or iPhone

The following procedure assumes licensing, setup, and configuration of the Interplay Central and iNEWS servers have already been completed.

To install Avid Central on the iPad or iPhone:

1. Open iTunes (the Apple market).
2. Locate the Avid Central mobile application.
3. Tap Download.

   When the Avid Central mobile application is installed on your touch-screen device, an icon representing the application appears on the home screen. You can move it elsewhere like the icons for other applications.

Appendix L: Installation Pre-Flight Checklist

This section lists all the information needed to perform the installation. Please gather the information from the customer before beginning the installation process. Take care to collect all the information relevant to the ICS deployment you are undertaking.

Default Password Information

The installation scripts establish login credentials for RHEL and Interplay Central at the administrator level. These enable you to carry out the work of installing and configuring ICS with the needed level of authority. It is highly recommended you secure the system by changing the default passwords at the first opportunity, as described in this guide.

> ***Note:*** *Obtain new administrator passwords that are in accordance with the customer's own password enforcement policies.*

For Linux the following default log in credentials are created:

- Linux administrator user name and password (case-sensitive):

  Default administrator user name: *root*

  Default root password: _____

  Note: *Please contact your Avid representative for the default root password.*

For Interplay Central the following default login credentials are created:

- Interplay Central administrator user name and password (case-sensitive):

  Default administrator user name: *Administrator*

  Default administrtor password: _____

  Note: *Please contact your Avid representative for the default Administrator password.*

Contact Information

Before beginning, please obtain contact information for the following people:

Avid Contact: _____

Phone Number: _____ Email: _____

In-House IT Specialist: _____

Phone Number: _____ Email: _____

Network Administrator: _____

Phone Number: _____ Email: _____

Pre-Flight Product Team Contact: _____

Phone Number: _____ Email: _____

Interplay MAM Administrator: _____

Phone Number: _____ Email: _____

Interplay MAM Configuration Specialist: _____

Phone Number: _____ Email: _____

Hardware

- **Windows Machine** (32-bit or 64-bit) (e.g. Window XP/Vista/7 laptop or desktop computer): Used to download software from the Internet and prepare the USB key.
- **8GB USB Key**: Used to contain RHEL OS, the ICS installation scripts, etc.
- **ICS Servers**: Already installed or ready to install in the machine room where they will reside.

Software

- ICS installation package: Interplay_Central_Services_<*version*>_Linux.zip
- RHEL 6.3 installation DVD or image (.iso) file
- GlusterFS files (needed for clustering)

If you do not have all the software you need, see "***Obtaining the Software***" on page 43.

Network Settings

Obtain the following information from your network administrator and enter it in the spaces provided. These items are needed by Linux.

- Facility Static IP address: _____
- Facility Netmask: _____
- Default Gateway IP: _____
- Primary DNS server: _____

- Secondary DNS server: _____
- DNS Search Path Domain: _____

NTP Time Server

Record the Network Time Protocol (NTP) time server address, for use in synchronizing the system clock. This is optional for a single-server deployment, but a must-have for a cluster. For reasons of security, it is recommended you synchronize to in-house NTP servers only.

- In-House NTP server: _____

ICS Server Information

For each ICS server record the information indicated in this section. You might find it helpful to print this page, once for each server.

Please indicate how you will be gaining access the server(s):

- Directly by connecting a monitor and keyboard to the server(s)
- Directly via KVM (keyboard, video and mouse) device, or comparable solution
- Indirectly using SSH from another machine's command prompt or shell. (Once network connectivity is established.)

For each server, record the following information in the spaces provided.

Server Machine Name (e.g. ics-dl360-1, ics-dl380-1): _____

> ***Note**: This is the host name only (e.g. **ics-dl360-1)**,that is, the name of the machine. Do not use the fully qualified domain names (e.g. **ics-dl360-1.mydomain.com** or **ics-dl360-1.mydomain.local)***

Type:

- HP Proliant DL360 G8
- HP ProliantDL380 G7
- Other: _____

Hard Drives[1]:

Number of Hard Drives Used for the OS (e.g. 2): _____

Number of Hard Drives Reserved for the Cache (e.g. 6): _____

System Drives Bay and Slots (e.g. Bay 1 Slots 1 &2):_____

Cache Drives Bay and Slots (e.g. Bay 2 Slots 1 to 8):_____

[1] The number and location of the hard drives might only be known once you boot the server and enter the BIOS screens.

Network Interface Cards (NICs) Present in the Enclosure:

- ¨ Myricom 10GigE
- ¨ Qualified Intel PRO/1000 (e1000) based GigE NIC
- ¨ Other: _____

Indicate the Network Interface Card (NICs) used to connect ICS to the network:

- ¨ Myricom 10GigE
- ¨ Qualified Intel PRO/1000 (e1000) based GigE NIC
- ¨ Other: _____

Cluster Information

- ¨ Are you setting up a cluster? YES / NO
- ¨ Does your network already use multicasting? YES / NO
- ¨ How many ICS servers will be in the cluster? _____
- ¨ Provide the machine names for each one (e.g. ics-dl360-1, ics-dl380-1):

  _____

  Note**: This is the host name only (e.g. **ics-dl360-1)**,that is, the name of the machine. Do not use the fully qualified domain names (e.g. **ics-dl360-1.mydomain.com** or **ics-dl360-1.mydomain.local)

- ¨ Obtain the following information from your network administrator and enter it in the spaces provided:
  - The *static IP address* allocated for the cluster (e.g.: **192.XXX.XXX.XXX**):

    _____
  - The *host name* associated with the static IP address (e.g.: **ics-cluster**):

    _____
  - If your network already uses multicasting, obtain a distinct multicast address for use by ICS. If there is no other multicast activity on the network, write “use default multicast address”:

    _____

  ***Note**: The “default” multicast address used for ICS clustering is 239.192.1.1. This is set by the* setup-corosync *script, if you do not specify one. If an ICS cluster already exists, and your new cluster will co-exist alongside it (in a test setting, for example), use a different multicsast address for the new cluster (e.g. 239.192.1.2).*

- An IP address that is always available/pingable (e.g. a network router):

  _____

- The email addresses of those to whom automated notifications about the status of the cluster should be sent (e.g. network administrators):

  _____

  _____

  _____

Port Bonding. If you will be using a cluster for Interplay MAM, enter the port bonding IP address below:

_____

iNEWS Information

- iNEWS Server Hostname: _____
- iNEWS login credentials (user name & password): _____
- Are MOS plug-ins used? YES / NO

  Interplay Central provides support for MOS Active-X plug-ins. For example, Deko Select is a plug-in for a newsroom computer system's interface that allows a user to drag and drop graphic templates directly into the story. These plug-ins are specific to iNEWS workflows, and they are available only in Rundown and Story layouts.

Interplay Central and Interplay Sphere Information

- **Interplay Credentials (e.g. ics-interplay):**

  Log into Interplay Central as an Interplay administrator, and create a unique set of user credentials (**user name** and **password**) for use by the ICS software, with the following attributes:

  - The credentials should not be shared with any human users
  - Permission to read all folders in the workgroup
  - We recommend using a name that indicates the purpose of the user credentials (e.g. **ics-interplay***)*

- **Interplay Sphere Playback User**

  Interplay Sphere requires a unique user name and password reserved for it. They are used to enable Sphere playback. Interplay Sphere supplies these credentials to the ICPS Player, which uses them to request video from the ICS server.

- Sphere Playback user name: _____
- Sphere Playback password: _____

¨ **Interplay Central UI**

The Interplay Central UI is used to configure ICS.

For future reference, record the IP address of Interplay Central (e.g. http://<hostname> or http://<cluster-IP>) as determined during the installation process[2]:

_____

Interplay Central default administrator user name and password (case-sensitive):

Default administrator user name: *Administrator*

Default root password: _____

Note: *Please contact your Avid representative for the default Interplay Central Administrator password.*

Interplay Production Information

Obtain the following information from the Interplay administrator and enter it in the spaces provided.

¨ Are you making use of an Interplay Production Media Indexer (MI) High-Availability Group (HAG)? YES / NO

Note*: Interplay Central connects to the MI leader in the HAG. (The MI with the highest weight is the leader of the HAG.) It does not participate in HAG redundancy.*

¨ Interplay Production (Interplay Engine) server hostname: _____

¨ User name reserved for ICS (e.g. **ics-interplay**): _____

¨ Password for above user: _____

¨ Interplay Central Distribution Service – Service URL (e.g. **https://<server>:<port>**): _____

¨ Media Indexer host name: _____

Note*: If the Interplay media indexer is connected to a High Availability Group (HAG), enter the host name of the active Media Indexer.*

¨ Interplay Workgroup name: _____

Lookup server host name: _____

Will you be making use of multi-resolution workflows? YES / NO

[2] The IP Address of the ICS Portal will only be known once you install the ICS software.

ISIS Information

¨ What kind of connection will you make to the ISIS:

- ¨ Zone 1 (direct connection)
- ¨ Zone 2 (layer 2 network switch)
- ¨ Zone 3 (layer 3 network switch – recommended)

¨ **Zone 2 & Zone 3 Information**

If connecting the ICS server(s) to the ISIS via a Zone 2 connection, obtain the following information from your ISIS and/or network administrator:

ISIS System Director(s) IP addresses: _____

¨ Indicate the speed of the connection to the ISIS:

- ¨ GigE
- ¨ 10GigE

¨ Is more than network connection available? YES / NO

If yes, obtain the following information from your ISIS and/or network administrator and enter it in the spaces provided.

NIC device name used for ISIS connection (e.g. **eth0**): _____

All other active NIC device names not used by ISIS (e.g. **eth1**, **eth2**): _____

¨ **ISIS Credentials (e.g. ics-isis): _____**

While logged in to the ISIS as administrator, create a unique set of user credentials for use by the ICS software, with the following attributes:

- The credentials should not be shared with any human users
- Permission to read all workspaces, and to write to the workspace flagged as VO (voice-over) workspace
- We recommend using a name that indicates the purpose of the user credentials (e.g. *ics-isis)*
- In multi-ISIS setups, create the same user credentials across all ISIS storage systems.

¨ Other ISIS Information

Obtain the following information from your ISIS administrator and enter it in the spaces provided.

Virtual ISIS host name(s): _____

User name created for ICS (e.g. ics-interplay): _____

Password for above user: _____

Media Indexer host name: _____

Interplay MAM Information

- Are you setting up port bonding? YES / NO
- If yes, enter the name you will apply to the port bonding interface (e.g. bond0): _____
- Also, record the device name for each NIC Ethernet port to be used in port bonding (e.g. eth0, eth1, etc.):

_____

- Interplay MAM user name for ICPS Player (e.g. MAM): _____
- Interplay MAM password for ICPS Player: _____

From your Interplay MAM system administrator, obtain the following information:

- Path to the Essence Pool to which ICS is being given access: _____

Note: The above information is found in the Interplay MAM Administrator interface, under the Essence Management Configuration tab. Look for the “MORPHEUS” entry.

Note: It is likely that ICS has been given access to more than one MAM essence pool. Be sure to mount all the associated file systems.

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