



EMC[®] Avamar[®] Data Store Gen4S

Comprehensive Reference Guide

P/N 300-999-652

REV 05

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Published May, 2016

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CHAPTER 1

Introduction

The following topics introduce Avamar and the Avamar Data Store (ADS) Gen4S family of hardware components:

- [Important Avamar terms and concepts](#)..... 6
- [Information for customers](#)..... 12
- [Avamar 7.x installation features overview](#).....13

Important Avamar terms and concepts

EMC Avamar solves the challenges associated with traditional backup, enabling fast, reliable backup and recovery for remote offices, data center LANs, and VMware environments.

Avamar is backup and recovery software that uses patented global data deduplication technology to identify redundant sub-file data segments at the source, reducing daily backup data by up to 500x - before it is transferred across the network and stored to disk. This enables companies to perform daily full backups even across congested networks and limited WAN links.

Key Avamar differentiators are:

- Deduplication of backup data at the source - before transfer across the network
- Enabling of fast, daily full backups across existing networks and infrastructure
- Reduction of required daily network bandwidth by up to 500x
- Up to 10x faster backups
- Encryption of data in flight and at rest
- Patented RAIN technology that provides fault tolerance across nodes and eliminates single points of failure
- Scalable grid architecture
- Reduction of total backup storage by up to 50x due to global data deduplication
- Daily verification of recoverability - no surprises
- Centralized web-based management
- Simple one-step recovery
- Flexible deployment options, including EMC Corporation Avamar Data Store package

The remainder of this section provides descriptions of key terms used in this guide and other Avamar core software guides.

Nodes

The primary building block in any Avamar system is a node. Each node is a self-contained, rack-mountable, network-addressable server that runs Avamar software on the Linux operating system. All Avamar nodes are Domain Name System (DNS) clients.

Note

The term "server" in the previous definition is used in the typical industry context (that is, a computer that provides services to other computers or devices). However, for the remainder of this guide, unless otherwise specified, the term "server" is used to refer to a single node or multi-node Avamar system. The term "node" is used to refer to the individual computer/storage platforms that make up an Avamar server.

All nodes run the Linux operating system and use RAID data protection. Nodes have 2, 6, 8, or 12 hard drives, depending on node type and storage capacity. The primary differences between node types are:

- The amount of internal data storage (if any)
- How internal data storage is configured and allocated (that is, RAID level, number of logical units [LUNs] and so forth)

- The Avamar application software that is installed on each node type [Hardware Specifications on page 17](#) provides additional information.

Utility node

In scalable multi-node Avamar servers, a single utility node provides essential internal services for the server (for example, administrator server, replication, external authentication, network time protocol [NTP], and Web access). Because utility nodes are dedicated to running these essential services, they cannot be used to store backups.

Storage nodes

The remaining nodes in scalable multi-node Avamar servers are storage nodes, which store the actual backups. There are three storage node models, the primary difference being the amount of usable storage available: the M600, M1200, and M2400. They are also offered as single node Avamar servers.

Single-node servers

Single node Avamar servers combine all the features and functions of utility and storage nodes on a single node. There are four single-node server models: the M600, M1200, M2400, and S2400. The S2400 (the Avamar Business Edition) is offered only as a single-node server and features no requirement for replication.

Extended retention media access node

The media access node exports backup data from an Avamar server to a tape library (physical or virtual) for long-term retention purposes. It has a 10GbE port and an HBA port that allows a tape device to be connected directly to the node via fiber-optic cable. It is not part of an ADS server (not connected to the Avamar multi-node system's internal network).

For installation instructions, refer to the *EMC Avamar Extended Retention Media Access Node Hardware Installation Guide*.

NDMP accelerator node

An Avamar NDMP accelerator (accelerator node) is a dedicated single-node Avamar client that, when used as part of an Avamar system, provides a complete backup and recovery solution for supported EMC Isilon, VNX, VNXe, and Celerra systems, and NetApp filers by using Network Data Management Protocol (NDMP) to communicate with these storage devices. It is not part of the ADS server.

For installation instructions, refer to the *EMC Avamar NDMP Accelerator User Guide*.

Node resource database (probe.xml)

An XML file that stores the types and IP addresses of Avamar server nodes. In addition, `probe.xml` stores the types and IP addresses of optional nodes, and supports both Network Address Translation (NAT) and multiple network interfaces.

Avamar Downloader Service

A Windows-based file distribution system that delivers software installation packages to target Avamar systems. [Avamar Downloader Service on page 15](#) provides more information.

Local downloader service

A component integrated into the Avamar Installation Manager. The local downloader service (LDLS) allows administrators to check the EMC repository for updated software packages by using the Avamar Installation Manager web interface. The LDLS supports environments where local Windows hosts are unavailable, removing the requirement to copy files directly to the local repository.

Avamar FTP site

An EMC FTP site that provides anonymous access to Avamar hotfixes and operating system (OS) patches. The FTP site is <ftp://ftp.avamar.com>. Typically, access to this site is for EMC personnel (there may be exceptions). The contents of the FTP site are not browsable.

Avamar Installation Manager

A web interface that manages installation, upgrade, and maintenance packages. [Avamar Installation Manager on page 13](#) provides more information.

Avamar login manager

A process that provides access to an external authentication database, which enables the Avamar system to use existing username and password information for Avamar authentication. Without the login manager, Avamar can only use its internal authentication mechanism. An Avamar server installation or upgrade installs the login manager, and then starts it. The login manager uses the domains configuration file to identify the supported domains.

Packages

Avamar software installation files, hotfix patches, and operating system (OS) patches available from the EMC repository. Packages comprise three types:

- Client - A release of Avamar file system or application backup software.
- Server - A new release of Avamar server software, a service pack, or a patch for the operating system, management console, or Avamar software.
- Workflow - A package that runs operations such as replacing a node or changing the session security configuration.

Package files use the extension `.avp`.

EMC repository

A repository that contains server installation packages, client installation packages, and manifest files. The EMC repository currently spans two locations: <ftp://ftp.avamar.com> and EMC Subscribenet:

- High urgency packages such as hot fixes and OS patches are available from <ftp://ftp.avamar.com>.
- Low urgency packages that have security and entitlement considerations are available from EMC Subscribenet.

The actual source location of a package is transparent to the user.

The repository is located on the EMC network. Each EMC customer has its own download center that contains files available to it. These files are maintained by the EMC

Subscribenet team. Outgoing communication from the Avamar Downloader Service and LDLS to the EMC repository is encrypted with SSL over an HTTP connection.

Local repository

The `/data01/avamar/repo/packages` directory on the utility node or single-node server. The directory contains the most current manifest file from the EMC repository, installation packages, and workflow packages. The Avamar Downloader Service and LDLS push packages from the EMC repository to the local repository. If a customer site does not allow Internet access, you can manually copy packages into the local repository.

Manifest file

An XML file listing all packages currently available for download from the EMC repository. When the EMC Subscribenet team adds a package to the EMC repository, it then adds an entry to the manifest file that describes the package. When the EMC Subscribenet team removes the package from the repository, it then removes the entry for the package from the manifest file.

The Avamar Downloader Service automatically downloads the manifest file from the EMC repository once a day and determines if new download packages are available. The Avamar Downloader Service sends the new manifest file to the local repository for each Avamar system.

The LDLS manages changes to the manifest file in a similar way to the Avamar Downloader Service. However, the LDLS downloads the manifest file directly to each Avamar system without the requirement for an intermediate host.

Segregated networks

In multi-node ADS servers, inter-node traffic is carried over an internal network that includes dual dedicated switches with specific utility node and storage node ports. All other data traffic is carried directly to external customer switches for access to backup, replication, and management sources or targets. Both internal and external networks provide protection against single points of failure.

[Bonded network interfaces on page 9](#) and [Networking on page 29](#) provide more information.

Bonded network interfaces

Bonded network interfaces are used in high-availability (HA) configurations that try to eliminate node ports and switches as single points of failure. Two separate customer network switches are required, one connected to each of two physical interfaces of an ADS node. Outgoing replication and management networks can be configured for bonding through the additional ports on the utility node or single-node server.

[Networking on page 29](#) provides more information.

High-availability network

HA configuration provides for continued operation in the event of a single point of failure between network components. The primary objective is to provide multiple paths to the internal ADS network and the external customer network so that the system can recover from an individual device or link failure. To do this, HA configuration employs bonded network interfaces and dual dedicated ADS switches. Each switch is connected to one of two physical interfaces of an ADS node.

[Networking on page 29](#) provides more information.

ConnectEMC

A Linux-based program that transfers event data from an Avamar server to EMC Technical Support. Installation of the Avamar software automatically initializes ConnectEMC by passing values from the workflow to the ConnectEMC configuration files.

The server software installation requires you to set the ConnectEMC attributes listed in the following table:

Table 1 ConnectEMC attributes

Attribute	Example setting
Site name	ABC Company, Site ID: 123456 Address: 123 Main Street, Anytown, CA 92618 US
Email server	mail.example.com
Email sender address	bob@example.com

You can set other ConnectEMC attributes after the installation by using Avamar Administrator. Additional information about ConnectEMC is available from the following resources:

- *EMC Avamar Administration Guide*
- *ConnectEMC for Linux 3.0 Reference Guide*

Email home

An Avamar feature that automatically emails configuration, capacity, and general system information to EMC Technical Support once daily, and critical alerts in near-real time on an as-needed basis. Email home uses the same email server that you configure for ConnectEMC.

Data deduplication

Data deduplication is a key feature of the Avamar system. Data deduplication ensures that each unique sub-file object is stored only once across sites and servers.

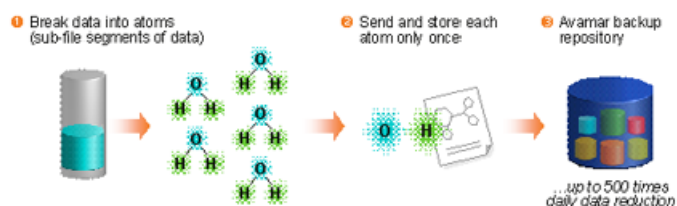
During backups, Avamar client software examines the client file system, applies a data deduplication algorithm that identifies redundant data sequences and breaks the client file system into sub-file data segments. Each data segment is assigned a unique ID. The client software then determines whether this unique ID has already been stored on the Avamar server.

If this object resides on the Avamar server, a link to the stored object is referenced in the backup. Once an object has been stored on the server, it never has to be re-sent over the network, no matter how many times it is encountered on any number of clients. This feature significantly reduces network traffic and provides for greatly enhanced storage efficiency on the server.

Figure 1 Avamar Global Data Deduplication

How it Works

Avamar Global Data De-Duplication

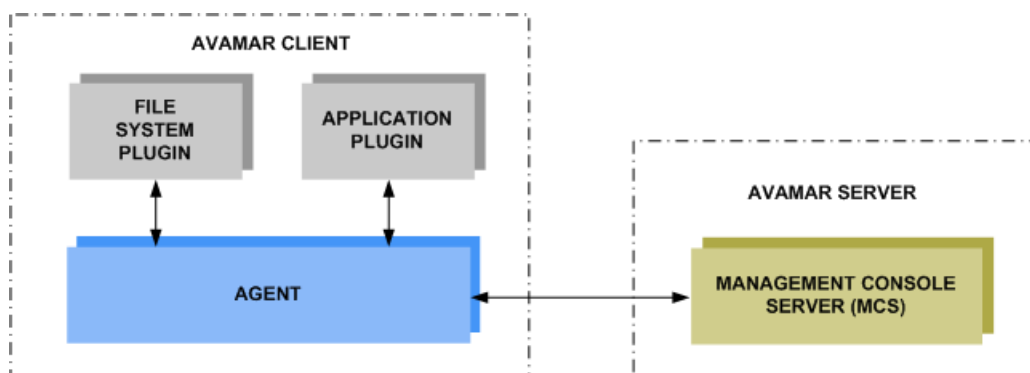


Replication

A feature that enables efficient, encrypted, and asynchronous exchange of data that is stored in an Avamar server to another Avamar server deployed in a remote location, without the requirement to ship tapes. Replication is a scheduled process between two independent Avamar servers that provides a higher level of reliability for stored backups. Replication can be scheduled to run at off-peak hours to minimize bandwidth impact.

Avamar clients

Avamar provides client software for various computing platforms. Each client comprises a client agent and one or more plug-ins.

Figure 2 Avamar Client Operation

Agents

Avamar agents are platform-specific software processes that run on the client and communicate with the Management Console Server (MCS) and any plug-ins installed on that client.

Plug-ins

Avamar provides two types of plug-ins:

- File system – used to browse, back up, and restore files or directories on a specific client file system (such as Linux, Mac OS, Microsoft Windows, and Sun Solaris).
- Application – support backup and restore of databases or other special applications (such as Microsoft Exchange or SQL Server, Oracle, and NDMP for NAS devices).

Encryption

Avamar can encrypt all data sent between clients and the server “in flight.” To provide enhanced security during client/server data transfers, Avamar supports two levels of “in-flight” encryption: medium and high. You can set the encryption level on a client-by-client basis in client properties, or for an entire group of clients in group properties. You also can disable “in-flight” encryption entirely.

Each Avamar server can also be configured to encrypt data that is stored on the server (“at rest”). The decision to encrypt all data that is stored in an Avamar server is typically a one-time decision that is made when the server is initially deployed at a customer site.

Starting in Avamar 7.3.x, additional security features use encryption during authentication of both the server and client. The *EMC Avamar Product Security Guide* provides more information.

Information for customers

The following is a collection of information about Avamar and the ADS that can guide you when installing and using this product.

The EMC Online Support site is a great resource for information and links: <https://support.emc.com/products/>

Avamar software downloads are located on the Avamar FTP site: <ftp://ftp.avamar.com>

Obtaining an Avamar license key file requires an account for the EMC Software Licensing Central (SLC) on the EMC Online Support site. EMC Technical Support is responsible for obtaining a license key file for your system.

For information about cross-version and cross-equipment compatibility, refer to the *EMC Avamar Compatibility and Interoperability Matrix* on the EMC Online Support site.

For numerous best-practice tips about installing, configuring, upgrading, and using Avamar, refer to the *EMC Avamar Operational Best Practices Guide* on the EMC Online Support site.

Numerous technical notes provide supplemental information about rare, unique, or version-specific installation, implementation, and configuration scenarios. Find technical notes by title on the EMC Online Support site.

For instance, one technical note, *Avamar Client Downloads and Client Manager Installer Upgrades Technical Note*, describes how to upgrade client downloads and Avamar Client Manager client installers.

Note

Starting in Avamar 7.2.x, Avamar Enterprise Manager is no longer available. The technical note *Avamar Enterprise Manager Transition to Backup and Recovery Manager* provides more information.

Fundamental Avamar principles

When working with Avamar, always consider the following:

- All nodes in an Avamar server must run the same version of the Avamar software.
- All storage nodes in a multi-node Avamar server must be the same size (capacity).
- The best practice for replication is to move data from an older generation Avamar server to a newer one and not the reverse. This scenario is typically used to replicate

data from the old server as a first step before upgrading it to the latest version of Avamar software, after which the data can be replicated back.

- All non-RAIN systems must be replicated, except the S2400 (Avamar Business Edition, see [Hardware Specifications on page 17](#)).

Avamar 7.x installation features overview

Avamar uses the Avamar Installation Manager user interface to automate the software installation process on servers. The Avamar Installation Manager runs on single-node servers and on the utility node of multi-node systems. EMC Technical Support uses this utility during implementation.

Avamar 7.x also includes the Avamar Downloader Service, a Microsoft Windows-based application that automates the installation of future patches and other packages to your Avamar system. Starting in Avamar 7.3, the LDLS is also available for direct download of packages.

How long will the Avamar software installation take?

Completing the Avamar server software installation takes about two hours, plus the amount of time it takes to upload the Avamar software installation packages to the server.

Note

Uploading the installation package can take a significant amount of time, depending on the method used. Installing and configuring the Avamar Downloader Service and LDLS are considered post-installation tasks because they are not required to perform Avamar software installation.

Avamar Installation Manager

During installation, the Avamar Installation Manager user interface is installed on the utility node or single-node server. The Avamar Installation Manager user interface enables EMC personnel to:

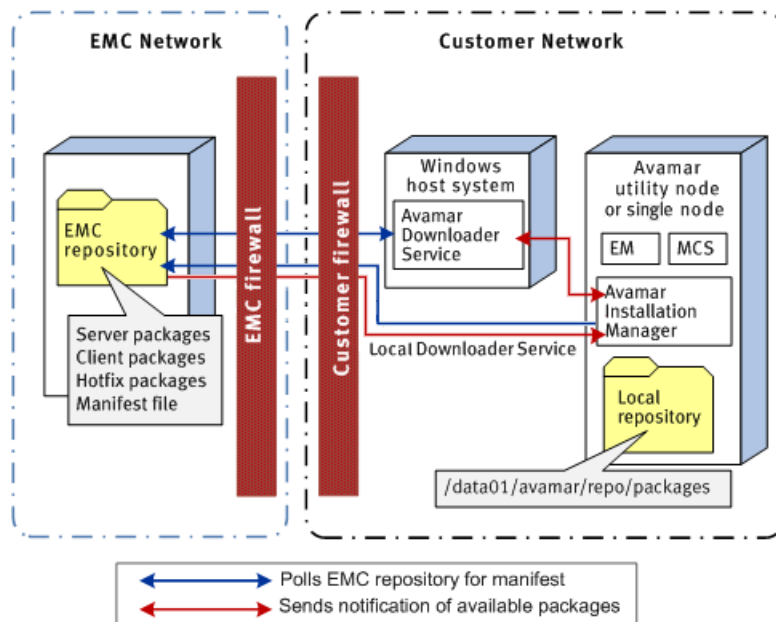
- Install or upgrade the Avamar software
- Install OS, Avamar software, or other hotfix patches after initial Avamar software installation

Avamar Installation Manager controls the following:

- The EMC repository manifest file
- Downloading of packages from the Avamar Downloader Service and LDLS
- Monitoring the local repository for any software packages manually added to the server
- Dependency and version checks of the downloaded packages
- Management of the temporary directory that is used to extract the packages
- Deletion of software packages after a successful installation or upgrade

Process flow

The following diagram shows how the Avamar Downloader Service, LDLS, and Avamar Installation Manager work together with other components to automatically provide installation, upgrade, and hot fix packages.

Figure 3 Process Flow for Packages

Process flow tasks:

1. The Avamar Downloader Service or LDLS checks with the EMC repository for new manifest files. This check is done automatically every 24 hours.
 - The Avamar Downloader Service downloads the manifest from the EMC repository and pushes it to the Avamar Installation Manager, or
 - The LDLS downloads the manifest from the EMC repository directly to the Avamar Installation Manager.


Note

During the first communication handshake between the Avamar Downloader Service and Avamar Installation Manager, the Avamar Downloader Service passes information such as its version, its host and IP address, and so forth, to the Avamar Installation Manager.

2. The Avamar Installation Manager processes the manifest file and notifies the user of new packages.
3. The user requests the package by clicking the **Download** button in the Avamar Installation Manager.
 - The Avamar Downloader Service then downloads the package and pushes it to the Avamar Installation Manager, or
 - The Avamar Installation Manager downloads the package directly using the LDLS.
4. The user installs the package by clicking the **Install** button in the Avamar Installation Manager.

Log files

The Avamar Installation Manager provides log file information through the web interface. The log information can be exported to a file (.xls or .pdf).

The Avamar Installation Manager also provides the **Download all system logs** icon , which enables you to download all system log files for troubleshooting issues, for example.

You must log in to the EMC Customer Support account to use the **Download all system logs** icon.

In-flight encryption

A new installation of Avamar sets in-flight encryption to High as the default setting. An upgrade does not change the current in-flight encryption setting. The *EMC Avamar Administration Guide* provides more information about in-flight encryption.

Avamar Downloader Service

The Avamar Downloader Service is a file distribution system that delivers software installation packages to target Avamar systems. The distribution process uses minimal bandwidth by downloading only files that you request through the Avamar Installation Manager.

The Avamar Downloader Service uses a local file cache to ensure that a file is fetched only once from the EMC repository, no matter how many times an Avamar system requests the file. You can remove old files from the local repository to free disk space.

The Avamar Downloader Service software runs on a stand-alone Microsoft Windows server. The Windows server must have network access to the EMC repository and the Avamar server.

The Avamar Downloader Service is installed as an automatic-startup service. You can view the Avamar Downloader Service from the Microsoft Management Console. After you install the Avamar Downloader Service, use the Avamar Downloader Service application to configure it.

The installation of the Avamar Downloader Service installs these components:

Table 2 Avamar Downloader Service components


Component	Description
Avamar Downloader Service Windows service	Monitors the EMC repository. When a package is available for the Avamar system, the Avamar Downloader Service service automatically downloads the package and pushes it to the local repository on the Avamar utility node or single-node server.
Avamar Downloader Service monitor	A process that provides status message about the Avamar Downloader Service.
	Moving the mouse over the  tray icon displays status messages from the Avamar Downloader Service monitor.
	Right-clicking the icon displays these options:
Configure Service	Opens the Avamar Downloader Service configuration application.
Open Repository	Opens the local file cache directory on the Windows server (C:\Program Files\EMC\Avamar Downloader Service\repository).

Table 2 Avamar Downloader Service components (continued)

Component	Description	
	Run Diagnosis	Runs a test of packages in the local manifest file and for network connectivity to the EMC repository.
	Check for New Packages	Queries the EMC repository for a new manifest file.
	Show Advanced Settings	Allows the input of new EMC repository credentials or the restoration of Avamar Downloader Service to default settings.
	Check for Updates	Checks for an updated version of the Avamar Downloader Service software.
	About	Shows the version of the Avamar Downloader Service.
	Exit	Closes the Avamar Downloader Service.

The Avamar Downloader Service installation also creates:

- A local repository in the installation directory.
This directory is where the Avamar Downloader Service puts packages it fetches from the EMC repository.
- A Start menu program group: **EMC Avamar Downloader Service *⟨version⟩***, where *⟨version⟩* is the version of the Avamar system software that is installed on the server. The program group contains:
 - Avamar Downloader Service Configuration
 - Avamar Downloader Service Monitor
- A desktop shortcut to the Avamar Downloader Service configuration application.

CHAPTER 2

Hardware Specifications

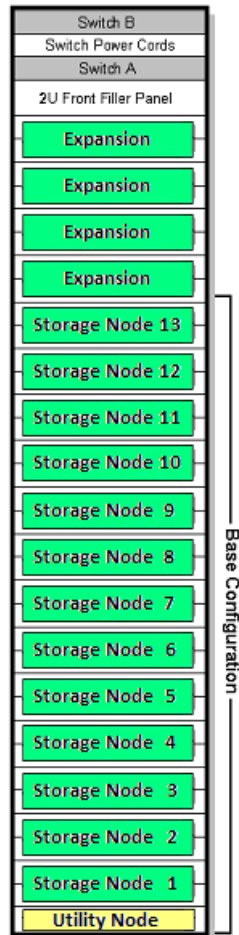
The following topics describe the set of ADS Gen4S hardware:

- [Multi-node server component locations](#).....18
- [Hardware specifications](#)..... 19
- [Service port connectivity](#)..... 20
- [Node components](#)..... 22

Multi-node server component locations

A 14-node example (1 utility node and 13 active storage nodes) of the initial configuration of a standard ADS multi-node server is shown here. Initial configurations range from 4 to 18 nodes (one utility node plus a maximum of 16 active storage nodes and one optional spare storage node).

Figure 4 Multi-Node Layout



Previous component replacement might have changed the arrangement of nodes in your rack. Since a spare can replace any defective storage node, and because a replacement node can become the new spare, the location of any specific storage node can vary over time.

Each rack configuration has 40U capacity. For Gen4S, the utility node takes up a 1U increment. All storage nodes take up 2U increments. The utility node is at the bottom of a multi-node configuration, with active storage nodes and an optional spare storage node stacked above it. Additional nodes can be added in expansion slots starting with the lowest available slot.

Switches A and B at the top are ADS internal network switches. Switch A is the bottom one.

The minimum ADS multi-node configuration is one utility node and three storage nodes. The maximum is 1 utility node, 16 active storage nodes, and an optional spare storage node.

Hardware specifications

Each node runs the SuSE Linux Enterprise Server v11 SP1 operating system and features a service port. See [Service port connectivity on page 20](#) for more information.

The M600, M1200, and M2400 can be used as single-node servers or as storage nodes within a multi-node server.

The S2400 (Avamar Business Edition) is available only as a single-node server and does not require replication.

The Extended Retention Media Access and NDMP Accelerator nodes are optional nodes associated with, but not part of, the Avamar server.

Utility node

- Two 2.5" hard drives
- Dual 750W power supplies
- Eight 10/100/1000baseT GbE ports
- RMM4 management port

M600 (2.0 TB licensed capacity)

- Six 3.5" hard drives
- Dual 750W power supplies
- Eight 10/100/1000baseT GbE ports
- RMM4 management port

M1200 (3.9 TB licensed capacity)

- Six 3.5" hard drives
- Dual 750W power supplies
- Eight 10/100/1000baseT GbE ports
- RMM4 management port

M2400 (7.8 TB licensed capacity)

- Twelve 3.5" hard drives
- One 2.5" SSD drive (internal mounting)
- Dual 750W power supplies
- Eight 10/100/1000baseT GbE ports
- RMM4 management port

Avamar Business Edition/S2400 node (7.8 TB licensed capacity)

- Eight 3.5" hard drives
- One 2.5" SSD drive (internal mounting)
- Dual 750W power supplies
- Eight 10/100/1000baseT GbE ports

- RMM4 management port

Extended Retention Media Access node

- Twelve 3.5” hard drives
- One 2.5” SSD drive (internal mounting)
- Dual 750W power supplies
- Eight 10/100/1000baseT GbE ports
- Dual Qlogic 8 Gbps fiber channel ports
- Dual 10 GbE ports
- RMM4 management port

Note

For installation instructions and hardware specifications for the Media Access node, see the *EMC Avamar Extended Retention Media Access Node Hardware Installation Guide*.

NDMP Accelerator node

- Two 2.5” hard drives
- Dual 750W power supplies
- Two NIC configurations:
 - **10GbE model:** Four 10/100/1000baseT 1GbE ports and dual 10GbE ports
 - **1GbE model:** Four 10/100/1000baseT 1GbE ports
- RMM4 management port

Service port connectivity

For each node type, use the following service port information to determine how to connect to the node. Unless otherwise specified, connection to a node service port can only occur after the node has booted.

Utility node

Table 3 Utility Node service ports

Node state	Service port	Service port IP address
Kickstarted (straight from manufacturing) or rekickstarted	NIC8 (eth7)	10.99.99.5
After Avamar multi-node installation	Switch port 24	Use the internal network IP address assigned to the node during installation (typically 192.168.255.1)

M600, M1200, and M2400

Table 4 M600, M1200, and M2400 service ports

Node state	Service port	Service port IP address
Kickstarted (straight from manufacturing) or rekickstarted	NIC8 (eth7)	10.99.99.5
After Avamar multi-node installation	Switch port 24	Use the internal network IP address assigned to the node during installation
After Avamar single node installation	NIC8 (eth7)	10.99.99.5

S2400

Table 5 S2400 service ports

Node state	Service port	Service port IP address
Kickstarted (straight from manufacturing) or rekickstarted	NIC8 (eth7)	10.99.99.5
After Avamar single node installation	NIC8 (eth7)	10.99.99.5

Extended Retention Media Access node

Table 6 Extended retention media access node service ports

Node state	Service port	Service port IP address
Kickstarted (straight from manufacturing) or rekickstarted	NIC8 (eth7)	10.99.99.5
After Avamar software installation	NIC8 (eth7)	10.99.99.5

NDMP accelerator node (1GbE and 10GbE models)

Table 7 NDMP accelerator node service ports

Node state	Service port	Service port IP address
Kickstarted (straight from manufacturing) or rekickstarted	NIC4 (eth3)	10.99.99.5
After Avamar software installation	NIC4 (eth3)	10.99.99.5

Node components

Before handling ADS Gen4S equipment, first familiarize yourself with the Gen4S node types and component locations for your specific hardware. See the figures and tables that follow for details.

Utility and accelerator nodes

Figure 5 Front View

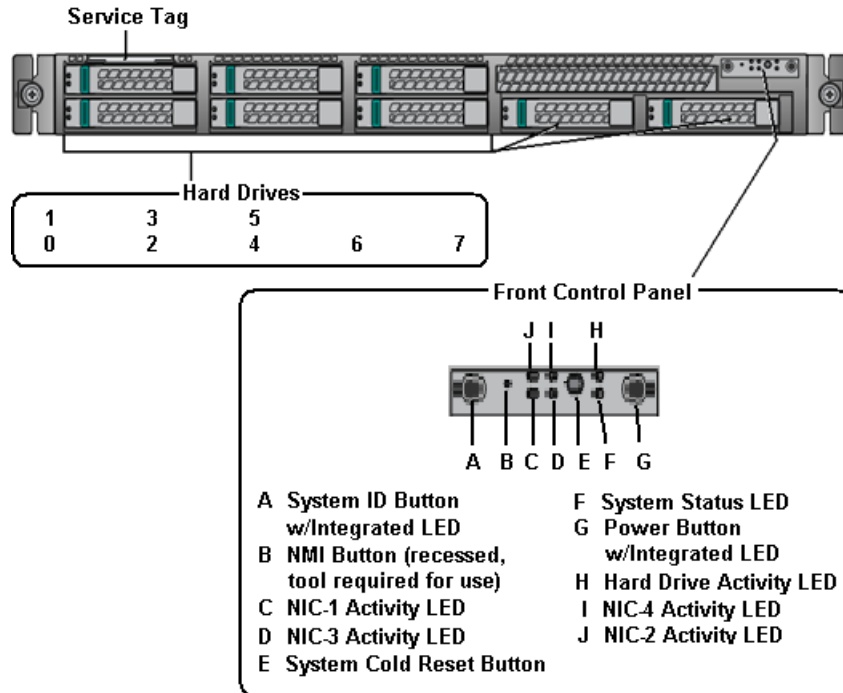


Table 8 Front panel components

Feature	Description
Service tag	A pull-out label for node serial number and other system information.
Hard drives	Two hot swappable 2.5” hard drives, in the 0 and 1 drive locations.
Front control panel	<p>A set of buttons, controls, and indicators:</p> <ul style="list-style-type: none"> System ID button - Use to locate a particular node in the rack. When pushed, the LED on the front and the system status indicator on the back panel flash blue until the button is pushed again. Non-Maskable Interrupt (NMI) button - Use to troubleshoot software and device driver errors. Press by using the end of a paper clip. When pressed, it puts the node in a halt state and issues the NMI. Use this button only if directed to do so by qualified support personnel. NIC activity LEDs - One LED per NIC on the back panel. Network link detected = LED solid on. Network activity = LED blinking according to activity.

Table 8 Front panel components (continued)

Feature	Description
	<ul style="list-style-type: none"> System Cold Reset Button - Reboots and reinitializes the node. System Status LED - Green or amber LED showing system health. Solid green indicates the node is booted and ready. All other states indicate a level of degraded status, which should be reported through Avamar systems. Power Button with Integrated LED - Toggles system power on and off. Hard Drive Activity LED - Indicates drive activity from onboard controllers.

Figure 6 Rear View - Utility Node

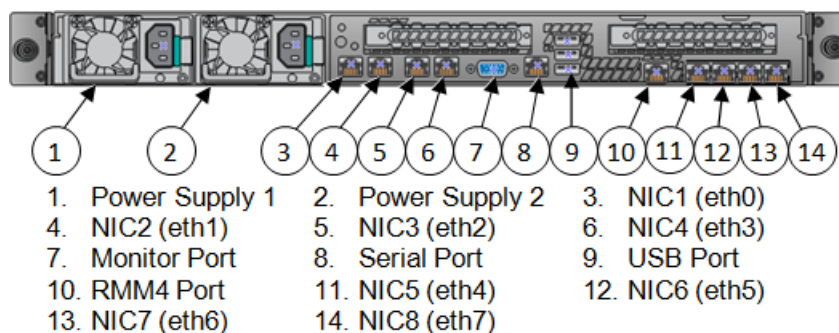


Table 9 Rear panel components

Feature	Description
Power supply #1	750W power supply
Power supply #2	750W power supply
NICs 1-8	10/100/1000baseT GbE ports
Monitor port	Connects a VGA display to the system.
Serial port	Connects a serial device to the system.
USB ports	Connects a USB device to the system
RMM4 port	Dedicated management port for the RMM4 card.

Figure 7 Rear View - Accelerator Node

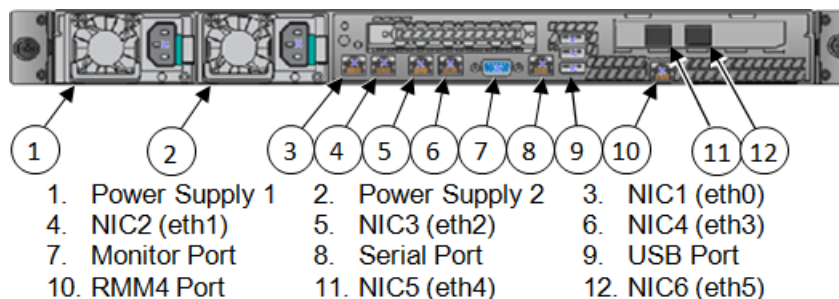


Table 10 Rear panel components

Feature	Description
Power supply #1	750W power supply
Power supply #2	750W power supply
NICs 1-4 or 1-6 (depending on model)	10GbE model: 10/100/1000baseT GbE ports (NICs 1-4) and 10GbE ports (NICs 5 and 6) 1GbE model: 10/100/1000baseT GbE ports (NICs 1-4)
Monitor port	Connects a VGA display to the system.
Serial port	Connects a serial device to the system.
USB ports	Connects a USB device to the system
RMM4 port	Dedicated management port for the RMM4 card.

M600, M1200, M2400, Avamar Business Edition (S2400), and Media Access Nodes

Figure 8 Front View

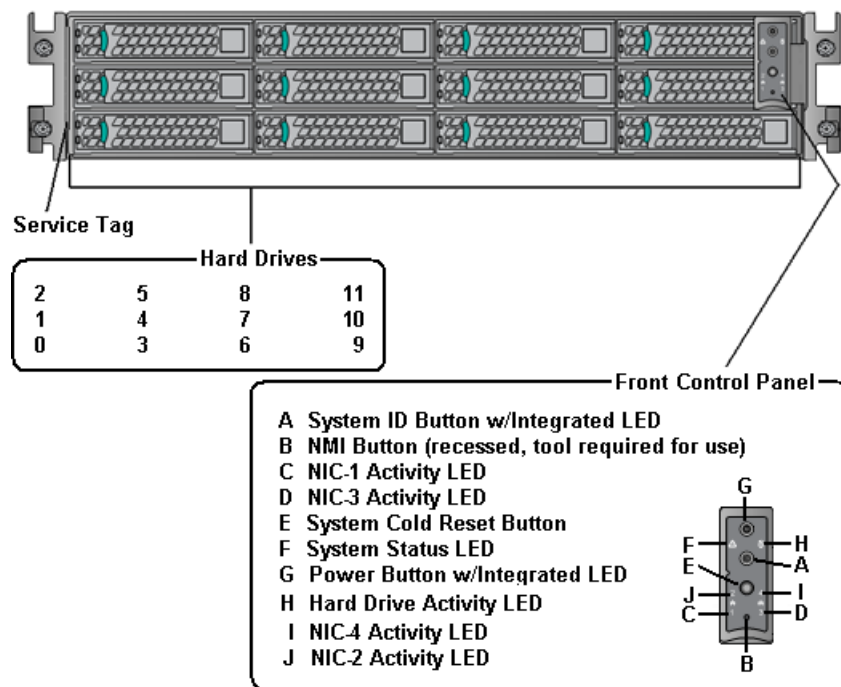


Table 11 Front panel components

Feature	Description
Service tag	A pull-out label for serial number and other system information.
Hard drives	Hot swappable 3.5" hard drives: <ul style="list-style-type: none"> M600 node - Six in the 0 through 5 drive locations. All others are blank.

Table 11 Front panel components (continued)

Feature	Description
	<ul style="list-style-type: none"> • M1200 node - Six in the 0 through 5 drive locations. All others are blank. • M2400 node - 12 in the 0 through 11 drive locations. • Avamar Business Edition (S2400) node - Eight in the 0 through 7 drive locations. All others are blank. • Media access node - Twelve in the 0 through 11 drive locations.
Front control panel	<p>A set of buttons, controls, and indicators:</p> <ul style="list-style-type: none"> • System ID button - Use to locate a particular node in the rack. When pushed, the LED on the front and the system status indicator on the back panel flash blue until the button is pushed again. • Non-Maskable Interrupt (NMI) button - Use to troubleshoot software and device driver errors. Press by using the end of a paper clip. When pressed, it puts the node in a halt state and issues the NMI. Use this button only if directed to do so by qualified support personnel. • NIC activity LEDs - One LED per NIC on the back panel. Network link detected = LED solid on. Network activity = LED blinking according to activity. • System Cold Reset Button - Reboots and reinitializes the node. • System Status LED - Green or amber LED showing system health. Solid green indicates the node is booted and ready. All other states indicate a level of degraded status, which should be reported through Avamar systems. • Power Button with Integrated LED - Toggles system power on and off. • Hard Drive Activity LED - Indicates drive activity from onboard controllers.

Figure 9 Rear View - M600, M1200, M2400, and Avamar Business Edition (S2400) Nodes

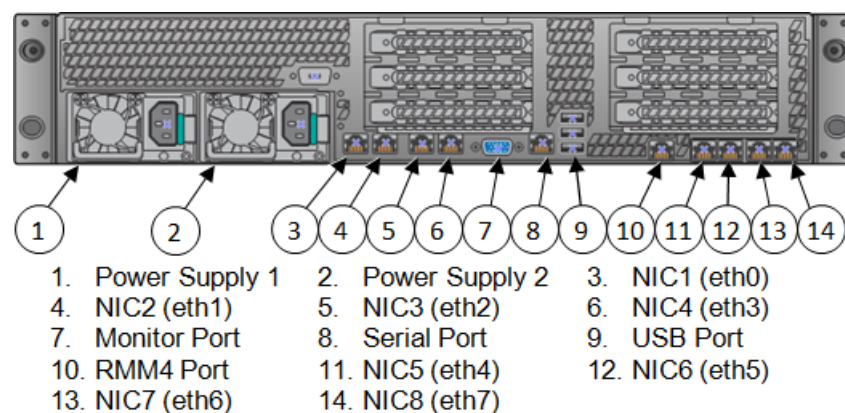


Table 12 Rear panel components

Feature	Description
Power supply #1	750W power supply.
Power supply #2	750W power supply.
NICs 1-8	10/100/1000baseT GbE ports.
Monitor port	Connects a VGA display to the system.
Serial port	Connects a serial device to the system.
USB ports	Connects a USB device to the system.
RMM4 port	Dedicated management port for the RMM4 card.

Figure 10 Rear View - Media Access Node

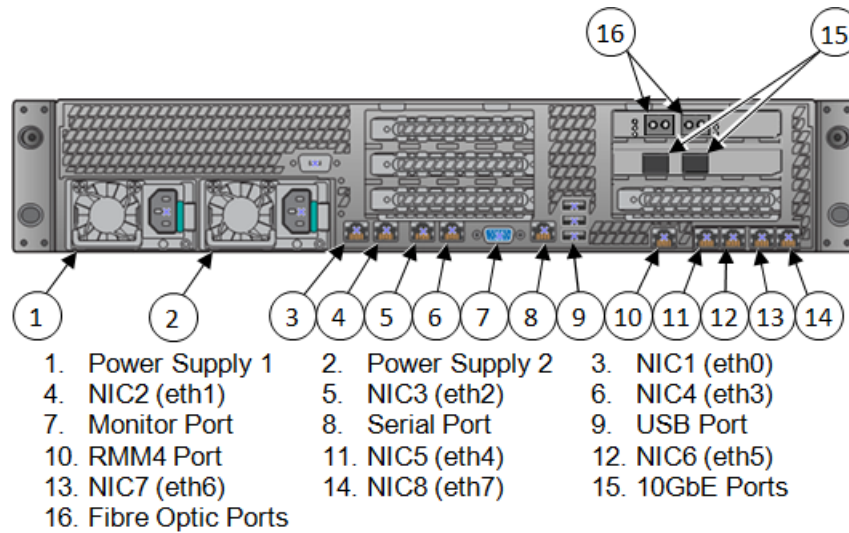


Table 13 Rear panel components

Feature	Description
Power supply #1	750W power supply.
Power supply #2	750W power supply.
Fiber optic ports	Dual Qlogic 8 Gbps fibre channel ports - connects a tape library or VTL to the node.
NICs 1-8	10/100/1000baseT GbE ports.
10GbE ports	Dual 10Gb Ethernet ports: <ul style="list-style-type: none"> • Left: NIC 9 (eth8) • Right: NIC 10 (eth9)
Monitor port	Connects a VGA display to the system.
Serial port	Connects a serial device to the system.
USB ports	Connects a USB device to the system.

Table 13 Rear panel components (continued)

Feature	Description
RMM4 port	Dedicated management port for the RMM4 card.

CHAPTER 3

Networking

This chapter provides a comprehensive description of optional networking features and requirements for both single-node and multi-node ADS Gen4S systems, including the following topics:

- [Overview](#)..... 30
- [Default port configuration](#)..... 30
- [Basic networking configuration](#)..... 31
- [Supported network configurations](#)..... 31
- [Advanced network configuration – dpnnetutil utility](#).....35
- [Replication](#).....37

Overview

The information in this chapter is for reference only. If advanced network or replication configuration is required, EMC personnel must perform those activities before installing the Avamar software.

Included in this chapter are:

- General overview of ADS Gen4S networking principles
- Descriptions of different network configurations ADS servers can interconnect with
- An overview of the optional `dpnnetutil` advanced configuration utility
- Descriptions of replication schemes supported by ADS Gen4S

Default port configuration

Multi-node servers

A multi-node ADS Gen4S server divides network traffic between internal Avamar traffic and external customer communications. Multi-node systems have two internal switches (to support high-availability) on an isolated network for internal Avamar traffic between nodes. Customers provide external switching and connections to match their infrastructure for backups, replication, and node management.

For the ADS internal network, default settings are:

- All nodes are connected directly to customer network switches through NIC1 (eth0) and NIC3 (eth2) ports (bonded as bond0) by default for backing up customer data.
- NIC2 is the primary, NIC4 is the failover.

For the ADS external network, default settings are:

- All nodes are connected directly to customer network switches through NIC1 (eth0) and NIC3 (eth2) ports (bonded as bond0) by default for backing up customer data.
- NIC1 is the primary, NIC3 is the secondary (failover).
- If RMM4 functionality is used and set to shared, the default shared port is NIC1 (eth0) on each node.

The preceding default settings can be changed through the `dpnnetutil` utility described in [Advanced network configuration – dpnnetutil utility on page 35](#).

Default network configuration is performed during Avamar software installation.

Single-node servers

Unlike multi-node servers, the single-node server has no internal network functionality. The eth1 port (NIC2) is not dedicated to Avamar-specific traffic. Customers typically provide network switching and connections to match their infrastructure for backups, replication, and node management.

For the ADS external network, default settings are:

- The server is connected directly to customer network switches through NIC1 (eth0) and NIC3 (eth2) ports (bonded as bond0) by default for backing up customer data.
- NIC1 is the primary, NIC3 is the secondary (failover).
- If RMM4 functionality is used and set to shared, the default shared port is NIC1 (eth0) on each node.

The preceding default settings can be changed through the `dpnnetutil` utility described in [Advanced network configuration – dpnnetutil utility on page 35](#).

Default network configuration is performed during Avamar software installation.

Basic networking configuration

ADS Gen4S systems follow these configuration principles:

- All networking ports are bonded in pairs, by default.
- For single-node servers, NIC1 (eth0) and NIC3 (eth2) port bonding can be broken to facilitate incoming replication, which is delivered directly to the server, or for server management. If this bond is broken, high availability backup capability is not possible. See [Replication on page 37](#) for more information.
- The For multi-node servers, the utility node can also be plugged in to an external customer switch for optional outgoing replication and management through its additional four network interfaces, NIC5 (eth4), NIC6 (eth5), NIC7 (eth6), and NIC8 (eth7). These NICs are also bonded in pairs for high availability configuration. Also, the internal dedicated ADS switches are not connected to the customer network. They have redundant power to support fault tolerance.
- The external customer network switch can be shared with other applications.
- If the customer network environment is segregated using backup virtual local area networks (VLANs), corresponding VLANs must be configured on the Avamar server. The customer network administrator must provide a list of VLAN IDs to be used by EMC personnel when running the `dpnnetutil` utility.
- For ADS networks that do not require advanced configuration like VLAN and network address translation (NAT) support, the network configuration included in the standard software installation is used. The exception is eth0, which must be configured by EMC personnel in advance of software installation.

Note

As noted in this list of basic network configurations, Avamar systems support the use of VLANs and separately support the use of NAT. However, Avamar does not support the use of NAT on VLANs.

- If all backup, replication, and management interfaces are used, ensure that they are configured for different subnets.
- All network ports autonegotiate to 1 Gb Ethernet (full duplex) on the external customer network.
- All connections to the customer network are standard leaf connections directly with individual nodes.

See [Node components on page 22](#) for descriptions and images related to node components. The following images provide further clarification of possible ADS Gen4S networking configurations.

Supported network configurations

The following sections describe networking scenarios supported by ADS Gen4S servers.

- Single uplink to an external customer network
- Dual uplink to an external customer network

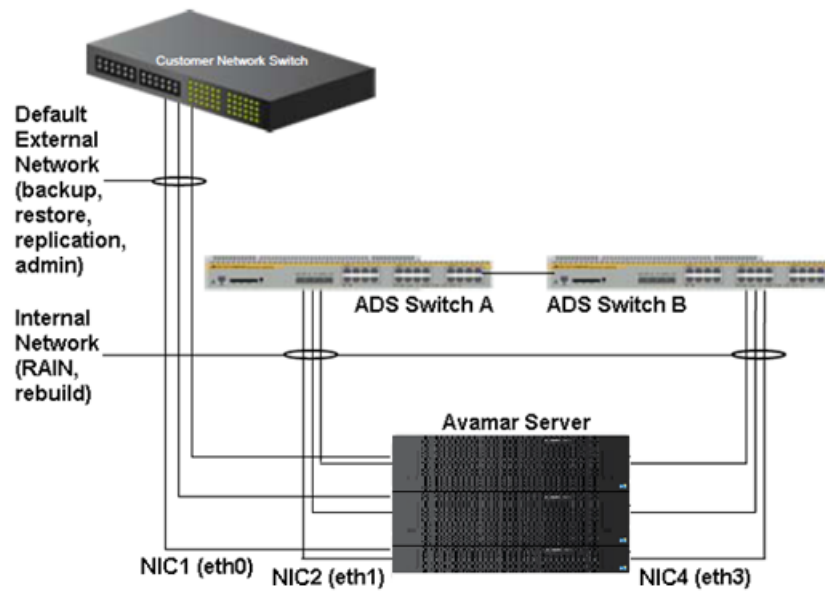
- Dual uplink plus options to an external customer network

Multi-node servers

Single uplink to external customer network

The following figure illustrates dual dedicated ADS switches (ADS Switch A and B) and a single uplink from all nodes to the customer network switch.

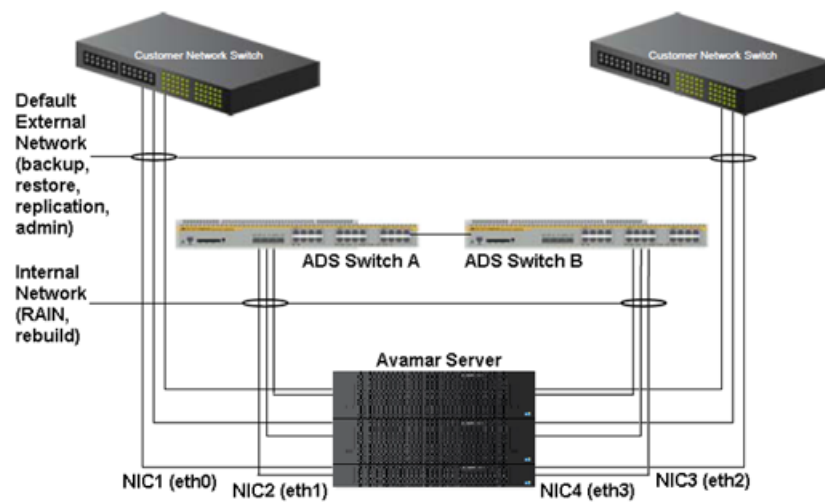
Figure 11 Single Uplink



Dual uplink to external customer network

For high-availability configurations, the following figure illustrates dual dedicated ADS switches (ADS Switch A and B) and dual uplinks from all nodes to the customer network.

Figure 12 Dual Uplink



The high-availability external network provides an Avamar server that continues operating through any single network component failure, including:

- Any ADS network interface on the external network

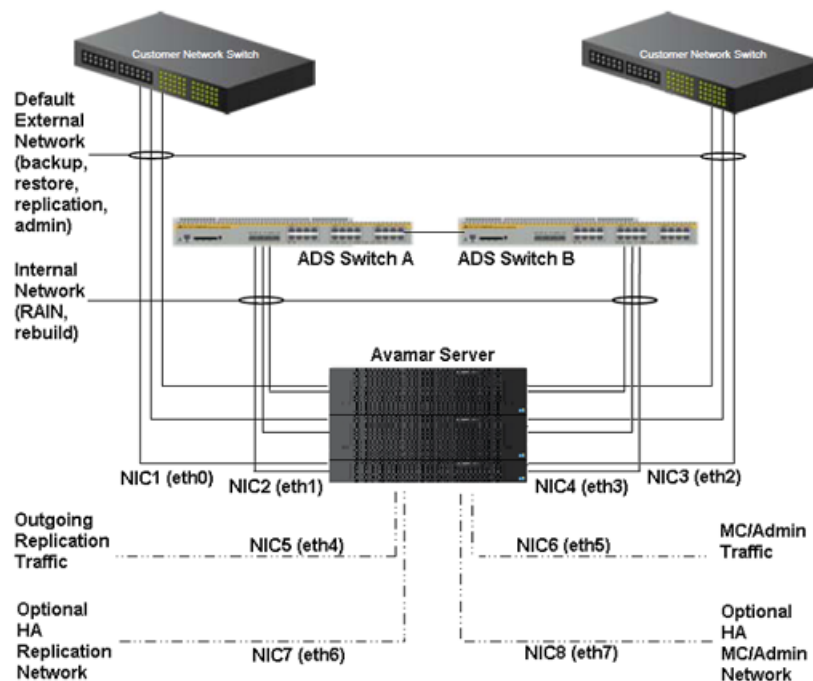
- Any single uplink cable from the ADS to the customer network
- Any port on the customer network used in the uplink
- An entire customer switch used in the uplink
- Connectivity between customer switches used in the uplink

Dual uplink plus options to external customer network

For high-availability configurations plus replication and management traffic options, the following figure illustrates:

- Dual dedicated ADS switches (ADS Switch A and B),
- Dual uplinks from all nodes to the customer network for high-availability backups, and
- Single or dual connections to the customer network for outgoing replication or administration traffic.

Figure 13 Dual Uplink plus Options



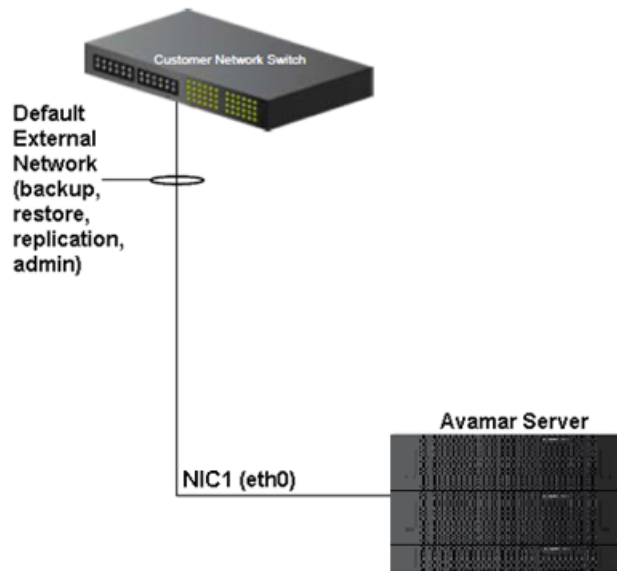
This high-availability external network provides an Avamar server that continues operating through any single failure in a default or optional network component, including:

- Any ADS network interface on the external network
- Any single uplink cable from the ADS to the customer network
- Any port on the customer network used in the uplink
- An entire customer switch used in the uplink
- Connectivity between customer switches used in the uplink

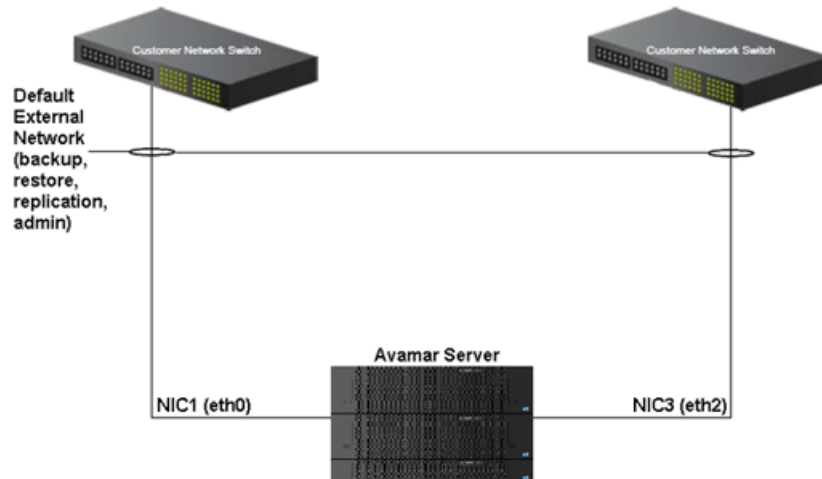
Single-node servers

Single uplink to external customer network

The following figure illustrates a single uplink from the server to the customer network switch.

Figure 14 Single Uplink**Dual uplink to external customer network**

For high-availability configurations, the following figure illustrates dual uplinks from the server to the customer network.

Figure 15 Dual Uplink

The high-availability external network provides an Avamar server that continues operating through any single network component failure, including:

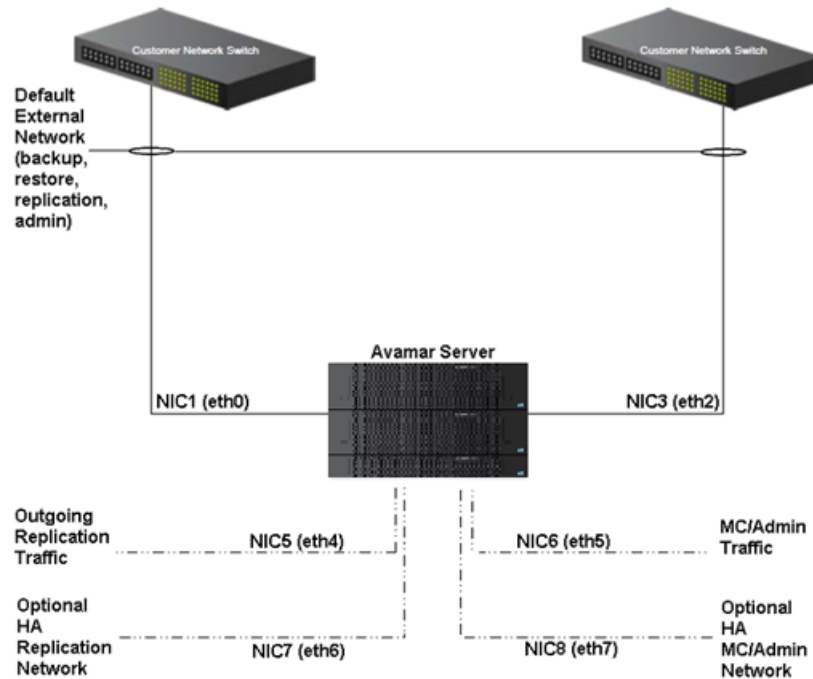
- Any ADS network interface on the external network
- Any single uplink cable from the ADS to the customer network
- Any port on the customer network used in the uplink
- An entire customer switch used in the uplink
- Connectivity between customer switches used in the uplink

Dual uplink plus options to external customer network

For high-availability configurations plus replication and management traffic options, the following figure illustrates:

- Dual uplinks from the server to the customer network for high-availability backups, and
- Single or dual connections to the customer network for outgoing replication or administration traffic.

Figure 16 Dual Uplink plus Options



This high-availability external network provides an Avamar server that continues operating through any single failure in a default or optional network component, including:

- Any ADS network interface on the external network
- Any single uplink cable from the ADS to the customer network
- Any port on the customer network used in the uplink
- An entire customer switch used in the uplink
- Connectivity between customer switches used in the uplink

Advanced network configuration – `dpnnetutil` utility

For ordinary implementations, the normal software installation process provides all functionality that is required to configure networking on ADS systems.

For more advanced configurations, the interactive `dpnnetutil` utility must be run before software installation. Advanced configuration scenarios include:

- Support for VLAN interfaces to backup networks
- Setting custom hostnames
- Configuring Network Address Translation (NAT)
- Circumstances in which the Avamar internal network subnet must be changed due to a conflict with existing customer network devices

Note

Only EMC personnel can run the `dpnnetutil` utility. If the customer site requires advanced network configuration, alert the EMC Account Team that the implementation specialist must run `dpnnetutil` before installing the Avamar software. While `dpnnetutil` is running, the customer may be asked to check certain hardware-related connectivity errors that the utility might report.

Features provided by `dpnnetutil`

Running `dpnnetutil` provides the following features:

Single-node Gen4S systems

For single-node systems, the feature set includes:

- Detection of cabling and connectivity errors during configuration, including:
 - No link detected on a network interface
 - Link speed below 1GB
 - Auto negotiation
 - Full duplex

When an error is detected, a dialog box is displayed that describes the error and the network interfaces affected.

- Determination of the cabling schema based on the number of physical network interfaces and link presence.
 - Configuration of the backup, replication, and management networks, including:
 - Requesting IP addresses and netmask for replication and management networks
 - Allowing edit and confirmation later
-

Note

Remember, if all backup, replication, and management interfaces are configured for use on the single node server, they must be configured for different subnets.

- Configuration of backup VLAN interfaces, including:
 - Requesting a list of VLAN IDs available on the customer network switch
 - Requesting corresponding parameters for each VLAN ID (IP, netmask)

The customer network administrator must provide a list of correct VLAN IDs (typically in the range 1 to 4094). The site networking topology must be such that all clients are able to resolve the Avamar server by the same hostname from different VLANs. Otherwise, backup failures may occur.

The `dpnnetutil` utility populates `probe.xml` with information obtained during the configuration procedure.

Multi-node Gen4S systems

For multi-node systems, the feature set includes:

- Detection of cabling and connectivity errors during configuration, including:
 - No link detected on a network interface

- Link speed below 1GB
- Auto negotiation
- Full duplex

When an error is detected, a dialog box is displayed that describes the error and the network interfaces affected.

- Determination of the cabling schema based on the number of physical network interfaces and link presence.
- Configuration of the internal network for advanced schemas, including:
 - Offering predefined IP ranges for the internal network
 - Allowing modification of the IP addresses and netmask later

The internal network isolates internal switches and internal traffic between ADS nodes from the external customer network. To simplify internal network configuration, `dpnnetutil` offers predefined ranges of IP addresses.

You can either select an IP subnet from this list or, to avoid ambiguous routing that is caused by one of the predefined IP addresses existing on the customer network or for other reasons, configure new IP addresses manually.

- Configuration of the backup, replication, and management networks, including:
 - Requesting IP addresses and netmask for replication and management networks
 - Allowing edit and confirmation later
- Configuration of backup VLAN interfaces, including:
 - Requesting a list of VLAN IDs available on the customer network switch
 - Requesting corresponding parameters for each VLAN ID (IP, netmask)

The customer network administrator must provide a list of correct VLAN IDs (typically in the range 1 to 4094). The site networking topology must be such that all clients are able to resolve the Avamar server by the same hostname from different VLANs. Otherwise, backup failures may occur.

The `dpnnetutil` utility populates `probe.xml` with information obtained during the configuration procedure.

Replication

The following sections describe the types of replication architectures supported by ADS systems. For complete instructions on setting up and performing replication, including terms and concepts, capabilities and limitations, and best practices, see the *EMC Avamar Administration Guide*.

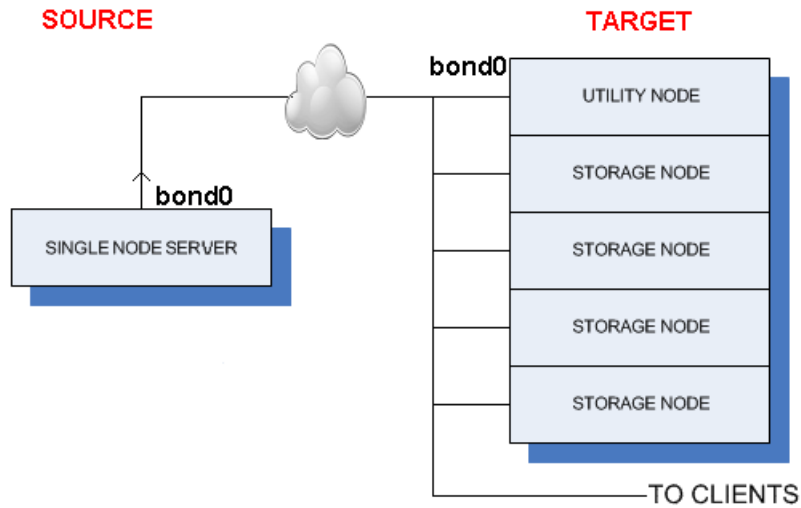
Single-node servers

The networking architecture of ADS Gen4S and the Avamar software provide two types of replication: Basic and Dedicated. They are described in the following sections.

Basic replication

The source and target systems each have a single network for traffic of all purposes. Replication is in and out on this single network between the source and target pair. The target system can be either a multi-node or single-node Avamar server. The following image shows a multi-node server as the target.

Figure 17 Basic Replication Network

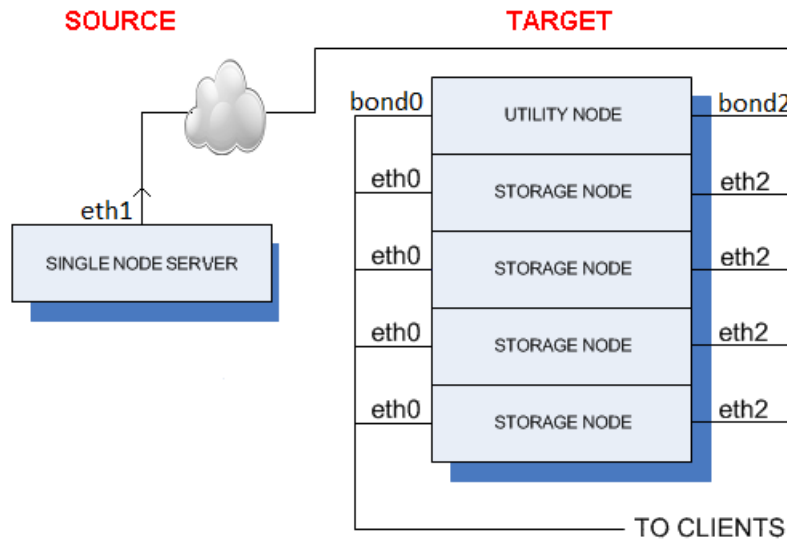


To configure basic replication, the Avamar software must be installed. The *EMC Avamar Administration Guide* provides more information about configuring basic replication.

Dedicated replication

A system that is configured for dedicated replication has dedicated networks on both source and target systems. On the source system, dedicated backup, replication, and management ports can be configured. The following image shows a multi-node server as the target.

Figure 18 Dedicated Replication Network



To configure dedicated replication, the Avamar software must be installed. An EMC implementation specialist must manually perform additional steps.

Multi-node servers

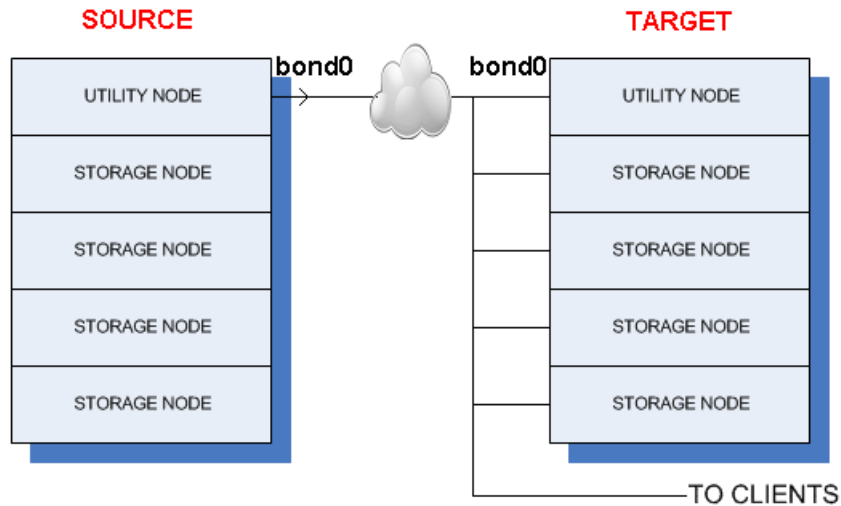
The networking architecture of ADS Gen4S and the Avamar software provide three types of replication: Basic, Dedicated, and Disaster Recovery (DR). They are described in the following sections.

Basic replication

The source and target systems each have a single network for traffic of all purposes. Replication is in and out on the single network between the source and target pair.

Cross-replication between source and target systems is also supported by performing the same procedure on the target.

Figure 19 Basic Replication Network



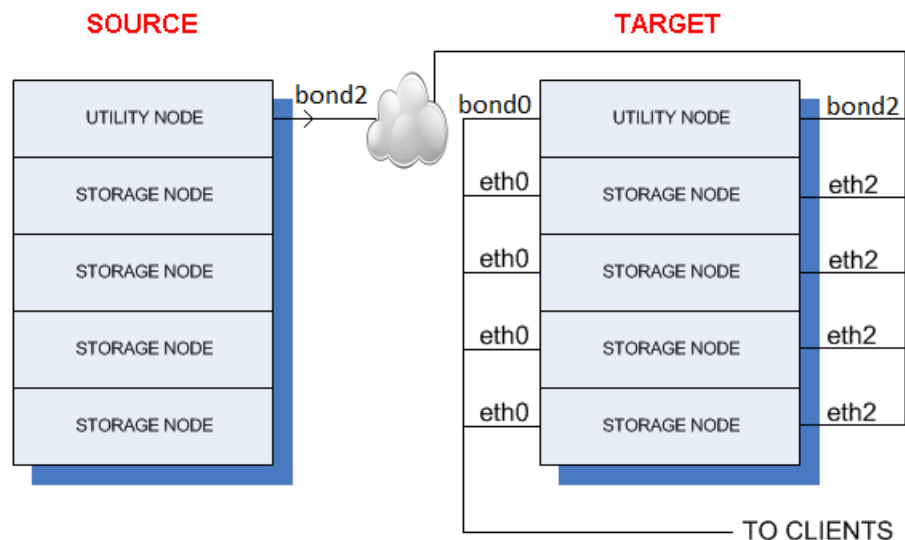
To configure basic replication, the Avamar software must be installed. The *EMC Avamar Administration Guide* provides more information about configuring basic replication.

Dedicated replication

A system that is configured for dedicated replication has dedicated networks on both source and target systems. On the source system, dedicated backup, replication, and management ports can be configured on the utility node. On the target system, the bonds between backup ports (eth0 and eth2) on the storage nodes are broken, and the eth2 ports are dedicated to replication traffic.

Cross-replication between source and target systems is also supported by performing the same procedure on the target.

Figure 20 Dedicated Replication Network



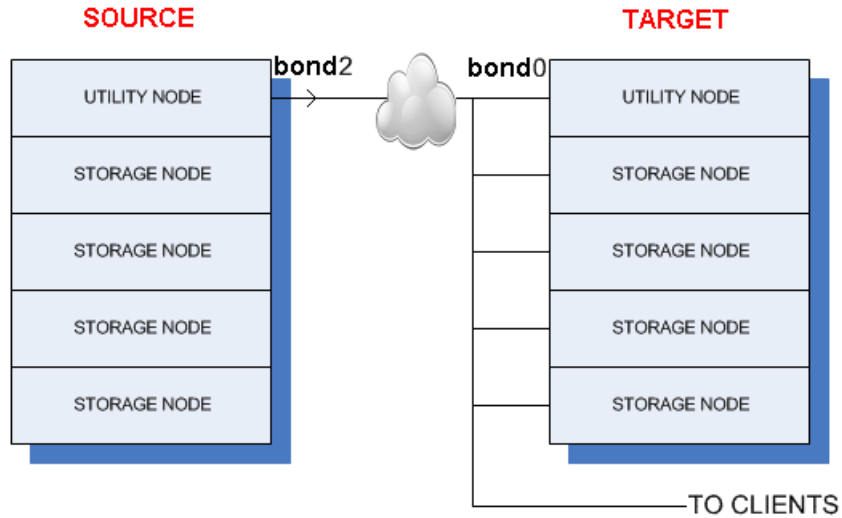
To configure dedicated replication, the Avamar software must be installed. An EMC implementation specialist must manually perform additional steps.

Disaster Recovery (DR) replication

This configuration is similar to dedicated replication, except replication is configured to the backup ports on the target system. Replication traffic is only segregated from backup traffic on the source system. DR replication is for providing a target system as a standby to the source in case of disaster.

Cross-replication between source and target systems is not supported.

Figure 21 DR Replication



To configure DR replication, the Avamar software must be installed. An EMC implementation specialist must manually perform additional steps.

CHAPTER 4

Installation and Beyond

The following topics describe setup procedures for an ADS system and followup activities:

- [Avamar "installation" process](#)..... 42
- [Everyday use of Avamar servers](#).....42
- [Maintenance of the server](#)..... 43

Avamar "installation" process

The industry term "installation" is generally used to describe the entire process of installing a product. For ADS hardware, at a high level, installation is actually a three-step process:

- Siting
- Installation
- Implementation

Siting

Siting is the process of determining where ADS equipment will be located. Numerous thermal, acoustic, electrical, regulatory, and environmental requirements must be taken into account before going forward with installation and implementation.

See the *EMC Avamar Data Store Gen4, Gen4S, and Gen4T Site Prep Technical Specifications* document on the EMC Online Support site (<http://support.emc.com>) for comprehensive information about siting ADS hardware.

Installation

Installation consists of racking, stacking, and cabling the ADS equipment and then performing a minimal amount of network configuration to place the system on the customer's network for remote implementation.

ADS multi-node server installation must be performed by EMC personnel. Instructions for doing so are contained in the SolVe Desktop utility and are accessible only to EMC personnel.

ADS single-node server installation can be performed by customers. Instructions for doing so are contained in the *EMC Avamar Data Store Single Node Customer Installation Guide*, which can be found on the EMC Online Support site. If EMC is contracted to do the installation, those instructions are located in the SolVe Desktop utility.

Implementation

Implementation consists of copying and configuring the Avamar software on each node in the ADS system and preparing the Avamar subsystem to function as a backup and restore tool. Implementation also involves procedures for setting up the initial Avamar configuration as it relates to the unique backup, restore, and replication requirements of the customer environment.

Everyday use of Avamar servers

The customer is responsible for the everyday configuration and use of the backup, restore, and replication functions of the Avamar server. Those activities are described in detail in the Avamar core documentation set, which provide a comprehensive set of feature overview, operational task, and technical reference information.

The primary user document is the *EMC Avamar Administration Guide* but that is just one of a wide range of guides that help define the possible uses of the Avamar server, including the following:

- *EMC Avamar Release Notes*

- *EMC Avamar Product Security Guide*
- *EMC Avamar Operational Best Practices Guide*
- *EMC Avamar and EMC Data Domain System Integration Guide*
- *EMC Avamar Backup Clients User Guide*
- *EMC Avamar for VMware User Guide*
- *EMC Avamar for Exchange VSS User Guide*
- *EMC Avamar for Lotus Domino User Guide*
- *EMC Avamar for Oracle User Guide*
- *EMC Avamar for SharePoint VSS User Guide*
- *EMC Avamar for SQL Server User Guide*
- *EMC Avamar for Hyper-V VSS User Guide*
- *EMC Avamar for SAP with Oracle User Guide*
- *EMC Avamar for Sybase ASE User Guide*
- *EMC Avamar for Windows Server User Guide*
- *EMC Avamar for IBM DB2 User Guide*
- *EMC Avamar Management Console Command Line Interface (MCCLI) Programmer Guide*
- *EMC Avamar NDMP Accelerator User Guide*
- *EMC Backup & Recovery Manager User Guide*

Before implementation, these documents can be found by using the search function on the EMC Online Support site. Search for each by the name shown above. After implementation, these documents can be found on the **Avamar Documentation** page on the Avamar server and on the EMC Online Support site.

In addition, various EMC technical notes provide details about specific product features, including step-by-step tasks, where necessary. These documents usually focus on supplemental information about rare, unique, or version-specific installation, implementation, and configuration scenarios. They are also located on the EMC Online Support site.

Maintenance of the server

ADS servers require maintenance from time to time, including replacement of defective components, upgrading software, and adding capacity to servers running out of backup space.

Replacement of components is an activity performed mostly by EMC personnel. Customers can replace defective hard drives and power supplies (see the *EMC Avamar Data Store Customer Service Guide* for instructions). To fix any other node component, the entire node must be replaced (either completely or through a “transplant” operation where the hard drives and the data they contain are inserted into a new chassis).

An Avamar software upgrade is an activity performed only by EMC personnel. Software upgrades consist of changes to the Linux operating system, hardware firmware, and patches to the Avamar software itself.

Adding capacity to an existing ADS server is another activity performed only by EMC personnel. Adding capacity to a multi-node server consists of installing and configuring additional nodes, and then including the additional nodes as part of the server.

