OPSWARE®

SERVER AUTOMATION SYSTEM

Opsware® SAS 7.0 Planning and Installation Guide

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Preface

Welcome to the Opsware Server Automation System (SAS) – an enterprise-class software solution that enables customers to get all the benefits of the Opsware data center automation platform and support services. Opsware SAS provides a core foundation for automating formerly manual tasks associated with the deployment, support, and growth of server and server application infrastructure.

Overview of this Guide

This guide describes how to use the Opsware Installer to install the software components that make up an Opsware core. It also describes the administrative tasks required prior to installing an Opsware core.

This guide is intended for Unix system administrators, database administrators, and network administrators.

Contents of this Guide

This guide contains the following chapters:

Chapter 1, "Opsware SAS Architecture": Provides an introduction to Opsware SAS architecture and presents the various Opsware SAS topologies.

Chapter 2, "Operating System and Hardware Requirements": Describes the supported operating systems for an Opsware SAS Core, Managed Servers, and the SAS Client (Java and Web). This chapter also describes the hardware requirements for the servers running an Opsware SAS Core and provides guidelines on how to distribute Opsware SAS Core Components across the servers running an Opsware SAS Core.

Chapter 3, "Pre-Installation Requirements": Describes the system and network administration tasks that must be performed before you can run the Opsware Installer.

Chapter 4, "Installation Methods and Checklists": Describes the types of Opsware SAS installations, reviews the Opsware SAS core installation process, and provides checklists to aid you in gathering required information for Opsware SAS Core installation.

Chapter 5, "Prerequisites for the Installer Interview": Describes the information you will need to have available to complete the Opsware Installer interview. Provides information about installer command line syntax, log files, and Opsware Installer distribution media.

Chapter 6, "Installing the First Opsware Core": Describes how to run the Opsware Installer to create a First Core.

Chapter 7, "First Core Post-Installation Tasks": Describes system administration tasks that you must perform after installing the First Core.

Chapter 8, "Multimaster Mesh Installation": Describes how to use the Opsware Installer to add subsequent cores.

Chapter 9, "Satellite Installation": Describes how to use the Opsware Installer to create an Opsware Satellite facility.

Chapter 10, "Opsware SAS Configuration": Provides an overview of the configuration tasks required for Opsware SAS after the First Core has been installed.

Chapter 11, "Opsware Core Uninstallation": Shows how to uninstall a single core, remove a single core from a Multimaster Mesh, or uninstall an entire Multimaster Mesh consisting of multiple cores in different facilities.

Appendix A, "Oracle Setup for the Model Repository": Explains how to manually configure and maintain an Oracle database to work with the Opsware Model Repository, necessary if you do not use the Opsware-supplied and installed Oracle database.

Appendix B, "TIBCO Rendezvous Configuration for Multimaster": Provides reference information about TIBCO Rendezvous configuration for use in a Multimaster Mesh.

Appendix C, "Opsware Gateway Properties File": Provides reference information about the parameters in the Gateway Properties file used by Opsware Gateways.

Conventions in this Guide

This guide uses the following typographical and formatting conventions.

NOTATION	DESCRIPTION
Bold	Identifies field menu names, menu items, button names, and inline terms that begin with a bullet.
`Courier`	Identifies text that is entered or displayed at the command-line prompt, such as Unix commands, Opsware SAS commands, file names, paths, directories, environment variable names, contents of text files that are viewed or edited with a text editor, source code in a programming language, and SQL (database) commands.
Italics	Identifies document titles, DVD titles, web site addresses. Used to introduce new terms when they are first defined in a document and for emphasis.

Icons in this Guide

This guide uses the following icons.

ICON	DESCRIPTION
	This icon represents a note. It identifies especially important concepts that warrant added emphasis.
	This icon represents a requirement. It identifies a task that must be performed before an action under discussion can be performed.
	This icon represents a tip. It identifies information that can help simplify or clarify tasks.

ICON	DESCRIPTION
	This icon represents a warning. It is used to identify significant information that must be read before proceeding.

Guides in the Documentation Set and Associated Users

- The *Opsware® SAS User's Guide: Server Automation* is intended for system administrators responsible for all aspects of managing servers in an operational environment. It describes how to use Opsware SAS, introducing the system and the user interface. It provides information about managing servers, remediating servers, script execution, configuration tracking, deploying and rolling back code, and agent deployment. It also explains how to use the Opsware Global Shell and open a Remote Terminal on managed servers.
- *Opsware® SAS User's Guide: Application Automation* is intended for system administrators responsible for performing the day-to-day functions of managing servers. It reviews auditing and compliance, software packaging, visual application management, application configuration, and software and operating system installation on managed servers.
- The *Opsware® SAS Administration Guide* is intended for administrators responsible for monitoring and diagnosing the health of the Opsware SAS core components. It also documents how to set up Opsware user groups and permissions.
- The *Opsware® SAS Planning and Installation Guide* is intended for advanced system administrators responsible for planning all facets of an Opsware SAS installation. It documents all the main features of Opsware SAS, scopes out the planning tasks necessary to successfully install Opsware SAS, explains how to run the Opsware Installer, and details how to configure each of the components. It also includes information on system sizing and checklists for installation.
- The *Opsware® SAS Policy Setter's Guide* is intended for system administrators responsible for setting up OS provisioning, configuration tracking, code deployment, and software management.
- The *Opsware® SAS Content Utilities Guide* is intended for advanced system administrators responsible for importing content such as software packages into

Opsware SAS. It documents the following command-line utilities: OCLI 1.0, IDK, and DET (CBT).

- The *Opsware® Automation Platform Developer's Guide* is intended for software developers responsible for customizing, extending, and integrating Opsware SAS. It documents how to create Web Services, Java RMI, Python, and CLI clients that invoke methods on the Opsware API.

Opsware, Inc. Contact Information

For more information, see the Opsware, Inc. main web site and phone number:

- *http://www.opsware.com/index.htm*
- +1 (408) 744-7300

For links to the latest product documentation and software downloads, see the Opsware Customer Support site:

- *https://download.opsware.com/opsw/main.htm*

For troubleshooting information, see the Opsware Knowledge Base:

- *https://download.opsware.com/kb/kbindex.jspa*

To contact Opsware Customer Support, see the following email address and phone number:

- support@opsware.com
- +1 (877) 677-9273

Chapter 1: Opsware SAS Architecture

IN THIS CHAPTER

This section discusses the following topics:

- The Opsware Core
- Opsware Server Agents
- The Core Components
- SAS Core Component Bundling
- Opsware SAS Interfaces
- Opsware Gateways
- Opsware SAS Topologies
- Opsware Satellites

This section provides an overview of Opsware SAS architecture. You will learn about the Opsware Core and its Core Components and the relationship between the core, Server Agents, and Satellites.

There is also a discussion of Opsware SAS topologies which will help you decide on the topology for your Opsware SAS installation.

Architecture Overview

Opsware SAS provides a fully automated IT environment. IT teams are able to work together seamlessly, even if they are in different geographies. All administrators have the same view of the environment.

At the simplest level, an Opsware SAS installation consists of:

- The Opsware Core and its Core Components installed on a host server or servers

- A set of Opsware Gateways (Core, Agent, Management, Satellite) that enable communications between the Opsware Core and the Managed Servers
- Opsware Server Agents installed on Managed Servers

The Opsware Server Agents are installed on a Facility's servers that are to be managed using Opsware SAS. A *Facility* is a construct that typically represents a collection of servers that a single Opsware SAS Core manages. The Core and its Core Components are installed on their own server (optionally, across multiple servers) and communicate with the Agents on Managed Servers to provide monitoring, reporting, and management functions from a central source.

New Architecture: SAS Core Component Bundling

New in this release is the concept of Core Component bundling. In a typical installation, certain Core Components are *bundled* or grouped together and must be installed together on the same host. This architecture facilitates ease of installation and maintenance, adds simplicity and robustness for multi-server deployments, supports horizontal scaling and Core Component load balancing. For detailed information about Core Component bundling, see "SAS Core Component Bundling" on page 7.

The Opsware Core

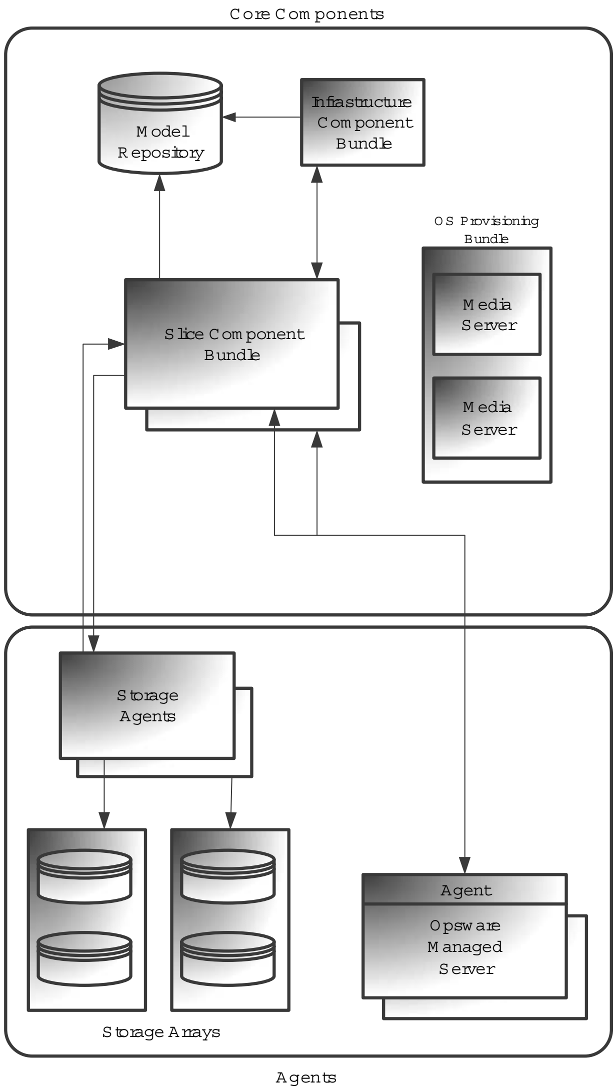
The *Core* is actually a set of *Core Components* that work together to allow you to discover servers on your network, add those servers to a Managed Server Pool, and then provision, monitor, configure, audit, and maintain those servers from a centralized Opsware SAS Web or Java™ client. These Components provide management, communication, and OS provisioning capabilities, among other services.

The machines that the Core Components are installed on are called *Core Servers*. *Server Agents* are installed and reside on the Managed Servers and facilitate communications between the Core and the Managed Servers, and actually perform certain actions on the Managed Servers as directed by user input from an SAS client.

A Simple Single Core Installation

Figure 1-1 shows a simplified representation of a single core with all Managed Servers in the same facility, typically the First Core of a Multimaster Mesh. Most installations consist of multiple cores in different facilities. See “Opsware SAS Topologies” on page 15.

Figure 1-1: An Opsware Core and Agents



A *Core Server* hosts the Opsware Core Components that allow Opsware SAS to discover and store information about the location and configuration of all the servers on your network as well as components that perform monitoring, auditing, provisioning and maintenance tasks.

Certain Core components can be installed in the same instance across multiple servers while still being seen as a single logical entity.

Opsware Server Agents

An Opsware Server Agent is intelligent software that is installed on a server that you want to manage through Opsware SAS. After an agent is installed, it registers with the Opsware Core which can then add that server to its pool of Managed Servers. The Server Agent also receives commands from the Core and initiates the appropriate action on its local server, such as software installation and removal, software and hardware configuration, server status reporting, auditing, and so on.

You can install agents on servers in the following ways:

- You can use the Opsware Deployment and Discover (ODAD) utility to discover the servers on your network that do not have Opsware Server Agents installed and then deploy the agents to those servers.
- You can use Opsware's OS Provisioning feature to provision an operating system to a bare-bones server – an Opsware Server Agent will also be installed.
- You can copy the Opsware Server Agent binary to the server and install it manually.

During agent registration, Opsware SAS assigns each server a unique ID (the Machine ID (MID)) and stores this ID in the Model Repository. Servers can also be uniquely identified by their MAC Address (the network interface card's unique hexidecimal hardware indentifier, which is used as the device's physical address on the network).

The Core Components

The Core Components are the heart of the Opsware Core making it possible to communicate with, monitor, and manage servers. Users and developers interact with the core through the SAS Client or Web Client, the command line, the API, and so on. Users can retrieve vital information about their network servers, provision servers, apply patches, take servers on and off line, configure and audit servers, and more. This interaction is controlled by the Core Components.

For example, a user could use the OS provisioning feature of the SAS Client to identify an unprovisioned server, assign an OS Sequence to that server, and remotely begin the provisioning process.

The following section describes the Opsware Core Components and interfaces. For detailed information about how the Opsware Components work together to manage your servers, see the *Opsware® SAS Administration Guide*.

SAS Core Component Bundling

The release of Opsware SAS 7.0 introduces the concept of Opsware *Core Component Bundling* as a way of distributing Core Components in an Opsware installation. Certain components are *bundled* together and must be installed as a *unit* during a Typical Installation. During a Custom installation, certain components can be broken out of their bundles (such as the Opsware Command Engine, the OS Provisioning Boot Server and Media Server, among others) and installed on separate servers. For more information about Typical vs. Custom installations, see Chapter 6, “Installing the First Opsware Core” and Chapter 8, “Multimaster Mesh Installation”.

Component Bundling provides the following benefits:

- Added simplicity and robustness for multi-server deployments
- Scaling capability: you can install additional Slice” Components bundles for horizontal scaling
- Improved High Availability
- Load balancing between slices when multiple instances installed

Table 1-1 shows how components are bundled. .

Table 1-1: Component Distribution

MODEL REPOSITORY	INFRASTRUCTURE SERVER	OS PROVISIONING	SLICE #1	SLICE #2
One per core	One per core	Typically one per core	Multiple per core	Multiple per core
Model Repository	Infrastructure Component Bundle: Management Gateway, Primary Data Access Engine Model Repository Multimaster Component/Tibco Command Engine Software Repository	Media Server Boot Server	Core Gateway/ Agent Gateway Opsware Command Center Opsware Global File System Web Services Data Access Engine Secondary Data Access Engine Build Manager	Core Gateway/ Agent Gateway Opsware Command Center Opsware Global File System Web Services Data Access Engine Secondary Data Access Engine Build Manager

If you have existing pre-release 7.0 Opsware SAS installations, you can upgrade your existing installation to 7.0 but will be unable to use SAS Component Bundling. Component Bundling requires a fresh install.

The Opsware “Boot Agent” is unrelated to Opsware Server Agents and operates as part of OS Provisioning.

Model Repository

The Model Repository is implemented as an Oracle database. It is a standalone component and is not bundled with other Core Components. All Opsware SAS components work from or update a data model maintained for all servers that Opsware SAS manages. The Model Repository contains essential information necessary to build, operate, and maintain the following items:

- An inventory of all servers under Opsware SAS management.
- An inventory of the hardware associated with these servers, including memory, CPUs, storage capacity, and so on.
- Information about the configuration of the servers, including IP addresses.
- An inventory of the operating systems, system software, and applications installed on servers.
- An inventory of operating systems and other software that is available to be provisioned to the servers along with software policies that control how the software is configured and installed.
- Authentication and security information.

Each Opsware Core contains a single Model Repository.

The Core Component Bundles

Infrastructure Components Bundle

- **Command Engine**

  The Command Engine is a system for running distributed programs across many servers (typically through Opsware Server Agents). Command Engine scripts are written in Python and run on the Command Engine server. Command Engine scripts can issue commands to Opsware Server Agents. These calls are delivered in a secure manner and are auditable by using data stored in the Model Repository.

  Opsware SAS features (such as Code Deployment & Rollback) can use Command Engine scripts to implement part of their functionality.

- **Primary Data Access Engine**

  The Data Access Engine provides an XML-RPC interface to the Model Repository that simplifies interaction with various clients, such as the SAS Web Client, system data collection, and monitoring agents on servers. The Data Access Engine installed with the

Infrastructure Component bundle is designated the *Primary* Data Access Engine. The Data Access Engine installed with the Slice Component bundle(s) is designated the *Secondary* Data Access Engine.

Because interactions with the Model Repository go through the Data Access Engine, clients are less impacted by changes to the Model Repository's schema. The Data Access Engine allows features to be added to Opsware SAS without requiring system-wide changes.

- **Management Gateway**

  Manages communication between Opsware Cores and between Opsware Cores and Satellites.

- **Model Repository Multimaster Component/TIBCO Rendezvous**

  The Model Repository Multimaster Component is installed with the Infrastructure Component bundle. A Multimaster Mesh, by definition, has multiple core installations and the Model Repository Multimaster Component synchronizes the data in the Model Repositories for all cores in the Mesh, propagating changes made in one repository to the other repositories. The Model Repository Multimaster Component uses TIBCO Rendezvous and its underlying transport capabilities.

  Each Model Repository Multimaster Component consists of a Sender and a Receiver. The Sender (Outbound Model Repository Multimaster Component) polls the Model Repository and sends unpublished transactions to other Model Repositories. The Receiver (Inbound Model Repository Multimaster Component) accepts the transactions from other Model Repositories and applies them to the local Model Repository.

- **Software Repository**

  A repository in which the binaries/packages/source for software/application provisioning and remediation is uploaded and stored.

  For information about how to upload software packages to the Software Repository, see the *Opsware® SAS Policy Setter's Guide*.

Slice Components Bundle

- **Core Gateway/Agent Gateway**

  The Core Gateway communicates directly withe Agent Gateways passing requests and responses to and from Core Components. Agent Gateways are installed on Managed Servers and communicate with the Core Gateway

- **Opsware Command Center**

  The Opsware Command Center (OCC) is the Core Component that underlies the Opsware SAS Web Client. The OCC includes an HTTPS proxy server and an application server. You access the OCC only through the Opsware SAS Web Client.

- **Opsware Global File System**

  The Opsware Global File System (OGFS) is installed with each Slice Component Bundle and provides the central execution environment for SAS.

  The OGFS runs on one or more physical servers; customers can scale SAS execution capacity by simply adding additional Slice Component bundles in a core.

  The OGFS runs SAS built-in components – as well as customer-written programs – within a virtual file system that presents the SAS data model, SAS actions, and managed servers as virtual files and directories.

  This unique feature of SAS allows users of the Opsware Global Shell and Opsware Platform Extensions to query SAS data and manage servers from any scripting or programming language. Since the OGFS filters all data, actions, and managed server access through the Opsware security model, programs running in the OGFS are secure by default.

- **Web Services Data Access Engine**

  The Web Services Data Access Engine provides a public-object abstraction layer to the Model Repository and provides increased performance to other Opsware SAS Core Components. This object abstraction can be accessed through a Simple Object Access Protocol (SOAP) API, through third-party integration components, or by a binary protocol of Opsware SAS components such as the SAS Web Client.

- **Secondary Data Access Engine**

  The Data Access Engine provides an XML-RPC interface to the Model Repository that simplifies interaction with various clients, such as the SAS Web Client, system data collection, and monitoring agents on servers. The Data Access Engine installed with the Infrastructure Component bundle is designated the *Primary* Data Access Engine. The Data Access Engine installed with the Slice Component bundle(s) is designated the *Secondary* Data Access Engine.

  Because interactions with the Model Repository go through the Data Access Engine, clients are less impacted by changes to the Model Repository's schema. The Data Access Engine allows features to be added to Opsware SAS without requiring system-wide changes.

- **Build Manager**

  Although the Build Manager is part of the OS Provisioning feature it is installed as part of the Slice Component bundle. The Build Manager facilitates communications between OS Build Agents and the Command Engine. It accepts OS Provisioning commands from the Opsware Command Engine. It provides a runtime environment for the platform-specific build scripts to perform the OS Provisioning procedures.

OS Provisioning Components Bundle

- **Boot Server**

  The Boot Server is part of the OS Provisioning feature. It supports network booting of Sun and x86 systems with inetboot and PXE, respectively. The processes used to provide this support include the Internet Software Consortium DHCP server, Sun Solaris TFTP, and NFS.

- **Media Server**

  The Media Server is part of the OS Provisioning feature. It is responsible for providing network access to the vendor-supplied media used during OS Provisioning. The processes used to provide this support include the Samba SMB server and Sun Solaris/Linux NFS. You copy and upload your valid operating system installation media to the Media Server.

OS Build Agent: The OS Build Agent is part of the OS Provisioning feature. It runs during the pre-provisioning (network boot) process and is responsible for registering a bare metal server with the Opsware SAS Core through the Build Manager and guiding the OS installation process.

Satellite Installations

- **Software Repository Cache**

  A Software Repository Cache contains local copies of the contents of a Core's Software Repository (or of another Satellite). Having a local copy of the Software Repository can improve performance and decrease network traffic when you install or update software on a Satellite's Managed Servers.

Opsware SAS Interfaces

Opsware SAS Web Client

The Opsware SAS Web Client is an HTML browser-based user interface to Opsware SAS through which users can:

- Manage servers
- Monitor servers
- Configure Software Policies
- Provision software/applications/packages onto Managed Servers
- Provision operating systems onto bare metal servers
- Run distributed scripts on servers
- Deploy code and content to servers

Opsware SAS Client

A Java™ Web-Start cross-platform application that extends the SAS Web Client features and provides the following features:

- Discovery and Agent Deployment
- Device Explorer, to provide detailed hardware information
- Virtualization Director, to manage your virtualized installations

- Visual Application Manager, to manage the operational architecture and behavior of your distributed business applications
- Audit and Remediation, to track compliance
- Compliance Dashboard
- Reports
- Software Management
- Patch Management for Windows
- Patch Management for Unix
- Visual Packager, to build software packages for audit and remediation purposes
- Application Configuration Management
- Global Shell
- NAS Integration

Opsware Command Line Interface (OCLI)

A command line interface used to upload packages into the Opsware Software Repository, and to perform batch commands, run scripts, and many other Opsware SAS operations.

DCML Exchange Tool (DET)

A utility that enables users to export almost all server management content from any Opsware Core and import it into any other Opsware Core.

ISM Development Kit

A development kit that consists of command-line tools and libraries for creating, building, and uploading ISMs. An ISM is a set of files and directories that include application bits, installation scripts, and control scripts.

Opsware APIs

A set of APIs and a command-line interface (CLI) that facilitate the integration and extension of Opsware SAS. This platform allows other IT systems – such as existing monitoring, trouble ticketing, billing, and virtualization technology – to exchange information with Opsware SAS. This broadens the scope of how IT can use Opsware SAS to achieve operational goals.

For more information about all the interfaces, see the *Opsware® SAS Administration Guide*.

Opsware Gateways

Opsware Gateways manage communication between Managed Servers and an Opsware Core, between multiple cores, and between Satellite installations and an Opsware Core. Multimaster installations are discussed in “Multimaster Mesh (Multiple Cores)” on page 16 and Satellite installations are discussed in “Multimaster Mesh (Multiples Cores and Satellites)” on page 17.

There are several types of gateways:

- **Management Gateway**

  This gateway manages communication between Opsware Cores and between Opsware Cores and Satellites.

- **Core Gateway/Agent Gateway**

  These gateways work together to facilitate communication between the Opsware Core and Server Agents.

- **Satellite Gateway**

  This gateway communicates with the Opsware Core through the Management Gateway.

Opsware SAS Topologies

You must decide what Opsware topology fits your facility’s needs. This section provides some background on the Opsware topologies to help you make that decision

Single Core

The simplest topology is a Single Core (formerly a Standalone Core) that manages servers in a single facility.

A Single Core is best for a small network of servers contained in a single facility. Although a Single Core does not communicate with other Opsware Cores, it has all the components required to do so and can be easily converted into a core that is part of a Multimaster Mesh.

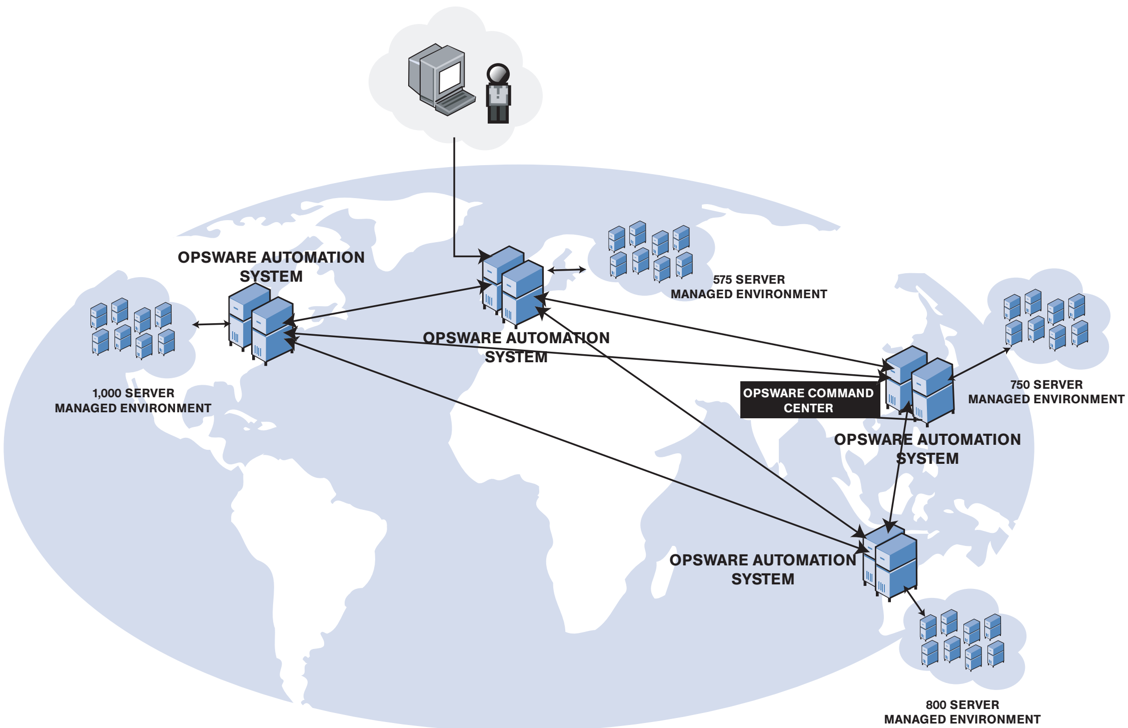
After the core is installed, you can use the Opsware Deployment and Discover (ODAD) utility to discover the servers on your network that do not have Opsware Server Agents installed and then deploy agents to those servers. After the Opsware Server Agents are deployed, they will automatically contact the Core through the Agent Gateway and register the server they are installed on with Opsware SAS.

You can then use the Opsware SAS client to manage your servers.

Multimaster Mesh (Multiple Cores)

To manage servers in more than one facility, you should install a Multimaster Mesh of Opsware Cores or a combination of Opsware Cores and Opsware Satellites.

Figure 1-2: Multimaster Topology



A *Multimaster Mesh* is a set of two or more Opsware Cores that communicate through Opsware Management Gateways and can perform synchronization of the data about their Managed Servers contained in their respective Model Repositories over the network. Changes to the data in any Model Repository in a Multimaster Mesh are broadcast to all other Model repositories in the Mesh.

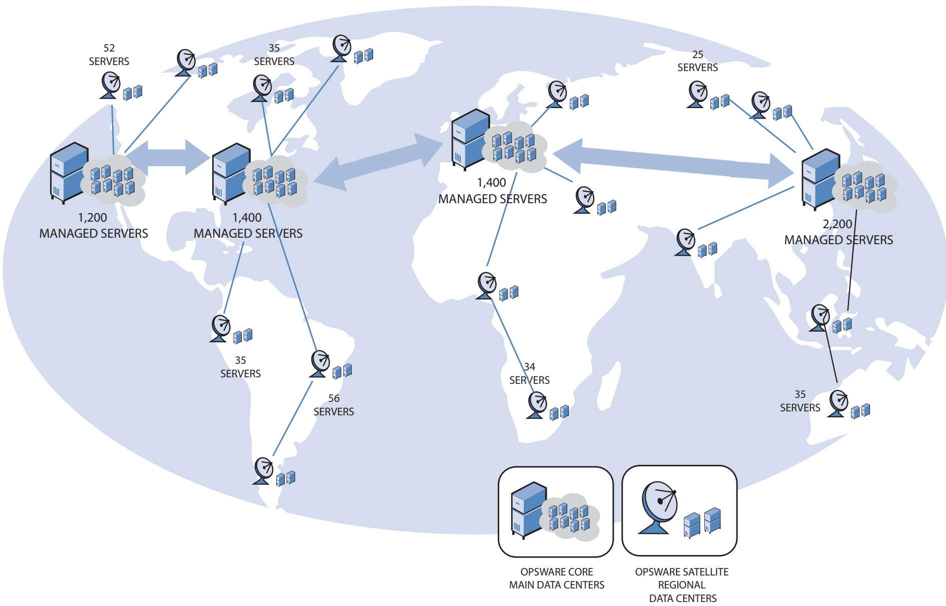
The Opsware Core Component that propagates and synchronizes changes from each model repository database to all other model repository databases is called the Model Repository Multimaster Component. This replication capability allows you to store and maintain a blueprint of software and environment characteristics for each facility making it easy to rebuild your infrastructure in the event of a disaster. It also provides the ability to easily provision additional capacity, distribute updates, and share software builds, templates and dependencies across multiple facilities – all from a single user interface.

Multimaster Mesh (Multiples Cores and Satellites)

A Multimaster Mesh can also include Satellite installations as shown in Figure 1-3.

Los Angeles, New York, London, and Tokyo have Opsware Core installations and each facility links to one or more Satellite installations in smaller facilities some in a star formation, others in cascading Satellite formation. See “Opsware Satellites” on page 21.

Figure 1-3: Server Management in Multiple Facilities with Satellites



Servers can be managed from any facility with an installed Opsware Core using the SAS Web or Java™ Client. Using the example in Figure 1-3, a user can log on to the SAS Client at the New York facility and manage servers that belong to the Los Angeles facility as long as he has the appropriate access rights and privileges.

Benefits of Multimaster Mesh

An Opsware Multimaster Mesh offers the following benefits among others:

- **Centralized Administration** – the Managed Servers in a Multimaster Mesh can be centrally administered from any facility with a Core installation. Administration is not locked into a single location or even restricted geographically.
- **Redundancy** – Synchronized (replicated) data management between facilities provides redundancy. For example, if the Opsware Core in one facility is damaged, another core in the Multimaster Mesh will contain a synchronized copy of the managed server data that can be used to restore the damaged core's Model Repository to a last known good state. In addition, while a damaged core is unavailable, other cores in the mesh can continue functioning without interruption.

  Replication also provides the ability to close down or add a facility while other facilities in the mesh continue operations without interruption.
- **Performance Scalability** – In a Multimaster Mesh, only multimaster database synchronizations are transmitted over the network reducing network bandwidth load.
- **Geographic Independence** – Cores can continue to manage servers during network interruptions regardless of location.

Facilities and Realms

Opsware Gateways use two constructs that facilitate routing network traffic and eliminate the possibility of IP address conflicts:

Facilities

A *Facility* is a construct that typically represents a collection of servers that a single Opsware SAS core manages through the data about the managed environment stored in its Model Repository. A facility typically represents a specific geographical location, such as Sunnyvale, San Francisco, or New York, or, commonly, a specific data center.

A Facility is a permissions boundary within Opsware SAS, that is, a user's permissions in one Facility do not carry over to another. Every Managed Server is assigned to a single facility. When a device initially registers with the Opsware Core, it is assigned to the facility associated with the gateway through which it is registering.

For example, Admin A works in Sunnyvale and is in charge of maintaining server patches. In a Facility framework, Admin A is bound to the Sunnyvale Facility as a user. When Admin A views servers, only those servers that are also bound to the Sunnyvale Facility are displayed. He will not see servers for any other Facility.

There are two types of facilities

- **Core Facilities**

  There is one Core Facility for every Opsware SAS Core installation.

- **Satellite Facilities**

  A default Facility created when you install a Satellite.

Realms

Realms are an Opsware concept that allow Opsware SAS to manage servers on different networks in the same Facility without fear of IP address conflicts.

A Realm is a logical entity that defines an IP namespace *within which* all Managed Server IP addresses must be unique. However, servers that are assigned to a *different Realms* can have duplicate IP addresses and still be uniquely identified within Opsware SAS by their Realm membership.

Realms are interconnected by gateways in what can be described as a *gateway mesh* – a single interconnected network of Opsware Gateways.

When you create and name a new Facility during installation, a *default* Realm is also created with the same name as the Facility. For example, when you create the Facility, *Datacenter*, the installation also creates a Realm named *Datacenter*. Subsequent Realms in that facility could be named *Datacenter001*, *Datacenter002*, and so on. IP address in each realm are uniquely identified by the combination of the Realm name and the IP address, eliminating any problem with duplicate IP addresses in the same Facility.

Multimaster Mesh Topology Examples

Figure 1-4 shows a Multimaster Mesh with cores installed in two separate facilities, San Francisco and Los Angeles. Each facility's core has a Model Repository that contains data about the Managed Servers in both facilities. That data is constantly synchronized (replicated) between both Facilities' Model Repositories. The cores communicate through their respective Management Gateways.

Communication from the Managed Servers in the Los Angeles facility to the San Francisco core travels through the Los Angeles Agent Gateway to the Core Gateway, then to the Los Angeles Management Gateway which then communicates with the San Francisco core through the San Francisco Management Gateway and Core Gateway.

Figure 1-4: Multimaster Mesh with Two Cores

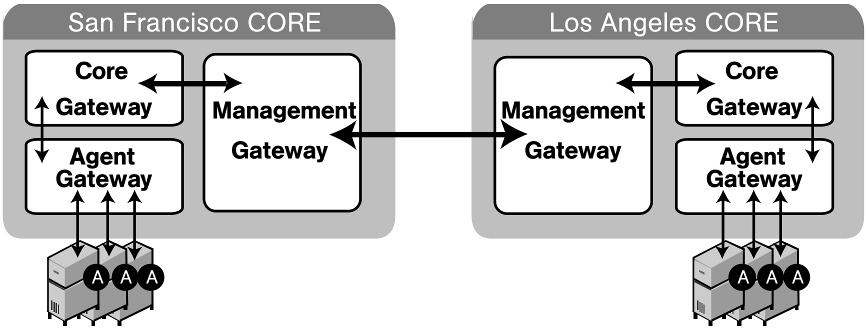
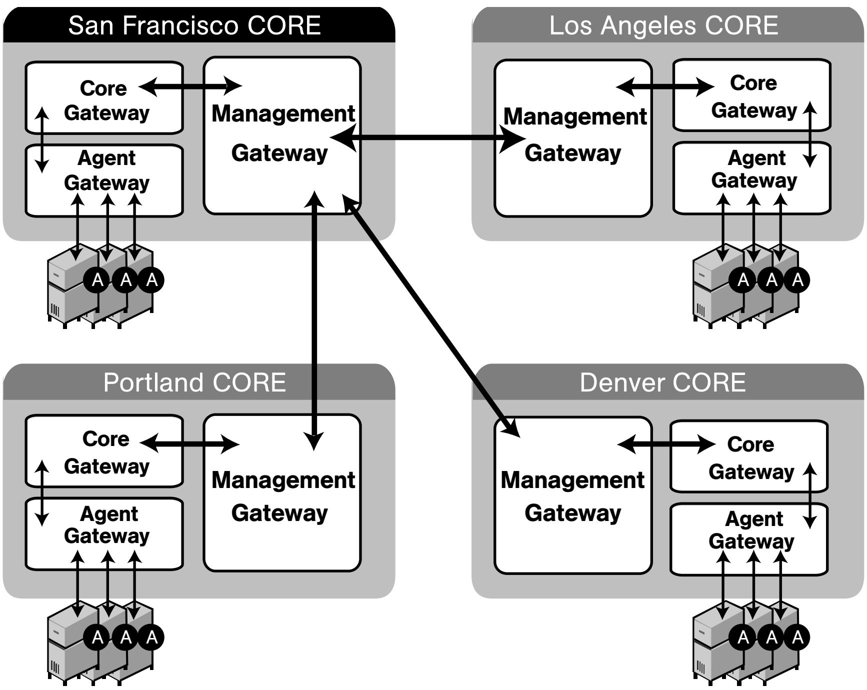


Figure 1-5 shows a Multimaster Mesh with four cores. This Mesh topology is called a *Star Formation* with the San Francisco core at the center of the Mesh. The Opsware Installer configures a Multimaster Mesh with a star topology by default.

Figure 1-5: Multimaster Mesh with Four Cores



Opsware Satellites

A Satellite installation can be a solution for remote sites that do not have a large enough number of potentially Managed Servers to justify a full Opsware Core installation. A Satellite installation allows you to install only the minimum necessary Core Components on the Satellite host which then accesses the Primary Core's database and other services through an Opsware Gateway connection.

A Satellite installation can also relieve bandwidth problems for remote sites that may be connected to a primary facility through a limited network connection. You can cap an Opsware Satellite's use of network bandwidth to a specified bit rate limit. This allows you to insure that Satellite network traffic will not interfere with your other critical systems network bandwidth requirements on the same pipe.

A Satellite installation typically consists of, at minimum, an Opsware Satellite Gateway and a Software Repository Cache and still allows you to fully manage servers at a remote facility. The Software Repository Cache contains local copies of software packages to be installed on Managed Servers in the Satellite while the Satellite Gateway handles communication with the Primary Core. You can optionally install the OS Provisioning Boot Server and Media Server on the Satellite host to support remote OS Provisioning. Installing other components on the Satellite host is not supported.

For more information about Satellite installations, see Chapter 9.

Satellite Topology Examples

A Simple Single Core to Satellite Link

Figure 1-6 shows a single Opsware Satellite linked to a Single Core. In this example, the main facility is in San Francisco, and a smaller remote facility is in San Jose.

The San Francisco Single Core consists of several components, including the Software Repository, the Model Repository, an Agent gateway and a Management Gateway. For simplicity, this figure does not show all required Core Components, such as the Command Engine.

The San Jose Satellite consists of a Software Repository Cache, an Satellite Gateway, and an optional OS Provisioning Boot server and Media Server.

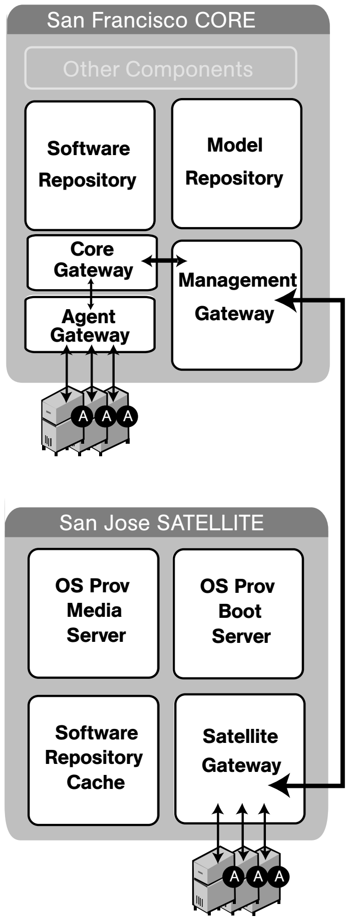
For a more detailed description of these Opsware SAS components, see "**Software Repository Cache**" on page 13, "**Boot Server**" on page 12, and "**Media Server**" on page 12.

The San Jose Satellite's Software Repository Cache contains local copies of software packages to be installed on Managed Servers in that facility.

The Server Agents installed on managed servers at the San Jose facility connect to the San Francisco core through the San Jose Satellite Gateway which communicates with the San Francisco Management Gateway, then through the San Francisco Core gateway, ultimately, with the required Core Components.

Return communication reverses that path. The Server Agents installed on managed servers in the San Francisco facility communicate with the Core Components through the San Francisco facility's Agent and Core Gateways.

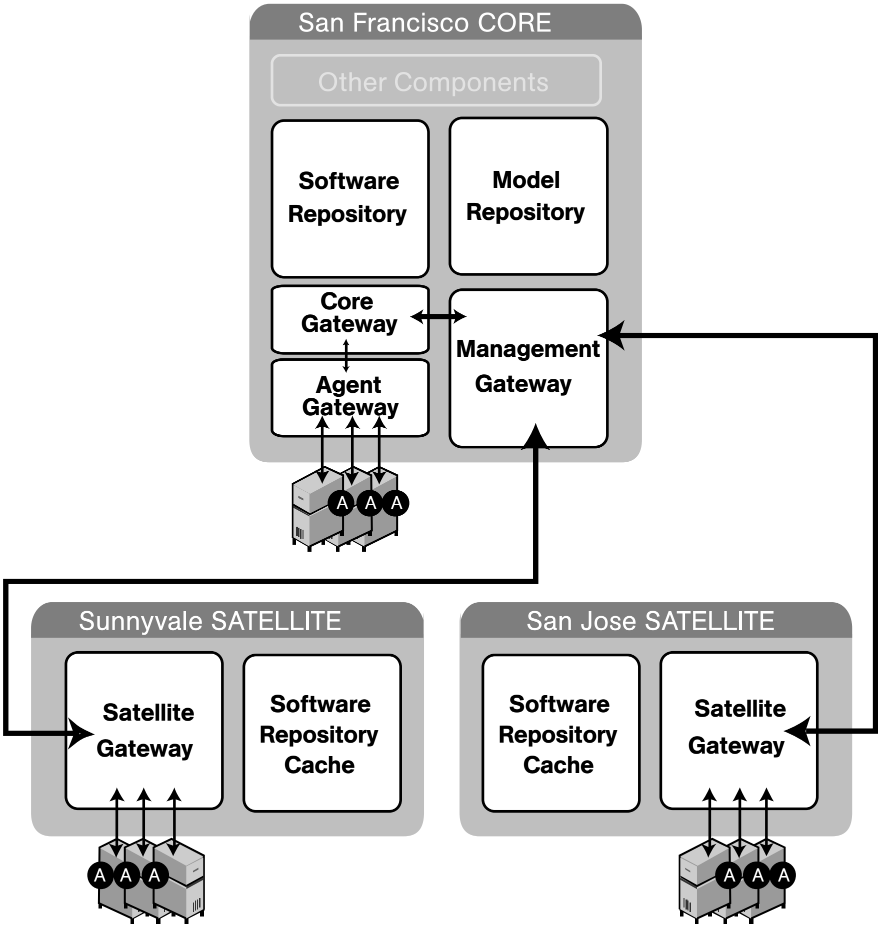
Figure 1-6: Satellite with the Single Core



A Two Satellite to Single Core Link

Figure 1-7 shows two Satellites linked to a Single Core. In this example, San Francisco is the main facility, Sunnyvale and San Jose are Satellite facilities.

Figure 1-7: Two Satellites with a Single Core

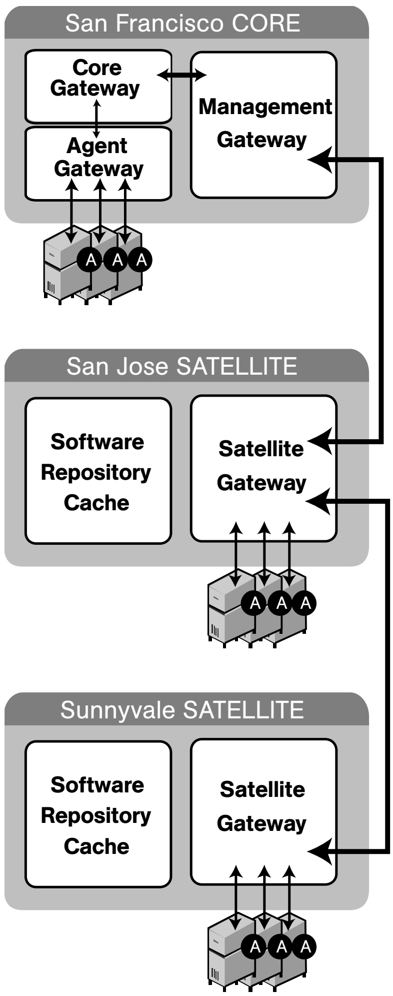


A Cascading Satellite Link

Figure 1-8 shows cascading Satellites, a topology in which Satellite Gateways are connected in a *chain*. This topology enables you to create a hierarchy of Software Repository Caches. Note that, the Satellite Gateways in this topology must belong to different Opsware Realms.

When tasked to install a package on a managed server in the Sunnyvale facility, Opsware SAS first checks to see if the package resides in the Software Repository Cache in Sunnyvale. If the package is not in Sunnyvale, then Opsware SAS checks the Software Repository Cache in San Jose. Finally, if the package is not in San Jose, Opsware SAS goes to the Software Repository in the San Francisco core. For more information, see "Managing the Software Repository Cache" in the *Opsware® SAS Administration Guide*.

Figure 1-8: Cascading Satellites with a Single Core



Satellites in a Multimaster Mesh

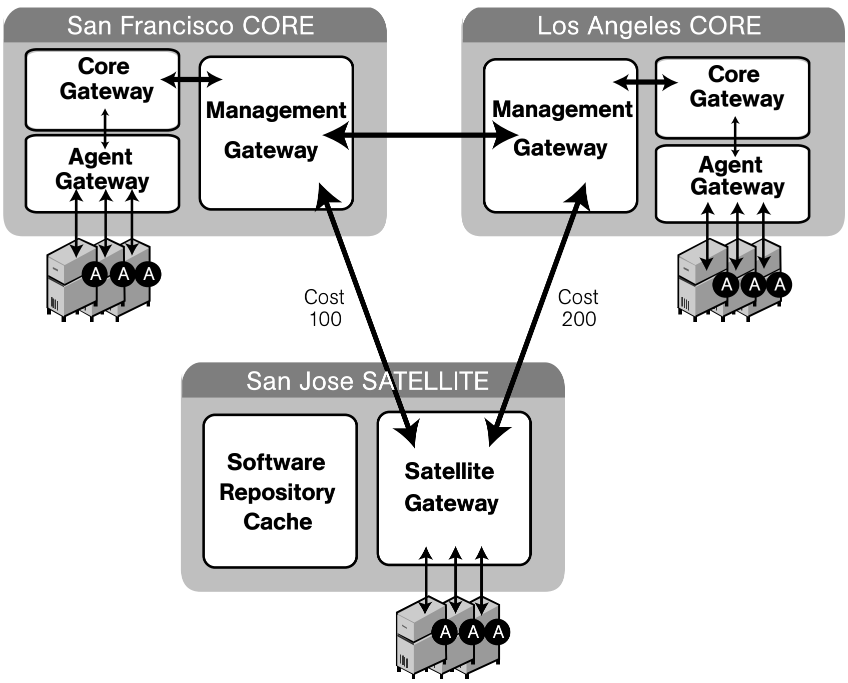
Figure 1-9 shows the San Jose Satellite connected to two Opsware Cores in a Multimaster Mesh.

Even when communication is possible to both Los Angeles and San Francisco, the Management Gateway chooses the route with the lowest cost (in Figure 1-9, the San Francisco route). You control cost evaluation using a parameter specified during Gateway installation. System designers can specify rules governing which Opsware Gateway routes to use to minimize network connectivity costs.

Using the same example environment in a failover scenario, during normal operations, the servers in the San Jose Satellite are managed by the San Francisco Core. Note, however, that the San Francisco and the Los Angeles Cores are directly connected through their Management Gateways.

If the connection between the San Jose Satellite and the San Francisco Core fails, the San Jose Satellite Gateway can immediately move communications from San Francisco to the Los Angeles core, allowing that core to maintain management of the San Jose servers. The Los Angeles Core will have up-to-date information about the San Jose site because the San Francisco Core's Model Repository data will have been replicated to the Los Angeles Model Repository as a part of normal Opsware operations.

Figure 1-9: Satellite in a Multimaster Mesh



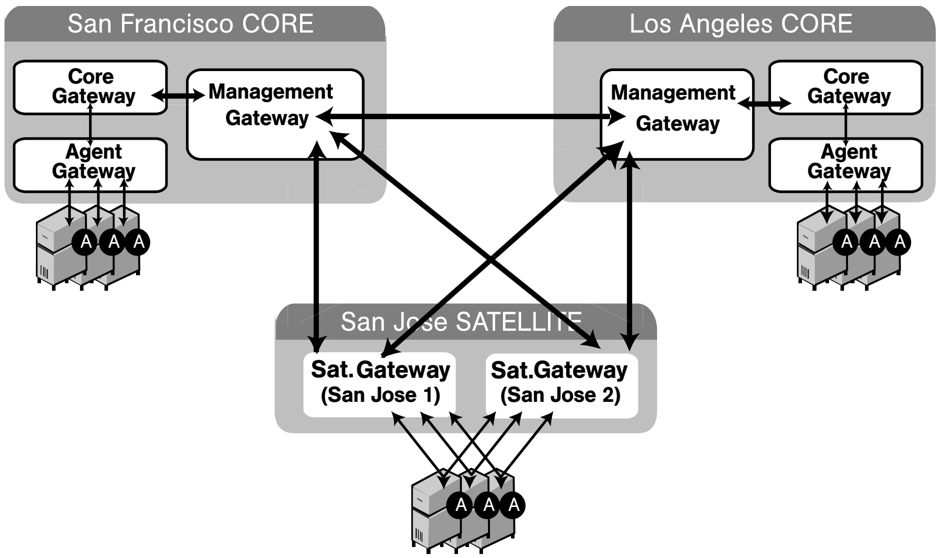
Satellite With Multiple Gateways in a Multimaster Mesh

Figure 1-10 shows a topology that provides failover capability in two ways. First, the San Jose Satellites 1 and 2 have Gateway connections to both the San Francisco and Los Angeles Management Gateways. If the Los Angeles core becomes unavailable, the San Francisco core can still manage the servers in the San Jose Satellite.

Second, the Agents installed on the Managed Servers in the San Jose Facility point to both of the Satellite's Agent Gateways. Opsware Agents automatically load balance over the available Agent Gateways and therefore can communicate directly with either the San Francisco or Los Angeles cores.

If one Gateway becomes unavailable, the Agents that are using the unavailable gateway as their primary gateway will automatically failover to using the secondary gateway. During routine agent-to-core communication, Opsware Agents will discover new gateways added to (or removed from) the Satellite.

Figure 1-10: Satellite With Multiple Gateways in a Multimaster Mesh



Chapter 2: Operating System and Hardware Requirements

IN THIS CHAPTER

This section discusses the following topics:

- Supported Operating Systems: Opsware Server Agents and the SAS Web/Java™ Clients
- Supported Operating Systems: Opsware Core Server
- Disk Space Requirements
- Opsware Core Performance Scalability

This section describes the supported operating systems for Opsware SAS Core Servers, Managed Servers, and the SAS Web Client and SAS Java™ Client. This chapter also describes the hardware requirements for the servers running an Opsware SAS Core and provides guidelines on how to distribute Opsware SAS Core Components across one or more servers.

Supported Operating Systems: Opsware Server Agents and the SAS Web/Java™ Clients

This section lists the supported operating systems for Opsware Agents and the SAS Client.

Opsware Agents

The following table lists the supported operating systems for Opsware Agents, which run on the servers managed by Opsware SAS.

Table 2-1: Opsware Agent Supported Operating Systems

SUPPORTED OPERATING SYSTEMS FOR OPSWARE AGENT	VERSIONS	ARCHITECTURE
AIX	AIX 4.3 AIX 5.1 AIX 5.2 AIX 5.3	POWER POWER POWER POWER
HP-UX	HP-UX 10.20 HP-UX 11.00 HP-UX 11.11 HP-UX 11.23 (11i v2)	PA-RISC PA-RISC PA-RISC PA-RISC and Itanium PA-RISC and Itanium
Sun Solaris	Solaris 6 Solaris 7 Solaris 8 Solaris 9 Solaris 10 (Update 1, Update 2, Update 3)	Sun SPARC Sun SPARC Sun SPARC Sun SPARC Sun SPARC, 64 bit x86, 32 bit x86 and Niagara
Fujitsu Solaris	Solaris 8 Solaris 9	Fujitsu SPARC Fujitsu SPARC
Windows	Windows NT 4.0 Windows 2000 Server Family Windows Server 2003 Windows XP Professional	32 bit x86 32 bit x86 32 bit x86 and 64 bit x86 32 bit x86

Table 2-1: Opsware Agent Supported Operating Systems (continued)

SUPPORTED OPERATING SYSTEMS FOR OPSWARE AGENT	VERSIONS	ARCHITECTURE
Red Hat Linux	Red Hat Linux 7.3	32 bit x86
	Red Hat Linux 8.0	32 bit x86
	Red Hat Enterprise Linux 2.1 AS	32 bit x86
	Red Hat Enterprise Linux 2.1 ES	32 bit x86
	Red Hat Enterprise Linux 2.1 WS	32 bit x86
	Red Hat Enterprise Linux 3 AS	32 bit x86 and 64 bit x86 and Itanium
	Red Hat Enterprise Linux 3 ES	32 bit x86 and 64 bit x86 and Itanium
	Red Hat Enterprise Linux 3 WS	32 bit x86 and 64 bit x86 and Itanium
	Red Hat Enterprise Linux 4 AS	32 bit x86 and 64 bit x86
	Red Hat Enterprise Linux 4 ES	32 bit x86 and 64 bit x86
	Red Hat Enterprise Linux 4WS	32 bit x86 and 64 bit x86
	Red Hat Enterprise Linux Server 5	32 bit x86 and 64 bit x86
	Red Hat Enterprise Linux Desktop 5	32 bit x86 and 64 bit x86
SUSE Linux	SUSE Linux Enterprise Server 8	32 bit x86
	SUSE Linux Standard Server 8	32 bit x86
	SUSE Linux Enterprise Server 9	32 bit x86 and 64 bit x86
	SUSE Linux Enterprise Server 10	32 bit x86 and 64 bit x86
VMware	ESX Server 3.0	32 bit x86 and 64 bit x86
	ESX Server 3.0.1	32 bit x86 and 64 bit x86
	ESX Server 3.0.2	32 bit x86 and 64 bit x86

On Red Hat Enterprise Linux 4 AS and 5, Opsware does not support SELinux (Security Enhanced Linux). By default, SELinux is enabled on Red Hat 4 AS and Enterprise Linux 5. You must disable the SELinux feature on Red Hat 4 AS and Enterprise Linux 5 for the Opsware Agent to function correctly.

Opsware SAS Client

The following table lists the operating systems supported for the SAS Client.

Table 2-2: SAS Client Supported Operating Systems

SUPPORTED OPERATING SYSTEMS FOR SAS CLIENT	VERSIONS	ARCHITECTURE
Windows	Windows Vista	32 bit x86 and 64 bit x86
	Windows XP	32 bit x86
	Windows 2003	32 bit x86
	Windows 2000	32 bit x86

For optimal performance, Opsware, Inc. recommends a minimum 1GB RAM on the system that runs the SAS Client.

Agent Installation on Windows 2000 and Windows 2003 Servers

Installation of an Opsware SAS Agent on a managed server requires the Windows Update service to be installed.

- If the service is installed, but has been disabled by the customer, the Agent will automatically start the service.
- If the service is not installed, the Agent will copy the Windows Update Agent installer to the managed server and then run it. This process will install the service and set it to automatically start on all deployed servers.

For information about the installer files for Patch Management, see "Windows Patch Management Requirements" on page 75.

If the Windows Update service is prevented from running when the agent triggers the service to start (such as, when the service is blocked by a domain policy), the following error will be reported in the managed server system log:

```
DCOM got error "The service cannot be started, either because it
is disabled or because it has no enabled devices associated with
it. " attempting to start the service wuauserv with arguments ""
in order to run the server:
{E60687F7-01A1-40AA-86AC-DB1CBF673334}
```

For more information about this error, see http://go.microsoft.com/fwlink/events.asp.

Supported Operating Systems: Opsware Core Server

Table 2-3 lists the supported operating systems for Opsware Core Components.

For a list of supported Oracle versions for the Model Repository, see Appendix A in the *Opsware® SAS Planning and Installation Guide*.

Table 2-3: Opsware Core Supported Operating Systems

SUPPORTED OS FOR OPSWARE CORE	VERSIONS	ARCHITECTURE	OPSWARE COMPONENTS
Sun Solaris	Solaris 9	Sun SPARC	All components
Sun Solaris	Solaris 10	Sun SPARC, Niagara	All components
Red Hat Linux	Red Hat Enterprise Linux 3 AS	32 bit x86	All components
Red Hat Linux	Red Hat Enterprise Linux 4 AS	64 bit x86	All components

A guest OS (virtual machine) of a VMWare ESX server *is not supported* as an Opsware core server.

Table 2-4 lists the supported operating systems for Opsware Satellite Components:

- Gateway
- Software Repository Cache
- Boot Server (optional)
- Media Server (optional)

Table 2-4: Opsware Satellite Supported Operating Systems

SUPPORTED OS FOR OPSWARE SATELLITE	VERSIONS	ARCHITECTURE
Sun Solaris	Solaris 9	Sun SPARC
Sun Solaris	Solaris 10	Sun SPARC
Red Hat Linux	Red Hat Enterprise Linux 3 AS	32 bit x86
Red Hat Linux	Red Hat Enterprise Linux 4 AS	64 bit x86
SUSE Linux	SUSE Linux Enterprise Server 9	32 bit x86

Disk Space Requirements

An Opsware *Core Server* is a computer hosting one or more Opsware *Core Components*. You have the option to install all of the Opsware Core Components on a single server or distribute them across multiple servers. This section describes the hardware requirements for any Opsware Core Server.

Core Server Disk Space Requirements

On each Core Server, the root directory must have at least 72 GB available hard disk space. Opsware components are installed in the `/opt/opsware` directory. Table 2-5 lists the recommended disk space requirements for installing and running Opsware Core Components. These sizes are recommended for the primary production data. Additional storage for backups must be calculated separately.

Table 2-5: Opsware Disk Space Requirements

OPSWARE COMPONENT DIRECTORY	RECOMMENDED DISK SPACE	REQUIREMENT ORIGIN
/etc/opt/opsware	50 MB	Configuration information for all Opsware Core services. (Fixed disk usage)

Table 2-5: Opsware Disk Space Requirements (continued)

OPSWARE COMPONENT DIRECTORY	RECOMMENDED DISK SPACE	REQUIREMENT ORIGIN
/media*	15 GB	**OS Provisioning**: The media directory holds the OS installation media that is shared over NFS or CIFS. The initial size for this directory depends on the total size of all OS installation media sets that you plan on provisioning, such as Windows 2003 CD (700mb), Redhat AS3 CDs (2GB), and Suse 9 SP3 (10GB). The network OS install shares do not need to reside on Opsware core systems and are typically dispersed across multiple servers as the Opsware mesh grows. (Bounded disk usage that grows quickly in large increments)
/opt/opsware	15 GB	The base directory for all Opsware Core services. (Fixed disk usage)
/u01/oradata*	20 GB	The Oracle tablespace directory that contains all model and job history information. Known sizes range from 5GB to 50GB of space, depending on the frequency and type of work, the amount of software and servers managed, and the garbage collection frequency settings. (Bounded disk usage that grows slowly in small increments)
/var/log/opsware	10 GB	The total log space used by all Opsware Core Components. (Fixed disk usage)
/var/opt/opsware	10 GB	The total run space used by all Opsware Core Components, including instances, pid files, lock files, and so on. (Fixed disk usage)

Table 2-5: Opsware Disk Space Requirements (continued)

OPSWARE COMPONENT DIRECTORY	RECOMMENDED DISK SPACE	REQUIREMENT ORIGIN
/var/opt/opsware/word*	80 GB	The total disk space used by software that is imported into Opsware. Theoretically, this is infinite disk usage depending on how much software you import. Initial size calculation is based on the total size of all packages and patches that you want managed by Opsware. Known sizes range from 10GB to 250GB.
/var/opt/opsware/ogfs/mnt	20 GB	The home directory for the Opsware Global File System (OGFS) enabled Opsware user accounts.

* The entries in Table 2-5 marked with an asterisk are directory path defaults that you can change during the installation process. The recommended disk space for these directories is based on average-sized directories, which could be smaller or larger, according to usage.

For performance reasons, you should install the Opsware Components on a local disk, not on a network file server. However, for the Software Repository, you can use a variety of storage solutions, including internal storage, Network Attached Storage (NAS), and Storage Area Networks (SANs).

Model Repository (Database) Disk Space Requirements

Additional disk space is required for the Oracle software and the Model Repository data files. Keep in mind that storage requirements for the database grow as the number of managed servers grows.

As a benchmark figure, you should allow an additional 3.1 GB of database storage for every 1,000 servers in the facility that Opsware SAS manages. When sizing the tablespaces, follow the general guidelines described in Table 2-6. If you need to determine a more precise tablespace sizing, contact Opsware Support.

Table 2-6: Tablespace Sizes

TABLESPACE	MB/1000 SERVERS	MINIMUM SIZE
AAA_DATA	256 MB	256 MB
AAA_INDX	256 MB	256 MB
AUDIT_DATA	256 MB	256 MB
AUDIT_INDX	256 MB	256 MB
LCREP_DATA	3,000 MB	1,500 MB
LCREP_INDX	1,600 MB	800 MB
TRUTH_DATA	1,300 MB	700 MB
TRUTH_INDX	400 MB	400 MB
STRG_DATA	1,300 MB	700 MB
STRG_INDX	400 MB	400 MB

Software Repository Disk Space Requirements

The Software Repository contains software packages and other installable files. Typical installations start with approximately 300 GB. However, more space might be required, depending on the number and size of the packages, as well as the frequency and duration of configuration backups.

Media Server Disk Space Requirements

Dependent on your OS Provisioning requirements. This component requires sufficient disk space for the OS media for all the operating system versions you intend to provision.

Opsware Core Performance Scalability

You can vertically scale the Opsware SAS Core Components, by adding additional CPUs and memory, or horizontally, by distributing the Core Components to multiple servers.

Core Server CPU Requirements

- Single-server: 4 dual-core CPUs (or equivalent)
- Multiple-server: 2 dual-core CPUs (or equivalent)

Core Server Memory Requirements

- Single-server: 8 GB RAM (1 GB per CPU core)
- Multiple-server: 4 GB RAM (1 GB per CPU core)

Table 2-7 and Table 2-8 list the recommended distribution of Opsware components across multiple servers. In both tables, the bundled Opsware Core Components are distributed in the following way:

- MR: Model Repository
- INFRA: Infrastructure Component
  - Model Repository Multimaster Component
  - Management Gateway
  - Software Repository
  - Primary Data Access Engine
  - TIBCO Rendezvous/Opsware messaging component
  - Opsware Command Engine
- Slice(*x*):
  - Agent Gateway
  - Core Gateway
  - Opsware Command Center
  - Build Manager
  - Web Services Data Access Engine
  - Secondary Data Access engine)
  - Opsware Global File System

Table 2-7: Distribution of Core Components

NUMBER OF CORE SERVERS	OPSWARE SAS CORE COMPONENTS					
	Number of CPU Cores per Server					
	8 CPU cores	8 CPU cores	4 CPU cores	4 CPU cores	4 CPU cores	No. of Managed Servers
1	MR Slice0 OS Provisioning INFRA					960
2	MR	Slice0 INFRA				2250
3	MR	Slice0 INFRA	Slice1			4500
4	MR	Slice0 INFRA	Slice1	Slice2		7200
5	MR	Slice0 INFRA	Slice1	Slice2	Slice3	8000

Table 2-8: Distribution of Core Components

NUMBER OF CORE SERVERS	OPSWARE SAS CORE COMPONENTS					
	Number of CPU Cores per Server					
	8 CPU cores	4 CPU cores	4 CPU cores	4 CPU cores	4 CPU cores	No. of Managed Servers

Table 2-8: Distribution of Core Components (continued)

NUMBER OF CORE SERVERS	OPSWARE SAS CORE COMPONENTS					
1	MR Slice0 INFRA					480
2	MR	INFRA	Slice0			1125
3	MR	INFRA	Slice0	Slice1		2250
4	MR	INFRA	Slice0	Slice1	Slice2	3600

Small Core Server Capacity

- 1 core server with 4 CPU cores, 4GB RAM: 480 managed servers
- 1 core server with 2 CPU cores, 4 GB RAM: 150 managed servers

Factors Affecting Core Performance

The hardware requirements for Opsware SAS vary based on these factors:

- The number of servers that Opsware SAS manages
- The number and complexity of concurrent operations
- The number of concurrent users accessing the Opsware Command Center
- The number of facilities in which Opsware SAS operates

Table 2-9 lists the approximate number of Opsware SAS servers per core and the CPU cores required for a given number of managed servers and Opsware users.

Table 2-9: Required Number of Core Servers

NUMBER OF MANAGED SERVERS	NUMBER OF OPSWARE USERS	NUMBER OF SAS SERVERS PER CORE & (CPU CORES)
960	40	1 (8 CPU cores)
2250	90	2 (12 CPU cores)
4500	180	3 (16 CPU cores)

Table 2-9: Required Number of Core Servers (continued)

NUMBER OF MANAGED SERVERS	NUMBER OF OPSWARE USERS	NUMBER OF SAS SERVERS PER CORE & (CPU CORES)
7200	280	4 (20 CPU cores)
8000	300	5 (24 CPU cores)

Multimaster Mesh Scalability

To support global scalability, you can install an Opsware core in each major facility, linking the cores in a Multimaster Mesh. The size of the Opsware core in each facility can be scaled according to local requirements.

Multimaster Mesh Availability

To support availability in a Multimaster Mesh, you can manage the servers in all facilities from a single location with the SAS Web Client or a SAS Java™ Client. Therefore, the number and location of SAS Web Client instances and SAS Java™ Clients is flexible. A common implementation is with two geographically distributed Opsware Web Clients.

In addition to Model Repository replication, a Multimaster Mesh supports the replication and caching of the packages stored in the Software Repository. Typically, the Opsware core in each facility owns the software that is uploaded to the core's Software Repository. To support availability, multiple copies of the packages can be maintained in remote Software Repositories. See the *Opsware® SAS Administration Guide* for more information.

Satellite Core CPU/Memory Requirements

Servers hosting Opsware Satellite Core installations must meet the following requirements:

- 2 CPUs per 1,500 managed servers per Satellite Core
- 2 GB RAM per 1,500 managed servers per Satellite Core

Load Balancing Additional Instances of Opsware Core Components

If Opsware SAS needs to support a larger operational environment, you might improve performance by installing additional instances the Opsware Slice Component bundle which will provide you with these additional components per slice:

- Agent Gateway
- Core Gateway

- Opsware Command Center
- Build Manager
- Web Services Data Access Engine
- Secondary Data Access engine
- Opsware Global File System

If you have installed multiple instances of the Core Component Slice, automatic load balancing between the instances will occur as requests for load services are received by the Gateway.

You can also deploy a hardware load balancer for the servers that run additional instances of the Opsware Core Component Slice. You can configure the load balancer for SSL session persistence (stickiness) with the least connections algorithm.

Chapter 3: Pre-Installation Requirements

IN THIS CHAPTER

This section discusses the following topics:

- Dual Layer DVD Requirements
- Solaris and Linux Requirements for Core Servers
- Requirements for Installing Oracle 10g using the Opsware Installer
- Network Requirements
- Windows Patch Management Requirements
- Configuration Tracking Requirements
- Opsware Global File System (OGFS) Requirements
- Time and Locale Requirements
- User and Group Requirements For Solaris and Linux

This section describes the system, environment, and network administration tasks that you must perform before you run the Opsware Installer.

Dual Layer DVD Requirements

The Opsware Product Software DVD and the Opsware Agent and Utilities DVD require a dual layer DVD drive. See “Opsware Installation Media” on page 126 for information about the Opsware DVD set.

Solaris and Linux Requirements for Core Servers

This section describes platform-specific packages and utilities that must be installed for the operating system on the server that will host an Opsware Core.

The supported operating systems for Opsware Core Components are discussed in Chapter 2, “Operating System and Hardware Requirements.”

If you plan to manually install the Oracle database or use an existing Oracle installation rather than use the Opsware-supplied Oracle database, the server that hosts the Oracle RDBMS software (required by the Opsware SAS Model Repository) has *additional* requirements, as described in “Oracle Setup for the Model Repository” on page 243.

Solaris Requirements

If you will be installing Opsware Core Server under Solaris, you must ensure that the packages listed in Table 3-1are installed. Table 3-2 lists recommended packages and Table 3-3 lists packages that must *not* be installed.

Table 3-1: Packages Required for Solaris

REQUIRED PACKAGES FOR SOLARIS		
SUNWCreq (cluster)	SUNWeurf	SUNWeudiv
SUNWadmap	SUNWi2rf	SUNWeudlg
SUNWadmc	SUNWi4rf	SUNWeudmg
SUNWdoc	SUNWi5rf	SUNWeuezt
SUNWesu	SUNWi7rf	SUNWeuhed
SUNWman	SUNWi8rf	SUNWeuluf
SUNWmkcdS	SUNWi9rf	SUNWeulux
SUNWswmt	SUNWi13rf	SUNWeuodf
SUNWtoo	SUNWi15rf	SUNWeuxwe
SUNWtoox**	SUNWtxfnt	SUNWuiu8
SUNWadmfw	SUNWinttf	SUNWuiu8x
SUNWlibC	SUNW5xmft	SUNWulcf
SUNWlibCx**	SUNWcxmft	SUNWulcfx
SUNWinst	SUNWjxmft	SUNWulocf
SUNWucbt	SUNWkxmft	SUNWuxlcf
SUNWucbtx**	SUNWeu8df	SUNWuxlcx
SUNWscpu	SUNWeu8os	SUNWeudbd
SUNWscpux**	SUNWeu8ox	SUNWeudhs
SUNWtcsh	SUNWeudba	SUNWeusru
SUNWsacom	SUNWeudda	SUNWuium
SUNWntpr	SUNWeudhr	NSCPeu8cm
SUNWntpu	SUNWeudis	
SUNWarrf		

** These packages are required only for Solaris 8 and Solaris 9.

Table 3-2: Packages Recommended for Solaris 8 and 9

RECOMMENDED PACKAGES FOR SOLARIS		
SUNWisolc	SUNWi1of	SUNWiniu8
SUNWisolx	SUNWjiu8	SUNWiniu8x
SUNWislcc	SUNWjiu8	
SUNWislcx	SUNWkiu8	
SUNWciu8	SUNWkiu8x	
SUNWciu8x	SUNWtiu8	
SUNWhiu8	SUNWtiu8x	
SUNWhiu8x		

Table 3-3: Packages That Must Be Removed from Solaris

PACKAGES THAT MUST BE REMOVED FROM SOLARIS
SUNWCpm

Other Solaris Requirements

The Opsware Core Server must also meet the following requirements:

- On the server where you will install the SAS Web Client component, you must install the J2SE Cluster Patches for Solaris. To download these patches, search for "J2SE Cluster Patches" for your version of Solaris at `http://www.sun.com/`.
- On all core servers, verify that the Network File System (NFS) is configured and running.
- For Daylight Saving Time (DST) on Solaris 9 servers, you must install the time zone patch 113225-07 or later, and libc patch 112874-33 or later. To download these patches, search for the patch ID at `http://www.sun.com/`.
- For Daylight Saving Time (DST) on Solaris 10 servers, you must install the time zone patch 122032-03 or later, and libc patch 119689-07 or later. To download these patches, search for the patch ID at `http://www.sun.com/`.

  For more information about DST changes, search for "Daylight Saving Time (DST)" at `http://www.sun.com/`.

If you attempt to download any of these files and receive an error page indicating that the file was not found, make sure you are using the correct URL. For the correct URL, check the Opsware Technical Support web site at *https://download.opsware.com*. For instructions, contact support@opsware.com.

Linux Package Requirements

For Linux AS3 32-bit x86, an Opsware Core Server must have the packages listed in Table 3-4 installed. For Linux AS4 64-bit x86, an Opsware Core Server must have the packages listed in Table 3-5 installed. For both and Linux AS4 32-bit x86 and Linux AS4 64-bit x86, the packages listed in Table 3-6 must *not* be installed.

Due to a known Linux AS4 64-bit x86 kernel bug, you must have Update 5 or later installed on all servers that will host an Opsware Core.

Table 3-4: Packages Required for Linux AS3 32-bit x86

REQUIRED PACKAGES FOR LINUX AS3 32-BIT X86		
at	iptables	patch
compat-db	kernel-source	patchutils
compat-libstdc++	libcap	sharutils
coreutils	libxml2-python	strace
cpp	libstdc++	unzip
expat	libstdc++-devel **	XFree86-libs
gcc	mkisofs *	XFree86-libs-data
glibc-devel	ncompress (contains	XFree86-Mesa-libGL
glibc-headers	uncompress utility)	xinetd
glibc-kernheaders	nfs-utils	zip
	ntp	
* mkisofs is used for premastering ISO 9660 file systems used on CD-ROMs. It is open source and available at *http://freshmeat.net,* search for “mkisofs”. ** Required for Oracle database (Model Repository)		

Table 3-5: Packages Required for Linux AS4 64-bit x86

REQUIRED PACKAGES FOR LINUX AS4 64-BIT X86
binutils-2.15.92.0.2-13.0.0.0.2.x86_64.rpm
chkfontpath-1.10.0-2.x86_64.rpm
compat-db-4.1.25-9.i386.rpm
compat-db-4.1.25-9.x86_64.rpm
cpp-3.4.6-3.x86_64.rpm
desktop-file-utils-0.9-2.x86_64.rpm
expat-1.95.7-4.i386.rpm
expat-1.95.7-4.x86_64.rpm
expat-devel-1.95.7-4.x86_64.rpm
gcc-3.4.3-22.1.x86_64.rpm
gcc-c++-3.4.6-3.x86_64.rpm
glibc-2.3.4-2.9.i686.rpm
glibc-2.3.4-2.25.x86_64.rpm
glibc-common-2.3.4-2.9.x86_64.rpm
glibc-devel-2.3.4-2.9.i386.rpm
glibc-devel-2.3.4-2.9.x86_64.rpm
glibc-headers-2.3.4-2.9.x86_64.rpm
glibc-kernheaders-2.4-9.1.87.EL.x86_64.rpm
iptables-1.2.11-3.1.x86_64.rpm
kernel-smp-2.6.9-55.EL.x86_64.rpm
kernel-smp-devel-2.6.9-55.EL.x86_64.rpm
libaio-0.3.103-3.i386.rpm
libaio-0.3.103-3.x86_64.rpm
libcap-1.10-20.i386.rpm
libcap-1.10-20.x86_64.rpm
libgcc-3.4.3-22.1.i386.rpm
libgcc-3.4.3-22.1.x86_64.rpm
libpng-1.2.7-1.el4.2.i386.rpm
libpng-1.2.7-1.el4.2.x86_64.rpm
libpng10-1.0.16-1.i386.rpm
libpng10-1.0.16-1.x86_64.rpm
libstdc++-3.4.3-22.1.i386.rpm
libstdc++-3.4.3-22.1.x86_64.rpm
libtermcap-2.0.8-39.i386.rpm
libtermcap-2.0.8-39.x86_64.rpm

Table 3-5: Packages Required for Linux AS4 64-bit x86 (continued)

REQUIRED PACKAGES FOR LINUX AS4 64-BIT X86
libxml2-2.6.16-6.i386.rpm
libxml2-2.6.16-6.x86_64.rpm
libxml2-python-2.6.16-6.x86_64.rpm
make-3.80-5.EL4.x86_64.rpm
mkisofs-2.01.1-5.x86_64.rpm
ncompress-4.2.4-41.rhel4.x86_64.rpm
nfs-utils-1.0.6-70.EL4.x86_64.rpm
ntp-4.2.0.a.20040617-4.EL4.1.x86_64.rpm
openmotif21-2.1.30-11.RHEL4.6.i386.rpm
patch-2.5.4-20.x86_64.rpm
patchutils-0.2.30-1.x86_64.rpm
pdksh-5.2.14-30.3.x86_64.rpm
popt-1.9.1-18_nonptl.i386.rpm
popt-1.9.1-18_nonptl.x86_64.rpm
readline-4.3-13.i386.rpm
readline-4.3-13.x86_64.rpm
rpm-build-4.3.3-18_nonptl.x86_64.rpm
sharutils-4.2.1-22.2.x86_64.rpm
strace-4.5.14-0.EL4.1.x86_64.rpm
sysstat-5.0.5-1.rhel4.x86_64.rpm
tcp_wrappers-7.6-37.2.i386.rpm
tcp_wrappers-7.6-37.2.x86_64.rpm
ttmkfdir-3.0.9-14.1.EL.x86_64.rpm
unzip-5.51-7.x86_64.rpm
vim-enhanced-6.3.046-0.40E.7.x86_64.rpm
vnc-4.0-8.1.x86_64.rpm
vnc-server-4.0-8.1.x86_64.rpm
xinetd-2.3.13-4.4E.1.x86_64.rpm
xinitrc-4.0.14.3-1.noarch.rpm

Table 3-5: Packages Required for Linux AS4 64-bit x86 (continued)

REQUIRED PACKAGES FOR LINUX AS4 64-BIT X86
xorg-x11-6.8.2-1.EL.13.36.x86_64.rpm
xorg-x11-Mesa-libGL-6.8.2-1.EL.13.36.i386.rpm
xorg-x11-Mesa-libGL-6.8.2-1.EL.13.36.x86_64.rpm
xorg-x11-Mesa-libGLU-6.8.2-1.EL.13.36.i386.rpm
xorg-x11-Mesa-libGLU-6.8.2-1.EL.13.36.x86_64.rpm
xorg-x11-Xvfb-6.8.2-1.EL.13.36.x86_64.rpm
xorg-x11-deprecated-libs-6.8.2-1.EL.13.36.i386.rpm
xorg-x11-deprecated-libs-6.8.2-1.EL.13.36.x86_64.rpm
xorg-x11-font-utils-6.8.2-1.EL.13.36.x86_64.rpm
xorg-x11-libs-6.8.2-1.EL.13.36.i386.rpm
xorg-x11-libs-6.8.2-1.EL.13.36.x86_64.rpm
xorg-x11-xauth-6.8.2-1.EL.13.36.x86_64.rpm
xorg-x11-xfs-6.8.2-1.EL.13.36.x86_64.rpm
xterm-192-4.EL4.x86_64.rpm
zip-2.3-27.x86_64.rpm
zlib-1.2.1.2-1.2.i386.rpm
zlib-1.2.1.2-1.2.x86_64.rpm

Table 3-6: Packages That Must Be Removed for Linux

PACKAGES THAT MUST BE REMOVED FROM LINUX		
samba	rsync	tftp**
apache	httpd	dhcp**

** Existing versions of the `tftp` and `dhcp` packages cannot reside on the same server as the OS Provisioning Boot Server component; however, they can reside on Opsware core servers that do not have the OS Provisioning Boot Server component.

To verify that the `samba` package, for example, is installed, enter the following command:

```
rpm -qa | grep samba
```

You can obtain the latest versions of these packages from the Red Hat errata web site.

To remove packages, enter the following command:


```
rpm -e package_name
```

Some packages in this list may be depended on by other packages that are installed on your system. For example, the default Red Hat installation includes `mod_python` and `mod_perl` that depend on `httpd` being installed. In order to remove packages that fulfill dependencies, you must simultaneously remove the packages that create the dependencies. In this example, you would need to enter the following command:

```
rpm -e httpd mod_python mod_perl
```

If `rpm` identifies an additional dependency, it will note which packages have dependencies on the components to be removed and fail. These packages must be added to the uninstall command line. If the chain of dependencies cannot be suitably resolved, enter the `rpm -e --nodeps` command to remove the desired packages without considering dependencies.

Additional Linux Requirements

For Linux systems, you must also adhere to the following requirements:

- Red Hat Enterprise Linux 4 AS must be at least Update 5.
- You must specify the server's initial run level as level 3 in the `/etc/inittab` file.
- If the server uses Integrated Drive Electronics (IDE) hard disks, you must enable Direct Memory Access (DMA) and some other advanced hard disk features that improve performance by running the following script as `root` on the server and then reboot the server:

  ```
  cat > /etc/sysconfig/harddisks << EOF
  USE_DMA=1
  MULTIPLE_IO=16
  EIDE_32BIT=3
  LOOKAHEAD=1
  EOF
  ```

- Due to a bug in the Linux kernel, you must configure the loopback interface to use a Maximum Transmission Unit (MTU) size of 16036 bytes or less. To make this change, perform the following tasks:

  1. Run the `ifconfig lo mtu 16036` command. This sets the MTU of the running kernel.
  2. Add the line `MTU=16036` to the end of the `/etc/sysconfig/network-scripts/ifcfg-lo` file. This causes the MTU to be properly set when the system is booted.

- Disable the Security-Enhanced Linux kernel (SELinux) on all core servers running Linux AS4 64-bit x86.
- For Daylight Saving Time (DST) on Red Hat Enterprise Linux AS 3 and AS 4, you must install the latest timezone data. You can download these timezone updates from the following location:

  `https://rhn.redhat.com/errata/RHEA-2006-0745.html`

- For Daylight Saving Time (DST) on SuSE Linux Enterprise Server 9, you must install the latest timezone data. You can download these updates from the following location:

  ```
  http://www.novell.com/support/
  dynamickc.do?externalId=3853518&sliceId=SAL_
  Public&command=show&forward=nonthreadedKC&kcId=3853518
  ```

- For Daylight Saving Time (DST) on Sun Solaris, you must install the latest timezone data. You can download these updates from:

  `www.sun.com`

- If you are using a Linux NFS server, be aware that, by default, Linux enables NFSv3, which prevents Solaris servers from entering the server pool. You can either disable NFSv3 on the Linux NFS server or you can add DHCP options to force Solaris 10 to use NFSv2:
  - To force the Solaris `miniroot` to use NFSv2, add the following lines to your DHCP configuration file:
    1. In the generic section of the DHCP configuration file, add the following lines:

       ```
       # added for nfs 2 miniroot
       option SUNW.SrootOpt code 1 = text;
       # end of nfs 2 miniroot stuff
       ```

    2. In the `solaris-sun4u`, `solaris-sun4us`, and solaris-specific-kernel classes, add the following lines:

       ```
       # added for nfs 2 miniroot
       option SUNW.SrootOpt "vers=2";
       # end of nfs 2 miniroot stuf
       ```


- To disable NFSv3 on the Linux NFS server add the following lines to the `/etc/sysconfig/nfs` file and then restart NFS:

```
MOUNTD_NFS_V3=no
MOUNTD_NFS_V2=yes
```

Requirements for Installing Oracle 10g using the Opsware Installer

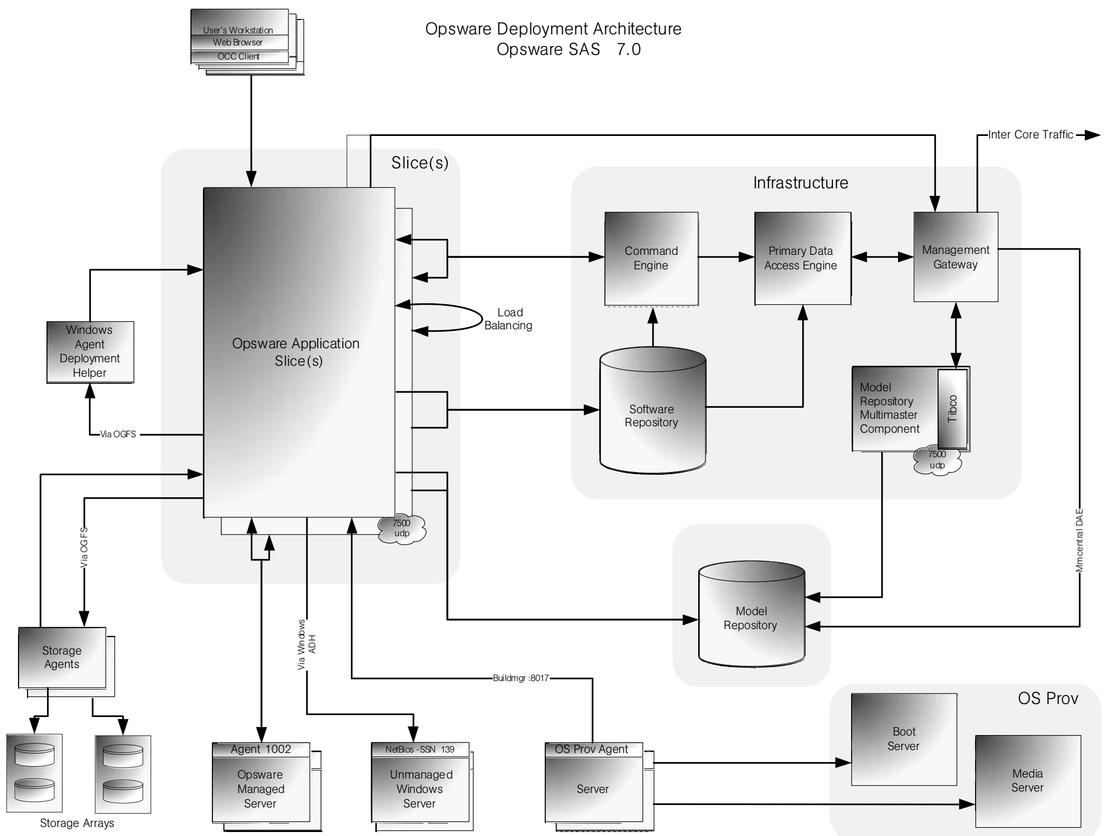
The Opsware Model Repository requires an installed Oracle database. You can use the Opsware Installer to install the Opsware supplied Oracle 10g database on a Solaris 8, Solaris 9, or Solaris 10 server or on a Red Hat Enterprise Linux 3 AS or Red Hat Enterprise Linux 4 AS server. You can also use a pre-existing Oracle installation. Whatever method you choose, you should see "Oracle Setup for the Model Repository" on page 243 for more information.

Network Requirements

This section discusses the network requirements within a facility, open ports required for Core Components, and name resolution requirements. These requirements must be met for both First Cores, Multimaster Mesh installations, and Satellite cores.

Figure 3-1 shows the network layout for an Opsware SAS Single Core configuration.

Figure 3-1: Network Layout for a Single Opsware SAS Core



Network Requirements within a Facility

Before running the Opsware Installer, your network environment must meet the following requirements:

- All Opsware Core Servers must be on the same Local Area Network (LAN or VLAN).
- There must be full network connectivity between all Opsware Core Servers and the servers that the Opsware Core will manage.
- Opsware Core Servers expect user accounts to be managed locally and cannot use the Network Information Service (NIS) directory to retrieve password and group information. During installation of the Opsware Core Components, the installer checks for the existence of certain target accounts before creating them. If you are using NIS, this check will fail.

- If you plan to use network storage for Opsware Core Components, such as the Software Repository or OS Provisioning Media Server, you must ensure that the `root` user has write access over NFS to the directories where the components will be installed.
- The speed and duplex mode of the Opsware Core's and Managed Servers' NIC adapters must match the switch they are connected to. A mismatch will cause poor network performance between the Core and Managed Servers.

Open Ports

You must configure any firewalls protecting your Core Servers to allow the ports shown in Table 3-7 to be open. Note that the ports numbers listed in the table are the default values which can be changed during the installation, so ensure you are leaving the correct ports open.

Table 3-7: Open Ports on a Firewall Protecting an Opsware Core

PORT	COMPONENT	PURPOSE
80 (TCP)	Opsware Command Center	HTTP redirector
443 (TCP)	Opsware Command Center	HTTPS Proxy for SAS Web Client UI, SAS Client, Opsware Web Services (2.2)
2001 (TCP)	Management Gateway/Core Gateways	Inbound tunnels from other Gateways (If Port 2001 is in use, rolls over to 2003)
2222 (TCP)	Opsware Global File System	Global shell session from an SSH client
3001 (TCP)	Agent Gateways	Inbound Agent connections
7580, 7581 (TCP)	Model Repository Multimaster Component	TIBCO Rendezvous web client
8017 (UDP, TCP)	Agent Gateways	Interface to the Build Manager
8080 (TCP)	Opsware Command Center	Load Balancing Gateway for the SAS Client

Table 3-8 shows the ports used by the OS Provisioning components that are accessed by servers during the provisioning process. (In Opsware SAS, provisioning refers to the installation of an operating system on a server.)

Table 3-8: Open Ports for the OS Provisioning Components

PORT	COMPONENT	SERVICE
67 (UDP)	Boot Server	DHCP
69 (UDP)	Boot Server	TFTP
111 (UDP, TCP)	Boot Server, Media Server	RPC (`portmapper`), required for NFS
Dynamic *	Boot Server, Media Server	`rpc.mountd`, required for NFS
2049 (UDP, TCP)	Boot Server, Media Server	NFS

* The `rpc.mountd` process runs on a dynamic port and is not fixed. Therefore, if you are using a firewall, it must be an application layer firewall that can understand the RPC request that the client uses to locate the port for `mountd.`The firewall must dynamically open that port.

The OS Provisioning Boot Server and Media Server run various services (such as `portmapper` and rpc.mountd) that could be susceptible to network attacks. Opsware Inc. recommends that you segregrate the OS Provisioning Boot Server and Media Server components onto their own DMZ network. When you segregate these components, the ports listed in Table 3-8 should be opened to the DMZ network from the installation client network. Additionally, the Boot Server and Media Server should have all vendor-recommended security patches applied.

Table 3-9 shows the Managed Server port that must be open for Opsware Core Server connections.

Table 3-9: Open Ports on Managed Servers

PORT	COMPONENT
1002 (TCP)	Opsware Agent

Host and Service Name Resolution Requirements

Opsware SAS must be able to resolve Opsware Core Server host names and service names to IP addresses through proper configuration of DNS or the `/etc/hosts file`.

Previous Releases

If you plan to install the Opsware Core Components on a server that had a previous Opsware SAS installation (for example, version 5.0 or 6.1), you must verify that the host names and service names resolve correctly for the new installation.

Opsware Core Servers and Host/Service Name Resolution

During the Opsware installation, the `/etc/hosts` file on machines where the Slice Component bundle is installed will be modified to contain entries pointing to the Secondary Data Access Engine, the Opsware Command Center, the Build Manager, and the fully qualified domain name of the `localhost`.

All other servers hosting Core Components must be able to resolve their own valid host name and the valid host name of any other Opsware Core Server (if you will be using a multiple core installation or Multimaster Mesh). A fully qualified name includes the subdomain, for example, `myhost.acct.buzzcorp.com`. Enter the `hostname` command and verify that it displays the fully qualified name found in the local `/etc/hosts` file.

Additionally, an Opsware Core Server must be able to resolve both the fully qualified and unqualified names of the Opsware Services. (Each service name represents an Opsware Core Component.) For example, both `truth` (unqualified) and `truth.acct.buzzcorp.com` (fully qualified) must resolve to the IP address of the server containing the Model Repository.

The list of fully qualified names of the Opsware services follows:

- `truth.`*`subdomain`* – Model Repository
- `way.`*`subdomain`* – Command Engine
- `spin.`*`subdomain`* – Primary Data Access Engine
- `theword.`*`subdomain`* – Software Repository
- `wordcache.`*`subdomain`* – Software Repository Multimaster Component (The name `wordcache` must resolve to the core server running the Software Repository.)

The Software Repository server must be able to resolve the IP address to the host name of the server hosting OGFS (part of the Opsware Component Slice). To enable this reverse lookup, configure DNS.

On Solaris 10, an OGFS installation requires the real host name of the server hosting OGFS. In the `dfstab` file on the Software Repository server, specify that the first host is the real host name of the server hosting OGFS.

OS Provisioning: DHCP Proxying

If you plan to install your OS Provisioning components on a separate network from the Opsware Core Components, you must set up DHCP proxying to the DHCP server (for example, using Cisco IP Helper). If you use DHCP proxying, the server/router performing the DHCP proxying must also be the network router so that PXE can function correctly.

The Opsware OS Provisioning Boot Server component provides a DHCP server, but does not include a DHCP proxy. For DHCP server configuration information, see "DHCP Configuration for OS Provisioning" on page 165.

Windows Patch Management Requirements

The Opsware Windows Patch Management feature requires that, before running the Opsware Installer, you obtain several files from the Microsoft software download repository and copy them to a directory that will be accessible during the Opsware installation. During the Opsware Software Repository installation process, the Opsware Installer will prompt you to enter the fully qualified path to the Microsoft files in this directory and will fail if the files do not exist at the specified location.

To obtain these files, perform the following tasks:

1. Obtain the following files from Microsoft:

    - `qchain.exe`

      The `qchain.exe` utility is a command-line program that chains hotfixes together. When you chain updates, you install multiple updates without restarting the computer between each installation.

      To download the package containing `qchain.exe`, search for "`qchain.exe`" at `http://www.microsoft.com`. Install the package on a Windows machine and note the location of the `qchain.exe` file.

- `wsusscn2.cab`

  The `wsusscn2.cab` file contains the Microsoft patch database. To download the package containing `wsusscn2.cab`, search for "`wsusscn2.cab`" at `http://www.microsoft.com`.

- `WindowsUpdateAgent20-x86.exe`

  The `WindowsUpdateAgent20-x86.exe` file is required by the `mbsacli.exe` utility. To download the package containing `WindowsUpdateAgent20-x86.exe`, search for "`WindowsUpdateAgent20-x86.exe`" at `http://www.microsoft.com`.

- `WindowsUpdateAgent20-x64.exe`

  The `WindowsUpdateAgent20-x64.exe` file is required by the `mbsacli.exe` utility. To download the package containing `WindowsUpdateAgent20-x64.exe`, search for "`WindowsUpdateAgent20-x64.exe`" at `http://www.microsoft.com`.

- `mbsacli.exe`

  Packaged with the MBSA 1.2.1 software, the `mbsaclie.exe` utility is a command-line program that performs security scans. To download the package containing `MBSA 1.2.1`, search for "`MBSA 1.2.1`" at `http://www.microsoft.com`.

  After the download, on a Windows machine run `MBSASetup-EN.msi` to install MBSA 1.2.1.

  In the directory where you installed MBSA 1.2.1, note the location of the `mbascli.exe` file. By default, the file is installed here:

  ```
  %program files%\Microsoft Baseline Security
  Analyzer\mbascli.exe
  ```

- `mbsacli20.exe`

  This file is packaged with MBSA 2.0 that you download by searching for "`MBSA 2.0`" at `http://www.microsoft.com`.

  After the download, on a Windows machine run `MBSASetup-EN.msi` to install MBSA 2.0. In the directory where you installed MBSA 2.0, locate the `mbsacli.exe` file. By default, the file is installed here:

  ```
  %program files%\Microsoft Baseline Security Analyzer
  2\mbsacli.exe
  ```

  Copy the `mbsacli.exe` file of MBSA 2.0 to a new file named `mbsacli20.exe`.

- `wusscan.dll`

  The `wusscan.dll` file is in the directory where you installed MBSA 2.0. By default, the file is here:

  ```
  %program files%\Microsoft Baseline Security Analyzer
  2\wusscan.dll
  ```

2. Copy the files you obtained in the preceding step to a directory that will be accessible by the Opsware Installer during the Software Repository installation. For example, you might copy the files to the following directory:

   ```
   /opsw/win_util
   ```

3. Verify that the destination directory contains all these files:

   ```
   mbsacli.exe
   mbsacli20.exe
   WindowsUpdateAgent20-x86.exe
   WindowsUpdateAgent20-x64.exe
   qchain.exe
   wsusscn2.cab
   wusscan.dll
   ```

4. Write down the name of the directory containing the files. When you run the Opsware Installer, during the Software Repository installation, you will prompted to provide the fully qualified directory path. The location you provide will be stored in the parameter, `windows_util_loc`.

These patch management files will be copied to Windows servers during Opsware Agent deployment. If you upload newer versions of the files to the Software Repository later, they will be downloaded to the managed Windows servers during software registration. After the core is installed and running, you can upload new versions of these files with the Patch Settings window of the SAS Client. For more information, see “Agent Installation on Windows 2000 and Windows 2003 Servers” on page 48.

For information on Windows Patch Management, see the *Opsware® SAS User’s Guide: Application Automation*.

Configuration Tracking Requirements

The Configuration Tracking feature tracks, backs up, and recovers critical software and system configuration information across Unix and Windows servers. When you enable the Opsware Configuration Tracking feature for a facility, by default, a separate partition is created on the server running the Software Repository. That partition will contain this Configuration Tracking backup directory:

```
/var/opt/opsware/word/<facility-name>/acsbar
```

You can optionally specify that the backup directory be created under the Software Repository root directory during Opsware installation.

The Configuration Tracking feature uses this directory to store backups of tracked configuration files and databases. The configuration tracking backup directory is relative to the Software Repository root directory:

```
<word_root>/<facility_name>/acsbar
```

Opsware Global File System (OGFS) Requirements

This section discusses requirements for the Opsware Global File System (OGFS).

OGFS Store and Audit Hosts

When you run the Opsware Installer interviewer in advanced mode, you can specify values for the `ogfs.store.host` and `ogfs.audit.host` parameters. (See “Opsware Global File System Prompts” on page 122.) If you set either of these parameters to point to a host that runs neither the Slice Component bundle (which contains OGFS) nor the Infrastructure Component bundle (which contains the Software repository), then perform the following steps on the host you do specify:

1. With `mkdir`, create the directories that you specified for the `ogfs.store.path` and `ogfs.audit.path` parameters.
2. Modify the export tables.

In these examples, the Slice Component bundle is installed on two separate hosts within the same core.

---

1. On a Solaris host, modify the /etc/dfs/dfstab file, similar to this:

```
# Begin Opsware ogfs export
share -F nfs -o anon=0,rw=1.2.3.4:1.2.3.5 /export/ogfs/
store
share -F nfs -o anon=0,rw=1.2.3.4:1.2.3.5 /export/ogfs/
audit
# End Opsware ogfs exports
```

   where 1.2.3.4 and 1.2.3.5 are example IP addresses of the two Slice Component bundle hosts and where /export/ogfs/store and /export/ogfs/audit are corresponding paths that exist on the host from where you are exporting the OGFS data.

2. On a Linux host, modify the /etc/exports file, such as:

```
# Begin Opsware ogfs export
/export/ogfs/store 1.2.3.4(rw,no_root_squash,sync) \
1.2.3.5(rw,no_root_squash,sync)
/export/ogfs/audit 1.2.3.4(rw,no_root_squash,sync) \
1.2.3.5(rw,no_root_squash,sync)
# End Opsware ogfs exports
```

   where 1.2.3.4 and 1.2.3.5 are example IP addresses of the two Slice Component bundle hosts and where /export/ogfs/store and /export/ogfs/audit are corresponding paths that exist on the host from where you are exporting the OGFS data.

3 After you add new entries to the export tables, export the directories or restart the Network File System using standard system procedures.

Remember to verify that the NFS Daemon will start when the system reboots.

Name Service Caching Daemon (nscd) and OGFS

If the Name Service Caching Daemon (nscd) runs on the same server as the Slice Component bundle, then users cannot open a global shell session with a direct ssh connection. If ncsd is running on the Slice Component bundle server, the Opsware Installer turns it off and runs the chkconfig nscd off command to prevent it from starting after a reboot. No action is required.

Time and Locale Requirements

This section discusses the time and locale requirements for Opsware Core Servers.

Core Time Requirements

Opsware Core Servers (either Single Core or Multimaster) and Opsware Satellite Core Servers must meet the following requirements. These time requirements do not apply to Managed Servers.

- All Opsware Core Servers must have their time zone set to Coordinated Universal Time (UTC).
- All Opsware Core Servers must maintain synchronized system clocks. Typically, you will synchronize the system clocks through an external server that uses NTP (Network Time Protocol) services.

Linux Time Configuration

To configure the time zone on a Linux server, perform the following tasks:

1. Copy or link

   `/usr/share/zoneinfo/UTC`

   to

   `/etc/localtime`.

2. Ensure that the `/etc/sysconfig/clock` file contains the following lines:

```
ZONE="UTC"
UTC=true
```

Solaris Time Configuration

To configure the time zone on a Solaris server, verify that the `/etc/TIMEZONE` file contains the following line:

```
TZ=UTC
```

Locale Requirements

The servers hosting the Model Repository and the Software Repository must have the `en_US.UTF-8` locale installed.

To display data from Managed Servers using various locales, the server hosting the Opsware Global File System (OGFS) must also have all the locales installed.

To enable non-English locales for Windows patching, follow the instructions in "Locales for Windows Patching" in the *Opsware® SAS User's Guide: Application Automation*.

To verify whether the `en_US.UTF-8` locale is installed on a server, enter the following command:

```
echo $LANG
```

To define or modify the locale, enter the following values in the `/etc/sysconfig/i18n` file:

```
LANG="en_US.UTF-8"
SUPPORTED="en_US.UTF-8:en_US:en"
```

User and Group Requirements For Solaris and Linux

During installation on Solaris and Linux servers, the Opsware SAS Installer creates three users (if you are installing OMDB, its installer will also add a user). These users and groups are:

Table 3-10: Users and Groups Created During an Opsware SAS Install

USERID	GROUP	UID	GROUPID	HOME DIRECTORY	SHELL
twist	twist		other	/var/opt/opsware/twist	/bin/sh twist
occ	occ		occ	/var/opt/opsware/occ	/bin/sh occ

If your security policies disallow the creation of these users and groups during installation, you will need to add them manually.

Chapter 4: Installation Methods and Checklists

IN THIS CHAPTER

This section discusses the following topics:

- Types of Opsware SAS Installations
- Opsware Core Installation Process Flow
- Installation Checklists

The section reviews the types of Opsware installations, gives a general outline of the core installation process, and provides checklists that will help you prepare for and complete the installation process.

Types of Opsware SAS Installations

There are three basic types of Opsware SAS installations: First Core (Single Core), Multimaster Mesh, and Satellite Core.

- **First Core or Single Core** (formerly Standalone Core): A Single Core typically provides management capabilities for servers in a single facility. By definition, a Single Core does not communicate or exchange information with other Opsware Cores however it can communicate with Opsware Satellite installations in remote facilities. The core contains all Opsware SAS components including the Management Gateway, so it can easily become the First Core for a Multimaster Mesh.
- **Multimaster Mesh**: A *Multimaster Mesh* is a set of two or more Opsware Cores that communicate through Opsware Management Gateways and can perform real-time synchronization of the data about their Managed Servers contained in their respective Model Repositories over the network.

  The Model Repositories in each of the cores are continually updated so that they are always exact duplicates of each other. All the servers in a Multimaster Mesh can be managed through a single Opsware Command Center. A Multimaster Mesh is best for larger networks that span multiple facilities.

- **Satellite**: Satellite installations are appropriate for smaller, remote sites that may not have the installed infrastructure for a full Opsware core installation. A satellite installation is not a full Opsware Core installation (it does not include the Model Repository (database)), but it does provide some core capabilities by providing network communication with a core through an Opsware Gateway. It also allows you to manage bandwidth between connected sites. A Satellite installation must be linked to at least one core, which can be either a Single Core or part of a Multimaster Mesh.

This guide uses the term *facility* to refer to the collection of servers and devices that reside in a single physical location. A facility can be all or part of a data center, server room, or computer lab. Each Opsware core or Satellite is associated with a specific facility.

Opsware Core Installation Process Flow

The six main phases of the Opsware core installation process are summarized below. For more detailed information, see the cross references associated with each step.

1. **Planning**: In the planning phase, you must decide which facilities and servers you will manage with Opsware SAS. You must also choose the type of Opsware SAS installation that is appropriate for your site(s) and ensure that you have the required hardware and software, including operating systems, and sufficient network connectivity.

   See Chapter 1, "Opsware SAS Architecture"

   See Chapter 2, "Operating System and Hardware Requirements" on page 45 of this guide for more information.

2. **Pre-installation Requirements**: Before beginning a core installation, whether it is a Single Core or a core in a Multimaster Mesh, you must perform such administrative tasks as ensuring that host names can be resolved, required ports are open and available, and installing any necessary operating system utilities, packages, and/or patches.

   See Chapter 3, "Pre-Installation Requirements" on page 59 of this guide for more information.

3 **Prerequisite Information for Installer Interview**: the Opsware Installer Interview Mode requires that you have certain information about your operational environment available because you will be asked to enter it during the interview. The information you provide will be saved into a *Response File* that will be used to set up the Core Server environment. You must gather this information and have it at hand as you run the pre-installation interview. Some examples of the information required are the name of the Facility to be managed by the core, the authorization domain, hostnames and IP addresses, and passwords used for Opsware users and the Oracle database, and so on.

For a detailed description of the information required during the Opsware Installer Interview, see Chapter 5, “Prerequisites for the Installer Interview”.

4 **Opsware Core Installation**: During this phase, you will run the Opsware Installer, complete the pre-installation interview to create the required response file, and then install one of the following types of Opsware SAS Cores or Opsware Satellite:

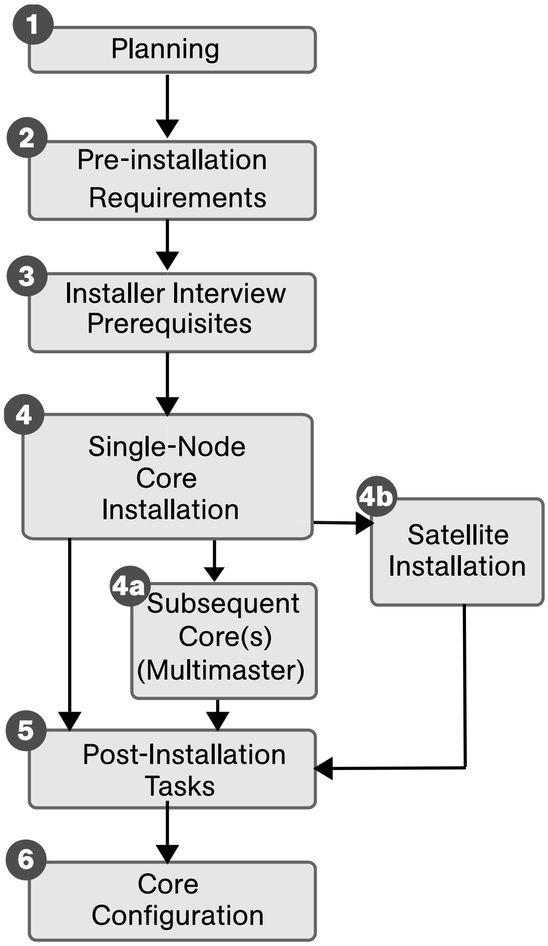
- **First or Single Core Installation**: See Chapter 6, “Installing the First Opsware Core” on page 135 of this guide for more information.
- **Subsequent Core Installations for a Multimaster Mesh:** See Chapter 8, “Multimaster Mesh Installation” on page 183 of this guide.
- **Satellite Core Installation**: See Chapter 9, “Satellite Installation” on page 205 of this guide for more information.

5 **Post-installation Tasks**: See Chapter 7, “First Core Post-Installation Tasks” on page 151 of this guide.

6 **Core Configuration**: You will configure Opsware SAS, performing tasks such as creating Opsware users and groups. At the end of this phase, Opsware SAS is ready for operational use by system administrators. See the *Opsware® SAS Administration Guide* for more information.

Figure 4-1 shows the overall process of an Opsware core installation.

Figure 4-1: Opsware Core Installation Process Flow



Installation Checklists

This section provides the following pre-installation checklists that you may find helpful in planning your Opsware installation:

- Overall Planning Checklist
- Core-Specific Planning Checklist
- Specific Core Requirements Checklist

- Pre-Installation Tasks Checklist
- Post-Installation Tasks Checklist

Overall Planning Checklist

The following checklist summarizes decisions regarding the overall design of your Opsware SAS installation.

Table 4-1: Overall Planning Checklist

OVERALL PLANNING ITEM	ANSWER
How many Facilities (locations/data centers) will you manage with Opsware SAS?	
In each of these Facilities, how many servers do you expect to manage with Opsware SAS?	
What is the naming convention for the Opsware Facilities? (For example, you might use site, building, or city names.)	
Have you taken an inventory of the operating systems and applications on the servers that you will manage with Opsware SAS?	
Are all installed operating systems on the servers you plan to manage compatible with Opsware SAS?	
Which of the following Opsware SAS architectures have you chosen? • Single Core/First Core • Multimaster Mesh	
Do you plan to install Satellites?	

Table 4-1: Overall Planning Checklist (continued)

OVERALL PLANNING ITEM	ANSWER
Which Opsware SAS features will you use?	
What is your installation schedule for the Opsware SAS Core and its components and for deploying Opsware Agents on the servers to be managed?	
Will you install the OS Provisioning Boot Server/Media Server bundle?	
Which operating systems will you provision (install) with Opsware OS Provisioning?	
What applications will you provision (install) with Opsware SAS?	
If you will be using Multimaster capabilities, how fast are the network connections between the Opsware Cores?	
Will you need Opsware Satellite capabilities, if so for how many sites?	
How many servers will be managed by the Satellite?	
In which remote Facilities will you install Satellite Cores?	
With which Cores will the Satellite communicate?	
How fast are the network connections between the Satellites and the core?	

Table 4-1: Overall Planning Checklist (continued)

OVERALL PLANNING ITEM	ANSWER
Have you diagrammed your system including the hosts that will run the Opsware Core Components? If applicable, the diagram should show the network connectivity between Multimaster Cores and between Cores and Satellites.	

Core-Specific Planning Checklist

The following checklist of design decisions should be completed for each Opsware Core installation.

Table 4-2: Core-Specific Planning Checklist

SPECIFIC CORE PLANNING ITEM	ANSWER
What is the name of the facility that this core will be associated with?	
For the Primary (First) Core, what is the Facility ID and the default customer name?	
How many servers will this Opsware Core manage?	
Will the Opsware Model Repository use: • The default Oracle software and database installed by the Opsware Installer? • An existing Oracle installation? Who is the DBA? Have you contacted the DBA about the required Oracle configuration changes needed for Opsware SAS?	

Table 4-2: Core-Specific Planning Checklist (continued)

SPECIFIC CORE PLANNING ITEM	ANSWER
Will you distribute the Opsware Core Components across multiple servers? If yes, diagram where the components are to be installed.	
What are the host names of the servers on which the Core Components will be installed?	
For a multiple-server core, will you have multiple instances of the Slice Component bundle?	
Will you install the following Opsware components into their own DMZ network? • OS Provisioning Boot Server • OS Provisioning Media Server	
Do you have the necessary licenses for Oracle?	
Have you written your backup and recovery plan for the servers running Opsware SAS?	
Have you contacted your database administrator (DBA)? Your DBA will need to monitor the Oracle database when it goes into production.	
Have you contacted your network administrator? the network administrator will need to setup host name resolution (`/etc/hosts`, DNS) before the installation and may need to run a DHCP configuration tool after the installation.	

Specific Core Requirements Checklist

The following checklist summarizes the technical requirements that must be met on each server before each Opsware core installation.

Table 4-3: Specific Core Requirements Checklist

REQUIREMENT	ANSWER
Have the servers on which you will install the Opsware Core Components been racked and stacked?	
Do you have root access to these servers?	
Do you have the permissions required to mount the Opsware SAS DVDs and copy their contents to the Core Servers?	
Are the Core Servers running a supported operating system?	
Do the Core Servers meet the minimum Opsware CPU requirements?	
Do the Core Servers meet the minimum Opsware memory requirements?	
Do the Core Servers meet the disk space requirements?	
Are the servers for an individual core on the same LAN or VLAN? (Multimaster Cores must be on separate VLANs.)	
Do the Core Servers have network connectivity to the servers they will manage?	
Have you verified that Network Information System (NIS) is *not* running on the Core Servers?	

Table 4-3: Specific Core Requirements Checklist (continued)

REQUIREMENT	ANSWER
If you will be using the Network File System (NFS) for Opsware Core Components, such as the Software Repository or Media Server, does the root user have write access over NFS to the directories where the components are to be installed?	
Does the link speed and duplex of the core and managed servers match the switch to which they are connected?	
Are the necessary TCP ports open on the core and managed servers?	

Pre-Installation Tasks Checklist

The following checklist summarizes the tasks you must perform before installing an Opsware Core.

Table 4-4: Pre-Installation Tasks Checklist

PRE-INSTALLATION TASK	TASK COMPLETED?
For the servers that will run the Opsware Core Components, perform the specific tasks for Linux and Solaris described in the section "Solaris and Linux Requirements for Core Servers" on page 60.	
Set up the host name resolution (`/etc/hosts` or DNS) for the core servers.	
If OS Provisioning occurs on a separate network from the Opsware Core Components, set up DHCP proxying.	
Obtain `mbsacli.exe` and the other utilities required for patches from Microsoft and copy them to a location on your network that is accessible by the Opsware installer.	

Table 4-4: Pre-Installation Tasks Checklist (continued)

PRE-INSTALLATION TASK	TASK COMPLETED?
Synchronize the system clocks on the Core Servers with an external Network Time Protocol (NTP) service.	
For a Multimaster Mesh installation, see the section “Prerequisites for Multimaster Mesh Installations” on page 184.	
Verify that you have followed the instructions in Chapter 5, “Prerequisites for the Installer Interview”.	

Post-Installation Tasks Checklist

The following checklist summarizes the tasks you must perform *after* installing an Opsware core. For more information, see the “Post-Installation Tasks” chapter of the *Opsware® SAS Planning and Installation Guide*.

Table 4-5: Post-Installation Tasks Checklist

POST-INSTALLATION TASK	TASK COMPLETED?
Install the Windows Agent Deployment Helper.	
OS Provisioning: Configure DHCP for OS Provisioning. You may use the DHCP server included with Opsware SAS or an external DHCP server.	
OS Provisioning: For Windows OS provisioning, the host name `buildmgr` should resolve on Windows installation clients.	
Patch Management: (on Windows NT or 2000) Create a silent-installable version of IE 6.0 or later.	
Multimaster Mesh: Associate customers with the new facility.	

Table 4-5: Post-Installation Tasks Checklist (continued)

POST-INSTALLATION TASK	TASK COMPLETED?
Multimaster Mesh: Update the group permissions for the new facility.	
Multimaster Mesh: Verify that the multimaster transaction traffic is flowing between the cores.	

Chapter 5: Prerequisites for the Installer Interview

IN THIS CHAPTER

This section discusses the following topics:

- The Opsware Installer Interview Mode
- Model Repository Prompts
- Database (Model Repository) Password Prompts
- Opsware Component Password Prompts
- Facility Prompts
- Opsware SAS Feature Prompts
- Opsware Gateway Prompts
- Opsware Global File System Prompts
- Uninstallation Prompts
- Using the Opsware Installer

This section lists the information about your environment that you will need gather to complete the Opsware Installer interview. It also provides information about the installer command line (CLI) syntax, log files, and Opsware Installer distribution on DVDs.

The Opsware Installer Interview Mode

Before installing the First Core, you must run the Opsware Installer in Interview Mode to provide certain information about your facility's environment. For example:

- Passwords (Opsware Admin, Database Administrator, etc.)
- Service Names (TNS name)
- Configuration parameter values
- Path names for programs, configuration file, logs
- IP Addresses for Core hosts and devices hosting Core Components
- Gateway port numbers, etc.

When started in *Interview Mode*, the Opsware Installer displays a series of *prompts* to which you will provide information about your environment. The specific prompts will vary depending on whether you choose the *Simple* or *Advanced* interview mode. All responses you make will be stored on the server from which you run the Opsware Installer in a *Response File* that is used during the installation.

After the interview completes, you can either continue the installation using the response file you just created or quit and continue the installation later. You may also use this response file when you install Subsequent Cores in a Multimaster Mesh or do a core upgrade. Therefore, you should record the location of the response file so that it can be easily found.

Opsware Installer Interview Prompts

Before you run the Installer interview, you must gather the information that you will enter when prompted during the interview process. Examples of this information are: the password for the Oracle `opsware_admin` user, the Opsware facility name for the core, and the Opsware authorization domain, etc.

Use the tables below, which list the various prompts that you will see when running the Installer interview, to compile your responses before invoking the Opsware Installer Interview. Prompts seen only during the Advanced Interview mode are labeled with the word **Advanced**.

When you run the Opsware Installation script, the Installer prompts you to choose either the **Simple** or **Advanced** interview. If you choose Simple mode, the default values will be used for certain values, for example, passwords for the Oracle database, the Model Repository (`truth)` and Data Access Engine (`spin)` user, ports used by the Opsware Gateways, among others. In Advanced Mode, you can select values other than the default, giving you finer control.

Model Repository Prompts

The Model Repository is the database that stores information about the hardware and software deployed in the operational environment. Most of the Model Repository interview prompts apply only to a Single or First Core installation.

Table 5-1 lists the Model Repository prompts and the expected response.

Table 5-1: Model Repository Prompts

PROMPT	RESPONSE
Please enter the service name (aka TNS name) of the Model Repository instance in the facility where the Opsware Installer is being run. **Parameter**: `truth.servicename`	Specify the service name, also known as the *alias*, for the Model Repository. For a Single Core, this is the server on which you are running the Opsware Installer. If you are installing the default Oracle database created by the Opsware Installer, the service name you provide here will be associated with the database during installation. If you intend to use an existing Oracle database, you can find the service name by looking in the `tnsnames.ora` file on the Model Repository instance. The service name is the value before the first equals sign (=) in the file. The location of this file can vary, so check with your DBA if you are not sure where to look. **Source**: The DBA who created the Oracle database. **Example**: `truth.opsware.com`

Table 5-1: Model Repository Prompts (continued)

PROMPT	RESPONSE
Enter the service name (aka TNS name) of the Model Repository instance. **Parameter:** `slaveTruth.servicename`	Specify the service name, also known as the *alias*, for the core's Model Repository. You will see this prompt only when defining a new First Core. If this is a new installation, the service name you specify will be associated with the Model Repository during installation. If you plan to use an existing Model Repository, you can find the service name by looking in the `tnsnames.ora` file on the Model Repository instance. The location of this file can vary, so check with your DBA if you are not sure where to look. **Source**: The DBA who created the Oracle database. **Example**: `truth02.opsware.com`
Enter the SID of the Oracle instance that contains the Data Model Repository. **Parameter**: `truth.sid`	Specify the database system ID (SID) that was set when Oracle was installed on the server where the Model Repository is installed. If you are installing the Opsware-supplied Oracle database created by the Opsware Installer, the SID is `TRUTH`. If you have an existing Opsware-supplied Oracle database, you will not be asked to supply this parameter. For an existing non-Opsware-supplied Oracle database, you can find the SID by looking in the `tnsnames.ora` file. The location of this file can vary, so check with your DBA if you are not sure where to look. **Source**: The DBA who created the Oracle database. **Example**: `DTC05`

Table 5-1: Model Repository Prompts (continued)

PROMPT	RESPONSE
Enter the path of the Oracle home directory. **Parameter**: `truth.orahome`	Specify the base directory of the Oracle database installation. If you are installing the Opsware-supplied Oracle database created by the Opsware Installer, the default location of `ORACLE_HOME` is `/u01/app/oracle/product/10.2.0/db_1`. If you have an existing Opsware-supplied Oracle database, you will not be prompted for this parameter. For an existing non-Opsware-supplied Oracle database, you can determine the Oracle home directory by logging in as the `oracle user` on the Model Repository server, and checking the value of the `$ORACLE_HOME` environment variable. (For a remote database installation, this parameter refers to the Oracle Client on the Model Repository server.) **Source**: The DBA who created the Oracle database. **Example**: `/u01/oracle/product/9.1 or /u01/app/oracle/product/10.2.0/db_1`

Table 5-1: Model Repository Prompts (continued)

PROMPT	RESPONSE
Enter the fully-qualified path to the TNS admin directory (where the `tnsnames.ora` file resides). **Parameter**: `truth.tnsdir`	Specify the directory that contains the `tnsnames.ora` file. **Note**: This directory and path must be the same on all servers in a core. For example, since the Data Access Engine must access the `tnsnames.ora` file to connect to the Model Repository, the location of `tnsnames.ora` directory on the Data Access Engine server must be the same as the directory location on the Model Repository server. If you are installing the Opsware-supplied Oracle database created by the Opsware Installer, the `tnsnames.ora` file will be installed under `/var/opt/oracle.` If you have an existing Opsware-supplied Oracle database installed, you will not be prompted for this parameter. If you have an existing non-Opsware-supplied Oracle database, the location of the `tnsnames.ora` file can vary, so check with your DBA if you are not sure where to look. **Source**: The DBA who created the Oracle database. **Example**: `/var/opt/oracle`

Table 5-1: Model Repository Prompts (continued)

PROMPT	RESPONSE
Enter the fully qualified path to the directory where the export file will be saved. **Parameter**: `truth.dest`	*You must create this directory on the Model Repository server before you run the Opsware Installer.* Specify the directory in which the database export file will be saved. This directory must reside on the Model Repository server in the source facility. You will see this prompt only when installing a new First Core. **Note**: When adding a facility to a Multimaster Mesh, you must export the Model Repository from the source facility, then copy it to the destination facility. **Source**: Variable **Example**: `/export/home/core1`
Enter the fully qualified path to the directory that contains the export file. **Parameter**: `truth.sourcePath`	*This parameter is used when a new facility is added to a Multimaster Mesh and the source export file is copied to the new facility. This directory must exist on the server and contain the database export file before you run the Opsware Installer on the server.* Specify the directory on the destination facility's Model Repository server to which you copied the export data file from the source facility. **Source**: Variable **Example**: `/export/home/core2`
Enter the IP address of the host where you want to install the Model Repository in the new facility. **Parameter**: `slaveTruth.truthIP`	Specify the IP address of the host on which you will install the Model Repository for the new target core. **Source**: Variable **Example**: `192.168.165.242`

Table 5-1: Model Repository Prompts (continued)

PROMPT	RESPONSE
Enter the IP address of the host where you want to install the Multimaster Infrastructure Components (vault). **Parameter**: `slaveTruth.vaultIP`	Specify the IP address of the host on which you will install the Model Repository Multimaster Component. The Model Repository Multimaster Component propagates and synchronizes changes from each Model Repository database to all other Model Repository databases **Source**: Variable **Example**: `192.168.165.242`

Database (Model Repository) Password Prompts

To ensure a secure installation of Opsware SAS, the Opsware Installer prompts you to set passwords for numerous Oracle user accounts that the Opsware components use to interact with one another. The passwords must meet the following standard Oracle criteria:

- The password cannot contain an Oracle reserved word (see Oracle's documentation for a full list).
- The password must be between 1 and 30 characters long.
- The password must start with a letter and use only alphanumeric and underscore (_) characters.

Table 5-2 lists the Database prompts and the expected responses.

Table 5-2: Database Password Prompts

PROMPT	RESPONSE
Please enter the database password for the opsware_admin user. This password is used to connect to the Oracle database. **Parameter:** truth.oaPwd	Specify the opsware_admin password created by your database administrator. opsware_admin is an Oracle user that the Opsware Installer uses during installation to perform required tasks. If you are installing the Opsware-supplied Oracle database created by the Opsware Installer, the password you provide here will be associated with opsware_admin during installation of the database. If you have an existing Oracle database installation, this must be the password that your DBA set for the opsware_admin user when setting up the Oracle instance on the server. **Source**: Oracle DBA

Table 5-2: Database Password Prompts (continued)

PROMPT	RESPONSE
Advanced Please enter the database password for the `lcrep` user. **Parameter**: `truth.lcrepPwd`	Specify the password for the `lcrep` database user. The Opsware Installer automatically creates an Oracle user `lcrep`, which Opsware SAS uses internally for running multimaster replication between Opsware cores. The password you specify here will be associated with the `lcrep` user during installation. If you have an existing Oracle database installation, this must be the password that your DBA set for the `lcrep` user when setting up the Oracle instance on the server. **Source**: Variable, however, it must meet the requirements for Oracle passwords. **Example**: `x145_pwd03`
Please enter the database password for the `gcadmin` user. **Parameter**: `truth.gcPwd`	Specify the password for the `gcadmin` database user. The Opsware Installer automatically creates an Oracle user `gcadmin`, which Opsware SAS uses internally for removing old data from certain tables (referred to as the garbage collection process). If you have an existing Oracle database installation, this must be the password that your DBA set for the `gcadmin` user when setting up the Oracle instance on the server. **Source**: Variable, however, it must meet the requirements for Oracle passwords. **Example**: `x145_pwd03`

Table 5-2: Database Password Prompts (continued)

PROMPT	RESPONSE
Advanced Please enter the database password for the `truth` user. **Parameter**: `truth.truthPwd`	Specify the password for the Model Repository (`truth)` schema owner. The `truth` user is the main schema owner for the Model Repository and is automatically created by the Opsware Installer. If you have an existing Oracle database installation, this must be the password that your DBA set for the `truth` user when setting up the Oracle instance on the server. **Source**: Variable, however, it must meet the requirements for Oracle passwords. **Example**: `x145_pwd03`
Advanced Please enter the database password for the `spin` user. **Parameter:** `truth.spinPwd`	Specify the password for the Data Access Engine (`spin)` user. **Note**: Passwords for the Data Access Engine (`spin)` user must be the same for all the cores in the mesh. The Opsware Installer automatically creates this database user. If you have an existing Oracle database installation, this must be the password that your DBA set for the Data Access Engine (`spin)` user when setting up the Oracle instance on the server. **Source**: Variable, however, it must meet the requirements for Oracle passwords **Example**: `x145_pwd03`

Table 5-2: Database Password Prompts (continued)

PROMPT	RESPONSE
Advanced Please enter the database password for the `twist` user. **Parameter**: `truth.twistPwd`	Specify the password for the Web Services Data Access Engine (`twist`) user. The Opsware Installer automatically creates this user. If you have an existing Oracle database installation, this must be the password that your DBA set for the Web Services Data Access Engine (`twist`) user when setting up the Oracle instance on the server. **Source**: Variable, however, it must meet the requirements for Oracle passwords. **Example**: `x145_pwd03`
Please enter the database password for the `vault` user. **Parameter:** `truth.vaultPwd`	Specify the Model Repository Multimaster Component (`vault`) user password. The Opsware Installer automatically creates the Model Repository Multimaster Component (`vault`) user. The Model Repository Multimaster Component propagates and synchronizes changes from each Model Repository database to all other Model Repository databases. If you have an existing Oracle database installation, this must be the password that your DBA set for the Model Repository Multimaster Component (`vault`) user when setting up the Oracle instance on the server. **Source**: Variable, however, it must meet the requirements for Oracle passwords. **Example**: `x145_pwd03`

Table 5-2: Database Password Prompts (continued)

PROMPT	RESPONSE
Advanced Please enter the database password for the `public views` user. **Parameter**: `truth.pubViewsPwd`	Specify the password for the `public_views` user, which Opsware SAS uses for the Data Center Intelligence (DCI) module (server reporting). The DCI module uses this password when connecting with the Model Repository. The Opsware Installer automatically creates the `public_views` user. If you are using Brio™, Crystal Reports™, or other data reporting tools with the DCI module, you will be asked for the database user password when logging in to those applications so that you have read-only access to the Model Repository data. If you have an existing Oracle database installation, this must be the password that your DBA set for the `public_views` user when setting up the Oracle instance on the server. **Source**: Variable, however, it must meet the requirements for Oracle passwords. **Example**: `x145_pwd03`
Advanced Please enter the database password for the `AAA` user. **Parameter**: `truth.aaaPwd`	Specify the password for the `AAA` user, (Access, Authentication, and Authorization (AAA) feature). The Opsware Installer automatically creates the `AAA` user. If you have an existing Oracle database installation, this must be the password that your DBA set for the `AAA` user when setting up the Oracle instance on the server. **Source**: Variable, however, it must meet the requirements for Oracle passwords. **Example**: `x145_pwd03`

Table 5-2: Database Password Prompts (continued)

PROMPT	RESPONSE
Advanced Please enter the password to use for DCML Exchange Tool user. **Parameter:** `truth.detuserpwd`	Specify the password for the DCML Exchange Tool user (`DETUSER)`. The Opsware Installer automatically creates the `DETUSER`. If you have an existing Opsware installation, this must be the password previously set for the `DETUSER`. **Source**: Variable, however, it must meet the requirements for Oracle passwords. **Example**: `x145_pwd03`

Opsware Component Password Prompts

Table 5-3 lists the password prompts for components other than the Model Repository and the expected responses.

If this installation is for a Multimaster Mesh, the following passwords must be the same for all cores belonging to the mesh.

Table 5-3: Component User and Password Prompts

PROMPT	RESPONSE
Advanced Please enter the password for the Build Manager user. **Parameter:** `twist.buildmgr.passwd`	Specify the password for the Build Manager user (`buildmgr`). The `buildmgr` process will use this password when connecting to and authenticating with the Web Services Data Access Engine. The Opsware Installer automatically creates the Build Manager user (`buildmgr`). If you have an existing Opsware installation, this must be the password previously specified for the `buildmgr` user for the other cores in the mesh. **Password Restrictions**: The password cannot contain spaces or a forward slash (/). **Source**: Variable **Example**: `x145_pwd03`

Table 5-3: Component User and Password Prompts (continued)

PROMPT	RESPONSE
Advanced Please enter the password for the `integration` user. **Parameter:** `twist.integration.passwd`	Specify the password for the `integration` user. Customers can use the `integration` user to access the SOAP APIs on the Web Services Data Access Engine. The Opsware Installer automatically creates the `integration` user. If you have an existing Opsware installation, this must be the password previously set for the `integration` user **Password Restrictions**: The password cannot contain a forward slash (/). **Source**: Variable **Example**: `x145_pwd03`
Please enter the password for the cryptographic material. **Parameter:** `decrypt_passwd`	Specify the password to use for decrypting cryptographic material. This password must be the same across all Opsware cores in a Multimaster Mesh. If you have an existing Opsware installation, this must be the password previously set for decrypting cryptographic material. **Password Restrictions**: The password cannot contain spaces and it must be between 4 and 20 characters long. **Source**: Variable **Example**: `x145_pwd03`

Table 5-3: Component User and Password Prompts (continued)

PROMPT	RESPONSE
Please enter the password for the Opsware `admin` user. this is the password that will be used to authenticate the user `admin` to Opsware. **Parameter:** `cast.admin_pwd`	Specify the password for the Opsware `admin` user. **Password Restrictions**: This password cannot contain spaces. The Opsware Installer automatically creates the `admin` user. The first time you log in to the SAS Web Client to access a new Facility, you must log in as the `admin` user. **Source**: Variable **Example**: `x145_pwd03`

Facility Prompts

A *Facility* is a system object that represents a specific geographical location (such as Sunnyvale, Plano, Sacramento, or a data center). Servers and users are often associated with a facility as a means to enforce access rights and privileges. If you are performing a Single Core installation, your deployment is a single facility. Multimaster installations, however, consist of two or more facilities.

In this section, the first core installed in a Multimaster Mesh is called the *Primary Core*, and is the core that has the first Model Repository installed. *Secondary Cores* are the second, third, and fourth (and so on) cores installed in the mesh. For historical reasons, Primary Cores are sometimes referred to in parameter names as *Master* and Secondary Cores as *Slave*.

Table 5-4 lists the Facility prompts and the expected responses.

Table 5-4: Facility Prompts

PROMPT	RESPONSE
Please enter the authorization domain. **Parameter:** `truth.authDom`	Specify the authorization domain for the initial (default) customer. This value is usually the same as the domain name. The domain name must be uppercase, less than 50 characters, and in domain name format. **Important**: You must use the same value for every Opsware core in your Multimaster Mesh. The Opsware Installer prompts you for this value only when you are installing your first Opsware Core. If you convert to a Multimaster core, the authorization domain will be picked up from the response file and carried over to all subsequent core installations. **Source**: Variable **Example**: `XYZ.COM`
Please enter the subdomain for this facility (lowercase, no spaces). **Parameter:** `truth.dcSubDom`	Specify the fully-qualified DNS subdomain where the Opsware core is to be deployed. This is the facility where you run the Opsware Installer. This value must be unique for each core in the Multimaster Mesh. The value is based on the VLAN for the facility in which you are installing the Opsware core. The subdomain name must be in lowercase, less than 50 characters long, and in subdomain format. **Source**: Your network administrator. **Example**: `dc1.opsware.com`

Table 5-4: Facility Prompts (continued)

PROMPT	RESPONSE
Enter the subdomain for the facility you are about to create (lowercase, no spaces). **Parameter:** `slaveTruth.dcSubDom`	Specify the fully-qualified DNS subdomain where the Destination Multimaster Core is to be deployed. This value must be *unique* for each core in the Multimaster Mesh, both Source and Destination Cores. The value is based on the VLAN for the facility in which you are installing the Multimaster core. The subdomain name must be in lowercase, less than 50 characters, and in subdomain format. **Source**: Your network administrator. **Example**: `dc2.opsware.com`
Enter the short name of the facility where the Opsware Installer is being run (no spaces). **Parameter:** `truth.dcNm`	Specify the short name of the facility where the Opsware Installer is being run. This would also be the location of the Primary Core. Some Opsware SAS processes use this name internally. It must be in uppercase, less than 25 characters, and cannot contain spaces or special characters (underscores are allowed, dashes are *not* allowed). **Source**: Variable **Example**: HEADQUARTERS
Multimaster Enter the short name of the new facility you would like to define **Parameter**: `slaveTruth.dcNm`	Specify the default facility name for the Secondary Core. Some Opsware SAS processes use this name internally. It must be less than 25 characters, and cannot contain spaces or special characters (both dashes and underscores are allowed). **Source**: Variable **Example**: NORTHSIDE

Table 5-4: Facility Prompts (continued)

PROMPT	RESPONSE
Please enter the default locale for users of the Opsware Command Center (en/ja) **Parameter**: `default_locale`	Specify the default locale for the Opsware Command Center. For example, the locale entry `en` sets the language, character set, and date-and-time formats to English. **Source**: In this release, the allowed values are `en` (English) and `ja` (Japanese). **Example**: `en` or `ja`
Advanced Please enter the facility long name. **Parameter**: `truth.dcDispNm`	Specify the name that will display in the SAS Web Client title. This is the facility where Primary Core is located. **Name Restrictions**: The name must be unique, less than 50 characters, and cannot include any special characters (`< > () & * \ ' ?`). **Source**: Variable **Example**: Los Angeles Office
Advanced Enter the long name for the facility that you are adding to the mesh. **Parameter:** `slaveTruth.dcDispNm`	Specify the name of the Secondary Core that displays in the SAS Web Client title. **Name Restrictions**: The name must be unique, less than 50 characters, and cannot include any special characters (`< > () & * \ ' ?`). **Source**: Variable **Example**: Toronto Office

Table 5-4: Facility Prompts (continued)

PROMPT	RESPONSE
Please enter the Facility ID (number only, less than or equal to 999, with no leading zeros). **Parameter**: `truth.dcId`	Specify an ID that uniquely identifies the facility. When you install the Primary Core, you will be prompted to provide this ID. When you install subsequent Secondary Cores in the same Multimaster Mesh, Opsware SAS automatically generates the Facility ID when you add a new facility using the SAS Web Client. You can determine the Secondary Core's Facility ID by logging in to the SAS Web Client at the Primary Core facility, then select **Opsware Facilities** under **Environment** in the Navigation pane and click the facility's name. **ID Restrictions**: The Opsware Facility ID value is capped at 1000. Therefore, you must specify a number for the first facility that is far enough below 1000 that you will have sufficient IDs available to continue adding facilities to your Multimaster Mesh. **Source:** Variable for the first facility; set by the Opsware SAS for subsequent facilities. **Default**: 1

Opsware SAS Feature Prompts

The responses to the following prompts will be used to configure the Opsware SAS features: OS Provisioning, Software Provisioning, Patch Management, and NAS Integration.

Table 5-5 lists the Opsware SAS Feature prompts and the expected responses.

Table 5-5: Opsware SAS Feature Prompts

PROMPT	RESPONSE
Please enter the directory that contains the Microsoft utilities. (Press Ctrl-I for a list of required files) **Parameter**: `windows_util_loc`	Specify the directory to which you have already copied the Microsoft utilities required for Window's Patch Management (`qchain.exe`, `mbsacli20.exe`, `wusscan.dll`, `WindowsUpdateAgent20-x86.exe` and `wsusscan.cab` files). **Note**: If you have not yet copied these Microsoft utilities onto the server you will use for OS Provisioning, see "Windows Patch Management Requirements" on page 75 **Source**: Variable, however, this directory *must* exist on the same server as the Software Repository. **Example**: `/home/win_util`
Please enter the OS Provisioning Boot Server IP address or hostname. **Parameter**: `bootagent.host`	Specify the server on which you will install the OS Provisioning Boot Server component. **Important**: You must provide a valid IP address or host name that can be resolved from the server on which you installed the OS Provisioning Boot Server and the Build Manager. Additionally, the host name must be resolvable by Opsware managed servers for OS provisioning. **Source**: Variable **Example**: foo.opsware.com

Table 5-5: Opsware SAS Feature Prompts (continued)

PROMPT	RESPONSE
Enter the default network speed/ duplex setting for Solaris servers. **Parameter:** `boot_server.speed_duplex`	Specify the default network speed and duplex that should be used by Solaris servers booted from the OS Provisioning Boot Server. **Valid Responses**: `100fdx`, `100hdx`, `10fdx`, `10hdx, 100T4`, and `autoneg`. Enter a value without spaces. **Source**: Variable **Example:** `100fdx`
Please enter the pathname to the Linux media. **Parameter**: `media_server.linux_media`	Specify the path to the Linux OS media on the server on which the Media Server will be installed. Providing the path to the Linux OS media does not actually copy the media to the Media Server. See the Opsware® SAS Policy Setter's Guide for the steps required to set up the media on the Media Server for OS Provisioning. **Source**: Variable, however, this directory must exist on the server where the Media Server is installed. **Example**: `/home/os_media/linux/`
Please enter the pathname to the Solaris OS media. **Parameter**: `media_server.sunos_media`	Specify the path to the Sun Solaris OS media on the server on which the Media Server will be installed. Providing the path to the Solaris OS media does not actually copy the media to the Media Server See the Opsware® SAS Policy Setter's Guide for the steps required to set up the media on the Media Server for OS Provisioning. **Source**: Variable, however, this directory must exist on the server where the Media Server is installed. **Example**: `/home/os_media/solaris/`

Table 5-5: Opsware SAS Feature Prompts (continued)

PROMPT	RESPONSE
Please enter the pathname to the Windows OS media. **Parameter**: `media_server.windows_ media`	Specify the path to the Microsoft Windows OS media on the server on which the Media Server will be installed. The OS Provisioning feature exports Windows OS media to SMB clients through a Samba share. Providing the path to the Windows OS media does not actually copy the media to the Media Server. See the Opsware® SAS Policy Setter's Guide for the steps required to set up the media on the Media Server for OS Provisioning. **Source**: Variable, however, this directory must exist on the server where the Media Server is installed. **Example**: `/home/os_media/windows/`
Advanced Please enter the share name to use for the Windows Media Sharing Server. **Parameter**: `media_server.windows_ share_name`	Specify the share name that Samba to will use to export the Windows OS media. **Name Restrictions:** Share names that are longer than eight (8) characters can give errors while browsing or may not be accessible to some older clients. The share name is not case sensitive. **Source**: Variable **Example**: `WINMEDIA`
Advanced Please enter a password to write-protect the Windows media share. The Import_media tool will prompt for this password each time it is run. **Parameter**: `media_server.windows_ share_password`	Specify the `root` user password, which enables write access to the Windows share. The Opsware Import Media Tool prompts for this password each time it is run. **Password Restrictions**: The password cannot contain spaces. **Source**: Variable **Example**: `x145_pwd03`

Table 5-5: Opsware SAS Feature Prompts (continued)

PROMPT	RESPONSE
Please enter the root directory for the Package Repository. **Parameter**: `word_root`	Specify the directory in which to store Software Provisioning packages on the Software Repository. **Note**: Ensure that this directory has sufficient free disk space. **Source**: Variable **Example**: `/var/opt/opsware/word`
Please enter the host name or IP address of the Network Automation (NAS) server. (Enter "none" if NAS is not installed.) **Parameter**: `twist.nasdata.host`	Specify the host name or IP address of the server running the Network Automation System (NAS), if installed. If NAS is not installed, accept the default value `none`. Enter a value without spaces. **Source**: The network administrator/Opsware administrator who installed the Network Automation System. **Example**: `192.168.165.242`

Opsware Gateway Prompts

The responses to the following prompts will be used to configure the IP addresses and ports at which Opsware Gateways can be contacted by Core Components, Agents, or other Opsware Gateways.

Table 5-6 lists the Gateway prompts and valid responses.

You can use only port numbers below 64001.

Table 5-6: Opsware Gateway Prompts

PROMPT	RESPONSE
Please enter the IP address of the Management Gateway. **Parameter**: `mgw_address`	Specify the IP address of the Management Gateway. The Management Gateway manages Core-to-Core communications. Core Gateways installed on Secondary Cores and/or Satellite Gateways also communicate with the Management Gateway. **Source**: Variable **Example**: `192.168.165.242`
Advanced Please enter the port on which the Core Gateway will listen for connections from other Gateways. **Parameter**: `cgw_slice_tunnel_listener_port`	Specify the port number on which the Slice Component Core Gateway listens for connections from other Gateways. **Source**: Variable **Default**: 2001
Advanced Enter the port on which the Management Gateway will listen for connections from other gateways. **Parameter**: `mgw_tunnel_listener_port`	Specify the port on which the Primary and Secondary Cores' Management Gateways will listen for connections from other Core and Satellite gateways. **Source**: Variable **Example**: 2001

Table 5-6: Opsware Gateway Prompts (continued)

PROMPT	RESPONSE
Please enter the port on which the Management Gateway in the Primary Core listens for connections from other Gateways. ***Parameter:*** `masterCore.mgw_tunnel_listener_port`	Specify the port number on which the Primary Core's Management Gateway listens for connections from other Gateways. This port will be used during installation of Secondary Cores to create a Multimaster connection between the Management Gateways on the Primary and Secondary Cores. **Source**: Variable **Example**: 2001
Advanced Enter the port on which the Management Gateway can be contacted to request connections to Core Components. ***Parameter***: `mgw_proxy_port`	Specify the port number through which Core Components can request tunneled connections to other components through the Management Gateway. **Source**: Variable **Example**: 3003
Advanced Please enter the port for the administrative interface for the Core Gateway. ***Parameter***: `cgw_admin_port`	Specify the communication port for the Core Gateway's administrative interface or accept the default. **Source**: Variable **Default**: 8085 **Example**: 8085
Please enter the port on which Server Agents can contact the Agent Gateway to request connections to Core Components. **Parameter**: `agw_proxy_port`	Specify the port number through which Server Agents request connections from the Agent Gateway to Core Components. **Source**: Variable **Example**: 3001

Table 5-6: Opsware Gateway Prompts (continued)

PROMPT	RESPONSE
Please enter the port on which Core Components can contact this Core Gateway to request tunneled connections. **Parameter**: `cgw_proxy_port`	Specify the port number through which core components can request tunneled connections from the Core Gateway. **Source**: Variable **Example**: 3002

Opsware Global File System Prompts

The responses to the following prompts will be used to configure IP addresses and directories for the Opsware Global File System.

Table 5-7 lists the Opsware Global File System prompts and the expected responses.

Table 5-7: Opsware Global File System Prompts

PROMPT	RESPONSE
Advanced Please enter the IP or host name of the NFS server for the Opsware `Global File System` user (user, home, and temp directories). **Parameter**: `ogfs.store.host`	Specify the IP address or host name of the NFS server from which Opsware Global File System `/usr`, `/home` and `/tmp` directories are to be mounted. **Source**: Variable **Example**: `192.168.198.92`
Advanced Please enter the absolute path on the NFS server for the Opsware Global File System user (user, home, and temp directories). **Parameter**: `ogfs.store.path`	Specify the absolute path to the `/usr`, `/home` and `/tmp` directories of the Opsware Global File System. **Source**: Variable **Example**: `/var/opt/opsware/ogfs/export/store`

Table 5-7: Opsware Global File System Prompts (continued)

PROMPT	RESPONSE
Advanced Please enter the IP or host name of the NFS server for the Opsware Global File System where the audit streams will be stored. **Parameter**: `ogfs.audit.host`	Specifies the IP address of the server where storage for audit streams for the Opsware Global File System will be mounted. **Source**: Variable **Example**: `192.168.165.242`
Advanced Please enter the absolute path on the NFS server for the Opsware Global File System where the audit streams will be stored. **Parameter**: `ogfs.audit.path`	Specify the absolute path for the storage of the audit streams for the Opsware Global File System. **Source**: Variable **Example**: `/var/opt/opsware/ogfs/export/audit`
Please enter the pathname of where you wish the local cache of snapshots and audits to be. This will require a large amount of disk space (4 Gb by default). **Parameter**: `spoke.cachedir`	Specify the directory win which the Global File System service will cache snapshots and audits for quick access. **Default:** `/var/opt/opsware/compliancecache` **Source**: Variable **Example**: `/var/opt/opsware/compliancecache`

Table 5-7: Opsware Global File System Prompts (continued)

PROMPT	RESPONSE
Advanced Please enter the *minimum ID number* to use when assigning Unix user IDs to Opsware users. **Parameter:** `twist.min_uid`	Specify the minimum UID number that can be used. Unix UIDs are automatically generated for each Opsware user. UIDs will be allocated by counting up from the minimum UID. **Valid Values**: • Numeric only • Minimum – 1024 • Maximum – 90000000 • No leading zeroes **Default**: 80001 **Source**: Variable **Example**: `80001`
Advanced Please enter the *default Unix group* ID to assign to Opsware users. **Parameter:** `twist.default_gid`	Specify the default group ID number that is assigned when an Opsware user is created. To restrict Opsware users from using certain ports, this group ID has the least amount of network privileges. The default value is 70001. **Valid Values**: • Numeric only • Minimum – 1024 • Maximum – 90000000 • No leading zeroes **Default**: 70001 **Source**: Variable **Example**: `70001`

Uninstallation Prompts

Table 5-8 lists the prompts lists the Database prompts and the expected responses for an uninstallation of an Opsware core.

Table 5-8: Uninstallation Prompts

PROMPT	DESCRIPTION
Do you need to preserve any of the data in this database? **Parameter**: `truth.uninstall.needdata`	Uninstalling the Model Repository permanently deletes all data in the database, therefore, the uninstallation process stops if you reply "Yes" to this prompt. If you want to do an uninstallation, backup your data, run the uninstallation again and answer "No" to this prompt. Remember, the Opsware Installer *does not* preserve any data. **Example**: `y`
Are you sure you want to remove all data and schema from this database? **Parameter:** `truth.uninstall.aresure`	Uninstalling the Model Repository permanently deletes all data in the database, you can stop the uninstallation by responding "no" to this prompt.
Would you like to preserve the database of cryptographic material? **Parameter**: `save_crypto`	If you answer yes, the database of cryptographic material is saved. If you answer no, the material is deleted as part of the uninstallation. Example: y
Are you absolutely sure you want to remove all packages in the repository? **Parameter:** `word.remove_files`	If you answer yes, the packages, logs, and cryptographic material for the Software Repository are removed. **Example**: `y`

Using the Opsware Installer

This section discusses the following topics:

- Opsware Installation Media
- Installer Command Line Syntax
- Installer Interview Modes
- Installer Logs

Opsware Installation Media

Opsware SAS is available on and installable from the following DVD set that contains the scripts for installing, uninstalling, and upgrading components.

- **Product Software DVD**: Contains all packages and scripts necessary to install an Opsware SAS core, including the Opsware-supplied Oracle RDBMS.
- **Agent and Utilities DVD**: Contains the Agents and utilities (such as the OS Provisioning Boot Agent, Opsware Agents for various operating systems, and so on) that must be uploaded to the Software Repository after the Opsware SAS core has been installed.
- **Satellite Base DVD**: Contains the packages and scripts required to install a Satellite Core including an Opsware Gateway and a Software Repository Cache.
- **Satellite Base Including OS Provisioning DVD**: Contains the packages and scripts required to install a Satellite Core including an Opsware Gateway, a Software Repository Caches, as well as the OS Provisioning components.

For reference, the script names are listed in the section, “Installer Command Line Syntax” on page 127.

The Product Software DVD and the Agent and Utilities DVD require a Dual Layer DVD drive.

Copying the DVDs to a Local Disk

Opsware Inc. recommends that you copy the contents of the Opsware SAS DVDs to a local disk or to a network share and run the Opsware Installer from that location.

When you copy the contents of an Opsware SAS DVD to a local disk or the network, you must create a directory structure that duplicates the structure of the DVD, for example:

```
/opsware_system
```

The path of the directory cannot have spaces.

Although you run the Opsware Installer from the common parent directory, `/opsware_system`, the Opsware Installer will change to other directories as needed during the installation.

Installer Command Line Syntax

You invoke the Opsware Installer using one of the following three scripts:

- `install_opsware.sh` – installs the Oracle database and Model Repository, installs the Core Components for a First Core, installs the components for subsequent cores, exports the contents of the Model Repository.
- `upgrade_opsware.sh` – upgrades a Core Component(s) to a new version.
- `uninstall_opsware.sh` – uninstalls a single Core Component or uninstalls all Core components.

All three of these scripts run with the same command line arguments, as the following table shows.

Table 5-9: Opsware Installer Command Line Arguments

ARGUMENT	DESCRIPTION
`-h`	Display the Opsware Installer help for the command line options. *To display help during the interview, press `ctrl-I`.*

Table 5-9: Opsware Installer Command Line Arguments (continued)

ARGUMENT	DESCRIPTION
`--resp_file=`*`file`* (`-r` *`file`*)	Invoke the Opsware Installer using the values in the specified response file. You will create and save the response file for an installation the first time you run the installer. The installer prompts for the component to install and then runs an interview that only prompts for data missing from the specified the response file. If the response file is incomplete, the installer prompts for the missing information. The installer keeps an inventory of the components that are installed on a given server.
`--interview`	Conduct the installation in interview mode. You will be prompted to provide values for a number of component parameters. At the end of the interview, the installer saves the response file. Typically, you specify this option when you run the Opsware Installer for the first time. You can also specify this option when you have an incomplete response file. If you specify both the `--interview` and `--resp_file` options, the installer runs the interview but uses the values in the response file you specified as the defaults. `--interview` is the default.
`--verbose`	Run the installer in verbose mode which causes more information to be displayed on the console. See also "Installer Logs" on page 130.

Installer Interview Modes

When you run the Opsware Installer in interview mode, you will be prompted to choose the Simple or Advanced interview.

Simple Interview

if you choose the Simple Interview, the default values for certain parameters that are rarely modified will be used (you will not be prompted to specify values for these parameters). These parameters include the various Oracle passwords used internally by the Opsware components.

Advanced Interview

If you choose the Advanced Interview, the installer prompts you to supply values for *all* parameters that are relevant to the type of installation.

The Interview Process

The installer validates certain responses to the interview prompts as you enter them; you will be asked to re-enter a value if the installer is not able to validate your response (for example, a directory or path that does not exist or an invalid value or range). Some parameters are also revalidated during the actual installation of the Core Components. If a response to a prompt cannot be validated at time of installation, the installer runs a mini-interview during which you can provide a valid response.

Help

At any time during the interview, you can press `ctrl-I` to display help for the current interview prompt. A brief description of the prompt and the expected responses will be displayed.

Concluding the Interview

After you have responded to all the prompts and have provided values for all parameters, the installer asks if you want to finish the interview.

You can go back to review or change your answers by pressing “n”. If you press “y”, the installer prompts you top provide the fully qualified file name and path name for the response file in which it will save your answers. Ensure that the directory in which the response file is to be saved exists.)

Continuing an Installation without Exiting the Opsware Installer

After you save the response file, the installer asks if you would like to continue the installation using the data from the response file you just saved. If you press “y”, the installer displays Component Installation screen. If you press “n”, the installer exits.

Reusing a Response File

When you start the Opsware Installer, you can specify the response file to use during the installation by invoking the installer using the `--resp_file=`*`file`* (or `-r file`) parameter and specifying the fully qualified path to the response file. The installer will read the response file and use the parameter values stored in that file during the installation.

When you install a core on multiple servers, you should copy the response file from the First Core installation to the other servers so that the installations of subsequent components can use the same data from that response file. This is useful because many parameter values, and directory, file, and path names must be identical on all servers in the Core.

Installer Logs

The Opsware Installer logs output to the console on which it is run and to a standard log file:

```
/var/log/opsware/install_opsware/install_opsware.timestamp.log
```

By default, it also generates a more verbose version to:

```
/var/log/opsware/install_opsware/install_opsware.timestamp_
verbose.log
```

If you specify the `--verbose` option, the output to the console will be more verbose while the contents of the standard and verbose log files will remain the same.

Some Core Components have supplementary logs that contain additional details about the installation of those components.

See the *Opsware® SAS Administration Guide* for information about the logs for Opsware SAS Core Components.

The following log files are created during the installation of the Model Repository:

```
/var/log/opsware/install_opsware/truth/truth_install_number.log
/var/log/opsware/install_opsware/truth/truth_install_number_
verbose.log
```

When you install a First Core, Opsware Inc. recommends as best practice that you open a second terminal window and issue the following command:

```
tail -f /var/log/opsware/install_opsware/install_
opsware.<date>_verbose.log
```

Where <date> is the most recent timestamp.

Obfuscating Cleartext Passwords

During the Opsware SAS installation or upgrade process, some cleartext passwords will be automatically obfuscated and some will not. Some passwords will be obfuscated when Opsware Core Components start up, such as the OS Provisioning Build Manager password when the Web Services Data Access Engine server starts up. Some passwords in certain files will not be obfuscated, such as passwords in the installation logs and Opsware Installer response files.

There are several ways to manually secure cleartext passwords. Which you choose will depend on your security requirements:

- Encrypt the response files and installation logs.
- Purge sensitive information from the Opsware Installer response files.
- Store the Opsware Installer response files and logs on a secure server.

Table 5-10 lists cleartext passwords that are automatically obfuscated and passwords that must be manually secured.

Table 5-10: Cleartext Passwords

CLEARTEXT PASSWORD	FILENAME	AUTOMATICALLY OBFUSCATED	MANUALLY SECURED
admin	`/var/opt/opsware/twist/?DefaultAuthenticatorInit.ldift`	✔	

Table 5-10: Cleartext Passwords (continued)

CLEARTEXT PASSWORD	FILENAME	AUTOMATICALLY OBFUSCATED	MANUALLY SECURED

buildmgr	`/var/opt/opsware/crypto/buildmgr/twist.passwd`
	`/var/opt/opsware/crypto/occ/twist.passwd`
	`/var/opt/opsware/twist/?DefaultAuthenticatorInit.ldift`
		✔
		✔
		✔	

cleartext admin	`/etc/opt/opsware/twist/startup.properties`	✔	
detuser	`/var/opt/opsware/crypto/twist/detuserpwd` `/var/opt/opsware/crypto/OPSWhub/twist.pwd`	✔ ✔	
integration	`/var/opt/opsware/twist/?DefaultAuthenticatorInit.ldift`	✔	
root	`/var/log/opsware/agent/agent.err`		✔

	Opsware Installer response files:
	`/var/opt/opsware/install_opsware/resp`
	`/var/opt/opsware/install_opsware/install_opsware*`
	`/var/tmp/@*`
	`/var/opt/opsware/install_opsware/truth/truth_install_*`
		✔	✔
			✔
			✔

spin	`/etc/opt/opsware/spin/spin.args`	✔	

Table 5-10: Cleartext Passwords (continued)

CLEARTEXT PASSWORD	FILENAME	AUTOMATICALLY OBFUSCATED	MANUALLY SECURED
vault	/var/opt/opsware/crypto/vault/vault.pwd	✔	

Securing Opsware Installer Log and Response Files

Depending on the level of your security requirements, Opsware Inc. recommends that the installation or upgrade team encrypt or move installation logs files to a secure server and, if necessary, encrypt, move to a secure server, and/or purge sensitive information from the Opsware Installer response file. Remember that the response file will be needed for upgrades and subsequent Core installations and the log files are useful for troubleshooting so completely removing them is not recommended.

The Opsware Installer reminds you to protect sensitive log files by displaying the following message at the end of the installation process:

```
###############################################################
WARNING: to make sure that no sensitive information is left
on this server, please encrypt or copy to a secure location the
following files and directories:
  -- /var/opt/opsware/install_opsware/resp/*
  -- /var/log/opsware/install_opsware/*
  -- /var/tmp/*.sh
Also, please encrypt or store in a secure location the response
file that you used to install this core.
###############################################################
```


Chapter 6: Installing the First Opsware Core

IN THIS CHAPTER

This section discusses the following topics:

- First Core Installation Basics
- Oracle Database Installation Options
- Pre-Installation Checklist
- First Core Installation Procedure
- Logging in to the SAS Web Client

This section describes the installation tasks for a First Core (formerly standalone core).

First Core Installation Basics

This section describes how to install the First Opsware Core for a facility. This core can be

- A single core that manages servers in a single facility
- The first core of a Multimaster Mesh installation

Whether you will be using a single core to manage servers in a single facility or a Multimaster Mesh to manage servers in multiple facilities, you will need to perform the tasks described in this section to install the First Opsware Core.

If you are planning a single core in a single facility, after you complete the tasks in this section, your core will be up-and-running and you will be ready to manage servers in your facility.

If you plan this core to be the first in a Multimaster Mesh installation, after you complete the tasks in this section to install the First Core of the mesh, you will need to complete the tasks described in Chapter 8, “Multimaster Mesh Installation” to add additional cores to your mesh.

As of this release, the First Core has all the components required to become the First Core of a Multimaster Mesh – there is no Multimaster conversion required. You simply need to add additional cores and configure them to communicate with the First Core.

In a Multimaster Mesh installation, the First Core is not much different than all the other cores in the mesh, however, it does have certain central components that oversee communication between the various cores as well as manage conflicts and load balancing.

Any core’s components (Model Repository, SAS Web Client, Data Access Engine, and so on) can be installed on different servers for performance scalability but the core will still be seen as a single logical entity.

Overview of the Installation Process

A typical First Core installation has the following phases:

1. *Pre-Installation*: Ensure that all installation pre-requisites have been met, that you have the information needed to complete the Opsware Installer interview, that you have all necessary permissions to complete the installation, and that you have the Opsware SAS installation DVDs. For more information, see Chapter 3, “Pre-Installation Requirements” and Chapter 5, “Prerequisites for the Installer Interview”.

2. *Database Installation*: The Model Repository requires an Oracle database be available before the Opsware Installer is run. You can install the Opsware-supplied Oracle database that is installed by the Opsware Installer, use an existing Oracle database installation, or you can manually install the Oracle software and create a database before beginning the installation. (For details, see Appendix A, “Oracle Setup for the Model Repository”).

3. *Installation Interview*: When you install your First Core, you will run the Opsware Installer script in Interview Mode. During this process, you be required to provide information about your environment. At the end of the process, the information will be saved in a Response File that will be used to complete the installation.

4. *Core Component Installation*: You will run the Opsware Installer and select the Opsware components to install. In this step, the Installer creates the Opsware directories and files on a server. For a single-server installation, you need only run the Installer once. For a multiple servers, you log on to each server and run the Installer, specifying the components to install. You must install the Opsware core components in the order displayed by the Opsware Installer (see step 1 on page 144).

5. *Upload software Repository Content*: On the server where you installed the Software Repository, you will mount the Agent and Utilities DVD or NFS-mount the directory that contains a copy of the DVD contents and upload the Software Repository Content and, optionally, the OS Provisioning Stage 2 Images to the core.

6. *Post-Installation*: You will complete the post-installation tasks. For more information, Chapter 7, “First Core Post-Installation Tasks”.

Oracle Database Installation Options

A functioning, properly configured Oracle database must be available before you install the Model Repository. You can choose to:

- Use the Opsware-supplied Oracle database and allow the Opsware Installer to install and pre-configure the database. This is done as an early step during the installation.

- Manually create an Oracle database by other means. For more information, see Appendix A, “Oracle Setup for the Model Repository”.
- Use an existing Oracle installation. Contact your Oracle DBA for information about integrating Opsware SAS with your pre-existing Oracle database.

If you choose to install the Opsware-supplied Oracle database, the Opsware Installer will guide you through the process.

If you choose to manually install Oracle, you must do so before running the Opsware Installer, making sure to record all database-related information required by the Opsware Interview, such as passwords, the path to ORACLE_HOME, and so on.

For more information about the database information required by the Opsware Installer, see Chapter 5, “Prerequisites for the Installer Interview”.

For information about manually installing Oracle, see Appendix A, “Oracle Setup for the Model Repository”, especially the following sections:

- “Pre-Oracle Universal Installer Tasks” on page 254
- “Manually Creating the Oracle Database” on page 256
- “Post-Create the Oracle RDBMS Tasks” on page 260

The version of the Opsware-supplied Oracle database is Oracle Database Standard Edition 10.2.0.2. For manual installations, Opsware SAS supports both the Oracle Database Standard Edition and the Oracle Database Enterprise Edition.

SAS Component Bundles

As of this Opsware SAS release, certain Opsware SAS Core Components are *bundled* together and installed as a *unit*. You can, however, install multiple instances of the Slice Component bundle and certain Core Components can be distributed over different servers. See “SAS Core Component Bundling” on page 7 in Chapter 1 for information about component bundles.

Table 6-1 shows how components are bundled in SAS Slices.

Table 6-1: SAS Slice Component Distribution

MODEL REPOSITORY	INFRASTRUCTURE SERVER	OS PROVISIONING	SLICE #1	SLICE #2
One per Core	One per Core	One per Core	Multiple per Core	Multiple per Core
Model Repository	Infrastructure Component Bundle: Management Gateway Primary Data Access Engine Model repository Multimaster Component/Tibco Command Engine Software Repository	Media Server Boot Server	Core Gateway Agent Gateway Opsware Command Engine Secondary Data Access Engine Opsware Global File System Web Services Data Access Engine Build Manager	Core Gateway Agent Gateway Opsware Command Engine Secondary Data Access Engine Opsware Global File System Web Services Data Access Engine Build Manage

Pre-Installation Checklist

Before you invoke the Opsware Installer, you should have:

- Planned your Opsware SAS Core Component deployment. When planning a core deployment, decide whether you want to install the Core Components on a single server or on multiple servers or whether you will need multiple instances of the Component Slice bundle. See Chapter 1, “Opsware SAS Architecture” and “Opsware Core Performance Scalability” on page 53.

- Performed the pre-installation administration tasks, such as configuring your network and verifying operating system, package/utility, and hardware and software availability/ compatibility. See Chapter 3, “Pre-Installation Requirements.”
- Gathered the information necessary to complete the Opsware Installer interview. See Chapter 5, “Prerequisites for the Installer Interview.”
- Verified that the server for the Opsware Model Repository (which uses the Oracle database) meets the prerequisites described in the following sections:
  - “Supported Oracle Versions” on page 245
  - “Oracle RDBMS Hardware Requirements” on page 246
  - '“Required Operating System Packages and Patches” on page 247

First Core Installation Procedure

A VMware ESX server guest OS (virtual machine) is *not* supported as an Opsware core server.

This section contains instructions for running the Opsware Installer to install an Opsware SAS First Core. The installer is a script called `install_opsware.sh` and is located on your Opsware distribution media.

Complete the following tasks to install a First Core:

Preparing to Install a First Core

1. You will need the Opsware Server Automation System (SAS) installation media.

   See “Opsware Installation Media” on page 126, including the recommendation, “Copying the DVDs to a Local Disk.”

2. On the server where you will install the new Opsware Core Components (or on each server that will host Core Components, if you plan a multi-server installation), mount the Product Software DVD or NFS-mount the directory that contains a copy of the DVD contents.

The Opsware Installer must have *read/write root access* to the directories where it will install the Opsware components, including NFS-mounted network appliances.

3. On the server where you will install the Opsware Model Repository, open a terminal window and log in as root.

When you install a Facility's first Opsware SAS Core, Opsware Inc. recommends that you open a second terminal window and issue the following commands:

```
cd /var/log/opsware/install_opsware/install_opsware
tail -f install_opsware.<date>_verbose.log
```

where `<date>` is the most recent timestamp. This will allow you to see all messages posted to the log by the installer as the installation progresses.

4. Change to the root directory:

```
cd /
```

Running the Opsware Installer

1. Run the Opsware Installer in *Interview Mode* by invoking it with no command-line options:

```
/opsware_system/opsware_installer/install_opsware.sh
```

You must specify the full path to the script. The example above assumes that you have copied the contents of the Opsware SAS Product Software DVD to a local disk or network share.

The Opsware Installer Installation Options screen displays the following:

```
Welcome to the Opsware Installer. Please select one of the
  following installation options:

1 - Multimaster Opsware Core - First Core
2 - Multimaster Installation: Define New Facility; Export
Model Repository
```

```
3 - Multimaster Opsware Core - Subsequent Core
```

2 At the installation options prompt, select the option:

```
1 - Multimaster Opsware Core - First Core
```

Note that, to install a First Core you select *Multimaster Opsware Core - First Core* even if you do not plan for a Multimaster Installation. A First Core is a fully Multimaster-capable core, even if you do not use the Multimaster functionality.

3 The Opsware Installer Component Layout Mode screen displays the following:

```
Please select the component layout mode. In a "typical"
install, components are already bundled together in a pre-
defined configuration. "Custom" install allows you to
install components "a la carte."

1 - Typical Component Layout Mode
2 - Custom Component Layout Mode
```

4 At the Component Layout Mode Prompt, select the option:

```
1 - Typical Component Layout Mode
```

Choosing Option 2, Custom Component Layout Mode, gives you the ability to more finely control the distribution of the Opsware Core Components by breaking certain components out of their component bundles. You should use this option only if you are very certain that you understand how to distribute Opsware Core Components across core servers. Be aware that breaking up the component bundles can make diagnosing and troubleshooting problems later more difficult.

Complete the Installation Interview

1 The Interview Mode screen appears. At the Interview Mode prompt, select one of the following options:

```
1 - Simple Interview Mode
2 - Advanced Interview Mode
```

Choose Option 1 to use the default values for certain configuration parameters.

Choose Option 2 to specify all configuration parameters during the interview.

2. The Database Configuration screen appears. At the Database Configuration option prompt, select the following option:

```
1 - Install Oracle with Opsware
```

For information about installing an Opsware SAS First Core using Option 2 (“`Use Existing Oracle Database`”), see Appendix A, “Oracle Setup for the Model Repository” which explains how to manually install and configure an Oracle database for use with Opsware SAS.

3. Respond to the interview prompts. Follow the on screen instructions to complete the interview. You should have gathered your responses to the interview prompts already. If not, see “Opsware Installer Interview Prompts” on page 96.

   The installer displays default values in square brackets [ ]. To accept the default value simply move on to the next interview question.

When you run the interview, the paths for the OS provisioning media must already exist on the server where you will install the OS Provisioning Slice.

4. Complete the interview. When you have completed entering all of the required information, the Opsware Installer displays this message:

```
All parameters have values. Do you wish to finish the
interview (y/n):
```

   If you are satisfied with your answers, press y.

   If you want to review or change your answers, press n. The installer displays the prompts again, showing in brackets [ ] the values that you previously entered.

   After modifying your responses, press y to finish the interview.

5. Create the response file. After completing the interview, the installer prompts you to provide a filename for the response file:


```
Name of response file to write
[/usr/tmp/oiresponse.slices_master_typical]
```

All of your interview responses will be written to a text response file and saved on the current server at the location you specify. You can enter the full path and name of the response file or accept the Opsware default location (`/usr/tmp/oiresponse.slices_master_typical`).

Record the fully qualified path to and name of the response file and store it where you can easily find it. You will need to use it again during future installations and upgrades.

6. After the response file is saved, you can continue the installation using the response file you just created or end the installation and use the response file later.

```
Would you like to continue the installation using this
response file? (y/n):
```

If you are satisfied with the responses you entered in the interview and you are ready to install Opsware SAS now, enter `y` to continue.

If you do not want to install Opsware SAS after completing the interview, enter `n`.

To use this response file later, invoke the Opsware Installer with the `-r` option and supply the fully qualified path to the file:

`/opsware_system/opsware_installer/install_opsware.sh -r <full_path_to_response_file>`

Install the Core Components

1. At the Component Selection screen, select one or more components to install:

```
Welcome to the Opsware Installer.
Please select the components to install.
1 ( ) Oracle RDBMS for SAS
2 ( ) Model Repository
3 ( ) Infrastructure
4 ( ) Slice
5 ( ) OS Provisioning
```



```
Enter a component number to toggle ('a' for all, 'n' for
none).
When ready, press 'c' to continue, or 'q' to quit.

Selection:
```

If you plan to install Opsware Core Components on multiple servers, be sure to complete step 2. If you will install all components on a single server, you can skip step 2.

The new SAS Component Bundle architecture bundles components for installation. Components within a bundle must always be installed together on the same server. For information about how components are distributed in bundles, see Table 6-1 on page 139.

If you are installing the database, Infrastructure Component bundle, Slice Component bundle(s), and optionally, the OS provisioning bundle on a single server, select Option a and press enter. Note that the database, the Model Repository, the infrastructure Component bundle, the Slice Component bundle, and the OS Provisioning bundle will be marked for installation. Then, press c to complete the installation.

If you plan to install on multiple servers, you must run the Opsware Installer (including specifying the response file) on each server on which you will install the components. You must also remember to install the components in the order that they are listed on the Components to Install screen. For example, you must install the database before the Model Repository, and the Model Repository before the Infrastructure bundle. See step 2.

To install the OS Provisioning component bundle, the Opsware Installer must be run on the server you specified as the OS Provisioning server during the Opsware Installer Interview.

2 **Multiple Server Installation**: If you are installing the database, any of the Core Component bundles, and/or Slice Component bundle(s) on different servers, follow the instructions in this step. (If you are installing on a single server, skip this step.)

1. Copy the response file generated by the Installer interview to all other servers on which you will install components or Slices Component bundles.

2. During the Model Repository installation, enter `y` when the installer asks whether you want to generate a new database of cryptographic material. After the cryptographic material has been generated, copy the database and the gzipped Unix tar file from the following directory to every Opsware core server:

   ```
   /var/opt/opsware/crypto/cadb/realm/opsware-crypto.db.e
   /var/opt/opsware/crypto/cadb/realm/opsware-crypto.tgz.e
   ```

   You must copy the database of cryptographic material and the gzipped tar file to the same directory and must use the same file names on every Opsware core server. The directory and database must also be readable by the root user.

3. Install the Model Repository on the First Core server by invoking the Opsware Installer with the `-r` (response file) option and specify the response file generated by the Installer interview.

4. After the Model Repository installation is complete, copy the Oracle `tnsnames.ora` file from the First Core server to all other servers that will host components. Ensure that the path for the file (`/var/opt/oracle/tnsnames.ora`) is the same on all servers. For more information, see "tnsnames.ora File Requirements" on page 261.

5. On each server that will host the remaining components or Component Slice bundles, run the Opsware Installer with the `-r` (Response File) option, specifying the response file you copied to the server in step 1. Select and install the component for that server from the menu shown in step 1.

If you install the Model Repository on a server *without* an installed Slice Component bundle, you must also install an Opsware Agent on that server *after* the Core installation is completed. For more information about deploying Opsware Agents, see the *Opsware® SAS User's Guide: Server Automation*.

---

3 If you are distributing the Core Components across multiple servers, you can install additional instances of the Slice Component bundle which includes a secondary Data Access Engine, Opsware Command Center, Core and Agent Gateways, Opsware Global file system, Web Services Data Engine, and a Build Manager.

Install the Software Repository Content and OS Provisioning Stage 2 Images

1. Now you must add the Software Repository Content and, optionally, the OS Provisioning Stage 2 Images. On the server where you installed the Software Repository, mount the Agent and Utilities DVD or NFS-mount the directory that contains a copy of the DVD contents.

The Opsware Installer must have *read/write root access* to the directories where it will install the Opsware components, including on NFS-mounted network appliances.

2. In a terminal window, log in as root and change to the root directory:

```
cd /
```

3. Invoke the Opsware Installer with the `-r` (response file) option. For example:

```
/opsware_system/opsware_installer/install_opsware.sh -r
/usr/tmp/oiresponse.slices_master_typical
```

   Specify the fully qualified path to the response file. The directory path in the preceding command assumes that you copied the Opsware SAS Agent and Utilities DVD to a local disk or network share.

   The Opsware Installer displays following options:

```
Welcome to the Opsware Installer.
Please select the components to upgrade.
1 ( ) Software Repository - Content (install once per mesh)
2 ( ) Add OS Provisioning Stage2 Images to Software
Repository
Enter a component number to toggle ('a' for all, 'n' for
none.
```

4. At the install prompt, select option 1 or 2 or press a for both:

```
1 ( ) Software Repository - Content
2 ( ) Add OS Provisioning Stage2 Images to Software
Repository
```


Post-Installation

1. When the installation of the Software Repository content and OS Provisioning Stage 2 images finishes, the Opsware installation phase is over.
2. You must now complete the tasks in the next section, "Logging in to the SAS Web Client."

Logging in to the SAS Web Client

Now that you have installed an Opsware SAS Core, completing the following tasks will enable you to log in to the SAS Web Client and begin to create users and user groups and use Opsware SAS to manage servers in your facility.

Browser Configuration

To use the SAS Web Client, your browser must:

- Accept cookies.
- Have Java™ support enabled.
- Support SSL and provide 128-bit encryption (recommended).
- Have third-party pop-up blockers disabled. As an alternative, use the supported browser's native pop-up blocking. Using a third-party pop-up blocker could prevent certain Opsware SAS Web Client functions from working correctly.

Logging in to the SAS Web Client

To log in to the SAS Web Client, perform the following tasks:

1. In a web browser, enter the following URL:

   http://<occ_hostname>

   where `<occ_hostname>` is the host name or IP address of the server on which you installed the Opsware Command Center component (part of the Component Slice bundle).
2. Follow the browser's instructions for installing the security certificate.
3. The SAS Web Client will then prompt you for a user name and password.

   Enter `admin` for the user name.

The password is Opsware Admin password you specified during the Installer Interview (`cast.admin_pwd`).

4. When you are logged on, the first task is to create a new Administrator user.

   From the Navigation panel, select Administration ➤ Users & Groups. Then follow the instructions for creating new users in the *Opsware® SAS Administration Guide*

   For the Group Membership, select *Opsware System Administrators*.

5. Next, create an Advanced User using the same method described in step 4. For the Group Membership, specify *Advanced Users*.

6. Now log out as `admin` and log back in to the SAS Web Client as the Advanced User you just created in the previous step. This Advanced User should now be able to use all available Opsware System functions.

7. Still logged in as the Advanced User, run Opsware System Diagnosis. From the Navigation panel, click Administration ➤ System Diagnosis.

   See the *Opsware® SAS Administration Guide* for detailed information about running the system diagnosis tool.

Post-Installation Tasks

You must now complete the tasks described in Chapter 7, “First Core Post-Installation Tasks.”

Chapter 7: First Core Post-Installation Tasks

IN THIS CHAPTER

This section discusses the following topics:

- The SAS Client
- Unattended Installation of the SAS Client
- Installing Application Configuration (AppConfig) Content
- Opsware Discovery and Deployment (ODAD)
- NAS/SAS Integration
- DHCP Configuration for OS Provisioning
- Additional Network Requirements for OS Provisioning
- Windows Patch Management Tasks
- Support for Redhat Network Errata and Channels
- Opsware Global File System Tasks

This section describes system administration tasks that you must perform after installing a First Core.

The SAS Client

The SAS Client is a powerful Java™ client for the Opsware Server Automation System. It provides the look-and-feel of a Microsoft Windows desktop application with the cross-platform flexibility of Java. If you installed your core on multiple servers, you can access the SAS Client from any Core Server hosting a Component Slice bundle.

To access the SAS Client for the first time, you must invoke the SAS Client Launcher from the SAS Web Client Main Page. Clicking on this link will install the SAS Client and the required Java Runtime Environment (JRE) on your local machine. Once installed, you can invoke the SAS Client from the local machine rather than from the SAS Web Client.

The SAS Client is installed with the Java™ 2 Runtime Environment, Standard Edition 1.4.2._15. The SAS Client is a Java application that installs and runs with its own Java Runtime Environment (JRE). The SAS Client will not interfere with any other versions of JRE you may have installed on your system. The JDK will not be used (and is not usable) by any other Java application on the target computer, and it will not set itself as the default JDK on the target computer.

Note that the SAS Client adds certain functionality not in the SAS Web Client. Instructions in this documentation set will explicitly identify either the SAS Web Client or the SAS Client as required to complete a task.

See the *Opsware SAS User's Guide: Server Automation* for more information about both clients.

Unattended Installation of the SAS Client

This section describes how to perform unattended installation of the SAS Client from the command line.

To begin an unattended installation, invoke the installer using the `-q` (quiet) argument, which causes the installer to perform the installation as if you had accepted all default settings and it asks for no user input.

For example, execute the following command on the server on which you want to install the SAS Client:

```
opswclientinstaller_windows_1_0.exe -q
```


By default, the SAS Client is installed in the following directory:

```
C:\Opsware
```

If you want to install the launcher in another directory, specify the `-d` option, as in the following example:

```
opswclientinstaller_windows_1_0.exe -q -dir C:\Opsware_SAS_
Client
```

See the *Opsware® SAS User's Guide: Server Automation* for more information on how to use the SAS Client.

Installing Application Configuration (AppConfig) Content

In order to get the baseline set of Application Configurations (AppConfigs) into your core, you must perform the post-installation tasks described in this section using the DCML Exchange Tool (DET).

The AppConfig content archive is located on the product DVD content disk in the `disk001/packages/` directory:

`OPSWContent-AppConfig-<current_version>.tgz.`

Complete the following steps:

1. The AppConfig content archive is in tar/gz format, so you must uncompress it with `gunzip` and extract it using tar. You can also use GNU tar with the `xzf` flags to simultaneously uncompress and extract the file, for example:

   ```
   tar xvzf OPSWContent-AppConfig-<current_version>.tgz
   ```

   This command creates a directory named `AppConfig`.

2. Install the Content Baseline Tool (`cbt`) (for example, `cbt-34_1_0_27.zip`) from the primary Product Software DVD. The tool is located in the directory `/disk001/packages/<core OS>.` Install the tool under `/usr/local` or any known path and add the location to your path, for example:

   ```
   export PATH=$PATH:/usr/local/cbt/bin
   ```


3 Set the JAVA_HOME environment variable to use Opsware's JRE:

```
export JAVA_HOME=/opt/opsware/j2sdk1.4.2/
```

4 Verify that `cbt` is working properly by invoking it using `cbt -v`. This command should return a version, if not, check your installation, PATH and/or JAVA_HOME settings.

5 Import the content using a `cbt` config file or by manually entering the user names and passwords for the DCML Exchange Tool and Web Services Data Access Engine users (for example, `admin` and `detuser`):

```
cbt -i AppConfig -cf core.cfg
```

Shown below is a sample `cbt` config file. Change the `*.host` entries and/or passwords as necessary:

```
cbt.numthreads: 5
mail.from: joeuser@opsware.com
spike.host: USE YOUR IP ADDRESS FOR YOUR SAS CORE OR COMPONENT
way.host: USE YOUR IP ADDRESS FOR YOUR SAS CORE
word.host: USE YOUR IP ADDRESS FOR YOUR SAS CORE
spin.host: USE YOUR IP ADDRESS FOR YOUR SAS CORE
twist.host: USE YOUR IP ADDRESS FOR YOUR SAS CORE
spike.username: admin
spike.password=admin
twist.username: detuser
twist.password=detuser
ssl.keyPairs: /var/opt/opsware/crypto/twist/spog.pkcs8
ssl.trustCerts: /var/opt/opsware/crypto/twist/opsware-ca.crt
twist.certPaths: /var/opt/opsware/crypto/twist/opsware-ca.crt
```

6 Launch the SAS Client (NGUI) and select **Tools ➤ Options** and **Reload cache now**, or wait a few minutes, then verify that your new Content is available.

7 AppConfig content appears in two locations in the SAS Client, in the Application Configuration and in the Audit and Remediation feature. To view the AppConfig content in the SAS Client, select:

Navigation pane ➤ Library ➤ By Type ➤ Application Configuration

or, when viewing an Audit or Snapshot Specification rule:

Navigation pane ➤ Library ➤ By Type ➤ Audit and Remediation

If you have any questions on any Content, please contact Opsware technical support.

Opsware Discovery and Deployment (ODAD)

The Opsware Discovery and Deployment (ODAD) utility allows you to use the SAS Client to identify servers on your network that do not have Opsware Agents installed and install (deploy) Opsware Agents onto those servers.

Enabling ODAD for Unix Servers

The Opsware Installer automatically installs all required software to use ODAD with Unix servers during a core installation.

However, before you use ODAD to open remote terminal sessions on unmanaged Unix servers, verify on the server hosting the Agent Gateway (part of the Component Slice bundle), that the `telnet`, `rlogin`, and `ssh` clients reside in either the `/bin`, `/usr/bin`, or `/usr/local/bin` directories. If the client resides in any other directory, create a symbolic link in `/usr/local/bin` to the actual location of the client on your server.

Enabling ODAD for Windows Servers

Before you can use ODAD to deploy Opsware Agents to Windows servers in a core installation, you must install an Opsware Agent on a Windows Server that is managed by that core and that is running a 32-bit version of:

- Windows 2000
- Windows 2003
- Windows XP

After the agent is installed, install the *Windows Agent Deployment Helper* on that server.

There must bidirectional connectivity between the server on which the Windows Agent Deployment Helper is installed and the core where the tasks described below will take place.

You can install only one Windows Agent Deployment Helper in each Opsware Multimaster Mesh. Note also that, a Windows Agent Deployment Helper will not function properly in an Opsware Satellite installation.

To install the Windows Agent Deployment Helper, perform the following tasks:

1. Identify a Windows server on which you can install the Windows Agent Deployment Helper. This server must be running a 32-bit version of Windows 2000, Windows 2003, or Windows XP. (Windows 64-bit operating systems are not supported.)

   On this Windows server, install an Opsware Agent using the Opsware Command Line Interface (CLI). For instructions, see the appendix, "Opsware Agent Utilities", in the *Opsware® SAS User's Guide: Server Automation*.

2. After the Opsware Agent is installed, log in to the SAS Client.

3. From the Navigation pane, select **Devices ➤ All Managed Servers**.

4. From the Content pane, select the Windows server on which you installed the Opsware Agent in step 1.

5. From the **Action** menu, select **Attach ➤ Attach Software Policy**. The Attach Software Policy window appears.

6. From the list of software policies, select Windows Agent Deployment Helper. (By default, the Remediate Servers Immediately option is selected. Do not deselect this option.)

7. Click **Attach**. The Remediate window appears.

8. Complete the tasks to remediate the server with the Windows Agent Deployment Helper policy. See the *Opsware® SAS User's Guide: Application Automation* for more information about how to remediate a server using a software policy.

9. Because the SAS Client caches information about the Windows Agent Deployment Helper, restart all running SAS Clients for this core.

10. Log in as `root` to *all* servers hosting a Component Slice bundle (which contains a Core Gateway) for the core. With a text editor, open the following file:

```
/etc/opt/opsware/opswgw-cgws0-<facility>/opswgw.properties
/etc/opt/opsware/opswgw-cgws1-<facility>/opswgw.properties
```

   and so on.

where `cgws0` identifies the first installed Component Slice bundle. Subsequent installed Component Slice bundles will be identified as `cgws1`, `cgws2`, and so on; `facility` is the facility name you applied to the core during installation.

11 Locate the following line:

```
opswgw.IngressMap=${NETBIOSHELPERIP}:NETBIOS
```

12 Replace `${NETBIOSHELPERIP}` with the IP address of the server where you installed the Windows Agent Deployment Helper. For example:

```
opswgw.IngressMap=192.168.165.242:NETBIOS
```

13 If `${NETBIOSHELPERIP}` has already been replaced by an IP address, then the Opsware Installer successfully discovered your Windows Agent Deployment Helper and inserted the IP address. You should, however, verify that the automatically discovered IP address is correct.

14 Restart the Core Gateway on each server on which you edited `opswgw.properties` with the following command:

```
/etc/init.d/opsware-sas restart opswgw-cgws
```

Setting up the Windows Agent Deployment Helper When the Administrator Account is Disabled

When, usually for security reasons, the Windows Administrator account is disabled on a Windows server, you must perform the following additional setup tasks to create an account that can run the Windows Agent Deployment Helper:

1 Log in as root to any Unix/Linux server in the same core as the Windows server.

2 Change to the following directory:

```
cd /opt/opsware/oi_util/bin/
```

3 Enter the following command to run the `shared_script_util.sh` script:

```
./shared_script_util.sh modify adt_deploy_agents.bat \
-U NEW_USER -p agentDeployment.deployAgent -e \
-c "Change user name"
```


where the NEW_USER account is a member of the Windows Agent Deployment Helper's local Administrators group. The Windows Agent Deployment Helper can now run under the user name you specified.

4 Enter the following command to review the current script settings:

```
./shared_script_util.sh showpolicy adt_deploy_agents.bat
```

You will see the following output, except that the `USER` line should contain the name of the account you specified in step 3.

```
PTY 0
USER NEW_USER
EXEMPT
PERM agentDeployment.deployAgent
```

Agent Deployment Tool (ADT) Requirements

If you plan to use the Agent Deployment Tool (ADT) to deploy Opsware agents, you must have the following in the root user's path on each server hosting the Slice Component bundle(s) (includes the Gateway) and each Satellite server:

- OpenSSH client
- telnet client (standard client that ships with Linux or Solaris)
- rlogin (standard rlogin that ships with Linux or Solaris)

NAS/SAS Integration

Opsware Network Automation System (NAS) Integration with the Opsware Server Automation System (SAS) enables IT staff members to see how servers are connected to network devices and to closely examine managed servers. With this information, they can determine how all devices are related and coordinate and implement required changes.

For more information about NAS/SAS Integration, see the *Opsware® SAS User's Guide: Server Automation*.

To set up NAS/SAS Integration, you must change certain configuration settings in both NAS and SAS, run diagnostics for NAS topology data, and configure user permissions.

To set up NAS Integration with the current SAS version, you must have Opsware Network Automation System (NAS) 6.1 or later installed.

Opsware Gateway Requirements

An Opsware NAS Core can use an existing Opsware Gateway that was installed for an Opsware SAS Core, but an SAS Core cannot use an existing Gateway that was installed for a NAS Core.

Therefore, NAS must be configured to use the SAS Core's Gateway that was installed using the Opsware SAS Installer.

SAS Client Communication with NAS

Ensure that the SAS Client can communicate with NAS. If the SAS Client is not communicating with (cannot find) the NAS server, see "Resetting the NAS Host" section of the *Opsware® SAS User's Guide: Server Automation*.

NAS Integration Port Requirements

Before you configure NAS Integration, ensure that SAS and NAS can communicate with each other over the following ports:

- **Port 1032 (NAS to SAS)**

  NAS must be able to access port 1032 on the server that is running the Opsware SAS Web Services Data Access Engine component (part of the Component Slice bundle). By default, the Web Services Data Access Engine listens on port 1032.

- **Port 8022** (Unix) / **Port 22** (Windows) **(SAS to NAS)**

  For the Opsware SAS Global File System (OGFS) feature to be able to display data about network devices, Opsware SAS must have access to port 8022 (Unix-based NAS Servers) and 22 (Windows-based NAS Servers).

- **RMI/JRMP Ports for NAS API**

  The NAS API uses Java RMI to connect to the NAS server. SAS uses the NAS API for the NAS integration. RMI/JRMP requires that the following ports are open:

  – **Port 1099**

    JNDI

– **Port 4444**

  RMI Object

– **Dynamic**

  RMI

  See the *Opsware® NAS User's Guide* for information about how to set up these port requirements to access the NAS API through a firewall.

Time Requirements for NAS Integration

The SAS and NAS core servers must be synchronized and have the same time and time zone settings. See also "Time and Locale Requirements" on page 80.

Configuring NAS for Integration

To set up NAS/SAS Integration, you must configure NAS to use SAS Authentication To complete this configuration, you will need to know:

- the IP address or Hostname of the server hosting the Web Services Data Access Engine (part of the Component Slice).
- The port number that the Web Services Data Access Engine listens on.
- The Web Services Data Access Engine user name.
- The Web Services Data Access Engine password
- The IP address or hostname of the server hosting the Opsware Command Center.
- The default user group for new SAS users.

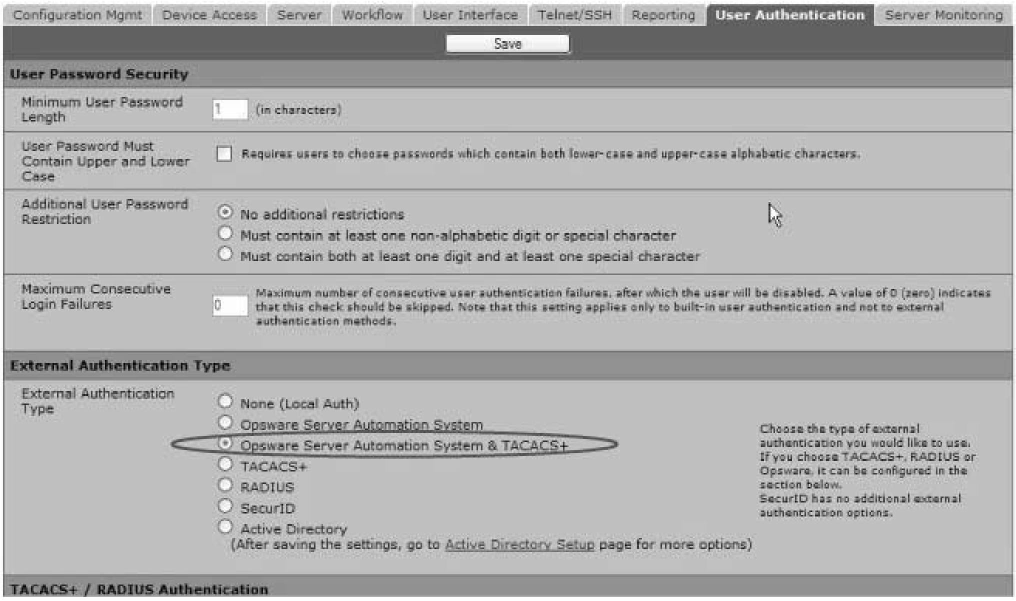
NAS Authentication Configuration

For detailed information on NAS/SAS authentication, see the *Opsware® NAS User's Guide*. To change the authentication settings in NAS, perform the following tasks:

1. Log in to Opsware NAS.
2. Select **Admin ➤ Administrative Settings ➤ User Authentication** to display the Administrative Settings – User Authentication page.

3 In the External Authentication Type section, use the radio button to select Opsware Server Automation System & TACACS+ as shown in Figure 7-1.

Figure 7-1: External Authentication Type in NAS



4 Scroll down and complete all fields in the Opsware Server Automation System Authentication section shown in Figure 7-2. NAS uses the Web Services Data Access Engine Username and Password (specified during installation for the parameter `truth.twistPwd`) when it gathers layer 2 data. NAS looks for the server interface information by MAC address, using that user's permissions. The user must have read access to server information.

Figure 7-2: Opsware Server Automation System Authentication

5 Click **Save** to save your configuration change.

See the *Opsware® NAS User's Guide* for more information on NAS configuration.

SAS Configuration Changes

Complete the following tasks to prepare Opsware SAS for NAS Integration:

- **Specify the NAS Server Name and NAS Port (Windows) in SAS**

  1. If you did not specify the NAS server name during the Opsware SAS Installer Interview, you must specify the value for the `twist.nasdata.host=<hostname>` parameter in the `/etc/opt/opsware/twist/twist.conf` file. For more information about modifying this file, see the *Opsware® SAS Administration Guide*.

After you edit the `twist.conf` file, you must restart NAS and the server hosting the SAS Web Services Data Access Engine.

  2. If NAS is running on a Windows server, you must change the port setting parameter from `nas.port=8022` to `nas.port=22` in the `/etc/opt/opsware/hub/hub.conf` file. A default Windows server installation runs the proxy SSH/Telnet servers on port 22/23 rather than the Unix default of port 8022/8023. See the *Opsware® NAS User's Guide* for more information on NAS servers.

After you make this configuration change, you must restart the server hosting the Component Slice bundle (specifically for OGFS).

- **Enable the spin.cronbot.check_duplex.enabled Parameter**

  The `spin.cronbot.check_duplex.enabled` parameter must be enabled for NAS integration. To do so:

  1. Log into the OCC as an Opsware Administrator.
  2. Click on Administration ➤ System Configuration.
  3. Select Data Access Engine from the Opsware component list.
  4. Locate the parameter, `spin.cronbot.check_duplex.enabled`.

5. Click `Use value:` and enter `1` in the text box.
6. Click Save.

For more information about using the OCC to modify parameter values, see the *Opsware® SAS Administration Guide*.

Configuring SAS/NAS Integration with CiscoWorks NCM

If you are deploying Opsware SAS with CiscoWorks NCM 1.2, you must make certain configuration changes. Some CiscoWorks NCM deployments (where CiscoWorks LMS is co-resident with NCM) use non-standard ports that affect integration with SAS.

To determine which changes you will need to make, perform the following tasks:

Phase 1: Edit tomcat4-service.xml:

1. Log in to your NAS server.
2. Open the XML file:

   `<NAS_install_dir>/server/ext/jboss/server/default/deploy/tomcat4-service.xml`.
3. Search for the string '`scheme=https`"'.
4. Check the preceding entry which should be

   ```
   port = "port_no".
   ```

   If the `port_no` value is 443, then go to Phase 4; otherwise, note the specified port and continue to Phase 2.

Phase 2: Assign the port number:

1. Log in to the SAS Client.
2. In the SAS Client, from the **Tools** menu, select **Options**.
3. In the Set Options window, select Opsware NAS.
4. In the Host field, append `:<port>` to the hostname, where `<port>` is the port number found in Phase1, step 4, for example:

   ```
   mycore.opsware.com:443
   ```

   Click Save.

The following warning will appear: “General.Host: must be a valid host string.” Ignore this warning. Close the Set Options window.

(Phase 2 must be performed for every user of the SAS Client.)

Phase 3: Edit Primary Data Access Engine files:

1. Log in to the SAS Core Server where the Primary Data Access Engine is installed (part of the Infrastructure Component bundle).
2. Open the `/opt/opsware/twist/twist.sh` file and change this line:

   ```
   https://$NASHOST/tcdocs/truecontrol-client.jar
   ```

   to read (assuming that 443 was the port you noted in Phase 1, step 4):

   ```
   https://${NASHOST}:443/tcdocs/truecontrol-client.jar
   ```

3. Restart the server hosting the Web Services Data Access Engine (part of the Component Slice bundle):

   ```
   /etc/init.d/opsware-sas restart twist
   ```

   (You will need to perform Phase 3 for each Web Services Data Access Engine server installation.)

Phase 4: Assign the SSH port:

1. Log in to Opsware NAS.
2. Select **Admin ➤ Administrative Settings ➤ Telnet/SSH** to display the Administrative Settings - Telnet/SSH page.
3. In the SSH Server section, locate the SSH Server Port.
4. If the port is 8022, then you are finished; otherwise, note the port being used and continue to Phase 4, step 5.
5. Log in to the SAS Core Server where the Opsware Global File System (OGFS) is installed (part of the Slice Component bundle).
6. Open the `/etc/opt/opsware/hub/hub.conf` file and change the value for `nas.port` to the port you found in Phase 4, step 4. For example:

   ```
   nas.port=9022
   ```


Topology Data

You must also run the NAS Topology Data Gathering and NAS Duplex Data Gathering diagnostics. For instructions, see the *Opsware® NAS User's Guide*.

User Permissions for NAS Integration

Access permissions for NAS/SAS Integration are based on two separate databases: a NAS database and a SAS database. NAS uses its own database for authorization. SAS uses a different security mechanism for authorization. However, for NAS integration, all authentication (for both NAS and SAS) is processed by SAS.

When NAS is configured to use SAS authentication, it tries to authenticate against SAS first. If NAS fails to authenticate against SAS, it falls back to the NAS database. If there is an account in the NAS database, the fallback is only allowed if that user is configured to allow fallback authentication. See the *Opsware® NAS User's Guide* for more information on NAS authentication.

When a new user is authenticated through SAS, an account is created in NAS. The account is placed in the Default User Group that was specified when SAS authentication was enabled in the Administrative Settings in NAS. This user group, which is configurable, controls the default permissions that the system administrator has assigned to SAS users.

You must have the required set of permissions to view servers and network devices. To obtain these permissions, contact your Opsware administrator, or for more information, see the *Opsware® SAS Administration Guide*.

DHCP Configuration for OS Provisioning

The Dynamic Host Configuration Protocol (DHCP) specifies how to assign dynamic IP addresses to servers on a network. Opsware OS Provisioning uses DHCP to allow network booting and configuration of unprovisioned servers in the Server Pool. DHCP is also used to configure networking on newly provisioned servers that have not been assigned a static network configuration.

For OS provisioning, you may use either the DHCP server included Opsware SAS, an existing ISC DHCP server, or the MS Windows DHCP server. The instructions for configuring these various DHCP servers are in the following sections:

• Configuring the Opsware DHCP Server for OS Provisioning

- Configuring an Existing ISC DHCP Server for OS Provisioning
- Configuring the Windows DHCP Server for OS Provisioning
- Controlling the Opsware and Windows DHCP Servers Responses to OS Provisioning Requests

DHCP Software included with the Opsware Boot Server

When you install the Opsware Boot Server, the Opsware Installer also installs the following:

- **dhcpd**: An Internet Software Consortium DHCP server (ISC dhcpd).
- **dhcpd.conf**: A default DHCP server configuration file, read by the `dhcpd` server.
- **dhcpdtool**: The Opsware DHCP Network Configuration Tool which allows you to modify the `dhcpd.conf` file.

Opsware DHCP Server (dhcpd)

The DHCP server provides service to two types of networks:

- **Local networks**: Networks that are attached directly to the network interfaces of the host running the DHCP server. No special network configuration is needed to support local networks.
- **Remote networks**: Networks that are not directly attached to the DHCP server host. A router sits between the DHCP server host and the remote networks. For remote networks, a DHCP proxy (sometimes called IP helper) must be configured on each remote network to relay DHCP packets to the DHCP server host.

A DHCP proxy is not provided with Opsware SAS and instructions for setting one up are beyond the scope of this document. DHCP proxy functionality is often included in modern routers. Check with your network administrator or router vendor.

Log messages that the DHCP server produces are sent to the standard Unix syslog process with the daemon facility. Consult your vendor documentation on how to configure and view syslog messages.

See “Starting and Stopping the Opsware DHCP Server” on page 171.

Opsware dhcpd.conf File

The `dhcpd.conf` file provides the necessary parameters to support network booting of Sun hardware (a DHCP-capable PROM is required) and x86 hardware (a PXE-compatible system is required).

For x86 hardware that does not support PXE, the server can be booted from a floppy (Windows) or CD (Linux). When a boot floppy or CD is used, the DHCP server still provides network configuration information to the host.

The DHCP configuration file is `/etc/opt/opsware/dhcpd/dhcpd.conf`. In most cases, you will modify this file by running the DHCP Network Configuration Tool. For some advanced configurations (as noted in the following section), you may need to modify the file with a text editor. Documentation on the DHCP configuration file is available at the ISC web site `www.isc.org`.

The DHCP leases file is `/var/opt/opsware/dhcpd/dhcpd.leases`. This file should not need editing.

Opsware DHCP Network Configuration Tool (dhcpdtool)

The DHCP Network Configuration Tool is a menu-driven, terminal-based utility that enables you to customize the `dhcpd.conf` file for common local and remote network configurations. The tool prompts you for network information needed to configure DHCP for each OS provisioning network. Using the DHCP Network Configuration Tool simplifies configuration of the DHCP server and ensures that the DHCP configuration contains the options that are needed for the OS Provisioning feature to function properly.

If you need to configure the network for Opsware OS Provisioning to support less common configurations, you must modify the `dhcpd.conf` file with a text editor. Less common configurations include dual-interfaces with split-horizon DNS requirements, private build networks, and static NAT. Contact Opsware Support for more assistance.

Additionally, in some environments, multiple IP networks (layer 3) are layered on top of a single VLAN (layer 2). While this configuration is supported by the ISC DHCP server, generally such a topology requires careful consideration to work properly with DHCP. Therefore, the DHCP Network Configuration Tool can only configure a single IP network per VLAN.

The man pages for the DHCP Network Configuration Tool are installed in `/opt/opsware/dhcpd/man` on the Boot Server. They are also available at the Opsware Support web site.

Required Information for the Opsware DHCP Network Configuration Tool

Before you use the DHCP Network Configuration Tool to configure an OS provisioning network, you need the following information:

- The range of IP addresses that are assigned dynamically by the DHCP server. For example, 192.168.0.11 - 192.168.0.20 might be used to configure a pool of 10 addresses.

Each of these IP addresses must resolve to a host name on the DNS server.

- The IP addresses of one or more DNS servers. The servers must be able to resolve the standard required Opsware DNS entries. The DNS servers do not need to be on the same network that is being configured.
- A default DNS domain. This domain must include the standard, required Opsware DNS entries. For example, if the default DNS domain is `example.org`, then there must be an entry `spin.example.org` that can be resolved by the DNS servers.

If you are going to configure a remote network with the DHCP Network Configuration Tool, you will also need to provide the following information:

- The network address and size (netmask or bits). For example, 192.168.0.0/255.255.255.0 or 192.168.0.0/24. Both specify a network range of 192.168.0.0 - 192.168.0.255.
- The network gateway or default router, for example, 192.168.0.1.

Configuring the Opsware DHCP Server for OS Provisioning

The DHCP Network Configuration Tool is installed with the Opsware Boot Server. Perform the following steps to configure networks for OS provisioning:

1. Log in as root to the server running the Opsware Boot Server.
2. Make a backup copy of the configuration file with the following commands:

```
cd /etc/opt/opsware/dhcpd
cp dhcpd.conf dhcpd.conf.orig
```

3. Run the DHCP Network Configuration Tool with the following command:

```
/opt/opsware/dhcpd/sbin/dhcpdtool
```


The following DHCP Network Configuration Tool main menu appears:

Example: DHCP Network Configuration Tool Main Menu

```
Opsware DHCP Network Configuration Tool

 a)dd a new network.
 e)xit.

Choice [a, e]:
```

4 To add a new network, enter `a` at the preceding prompt.

The following menu to add local or remote networks appears:

Example: Menu to Add Local or Remote Networks

```
Opsware DHCP Network Configuration Tool

You may view/edit/delete one of the currently configured
network(s):

 1) 192.168.164.0/28
 2) 192.168.165.128/28

Or

 a)dd a new network.
 e)xit.

Choice [1..2, a, e]: a:
```

5 To configure the DHCP service on the local network, enter `l` at the preceding prompt. Local networks are detected automatically and displayed,

or,

to add a remote network, enter `r` at the preceding prompt.

6 If you are adding a local network, you need to enter the IP addresses or host names of the DHCP range and the DNS servers.

In the following example, note that the IP addresses are separated by a comma and a space.

Example: Local Network Configuration

```
Opsware DHCP Network Configuration Tool

Editing DHCP information for 192.168.8.0/23 (255.255.254.0)

All values which prompt for an address accept either a IP or
a hostname.

Enter the DHCP Range (start address, stop address)
: 192.168.8.20, 192.168.8.29
Enter the DNS server(s) (comma separated)
: 192.168.2.25, 192.168.2.28
Enter the DNS domain: opsware.com
```

7. If you are adding a remote network, supply information for the network address, size, and gateway. See the following example:

Example: Remote Network Configuration

```
Opsware DHCP Network Configuration Tool

All values which prompt for an address accept either a IP or
a hostname.

Enter network/netmask or network/bits: 192.168.10.0/24
Enter the network gateway: 192.168.10.1
Enter the DHCP Range (start address, stop address)
: 192.168.10.51, 192.168.10.59
Enter the DNS server(s) (comma separated)
: 192.168.2.25, 192.168.2.28
Enter the DNS domain: opsware.com
```

8. If the displayed information is correct, enter `k` to keep the network and return to the main menu.

9. At the main menu, to save the information you have entered, enter `s`,

   or,

to edit a configured network, enter the corresponding integer and go back to step 3,

or,

to add more networks, enter `a` and go back to step 3.

10 To exit the DHCP Network Configuration Tool, enter `e`. You are prompted to start (or restart) the DHCP server process.

11 To start (or restart) the DHCP server process, enter `y`. The DHCP Network Configuration Tool displays diagnostic output as part of its startup.

Starting and Stopping the Opsware DHCP Server

To start the DHCP server process, enter the following command on the server running the Opsware Boot Server:

```
/etc/init.d/opsware-sas start dhcpd
```

To stop the DHCP server process, enter the following command on the server running the Opsware Boot Server:

```
/etc/init.d/opsware-sas stop dhcpd
```

Configuring an Existing ISC DHCP Server for OS Provisioning

You may use an existing ISC DHCP server for OS provisioning instead of the DHCP server included with Opsware SAS. An existing ISC DHCP server will work with the provisioning of PXE 2.0 clients, but not with older clients such as PXE 0.99 or 1.0. (These older PXE clients have old PROMS and a PXE bootstrap floppy made with `rbfg.exe`.) The following instructions apply to recent versions of an ISC DHCP server, such as version 3.02rc3.

To configure an existing ISC DHCP server, perform the following steps:

1 The Opsware DHCP server must not be running on the server hosting the Boot Server. To disable DHCP on that server:

On a Linux server, enter the following command:

```
chkconfig --level 345 dhcpd off
```

On a Solaris server, enter the following commands:

```
rm /etc/rc2.d/S90dhcpd
rm /etc/rc0.d/K30dhcpd
```

2. Ensure that the configuration file for the existing ISC DHCP server has the entries shown in: “**Sample Configuration File Entries for an Existing ISC DHCP Server**” on page 172.

   The example is a snippet of the `dhcp.conf` file shipped with Opsware SAS, with the addition of `next-server`. This addition tells the PXE client to look for the `tftpserver` on the Opsware core, not on the existing DHCP server.

If you copy and paste the example, change all of the IP addresses (`1.2.3.4`) to the IP address of your core.

3. Ensure that the DHCP scope for the systems to be provisioned is set up with the required details, such as the DNS server, netmask, default router, DNS domain, and so forth.

4. Restart the existing ISC DHCP server.

Sample Configuration File Entries for an Existing ISC DHCP Server

```
#
# declare OPSW site options
#
option space OPSW;
#
# DANGER WILL ROBINSON - if you change the codes for these
# options, you'll need to also edit them in the param-request-
# lists appearing below. Note that in the pxeclient section, you
# need to specify the values in hex, not in decimal. Also, these
# values are burned into a couple other files you'll need to
# edit as well:
# /opt/opsware/boot/tftpboot/pxelinux.cfg/default
# /opt/opsware/boot/jumpstart/Boot/etc/dhcp/inittab
# /opt/opsware/boot/jumpstart/Boot/etc/default/dhcpagent
#
option OPSW.buildmgr_ip code   186 = ip-address;
option OPSW.buildmgr_port code 187 = unsigned integer 16;

#
# define OPSW site options
#
```

```
site-option-space "OPSW";
option OPSW.buildmgr_ip   1.2.3.4;
 option OPSW.buildmgr_port 8017;

#
# declare SUNW jumpstart vendor options (Sun recommended naming)
#
option space SUNW;
option SUNW.SrootIP4 code 2  = ip-address;
option SUNW.SrootNM  code 3  = text;
option SUNW.SrootPTH code 4  = text;
option SUNW.SbootFIL code 7  = text;
option SUNW.SinstIP4 code 10 = ip-address;
option SUNW.SinstNM  code 11 = text;
option SUNW.SinstPTH code 12 = text;
option SUNW.SsysidCF code 13 = text;
option SUNW.SjumpsCF code 14 = text;
option SUNW.Sterm    code 15 = text;

#
# define SUNW jumpstart vendor options
#
class "solaris-sun4u" {
   match option vendor-class-identifier;
   vendor-option-space SUNW;
   next-server 1.2.3.4;
   option SUNW.SrootIP4 1.2.3.4;
   option SUNW.SrootNM  "js";
   option SUNW.SrootPTH "/opt/opsware/boot/jumpstart/Boot";
   option SUNW.SinstIP4 1.2.3.4;
   option SUNW.SinstNM  "js";
   option SUNW.SjumpsCF "js:/opt/opsware/boot/jumpstart/Conf";
   option SUNW.SsysidCF "js:/opt/opsware/boot/jumpstart/Conf";
   option SUNW.Sterm    "vt100";
   option SUNW.SbootFIL "/platform/sun4u/kernel/sparcv9/unix";
#
# We use a bogus install path just to give the installer
# something to mount for now.
#
   option SUNW.SinstPTH "/opt/opsware/boot/jumpstart/Boot";
   option dhcp-parameter-request-list 1,3,6,12,15,43,186,187;
}
#
# Begin dhcptool added SUNW client classes (do not edit)
#
subclass "solaris-sun4u" "FJSV.GPUU";
subclass "solaris-sun4u" "NATE.s-Note_737S";
```



```
subclass "solaris-sun4u" "NATE.s-Note_747S";
subclass "solaris-sun4u" "NATE.s-Note_777S";
subclass "solaris-sun4u" "SUNW.Netra-T12";
subclass "solaris-sun4u" "SUNW.Netra-T4";
subclass "solaris-sun4u" "SUNW.Sun-Blade-100";
subclass "solaris-sun4u" "SUNW.Sun-Blade-1000";
subclass "solaris-sun4u" "SUNW.Sun-Fire-15000";
subclass "solaris-sun4u" "SUNW.Sun-Fire-280R";
subclass "solaris-sun4u" "SUNW.Sun-Fire-480R";
subclass "solaris-sun4u" "SUNW.Sun-Fire-880";
subclass "solaris-sun4u" "SUNW.Sun-Fire";
subclass "solaris-sun4u" "SUNW.Ultra-1-Engine";
subclass "solaris-sun4u" "SUNW.Ultra-1";
subclass "solaris-sun4u" "SUNW.Ultra-2";
subclass "solaris-sun4u" "SUNW.Ultra-250";
subclass "solaris-sun4u" "SUNW.Ultra-30";
subclass "solaris-sun4u" "SUNW.Ultra-4";
subclass "solaris-sun4u" "SUNW.Ultra-5_10";
subclass "solaris-sun4u" "SUNW.Ultra-60";
subclass "solaris-sun4u" "SUNW.Ultra-80";
subclass "solaris-sun4u" "SUNW.Ultra-Enterprise-10000";
subclass "solaris-sun4u" "SUNW.Ultra-Enterprise";
subclass "solaris-sun4u" "SUNW.UltraAX-MP";
subclass "solaris-sun4u" "SUNW.UltraAX-e";
subclass "solaris-sun4u" "SUNW.UltraAX-e2";
subclass "solaris-sun4u" "SUNW.UltraAX-i2";
subclass "solaris-sun4u" "SUNW.UltraSPARC-IIe-NetraCT-40";
subclass "solaris-sun4u" "SUNW.UltraSPARC-IIe-NetraCT-60";
subclass "solaris-sun4u" "SUNW.UltraSPARC-IIi-Engine";
subclass "solaris-sun4u" "SUNW.UltraSPARC-IIi-Netract";
subclass "solaris-sun4u" "SUNW.UltraSPARC-IIi-cEngine";
subclass "solaris-sun4u" "SUNW.UltraSPARCengine_CP-20";
subclass "solaris-sun4u" "SUNW.UltraSPARCengine_CP-40";
subclass "solaris-sun4u" "SUNW.UltraSPARCengine_CP-60";
subclass "solaris-sun4u" "SUNW.UltraSPARCengine_CP-80";
#
# End dhcptool added SUNW client classes (do not edit)
#
# declare PXE vendor options
#
option space PXE;
option PXE.mtftp-ip            code 1  = ip-address;
option PXE.mtftp-cport         code 2  = unsigned integer 16;
option PXE.mtftp-sport         code 3  = unsigned integer 16;
option PXE.mtftp-tmout         code 4  = unsigned integer 8;
option PXE.mtftp-delay         code 5  = unsigned integer 8;
option PXE.discovery-control   code 6  = unsigned integer 8;
```



```
option PXE.discovery-mcast-addr code 7  = ip-address;
option PXE.boot-item            code 71 = unsigned integer 16;

#
# define PXE vendor options
#
class "pxeclients" {
   match if substring (option vendor-class-identifier, 0, 9) =
"PXEClient";
   vendor-option-space PXE;
   filename "pxelinux.0";
   next-server 1.2.3.4;
   option vendor-class-identifier "PXEClient";
#
# We set the MCAST IP address to 0.0.0.0 to tell the boot ROM we
# can't provide multicast TFTP, so it will have to use just
# plain ol' TFTP instead (address 0.0.0.0 is considered
# as "no address").
#
    option PXE.mtftp-ip 0.0.0.0;
    option dhcp-parameter-request-list = concat(dhcp-parameter-
    request-list,ba,bb);
}
```

Configuring the Windows DHCP Server for OS Provisioning

You can use a Microsoft Windows DHCP server instead of the Opsware-supplied DHCP server to provision both Windows or Linux on PXE 2.0 clients.

The Microsoft Windows DHCP server *cannot* be used during the OS provisioning of the following types of systems:

- Solaris
- PXE 0.99 or 1.x clients (These older PXE clients have old PROMS and a PXE bootstrap floppy made with `rbfg.exe`.)

To configure a Microsoft Windows DHCP server for use with OS Provisioning, perform the following tasks:

1. On the Windows system running the DHCP server, you must define option #60, so that it appears in the DHCP scope options. To do so, open a command prompt window, and enter the following command:

   ```
   netsh.exe dhcp server add optiondef 60 "PXEClient" STRING
   ```


2. Using the Windows DHCP Management Snap-in (`dhcpmgmt.msc`), create a scope, which is usually a subnet declaration. In the scope options, #60 should now appear. Check the box, and then add the string `PXEClient`.

3. Using the same scope options box, configure options 66 and 67: Click the DHCP option #66 (Boot Server Host Name), and add the full DNS name of the TFTP/Boot Server (for example `core01.test.com`). For option #67 (Bootfile Name), add the boot file name: `pxelinux.0`.

4. Ensure that the DHCP scope for the systems to be provisioned is configured with the required details, such as the DNS server, netmask, default router, DNS domain, and so on.

5. At the command prompt, enter the following commands to define the IP address of the Opsware Agent Gateway and the port forward for the Build Manager:

```
netsh.exe dhcp server add optiondef 186 "buildmgr_ip" IPADDRESS

netsh.exe dhcp server add optiondef 187 "buildmgr_port" WORD
```

6. Using the DHCP Management Snap-in (`dhcpmgmt.msc`), configure options 186 and 187 to be part of your scope, and give them the appropriate values (IP address of the Opsware Agent Gateway and the port forward for the Build Manager, normally 8017).

7. Define option 043 (Vendor specific options) as a BINARY type, with the value `01 04 00 00 00 00 ff`. This setting tells the DHCP server to go directly to the FTP server specified in the Boot Server Host Name parameter, and also tells it to not use Multicast TFTP.

8. Restart the Windows DHCP server.

Controlling the Opsware and Windows DHCP Servers Responses to OS Provisioning Requests

You can configure the Opsware DHCP server to respond only to the OS provisioning requests from PXE and Sun Solaris JumpStart clients while the Microsoft Windows DHCP server responds to all Windows provisioning requests.

1. Add the network subnet to the Opsware DHCP server. See “Configuring the Opsware DHCP Server for OS Provisioning” on page 168.

2. Stop the Opsware DHCP server:


```
/etc/init.d/opsware-sas stop dhcpd
```

3. Make a backup copy of the Opsware DHCP configuration file:

```
cd /etc/opt/opsware/dhcpd
cp dhcpd.conf dhcpd.conf.orig
```

4. In a text editor, open the Opsware DHCP configuration file.

5. Below the `pool` entry, find the subnet definition you want to configure and comment it out with the # character:

```
range <IP1> <IP2>;
```

Should now read:

```
# range <IP1> <IP2>;
```

6. Immediately after the now commented out range line, enter:

```
pool {

      # range <IP1> <IP2>;
      allow members of "solaris-sun4u";
      allow members of "solaris-sun4us";
      allow members of "pxeclients";
      range <IP1> <IP2>;
      }
```

modifying the above as necessary to fit your system. The `pool` statement tells the DHCP server to continue serving the specified range, but only for the three types of clients indicated. (The first two `allow` statements are for Sun machines, the third is for PXE clients). The closing brace in the `pool` statement is required.

7. Repeat the preceding two steps for every subnet you wish to configure.

8. In the text editor, save the `dhcpd.conf` file.

9. Start the Opsware DHCP server:

```
/etc/init.d/opsware-sas start dhcpd
```


10 Check the DHCP logs for errors. The DHCP service logs with `syslog`. See the `syslog.conf` file to determine how logging has been configured for the Opsware DHCP server.

11 Ensure that the Windows DHCP server subnet/scope declarations are modified to include the Build Manager DHCP options (code 186 and 187). See “Configuring the Windows DHCP Server for OS Provisioning” on page 175.

12 Ensure that the Windows DHCP server does not include options 43, 60, 66, or 67 in the scope/subnets. This will prevent the PXE and Sun JumpStart clients from connecting to the Windows DHCP server but allow them to connect to the Opsware DHCP server.

13 Ensure that the IP ranges of the Windows and Opsware DHCP servers don't overlap. As a guideline, the number of IP addresses in a given range should be twice the maximum number of servers that will be provisioned concurrently.

14 If the DHCP servers aren't directly connected to the network/subnet of the systems being provisioned, the DHCP requests must be forwarded to both DHCP servers, the Opsware DHCP server first.

Additional Network Requirements for OS Provisioning

OS Provisioning for Solaris

If you are using OS provisioning for Solaris (JumpStart) on an isolated network, you must have a default Gateway (router) available, even if it does not route packets. For Solaris JumpStart to function properly, the IP address of the default Gateway must be sent to the installation client that is being provisioned with DHCP. When you use the Opsware DHCP Configuration Tool, a default Gateway is properly configured for Solaris because the tool adds the appropriate default router.

Host Name Resolution

For Windows OS provisioning, the host name `buildmgr` must resolve on all Windows OS installation clients.

The Opsware core host names must resolve using the DNS search order and DNS server information that the DHCP server provides. The DHCP server provides the DNS server IP address and the DNS search order. For each subnet you configure with the Opsware DHCP Configuration Tool, the DNS domain used by that subnet must have a DNS entry for `buildmgr`.

For example, you could have two subnets with the following domain names:

```
subnet1.example.com
subnet2.example.com.
```

Therefore, there must be two DNS entries for `buildmgr`:

```
buildmgr.subnet1.example.com
buildmgr.subnet2.example.com.
```

The host running the OS Provisioning Media Server must be able to resolve the IP address to the host name (reverse lookup) for any server being provisioned.

See also “Host and Service Name Resolution Requirements” on page 74.

Open Ports

Any server on which an OS is to be provisioned must meet the same requirements for connectivity to the Opsware Core network as any managed server. See “Open Ports” on page 72.

Windows Patch Management Tasks

This section includes post-installation tasks for the Windows Patch Management feature of Opsware SAS.

Import Windows Patches into the Software Repository

Before Windows patches can be installed on managed servers using Opsware SAS, the patches must be imported into the Software Repository. You can import the patches with the SAS Client or with the following shell script:

```
/opt/opsware/mm_wordbot/util/populate-opsware-update-library
```

This script downloads the Microsoft Patch Database and patches from the Microsoft site and imports them into the Software Repository. You should schedule the script to run weekly as a `cron` job on the Software Repository server. Non-administrative users of the SAS Client will have the new patches available to them without any action on their part.

For more information about the Opsware-supplied Windows Patch Import script, see the *Opsware® SAS Administration Guide*“. For more information about importing Windows patches using the SAS Client, see the *Opsware® SAS User’s Guide: Application Automation*.

Install Internet Explorer 6.0 or Later for Patch Management on Windows NT 4.0 and Windows 2000

The `mbsacli.exe` patch utility for patch management on Windows NT 4.0 and Windows 2000 requires Internet Explorer 6.0 or later. Note that IE 6.0 is pre-installed on Windows Server 2003.

Automating Installation of IE 6.0 or Later

To automatically deploy IE 6.0 or later, use the Internet Explorer Administrator's Kit (IEAK) for the version of IE that you want to install. For more information on IEAK, see the following URL:

```
http://microsoft.com/windows/ieak/default.asp
```

To automate deployment of IE 6.0 or later to managed servers, perform the following tasks:

1. Install IEAK on a Windows 2000 or Windows Server 2003 system.
2. After you install IEAK, start the Internet Explorer Customization Wizard.
3. IEAK will prompt you to choose a Media Selection option. Select the option *Flat* (all files in one directory).
4. Accept the defaults for all other options.
5. After the wizard completes, zip the contents of the directory it created. This directory contains the automatically deployable version of IE 6.0 or later.
6. Upload the ZIP package into the Opsware SAS Software Repository. See the *Opsware® SAS Policy Setter's Guide* for instructions on importing software into the Software Repository.

   Set the following properties for the package when you import it into the Software Repository. See the *Opsware® SAS Policy Setter's Guide* for the steps to edit the properties for a package in the SAS Client.

   - In the Installation Parameters section in the **Install Flags field**, specify the installation location:

     ```
     %SystemDrive%\IE-redist
     ```

   - In the Installation Parameters section in the **Reboot Required field**, specify Yes.

- In the Install Scripts section in the **Post-Install Script tab**, enter this text:

  ```
  %SystemDrive%\IE-redist\ieX.xsetup.exe /q:a /r:n
  ```

  Where `ieX.xsetup.exe` is the IE stub installer and `X.x` identifies the version.

  The `/q:a` install option specifies quiet install mode, with no user prompts. The `/r:n` install option suppresses restarting the server after IE installation.

7. Start the Opsware SAS Web Client, create a Software Policy, and add the package you imported into the Software Repository in step 6 to that policy. See the *Opsware® SAS Policy Setter's Guide* for the steps to create a software policy and add a package to a software policy.

8. Use the SAS Client to remediate the Software Policy to your managed Windows servers. See the *Opsware® SAS User's Guide: Application Automation* for the steps to install software on a server by remediating a software policy onto a managed server.

Support for Redhat Network Errata and Channels

The Red Hat Network (RHN) is a web-based system for administrators that assists them in patch management, updating, monitoring, and maintenance. Of particular interest to Opsware administrators is the ability to install and upgrade packages (RPMs) on Red Hat Linux servers.

Included with Opsware SAS, the `rhn_import` CLI program allows you to download packages from the Red Hat Network, upload the packages into Opsware SAS Software Repository, and create software policies that correspond to Red Hat Network patches, errata, and channels. When you remediate the software policies, the packages in the policies are installed or upgraded on the managed servers.

Opsware administrators can import these packages and create software policies using the SAS Client. Alternatively, all these operations can be done from the command line using the `rhn_import` utility. This remediation process can be transparent to end users.

For more information on `rhn_import`, see "Automatically Importing Red Hat Network Errata" in the *Opsware® SAS Policy Setter's Guide*.

Opsware Global File System Tasks

This section contains optional post-installation tasks for the Opsware Global File System (OGFS).

Configuring User ID Numbers for the Opsware Global File System

When you install an Opsware SAS core, you can set values to control the range of UID and GID numbers used by the Opsware Global File System. These values are used to provide unique user IDs for all Opsware users that are logged in to the OGFS. When the Web Services Data Access Engine creates a new user, it will use these values to determine the next available (unique) user ID that is within the range for the local data center.

To set values that control the range of UID and GID numbers, you must specify the following Web Services Data Access Engine parameters in the `params.conf` file:

- **twist.min_uid**: Contains the minimum UID number that can be used. The default value is 80001.
- **twist.default_gid**: Contains the group ID number that a user is assigned to restrict Opsware users from using certain ports. The default value is 70001.

These parameters are specified as global in the `params.conf` file, which means that they will be written out to the global response file (`oiresponse.global`). This file is generated when the Model Repository export is performed on the First Core server. When you follow the installation instructions and provide the global response file (`oiresponse.global`) as the initial response file to the Secondary Core server, Opsware Installer will use the specified values.

For more information, see Table 5-7, “Opsware Global File System Prompts,” on page 122.

After you make changes to these parameters, you must restart the Web Services Data Access Engine server.

Chapter 8: Multimaster Mesh Installation

IN THIS CHAPTER

This section discusses the following topics:

- Multimaster Mesh Installation Basics
- Prerequisites for Multimaster Mesh Installations
- Adding a Subsequent Core to a Multimaster Mesh
- Multimaster Mesh Post-Installation Tasks

This section describes how to run the Opsware Installer to create a Multimaster Mesh of Opsware Cores by adding additional cores to the mesh. These instructions are followed by a short list of post-installation tasks.

Multimaster Mesh Installation Basics

A *Multimaster Mesh* is a set of two or more Opsware Cores that communicate through Opsware Management Gateways and can perform real-time synchronization of the data about their Managed Servers contained in their respective Model Repositories over the network. The First Core installed in a Multimaster Mesh is the *First Core*. The second, third, or subsequent cores that you install in a Multimaster Mesh are *Secondary Cores*.

The Model Repositories in each of the cores are continually updated so that they are always exact duplicates of each other. All the servers in a Multimaster Mesh can be managed through a single OCC. A Multimaster Mesh is best for larger networks that span multiple facilities.

The Opsware Core Component that propagates and synchronizes changes from each model repository database to all other model repository databases is called the Model Repository Multimaster Component. This replication capability allows you to store and maintain a blueprint of software and environment characteristics for each facility making it easy to rebuild your infrastructure in the event of a disaster. It also provides the ability to easily provision additional capacity, distribute updates, and share software builds, templates and dependencies across multiple facilities – all from a single user interface.

The following procedures assume that you have already installed the First Core. If not, follow the installation procedures described in Chapter 6, “Installing the First Opsware Core” to install the First Core.

Prerequisites for Multimaster Mesh Installations

This section discusses prerequisites for installation and preexisting conditions that might affect your Multimaster installation.

The First Opsware Core

Before adding subsequent cores to a Multimaster Mesh, you must have installed the First Core as described in Chapter 6, “Installing the First Opsware Core”. You can then perform the tasks in this section to install subsequent cores in the mesh.

Opsware Command Center (OCC)

The OCC is bundled into the Slice Component bundle. Any Core Server in your Multimaster Mesh that has a Slice Component bundle installed will have the Opsware Command Center (OCC) component installed. All servers, First Core or Secondary Core, with the OCC component installed can be used to manage the servers in the Facility that the server is associated with.

TIBCO Rendezvous

In a Multimaster Mesh, Opsware SAS uses the TIBCO Certified Messaging system to synchronize Model Repositories at different Facilities. The TIBCO Messaging system is always installed as part of a core’s Infrastructure Component.

When you add a Secondary Core to a Multimaster Mesh, the Opsware Installer automatically configures the TIBCO Rendezvous routing daemon (`rvrd`). For more information, see “TIBCO Rendezvous Configuration for Multimaster” on page 277.

Plan Your Core Deployment

You must plan your Opsware System deployment. You must decide whether you want to install the Core Components on a single server or on multiple servers, whether you will have multiple Slice Component bundles, which servers in your Facility will have Secondary Cores installed, whether to install the OS Provisioning bundle, and so on. See Chapter 1, “Opsware SAS Architecture” and “Opsware Core Performance Scalability” on page 53.

Administrative Tasks

Perform the pre-installation administration tasks, such as configuring your network. See Chapter 3, “Pre-Installation Requirements.”

Gather Environment Information

Gather information in preparation for the Opsware Installer interview. This includes such information as the name and ID of the Facility for the core, passwords, IP addresses, and so on.

You will use the Opsware Installer Interview Response File you created and saved during the installation of the First Core. See Chapter 5, “Prerequisites for the Installer Interview.”

IP Addresses

Verify that all Opsware Core Servers have unique IP addresses within the entire Multimaster Mesh.

Synchronize Time (UTC)

All servers in a Multimaster Mesh must use UTC. After you synchronize the time on all servers within a Facility, synchronize the time between the facilities in the Multimaster Mesh. Synchronize the time with an external time-server that uses Network Time Protocol (NTP) so that all servers are using the same Coordinated Universal Time (UTC).

Network Requirements

Verify that the Multimaster installation meets the same network requirements as a First Core installation, with the exceptions that each core must be on a different Local Area Network (LAN or VLAN). The cores must be in different broadcast domains.

Subdomains

Ensure that each core in a Multimaster Mesh has a different subdomain so that managed servers can resolve the unqualified host names `spin`, `way`, and `theword`.

tsnnames.ora File

the `tnsnames.ora` file on the First Core contains entries for every Model Repository in the Multimaster Mesh. With this Opsware SAS release, the `tnsnames.ora` file is automatically populated with the required entries for the Secondary Core being installed during the installation procedure.

For example entries, see “tnsnames.ora: Multimaster Mesh Requirements” on page 262.

Oracle RDBMS Versions

Ensure that you do not have conflicting Oracle software versions within the Multimaster Mesh. See “Multiple Oracle Versions and Multimaster Cores” on page 246.

The Multimaster State Monitoring Utility

When installing an additional core in an existing Multimaster Mesh, you must shut down the Opsware Command Center and the Data Access Engine and then, on the server running the Model Repository Multimaster Component (part of the Infrastructure component), ensure that all transactions have been published and conflicts resolved before exporting Model Repository data.

See "Prepare the Environment to Export First Core Model Repository Data" on page 194.

In previous Opsware versions, this required inspecting the Model Repository Multimaster Component log files. Opsware SAS now provides the Multimaster State monitoring utility to assist you in this task.

You must invoke the utility on the server that hosts the central Model Repository Multimaster Component (the Infrastructure Server).

Running the MSM Utility

To run the MSM utility, you must first set the environment:

```
export LD_LIBRARY_PATH=/opt/opsware/lib
```

Now you can enter the following to invoke the MSM utility:

```
cd /opt/opsware/spin/util
/opt/opsware/bin/python ./mm_state.pyc
```

The default for the MSM utility is to refresh the data display in near real time.

The MSM utility uses the Data Access Engine's library layer, therefore the Data Access Engine itself need not be running. However, the Model Repository and the Management and First Core gateways (if your SQL*Net traffic is tunneled) must be running.

Once the MSM utility is started, you will see a screen similar to this:

```
# Transactions Conflicting
From\To|   832   834 |
-------+-------------+
   832 |    --     0 |
   834 |     0    -- |
-------+-------------+
```

The screen above is the Transaction Conflict screen. It shows the source of the transaction for which a conflict has occurred in the left column and the destination in the top row.

If you press `h` at this screen, you will see the following options:

```
>>> Help:
  'a' for all counts
  'u' for unpublished counts
  'n' for not received counts
  'c' for conflict counts
  'e' for error counts
  'q' to exit

Press any key to continue
```

The MSM utility provides several monitoring options:

- `u` – show the count of transactions waiting to be published at each core.
- `n` – show the count of transactions published, but not received by the destination core.
- `c` – show the count of unresolved transaction conflicts at each core.
- `e` – show the count of all errors reading data from each core.
- `a` – show `u`, `n` and `c` data presented together. Note that, if the number of transaction is large, the column alignment may not be maintained.
- q – exit the MSM utility.

Select the optional views by pressing the associated key. Press `q` to exit.

Using the MSM Utility during Installation

To ensure that your system is quiesced as required, after shutting down the Opsware Command Center and the Data Access Engine, invoke the MSM utility and monitor the outstanding transactions and unresolved conflicts. When these reach zero, then all transactions and conflicts are resolved and you can continue the installation.

Batch Mode

You can also invoke the MSM utility in batch mode using the `-b` command-line argument which will simply do a one time display of the current state and will not refresh the data.

```
export LD_LIBRARY_PATH=/opt/opsware/lib
cd /opt/opsware/spin/util
/opt/opsware/bin/python ./mm_state.pyc -b
```

Adding a Subsequent Core to a Multimaster Mesh

This section describes how to add a subsequent Secondary Opsware Core to a Multimaster Mesh. There are several cross references, so ideally, you should scan this section first and make sure that you are prepared to perform all of the steps.

Throughout this section, the First Core in the mesh is referred to as the First Core. The new core that you are adding is called a Secondary or Subsequent Core.

Overview of the Installation Process

The following are the typical phases of installing a Secondary Core:

1. *Pre-Installation*: Ensure that all installation prerequisites have been met, that you have the information needed to complete the Opsware Installer interview, that you have all necessary permissions to complete the installation, and that you have the Opsware SAS installation DVDs. For more information, see Chapter 3, “Pre-Installation Requirements” and Chapter 5, “Prerequisites for the Installer Interview”.

2. *Define New Facility*: During this phase you will complete the Opsware Installer Interview and define the facility in which the new Secondary Core is to be installed; this operation will take place on the server that hosts the Infrastructure component on the First Core.

3. *Export Model Repository Data*: Export the First Core's Model Repository data, copy the export file (along with both versions of the cryptographic material bundle, the `db.e` and `tgz.e` files) to the new Secondary Core server.

4. *Install Secondary Core*: Install the Oracle RDBMS and Model Repository on the Secondary Core's Infrastructure Server (or install the Model Repository to an existing or manually installed Oracle database). For information about using an existing or manually installed Oracle database, see Appendix A, "Oracle Setup for the Model Repository". The exported data will be imported into the database during the Model Repository installation.

5. *Post Installation Tasks*: Perform various post-installation tasks to complete the configuration of the new Secondary Core.

When you installed the First Core, you also installed an Oracle database for use by the Model Repository. Secondary Cores also require their own Oracle database installation for use by their Model Respiratory. This section provides instructions for installing a Secondary Core using the Opsware Installer to install an Opsware-supplied Oracle 10g database.

If you have an existing Oracle database and want to use that instead of the Opsware-supplied Oracle database on the server that will host the Secondary Core Model Repository, you must configure the existing Oracle database instance correctly to work with the Opsware SAS core. For information about installing an Opsware SAS core to use an existing Oracle database, see Appendix A, "Oracle Setup for the Model Repository" in this guide.

Before proceeding with the installation, ensure that you have complied with the "Prerequisites for Multimaster Mesh Installations" on page 184.

Phase 1: Preparing for Installation

To add a new Secondary core to a Multimaster Mesh, perform the following tasks:

1. Locate the Opsware Server Automation System (SAS) installation DVD/media.

   See "Opsware Installation Media" on page 126, including the recommendation, "Copying the DVDs to a Local Disk."

2. On the First Core's Model Repository server and Infrastructure component server, and on each server of the new Secondary Core, mount the Product Software DVD or NFS-mount the directory that contains a copy of the DVD contents.

The Opsware Installer must have *read/write root* access to the directories where it installs Opsware components, even NFS-mounted network appliances.

3. On the Secondary Server on which you will install the Opsware Model Repository, open a terminal window and log in as root.

4. Change to the root directory:

```
cd /
```

5. On the First Core's Model Repository server, invoke the Opsware Installer with the `-r` (response file) and the `--interview` options. For example:

```
/opsware_system/opsware_installer/install_opsware.sh -r
/usr/tmp/oiresponse.stand_to_mm --interview
```

In the above example, both the `-r` (response file) and `--interview` options are invoked. This is because you need to use many of the parameter values you set for the First Core and specifying the response file created during the First Core installation will make those values the default during this interview. There will be, however, several new parameters that must have values supplied.

The response file should be the one you used when you installed the Ffirst Core. You must specify the full path to the response file and to the installer script. The example above assumes that The you have copied the contents of the Opsware SAS Product Software DVD to a local disk or network share.

Phase 2: Define the New Facility

The Opsware Installer Installation Options screen displays the following:

```
Welcome to the Opsware Installer. Please select one of the
following installation options:

1 - Multimaster Opsware Core: First Core
2 - Multimaster Installation: Define New Facility; Export
Model Repository
3 - Multimaster Installation: Subsequent Core
```


1. At the installation options prompt, select the second option:

```
2- Multimaster Installation: Define New Facility; Export
Model Repository
```

2. At the interview mode prompt, select one of the following options:

```
1 - Simple Interview Mode
2 - Advanced Interview Mode
```

   Choose Option 1 to use the default values for certain configuration parameters.

   Choose Option 2 to specify all configuration parameters during the interview.

3. Respond to the interview prompts. Follow the on screen instructions to complete the interview. You should have specified the response file from the installation of the First Core, so many of your responses will be displayed as the default during this installation. For more information about the installer prompts, see "Opsware Installer Interview Prompts" on page 96.

   The installer displays default parameter values in square brackets [ ].

For the short name of the Secondary Core (`slaveTruth.dcNm` parameter), you must enter a new Facility name. This name must be unique within the Multimaster Mesh. That is, do not use the same Facility short name as the First Core or any other Secondary Core.

4. Complete the interview. When you have completed entering all of the required information, the Opsware Installer displays this message:

```
All parameters have values. Do you wish to finish the
interview (y/n):
```

   If you are satisfied with your answers, press y.

   If you want to review or change your answers, press n. The installer displays the prompts again, showing in brackets [ ] the values that you just entered during the interview.

   After modifying your responses, press y to finish the interview.

5 Create the response file. After completing the interview, the installer prompts you to provide a filename for the response file:

```
Name of response file to write
[/usr/tmp/oiresponse.add_dc_to_mesh]
```

The response file is a text file that contains the answers you entered during the interview. You can enter a path and name for the response file or accept the default location and name. In either case, write down the location and name of the response file for future reference.

6 The Opsware Installer prompts you to indicate whether you want to continue the installation by using the current response file. Select one of the following options:

- If you are satisfied with the responses you entered in the interview and you are ready to define the new Facility now, enter `y` to continue.
- If you do not want to define the new Facility now, enter `n`.
- If the First Core's Management Gateway is on a different server than the First Core's Model Repository, enter `n`. Copy the response file to the First Core's Management Gateway server and go to step 7.

7 *If you entered* `y` *in the previous step, skip this step and go to step 8*. If you entered `n` in the previous step, when you are ready to complete the installation, log in to the server running the First Core's Management Gateway and invoke the Opsware Installer using the `-r` (response file) option. Be sure to specify the name and fully qualified path to the response file. For example:

```
/opsware_system/opsware_installer/install_opsware.sh -r
/usr/tmp/oiresponse.add_dc_to_mesh
```

8 At the Components prompt, select the following option:

```
1 ( ) Define New Facility
```

Wait for the installer to finish this operation before continuing with the Phase 2. During this process, the Opsware Installer registers the new Secondary Facility with the First Core's Model Repository, automatically generating a unique ID for the Secondary Facility.

Before beginning Phase 3, you must allow enough time for the New Facility configuration you defined above to propagate to all other cores in the Multimaster Mesh.

Phase 3: Export the First Core Model Repository Data/Import into the Secondary Core's Model Repository

1 Determine the Secondary Facility's unique ID.

To find the Facility ID, perform the following tasks:

- Log in to the SAS Web Client as the `admin` user at the First Core Facility.
- From the navigation panel, click Facilities under Environment.
- Click the link for the secondary Facility. Note the Facility's ID.

From this point on, Phase 3 has three sub-phases:

1. In step 2 through step 7, you perform the tasks required to prepare the environment to export data from the First Core's Model Repository.
2. In step 8 and step 9, you export the data.
3. In step 10 through step 16 you will restart the First Core components and copy the data to the new Facility.

Prepare the Environment to Export First Core Model Repository Data

If you are adding a third core (or more) to a Multimaster Mesh, you can also export data from a core other than the original First Core. The steps to do so differ slightly, see step 4 on page 195 and step 13 on page 202.

2 On the server(s) where the First Core's Slice Component bundle(s) (which contains the Opsware Command Center (OCC) and the Opsware Global File System) is installed, stop the Web Services Data Access Engine:

```
/etc/init.d/opsware-sas stop twist
```

3 On the server where the First Core's Infrastructure component (which bundles the Data Access Engine) is installed, stop the engine:

```
/etc/init.d/opsware-sas stop spin
```


If the OCC (in the Slice component bundle) and the First Core's Data Access Engine are installed on different servers, you must also run the preceding command on the OCC server(s).

4. On the server running the Model Repository Multimaster Component (part of the Infrastructure component), ensure that the number of unpublished *and* unreceived transactions from the First Core to other cores has dropped to zero and that there are no unresolved conflicts before stopping the secondary servers' `vaultdaemons`.

   You can confirm this by using the Multimaster State Monitoring utility (MSM). See "The Multimaster State Monitoring Utility" on page 187. If you have unresolved conflicts, you must resolve them before continuing. For information about resolving Multimaster Mesh conflicts, see the *Opsware® SAS Administration Guide*.

> If you are going to export data from a core other than the First Core, ensure that all transactions have propagated to the core that is to be exported before performing step 9 or some transaction will be lost.

5. After all transactions have propagated, stop the `vaultdaemon` on all Secondary Server(s) running the Model Repository Multimaster Component (part of the Infrastructure bundle), *except the First Core*:

```
/etc/init.d/opsware-sas stop vaultdaemon
```

6. Ensure that the number of *unreceived* transactions to the First Core from all other cores is zero. You can confirm this by using the Multimaster State Monitoring utility (MSM). See "The Multimaster State Monitoring Utility" on page 187. Then, stop the First Core's `vaultdaemon`:

```
/etc/init.d/opsware-sas stop vaultdaemon
```

7. On all Secondary Servers, restart the `vaultdaemon`:

```
/etc/init.d/opsware-sas start vaultdaemon
```


After all Secondary Server `vaultdaemons` have been restarted you can Export the data from the Model repository, see step 8. Restarting the Secondary Core `vaultdaemons` also restarts the listener processes and allows all Secondary Cores to see transactions from the new Facility as soon as it is defined and the configuration propagates.

Before you begin the data export from the Model Repository, ensure that you do not have conflicting Oracle versions within the Multimaster Mesh. See “Multiple Oracle Versions and Multimaster Cores” on page 246.

Exporting the First Core Model Repository Data

8 Log in as `root` to the server hosting the First Core’s Model Repository and invoke the installer with the `-r` option and specify the response file created by the latest interview. For example:

```
/opsware_system/opsware_installer/install_opsware.sh -r
/usr/tmp/oiresponse.add_dc_to_mesh
```

9 At the Components prompt, select the following option:

```
2 ( ) Export Model Repository
```

The installer exports the data from the Model Repository into a gzipped tar file called `truth_data.tar.gz`, which by default resides in the directory `/var/opt/opsware/truth` (or the directory that you specified as the `truth.dest` parameter value during the Installer interview).

Depending on the amount of data, the export can take 20 minutes or more. To track the progress of the export, open a new terminal window and run the following command where <`number`> is the most recent log file number plus one.

```
tail -f /var/log/opsware/install_opsware/truth
/truth_exp<number>.log
```


Restart the First Core Components and Copy the Data to the New Facility

10 On the First Core server where the Infrastructure component (which bundles the Primary Data Access Engine) is installed and on all cores where a Slice Component bundle (which bundles the Secondary Data Access Engine) is installed, start the engine:

```
/etc/init.d/opsware-sas start spin
```

If the OCC and the Data Access Engine are installed on different servers, you must also run the preceding command on the OCC server.

11 On the servers where the Slice component bundle (which contains the OCC and the Opsware Global File System Server) are installed, start the Web Services Data Access Engine:

```
/etc/init.d/opsware-sas start twist
```

12 Start the First Core's Model Repository Multimaster Component:

```
/etc/init.d/opsware-sas start vaultdaemon
```

Examine the logs for the Model Repository Multimaster Component to ensure that it started properly. These logs are located in the following directory:

```
/var/log/opsware/vault
```

The log files are named `log`, `log.1`, `log.2`, `log.3`, and so on.

13 Copy the First Core's Model Repository export file (`truth_data.tar.gz`) to the server where you will install the Secondary Core's Model Repository.

The Unix `oracle` user must have read access to the `truth_data.tar.gz` file on the Secondary Core's Model Repository server.

14 Copy the Global Response File (`oiresponse.global`) from the First Core's Model Repository server to the new Secondary Core's Model Repository server.

On the First Core, the `oiresponse.global` file resides in the same directory as the Model Repository export file. The default directory is `/var/opt/opsware/truth`.

15 On all new Secondary Core servers, make the following directory:

```
mkdir -p /var/opt/opsware/crypto/cadb/realm
```

16 Copy the cryptographic material database and Unix gzip tar file from the First Core's Model Repository server to every Secondary Core server. The cryptographic material database and Unix gzip tar file are located in:

```
/var/opt/opsware/crypto/cadb/realm/opsware-crypto.db.e
/var/opt/opsware/crypto/cadb/realm/opsware-crypto.tgz.e
```

You must copy these files to the same location on the new Secondary Core servers. Paths and filenames must match on all servers in the Multimaster Mesh.

The root user must have read access to these directories and files.

Phase 4: Install the Secondary Core

1 Log in to the new Model Repository server and invoke the Opsware Installer using the `-r` (response file) and the `--interview` options. For this step, specify the `oiresponse.global` response file.

For example:

```
/opsware_system/opsware_installer/install_opsware.sh -r
/usr/tmp/oiresponse.global --interview
```

Be sure to specify the full path to and filename of the global response file that you copied to the Secondary Core in step 14.

The Opsware Installer displays following options:

```
Welcome to the Opsware Installer. Please select one of the
following installation options:

1 - Multimaster Installation: First Core
```



```
2 - Multimaster Installation: Define New Facility; Export
Model Repository
3- Multimaster Installation: Subsequent Core
```

2 At the Installation Options prompt, select option 3:

```
3- Multimaster Installation: Subsequent Core
```

3 At the Interview Mode prompt, select one of the following options:

```
1 - Simple Interview Mode
2 - Advanced Interview Mode
```

Choose Option 1 to use the default values for certain configuration parameters.

Choose Option 2 to specify all configuration parameters during the interview.

4 At the Database Configuration Option prompt, select the following option:

```
1 - Install Oracle with Opsware
```

For information about using an existing Oracle database (Option 2 -“`Use Existing Oracle Database`”), see Appendix A, “Oracle Setup for the Model Repository”. When you use an existing Oracle database, you must configure the existing Oracle database instance correctly to work with the Opsware SAS core.

5 Respond to the interview prompts. Since you specified the global response file when invoking the installer, many of the parameters will display your default settings which you can accept.

The installer displays default parameter values in square brackets [ ].

Unless you have changed parameter values for the First Core since creating the global response file, accept the default values provided by that file. Parameter values must match the values for the First Core.

Parameter values supplied during this interview must adhere to the following standards:

- The Facility ID (`truth.dcId`), Short Name (`truth.dcNm`), and Subdomain (`truth.dcSubDom`) must match the values generated when the Secondary *Facility* was defined in the First Core. You noted the Facility ID in step 1 on page 194.
- The Secondary Core's Authorization Domain (`truth.authDom`) must match the value provided for the First Core.
- The path to the Model Repository data export file, `truth_data.tar.gz`, must be the same for both the First Core's Model Repository server and the Secondary Core's Model Repository server.
- The directories for the OS provisioning OS media must already exist on the server on which you will install the OS Provisioning Media Server component.

6 Complete the interview. When you have completed entering all of the required information, the Opsware Installer displays this message:

```
All parameters have values. Do you wish to finish the
interview (y/n):
```

If you are satisfied with your answers, press y.

If you want to review or change your answers, press n. The installer displays the prompts again, showing in brackets [ ] the values that you previously entered.

After modifying your responses, press y to finish the interview.

7 Create the response file. After completing the interview, the installer prompts you to provide a filename for the response file:

```
Name of response file to write
[/usr/tmp/oiresponse.slices_slave_typical]
```

All of your interview responses will be written to a text response file and saved on the current server at the location you specify. You can enter the full path and name of the response file or accept the Opsware default location.

Record the fully qualified path to and name of the response file and store it where you can easily find it. You will need to use it again during future installations and upgrades.

8 The Opsware Installer prompts you to indicate whether you want to continue the installation by using the response file. Select one of the following options:

- If you are satisfied with the responses you entered in the interview and you are ready to install the Model Repository now, enter `y` to continue.
- If you do not want to install the Model Repository now, enter `n`.

9 If you entered `y` in the previous step, skip this step. If you entered `n` in the previous step, invoke the Opsware Installer with the `-r` option to specify the response file created by the interview. For example:

```
/opsware_system/opsware_installer/install_opsware.sh -r
/usr/tmp/oiresponse.slices_slave_typical
```

10 At the components prompt, select one or more components to install:

```
Welcome to the Opsware Installer.
Please select the components to install.

1 ( ) Oracle RDBMS for SAS
2 ( ) Model Repository, Subsequent Core
3 ( ) Infrastructure Components
4 ( ) Slice
5 ( ) OS Provisioning Component
Enter a component number to toggle ('a' for all, 'n' for
none).
When ready, press 'c' to continue, or 'q' to quit.

Selection:
```

You must install the components in the order they are listed. For example, you must install the Model Repository first and the Command Engine before the Software repository.

If you are installing all of the components of a core on a single server, then you may enter `a` for all. If you plan to distribute the core components over multiple servers, then you must run the Opsware Installer once for each component installation. If you are installing the components on multiple servers, see the next step.

11 **Multiple Server Installation**: If you are installing the components and/or Slices on multiple servers, follow the instructions in this step. (If you are installing the components on a single server, skip this step.)

1. Copy the response file generated by the installer interview to all other servers on which you will install components or Slices for this core.
2. Copy the `tnsnames.ora` file from the server with the Model Repository to the other Core Servers. Make sure that the path for the file (`/var/opt/oracle/tnsnames.ora`) is the same on all Core Servers. See “tnsnames.ora File Requirements” on page 261.
3. On each server in this core, run the Opsware Installer with the `-r` option, as shown in step 9. Select and install the remaining components from the menu shown in step 10.
4. If the Model Repository exists on a server with no other Opsware components installed on it, you must install an Opsware Agent on that server. See the *Opsware® SAS User’s Guide: Server Automation* for instructions.

12 (**Optional**) Distributing Core Components across multiple servers, you can install instances of the following components on different servers:

- Infrastructure Component bundle (one per core)
- Primary Command Engine (one per core)
- Software Repository (one per core)
- Slice Component bundle(s) (multiple per core)
- OS Provisioning Media Server (typically one per core)
- OS Provisioning Boot Server (typically one per core)

13 If you exported data from a core other than the First Core, you might need to configure TIBCO manually.

By default, the Secondary Core will try to connect to the First Core. If you want the Secondary Core to connect to a different core then you must configure TIBCO manually and edit the Opsware Gateway properties file. For instructions, see “Adding a TIBCO Rendezvous Neighbor” on page 279.

14 Perform the tasks in Chapter 7, “First Core Post-Installation Tasks” on page 151 of this guide.

15 Perform the post-installation tasks in the next section.

Multimaster Mesh Post-Installation Tasks

After you have added a new core to a Multimaster Mesh, you must perform the tasks described in this section.

Associate Customers with the New Facility

Associate the appropriate customers with each new Facility so that servers managed at that Facility are associated with the correct customers accounts. For more information, see the Customer Account Administration section of the *Opsware® SAS Policy Setter's Guide*.

Update Permissions for the New Facility

After you have added a new Facility to your Multimaster Mesh, your Opsware users will not yet have the required permissions to access the new Facility. You must assign the required permissions to the user groups. For more information, see the User Group and Setup section of the *Opsware® SAS Administration Guide*.

Verify Multimaster Transaction Traffic

To verify Multimaster transaction traffic with the target Facility, perform the following tasks:

1. Log in to the SAS Web Client as any user who belongs to the Opsware System Administrators group.
2. From the Navigation panel, click Multimaster Tools under Administration. The View window appears.
3. In the State View Window, note the color of the status box beside each transaction.

   A *transaction* is a unit of change to a Model Repository database that consists of one or more updates to rows and has a globally unique transaction ID. If the transactions within the secondary Facility are green, the new Opsware core is integrated into the Multimaster Mesh.

It is normal for some transactions to display an orange status (not sent) for a short period.

4. Click **Refresh** to refresh the cached data until all transactions display green.

For more information, see the Opsware Multimaster Mesh Administration section in the *Opsware® SAS Administration Guide*.

Chapter 9: Satellite Installation

IN THIS CHAPTER

This section discusses the following topics:

- Satellite Installation Basics
- Satellite Installation Requirements
- Satellite Gateway Configuration
- Satellite Installation
- Post-Satellite Installation Tasks

This section provides an overview of Satellites and Satellite installation requirements as well as instructions for installing a Satellite and post-installation tasks.

Satellite Installation Basics

A Satellite installation can be a solution for remote sites that do not have a large enough number of potentially Managed Servers to justify a full Opsware Core installation by allowing you to install only the necessary Core Components for the remote site to function as a Satellite.

If you are not sure what an Opsware Satellite is, for a introduction to Satellites see “Opsware Satellites” on page 21.

The following is an overview of the Satellite installation process. For detailed instructions, see “Satellite Installation” on page 217.

1. Locate the Opsware SAS Satellite Base DVD (optionally, the Satellite Base Including OS Provisioning DVD) or NFS-mount the directory that contains a copy of the DVD contents
2. Run the Opsware Installer in interview mode. The interviewer prompts you for information about your Satellite server environment and saves the information in a response file.
3. Run the Opsware Installer and select the Opsware Gateway from the list of components to install. The Opsware Installer launches the Opsware Gateway Installer.
4. Respond to the Opsware Gateway Installer prompts.
5. If necessary, re-run the Opsware Installer and select other components to install.

Satellite Installation Requirements

Before you install an Opsware Satellite, verify that you adhere to the following requirements.

- If you plan to install an OS Provisioning Boot Server and Media Server in the Satellite, you must adhere to the requirements in “OS Provisioning: DHCP Proxying” on page 75.
- The required packages listed in “Solaris and Linux Requirements for Core Servers” on page 60 must be installed on the Satellite server.
- The core(s) that will provide component services to the Satellite must be running.
- The Satellite server must have network connectivity to the server running the Primary Core’s Management Gateway.

- You must be able to log in to the Primary Core SAS Web Client as a member of the Administrators (`admin`) group as well as a member of a group that has Manage Gateway permissions.
- You must have root access on the Primary Core server so that you can export and copy the database of cryptographic material to the Satellite server.
- The Satellite server uses UTC, as described in "Time and Locale Requirements" on page 80. The Satellite server's system time must be synchronized with the Primary Core server.
- If you plan to locate the Software Repository Cache on a network storage device, the network storage configuration must allow root write access over NFS to the directories in which the Software Repository Cache will be installed.
- You must know how to edit files using the `vi` editor. By default, the Opsware Gateway Installer launches the `vi` editor during the installation process, which you will use to edit the Gateway Properties File.

Required Open Ports

The ports listed in Table 9-1 must be open for use by the Satellite's Gateway. The port numbers listed in the table are default values. You can select other values during the installation.

Table 9-1: Open Ports for a Satellite Gateway

PORT	PROPERTY NAME IN OPSWARE GATEWAY PROPERTIES FILE	DESCRIPTION
2001	`opswgw.TunnelDst`	The port used by a tunnel end-point listener. This port is used when you install other Gateways that tunnel to the Satellite Gateway on this Satellite.
3001	`opswgw.ProxyPort`	The proxy port on which Agents contact the Satellite Gateway.
4040	`opswgw.IdentPort`	The Gateway `ident` service port, used by the Software Repository Cache.

If you plan to install the OS Provisioning Boot Server and Media Server in the Satellite, then additional ports must be open. For a list of these ports, see Table 3-8 on page 73.

Required Entries in /etc/hosts

The Satellite's Software Repository Cache requires that the server hosting the cache have the following entries in the `/etc/hosts` file:

```
127.0.0.1  theword
127.0.0.1  wordcache
```

Required Packages for SuSE Linux Enterprise Server 9

In addition to the packages listed in "Solaris and Linux Requirements for Core Servers" on page 60, a Satellite on a server running SuSE Linux Enterprise Server 9 requires that the `compat-2004.7.1-1` package be installed.

Satellite Gateway Configuration

This section presents several Satellite topologies and the appropriate parameter values in the Gateway Properties File for those topologies. In the diagrams in this section, the arrows between Gateways represent tunneled connections. (A tunnel is a TCP connection between two Opsware Gateways that carries multiplexed TCP or UDP connections.) The servers labelled with the letter "A" represent Managed Servers that have Opsware Server Management Agents installed.

A Satellite Installation with a Single Core

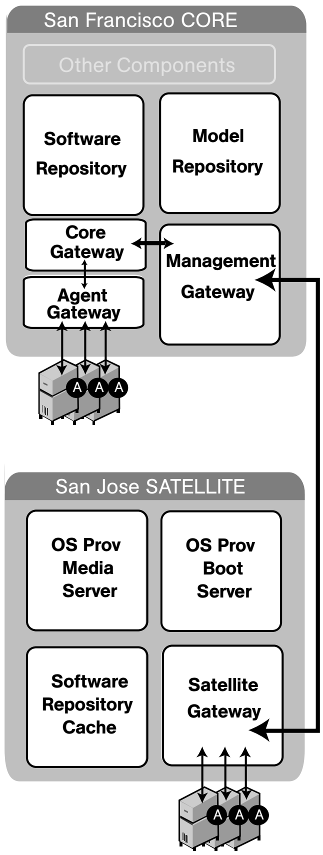
Figure 9-1 shows a single Opsware Satellite that has a tunneled connection to a Single Core's Management Gateway. In this example, the main facility is in San Francisco, and a smaller remote Satellite facility is in San Jose.

Server Management Agents running on the managed servers in the main San Francisco facility communicate with the San Francisco Core through an Agent Gateway. The Agent Gateway routes the requests to the Core Gateway which then communicates with the required Core Component(s).

The Server Management Agents on the managed servers in the San Jose facility connect to the San Francisco Core via tunneled TCP connections between the San Jose Satellite Gateway and the San Francisco Core's Management Gateway which, in turn, communicates with the San Francisco Core Gateway which ultimately communicates with the required Core Component(s).

A Satellite installation requires only the Software Repository Cache and Satellite Gateway components. The Software Repository Cache contains local copies of software packages that will be installed on the Satellite's managed servers. The Satellite Gateway multiplexes connections into and out of the Satellite via one or more tunnels to the Core's Management Gateway.

Figure 9-1: Single Satellite with a Single Core



Each Opsware Gateway is configured by entries in a Gateway Properties File. The following sections describe some of the entries in the San Jose Satellite's Gateway Properties File that configure the Satellite Gateway for use with a Single Core.

opswgw.GWAddress

The `opswgw.GWAddress` parameter specifies the IP address of the server on which the Satellite Gateway is installed.

Facilities can belong to Realms. Realms are an Opsware concept that allow Opsware SAS to manage servers on different networks without fear of IP address conflicts. A Realm is a logical entity that defines an IP namespace within which all managed server management IP addresses must be unique.

When a new Satellite Gateway is added to a Realm, the value of `opswgw.GWAddress` is dynamically added to the list of gateways that Agents in the same Realm can communicate with.

Although Opsware recommends that you use the IP address for `opswgw.GWAddress` you can use the hostname, however, if you do use the hostname then the value of the `opsw_gw_addr_list` parameter (used for Agent installations) must also use the hostname. If host names are used, they must be resolvable (with DNS or `/etc/hosts`) by the Agents that contact this gateway. Specifying IP addresses is recommended because it is less error prone.

opswgw.Realm

The `opswgw.Realm` parameter specifies the Realm to use for the Gateway. A Realm is a logical name for a group of IP addresses that can be contacted by a particular set of gateways. Realms enable Opsware SAS to manage servers with overlapping IP addresses. (This situation can occur when the servers in a remote facility are behind NAT devices or firewalls.) The Realm plus the IP address uniquely identifies a managed server. Servers with overlapping IP addresses must reside in separate Realms.

opswgw.TunnelSrc

The `opswgw.TunnelSrc` parameter has five entries. The first two entries identify the remote host (`sanfran.myops.com`) and port (2001) where the Core Gateway listens for connections. Note that the host and port of the Satellite's `opswgw.TunnelSrc` parameter must match those of the Core's `opswgw.TunnelDst` parameter.

The next two entries specify the cost and bandwidth of the tunnel. (See "Configuring Routing (Cost)" on page 214 and "Limiting Bandwidth" on page 217.)

The last entry (`.../opswgw.pem`) is a certificate file in the Privacy Enhanced Mail (PEM) format. If you specify a certificate file, the data transmitted through the tunnel will be encrypted using SSL. The header of the certificate file includes the cipher choice and authentication options.

opswgw.DoNotRouteService and opswgw.HijackService

The parameters `opswgw.DoNotRouteService` and `opswgw.HijackService` must be enabled for this Satellite Gateway because the Satellite includes a Software Repository Cache. With these parameters enabled, when a Server Management Agent receives a request to access the Software Repository, the Satellite Gateway routes the request to the local Software Repository Cache rather than a remote cache. These parameters are disabled when commented out.

opswgw.ProxyPort and opswgw.IdentPort

The `opswgw.ProxyPort` parameter identifies the Satellite port through which Server Management Agents contact the Satellite Gateway. The `opswgw.IdentPort` parameter is used by an identity service required by the Software Repository Cache.

The following Gateway Property File excerpt shows some of the entries that would be appropriate for the San Jose Satellite in the example topology shown in Figure 9-1.

```
opswgw.Gateway=SanJose
opswgw.Realm=SanJose
opswgw.GWAddress=192.168.198.92
opswgw.TunnelSrc=sanfran.myops.com:2001:10:0:/var/opt/opsware/
crypto/SanJose/opswgw.pem
opswgw.DoNotRouteService=theword:1003
opswgw.DoNotRouteService=127.0.0.1:1003
opswgw.HijackService=wordcache:1003
opswgw.ProxyPort=3001
opswgw.IdentPort=4040
```

(Although the `opswgw.TunnelSrc` entry wraps around to the next line in this listing, in the actual properties file, the entry is on a single line.)

The following Gateway Property File excerpt shows some of the entries that would be appropriate for the San Francisco facility's Core Gateway Properties File:

```
opswgw.Gateway=cgw0-SanFrancisco
opswgw.Realm=SanFrancisco
opswgw.TunnelDst=2001:/var/opt/opsware/crypto/cgw0-
SanFrancisco/opswgw.pem
```

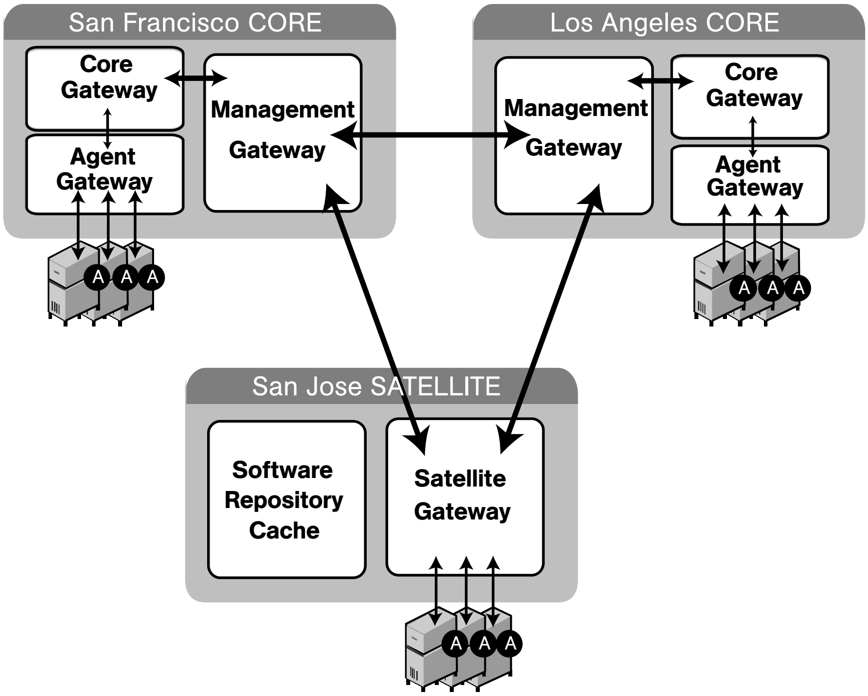
Satellite in a Multimaster Mesh

Figure 9-2 shows two Cores, San Francisco and Los Angeles, in a Multimaster Mesh. The Multimaster traffic passes through the Management Gateways. The Satellite Gateway in San Jose can route to either the San Francisco or Los Angeles Management Gateways, however the San Francisco Management Gateway is the primary route, the San Jose Management Gateway is a backup in case the San Francisco Management Gateway communications fail.

For the purposes of this example, assume that the communication link between the San Jose and San Francisco facilities is the fastest and has the most bandwidth. Therefore, during normal operations, the servers in San Jose are managed by the San Francisco Core.

Now, assume that the connection between San Jose and San Francisco has failed. The Satellite Gateway in San Jose can immediately begin to route communications through the Management Gateway in Los Angeles. (See “Configuring Routing (Cost)” on page 214.) allowing continued management of the San Jose servers.

Figure 9-2: Single Satellite in a Multimaster Mesh



The Gateway Properties File excerpt below would be appropriate for the San Jose Satellite Gateway. The first `opswgw.TunnelSrc` parameter points to the San Francisco Management Gateway; the second points to the Los Angeles Management Gateway. Both Management Gateways use the default port (2001) to listen for connection requests.

```
opswgw.Gateway=SanJose
opswgw.Realm=SanJose
opswgw.TunnelSrc=sanfran.myops.com:2001:100:0:/var/opt/opsware/
crypto/SanJose/opswgw.pem
opswgw.TunnelSrc=losang.myops.com:2001:200:0:/var/opt/opsware/
crypto/SanJose/opswgw.pem
```


Configuring Routing (Cost)

A Satellite Gateway routes traffic to only one Core Management Gateway at a time. The Management Gateway chooses the route with the lowest cost based on the third entry of the `opswgw.TunnelSrc` parameter.

In the Gateway Properties File excerpt above, the `opswgw.TunnelSrc` parameter entries specify that the cost from San Jose to San Francisco is 100 and the cost between San Jose and Los Angeles is 200. Therefore, the Satellite Gateway uses the San Francisco route, unless for some reason that connection becomes unavailable.

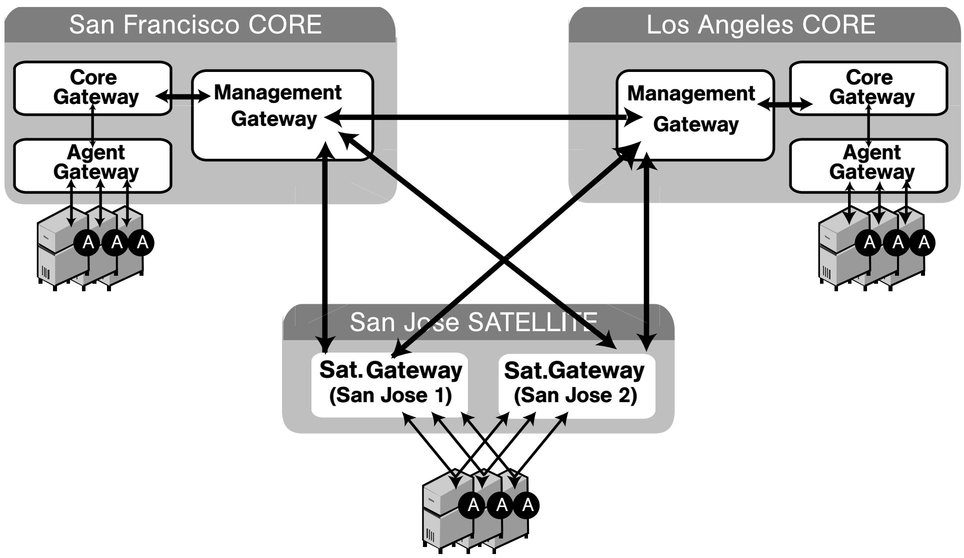
Multiple Gateways in a Satellite

The topology shown in Figure 9-3 provides failover capability in two ways. First, each Satellite Gateway in the San Jose facility tunnels to both the Los Angeles and San Francisco Management Gateways. If one of those Cores becomes unavailable, the other Core can take over management of the servers in San Jose.

Second, the Satellite Agents in San Jose point to both local Satellite Gateways (Gateway, San Jose 1 and gateway, San Jose 2). If one these gateways becomes unavailable, the Agents on the managed servers can communicate with a Management Gateway via the other Satellite's Gateway.

In this example, both Satellite Gateways in San Jose must belong to the same Realm. A Server Agent can communicate with any Gateway in the same Realm.

Figure 9-3: Multiple Gateways in a Satellite



The Gateway Properties File excerpt below would be appropriate the San Francisco Management Gateway:

```
opswgw.Gateway=cgw0-SanFrancisco
opswgw.Realm=SanFrancisco
opswgw.TunnelDst=2001:/var/opt/opsware/crypto/cgw0-
SanFrancisco/opswgw.pem
```

The Management Gateway Properties File for the Los Angeles facility would have similar entries:

```
opswgw.Gateway=cgw0-LosAngeles
opswgw.Realm=LosAngeles
opswgw.TunnelDst=2001:/var/opt/opsware/crypto/cgw0-LosAngeles/
opswgw.pem
opswgw.TunnelSrc=sanfran.myops.com:2001:1:0:/var/opt/opsware/
crypto/cgw0-LosAngeles/opswgw.pem
```

The Gateway Properties File excerpt below would be appropriate for the first Satellite Gateway in San Jose:

```
opswgw.Gateway=SanJose1
opswgw.Realm=SanJose
opswgw.TunnelSrc=sanfran.myops.com:2001:100:0:/var/opt/opsware/
crypto/SanJose1/opswgw.pem
opswgw.TunnelSrc=losang.myops.com:2001:200:0:/var/opt/opsware/
crypto/SanJose1/opswgw.pem
```

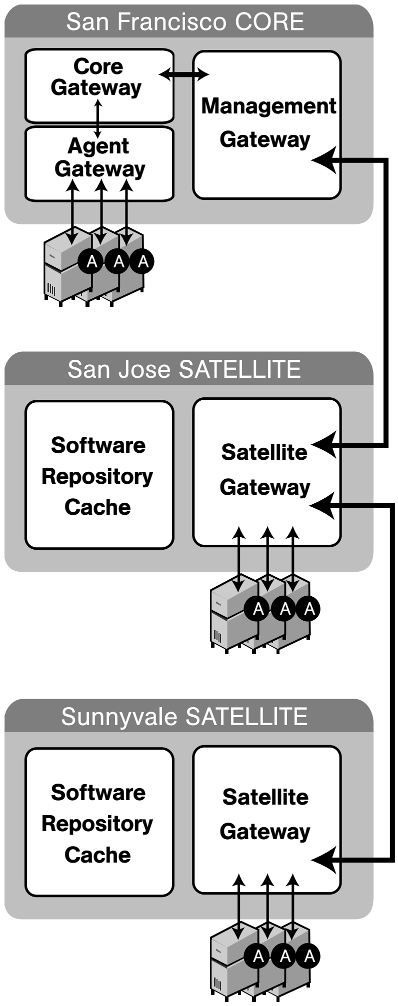
The Gateway Properties File excerpt below would be appropriate for the second Satellite Gateway in San Jose:

```
opswgw.Gateway=SanJose2
opswgw.Realm=SanJose
opswgw.TunnelSrc=sanfran.myops.com:2001:100:0:/var/opt/opsware/
crypto/SanJose2/opswgw.pem
opswgw.TunnelSrc=losang.myops.com:2001:200:0:/var/opt/opsware/
crypto/SanJose2/opswgw.pem
```


Cascading Satellites

Figure 9-4 is an example of cascading Satellites, a topology in which Satellite Gateways are connected to each other and a Core Management Gateway in a *chain* with the Core at the top of the chain. These Satellite Gateways must be in different Realms. (For more information, see "Managing the Software Repository Cache" in the *Opsware® SAS Administration Guide*.)

Figure 9-4: Cascading Satellites with a Standalone Core



The Gateway Properties File excerpt below would be appropriate for the San Francisco Management Gateway:

```
opswgw.Gateway=cgw0-SanFrancisco
```



```
opswgw.Realm=SanFrancisco
opswgw.TunnelDst=2001:/var/opt/opsware/crypto/cgw0-
SanFrancisco/opswgw.pem
```

The Gateway Properties File excerpt below would be appropriate for the San Jose Satellite Gateway:

```
opswgw.Gateway=SanJose
opswgw.Realm=SanJose
opswgw.TunnelDst=2001:/var/opt/opsware/crypto/SanJose/
opswgw.pem
opswgw.TunnelSrc=sanfran.myops.com:2001:100:0:/var/opt/opsware/
crypto/SanJose/opswgw.pem
```

The Gateway Properties File excerpt below would be appropriate for the Sunnyvale Satellite Gateway:

```
opswgw.Gateway=Sunnyvale
opswgw.Realm=Sunnyvale
opswgw.TunnelSrc=sanjose.myops.com:2001:100:256:/var/opt/
opsware/crypto/Sunnyvale/opswgw.pem
```

Limiting Bandwidth

In Figure 9-4, assume that the tunnel between Sunnyvale and San Jose shares a 512 kilobit/sec DSL connection with another application. Since this connection is relatively slow, you might want to limit the tunnel bandwidth to 256 kilobits/sec.

To limit the bandwidth, you would modify the Gateway Properties file and specify 256 for the fourth entry of the `opswgw.TunnelSrc` parameter. If you do not want to limit tunnel bandwidth, set this parameter to 0. Note that the bandwidth parameter is not used to determine the cost of a route. (See “Configuring Routing (Cost)” on page 214.)

Satellite Installation

This section describes how to create a new Opsware Satellite installation with the simple topology shown in Figure 9-1: a Satellite with a Single Core.

This topology has the following characteristics:

- The Satellite contains one Satellite Gateway and one Software Repository Cache, installed on the same server.

- The Satellite Gateway communicates with a single Management Gateway on the Primary Core server. No other gateways communicate with the Satellite Gateway.

Required Information

You will be prompted to supply the following information during the installation process:

- The password required to decrypt cryptographic material.
- The IP address of the server running the First Core's Management Gateway.
- The IP address of the server on which you will install the Satellite Gateway.
- The port number through which tunnel connections to the First Core's Management Gateway will pass. (The default port is 2001.) The Management Gateway listens on this port for connection requests from the Satellite Gateway. In the Management Gateway Properties File, this port specified with the `opswgw.TunnelDst` parameter.

  The path to the Core's Gateway Properties file is:

  ```
  /etc/opt/opsware/opswgw-mgw0-<facility>/opswgw.properties
  ```

- The `admin` username and password. You can also use the username and password of any user that belongs to the Administrators group.
- The name of the new Satellite Gateway. The default directory on the Satellite server in which this Gateway will be installed is:

  ```
  /opt/opsware/opswgw/bin
  ```

- The name of the new Realm to be serviced by the Satellite Gateway. Opsware SAS uses the Realm name and the IP address of a managed server to uniquely identify a managed server. The Opsware Gateway Installer assigns the Realm name to the new Satellite facility. The Core and Satellite facility names must be different.

You may want to name the Realm according to the physical location of the Satellite's data center, for example, the building, corporate site, or city. The SAS Web Client lists the facility names of the core and its Satellites.

Before Installing the New Satellite

If you already have an Opsware SAS Server Management Agent installed on the server you plan to use for the new Satellite, you must uninstall it before running the Satellite Installer.

Make note that after the installation process completes, the new Satellite server is owned by the customer “Opsware”. You should take into account any effects this may have on access rights before beginning the installation.

Run the Opsware Satellite Installer

This section provides instructions for running the Opsware Installer. Complete the following tasks to install an Opsware Satellite:

Phase 1: Prepare for Installation

1. Locate the Opsware Server Automation System (SAS) installation DVD/media.

   See “Opsware Installation Media” on page 126, including the recommendation, “Copying the DVDs to a Local Disk.”

2. On the server where you will install the new Opsware Satellite, mount the Satellite Base DVD (optionally, the Satellite Base Including OS Provisioning DVD) or NFS-mount the directory that contains a copy of the DVD contents.

Whether you choose to install the “Satellite Base” DVD or the “Satellite Base Including OS Provisioning” DVD depends on whether you plan to install the OS Provisioning components. See “Opsware Installation Media” on page 126 for information about each of the Opsware SAS DVDs.

The Opsware Installer must have *read/write root* access to the directories where it will install the Opsware components, including NFS-mounted network appliances.

---

3. In a terminal window, log in as root.

4. Create the Opsware Realm directory:

```
mkdir -p /var/opt/opsware/crypto/cadb/realm
```


5 Copy the database of cryptographic material and the gzipped tar file from any Core server in the facility to the Satellite server. On the Core server, the database and the gzipped tar file are located in:

```
/var/opt/opsware/crypto/cadb/realm/opsware-crypto.db.e
/var/opt/opsware/crypto/cadb/realm/opsware-crypto.tgz.e
```

The database of cryptographic material and the gzipped tar file must be copied to the same directory path and filenames on the Satellite server. The directory, database, and gzipped tar file must be readable by the root user.

6 Change to the root directory:

```
cd /
```

7 Go to Phase 2.

Phase 2: Complete the Opsware Installer Interview/Create the Response File

1 Run the Opsware Installer script in interview mode by invoking it with no command-line options:

```
/opsware_system/opsware_installer/install_opsware.sh
```

You must specify the full path to the script. The directory path shown in this step assumes that you copied an Opsware SAS Satellite DVD (the Satellite Base DVD or the Satellite Base Including OS Provisioning DVD) to a local disk or a network share using the required directory structure.

2 At the Interview mode prompt, select one of the following options:

```
1 - Simple Interview Mode
2 - Advanced Interview Mode
```

Choose Option 1 to use the default values for certain configuration parameters.

Choose Option 2 to specify all configuration parameters during the interview.

3 Respond to the interview prompts.

The `mgw_address` prompt applies to the Core Management Gateway IP address, not the Satellite Gateway address.

For more information on the Opsware Installer prompts, see Chapter 5, "Prerequisites for the Installer Interview".

4. Complete the interview. When you have completed entering all of the required information, the Opsware Installer displays this message:

```
All parameters have values. Do you wish to finish the
interview (y/n):
```

   If you are satisfied with your answers, press y.

   If you want to review or change your answers, press n. The installer displays the prompts again, showing in brackets [ ] the values that you just entered during the interview.

   After modifying your responses, press y to finish the interview.

5. Create the response file. After completing the interview, the installer prompts you to provide a filename for the response file:

```
Name of response file to write
[/usr/tmp/oiresponse.satellite]
```

   The response file is a text file that contains the answers you entered during the interview. You can enter a path and name for the response file or accept the default location and name. In either case, write down the location and name of the response file for future reference.

6. The Opsware Installer prompts you to indicate whether you want to continue the installation by using the current response file. Select one of the following options:

   - If you are satisfied with the responses you entered in the interview and you are ready to install the Satellite now, enter `y` to continue. Go to Phase 3
   - If you do not want to install the Satellite now, enter `n`. Go to step 7.

7 *If you entered y in the previous step, skip this step and go to Phase 3.* If you entered n in the previous step, when you are ready to complete the installation later, log in to the server on which you will install the Satellite Gateway and invoke the Opsware Installer using the -r (response file) option and follow the instructions in Phase 3. Be sure to specify the name and fully qualified path to the response file. For example:

```
/opsware_system/opsware_installer/install_opsware.sh -r
<full_path_to_response_file>
```

Phase 3: Install the Satellite Gateway

1 At the components prompt, select 1 to install the Opsware (Satellite) Gateway. The components prompt follows:

```
Welcome to the Opsware Installer.
Please select the components to install.
1 ( ) Opsware Gateway (Interactive Install)
2 ( ) Software Repository Cache (wordcache)
3 ( ) OS Provisioning Boot Server
4 ( ) OS Provisioning Media Server
Enter a component number to toggle ('a' for all, 'n' for
none).
When ready, press 'c' to continue, or 'q' to quit.

Selection: 1
```

The selections for the OS Provisioning Boot Server and OS Provisioning Media Server only appear if you are running the installation from the Satellite Base Including OS Provisioning DVD.

2 The Opsware Installer launches the Opsware Gateway Installer, which then displays the following banner:

```
************************************************************
*                                                          *
*                 Opsware Gateway Installer                *
*         Copyright (C) 2004-2007: Opsware Inc.            *
*                  support@opsware.com                     *
*                                                          *
************************************************************
```


3 You should already have the required information for this step as described in the section "Required Information" on page 218. If not, get it now before continuing. The Opsware Gateway Installer displays the following message:

```
For a new install please have the following information
available before you begin:

1) Opsware administrator username and password.
2) The Realm name this Gateway will service.
3) If the Realm is new what type will it be.
4) The unique Gateway name for this Gateway.

Are you ready to proceed? [y/n]
```

4 Enter y. The Opsware Gateway Installer displays the following:

```
==================================================
ISM install
==================================================
. . .
```

5 Enter the name of the Realm for the Opsware Satellite Gateway you are installing:

```
==================================================
Create/Verify Realm
==================================================
Enter the Gateway's Realm name:
You entered '<realm-name>', is this correct [y/n]
```

6 There are three ways for the installer to contact the Core. At the prompt for the option number, enter 3. The installer displays the following lines:

```
I must now contact an Opsware Core to continue the
intallation...
There are three ways this can be done:
 1) Via an existing Gateway's ProxyPort
 2) Via direct connections (no NATs)
 3) Via a temporary (local) Gateway
Enter option number: 3
```

7 Enter the IP address of the server running the Core Gateway at the following prompt:

```
Enter IP of a remote GW:
```


8 Enter the tunnel destination port for the Management Gateway at the following prompt. The default port is 2001.

```
Enter TunnelDst port of the remote GW: 2001
```

9 At the next prompt, enter y.

```
Is the tunnel listener at <ip-addr:port>
using SSL? [y/n] y
```

10 Enter the `admin` username and password or the username and password of any Opsware user that belongs to the Administrators group:

```
==================================================
Connect to Opsware
==================================================

Log in to Opsware as an administrator

Enter username:admin
Enter password:
```

11 The Opsware Gateway Installer displays the following:

```
==================================================
Checking time synchronization
==================================================

Gateway time looks good.
```

12 At the next prompt, create a new Realm for this Satellite Gateway by selecting 1 and supplying the Realm name to create a new Satellite Gateway. If you are adding the Realm to an existing DC, select `2` and supply the Realm name.

You also have the option to exit at this point by entering `3`.

```
==================================================
Configure Realm
==================================================
```



```
The realm '<realm-name>' does not exist.  You have two
options:
  1) Create a new Satellite DC named '<realm-name>'.
  2) Add a new Realm, '<realm-name>', to an existing DC.
  3) Exit.
Enter option number: 1
```

13 At the next prompt, enter the name for the new Opsware Satellite Gateway that you are installing.

```
==================================================
Gateway Configuration
==================================================

Enter the Gateway's name:
```

14 The Opsware Gateway Installer opens the Gateway Properties File in the `vi` text editor. The following lines are at the top of this file:

```
###################################################
#
# Opsware Gateway Properties File for a SAT Gateway
#
####################################################
```

The fully qualified path to the Gateway Properties File is:

```
/etc/opt/opsware/<gateway_name>/opswgw.properties
```

Where `<gateway_name>` is the name you specified in step 13.

15 For the `opswgw.GWAddress` parameter, enter the IP address of the server on which you are installing this Satellite Gateway (the server you are running this installation on). For example:

```
opswgw.GWAddress=192.168.198.92
```

16 For the `opswgw.TunnelSrc` parameter, change the placeholder IP address of 10.0.0.11 to the IP address of the server running the Core Management Gateway. The port following the IP address is the tunnel destination of the Core Gateway. (The default port is 2001.) For example:


```
opswgw.TunnelSrc=192.168.165.242:2001:100:0:/var/opt/
opsware/crypto/<gateway-name>/opswgw.pem
```

17 You will be installing a Software Repository Cache in a later step, so verify that the following lines in the Opsware Gateway Properties File are *not* commented out:

```
opswgw.DoNotRouteService=theword:1003
opswgw.DoNotRouteService=127.0.0.1:1003
opswgw.HijackService=wordcache:1003
```

These parameters are disabled when they are commented out. If the Gateway and Software Repository Cache are to reside on the same server, these parameters must be enabled by removing the commenting.

18 After you've finished editing the Opsware Gateway Properties File, save it and exit `vi`. You will see a prompt asking if you want to proceed. Enter `y`. The Opsware Gateway Installer performs several more tasks then displays the following messages:

```
Gateway Crypto Generation
. . .
Wordcache Crypto Generation
. . .
Starting Opsware Gateway
. . .
Verify Gateway Startup
```

When the installer is finished, it displays the following:

```
Opsware Gateway Installed!
```

Phase 4: Install the Remaining Satellite Components

1 Invoke the Opsware Installer again with the `-r` option to specify the response file created by the interview in step 5 on page 221:

```
/opsware_system/opsware_installer/install_opsware.sh -r
<full_path_to_response_file>
```

2 At the components prompt, select one or more components to install:

```
Welcome to the Opsware Installer.
Please select the components to install.
```



```
1 ( ) Software Repository Cache (wordcache)
2 ( ) OS Provisioning Boot Server
3 ( ) OS Provisioning Media Server

Enter a component number to toggle ('a' for all, 'n' for
none).
When ready, press 'c' to continue, or 'q' to quit.

Selection:
```

You must install the components in the order they are listed. For example, you must install the Software Repository Cache before the OS Provisioning Boot Server.

The Software Repository Cache is required and must be installed on the same server as the Satellite Gateway.

The selections for the OS Provisioning Boot Server and OS Provisioning Media Server only appear, if you are running the installation from the Satellite Base Including OS Provisioning DVD.

The OS Provisioning Boot Server and Media Server are required only if you want to use the Opsware OS Provisioning feature in the Satellite. The OS Provisioning Boot Server and Media Server can reside on a different server than the Gateway and Software Repository Cache. (See step 3.)

If you are installing all of the components on the same server, then you may enter `a` for all. If you do not select `a`, then you must run the Opsware Installer again (specifying the response file) and select the remaining components.

3 (**OS Provisioning Only**) If you are installing the OS Provisioning components on a different server than the other Satellite components, follow the instructions in this step.

- Copy the database of cryptographic material and the gzipped tar file from the server with the Satellite Gateway to the server that will run the OS Provisioning components. Here is the full path to these files on the Satellite server:

```
/var/opt/opsware/crypto/cadb/realm/opsware-crypto.db.e
```


`/var/opt/opsware/crypto/cadb/realm/opsware-crypto.tgz.e`

The database of cryptographic material and the gzipped tar file must have the same paths and filenames on both servers. The directory and files also need to be readable by the root user.

- Copy the response file generated by the installer interview to the server that will run the OS Provisioning components.
- On the server that will run the OS Provisioning components, run the Opsware Installer with the `-r` option, as shown in step 1 on page 226. Select and install the OS Provisioning components from the menu shown in step 2 on page 226.

Post-Satellite Installation Tasks

After you install the Satellite, perform the tasks listed in the following sections. For more information, see the Opsware Satellite Administration section of the *Opsware® SAS Administration Guide*.

Facility Permission Settings

The Opsware Gateway Installer assigns the Realm name to the facility name of the Satellite. To access managed servers in the Satellite, an Opsware user must belong to a group that has the necessary permissions for the Satellite's facility. Until you set the facility permissions, Opsware users cannot view or modify the managed servers associated with the Satellite's facility. For example, you might set the permissions for the Satellite facility to Read & Write for the Advanced Users group, enabling members of this group to modify the servers managed by the Satellite.

For instructions, see "Setting the Facility Permissions of a User Group" in the *Opsware® SAS Administration Guide*.

Checking the Satellite Gateway

To verify that the Core Management Gateway is communicating with the Satellite Gateway, perform the following steps:

1. Log in to the SAS Web Client as a member of a users group that has the Manage Gateway permission.
2. From the navigation panel, click **Administration ➤ Gateway**.

3. Verify that the upper left corner of the Manage Gateway page displays a link for the new Satellite Gateway.

   If the Manage Gateway page does not display the link for the Satellite, you might need to correct the properties file of the Satellite Gateway. The full path name of the properties file follows:

   ```
   /etc/opt/opsware/opswgw-cgw0-<facility>/opswgw.properties
   ```

   If you modify the properties file, you must restart the Satellite Gateway:

   ```
   /etc/init.d/opsware-sas restart opswgw-cgw0
   ```

4. Log in to the SAS Web Client as a member of a users group that has the Read (or Read & Write) permission on the Satellite's facility.
5. From the navigation panel, click **Servers ➤ Manage Servers**.
6. Verify that the Manage Server page displays the host name of the Satellite server.

Enabling the Display of Realm Information

By default, the SAS Web Client does not display realm information, which is needed by users who manage Gateways and Software Repository Caches.

To enable access to the realm information, perform the following steps:

1. Log into the SAS Web Client as a user that belongs the Administrators group and to a group that has the Configure Opsware permission.
2. From the navigation panel, click Administration ➤ System Configuration.
3. Select the Opsware Server Automation System Web Client link.
4. In the System Configuration page, for the name `owm.features.Realms.allow`, type the value `true`.
5. Click **Save**.

DHCP Configuration for OS Provisioning

After you install the OS Provisioning Boot Server component, you must set up a DHCP server. For more information, see "DHCP Configuration for OS Provisioning" on page 165.

Chapter 10: Opsware SAS Configuration

IN THIS CHAPTER

This section discusses the following topic:

- Opsware SAS Configuration
- Configure e-mail Alerts
- Set Up Opsware Groups and Users
- Create Opsware Customers
- Define Software Management Policies
- Deploy Opsware Server Agents on Unmanaged Servers
- Prepare Opsware SAS for OS Provisioning
- Prepare Opsware SAS for Patch Management
- Opsware SAS Monitoring

Opsware SAS Configuration

After you have installed the first Opsware SAS Core, whether as part of a Single Core or Multimesh installation, the Core Components of Opsware SAS will be running and you will be able to log in to that Core's SAS Web Client. You can now configure Opsware SAS so that end users can start managing servers in their operational environment.

The following sections provide a general outline of the Opsware SAS configuration tasks you will need to do and pointers to the Opsware documentation that contains the detailed instructions needed to complete the tasks.

Configure e-mail Alerts

You can configure Opsware SAS to send e-mail alerts to the Opsware administrator (or other designated users) when certain conditions are met, such as Opsware Managed Server error conditions, Multimaster Mesh conflicts, and Opsware Code Deployment and Rollback errors. To do so, your e-mail administrator must configure the Opsware Core and Managed Servers as Sendmail clients. You should configure e-mail alerts In the SAS Web Client when you install Server Agents on your managed servers. For information about e-mail alerts, see the *Opsware® SAS Administration Guide*.

Set Up Opsware Groups and Users

You must assign the necessary access rights and permissions to Opsware administrators, users, and user groups. For example, to log in to the SAS Web Client, you specify a user name and password. Each user belongs to a user group, and each user group has a set of permissions that control access to features (actions), managed servers, and folders. For information about user access rights and permissions, see the *Opsware® SAS Administration Guide*.

Create Opsware Customers

When you installed the First Core, whether Single Core or Multimaster, you specified a single default Opsware SAS customer. For information about creating and assigning additional customers to a facility, see the *Opsware® SAS Policy Setter's Guide*.

Define Software Management Policies

Software policies allow you to install software and configure applications simultaneously. A software policy can contain packages, RPM packages, patches, application configurations, and other software policies. After creating a software policy, you can attach it to servers or groups of servers. When you remediate a server or group of servers, the patches, packages, RPM packages, and application configurations specified in the attached policy are automatically installed and applied.

See the *Opsware® SAS Policy Setter's Guide* for information.

Deploy Opsware Server Agents on Unmanaged Servers

After you install an Opsware Server Agent on an unmanaged server, it can be managed by Opsware SAS. For more information about deploying Opsware Server Agents on your unmanaged servers, see the *Opsware® SAS User's Guide: Server Automation*.

Prepare Opsware SAS for OS Provisioning

Opsware SAS OS Provisioning is a feature that allows you to remotely install and uninstall operating systems (and related configurations, packages, and applications) on your servers. During OS Provisioning, an Opsware Server Agent is also installed, allowing the server to be immediately managed. For more information about configuring OS Provisioning, see the *Opsware® SAS Policy Setter's Guide*.

Prepare Opsware SAS for Patch Management

The Patch Management for Windows feature enables you to identify, install, and remove Microsoft® Windows patches. With the Opsware SAS Client user interface, you can identify and install patches for the Windows 2000, Windows 2003, and Windows NT4.0 operating systems. These patches include Service Packs, Update Rollups, and hotfixes. This feature also supports patching on 64 bit for Windows 2003 operating systems and for 32 bit for Windows XP operating systems.

For information about Windows patch management, see the *Opsware® SAS User's Guide: Application Automation*.

Opsware SAS Monitoring

Opsware SAS provides several methods that you can use to ensure that your Opsware system is performing correctly:

- **Agent reachability tests**: to determine the current reachability of a specific Opsware Agent, you can run a Communication Test in the SAS Web Client to find those servers that have unreachable agents. For more information about the Opsware Communications Test, see the *Opsware® SAS User's Guide: Server Automation*.
- **System Diagnostic tests**: several system diagnostics tests are available in the SAS Web Client that can help you determine that your Opsware SAS installation is operating correctly and help you troubleshoot when there are problems. For more information about the Opsware SAS System Diagnostic Tests, see the *Opsware® SAS Administration Guide*.
- **Core Component logs**: Opsware SAS components have logs that can help you troubleshoot problems. For more information about Component Logs, see the *Opsware® SAS Administration Guide*.

Chapter 11: Opsware Core Uninstallation

IN THIS CHAPTER

This section discusses the following topics:

- Uninstall Basics
- Procedures for Uninstalling Cores
- Uninstall a Single Core
- Uninstall a Single Core in a Multimaster Mesh
- Uninstall All Cores in a Multimaster Mesh
- Decommission a Facility using the SAS Web Client

This section describes how to uninstall a Single Core, remove a core from a Multimaster Mesh, and how to uninstall all cores of a Multimaster Mesh.

Uninstall Basics

There are several reasons that you might choose to uninstall an Opsware core.

- Removing test installations
- Removing demonstration installations
- Merging or modifying a Facility's Multimaster Mesh Cores
- Decomissioning or moving a Facility

Make backups of your Model Repository, Software repository, and your database of cryptographic material unless you are certain that you no longer need that data, because a complete Core uninstall also removes the Model Repository and the Cryptographic Material database and permanently deletes all their data. You can preserve the Opsware SAS data in the Model Repository database by doing a database backup before uninstalling.

Before you uninstall an Opsware Core, Opsware Inc. recommends that you back up the Oracle database running on the server where that core's Model Repository is installed. See "Oracle Database Backup Methods" on page 273.

Like an Opsware installation, the uninstall is done using a script that you run from the server hosting the Opsware Core to be uninstalled.

Procedures for Uninstalling Cores

You can perform any of the following four uninstallation procedures according to your requirements:

- Uninstall a Single Core
- Uninstall a Single Core in a Multimaster Mesh
- Uninstall All Cores in a Multimaster Mesh
  - Decommission a Facility using the SAS Web Client

Uninstall a Single Core

To uninstall a Single Core, perform the following tasks:

1. Before uninstalling an Opsware Core, you must deactivate all servers hosting components for that Core in the SAS Web Client. For more information about deactivating Core Component servers, see “Deactivating a Server” in the *Opsware® SAS User’s Guide: Server Automation*.

2. On the server hosting the core to be uninstalled, log in as root.

3. Change to the root directory:

```
cd /
```

4. Run the `uninstall_opsware.sh` script:

```
/opsware_system/opsware_installer/uninstall_ opsware.sh -r
<response-file>
```

5. At the components prompt, select one or more or all components to uninstall:

```
Welcome to the Opsware Installer.
Please select the components to uninstall.
1 ( ) OS Provisioning
2 ( ) Slice
3 ( ) Infrastructure
2 ( ) Model Repository
1 ( ) Oracle RDBMS for SAS
```

Select `a` for all. If you want to uninstall components separately, they must be uninstalled in the order they appear on the menu above. To do so, enter the number of the component to uninstall.

If the Opsware Gateway does not run on a separate server, uninstall it last. You will be asked if you want to preserve the database of Cryptographic Material. If you respond y, the directory containing the database will not be removed during the uninstall.

You will also see this prompt:


```
Are you absolutely sure you want to remove users' OGFS home
and audit directories? (home and audit directories will only
be removed if they are stored on the Software Repository
server) (y/n)?
```

Select y if you want to remove the OGFS home and audit directories. If you press n, the directories will not be removed. If you chose to place the OGFS home and audit directories on a server other than the server hosting the Software Repository, the uninstall will not remove those directories even if you press y.

If you installed the core using Custom Mode, it is important that you uninstall the components in the reverse order that they were installed.

6 After the uninstall has completed, remove the `/var/opt/opsware/install_opsware` directory.

If you specified during the uninstall that you want to preserve the database of cryptographic material, you should *not* delete the `/var/opt/opsware/crypto` directory. This directory contains the database of cryptographic material.

Uninstall a Single Core in a Multimaster Mesh

Do not uninstall the Primary Core (First Core) unless you plan to uninstall the entire Multimaster Mesh and all its cores. See “Uninstall All Cores in a Multimaster Mesh” on page 240 in this chapter for more information.

To uninstall a single core in a Multimaster Mesh, perform the following tasks

1 Log in to any SAS Web Client available for that Mesh:

   1. Using the System Configuration feature, update the `listeners` configuration parameter by removing the entry for the core that you will uninstall. Update the listeners parameter by selecting “Model Repository, Multimaster Component” in the System Configuration page.

2. If the core to be uninstalled has a Data Access Engine that is currently serving in the Multimaster central role, you must specify a Data Access Engine in another Core to serve as the Multimaster Central.

   See “Reassigning the Data Access Engine to a Secondary Role” in the *Opsware® SAS Administration Guide*.

3. Verify that all transactions have propagated to the other facilities in the Multimaster Mesh.

   For more information about verifying transaction traffic, see “Verify Multimaster Transaction Traffic” on page 203.

2 Decommission the facility for the core you will uninstall. See “Decommission a Facility using the SAS Web Client” on page 241.

3 Restart the Model Repository Multimaster Component in all cores except the core that you will uninstall by entering the following command as root on the server running the engine:

```
/etc/init.d/opsware-sas stop vaultdaemon

/etc/init.d/opsware-sas start vaultdaemon
```

4 Stop the OCC component in the core that you will uninstall by entering the following command as root:

```
/etc/init.d/opsware-sas stop occ.server
```

5 In the core that you will uninstall, stop all Data Access Engines.

Log in as root to the server where the Data Access Engine is running and enter the following command:

```
/etc/init.d/opsware-sas stop spin
```

6 If the OCC and the Data Access Engine are installed on different servers, you must also run the `spin stop` command on the OCC server.

7 Stop the Model Repository Multimaster Component in the core that you will uninstall by entering the following command as root on the server running the engine:

```
/etc/init.d/opsware-sas stop vaultdaemon
```


8 Restart the Data Access Engine that is serving as Multimaster Central by entering the following commands as root:

```
/etc/init.d/opsware-sas stop spin
```

```
/etc/init.d/opsware-sas start spin
```

9 You are now ready to uninstall the core. On each server running an Opsware component, run the following script.

```
/opsware_system/opsware_installer/uninstall_opsware.sh
```

Uninstall the components by following the instructions in step 4 through step 6 in the section “Uninstall a Single Core.”

Uninstall All Cores in a Multimaster Mesh

To uninstall all cores in a Multimaster Mesh, perform the following steps:

1 Stop the OCC by logging on as root to the server where the OCC is running and enter the following command:

```
/etc/init.d/opsware-sas stop occ.server
```

2 Stop the Data Access Engine.

Log in as root to the server where the Data Access Engine is running and enter the following command:

```
/etc/init.d/opsware-sas stop spin
```

If the OCC and the Data Access Engine are installed on different servers, you must also run the `stop spin` command on the OCC server.

3 Stop the Model Repository Multimaster Component in all cores by logging in to the servers running the engines and running the following command as root:

```
/etc/init.d/opsware-sas stop vaultdaemon
```


4. In each core, uninstall the Opsware components on the servers where they are installed.

   ```
   /opsware_system/opsware_installer/uninstall_opsware.sh
   ```

   Follow the instructions in step 4 through step 6 in the section “Uninstall a Single Core.”

Decommission a Facility using the SAS Web Client

Performing this procedure does not shut down or uninstall Opsware SAS in a facility. Decommission facilities with care, because this task cannot be undone.

When you decommission a facility, the facility is still listed in the SAS Web Client, however, it is grayed out. After a short name is used, even if it is decommissioned, that name cannot be reused.

To decommission a facility, perform the following steps:

1. In the SAS Web Client, deactivate the server running the core for the facility that you want to decommission. (For instructions, see “Deactivating a Server” in the *Opsware® SAS User’s Guide: Server Automation*.)
2. From the navigation panel, click **Environment ➤ Facilities**. The Facilities page appears.
3. Select the facility that you want to decommission.
4. On the Properties tab, note the answer to the following question:

   ```
   Is this facility in use?
   ```

   If the answer is No, the **Decommission** button is displayed.
5. Click **Decommission**.

Appendix A: Oracle Setup for the Model Repository

IN THIS APPENDIX

This appendix discusses the following topics:

This appendix explains how to install, configure, and maintain a non-Opsware-supplied Oracle database to support the Opsware Model Repository.

Oracle RDBMS Install Basics

The Model Repository is an Opsware Core component that stores information in an Oracle database.

Although, the Opsware SAS Installer can install and configure an Opsware-supplied (version 10g) database, this section is applicable only when you choose to install your own Oracle database or have an existing Oracle database installation. For information about installing the Opsware-supplied Oracle database, see Chapter 6, “Installing the First Opsware Core” and/or Chapter 8, “Multimaster Mesh Installation”.

This section describes the setup and configuration tasks required to use your own database installation with the Opsware Model Repository.

The process for installing Oracle and the Model Repository has the following three major steps:

1. Install the Oracle RDBMS software.
2. Create the Oracle database (instance).
3. Install the Model Repository.

You can perform both Steps 1 and 2 by using the Opsware Installer or by using the Oracle Universal Installer. You can perform Step 3 only using the Opsware Installer.

The Oracle database must be created before you install the Model Repository, whether you use the Opsware Installer to install and create the database or use the Oracle Universal Installer.

Using the Opsware Installer to install the Oracle RDBMS

The Opsware Installer performs steps 1 and 2 as a single procedure, installing Oracle version 10g. If you intend to perform steps 1 and 2 using the Opsware Installer, see “Opsware-Installed Oracle vs. a Standard Oracle RDBMS” on page 250.

Oracle RDBMS Installation using a Standard Oracle Installation

The following sections If you will use the Oracle Universal Installer to install the Oracle database, or will use an existing Oracle database, then you should read the following sections:

- “Pre-Oracle Universal Installer Tasks” on page 254

Supported Oracle Versions

Support for the Model Repository is limited to certain versions of Oracle running on certain versions of operating systems. Table A-1 lists the supported Oracle versions.

Table A-1: Supported Oracle Versions for Model Repository

ORACLE EDITION	VERSIONS
Oracle Standard Edition	9.2.0.8 10.2.0.2
Oracle Standard Edition One	10.2.0.2
Oracle Enterprise Edition	9.2.0.8 10.2.0.2

Oracle version 9.2.0.5 is not supported by Opsware SAS. Oracle 10.2.0.3 is not supported by Opsware SAS due to known incompatibilities.

To be supported on the Model Repository, the Oracle versions listed in Table A-1 are limited to the operating systems listed in Table A-2.

Table A-2: Supported Operating Systems for Model Repository

SUPPORTED OPERATING SYSTEMS FOR MODEL REPOSITORY	VERSIONS	ARCHITECTURE
Sun Solaris	Solaris 9 Solaris 10	Sun SPARC Sun SPARC
Red Hat Linux	Red Hat Enterprise Linux 3 AS	32 bit x86
Red Hat Linux	Red Hat Enterprise Linux 4 AS	64 bit x86

Multiple Oracle Versions and Multimaster Cores

For the database export to succeed during the installation of a Multimaster core, the version of the target (slave) database cannot be 9.x if the version of the source (master) database is 10.x. Table A-3 lists these allowed version combinations.

Table A-3: Database Versions Allowed for Multimaster

SOURCE DB VERSION	TARGET DB VERSION	ALLOWED?
9	9	Y
9	10	Y
10	9	N
10	10	Y

Oracle RDBMS Hardware Requirements

The server that will run the Oracle database for the Model Repository has the following hardware requirements.

Physical Memory and Swap Space

Oracle requires at least 1024 MB of physical RAM. The amount of swap space required depends on the size of the physical RAM, as shown in Table A-4.

Table A-4: RAM and Swap Space

SIZE OF RAM (MB)	SWAP SPACE REQUIRED (MB)
1024 - 2048	1.5 times the size of RAM
2094 - 8192	equal to size of RAM
more than 8192	9

Temporary Disk Space

The Oracle Universal Installer (OUI) requires up to 400 MB free space in the `/tmp` directory.

Permanent Disk Space

The amount of disk space required depends on the Oracle edition and the number of servers managed by Opsware SAS, as listed in Table A-5.

Table A-5: Database Versions Allowed for Multimaster

ORACLE EDITION	DISK SPACE REQUIRED BY ORACLE RDBMS SOFTWARE (GB)	ADDITIONAL DISK SPACE (FOR DATA AND INDEX TABLESPACES) REQUIRED FOR EVERY 1000 SERVERS MANAGED BY SAS (GB)
Enterprise	2.0	3.1
Standard	1.5	3.1

See *Tablespace Sizes* in Chapter 2, on page 53.

For the disk space requirements of an upgrade, see the *Opsware® SAS Upgrade Guide*.

Hostname Setup

You need to be able to ping the database server hostname. To verify this, enter the following command:

```
ping <hostname>
```

or, on the database server, enter the following command:

```
hostname
```

If the hostname is not set up correctly, Oracle will not start up and you will encounter the following error:

```
ORA-00600: internal error code, arguments: [keltnfy-ldmInit],
[46], [1], [], [], [], [], []
```

Required Operating System Packages and Patches

The following sections list the packages and patches required by the Oracle 10g database. The Opsware Installer checks for these packages and patches before installing the Oracle database.

If you create the database using the Oracle Universal Installer rather than the Opsware Installer, you must check for these packages and patches manually.

Required Packages for RedHat Enterprise Linux AS3 32 bit x86

The following packages are required for Oracle 10g on Linux AS3 32 bit x86. These packages must be the versions listed or higher.

```
make-3.79.1
gcc-3.2.3-34
glibc-2.3.2-95.20
compat-db-4.0.14-5
compat-gcc-7.3-2.96.128
compat-gcc-c++-7.3-2.96.128
compat-libstdc++-7.3-2.96.128
compat-libstdc++-devel-7.3-2.96.128
openmotif21-2.1.30-8
setarch-1.3-1
libaio-0.3.96-5
```

Required Packages for RedHat Enterprise Linux AS4 64 bit x86

The following packages are required for Oracle 10g on Linux AS4 64 bit x86. These packages must be the versions listed or higher.

```
binutils-2.15.92.0.2-13.0.0.0.2.x86_64
compat-db-4.1.25-9.i386.rpm
compat-db-4.1.25-9.x86_64.rpm
compat-libstdc++-33-3.2.3-47.3.x86_64.rpm
compat-libstdc++-33-3.2.3-47.3.i386.rpm
control-center-2.8.0-12.x86_64.rpm
gcc-3.4.3-22.1.x86_64.rpm
gcc-c++-3.4.3-22.1.x86_64.rpm
glibc-2.3.4-2.9.i686.rpm
glibc-2.3.4-2.9.x86_64.rpm
glibc-common-2.3.4-2.9.x86_64.rpm
glibc-devel-2.3.4-2.9.x86_64.rpm
glibc-devel-2.3.4-2.9.i386.rpm
glibc-headers-2.3.4-2.9.x86_64.rpm
glibc-kernheaders-2.4-9.1.87.x86_64.rpm
gnome-libs-1.4.1.2.90-44.1.x86_64
libaio-0.3.103-3.i386.rpm
libaio-0.3.103-3.x86_64.rpm
libgcc-3.4.3-22.1.i386.rpm
libstdc++-3.4.3-22.1.x86_64
libstdc++-devel-3.4.3-22.1.x86_64
```



```
make-3.80-5.x86_64.rpm
pdksh-5.2.14-30.x86_64.rpm
sysstat-5.0.5-1.x86_64.rpm
xorg-x11-deprecated-libs-6.8.2-1.EL.13.6.i386.rpm
xscreensaver-4.18-5.rhel4.2.x86_64.rpm
```

To verify whether these rpms are installed on the OS, enter the following command:

```
rpm -q --qf '%{NAME}-%{VERSION}-%{RELEASE} (%{ARCH})\n'
<rpm_name>
```

Required Packages for Solaris 8, 9, and 10

Solaris 8, 9 and 10 must have the following packages:

```
SUNWarc
SUNWbash
SUNWbtool
SUNWhea
SUNWlibm
SUNWlibms
SUNWsprot
SUNWtoo
SUNWi1of
SUNWxwfnt
SUNWi1cs
SUNWsprox (only for Solaris 8 and Solaris 9)
SUNWi15cs
SUNWpool (only for Solaris 10)
SUNWpoolr (only for Solaris 10)
SUNWmfrun (only for Solaris 10)
```

Required Patches for Solaris 8

Solaris 8 must have the following patches (or later):

```
108528-23: SunOS 5.8: kernel update patch
108652-66: X11 6.4.1: Xsun patch
108773-18: SunOS 5.8: IIIM and X I/O Method patch
108921-16: CDE 1.4: dtwm patch
108940-53: Motif 1.2.7 and 2.1.1: Runtime lib. patch for
Solaris 8
108987-13: SunOS 5.8: Patch for patchadd and patchrm
108989-02: /usr/kernel/sys/acctctl & /.../exacctsys patch
108993-18: SunOS 5.8: LDAP2 client, libc, libthread ... lib.
patch
109147-24: SunOS 5.8: linker patch
110386-03: SunOS 5.8: RBAC Feature Patch
111023-02: SunOS 5.8: /kernel/fs/mntfs and ... sparcv9/mntfs
111111-03: SunOS 5.8: /usr/bin/nawk patch
```



```
111308-03: SunOS 5.8: /usr/lib/libmtmalloc.so.1 patch
111310-01: SunOS 5.8: /usr/lib/libdhcpagent.so.1 patch
112396-02: SunOS 5.8: /usr/bin/fgrep patch
111721-04: SunOS 5.8: Math Library (libm) patch
112003-03: SunOS 5.8: Unable to load fontset in 64-bit
Solaris 8 iso-1 or iso-15
```

Required Patches for Solaris 9

Solaris 9 must have the following patches (or later):

```
112233-11: SunOS 5.9: Kernel Patch
111722-04: SunOS 5.9: Math Library (libm) patch
```

Required Patches for Solaris 10

When Oracle 10.2 is installed on T2000 hardware with the Solaris 10 operating system, the Opsware Installer hangs during the installation of the Model Repository. The Oracle alert.log includes errors, such as the following:

```
MMNL absent for 28552 secs; Foregrounds taking over
Wed Aug  2 12:45:57 2006
MMNL absent for 28853 secs; Foregrounds taking over
Wed Aug  2 12:50:57 2006
MMNL absent for 29151 secs; Foregrounds taking over
```

Customers should look at Bug 6385446 from Sun Microsystems and apply Patches 118833-18, 119578-24 and 119254-24 as per:

`http://sunsolve.sun.com/search/document.do?assetkey=1-26-102289-1`

Opsware-Installed Oracle vs. a Standard Oracle RDBMS

An Oracle database created by the Opsware Installer differs in certain ways from a database installed using the Oracle Universal Installer, this section explains those differences.

Opsware Installer Changes to Database Configuration and Files

When the Opsware Installer installs the Oracle RDBMS software and creates the database, it makes the following changes:

- Creates the Unix user `oracle` locally in `/etc/passwd`.
- Creates the Unix groups `dba` and `oinstall` locally in `/etc/group`.

- Sets the `$ORACLE_HOME` environment variable to the following directory:

  `/u01/app/oracle/product/10.2.0/db_1`

- Sets the `$ORACLE_SID` environment variable to `truth`.

- Gets the service name (TNS name) from the Opsware Installer interview (truth.servicename prompt) and inserts it into the `tnsnames.ora` file in `$ORACLE_HOME/network/admin` and `/var/opt/oracle`. The Opsware Installer changes the value of the `host` parameter to the value returned by the Unix `hostname` command.

- Creates the data and index files under the following directories:

  ```
  /u01/oradata/truth
  /u02/oradata/truth
  /u03/oradata/truth
  ```

  The system administrator can configure the `/u01`, `/u02`, `/u03` directories before installing the Oracle RDBMS software.

- In the `/$ORACLE_HOME/network/admin/listener.ora` file, changes the value of the `host` parameter to the value returned by the Unix `hostname` command.

  The listener is password protected and OS authenticated. (The default password is `opsware`.) By default, it listens on port 1521.

- Creates the `/etc/init.d/opsware-oracle` script, which you can use to start up and shut down the database and listener.

  This script is linked to corresponding scripts in the `/etc/rc*.d` directories.

- For Solaris 8 and 9, modifies `/etc/system` and asks the user to reboot the sever.

- For Solaris 10 and Linux, you are not required to reboot the server.

Database Parameter Value Differences

When it creates the Oracle database, the Opsware Installer sets the values for parameters in various files. This section lists the parameters set by the Opsware Installer that can be changed without adversely affecting Opsware SAS.

Kernel Parameter Differences in RedHat Enterprise Linux 3 AS and RedHat Enterprise Linux 4 AS

This section identifies the kernel parameters you can change for Linux 3 AS (32 bits) and Linux 4 AS (64 bits.

You can change values for the following parameters in `/etc/sysctl.conf`:


```
kernel.shmmax=2147483648
kernel.shmall=2097152
kernel.shmmni=4096
kernel.sem=256 32000 256 256 (for Linux 3 AS, 32 bits)
kernel.sem=250 32000 100 128 (for Linux 4 AS, 64 bits)
net.core.rmem_default=262144
net.core.wmem_default=262144
net.core.rmem_max=262144
net.core.wmem_max=262144
fs.file-max=65536f
net.ipv4.ip_local_port_range=1024 65000
```

You can change values for the following parameters in `/etc/security/limits.conf`:

```
oracle soft nofile 4096
oracle hard nofile 63536
oracle soft nproc 2047
oracle hard nproc 16384
```

You can change values for the following parameters in `/etc/pam.d/login`:

```
session required /lib/security/pam_limits.so (for Linux 3
AS, 32 bits)
session required pam_limits.so
```

Kernel Parameter differences in Solaris 8 and 9

The following parameters are set by the Opsware Installer in `/etc/system`:

```
forceload: sys/shmsys
forceload: sys/semsys
forceload: sys/msgsys
set shmsys:shminfo_shmmax=2147483648
set shmsys:shminfo_shmmin=1
set shmsys:shminfo_shmmni=100
set shmsys:shminfo_shmseg=10
set semsys:seminfo_semmns=2058
set semsys:seminfo_semmsl=256
set semsys:seminfo_semmni=100
set semsys:seminfo_semvmx=32767
set noexec_user_stack=1
```

You can change values for the following parameters in `/etc/system`:

```
set shmsys:shminfo_shmmin=1
set shmsys:shminfo_shmmni=100
set shmsys:shminfo_shmseg=10
set semsys:seminfo_semmns=2058
set semsys:seminfo_semmsl=256
```



```
set semsys:seminfo_semmni=100
set semsys:seminfo_semvmx=32767
set noexec_user_stack=1
```

You can increase the value for the following parameter in `/etc/system`:

```
set shmsys:shminfo_shmmax=2147483648
```

You can remove the following parameters in `/etc/system`:

```
forceload: sys/shmsys
forceload: sys/semsys
forceload: sys/msgsys
```

Kernel Parameter Differences in Solaris 10

To change a kernel parameter for Solaris 10, perform the following steps:

1. Enter set `noexec_user_stack=1` in `/etc/system`.

2. Run the following commands:

```
projadd -U oracle -K "project.max-shm-
memory=(priv,2048MB,deny)" user.oracle

projmod -s -K "project.max-sem-ids=(priv,100,deny)"
user.oracle
projmod -s -K "process.max-sem-nsems=(priv,256,deny)"
user.oracle

projmod -s -K "project.max-shm-ids=(priv,100,deny)"
user.oracle

echo "oracle::::project=user.oracle"  >> /etc/user_attr
```

3. Use the vi editor for `/etc/project` and `/etc/user_attr` to verify the changes made in step 2.

Differences in init.ora

You can increase values for the following parameters in `init.ora`:

```
db_cache_size=629145600
shared_pool_size=262144000
java_pool_size=52428800
large_pool_size=52428800
log_buffer=1048576
```


Location of Additional Oracle Data Files

If you want to add data files to a database created with the Opsware Installer, you can add them to the following directories:

```
/u01/oradata/truth
/u02/oradata/truth
/u03/oradata/truth
```

Pre-Oracle Universal Installer Tasks

If you create the database with the Opsware Installer, you do not need to perform the tasks in this section.

This section discusses the prerequisites for an installation of the Oracle RDBMS using the Oracle Universal Installer for use with Opsware SAS. For more detailed information about installing Oracle, see the *Oracle Installation Guide* for your operating system. Each operating system and Oracle version has a different guide. The Oracle documentation is available at the following URL:

`http://www.oracle.com/technology/documentation/index.html`

Before installing the Oracle RDBMS software, perform the following steps:

1. Verify that the server has the software listed in “Required Operating System Packages and Patches” on page 247.

2. Download and unzip the sample files.

   The sample files are available in the support area of the Opsware, Inc. web site at `www.opsware.com`. See “Sample Scripts and Configuration Files” on page 256.

3. Set the kernel parameters.

   The easiest way to set these parameters is by copying and editing the following sample files:

   ```
   kernel_params_redhat.txt
   kernel_params_solaris.txt
   ```

   These two files contain instructions, Unix commands, and lines of text for configuration files.

4. Create the required Unix users and groups by running the following commands. (If you use a directory different than `/u01/app/oracle`, modify the commands accordingly):

```
mkdir -p /u01/app/oracle
groupadd oinstall
groupadd dba
groupadd dboper
useradd -g oinstall -G dba \
  -d /u01/app/oracle -s /usr/bin/sh oracle
chown oracle:oinstall /u01/app/oracle
```

5. Set the environment variables for the `oracle` user.

   The easiest way to set these variables is by copying and editing the following sample files:

```
bash_profile
profile
```

Now you should be ready to install the Oracle RDBMS. For instructions, see the *Oracle Installation Guide* for your operating system.

Manually Creating the Oracle Database

If you create the database with the Opsware Installer, you do not need to perform the tasks in this section.

Sample Scripts and Configuration Files

Opsware, Inc. provides a bundle of sample files for you to copy and edit. Referenced throughout the instructions in this document, the sample files include SQL scripts, database configuration files, and kernel parameter settings.

The sample files are available in the support area of the Opsware, Inc. web site at `www.opsware.com`.

The following list summarizes the sample scripts and configuration files:

- **truth.sh**: A shell script that creates directories and then launches the `truth.sql` script.
- **truth.sql**: Prompts for passwords of the `SYS` and `SYSTEM` users and then launches the remainder of the SQL scripts in this list.
- **CreateDB.sql**: Creates a database with the UTF8 character set (as required by Opsware SAS), the data and index files, the default temporary tablespace, the undo tablespace, and the log files.
- **CreateDBFiles.sql**: Creates the following tablespaces that are required by Opsware SAS:

  ```
  LCREP_DATA
  LCREP_INDX
  TRUTH_DATA
  TRUTH_INDX
  AAA_DATA
  AAA_INDX
  AUDIT_DATA
  AUDIT_INDX
  STRG_DATA
  STRG_INDX
  ```

  See Table 2-6 on page 53 for additional tablespace sizing information.
- **CreateDBCatalog.sql**: Runs Oracle scripts to create data system catalog objects.
- **JServer.sql**: Sets up the Oracle Java environment.

- **CreateAdditionalDBFiles.sql**: Adds data and index files to certain tablespaces and allocates additional disk space. This script is optional, but recommended.
- **CreateUserOpsware_Admin.sql**: Creates the `opsware_admin` database user and grants permissions (privileges) to this user (required by Opsware SAS).
- **postDBCreation.sql:** Creates the `spfile` from the `pfile` (parameter file).
- **init.ora**: Contains initialization parameters for the database. See “Required and Suggested Parameters for init.ora” on page 258.
- **tnsnames.ora**: Enables resolution of database names used internally by Opsware SAS.
- **listener.ora**: Contains configuration parameters for the listener. Opsware SAS by default listens on port 1521. You can change the default port during installation or by editing the tsnames.ora file.
- **bash_profile**: Sets environment variables and sets shell limits for the `oracle` Unix user.
- **profile**: Sets environment variables for the `oracle` Unix user.
- **kernel_params_redhat.txt**: Contains kernel parameters for RedHat Enterprise Linux 3 AS.
- **kernel_params_solaris.txt**: Contains kernel parameters for Solaris 8, 9, and 10.
- **opsware-oracle**: A script residing in `/etc/init.d` that starts up and shuts down the database and listener.

  Note that the `/etc/init.d/opsware-sas` script, which starts and stops the SAS components, does not start and stop the database and listener. For more information on the `opsware-sas` script, see the *Opsware® SAS Administration Guide*.
- **Export-Import**: A directory that contains parameter files and instructions for performing full database exports and imports.

Required and Suggested Parameters for init.ora

For Opsware SAS, the following `init.ora` entries are either suggested or required:

```
sga_max_size >=1GB
db_cache_size>=629145600
shared_pool_size>=262144000
java_pool_size>=52428800
large_pool_size>=52428800
log_buffer>=1048576
db_block_size>=8192
open_cursors >=300
session_cached_cursors=50
job_queue_processes >=10
nls_length_semantics=CHAR
nls_sort=GENERIC_M
processes >=1024
sessions >=1152
pga_aggregate_target >=104857600
workarea_size_policy=auto
change remote_login_passwordfile=SHARED
undo_management=AUTO (Suggested)
undo_tablespace=UNDO (Suggested)
query_rewrite_integrity=TRUSTED
query_rewrite_enabled=true
optimizer_mode=choose (for 9i) or all_rows (for 10g)
optimizer_index_cost_adj=20
optimizer_index_caching=80
cursor_sharing=SIMILAR, value can be set to
SIMILAR(preferred) or EXACT (recommended only if you
encounter Oracle Bug No. 3102053)
recyclebin=OFF (Suggested, for Oracle 10g only)
```

A bug in Oracle10g regarding DML containing inline views and certain types of subqueries causes Oracle to throw an ORA-00600 exception. Until the bug is fixed in Oracle 10g, the workaround is the following entry in `init.ora`:

```
_complex_view_merging = false
```

File Location Values in the Sample Scripts

In the sample scripts and configuration files, `ORACLE_HOME` environment variable is set to the following value:

```
/u01/app/oracle/product/10.2.0/db_1
```

The sample `init.ora` file has the following settings for files:

```
db_create_file_dest=/u01/oradata/truth
```



```
db_create_online_log_dest_1=/u02/oradata/truth
db_create_online_log_dest_2=/u03/oradata/truth

control_files=(/u02/oradata/truth/control01.ctl,/u03/
oradata/truth/control02.ctl)
```

If your organization has policies that do not match these settings, then you should modify the sample files accordingly.

Creating the Database with the Sample Scripts

To create the database with the sample scripts, perform the following steps:

1. Download and unzip the sample files.

   The sample files are available in the support area of the Opsware, Inc. web site at `www.opsware.com`. See "Sample Scripts and Configuration Files" on page 256.

2. Log in to the server as the Unix user `oracle`.

3. Copy the sample `init.ora` file to the following directory:
   `$ORACLE_BASE/admin/truth/create`

4. Examine the sample SQL scripts that you will run in step 6. If necessary, edit the scripts to conform to your organization's policies.

5. Log on to the server as the `oracle` user and change the mode of the sample `truth.sh` script:
   `chmod 755 truth.sh`

6. To launch the sample SQL scripts that create the database, run the `truth.sh` script:
   `./truth.sh`

7. After the scripts launched by `truth.sh` complete, check the log files in the following directory:
   `$ORACLE_HOME/assistants/dbca/logs`

Post-Create the Oracle RDBMS Tasks

If you create the database with the Opsware Installer, you do not need to perform the tasks in this section, except for step 1.

After creating the database, but before installing the Model Repository with the Opsware Installer, perform the following steps:

1. Create the `tnsnames.ora` file in the following directory:

   `$ORACLE_HOME/network/admin`

   Verify that the file conforms to the rules listed in "tnsnames.ora File Requirements" on page 261.

2. If it does not exist, create the following directory:

   ```
   mkdir -p /var/opt/oracle
   ```

3. Create the following symbolic link:

   ```
   ln -s $ORACLE_HOME/network/admin/tnsnames.ora \
   /var/opt/oracle/tnsnames.ora
   ```

4. Make sure that the oracle Unix user has read-write permission on the `tnsnames.ora` file.

5. For RedHat Enterprise Linux 3 AS, create another symbolic link:

   ```
   ln -s /etc/oratab /var/opt/oracle/oratab
   ```

6. Copy the sample `opsware-oracle` script to `/etc/init.d/`.

7. Link `/etc/init.d/opsware-oracle` to corresponding scripts in the `/etc/rc*` directories. For example:

   ```
   ln -s /etc/init.d/opsware-oracle \
         /etc/rc0.d/K02opsware-oracle
   ln -s /etc/init.d/opsware-oracle \
         /etc/rc1.d/K02opsware-oracle
   ln -s /etc/init.d/opsware-oracle \
         /etc/rc2.d/S60opsware-oracle
   ln -s /etc/init.d/opsware-oracle \
         /etc/rcS.d/K02opsware-oracle
   ```

8. Copy the sample `listener.ora` file to `$ORACLE_HOME/network/admin`.

9. In `listener.ora`, change the value of the `host` parameter to the host name of server running the database.

10 Turn on table level monitoring for `dbms_stats` collection. Run the following SQL to turn the monitoring on:

- **Oracle 9i**:

```
SQL> connect / as sysdba

exec dbms_stats.alter_schema_tab_monitoring(ownname=>'AAA',monitoring=>TRUE);

exec dbms_stats.alter_schema_tab_monitoring(ownname=>'TRUTH',monitoring=>TRUE);

exec dbms_stats.alter_schema_tab_monitoring(ownname=>'LCREP',monitoring=>TRUE);
```

- **Oracle 10g**:

  Monitoring is turned on in Oracle 10g by default. Nothing need be done.

To check that table monitoring has been turned on, run the following SQL:

```
SQL> select owner, table_name, monitoring from dba_tables where owner in ('AAA');

SQL> select owner, table_name, monitoring from dba_tables where owner in ('TRUTH');

SQL> select owner, table_name, monitoring from dba_tables where owner in ('LCREP');
```

tnsnames.ora File Requirements

The `tnsnames.ora` file enables resolution of database names used internally by the core components. Opsware SAS has the following requirements for the `tnsnames.ora` file:

- The file must reside in the following location:

  `/var/opt/oracle/tnsnames.ora`

- If the core is installed across multiple servers, a copy of the file must reside on the servers running the following components:
  - Model Repository
  - Data Access Engine
  - Web Services Data Access Engine
  - Opsware Command Center
  - Global File System
  - Model Repository Multimaster Component

- For a core installed on multiple servers, the directory path of the `tnsnames.ora` file must be the same on each server.
- In a Single Core installation, the `tnsnames.ora` file must contain an entry for the Model Repository, as in the following example:

```
truth =
(DESCRIPTION=
(ADDRESS=(HOST=magenta.opsware.com)(PORT=1521)
(PROTOCOL=tcp))
(CONNECT_DATA=(SERVICE_NAME=truth)))
```

tnsnames.ora: Multimaster Mesh Requirements

In a Multimaster Mesh, the `tnsnames.ora` file must be set up for a central and a non-central core using the following guidelines.

Central (source, master) Core

The `tnsnames.ora` file must contain an entry for its own Model Repository. The port number must be set to the port that you have designated that the Oracle listener process use, such as `1521 (default)`, `1526`, and so on.

The `tnsnames.ora` file must also contain an entry that specifies the central core Gateway. This port is used by the Data Access Engine for Multimaster traffic. The port number is derived from the following formula: (20000) + (facility ID of the non-central core).

Example: In the following example, the TNS service name of the central core is `orange_truth`, which runs on the host `orange.opsware.com`. The TNS name of the non-central core is `cyan_truth`, which has a facility ID of `556`. Note that the entry for `cyan_truth` specifies `orange.opsware.com`, which is the host running the central core's Gateway.

```
orange_
truth=(DESCRIPTION=(ADDRESS=(HOST=orange.opsware.com)(PORT=1
521)(PROTOCOL=tcp))(CONNECT_DATA=(SERVICE_NAME=truth)))
cyan_
truth=(DESCRIPTION=(ADDRESS=(HOST=orange.opsware.com)(PORT=2
0556)(PROTOCOL=tcp))(CONNECT_DATA=(SERVICE_NAME=truth)))
```

Non-central (non-master) Core

The `tnsnames.ora` file must contain an entry for its own Model Repository. The port number must be set to the port that you have designated that the Oracle listener process use, such as `1521` (default), `1526`, and so on. The `tnsnames.ora` file does not require any entries for other cores in the mesh.

Example: In the following example, the TNS service name of the non-central core is `cyan_truth`, and the core runs on the host, `cyan.opsware.com`.

```
cyan_truth
=(DESCRIPTION=(ADDRESS=(HOST=cyan.opsware.com)(PORT=1521)(PR
OTOCOL=tcp))(CONNECT_DATA=(SERVICE_NAME=truth)))
```

Requirements for Enabling Oracle Daylight Saving Time (DST)

To enable Daylight Saving Time for the Oracle database, you must apply database tier patches. To apply these patches, perform the following steps:

1. Verify that your database is running on Oracle 9i or higher. If you are on an earlier database release, use one of the following MetaLink Notes to upgrade your database:

   10gR2 Database: MetaLink Note 362203.1

   9iR2 Database: MetaLink Note 216550.1

2. Use MetaLink Note 359145.1 to apply Oracle Database time zone fixes specific to your database version.

3. Use MetaLink Note 359145.1 to apply time zone fixes to the Oracle Java Virtual Machine (JVM) in the Oracle Database specific to your E-Business Suite database version.

Installing the Model Repository on a Remote Database Server

To install or upgrade the Model Repository on a remote database server, perform the following steps:

1. Install the following on the machine that will run the Opsware Installer:

   1. Ensure that the file `$ORACLE_HOME/jdbc/lib/classes12.zip` exists on the client machine. You can copy this file from the database server.

   2. Edit the `tnsnames.ora` file to allow access the Model Repository (truth). This file can be found at `/var/opt/oracle/tnsnames.ora`

   3. Ensure that the Opsware Installer response file contains the correct path to the client's `tnsnames.ora file` (`%truth.tnsdir`), to the Oracle client home (`%truth.orahome`), to the listener port (`%truth.port`) and so on.

4. Ensure that the /etc/hosts file has the Model repository (truth) server name/IP address set to truth.

2 Perform the following steps on the Model Repository (truth) server:

1. Log in as user oracle.
2. CD to $ORACLE_HOME/network/admin.
3. Ensure that the listener.ora file has the following SID_LIST_* section:

```
SID_LIST_<your_listener_name> =
        (SID_LIST =
        (SID_DESC=
        (SID_NAME=truth)
        (ORACLE_HOME=<oracle_home>
```

3 Ensure that the listener is started with the command:

```
lsnrctl start <your_listener_name>
```

Database Monitoring Strategy

Because the Model Repository is a critical component of Opsware SAS, the DBA should implement a monitoring strategy. The DBA can write custom monitoring scripts or use third-party products.

This section contains example commands for monitoring the Oracle database used by the Model Repository. When issuing the commands shown in this section, you must be logged on to the server as the user oracle:

```
$ su - oracle
```

The SQL commands shown in this section are entered in the sqlplus command-line utility. To run sqlplus, log on as oracle and enter the following command:

```
$ sqlplus "/ as sysdba"
```

Verify that the Database Instances are Up and Responding

To verify that the Database Instances are up and running, perform the following steps:

1 Check to see if the Oracle processes are running by entering the following command:

```
ps -ef | grep ora_
```

This ps command should generate output similar to the following lines:


```
oracle    1883     1  0 Jul24 ?        00:00:00 ora_pmon_truth
oracle    1885     1  0 Jul24 ?        00:00:00 ora_psp0_truth
oracle    1887     1  0 Jul24 ?        00:00:00 ora_mman_truth
oracle    1891     1  0 Jul24 ?        00:00:45 ora_dbw0_truth
oracle    1895     1  0 Jul24 ?        00:01:11 ora_lgwr_truth
oracle    1897     1  0 Jul24 ?        00:00:02 ora_ckpt_truth
oracle    1899     1  0 Jul24 ?        00:00:24 ora_smon_truth
oracle    1901     1  0 Jul24 ?        00:00:00 ora_reco_truth
oracle    1903     1  0 Jul24 ?        00:00:02 ora_cjq0_truth
oracle    2391     1  0 Jul24 ?        00:00:00 ora_qmnc_truth
oracle    2513     1  0 Jul24 ?        00:00:00 ora_q000_truth
oracle    2515     1  0 Jul24 ?        00:00:00 ora_q001_truth
oracle   18837     1  0 03:04 ?        00:00:00 ora_mmon_truth
oracle   18839     1  0 03:04 ?        00:00:00 ora_mmnl_truth
oracle   25184 24635  0 21:35 pts/1    00:00:00 grep ora_
```

2. Verify that the database status is `ACTIVE` by entering the following command in `sqlplus`:

   ```
   select database_status from v$instance;
   ```

3. Verify that the open mode is `READ WRITE` by entering the following command in `sqlplus`:

   ```
   select name, log_mode, open_mode from v$database;
   ```

Verify that the Datafiles are Online

To verify that the datafiles are online, in `sqlplus`, enter the following commands:

```
Col file_name format a50
Col status format a10
Set line 200
Select file_id, status, bytes, file_name from dba_data_files
order by tablespace_name;
```

The status should be AVAILABLE for all the data files.

Verify That the Listener is Running

To verify that the listener is running, perform the following steps:

1. Check to see if the Oracle listener processes are running by entering the following command:

   ```
   ps -ef | grep tns

   oracle    1762     1  0 Jul24 ?        00:00:01 /u01/app/
   oracle/product/10.2.0/db_1/bin/tnslsnr LISTENER -inherit
   oracle   25231 25189  0 21:39 pts/1    00:00:00 grep tns
   ```


2. Check the status of the listener with the `lsnrctl` command:

   ```
   lsnrctl status
   ```

   The listener should be listening on port 1521 (default), or on the port that you have designated that the Oracle listener process use, with the TCP protocol, and should be handling the instance named truth. The `lsnrctl` command should generate output similar to the following lines:

   ```
   . . .
   Connecting to (ADDRESS=(PROTOCOL=tcp)
   (HOST=per1.performance.qa.opsware.com)(PORT=1521))
   . . .
   Instance "truth", status READY, has 1 handler(s) for this
   service...
   ```

3. Test connectivity to the instance from the Data Access Engine (spin) and Web Services Data Access Engine (twist) hosts by running the `tnsping` utility:

   ```
   tnsping truth
   ```

   The `OK` statement displayed by the `tnsping` utility confirms that the listener is up and can connect to the instance. The `tnsping` utility should generate output similar to the following lines:

   ```
   . . .
   Used parameter files:

   Used HOSTNAME adapter to resolve the alias
   Attempting to contact (DESCRIPTION=(CONNECT_DATA=(SERVICE_
   NAME=truth.performance.qa.opsware.com))(ADDRESS=(PROTOCOL=TC
   P)(HOST=192.168.165.178)(PORT=1521)))
   OK (0 msec)


   Attempting to contact
   (DESCRIPTION=(ADDRESS=(HOST=localhost)(PORT=1521)(PROTOCOL=t
   cp))(CONNECT_DATA=(SERVICE_NAME=truth)))
   OK (0 msec)
   ```

   As an alternative to running the `tnsping` utility in this step, you can check the connectivity by running `sqlplus` and connecting to the database instance with the service name (TNS alias), for example:

   ```
   sqlplus myuser/mypass@truth
   ```

Examine the Log Files

To examine the log files, perform the following steps:

1. Look for errors in the `alert.log` file.

For each instance, locate the `alert.log` file in the background dump destination directory:

```
$ORACLE_BASE/admin/<SID>/bdump
```

Here is an example `bdump` directory for an instance with the `truth` SID:

```
/u01/app/oracle/admin/truth/bdump
```

2. Look for errors in the other log and trace files, located in the following directories:

```
$ORACLE_BASE/admin/<SID>/cdump
$ORACLE_BASE/admin/<SID>/adump
$ORACLE_BASE/admin/<SID>/udump
```

Check for Sufficient Free Disk Space in the Tablespaces

To check for sufficient disk space, perform the following steps:

1. Enter the following commands in `sqlplus`:

```
column dummy noprint
column  pct_used format 999.9       heading "Pct|Used"
column  name    format a16      heading "Tablespace Name"
column  Kbytes   format 999,999,999    heading "Current|File
Size|MB"
column  used    format 999,999,999   heading "Used MB "
column  free    format 999,999,999  heading "Free MB"
column  largest    format 999,999,999  heading
"Largest|Contigous|MB"
column  max_size format 999,999,999 heading "Max
Possible|MB"
column  pct_max_used format 999.999       heading
"Pct|Max|Used"
break   on report
compute sum of kbytes on report
compute sum of free on report
compute sum of used on report

select nvl(b.tablespace_name,
             nvl(a.tablespace_name,'UNKOWN')) name,
       kbytes_alloc Kbytes,
       kbytes_alloc-nvl(kbytes_free,0) used,
       nvl(kbytes_free,0) free,
       ((kbytes_alloc-nvl(kbytes_free,0))/
                          kbytes_alloc)*100 pct_used,
       nvl(largest,0) largest,
       nvl(kbytes_max,kbytes_alloc) Max_Size,
       ((kbytes_alloc-nvl(kbytes_free,0))/kbytes_max)*100
pct_max_used
from ( select sum(bytes)/1024/1024 Kbytes_free,
```

```
              max(bytes)/1024/1024 largest,
              tablespace_name
       from  sys.dba_free_space
       group by tablespace_name ) a,
     ( select sum(bytes)/1024/1024 Kbytes_alloc,
              sum(decode(maxbytes,0,bytes,maxbytes))/1024/
1024 Kbytes_max,
              tablespace_name
       from sys.dba_data_files
       group by tablespace_name
       union all
      select sum(bytes)/1024/1024 Kbytes_alloc,
              sum(decode(maxbytes,0,bytes,maxbytes))/1024/
1024 Kbytes_max,
              tablespace_name
       from sys.dba_temp_files
       group by tablespace_name) b
where a.tablespace_name (+) = b.tablespace_name
order by 1
/
```

In the output generated by the preceding commands, compare the numbers under the `Used` and `Free` headings.

2. To list the existing data, index, and temp files, enter the following commands in `sqlplus`:

```
Select file_id, bytes, file_name from dba_data_files;
Select file_id, bytes, file_name from dba_temp_files;
```

3. If a tablespace has auto-extended to its maximum size and is running out of disk space, then add new data files by entering the `ALTER TABLESPACE` command in `sqlplus`.

   The following example commands add data files to four of the tablespaces. For a full list of tablespaces and data files, see the output generated by the commands in the preceding two steps.

```
ALTER TABLESPACE "AAA_DATA"
ADD DATAFILE '/u01/oradata/truth/aaa_data10.dbf'
SIZE 32M AUTOEXTEND ON NEXT 128M MAXSIZE 4000M ;

ALTER TABLESPACE "AAA_INDX"
ADD DATAFILE '/u02/oradata/truth/aaa_indx11.dbf'
SIZE 32M AUTOEXTEND ON NEXT 128M MAXSIZE 4000M ;

ALTER TABLESPACE "UNDO"
```



```
ADD DATAFILE '/u03/oradata/truth/undo12.dbf' SIZE 32M
AUTOEXTEND ON NEXT 128M MAXSIZE 4000M ;

ALTER TABLESPACE "TEMP" ADD
TEMPFILE '/u04/oradata/truth/temp14.dbf' SIZE 32M AUTOEXTEND
ON NEXT 128M MAXSIZE 4000M ;
```

Verify That the Jobs in DBA_JOBS Ran Successfully

When the Model Repository is installed, the Opsware Installer sets up these jobs, which perform statistics and garbage collection. If these jobs do not run successfully, database performance will degrade.

To verify that the Jobs in DBA_JOBS ran successfully, perform the following steps:

1. To see if the jobs have run successfully, enter the following commands in `sqlplus`:

```
Col schema_user format a10
Col what format a50
Set line 200
Select job, schema_user, last_date, this_date, next_date,
broken, what from dba_jobs;
```

   In the output generated from the preceding statement, the value of the "what" column indicates the type of job. If the value of "what" is `DBMS_STATS*` or `GATHER_*`, the job performs statistics collection. The jobs owned by 'GCADMIN' perform the garbage collection.

2. If you need to run the statistics and collection jobs manually, start by entering the following command in `sqlplus`:

```
grant create session to truth, aaa, lcrep;
```

   To run the statistics collection jobs manually in `sqlplus`, enter `exec` commands similar to the example shown in this step.

   If you copy and paste the following `exec` command examples, substitute the variables such as `schema_user_1` with the values of the `schema_user` column displayed by the preceding `select` statement. Substitute the variables such as `job_no_1` with the values of the `job` column displayed by the same `select` statement.

```
connect <schema_user_1>/<password>
exec dbms_job.run(<job_no_1>)

connect < schema_user_2>/<password>
exec dbms_job.run(<job_no_2>);
```



```
connect < schema_user_3>/<password>
exec dbms_job.run(<job_no_3>)

connect < schema_user_4>/<password>
exec dbms_job.run(<job_no_4>);
```

3. To run the garbage collection jobs manually, enter the following commands in `sqlplus`, substituting the job ID variables such as `job_no_1`:

```
grant create session to gcadmin;
connect gcadmin/<password_of_gcadmin>

exec dbms_job.run(<job_no_1>);
exec dbms_job.run(<job_no_2>);
exec dbms_job.run(<job_no_3>);
exec dbms_job.run(<job_no_4>);
```

4. If you entered the `grant` command in step 2, enter the following command in `sqlplus`:

```
revoke create session from truth, aaa, lcrep;
```

Monitor the ERROR_INTERNAL_MSG Table

The garbage collection jobs write exceptions to the `truth.ERROR_INTERNAL_MSG` table. Monitor this table daily for errors.

Monitor Database Users

To monitor database users, perform the following steps:

1. To check the database users, enter the following command in `sqlplus`:

```
Select username, account_status, default_tablespace,
temporary_tablespace from dba_users;
```

The preceding `select` command should display the following users:

```
OPSWARE_PUBLIC_VIEWS
TRUTH
AAA_USER
LCREP
GCADMIN
TWIST
SPIN
AAA
OPSWARE_ADMIN
VAULT
```

(The `VAULT` user is for Multimaster databases only.)

The `default_tablespace` of the Opsware SAS users should not be `SYSTEM` or `SYSAUX`. The `temporary_tablespace` of all users should be `TEMP`.

2. If a database user listed in the preceding step has the `account_status` of `LOCKED`, then unlock the user by entering the following command in `sqlplus`:
`ALTER USER <username> ACCOUNT UNLOCK;`

Troubleshooting System Diagnosis Errors

If an additional privilege (permission) has been made manually to the database, when Opsware SAS performs a system diagnosis on the Data Access Engine, an error message might be generated. For example, if an additional grant has been made to the `truth.facilities` table, the following error appears:

```
Test Information
Test Name: Model Repository Schema
Description: Verifies that the Data Access Engine's version
of the schema
matches the Model Repository's version.
Component device: Data Access Engine
(spin.blue.qa.opsware.com)
Test Results: The following tables differ between the Data
Access Engine and
the Model Repository:  facilities.
```

To fix this problem, revoke the grant. For example, if you need to revoke a grant on the `truth.facilities` table, log on to the server with the database and enter the following commands:

```
su - oracle
sqlplus "/ as sysdba"
grant create session to truth;
connect truth/<truth passwd>;
revoke select on truth.facilities from spin;
exit
sqlplus "/ as sysdba"
revoke create session from truth;
```

Garbage Collection

Opsware SAS creates four Oracle jobs for garbage collection or for deleting the old data. For details about how these jobs are set up, see the Oracle Jobs section of the Opsware SAS documentation.

By default, the garbage collection is run daily. The default values for retaining the data are as follows:

```
DAYS_WAY = 30 days
DAYS_TRAN = 7 days
DAYS_CHANGE_LOG = 180 days
DAYS_AUDIT_LOG = 180 days
```

These values can be read or updated in the `AUDIT_PARAMS` table. See Table A-6.

These values must be exactly the same for all the cores in a mesh.

To view the data, run the following sql command:

```
1* select name, value from audit_params
```

Table A-6: Garbage Collection Parameters

NAME	VALUE
DAYS_WAY	30
DAYS_TRAN	7
DAYS_CHANGE_LOG	180
LAST_DATE_WAY	07-OCT-06
LAST_DATE_TRAN	30-OCT-06
LAST_DATE_CHANGE_LOG	10-MAY-06
DAYS_AUDIT_LOG	180
LAST_DATE_AUDIT_LOG	10-MAY-06

To update the data, run a sql command similar to the following example as user lcrep:

```
update audit_params set value=x where name = 'DAYS_AUDIT_LOG';
```

These values must be exactly the same for all the cores.

Oracle Database Backup Methods

It is important that you back up the database on a regular basis. Be sure to use more than one backup method and to test your recovery process.

You can use the following methods to back up the Oracle database:

- **Export-Import**: An export extracts logical definitions and data from the database and writes the information to a file. Export-import does not support point-in-time recoveries. Do not use Export-Import as your only backup and recovery strategy.

  See the information on the `Export-Import` subdirectory in "Sample Scripts and Configuration Files" on page 256.

- **Cold or Off-Line Backups**: This procedure shuts the database down and backs up all data, index, log, and control files. Cold or off-line backups do not support point-in-time recoveries.

- **Hot or Online Backups**: During these backups, the database must be available and in ARCHIVELOG mode. The tablespaces are set to backup mode. This procedure backs up tablespace files, control files, and archived redo log files. Hot or online backups support point-in-time recoveries.

- **RMAN Backups**: While the database is either off-line or on-line, use the `rman` utility to back up the database.

Regardless of your backup strategy, remember to back up all required Oracle software libraries, parameter files, password files, and so forth. If your database is in ARCHIVELOG mode, you also need to back up the archived log files.

For more information on backing up Oracle databases, see the following documents:

- *Oracle Database 2 Day DBA*
- *Oracle Database Concepts*
- *Oracle Database Administrator's Guide*

These guides are on the Oracle web site at the following URL:

```
http://www.oracle.com/technology/documentation/index.html
```

Useful SQL

The following sql commands help you manage information in the Oracle database that the Model Repository uses.

Locked and Unlocked User

A user in Oracle 10.2.0.2 will be locked out after ten unsuccessful logons.

To verify whether the user has been locked or unlocked, enter the following sql command:

```
select username, account_status from dba_users;
```

To unlock the user, enter the following sql command:

```
>ALTER USER <username> ACCOUNT UNLOCK;
```

GATHER_SYSTEM_STATS

Sometimes the `GATHER_SYSTEM_STATS` job will be suspended. To remove this from '`AUTOGATHERING"` mode, perform the following steps:

1. Select `PNAME, pval2` from `SYS.AUX_STATS$` where `pname ='STATUS';.`
2. If the `PVAL2` status is `"AUTOGATHERING"`, run `GATHER_SYSTEM_STATS` with `gathering_mode=('STOP');.`
3. Run your job `'exec dbms_job.run(xxx);.`

BIN$ Objects

If the Opsware Installer discovers the existence of `BIN$` objects in the database, enter the following sql commands:

```
show parameter recyclebin;
SELECT owner,original_name,operation,type FROM dba_
recyclebin;
connect <owner>/password
purge recyclebin; or purge table BIN$xxx;
```

By default, `recyclebin` is set to `OFF`.

Model Repository Installation on a Remote Database Server

To install or upgrade the Model Repository on a remote database server, perform the following steps:

1. Install the following on the server that will run the Opsware Installer:
    1. Full Oracle client or Oracle instant client, depending on the Opsware SAS version
    2. Set up the `tnsnames.ora` file to access the Truth/database

2 Set up the following on the Truth/database server:

1. Log in as user `oracle`
2. `cd $ORACLE_HOME/network/admin`
3. Make sure that the listener.ora file has the following `SID_LIST_*` section:

```
SID_LIST_<your_listener_name> =
    (SID_LIST =
     (SID_DESC=
         (SID_NAME=truth)
         (ORACLE_HOME=<oracle_home>
```

4. Make sure that the listener is started with the command:

```
lsnrctl start <your_listener_name>
```

Troubleshooting Model Repository Installation

When you install or upgrade the Model Repository on a remote database server, Oracle gives the following error and the Opsware Installer aborts:

```
Error: ORA-12526: TNS:listener: all appropriate instances are in
restricted mode
```

Problem

When Opsware SAS installs or upgrades the schema in the Oracle database, it puts the database in a "restricted mode". In Oracle 9i, users with "restricted session" privileges could connect to the remote database. In Oracle 10g, the standard listener will reject connections if the database is in a restricted mode. In Oracle 10g, a database administrator can only access the restricted instance locally from the machine that the instance is running on.

Solution

In Oracle10g, if the listener has the `SID_LIST_*` paragraph in the `listener.ora` file, then the users with "restricted session" privilege are able to connect to a remote database, even if the database is in restricted more. If the `listener.ora` file does not have the `SID_LIST_*` paragraph, then the listener rejects the client connections and gives an `ORA-12526: TNS: listener: all appropriate instances are in restricted mode` error.

Example: A listener.ora Entry

```
OPSCORE1 =
      (DESCRIPTION_LIST =
        (DESCRIPTION =
```

```
        (ADDRESS = (PROTOCOL = TCP)(HOST =
opscore1.mycompany.com)(PORT = 1521))
        (ADDRESS = (PROTOCOL = IPC)(KEY = EXTPROC0))
      )
    )

SID_LIST_OPSCORE1 =
    (SID_LIST =
     (SID_DESC=
         (SID_NAME=truth)
         (ORACLE_HOME=/u01/app/oracle/product/10.2.0/db_1)
     )
      (SID_DESC =
        (SID_NAME = PLSExtProc)
        (ORACLE_HOME = /u01/app/oracle/product/10.2.0/db_1)
        (PROGRAM = extproc)
      )
)
```

In this example, the listener alias is `OPSCORE1`.

To start, stop, or check the status of the listener, enter the following commands:

`su`- Oracle to the truth box

To start the listener, enter `lsnrctl start opscore1`.

To stop the listener, `Lsnrctl stop opscore1`.

To check the status of the listener, enter `lsnrct status opscore1`.

Appendix B: TIBCO Rendezvous Configuration for Multimaster

IN THIS APPENDIX

This section discusses the following topics:

- TIBCO Rendezvous and Opsware SAS
- TIBCO Rendezvous Configuration

TIBCO Rendezvous and Opsware SAS

In a Multimaster Mesh, Opsware SAS uses the TIBCO Rendezvous Certified Messaging system to synchronize the Model Repositories in different facilities. This section provides reference information about TIBCO Rendezvous configuration for use in a Multimaster Mesh.

The Opsware Installer automatically installs and configures TIBCO Rendezvous. By default, the installer configures the Rendezvous neighbors in a star topology with the Primary core at the center. Unless you want another configuration, no further action is required. If you need to modify the default TIBCO Rendezvous configuration, see the TIBCO Rendezvous documentation.

TIBCO Rendezvous Configuration

This section explains how to add TIBCO Rendezvous routers and neighbors. For detailed information about TIBCO Rendezvous, see the following TIBCO Rendezvous documentation:

- *TIBCO Rendezvous Installation Guide*
- *TIBCO Rendezvous Concepts*

Running the TIBCO Rendezvous Web Client

To run the TIBCO Rendezvous web client, enter the following URL in a web browser:

```
http://<hostname>:7580
```

The <*hostname*> is the IP address or fully-qualified host name of the server running the Model Repository Multimaster Component.

The TIBCO Rendezvous General Information page is displayed.

Adding a TIBCO Router

To add a TIBCO router, perform the following steps:

1. Run the TIBCO Rendezvous web client.
2. From the Navigation pane, select **Configuration ➤ Routers**. The Routers Configuration page appears.
3. Ensure that your browser can resolve the host name so that the link in the Router Name field functions correctly.
4. In the Router Name field, enter a value. Typically, you enter the facility name for the router name.
5. Click **Add Router**. The new router appears in the table on the page.
6. In the Local Network column under Interfaces, click the number link for the router you just added. The Local Network Interfaces Configuration page appears.
7. Define a new network by entering the following data:
    1. In the Local Network Name field, enter the network name. In most cases, the network is given the same name as the facility name.
    2. In the Service field, set the service to 7500.
    3. Click **Add Local Network Interface**. The new local network appears in the table in the page.
8. Click the link for the new local network name. The Subject Configuration page appears.
9. In the Subject field, enter a greater-than symbol (>) and click **Import** and **Export**. (The greater-than symbol means "any.") The greater-than symbol appears in the Import Subjects and Export Subjects tables in the page.
10. Repeat the previous steps for the other facilities in the Multimaster Mesh.

Adding a TIBCO Rendezvous Neighbor

To add a TIBCO Rendezvous neighbor, perform the following tasks:

1. In the Core Gateway Properties file, add the following line:

```
opswgw.ForwardTCP=<port>:<remote_realm>:<remote_host>:7501
```

   The <*port*> is derived from this formula: 10000 + remote_facility_ID. The <*remote_realm*> is the Realm name of the Core's Management Gateway in the remote facility. The <*remote_host*> is the IP address of the server running the Model Repository Multimaster Component in the remote facility. In the following example, the remote facility ID, is 667, the realm name is LIME, and the IP address of the Model Repository Multimaster Component is 192.168.165.98:

```
opswgw.ForwardTCP=10667:LIME:192.168.165.98:7501
```

2. Run the TIBCO Rendezvous web client. From the Navigation pane, click Routers under Configuration. The Routers Configuration page appears.
3. In the Neighbor column of the table, click the number link for the router you added in the previous procedure. The Neighbor Interfaces Configuration page appears. You must define a neighbor for each facility in the Multimaster Mesh, except for the local facility.
4. In the Host field under the Remote Endpoint section, enter the host name of the server running the local Core Gateway.
5. In the Port field under the Local Endpoint section, enter 7501.
6. In the Port field under the Remote Endpoint sections, set the port to the value derived from the following formula: 10000 + remote_facility_ID.
7. In the Router Name field under the Remote Endpoint section, enter the router name for the other facility.
8. For the Connection Type, select Normal Connection.
9. Click **Add Neighbor Interface**. The Local and Remote endpoints are added to the table in the page.

Verifying TIBCO Rendezvous Configuration

To see if the neighbor has connections to a facility, perform the following steps:

1. Run the TIBCO Rendezvous web client.
2. Click Connected Neighbors in the Navigation pane. For each neighbor you defined for this facility, you should see links for the RVRD interface.

Appendix C: Opsware Gateway Properties File

IN THIS APPENDIX

This section discusses the following topics:

- Opsware Gateway Properties File Syntax
- opswgw Command-Line Arguments

This section provides reference information about the parameters in the Gateway Properties file used by the Opsware Gateway.

Opsware Gateway Properties File Syntax

An Opsware Gateway properties file can have the following entries:

Usage: `./opswgw-tc-70 [options]`

`--Gateway name`

(**Required**) Set the name of the Opsware Gateway. This name must be unique in a Gateway mesh.

`--Realm realm`

(**Required**) All Opsware Gateways operate in a named Realm. A *Realm* is an Opsware construct that refers to a set of servers which are serviced by the Gateways in the Realm. Realms can support an IPV4 address space which may overlap with other Realms. Realms are also used to define bandwidth utilization constraints on Opsware SAS functions.

`--Root true | false`

Specifies that this Gateway will act as a root of the Gateway mesh. All Gateways in a Root Realm must be Root Gateways.

Default: false.

`--Level int`

(*Experimental*) Routing level for the Gateway. There are eight possible levels, 0-7. All Gateways in a realm must have the same level.

Default: 0

`--GWAddress lhost`

Sets the local host address (if you are specifying the value for the Management Gateway, use the IP address only, do not use the hostname; you can, however, use the hostname for other, non-Management Gateways) that this Gateway uses to tell other components how to contact it. This value is used by the core to discover new core-side Gateways. It is also used to communicate the active list of Gateways that are servicing Realm to proxy clients (such as Agents) via the `X-OPSW-GWLIST` mime header.

`--Daemon true | false`

Daemonize the process.

Default: false.

`--Watchdog true | false`

Start an internal watchdog process to restart the Gateway in case of a failure or signal. A `SIGTERM` sent to the watchdog will stop the watchdog and Gateway processes.

Default: false.

`--User name`

Change to this user on startup.

`--RunDir path`

Change to this directory on startup.

`--ChangeRoot true | false`

If `true` chroot into `RunDir`. This can to used by a helper script to construct a jail.

Default: false

`--PreBind proto:ip:port, ...`

For security reasons, it can be useful to run a Gateway chrooted as a non-privileged use (only ports above 1024 can be used for any listeners). If you want to use a non-privileged user *and* a privileged listener port, you can use the `--PreBind` directive to reserve the port while the process is `root` and before privileges are dropped.

`--HardExitTimeout seconds`

The number of seconds after a restart or exit request that the main thread will wait for internal threads and queues to quiesce before performing a hard exit.

`--LogLevel INFO | DEBUG | TRACE`

Sets the logging level. Note that `DEBUG` and `TRACE` can produce a large amount of output, which is typically relevant only to developers, and can negatively affect performance.

Default: `INFO`.

`--LogFile file`

The filename of the Opsware SAS log file.

`--LogNum num`

The number of rolling log files to keep.

`--LogSize size`

The size in bytes of each log file.

`--TunnelDst [lip1:]lport1[:crypto1],...`

If specified, starts a tunnel destination listener. The tunnel listener can listen on multiple ports (a comma-separated list with no spaces). If the port is prefixed with an IP address, the listener will bind only to that IP address. For example: `2001, 10.0.0.2:2001, 2001:/var/foo.pem, 10.0.0.2:2001:/var/foo.pem`

`--TunnelSrc rhost1:rport1:cost1:bw1[:crypto1],...`

If specified, creates a tunnel between this Gateway and the Gateway listening at `rhost1:rport1`. The link `cost1` and link bandwidth `bw1` must be set. The cost is a 32-bit unsigned int, and bandwidth is in Kbits/sec (K=1024bits). (Additional tunnels are separated by commas.) Examples: `gw.foo.com:2001:1:0, gw.bar.com:2001:10:256:/var/foo.pem`

`--ProxyPort [lip1:]lport1,[lip2:]lport2,...`

The HTTP CONNECT proxy listener port. If more than one proxy listener port is needed, you can add more using a comma separated list. You can enable interface binding by prepending an IP address to the port.

`--ForwardTCP [lip1:]lport1:realm1:rhost1:rport1,...`

Creates a static TCP port forward. Forward the local port `lport(x)` to the remote service `rhost(x):rport(x)`, which is in `realm(x)`. A blank `realm` (such as `lport::rhost:rport`) means route to the closest Root Realm.

`--ForwardTLS  [lip1:]lport1:realm1:rhost1:rport1, ...`

Creates a static TCP port forward that specializes in TLS traffic. The TLS session ID is parsed and sent to the egress Gateway for use in load balancing algorithms. In all other respects, this feature behaves like `ForwardTCP`.

`--ForwardUDP [lip1:]lport1:realm1:rhost1:rport1,...`

Creates a static UDP port forward. Forward local port `lport(x)` to remote service `rhost(x):rport(x)`, which is in `realm(x)`. A blank `realm` (such as `lport::rhost:rport`) means route to the closest Root Realm. (Note: Some UDP services, such as DHCP, cannot be proxied in this way.)

`--IdentPort [lip:]lport`

Starts an IDENT service listening on local port `lport` (optionally bound to the local IP `lip`.

`--AdminPort [lip:]lport[:crypto1]`

Starts an administration interface listening on local port `lport`, which is optionally bound to the local IP `lip`. If you use `crypto`, include a `crypto` specification file name.

`--ConnectionLimit int`

Specifies the soft memory tuning limit for the ‘maximum number of connections.

`--OpenTimeout seconds`

Wait a maximum `seconds` for a remote `CONNECT` call to establish a remote connection.

`--ConnectTimeout seconds`

Wait a maximum `seconds` for a `connect()` to complete. If a timeout occurs, then an `HTTP 503` message is returned to the client (via the ingress Gateway). The client will get this message if the `ConnectTimeout` plus the Gateway mesh transit delay is less than the `OpenTimeout`.

`--ReorderTimeout seconds`

In the event of out-of-order messages (for a TCP flow), limits the amount of time (`seconds`) to wait for messages needed for reassembly to arrive. The most common cause of out-of-order messages is when a transit tunnel fails and a new route is taken mid-flow.

`--TunnelStreamPacketTimeout  seconds`

If a portion of a TCP flow cannot be delivered to an endpoint, then teardown the TCP connection after `seconds`.

`--QueueWaitTimeout seconds`

Specifies the maximum time that a tunnel message can wait at the head of an internal routing queue (while waiting for a tunnel to be restored).

`--KeepAliveRate  seconds`

Send link `keepalive` messages once every *x* seconds on each link.

`--LsaPublishRateMultiple float`

Link State Advertisements (LSAs) are published once every `k*M` seconds. Where `M` is the number of Gateways in the mesh and `k` is a floating point constant specified using `--LsaPublishRateMultiple`. For example, if there are 100 Gateways in a mesh and `--LsaPublishRateMultiple` is set to 2.0, then an LSA is published approximately every 200 seconds (due to implementation factors, the actual delay will be somewhere between 190 and 210 seconds).

`--LsaTTLMultiple float`

Sets the TTL for LSAs to `float` multiplied by the `LsaPublishRate`. Example: If `LsaPublishRate` is 10 seconds and `LsaTTLMultiple` is 3 then, the TTL for LSAs published by this Gateway is set to 30 seconds.

`--MaxRouteAge seconds`

Discards the routes from the routing table that have not been refreshed within `seconds`.

`--RouteRecalcDutyCycle  percentage`

If the time to calculate Dijkstra takes `tau` seconds, then wait for `tau*(1/RouteRecalcDutyCycle-1)` seconds until another recalculation can take place.

`--TunnelTimeoutMultiple float`

This number, multiplied by the `KeepAliveRate`, gives the maximum time that a tunnel can be idle before it is garbage collected.

`--DoNotRouteService host1:port1,host2:port2,...`

Specifies that, when a local client creates a proxy connection to `host:port`, do not route the message; service it locally. Use this property to ensure that certain services are handled locally, in the Gateway's current Realm.

`--ForceRouteService host1:port1:realm1,host2:port2:realm2,...`

When a local client creates a proxy connection to `host:port`, force the message to route to a specified Realm.

`--HijackService host1:port1,host2:port2,...`

When the local Gateway sees a connection to `host:port` via a tunnel, and the source Realm is not the local Realm, it must service the connection. If the connection is from the local Realm, the Gateway must allow the message to continue to its destination. You can use this feature to implement transparent caches.

`--RouteMessages  *true | false`

If specified as `true,` turn on transit routing. If `false`, disable transit routing. If the destination of the message is *not* the local Gateway, then, by default, the message is routed based on the current routing table. If such routing is not desired set this property to `false`.

`--EgressFilter proto:dsthost1:dstport1:srchost1:srcrealm1,...`

When the local Gateway sees a `TCP` connection attempt to `dsthost:dstport` from `srchost1:srcrealm1`, it must allow the connection. The implied default is to deny all connections. If you want to *allow* all connections, specify the egress filter as `*:*:*:*:*`. It is also common for an egress filter to only allow connections from the Root Realm. This can be expressed by leaving the `srcrealm` blank. Example: `tcp:10.0.0.5:22:172.16.0.5:` would allow tcp connections to 10.0.0.5, port 22, from 172.16.0.5 in a Root Realm.

`--IngressMap ip1:name,ip2:name,...`

When sending an open message (and the `srcip` is in the ingress map), append (as metadata) the `ip:name` mapping to the open message. This allows a remote egress filter to use the `name` as the `srchost` instead of the `ip`. This feature supports the addition of a server to a farm without the need to individually add the server to many `EgressFilter` entries.

`--LoadBalanceRule proto:thost:tport:mode:rhost1:rport1:`
`rhost2:rport2, ...`

When receiving a new connection message for `thost:tport`, load balance the connection over real hosts `rhost1:rport1, rhost2:rport2` etc. The load balance strategy is defined by `mode`.

There are six load-balancing modes:

STICKY: Send the connection to a working target based on a priority list randomized by a hash of the source IP and source Realm (the hash string can be overridden via the input MIME header X-OPSW-LBSOURCE).

LC: Send connection to a working target with the least number of connections.

RR: Send connection to the next working target in a round-robin fashion.

TLS_STICKY: Use an `SSLv3/TLSv1.0` session ID to send the connection back to the previous target based on a session ID cache. If the target is in error, or the session ID is missing from the cache, fall back to STICKY mode to make a new selection.

TLS_LC: Similar to TLS_STICKY mode, but falls back to LC mode (least connections).

TLS_RR: Similar to TLS_STICKY mode, but falls back to RR mode (round-robin). Remember to add an egress filter for `proto:thost:tport`. You do not need to add egress filters for the targets. Non-TLS load balancing modes *can* be used with UDP services.

`--LoadBalanceRetryWindow seconds`

If an error occurs when using a load balanced target (such as `rhost1:rport1` above) then the target is marked `in-error`. This property controls how many seconds a Gateway will wait until it re-tries the target. If the target is missing (such as an `RST` is received upon the connection request) the load balancer will silently try to find a good target.

`--SessionIdTimeout  seconds`

The number of seconds a load balanced `SSLv3/TLS` client can be idle before the `sessionId` association is reaped. This property affects the egress Gateway of a TLS flow.

`--SessionIdCacheLimit  slots`

A soft limit on the number of `SSLv3/TLS` session IDs that the cache can hold. If this limit is exceeded, then the garbage collector begins reducing the `SessionIdTimeout` value in order to achieve the cache limit specified by `--SessionIdCacheLimit`.

`--MinIdleTime seconds`

Specifies the minimum number of `seconds` a connection can be idle during an overload condition before it will be considered for reaping.

`--GCOverloadTrigger float`

Specifies the fraction of `SoftConnectionLimit` at which to start overload protection measures. When the number of open connections hits this overload trigger point, overload protection starts, reaping the most idle connections over `MinIdleTime`. Overload protection stops when the connection count falls below the overload trigger point.

`--GCCloseOverload true | false`

When a client tries to open a connection after the `ConnectionLimit` has been reached, this property tells the Gateway what to do with the new connection. A value of `true` causes the Gateway to close the new connection. A value of `false` causes the Gateway to park the new connection in the kernel's backlog and to service it after the overload condition subsides. The proper setting is application dependent.

Default: `false`.

`--VerifyRate seconds`

When a connection stops moving data for the specified number of `seconds`, a connection verify message is sent to the remote Gateway to verify that the connection is still open. This check is repeated periodically and indefinitely when the timeout has expired.

`--OutputQueueSize slots`

Specifies the size of the tunnel output queues. These queues store messages destined for remote Gateways. Each remote Gateway has an output queue. Queues are garbage collected after `MaxQueueIdleTime` is reached.

`--MaxQueueIdleTime seconds`

Specifies the maximum time to keep an idle output queue before garbage collection removes it.

`--TunnelManagementQueueSize  slots`

Specifies the size of the queues used to manage tunnel management traffic, such as Link State Advertisements.

`--TunnelTCPBuffer bytes`

Specifies the size of the `TCP SEND` and `RECV` buffer in bytes. The operating system must be configured to handle the specified value. You can view the Gateway's log file to see if the specified is denied by the operating system.

`--DefaultChunkSize bytes`

Specifies the default (maximum) IO chunk size when encapsulating a TCP stream. This property value can be applied only to links with no bandwidth constraint.

`--LinkSaturationTime seconds`

When a links has a bandwidth constraint, the chunk size, `DefaultChunkSize`, is computed based on two parameters. The first is the link's bandwidth constraint. The second is the amount of time that the bandwidth shaper should utilize the full, real, bandwidth on the link. This parameter controls the duty cycle of the bandwidth shaper. Smaller values give a smoother bandwidth control at the cost of more overhead, because each smaller IO chunk has a header.

`--TunnelPreLoad slots`

Specifies the maximum number of output queue slots to use before waiting for the first `Ack` message. This allows for pipelining in Long Fat Pipes. This value is reduced geometrically to one as the number of queue s'lots diminish.

`--BandwidthAveWindow samples`

Specifies the maximum number of IO rate samples for the bandwidth estimation moving window. The samples in this window are averaged to provide a low pass estimate of the bandwidth in use by a tunnel. This estimate has high frequency components due to the sharp edge of the filter window.

`--BandwidthFilterPole float`

Specifies the pole of a discrete-time first-order smoothing filter used to remove the high frequency components of the moving window estimator. Set the value to 0.0 to turn off this filter.

`--StyleSheet URL`

Adds a stylesheet link to a URL when rendering the admin UI. This is useful for embedding the admin UI in another web-based UI. In addition to using this property to control the default stylesheet, a dynamic stylesheet override is supported by adding the variable `StyleSheet=<url>/style.css` to the admin UI URL.

`--ValidatePeerCN true | false`

Specifies whether the peer CN is validated against the peer configuration during a tunnel handshake operation. The peer must be turned off during the installation of an untrusted Gateway.

Default: true.

`--PropertiesCache file`

Link cost and bandwidth can be controlled via `parameter-modify` messages over tunnel connections. These real-time adjustments are made to the running process and written to a parameter cache which will override the properties file or command-line arguments.

`--PropertiesInclude file`

Specifies an Include file to load and merge with the current properties. Properties in the include file can override properties from the original PropertiesFile. This property can be specified from the command line. If so, it will override *all* properties, including command line overrides. It is not recursive and does not support a list.

`--PropertiesFile  file`

Places all command-line arguments into a properties file within the `opswgw` name space. Note that, the `PropertiesFile` command-line argument itself *must not* be placed in the properties file within the `opswgw` name space.

opswgw Command-Line Arguments

All of the parameters in the preceding section can be specified as options for the `opswgw` command. For example, the `opswgw.Gateway foo` entry in the Gateway Properties file is equivalent to the following command-line argument:

```
/opt/opsware/opswgw/bin/opswgw --Gateway foo
```

Command-line arguments override corresponding entries in the Gateway Properties file. In addition to the entries listed in the preceding section, the `opswgw` command can specify a Gateway Properties file as an argument, for example:

```
/opt/opsware/opswgw/bin/opswgw --PropertiesFile filename
```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