



CHAPTER 2

Installation Requirements

This section describes what is required to install Prime Optical, the components that come with Prime Optical, and how to calculate the total number of Oracle Named User Plus licenses required for your Prime Optical server and client installations. It contains the following topics:

- [2.1 Prime Optical Server and Database Requirements, page 2-1](#)
 - [2.1.1 Server Specifications, page 2-3](#)
 - [2.1.2 Disk Space and Partition Specifications, page 2-5](#)
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Note

Although Cisco makes every attempt to ensure the availability of third-party hardware and software platforms specified for Prime Optical, Cisco reserves the right to change or modify system requirements due to third-party vendor product availability or changes that are beyond Cisco's control.

2.1 Prime Optical Server and Database Requirements

The Prime Optical server runs on any of the platforms listed in [Table 2-1](#).



Note

The Prime Optical server must run on a dedicated workstation. Any application that is not explicitly listed in this section as being required or supported by Prime Optical, cannot be installed on the dedicated Prime Optical server workstation.

Table 2-1 Supported Platforms and Operating Systems

Platform	Operating System
Sun UltraSPARC-based server ¹	Sun Solaris 10, release 10/09 or later
Sun UltraSPARC T Series	
Cisco UCS B series	Red Hat Enterprise Linux (RHEL) 5.5, server 64-bit or RHEL 5.6, 5.7, server 64-bit (with or without VMware ESXi version 4.1 or 5.0)
Cisco UCS C series	

1. Prime Optical requires the same number of processors regardless of whether you use UltraSPARC IV or UltraSPARC IV+. If you are using the next generation of UltraSPARC processors (UltraSPARC V, VI, or VII), contact your Oracle account representative for the equivalent number of processors.

**Note**

- Prime Optical is not validated against required file systems (/oracle, /db01, /db02, /db03, /db04, /db05) of the Network File System (NFS) type.
- Prime Optical does not support local Solaris zones.
- If you are installing Prime Optical with Prime Central, Domain Name System (DNS) must be enabled on the Prime Optical server.

Table 2-2 lists the items required to install the Prime Optical server.

Table 2-2 Items Required to Install the Prime Optical Server

Requirement	Notes
Prime Optical installation DVDs	—
One of the following: <ul style="list-style-type: none"> • Solaris Operating System 10 Media Kit, 64-bit • Red Hat Enterprise Linux (RHEL) 5.5, 5.6, or 5.7 64-bit 	<ul style="list-style-type: none"> • Product is available on CD or DVD. • During the Solaris 10 installation, you are prompted to select software to install. (The default is End User System Support—769 MB.) Choose Entire Distribution plus OEM support—5641 MB. • Make sure that your file systems are configured to allow large files. If this configuration is not applied, no single file can be larger than 2 GB, which can be problematic for large database installations of the Prime Optical server. Choose Include Solaris 64-bit support. <p>When Solaris 10 is installed, its Windows manager, Java Desktop System (JDS), is also installed.</p> <p>Note Enable the IPV6 networking option to install Linux.</p> <p>The first time you start Solaris 10, you are prompted with a message to choose Common Desktop Environment (the legacy desktop system) or JDS.</p>

Table 2-2 *Items Required to Install the Prime Optical Server (continued)*

Requirement	Notes
Prime Optical 9.6 is compliant with the latest Solaris patch	<ul style="list-style-type: none"> • Install the most recent Solaris patch cluster available. Visit the Oracle website for the most up-to-date patch information. • While installing Solaris patches, you might receive a message saying, “This patch is obsoleted by patch <i>number</i>, which has already been applied to this system.” This message indicates that an updated version of the patch is already installed, and no action is required. • Enter the showrev -p grep patch-number command to verify that the Solaris patches are installed. • Always install Solaris patches in single-user mode. • The setup program generates a warning if the following OS packages are missing: <ul style="list-style-type: none"> – SUNWi1cs – SUNWi15cs
Sun Microsystems Java Development Kit (JDK) Standard Edition version 1.6.0_33	<ul style="list-style-type: none"> • JDK is installed automatically for the Prime Optical server and Prime Optical GateWay/CORBA. • Java Runtime Engine (JRE) 1.6 must be installed on the machine. If the client does not start, check that Java Web Start is associated to the browser with the correct javaws.
Oracle 11g software For Solaris and Linux: 10404530	<ul style="list-style-type: none"> • The Oracle product is available on CD or in .cpio file format. • Oracle patches are available in .zip file format. • See 4.3 Downloading and Installing the Required Oracle 11g Patches for 64-Bit Solaris or Linux Platforms, page 4-5.
Oracle 11g licenses	Oracle licenses can be purchased either for the server processor or for named users. For more information on Oracle named users, see 2.3 Oracle Licensing for Prime Optical , page 2-20.
GNU tar	Prime Optical uses GNU tar to extract files from archives. GNU must be installed on the Prime Optical server workstation. The Prime Optical server supports the latest version of GNU tar.
DVD-ROM drive	—

2.1.1 Server Specifications

The following tables show recommended hardware specifications for installing the Prime Optical server, and the resulting maximum number of NEs the server manages for each configuration.

If the Prime Optical server and Oracle database are installed on separate workstations, both workstations must meet the hardware requirements shown in the following tables. [Table 2-3](#) lists the minimum processor requirements.

**Note**

It is possible to use and configure disk arrays for database storage with any type of RAID layout. You can do so only if the disk throughput is equal to or higher than the throughput calculated for internal disks.

Table 2-3 Minimum Processor Requirements

Network Size	UltraSPARC T Series ¹	UCS B or C Series ²
Small	1 x 4 cores	2 x Intel Xeon 5620
Medium	1 x 4 cores	2 x Intel Xeon 5620
Large	1 x 4 cores	2 x Intel Xeon 5620
High end	1 x 8 cores	2 x Intel Xeon 5640

1. Prime Optical has been tested with UltraSPARC T2 and UltraSPARC T2 Plus systems.
2. Prime Optical has been tested on a UCS C210 M2 system.

Table 2-4 Legacy Processor Requirements

Network Size	UltraSPARC
Small	2 x UltraSPARC III or 2 x UltraSPARC IIIi
Medium	4 x UltraSPARC III or 2 x UltraSPARC IV
Large	8 x UltraSPARC III or 4 x UltraSPARC IV
High end	8 x UltraSPARC IV with fiber-channel disk array

Cisco tests the simulated network configurations listed in [Table 2-5](#). Your setup and performance might vary depending on the size of your network and the usage pattern of management tasks.

Table 2-5 Recommended Specifications for the Prime Optical Server Installation

Network Size	Oracle Database Type	RAM—Solaris (Sun Workstation)	RAM—Linux (UCS System)	RAM—Linux (VM)	No. of Network Partitions ¹	Maximum No. of NEs ²
Small	Enterprise Edition	8 GB	24 GB	8 GB	1	200
Medium	Enterprise Edition	16 GB	24 GB	16 GB	1	500
Large	Enterprise Edition	32 GB	48 GB	32 GB	4	2000
High end	Enterprise Edition	64 GB	96 GB	64 GB	8	5000

1. In Prime Optical 9.6, a single NE service (or a single network partition) can support up to 750 nodes.

A high-end network supports any combination of up to 5000 nodes, 8 network partitions, and 750 nodes per network partition. For example, 6 NE services with 750 nodes + 1 NE service with 500 nodes (6 x 750 + 1 x 500 = 5000).

A large network supports any combination of up to 2000 nodes, 4 network partitions, and 750 nodes per network partition. For example, 4 NE services with 500 nodes (4 x 500), 2 NE services with 750 nodes + 1 NE service with 500 nodes (2 x 750 + 1 x 500).

2. These numbers assume you are using fully equipped ONS 15454 MSPP nodes (for example, 12 OC-48, 2 TCC, and 1 XC10G with up to 2 links and 48 SONET cross-connections per node). Note that these numbers should be used as a guideline, and vary depending on the software and hardware configuration of your NEs.

The following list describes the server configuration parameters and the effect of changes in each parameter on the maximum number of NEs the server can manage:

- Network Size—If the network size increases, more resources are reserved for the higher number of NEs to be managed.
- RAM—The server can manage more NEs as the RAM increases. The server can manage fewer NEs as the RAM decreases.
- Number of Network Partitions—For each network partition, the server reserves resources for the higher number of NEs to be managed. The server can manage more NEs as the number of network partitions increases. The server can manage fewer NEs as the number of network partitions decreases.

2.1.2 Disk Space and Partition Specifications

The following tables show disk space and partition requirements for optical NEs based on network size and PM data collection status.

- The minimum disk space is the total space required for `/ swap`, `/cisco`, `/oracle`, `/db01`, `/db02`, `/db03`, `/db04`, and `/db05`. (The minimum disk space does not include `/ctm_backup` or the optional partitions `/db01_rd` and `/db02_rd`.)
- The maximum disk space is the total space required for `/ swap`, `/cisco`, `/oracle`, `/db01`, `/db02`, `/db03`, `/db04`, `/db05`, `/db01_rd`, `/db02_rd`, and `/ctm_backup`.



Note

- It is recommended that you use the partition sizes described in this section. Prime Optical performance degrades if you do not use the recommended partition sizes.
- To improve database performance and maximize data input/output, configure a dedicated disk array with the following setup:
 - Dynamic multipathing (DMP) to parallelize the file system access.
 - Raid 0 (striping) to optimize the disk input data.
- Prime Optical is a high-transaction application, which causes high I/O throughput for Oracle redo logs. It is recommended that you reserve dedicated system controllers for file systems—including the optional `/db01_rd` and `/db02_rd` file systems—that manage redo logs.



Caution

For large and high-end networks, if you do not follow the preceding disk striping recommendations, the I/O might create a critical bottleneck and cause an unexpected Prime Optical shutdown.

Table 2-6 *Disk Space and Partition Requirements for Installing the Prime Optical Server and Oracle on the Same Workstation—PM Collection Enabled*

Network Size	Disk Space	/	swap ¹	/cisco ²	/oracle	/db01	/db02	/db03	/db04	/db05	/db01_rd (optional)	/db02_rd (optional)	/ctm_backup
Small	133 GB (min)	12 GB	12 GB	20 GB	10 GB	5 GB	6 GB	40 GB	30 GB	8 GB	1 GB	1 GB	101 GB
	236 GB (max)												

Table 2-6 Disk Space and Partition Requirements for Installing the Prime Optical Server and Oracle on the Same Workstation—PM Collection Enabled (continued)

Network Size	Disk Space	/	swap ¹	/cisco ²	/oracle	/db01	/db02	/db03	/db04	/db05	/db01_rd (optional)	/db02_rd (optional)	/ctm_backup
Medium	250 GB (min)	12 GB	24 GB	20 GB	10 GB	8 GB	16 GB	90 GB	70 GB	10 GB	2 GB	2 GB	208 GB
	462 GB (max)												
Large	458 GB (min)	12 GB	48 GB	20 GB	10 GB	10 GB	26 GB	190 GB	140 GB	12 GB	3 GB	3 GB	394 GB
	858 GB (max)												
High end	868 GB (min)	12 GB	96 GB	20 GB	10 GB	12 GB	50 GB	360 GB	300 GB	18 GB	4 GB	4 GB	758 GB
	1634 GB (max)												

1. Use swap when creating the partition. Do not use /swap.
2. 10 GB is required for /cisco, but 20 GB is strongly recommended.

Table 2-7 Disk Space and Partition Requirements for Installing the Prime Optical Server and Oracle on the Same Workstation—PM Collection Disabled

Network Size	Disk Space	/	swap ¹	/cisco ²	/oracle	/db01	/db02	/db03	/db04	/db05	/db01_rd (optional)	/db02_rd (optional)	/ctm_backup
Small	72 GB (min)	12 GB	12 GB	20 GB	10 GB	5 GB	6 GB	8 GB	7 GB	8 GB	1 GB	1 GB	40 GB
	114 GB (max)												
Medium	104 GB (min)	12 GB	24 GB	20 GB	10 GB	8 GB	16 GB	12 GB	10 GB	10 GB	2 GB	2 GB	62 GB
	170 GB (max)												
Large	154 GB (min)	12 GB	48 GB	20 GB	10 GB	10 GB	26 GB	20 GB	18 GB	12 GB	3 GB	3 GB	90 GB
	250 GB (max)												
High end	246 GB (min)	12 GB	96 GB	20 GB	10 GB	12 GB	50 GB	28 GB	24 GB	18 GB	4 GB	4 GB	136 GB
	390 GB (max)												

1. Use swap when creating the partition. Do not use /swap.
2. 10 GB is required for /cisco, but 20 GB is strongly recommended.

Table 2-8 *Disk Space and Partition Requirements for the Prime Optical Server when Installing the Prime Optical Server and Oracle on Separate Workstations*

Network Size	Total Disk Space	/	swap ¹	/cisco ²
Small	44 GB	12 GB	12 GB	20 GB
Medium	56 GB	12 GB	24 GB	20 GB
Large	80 GB	12 GB	48 GB	20 GB
High end	128 GB	12 GB	96 GB	20 GB

1. Use swap when creating the partition. Do not use /swap.
2. 10 GB is required for /cisco, but 20 GB is strongly recommended.

Table 2-9 *Disk Space and Partition Requirements for the Oracle Database Server when Installing the Prime Optical Server and Oracle on Separate Workstations—PM Collection Enabled*

Network Size	Disk Space	/	swap ¹	/cisco	/oracle	/db01	/db02	/db03	/db04	/db05	/db01_rd (optional)	/db02_rd (optional)	/ctm_backup
Small	133 GB (min)	12 GB	12 GB	20 GB	10 GB	5 GB	6 GB	40 GB	30 GB	8 GB	1 GB	1 GB	101 GB
	236 GB (max)												
Medium	250 GB (min)	12 GB	24 GB	20 GB	10 GB	8 GB	16 GB	90 GB	70 GB	10 GB	2 GB	2 GB	208 GB
	462 GB (max)												
Large	458 GB (min)	12 GB	48 GB	20 GB	10 GB	10 GB	26 GB	190 GB	140 GB	12 GB	3 GB	3 GB	394 GB
	858 GB (max)												
High end	868 GB (min)	12 GB	96 GB	20 GB	10 GB	12 GB	50 GB	360 GB	300 GB	18 GB	4 GB	4 GB	758 GB
	1634 GB (max)												

1. Use swap when creating the partition. Do not use /swap.

Table 2-10 *Disk Space and Partition Requirements for the Oracle Database Server when Installing the Prime Optical Server and Oracle on Separate Workstations—PM Collection Disabled*

Network Size	Disk Space	/	swap ¹	/cisco ²	/oracle	/db01	/db02	/db03	/db04	/db05	/db01_rd (optional)	/db02_rd (optional)	/ctm_backup
Small	72 GB (min)	12 GB	12 GB	20 GB	10 GB	5 GB	6 GB	8 GB	7 GB	8 GB	1 GB	1 GB	40 GB
	114 GB (max)												

Table 2-10 Disk Space and Partition Requirements for the Oracle Database Server when Installing the Prime Optical Server and Oracle on Separate Workstations—PM Collection Disabled (continued)

Network Size	Disk Space	/	swap ¹	/cisco ²	/oracle	/db01	/db02	/db03	/db04	/db05	/db01_rd (optional)	/db02_rd (optional)	/ctm_backup
Medium	104 GB (min)	12 GB	24 GB	20 GB	10 GB	8 GB	16 GB	12 GB	10 GB	10 GB	2 GB	2 GB	62 GB
	170 GB (max)												
Large	154 GB (min)	12 GB	48 GB	20 GB	10 GB	10 GB	26 GB	20 GB	18 GB	12 GB	3 GB	3 GB	90 GB
	250 GB (max)												
High end	246 GB (min)	12 GB	96 GB	20 GB	10 GB	12 GB	50 GB	28 GB	24 GB	18 GB	4 GB	4 GB	136 GB
	390 GB (max)												

1. Use swap when creating the partition. Do not use /swap.
2. 10 GB is required for /cisco, but 20 GB is strongly recommended.

Note the following PM assumptions for optical NEs:

- In a small network, PM data collection assumes 30 days of storage for PM data collected across 200 NEs, assuming an average of 200 interfaces per NE, up to a maximum of 40,000 interfaces (includes logical and physical interfaces).
- In a medium network, PM data collection assumes 30 days of storage for PM data collected across 500 NEs, assuming an average of 100 interfaces per NE, up to a maximum of 40,000 interfaces (includes logical and physical interfaces).
- In a large network, PM data collection assumes 30 days of storage for PM data collected across 2000 NEs, assuming an average of 100 interfaces per NE, up to a maximum of 200,000 interfaces (includes logical and physical interfaces).
- In a high-end network, PM data collection assumes 30 days of storage for PM data collected across 5000 NEs, assuming an average of 100 interfaces per NE, up to a maximum of 500,000 interfaces (includes logical and physical interfaces).

2.1.2.1 Ctm_backup Directory Size

The ctm_backup directory is a repository used by the oracle user to back up the following main categories of information:

- Prime Optical database backup and export dump
- Configuration files
- Database ARCHIVELOG files

The oracle user must have read/write permissions or the database backup will fail. The database should be blocked if the ARCHIVELOG files cannot be moved to the /ctm_backup directory.

It is recommended that the /ctm_backup size be equivalent to the sum of the single database partitions (that is, the sum of /oracle, /db01, /db02, /db03, /db04, /db05, and—if configured—/db01_rd and /db02_rd).

**Note**

- The final /ctm_backup size is also related to the ARCHIVELOG files.
- The /ctm_backup directory can be a symbolic link to a user-defined directory and must have read/write permissions.

2.1.3 VMware Support

Prime Optical 9.6 can run on a virtual machine (VM) on VMware vSphere version 4.1 or 5.0. VM RAM, disk and partitioning requirements must comply with the same requirements for a non-virtualized setup based on system size. Do the following:

-
- Step 1** Assign RAM as listed in [Table 2-5, “Recommended Specifications for the Prime Optical Server Installation”](#)
- Step 2** Follow disk space and partition requirements as listed in [2.1.2 Disk Space and Partition Specifications, page 2-5](#).
- Step 3** Configure VM vCPU settings. Refer to VMware vSphere performance guidelines for information on vCPU settings.
- As a general guideline, it is suggested to configure 2vCPU for every 500nodes. This is based on a UCS C210 M2 machine, with a dual-socket, multicore 2.93GHz processor in a medium network Prime Optical setup during Cisco internal validation.
- Step 4** Confirm that the /etc/hosts file exists inside the guest OS of the VM and that the hostname (with and without a domain) is associated to the proper IP address and not to the loopback IP 127.0.0.0

Example of a correct entry in the /etc/hosts file:

```
127.0.0.1 localhost.localdomain localhost
::1 localhost6.localdomain6 localhost6
10.58.65.195 vm-rh-01 vm-rh-01.cisco.com
```

Example of an incorrect entry in the /etc/hosts file:

```
127.0.0.1 vm-rh-01 localhost.localdomain localhost
::1 localhost6.localdomain6 localhost6
```

where the hostname vm-rh-01 is associated to the loopback address 127.0.0.1.

**Note**

The file can be wrong if the VM OS was installed without network connectivity.

2.1.4 Southbound Port Details

This section describes the ports that Prime Optical uses to communicate with NEs:

- Inbound ports are for operations initiated by the node and then directed to the Prime Optical server.
- Outbound ports are for operations initiated by the Prime Optical server and then directed to the node.

The following table lists the ports that Prime Optical uses to communicate with ONS 15216 NEs.

Table 2-11 Port Information for ONS 15216 NEs

Port	ONS 15216 NE	Inbound or Outbound?
TL1 Telnet	3083	Outbound
CLI	23, 8023	Outbound
Prime Optical GateWay/SNMP set/trap Note Prime Optical GateWay/SNMP uses port 162 as an internal port.	161, 162	Outbound
TFTP	69	Inbound

The following table lists the ports that Prime Optical uses to communicate with ONS 15305 NEs.

Table 2-12 Port Information for the ONS 15305 NEs

Port	ONS 15305
CLI	23
Prime Optical GateWay/SNMP Note Prime Optical GateWay/SNMP uses port 162 as an internal port.	161

The following table lists the ports that Prime Optical and CTC use to communicate with CTC-based NEs.

Table 2-13 Port Information for CTC-Based NEs

Port	NE
CORBA listener port on the Timing Communications and Control Card (TCC+/TCC2) (NE)	Configurable with: <ul style="list-style-type: none"> TCC+/TCC2 fixed (57790, outbound). Standard Internet Inter-ORB Protocol (IIOP) port (683, outbound). User-defined constant. Note After Prime Optical is installed, you can configure the port in the NE Explorer (Network > Address subtab). For more information, see the section on viewing and changing the network address for CTC-based NEs in the Cisco Prime Optical user guide.
CORBA listener port on Prime Optical server (callback)	Dynamic (current functionality). Note To make the port static, see the section on CTC IIOP Port Configuration in the Cisco Prime Optical user guide.
HTTP	From any CTC or Prime Optical port to HTTP port 80 (outbound) on the NE.
HTTPS	Port 443, active if configured on the NE. This port is only available in NE release 6.0 and later. Prime Optical tries to communicate on this port regardless of whether the NE supports HTTPS. If this port is blocked, it could cause long NE initialization times.

Table 2-13 Port Information for CTC-Based NEs (continued)

Port	NE
TL1 port on TCC+/TCC2 (NE)	From any CTC or Prime Optical port to TCP port 3082, 2361 (outbound), or port 4083 (secure).
CTC launched from Prime Optical Domain Explorer	<ul style="list-style-type: none"> • From any CTC port to the IIOP port on the NE. • From any NE port to the IIOP port on CTC. • From any CTC port to HTTP port 80 (outbound) on the NE. • Either port is configurable in the CTC.INI (Windows) or .cterc (UNIX): <ul style="list-style-type: none"> – Dynamic (default). – Standard IIOP port (683, outbound). – User-defined constant.
L2 Service Resync and IOS CLI ports	From any port on Prime Optical to ports 20xx and 40xx on the NE, where xx is the ML-series card slot number. Note Ports 40xx are required only if shell access is set to Secure.
Prime Optical GateWay/SNMP Note Prime Optical GateWay/SNMP uses port 162 as an internal port.	From any NE port to SNMP trap port 162 (inbound) on the Prime Optical server.

The following table lists the ports that Prime Optical uses to communicate with ONS 155xx NEs.

Table 2-14 Port Information for the ONS 155xx

Port	ONS 155xx	Inbound or Outbound?
HTTP	80/81	Outbound
TL1	TCP 3082, 3083	Outbound
IOS CLI	TCP 23 (Telnet)	Outbound
Software download, backup, restore	69 (TFTP server)	Inbound
Prime Optical GateWay/SNMP requests Note Prime Optical GateWay/SNMP uses port 162 as an internal port.	UDP 161	Outbound
SNMP traps	UDP 162	Inbound

2.1.5 Static CORBA Listener Port on the Prime Optical Server

See the section on CTC IIOP port configuration in the Cisco Prime Optical user guide to configure the static CORBA listener port after Prime Optical is installed.

2.1.6 Client-Server Communication Protocols

Prime Optical uses the following protocols for client-server communication:

- Common Object Request Broker Architecture (CORBA)—Object Management Group’s open, vendor-independent architecture and infrastructure that computer applications use to work together over networks.
- Java Management Object and Configuration Object (JMOCO)—Cisco-proprietary, TCP/IP-based request/response protocol.
- Telnet—A standard internet protocol that provides terminal emulation using the TCP/IP protocols.
- Java Database Connectivity (JDBC)—The industry standard for database-independent connectivity between Java programming languages and databases. The Prime Optical client uses JDBC to communicate directly with the Prime Optical database, independently from the Prime Optical server.
- Inbound ports are for operations initiated by the Prime Optical client and then directed to the Prime Optical server.
- Outbound ports are for operations initiated by the Prime Optical server and then directed to the Prime Optical client.

The following table lists the ports used for communication between the Prime Optical server host and the Prime Optical client host.

Table 2-15 Prime Optical Server-to-Prime Optical Client Ports

Port	Inbound or Outbound	Protocol	Application Protocol	Service	Notes
80 (configurable)	Inbound	TCP	HTTP	Web server	Apache HTTP port
443 (configurable)	Inbound	TCP	HTTPS	Web server	Apache HTTP port
61616 (configurable)	Inbound	TCP	JMS	JMS Broker	ActiveMQBroker port
27613 (configurable)	Inbound	TCP	Proprietary	Prime Optical server	JMOCO port
20000 (configurable)	Inbound	TCP	CORBA	CORBA ImR	CORBA Implementation Repository port
30000	Inbound	TCP	CORBA	SM service	Service Manager port
CORBA IIOP listener port	Inbound	TCP	CORBA	CTC-based network services	Dynamic: Ports are selected randomly
22	Inbound	TCP	SSH	Prime Optical server host	Standard SSH port for secure login
1521	Inbound	TCP	JDBC	Oracle listener	Database listener port
10023–10086	Inbound	TCP	Telnet	Telnet relay ports	Telnet port
3000–3200	Outbound	UDP	SNMP	ONS 1530x	ONS 1530x SNMP trap forwarding to CEC

The following table lists the ports used for communication between the Prime Optical server workstation and the OSS CORBA client workstation.

Table 2-16 Prime Optical Server-to-OSS CORBA Client Ports

Port	Inbound or Outbound	Protocol	Application Protocol	Service	Notes
Dynamic	Inbound/outbound	TCP	CORBA	Prime Optical GateWay/CORBA	CORBA notification: Ports are assigned randomly by the operating system; however, the notification service can be configured to specify a pool of ports
14005	Inbound	TCP	CORBA	Prime Optical GateWay/CORBA	CORBA naming service

The following table lists the ports used for communication between the Prime Optical server workstation and the NEs.

Table 2-17 Prime Optical Server-to-NE Ports

Port	Inbound or Outbound	Protocol	Application Protocol	Service	Notes
161	Outbound	UDP	SNMP	Base service	—
162	Inbound	UDP	SNMP	Base service	—
4500–4510	Inbound	TCP	Proprietary	ONS 15305 R3.0 (CTC-based)	—
12345	Outbound	TCP	Proprietary	ONS 15305 R3.0 (CTC-based)	—
17476	Inbound	TCP	Proprietary	ONS 15305 R3.0 (CTC-based)	—
80	Outbound	TCP	HTTP	ONS 15305 R3.0 (CTC-based)	—
23	Outbound	TCP	Telnet	ONS 15305	—
4500–4510	Inbound	TCP	Proprietary	ONS 15305	—
23	Outbound	TCP	Telnet	ONS 15305	—
161	Outbound	UDP	SNMP	ONS 15305 R3.0 (CTC-based)	—
161	Outbound	UDP	SNMP	ONS 15305	—
3083	Outbound	TCP	TL1	ONS 15216	—
23	Outbound	TCP	Telnet	ONS 15216	—
8023	Outbound	TCP	Telnet	ONS 15216	—
69	Inbound	TCP	TFTP	ONS 15216	—
161	Outbound	UDP	SNMP	ONS 15216	—
161	Outbound	UDP	SNMP	CTC-based	ML cards.
7200	Inbound	UDP	SNMP	CTC-based	ML cards.

Table 2-17 Prime Optical Server-to-NE Ports (continued)

Port	Inbound or Outbound	Protocol	Application Protocol	Service	Notes
7209	Outbound	UDP	SNMP	CTC-based	ML cards.
7210	Inbound	UDP	SNMP	CTC-based	ML cards.
CORBA listener port on the TCC+/TCC2 card (NE)	Outbound	TCP	CORBA	CTC-based	The port is configurable with: <ul style="list-style-type: none"> TCC+/TCC2 fixed (57790, outbound). Standard Internet Inter-ORB Protocol (IIOP) port (683, outbound). User-defined constant.
CORBA listener port on the Prime Optical server (callback)	Inbound	TCP	CORBA	CTC-based	Dynamic.
80	Outbound	TCP	HTTP	CTC-based	—
3082	Outbound	TCP	TL1	CTC-based	TL1 port on TCC+/TCC2 (NE).
2361	Outbound	TCP	TL1	CTC-based	TL1 port on TCC+/TCC2 (NE).
4083	Outbound	TCP	TL1	CTC-based	TL1 port on TCC+/TCC2 (NE), secure.
20xx	Outbound	TCP	Telnet	CTC-based	ML cards: L2 Service Resync port. From any port on Prime Optical to port 20xx on the NE, where xx is the ML card slot number.
40xx	Outbound	TCP	Telnet	CTC-based	ML cards: L2 Service Resync port when the shell access is set to secure. From any port on Prime Optical to port 40xx on the NE, where xx is the ML card slot number.
3082, 3083	Outbound	TCP	TL1	ONS 155xx	—
161	Outbound	UDP	SNMP	ONS 155xx	—
80, 81	Outbound	TCP	HTTP	ONS 155xx	—
23	Outbound	TCP	Telnet	ONS 155xx	—
69	Inbound	TCP	TFTP	ONS 155xx	—

The following table lists the ports used for communication between the Prime Optical client workstation and the NEs.

Table 2-18 Prime Optical Client-to-NE Ports

Port	Inbound or Outbound	Protocol	Application Protocol	Cross-Launched Application	Notes
161	Outbound	UDP	SNMP	CEC	—
4500–4510	Inbound	TCP	Proprietary	CEC	—
161	Outbound	UDP	SNMP	CTC	—
4500–4510	Inbound	TCP	Proprietary	CTC	—
12345	Outbound	TCP	Proprietary	CTC	—
17476	Inbound	TCP	Proprietary	CTC	—
69	Inbound	UDP	TFTP	CTC	—
23	Outbound	TCP	Telnet	CTC	—
80	Outbound	TCP	HTTP	CTC	—
CORBA listener port on the TCC+/TCC2 card (NE)	Outbound	TCP	CORBA	CTC	The port is configurable with: <ul style="list-style-type: none"> TCC+/TCC2 fixed (57790, outbound) Standard Internet Inter-ORB Protocol (IIOP) port (683, outbound) User-defined constant
CORBA listener port on the Prime Optical server (callback)	Inbound	TCP	CORBA	CTC	Dynamic: The port range can be configured
80	Outbound	TCP	HTTP	CTC	—

The following table lists the TCP ports to use in a SOCKS proxy server configuration. This information is helpful when setting up a firewall routing table.

Table 2-19 TCP Ports to Open in a SOCKS Proxy Server Configuration

Port	Inbound or Outbound	Protocol	Application Protocol	Notes
1080	Inbound on firewall/SOCKS proxy host	TCP	SOCKS v5	The port is configurable and is used for the connection between the Prime Optical client host and the firewall host.
10023–10086	Inbound (Prime Optical server host)	TCP	Telnet	Used for the connection between the Prime Optical client host and the Prime Optical server host.

Table 2-19 TCP Ports to Open in a SOCKS Proxy Server Configuration (continued)

Port	Inbound or Outbound	Protocol	Application Protocol	Notes
80	Inbound (Prime Optical server host)	TCP	HTTP	Used for the connection between the Prime Optical client host and the Prime Optical server host.
All CTC ports, for CTC cross-launch	Inbound on the NE that CTC is connected to	TCP	—	Used for the connection between the Prime Optical client host and the subnetwork that contains the NE that CTC is trying to reach.

2.2 Prime Optical Client Requirements

To install the Prime Optical client, you must have a Linux or Solaris workstation or Windows PC. Memory, CPU, and disk requirements are reported in [Table 2-20](#).

The delta RAM and delta CPU must be counted for each additional launched client.

Table 2-20 Minimum Requirements for the Prime Optical Client

Platform	Delta RAM ^{1, 2}	Delta CPU Speed	Disk Space Without CEC ³	Disk Space with CEC	Other ⁴
Sun workstation	512 MB	240 MHz	640 MB	710 MB	<ul style="list-style-type: none"> Sun Solaris 10 release 10/09 or higher with CDE, with graphics support for 16-bit color or higher, or Java Desktop System (JDS) Mozilla Firefox 8.0, 9.0
Linux workstation	512 MB	240 MHz	730 MB	760 MB	—
Pentium 4 class PC	512 MB	240 MHz	630 MB	700 MB	<ul style="list-style-type: none"> Microsoft Windows 7 (32- and 64-bit), Windows Vista, Windows 2000 Professional with Service Pack 4, Windows XP Professional with Service Pack 2, or Windows Server 2003 Enterprise Edition with Terminal Services, each with graphics support for 16-bit color or higher Microsoft Internet Explorer 8.0, 9.0, or Mozilla Firefox 8, 9.0, with JavaScript enabled Microsoft Windows XP and Windows 2003 patch number KB928388 for the 2007 Daylight Saving Time

- If you plan to run multiple Prime Optical client sessions on a single client workstation, add 512 MB of RAM and 240 MHz CPU for each additional Prime Optical client.
- Memory requirements are for Prime Optical client software only. For cross-launched applications such as Cisco Transport Controller (CTC) or Cisco Edge Craft (CEC), see the CTC or CEC documentation.
- Disk space requirements are for Prime Optical and CEC client software only.
- If you are installing Prime Optical with Prime Central, DNS must be enabled on the machine where Prime Optical is installed. If the machine cannot resolve hostnames into IP addresses through DNS, Prime Optical registration will fail.

It is strongly recommended that you install the Prime Optical client on a workstation separate from the Prime Optical server. Installing the Prime Optical client and server on the same workstation consumes server resources and could degrade performance.

Table 2-21 shows the maximum number of simultaneous Prime Optical client sessions.

Table 2-21 Maximum Number of Simultaneous Prime Optical Client Sessions

Network Size	Max. No. of Prime Optical Client Sessions
Small	30
Medium	60
Large	100
High end	100

2.2.1 Remote Application Software with the Prime Optical Client

Client launch and operation are supported by the following remote application software:

- Windows Server 2003 Enterprise Edition with Terminal Services
- Citrix Presentation Server 4.0
- Secure Global Desktop Enterprise Edition 4.0 (previously known as Tarantella Enterprise)



Note

If you are using Secure Global Desktop, enable full-duplex autodetection on the GUI server interface to prevent performance slowdown.

The hardware requirements for the remote application depend on the number of clients that the system must export, calculated with the following formula:

Target RAM = base RAM + (delta RAM x number of clients)

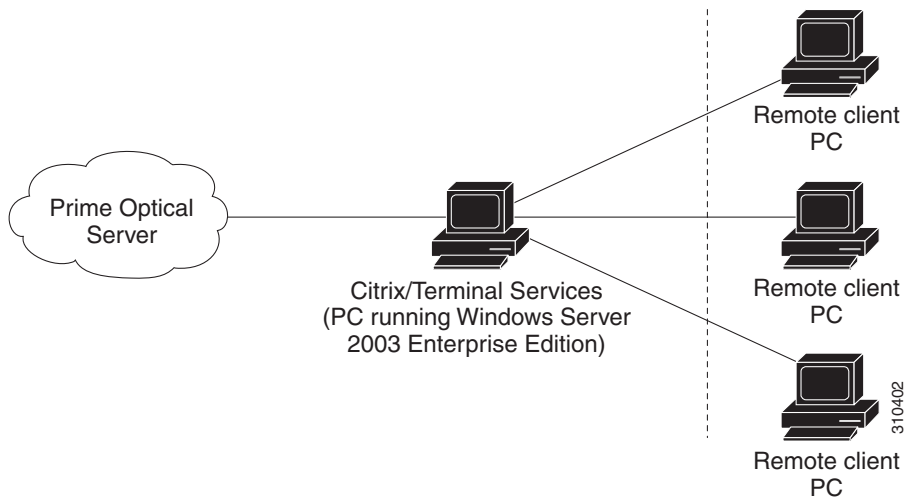
Target CPU = base CPU + (delta CPU x number of clients)

where:

- base RAM—Amount of RAM required by the remote application software.
- base CPU—Amount of CPU required by the remote application software.
- delta RAM—Amount of RAM required for each additional client.
- delta CPU—Amount of CPU required for each additional client.

2.2.1.1 Citrix and Windows Server 2003 Terminal Services

The following figure shows the environment for a remote Citrix Presentation Server or Windows Server 2003 Terminal Server. In this example, the GUI application server and the presentation server reside on the same workstation.

Figure 2-1 Remote Citrix or Windows Server 2003 Terminal Server Environment**Table 2-22 Requirements for Remote Windows Server 2003 Enterprise Edition and Citrix Presentation Server**

Remote Application Software	Delta RAM	Delta CPU
Windows Server 2003 Enterprise Edition with Terminal Services	512 MB	240 MHz
Citrix Presentation Server 4.0	512 MB	240 MHz

In this example, the hardware requirements for 10 clients are:

- CPU = base CPU + (240 MHz x 10)
- RAM = base RAM + (512 MB x 10)

**Note**

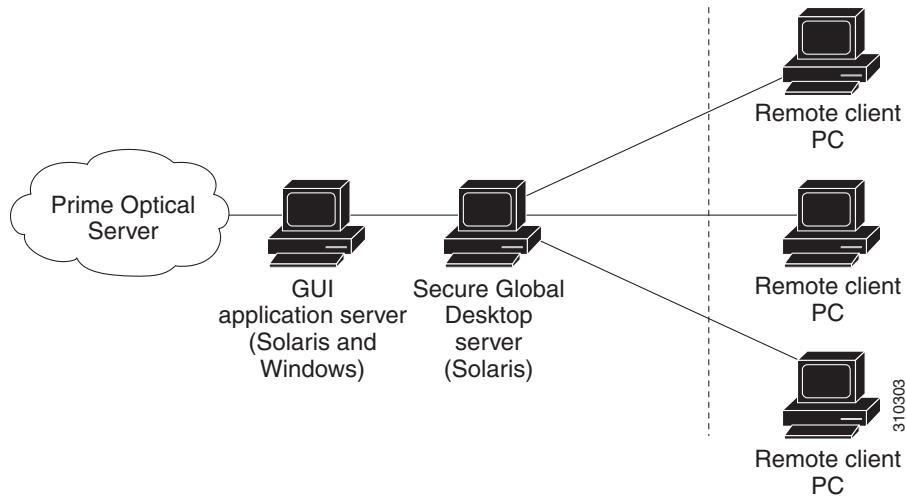
For the base RAM and base CPU requirements, refer to the documentation for:

- Windows Server 2003 Enterprise Edition with Terminal Services
- Citrix Presentation Server 4.0

2.2.1.2 Secure Global Desktop Enterprise Edition 4.0

The following figure shows the environment for a remote client via the Secure Global Desktop server. In this example, the GUI application server and the Secure Global Desktop server reside on different workstations. The application server is where Prime Optical clients run.

Figure 2-2 Remote Secure Global Desktop Environment



The following example shows requirements for a remote Secure Global Desktop server on a Solaris workstation and a GUI application server on a Windows PC.

Table 2-23 Requirements for Secure Global Desktop Server and GUI Application Server on Separate Solaris and Windows Workstations

Server and Platform	Delta RAM	Delta CPU
GUI application server on Windows Server 2003 Enterprise Edition with Terminal Services	512 MB	240 MHz

In this example, the hardware requirements for 10 clients are:

- Application server CPU = base CPU + (240 MHz x 10)
- Application server RAM = base RAM + (512 MB x 10)



Note

- For the Secure Global Desktop server CPU and RAM requirements, refer to the Secure Global Desktop documentation.
- For the application server base RAM and base CPU requirements, refer to the documentation for Windows Server 2003 Enterprise Edition with Terminal Services.

The following example shows requirements for a remote Secure Global Desktop server on a Solaris workstation and a GUI application server on another Solaris workstation.

Table 2-24 Requirements for Secure Global Desktop Server and GUI Application Server on Separate Solaris Workstations

Server and Platform	Delta RAM	Delta CPU
GUI application server on Solaris	512 MB	240 MHz

In this example, the hardware requirements for 10 clients are:

- Application server CPU = base CPU + (240 MHz x 10)
- Application server RAM = base RAM + (512 MB x 10)

**Note**

- For the Secure Global Desktop server CPU and RAM requirements, refer to the Secure Global Desktop documentation.
- For the application server base RAM and base CPU requirements, refer to the documentation for Windows Server 2003 Enterprise Edition with Terminal Services.

Using the Prime Optical Client in a Sun Ray Environment

The Prime Optical client is supported in an Oracle Sun Ray 2 environment. The setup uses thin terminal devices and Oracle Sun Ray 2 virtual display clients that are network-connected to a server running Sun Ray server software.

A virtual desktop runs on the Sun Ray server, while the related display is exported remotely to the associated Sun Ray 2 virtual display client.

- For Prime Optical client requirements, see [Table 2-20](#).
- For Oracle Sun Ray 2 virtual display client requirements and network and software configurations, see:
 - <http://www.oracle.com/us/products/servers-storage/desktop-workstations/030726.htm>
 - <http://www.oracle.com/us/products/servers-storage/desktop-workstations/036088.pdf>

2.2.2 Java Heap Sizes

The Prime Optical client startup script provides memory allocation and identifies the maximum heap allocation for the client Java Virtual Machine (JVM) process. The Prime Optical client launches with a maximum heap size of 512 MB.

2.3 Oracle Licensing for Prime Optical

**Note**

Prime Optical comes with an embedded database. If the database is accessed only by Prime Optical, there is no need for licensing. However, if other applications need to access the Oracle database used by Prime Optical, then the database needs to be licensed.

This section explains how to calculate the total number of Oracle Named User Plus licenses required for your Prime Optical server and client installations. This section describes with examples the Oracle Enterprise Edition database edition.

**Note**

See the Oracle website for detailed information about Oracle licensing definitions and requirements.

Oracle's technology products, including the Oracle database required for use with Prime Optical, are licensed using one of two possible metrics. Which metric to use normally depends on which will result in a lower price for the database. If for some reason the number of database users cannot be counted, the Processor metric must be used. However, in a Prime Optical environment, database users normally can be counted:

- *Processor*—This metric is defined as the number of processors on the server on which the Oracle database is installed or running. This option must be used in environments in which software users cannot easily be identified or counted (not normally the case in a Prime Optical environment).



Note For the purpose of counting the number of processors, a multicore chip with n cores is determined by multiplying n cores by a core processor licensing factor of 0.75. All cores on all multicore chips for each licensed program for each core processor licensing factor listed above are aggregated, before multiplying by the appropriate core processor licensing factor. All fractions of a number are rounded up to the next whole number.

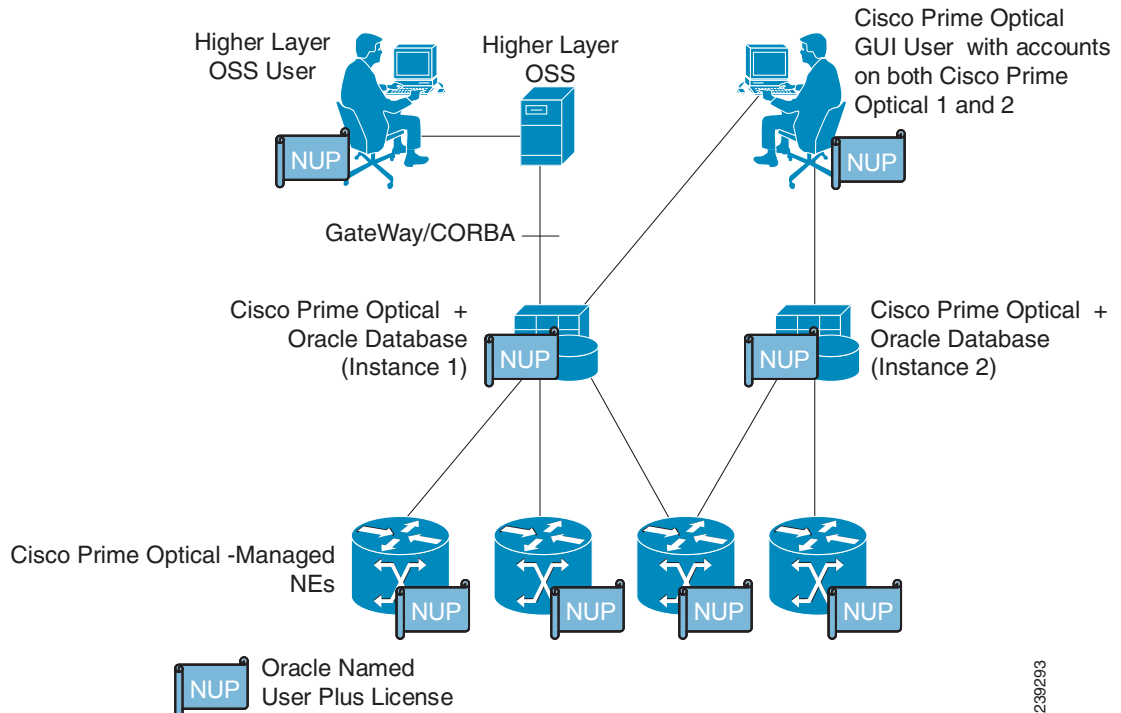
- *Named User Plus*—This metric is used in environments in which users can be identified and counted. Named User Plus includes both human-operated and automated devices. All human-operated and automated devices that access the program must be licensed. A Named User Plus license may access the program on any instances on which it is deployed, provided that the minimum license requirement on each server is met.

In the context of a Prime Optical environment, *human-operated device* means any device operated by a user who has direct or indirect access to Prime Optical. Direct access is gained through a user account on Prime Optical that allows access through the Prime Optical client GUI. Indirect access is possible through a user account on a higher-layer OSS, which in turn communicates with Prime Optical through Prime Optical GateWay/CORBA. Automated users include the NEs managed by Prime Optical and the Prime Optical server itself.

Oracle Enterprise Edition requires a minimum of 25 Named User Plus licenses per processor or the total number of actual users, whichever number is higher.

The following figure shows an example Prime Optical environment to illustrate identifying the human and automated database users that must be counted.

Figure 2-3 Example Prime Optical Environment



In the example shown in [Figure 2-3](#) there are two independent Prime Optical servers and Oracle database instances. There are four NEs, one of which is managed by both Prime Optical servers. There is one direct Prime Optical user and one indirect user. So in this example the total number of Oracle named users is as follows:

Prime Optical servers: 2*

NEs: 4**

Prime Optical users: 1**

Higher-layer OSS users: 1

Total Named User Plus: $8 = 2 + 4 + 1 + 1$

*Because of the *self-monitor feature* of Prime Optical, a Prime Optical server itself is considered an automated user of the database and is therefore counted.

**A Named User Plus license entitles the user to access Oracle on any instances where it is deployed. So if a user has access to multiple Prime Optical servers, only a single license is needed per user. Also, if an NE is managed by multiple Prime Optical servers, only a single license is needed per NE.

This example explains how to count the named users, but the number of named users required is the larger of either 1) the actual count or 2) the required minimum.

2.3.1 Oracle Enterprise Edition

Oracle Database Enterprise Edition (EE) provides improved scalability performance. The two major features in this release are:

- The Oracle partitioning option
- An increased maximum number of supported CPUs



Note

Oracle EE requires a separate license.

2.3.1.1 Prime Optical with Oracle EE Calculation (Example A)

A service provider has 800 NEs and a data center with 10 Prime Optical client workstations. 100 employees in the data center are authorized to use the Prime Optical client. Some of the employees in the data center share the same Prime Optical account (username/password). Prime Optical is running on a Sun V880 with 8 processors, with only one core and 32 GB of RAM.

- Named User Plus: 1) Minimum = 8 processors x 25 users/processor = 200 or 2) Count = 800 licenses for NEs + 100 licenses for data center personnel + 1 Prime Optical server = 901

Result: 901 Named User Plus licenses are required

- Processor: 8 processor licenses

If the processors are UltraSPARC IV and IV+ (dual core), the calculation for processor licensing is:

- Processor: $(8 \times 2) \times 0.75 = 12$ processor licenses

2.3.1.2 Prime Optical with Oracle EE Calculation (Example B)

The same service provider as in the previous example decides to enable Prime Optical GateWay/CORBA and connect to a higher-layer OSS that handles inventory management. There are 20 employees in the data center authorized to access the inventory system; 5 of them are also Prime Optical users (that is, they are a subset of the 100 Prime Optical users identified in the previous example). In this case, the total number of human users is:

95 Prime Optical-only users + 15 inventory system-only users + 5 Prime Optical/inventory system users, or 115 human named users.

As a result of adding the OSS and related users, the total number of named users required has increased from 901 to 916.

2.4 Prime Optical-Supported Third-Party Tools

The following table lists third-party components shipped with Prime Optical 9.6.

Table 25 Supported Third-Party Tools

Component	Version	Supplier
ADC Worldmap	4	American Digital Cartography, Inc.
Apache ActiveMq	5.5.1	Apache Software Foundation
Apache CXF	2.4	Apache Software Foundation

Table 25 Supported Third-Party Tools (continued)

Component	Version	Supplier
Apache Tomcat	7.0.25	Apache Software Foundation
Apache Web Server	2.2.22	Apache Software Foundation
CAS Server	3.4.12	Jasiq
CUES Desktop (Kubrick compliant)	1	Cisco Systems
DbUnit	2.4.7	DbUnit.org
DynamicTL1	1	Monfox
guava	11.0	Google, Inc.
Hen Plus JDBC SQL shell	0.9.8	Holger Engels, Henner Zeller, Ole Langbehn, Neurolabs
Images and icons	NA	R2 Graphics
InstallAnywhere	2009	Flexera Software (Acesso Software)
Jasper Reports	3.7.0	JasperSoft
Java JDK	1.6.0_33	Oracle America, Inc.
Java Telnet Application	NA	Matthias L. Jugel and Marcus Meissner
jaxb	2.0.3	Oracle America, Inc.
JCE	1.2.1	The Legion of the Bouncy Castle
JDBC Driver	11	Oracle America, Inc.
JIDE	2.11.1	JIDE Software, Inc.
Jloox	3	ILOG Inc.
Jviews	8.1	IBM Corporation
Libssh	2	SourceForge.net
Log4j	1.2.16	Apache Software Foundation
log4jdbc	1.2	Arthur Blake
NetBeans AbsoluteLayout	6.8	Oracle America, Inc.
Openfusion	1.4	Prism Tech Corporation
Oracle Database 11g Release 2	11	Oracle America, Inc.
SIGAR	1.6.4	SourceForge.net
Simple Logging Facade for Java (SLF4J)	1.6.2	SLF4J
slf4j-api-1.6.1	1.6.1	SLF4J
SNMP API	4	AdventNet Inc.
Spring Framework	3.0.5	VMware, Inc.
sudo	1.6.9p23	Free Software Foundation
XMP Persistence Implementation	8.0.21-SNAPSHOT	Cisco Systems XMP