Planning for Large Configuration of Netra™ t1 Server

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Sun BluePrints OnLine - January 2001

`http://www.sun.com/blueprints`

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Part No.: 806-6640-10
Revision 01, 01/10/01
Edition: January 2001

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Scenario

Many service providers want to use large server farms for application front ends, such as Web and cache services. This approach can result in benefits including cost savings and easy incremental scaling, but it requires consideration of several key issues regarding the manageability and serviceability of large numbers of servers that may be geographically disbursed. In addition, this approach requires consideration of power, cooling, and installation issues related to densely populated racks of servers. This wide-ranging article addresses these topics and is intended to assist Sun customers who want to deploy large server farms consisting of Netra™ t1 servers. Particular attention is given to the AC powered Netra t1 model 105 server.

Horizontal Scaling Issues

Horizontal scaling is most appropriate for applications that do not maintain session state, such as Web servers. When an application does not maintain session state, different servers can be assigned to handle requests from a single client during a single session. This makes it easy to load balance user sessions efficiently across a server farm. If an application maintains session state, it may be more difficult to scale it across many servers and still use resources efficiently.

Since a large horizontally scaled solution necessarily consists of many individual servers, by definition the system's overall reliability is reduced. (Simply adding more components increases the probability that some component will fail at any given point in time.) Given that reliability is critical in service provider environments, it is important to construct a server farm out of highly reliable individual components. The Netra t1 server is popular among service providers in part because of its inherent reliability and the fact that it is NEBS Level 3 certified (as are all Netra server and storage products). Note, however, that Sun qualifies individual Netra servers, not racks of servers.

Serviceability is another important consideration in any architecture where many servers are deployed. The Netra servers feature back-end cabling and front-end servicing. This allows field personnel to replace server components, such as disk drives, quickly without detaching cables. The Netra t1 server is mounted with a slide mechanism that allows the entire unit to be easily replaced (after uncabling it). Thus, the server, itself, can be treated as a field replaceable unit (FRU). Note that the Netra t1 server is factory shipped with the Solaris™ Operating Environment and the Lights-Out Management (LOM) software pre-installed.

Floor space considerations also come into play when large numbers of servers are deployed, especially in service provider environments which often must cope with limited floor space. Densely packing servers into racks has proven to be a popular solution to this problem. Sun’s most successful product in this space is the Netra t1 server which requires only one rack unit—or 1.75 inches—of rack height, and can fit into shallow 600 mm deep cabinets.

Manageability of Server Farms

Manageability is a key consideration for any architecture that consists of a large number of components, especially when the components are geographically disbursed or when Lights-Out Management (LOM) facilities are setup and maintained. This article examines a few important LOM datacenter manageability issues.

Change Management

It is important to work out a strategy for upgrading or modifying many servers. To choose an upgrade strategy, ask the following questions:

- Will the application and operating system run successfully if you upgrade some of the servers while the remaining servers continue to run older versions of the software? If this is the case, it should be fairly easy to implement a procedure for upgrading the entire server farm during off peak hours, perhaps over several days. Generally, this upgrade strategy will work with server farms that use load balancing mechanisms—a common approach in service provider front end applications. Note that Netra servers are qualified to run the Solaris 2.6, 7, and 8 Operating Environments.

- Is it possible to redirect user traffic to a secondary site while you upgrade the primary site? If the secondary site offers reduced capacity, you must determine if your service levels allow for degraded performance during the upgrade period. Once the upgrade is complete, it should be a straightforward matter to redirect user traffic back to the primary site.
- If neither of the above approaches will work, can you shut down 50% of the servers at your primary site and upgrade them, and then shut down the other 50% of the servers and upgrade them, all during a single offpeak period?

Because of change management requirements, there may come a point at which it makes more sense to move up the vertical scaling curve. For example, you might deploy your application across two-processor Netra t 1125 servers or four-processor Netra t 1405 servers, instead of single-processor Netra t1 servers. However, your application must be able to scale vertically (as well as horizontally) for this approach to work.

Setting Up the LOM Serial Connector

The Netra t1 servers support Lights-Out Management (LOM) features, such as the ability to remotely power a server on and off. The LOM functionality is accessed over an RS-232 serial port that is available via an RJ45 connector on the back of the unit. Altogether, there are four RJ45 connectors on the back of the unit, two of which are 10/100 Mbps Ethernet ports with standard wiring pinouts, and two of which are RS-232 serial ports. The LOM features are accessed via the Serial A port. The remote console can be accessed via either the Serial A port or the Serial B port. If you are using a remote console and LOM features, you should connect the remote console to Serial B port, since its function is totally independent of the LOM facility.

To manage and monitor a Netra t1 system, you must use at least one of the serial ports. You can connect either or both serial ports to any of the following devices:

- A “dumb” terminal or a Sun workstation

  For either or these purposes, you can use the standard RJ45 patch cable supplied with the Netra t1 server, but you need to insert one end into the DB25 adapter which is also supplied with the Netra t1 system.

- A modem

  For this connection, you can use the standard RJ45 patch cable supplied with the Netra t1 server, but you must insert one end into the DB25 adapter which is also supplied with the system. Do not connect a modem to the Serial A/LOM port; use the Serial B port. The DTR signal that is asserted on the Serial A/LOM port changes to DCD when the system is booted or when control of the port is given to the LOM device, and this can cause modem connections to be lost. If you connect the Serial A/LOM port to a Terminal Server, disable modem control on the Terminal Server port.

■ A Terminal Server (or patch panel connected to a Terminal Server)

  The pinouts for the Netra t1 serial ports correspond to the pinouts for the RJ45 ports on the Asynchronous Serial Interface Breakout Cable supplied by Cisco for use with the Cisco L2511 Terminal Server. For terminals from other manufacturers, you may need to make your own cross-over (null-modem) cable. The pinouts are shown in TABLE 1. For EMC compliance, all connectors or connector adaptors must be shielded and must use metal housing construction.

If you are using a Cisco L2511 Terminal Server (and you are connecting the Netra t1 system to it using the Cisco Asynchronous Serial Interface Breakout Cable), you can either connect the Breakout Cable directly to the Netra t1 server, or you can connect the Breakout Cable to a patch panel and use the straight-through patch cable (supplied by Sun) to connect the patch panel to the Netra t1 server.

You do not have to use the Netra t1 server with a Cisco Terminal Server. For other Terminal Servers, check the manufacturer's documentation to see if the pinouts of the serial ports on the Terminal Server match the pinouts of the Netra t1 serial ports. If they do not match, you must create a cable that directs each pin on one of the Netra t1 serial ports to the corresponding pin in the Terminal Server's serial port.

For your convenience, TABLE 1 provides the RJ45 pinouts, where Pin 1 is on the left if the unit is viewed from the back.

TABLE 1 RJ45 Pinouts

PIN#	FUNCTION
1	RTS
2	DTR
3	TXD
4	Signal Ground
5	Signal Ground
6	RXD
7	DSR
8	CTS

The LOMlite Device

The Netra t1 server contains a built-in hardware component called the LOMlite device. (The Netra t 1400/1405 servers also contain the built-in LOMlite device.) The LOMlite device provides remote management of the system over the Serial A port. The LOMlite device is powered by auxiliary power, so that you can monitor and control the server even when it is powered off or when the operating system is not running. When the operating system is running, LOMlite performs event reporting via the Solaris Operating Environment over the Serial A/LOM port.

The LOMlite device monitors the status of the power supply unit (PSU) and fans in the system. It provides a fault LED panel and three alarms to notify you of events or failures. It also provides an automatic server restart (ASR) function, which can reset the system in the event of a hard system hang. LOMlite provides the capability to power up the system, to return it to standby mode, and to reset the host from the serial command interface. Events such as fan failures and alarm state changes are stored in an event log of ten events. The oldest fatal event is stored separately as the most likely cause of subsequent failures. To avoid filling the event log with repeated failures from a given source, only the first failure from any given source is stored. After you clear the fault, you can re-enable monitoring of the failed device by restoring standby power to the system—if the system was powered off to repair the fault—or by issuing a `check` command at the LOMlite prompt. (The LOMlite command line interface, which you can display on the console by entering a control sequence, is beyond the scope of this article.) Re-enabling device monitoring also clears the error indication on the fault LED. All device state changes are reported via the interface to the Solaris Operating Environment, which provides additional capacity for storing such events.

Netra t Alarms

The Netra servers support four separate alarms. One is the system alarm which indicates whether or not the operating system is running. This alarm is reset periodically by a UNIX® process called the *watchdog*. If the watchdog fails to fire, it is an indication that the operating system has stopped running. The LOM hardware notices failure, and if it is configured appropriately, it reboots the Netra t1 server.

The other three alarms are user-configurable, and are not tied into system resets. These alarms are typically used by applications. For example, an application might set an alarm condition if a daemon is not responding. In this case, remote management software—possibly custom developed code—would notice that the alarm condition has been set and take the appropriate action.

Note that there is no external physical alarm interface for the Netra t1 server, and no relay contacts that attach to flashing lights. (Other Netra servers, including the Netra t 1400/1405 server offer this feature.) The alarm conditions must be monitored by a tool such as Sun™ Management Center software or a proprietary tool developed using the API’s and scripts provided.

Choosing a Management Approach

You have several options for taking advantage of the LOMlite technology in order to remotely manage a large farm of Netra servers:

- Use the provided UNIX utilities that interface with the Netra t Alarms/LOMlite hardware. This is probably the best choice for most service providers, and it is the approach that is examined in this article.
- Write your own software programs using LOMlite UNIX ioctls. This provides finer granularity of control and better performance. But this approach is much more difficult to implement and it potentially ties you to a particular release of the operating system. In addition, the performance benefits are probably not critical for a “homegrown” remote management system.
- Use Sun Management Center software. The Sun Management Center software now provides support for Netra alarms and LOMlite features. To add this support to an existing Sun Management Center installation, download the SunMC Netra server packages from:

  `http://www.sun.com/netra/software`

  You will need to install the *agent* module (25 MBytes for the generic module plus 5 MBytes for the Netra server packages) on each Netra server to be monitored. In addition, you will need to install the *server* module (45 MBytes for the generic module plus 4 MBytes for the Netra server packages) on each server or console that will perform monitoring tasks. For more information, see the *Sun Management Center 2.x Software User’s Guide* and the *Sun Management Center 2.x.x Software Release Notes*.
- Use a third party systems management tool, such as HP Openview or Unicenter TNG. It is unlikely you will use such a tool simply to manage a server farm. However, if you have standardized on one of these tools to manage your environment, you can now download the SNMP MIB package that allows the tool to interface with the Netra alarms and LOMlite features. The package is located at: `http://www.sun.com/netra/software`.
- Support is also provided for BMC Patrol through Sun Professional Services^{SM}.

If you choose to write scripts to monitor and manage your Netra t1 server farm, you can call the system utilities shown in TABLE 2.

TABLE 2 Netra t Alarms & LOMlite System Utilities

tsalarm(7D)	Alarm device driver
tsctl(1M)	Controls alarms and watchdog
tsdog(1M)	Sets watchdog parameters & failure actions
tsmonitor(1M)	Simple example alarm monitor process

TABLE 2 Netra t Alarms & LOMlite System Utilities

tsstate(1M)	Gets state of PSU, fans, and watchdog clock
tsunlock(1M)	Enables detach requests for tsalarm driver
lomctl(1M)	Configure & control the LOMlite
lominfo(1M)	Returns environmental and configuration information
lomprog(1M)	Reprogram the LOMlite with new firmware
lom(7D)	LOM device driver
lomlited(1M)	Controls LOM alarms and watchdog

For a detailed description of these utilities, see the man pages that accompany the Netra t Alarms/LOMlite software.

CODE EXAMPLE 1 provides an example Netra t Alarms/LOMlite control script. This script uses the `tsstate` command within a loop which calls the function `doalarm` in order to set `Alarm1` upon any fault condition.

CODE EXAMPLE 1 Example Netra t Alarms/LOMlite Control Script

```
#!/bin/sh
#
# We set alarm1 for any fan failure, supply failure, or watchdog
# failure.
#
TSSTATE="tsstate"
TSCTL="tsctl"
FAULTY="faulty"
MONALARM=alarm1
# Define a function to set alarm when anything is faulty
doalarm()
{
if [ "$fan1" = "$FAULTY" -o "$fan2" = "$FAULTY" -o \
"$fan3" = "$FAULTY" -o "$fan4" = "$FAULTY" -o \
"$supplya" = "$FAULTY" -o \
"$supplyb" = "$FAULTY" -o \
"$watchdog" = "$FAULTY" ]
then
$TSCTL $MONALARM=on
else
$TSCTL $MONALARM=off
fi
}
#
# MAIN
#
# Ignore common signals: HUP, INTR, QUIT
#
trap "" 1
trap "" 2
trap "" 3
#
# What’s the current state of play?
# This sets shell variables ’fan1’ etc. to their states ’ok’ or
# ’faulty’ if they are configured.
```

```
#
eval ‘$TSSTATE‘
if [ $? != 0 ]
then
# Can’t go on
exit $?
fi
#
# Set the initial alarm state
#
doalarm
#
# Now enter the loop, waiting for a change, and setting the alarm
# accordingly.
# Have to handle any combination of supported monitor bits, hence
# the long-winded parameter substitutions below. If this system
# monitor doesn’t report it, it isn’t configured.
#
while eval ‘$TSSTATE wait ${fan1:+fan1=$fan1} \
${fan2:+fan2=$fan2} \
${fan3:+fan3=$fan3} \
${fan4:+fan4=$fan4} \
${alarm3:+alarm3=$alarm3} \
${supplya:+supplya=$supplya} \
${supplyb:+supplyb=$supplyb} \
${watchdog:+watchdog=$watchdog}‘
do
doalarm
done
```

Powering Densely Populated Racks

There are two Netra t1 models: the AC powered Netra t1 model 105 server, and the DC powered Netra t1 model 100 server. The power supply unit is the only difference between the two models. DC power is typically used in Telco environments, and AC power is used in other service provider environments. Much of the information in this section applies to both models, but the focus here is on the AC powered model, since that model requires special power considerations.

Calculating Power Requirements

You should determine your overall power requirements, and verify that your site can support those power requirements. The power requirements for the individual components within a Netra t1 server are shown in TABLE 3.

TABLE 3 Estimated Power Consumption for Netra t1 Components

Component	Estimated Power Consumption (at 100% PSU efficiency)
CPU 360 MHz	34.3 W
CPU 440MHz	36.3 W
Memory (per DIMM)	0.21 W per 64 MBytes
9 GByte (7200 rpm) Disk Drive	11.0 W
18 GByte (10000 rpm) Disk Drive	13.8 W
CD-ROM	3.2 W
PCI Card	Variable—25 W maximum

TABLE 3 assumes the power supply unit (PSU) is operating at 100% efficiency. You should allow for 65% PSU efficiency. So, to determine a Netra t1 server's total power requirements, add together the figures from the table for each installed component and divide the result by 0.65.

For example, assume a Netra t1 unit contains:

- 440 MHz CPU
- 512 Mbyte RAM
- Two 9 Gbyte disk drives

You would calculate the unit's power requirements as follows:

$$\frac{36.3 + (0.21 \times 8) + (11.0 \times 2)\ W}{.65} = 92.28\ W$$

To calculate the total power requirements for all servers installed in a rack, simply add up the power requirement figures for the individual servers.

Applying Power to the Rack

This article focuses on the StorEdge 72" Expansion Cabinet, which provides 36 RU of rack space and includes two AC power sequencers. It has the characteristics shown in TABLE 4.

TABLE 4 StorEdge 72" Expansion Cabinet

Height	187 cm (73.5 inches)
Width	61 cm (24 inches)
Depth	93 cm (36.5 inches)
Weight	159 kg (350 lbs) empty
Power	220-240 VAC, 50-60 Hz
Watts	5,400 maximum
Amps	24

The 36 RU of rack space is over and above the space required by the power sequencers. In theory, you could mount 36 Netra t1 servers in a single rack. However, because of the power considerations (described below), it is recommended that you mount a maximum of 32 Netra t1 servers in a single StorEdge 72" Expansion Cabinet.

Each sequencer provides 10 AC outputs, as follows:

- Two unswitched outputs. It is recommended that you do not use these outputs in a rack of Netra t1 servers. For your information, however, one of the outputs is an IEC320 AC outlet which is UL rated at 20 amps but European rated only at 16 amps. The second output is rated at 10 amps. Whenever power is applied, both of these outputs are always on.
- The Switched1 group consists of four outputs, each rated for 10 amps.
- The Switched2 group also consists of four outputs, each rated for 10 amps.

When you turn on the power sequencer with the key switch, all of the outputs in the Switched1 group turn on immediately. After 30 seconds, all the outputs in the Switched2 group turn on simultaneously.

Between the two power sequencers in a StorEdge 72" Expansion Cabinet, there are a total of 16 AC outlets that you could use. If you want to mount 32 Netra t1 units in the rack, you can attach splitter cables (part number 530-2264-01) to each of the 16 outputs, thereby providing 32 AC power sources. Thus, each power sequencer provides power to a maximum of 16 Netra t1 servers.

This configuration is used successfully by many of Sun's customers. However, there are some issues that you should be aware of.

First, you may only be able use this maximum configuration with high-line voltage (180 to 240 volts). Consider TABLE 5 which shows an example of the measured amps and watts drawn by a Netra t1 server under different input voltages. These measurements were taken by Sun personnel.

TABLE 5 Netra t1 Model 105 Server Amperes and Watts

Input Voltage	Amperes	Watts
90	0.95	85.6
100	0.85	84.5
120	0.70	84.5
180	0.51	82.6
200	0.46	81.7
240	0.39	81.9

Despite these particular measurements, the rated current for a Netra t1 server is 1.5 amps at 100VAC. This is a conservative value, but it is worth examining the implications.

Each power sequencer is rated for a maximum of 24 amps. In the configuration we are considering, 16 Netra t1 servers are connected to a single power sequencer. This poses no problem in the 180VAC to 240VAC range. For example, at 240VAC, the total amps requirement is 16 x 0.39 = 6.24 amps, which is less than 24 amps. However, using the (admittedly conservative) 1.5 amp rating for 100VAC, the calculation is 16 x 1.5 = 24 amps, which is the maximum rating for the sequencer. Note that this does not include the current required for the rack's fan unit, if installed.

Another issue to consider is related to the potential *in-rush current*. When a server is initially powered on, a transient spike occurs in the level of current as the capacitors are charged within the power supply. This high current level decays very quickly—generally in less than 200 milliseconds. The exact amount of current varies, depending on when the power is applied with respect to the AC power cycle. The in-rush current is maximized if power is applied at the point where the positive or negative voltage is at it's greatest value. The in-rush current is minimized if power is applied at the zero-crossing point, when the voltage is momentarily at zero. AC power generally goes through this cycle at 50 to 60 Hz.

The potential maximum amount of in-rush current for a Netra t1 server depends upon how long the unit has been turned off. A *cold start* occurs when the unit has been powered off for about one minute or longer. A *warm start* occurs when the unit has been powered off for less than about one minute, for example if the power goes off and comes back on within 50mS. The maximum in-rush current for a Netra t1 server is 56 amps upon a cold start, and 100 amps upon a warm start. Note that these numbers are significantly higher than the nominal steady state current for a Netra t1 server, which tends to be less than one amp, as shown above.

It is possible for in-rush current to open circuit breakers. In the configuration we are discussing, eight Netra t1 servers are powered on simultaneously. If this occurs as a warm start (e.g. if the AC power goes off and comes back on automatically within 50mS), and if the power is applied at the point where in-rush current is maximized, a transient current of 800 amps could occur. This could potentially open a circuit breaker on the wall.

This issue may or may not be important for a particular site. In many environments, the service levels would permit you to simply wait a minute or so, and then turn on the power sequencers with the key switches. However, if you have high availability requirements and are using full racks of Netra t1 servers, you may need to consider this issue. One potential solution is to use a power sequencer (or similar unit) that always applies power when the AC voltage is at the zero-crossing point. You can obtain such a unit from a third party supplier.

The circuit breakers in the power sequencers supplied with the StorEdge 72" Expansion Cabinet allow only 360 amps of in-rush current. If you are using these power sequencers, and if your service level agreements call for very high availability, it is recommended that you attach only six Netra t1 units to each power sequencer, without using splitter cables. Three units should be attached to the Switched1 group, and three units should be attached to the Switched2 group. In this situation, if three Netra t1 units are powered on simultaneously, the maximum in-rush current should never exceed 300 amps.

Electrical Requirements for Netra t1 Server

The following tables show the electrical requirements for the Netra t1 model 100 server and Netra t1 model 105 server. This information is included here for your convenience since some of the values shown have not yet been published in the Netra documentation.

TABLE 6 Netra t1 model 105 server—Maximum Design Values at Rated Nominal Voltage

Voltage (V)	100 VAC
Current (A)	1.0 A
Power (W)	100 W
In-rush current (A) at 264 VAC (warm start)	Less than 100A decaying to normal in 200 msec.
Rated current of system	1.5 A
Rated voltage of system	100/240 VAC (Nominal)

TABLE 7 Netra t1 model 105 server—Measured Values

Configuration	1 440 MHz CPU 1 GByte memory (4 memory modules) 1 CD-ROM 2 1" 18 GByte, 10K rpm disk drive 1 PCI Card (QFE) Running Sun VTS
Voltage (V)	100 VAC
Current (A)	0.85A
Power (W)	84.5 W
In-rush current (A) at 264 VAC (cold start)	56 A for less than 5 msec, decaying to 1A in less than 20 msec.

TABLE 8 Netra t1 model 100 server—Maximum Design Values at Rated Nominal Voltage

Voltage (V)	-48 VDC
Current (A)	2.1 A
Power (W)	100 W
In-rush current (A) at -75 VDC (cold start)	Less than 20 A decaying to normal in 200 msec.
Rated current of system	2.5 A
Rated voltage of system	-48 / -60 VDC (Nominal)

TABLE 9 Netra t1 model 100 server—Measured Values

Configuration	1 440MHz CPU 1 GByte Memory (4 memory Modules) 1 CD-ROM 2 1" 18GByte, 10K rpm disk drives 1 PCI Card (QFE) Running Sun VTS
Voltage (V)	-48 VDC
Current (A)	1.63 A
Power (W)	78 W
In-rush current (A) at -75 VDC (cold start)	7.32 A, decaying to 3 A in less than 25 msec.

Cooling Issues

All Netra servers use front-to-back cooling. These are known as Type A devices. Some products from Sun, such as the Sun Enterprise™ 4500 server, use side-to-side cooling. These are known as Type B devices. Front-to-back cooling is more efficient, and makes it much easier to mount many devices in a single rack without encountering cooling problems.

If you intend to mount 32 Netra t1 servers in a 36U StorEdge 72” Expansion Cabinet, the left over 4U of cabinet space should be trimmed off with panels. This prevents warm air from flowing to the front of the rack and being recirculated, which would reduce the efficiency of the cooling system and potentially contribute to overheating problems. Panels for the StorEdge 72” Expansion Cabinet are available in a variety sizes, such as 1U, 2U, 3U, 4U, and 5U.

You may want to order the optional redundant fan tray cooling package (x-option X9819A) that can be housed at the top of the StorEdge 72” Expansion Cabinet. The fans pull air upward through the top of the rack. If space is limited at the rear of your rack, it may be important to use a fan so that heat does not build up there. The fan unit does not require any rack space.

You should calculate the overall heat generated by your racks so that you can size your cooling system appropriately. To do this, simply convert the power requirements figure (described in “Calculating Power Requirements, above) from Watts to BTU/hour by multiplying the Watts figure by 3.415. For example, if a rack requires 92.28 W, the heat dissipated is 92.28 x 3.415 = 315.14 BTU/hour.

Be sure to arrange your racks so that the warm air exhaust from one rack does not flow directly into the cool air intake area for another rack. Any configuration you select must be tested and qualified to pass performance and agency regulations, including EMI.

Rackmount Installation

In addition to the StorEdge 72” Expansion Cabinet, Sun also offers the following rackmount kits:

TABLE 10 Netra Rackmount Kits

X6919A	Netra Telco 19" conversion kit, for industry 72" rack 36U allowed 30U recommended
X6966A	Netra Telco 23" conversion kit, for industry 72" rack 36U allowed 30U recommended
X6967A	Netra Telco 24" conversion kit, for industry 72" rack 36U allowed 30U recommended
X6968A	600mm rack conversion kit

To mount a Netra t1 or Netra st D130 (one RU storage unit) into one of these racks, you need one of the following rack mounting kits:

TABLE 11 Netra t1 server (or Netra st D130 storage unit) Rack Mounting Kit for StorEdge 72” Expansion Cabinet

Description	Quantity	Part No.
Front slide	2	340-6215
Rear slide	2	340-6234
Cable bracket	1	340-6151
Thumbscrew bracket	2	340-6085
M4 8mm Phillips countersunk screw	4	240-3070
10-32 UNF screws	8	240-1207
M4 nut	4	240-1373

TABLE 12 Netra t1 server (or Netra st D130 storage unit) 19-inch Rack Mounting Kit

Description	Quantity	Part No.
Front slide	2	340-6215
Rear slide	2	340-6234
Cable bracket	1	340-6151
Thumbscrew bracket	2	340-6085
M4 8mm Phillips countersunk screw	4	240-3070
10-32 UNF screws	8	240-1207
M4 nut	4	240-1373

TABLE 13 Netra t1 server (or Netra st D130 storage unit) 23-inch Rack Mounting Kit

Description	Quantity	Part No.
Front slide	2	340-6209
Rear slide	2	340-6210
Cable bracket	1	340-6151
Thumbscrew bracket	2	340-6085
M4 8mm Phillips countersunk screw	4	240-3070
10-32 UNF screws	8	240-1207
M4 nut	4	240-1373

TABLE 14 Netra t1 server (or Netra st D130 storage unit) 24-inch Rack Mounting Kit

Description	Quantity	Part No.
Front slide	2	340-6211
Rear slide	2	340-6212
Cable bracket	1	340-6151
Thumbscrew bracket	2	340-6085
M4 8mm Phillips countersunk screw	4	240-3070
10-32 UNF screws	8	240-1207
M4 nut	4	240-1373

TABLE 15 Netra t1 server (or Netra st D130 storage unit) 600mm Rack Mounting Kit

Description	Quantity	Part No.
Front slide	2	340-6213
Rear slide	2	340-6214
Cable bracket	1	340-6151
Thumbscrew bracket	2	340-6085
M4 8mm Phillips countersunk screw	4	240-3070
10-32 UNF screws	8	240-1207
M4 nut	4	240-1373

The cable bracket is provided to aid cable management at the rear of the system. It is recommended that you mount units from the bottom of the rack to the top for maximum stability. For step-by-step instructions on how to rackmount a Netra t1 server or a Netra st D130 storage unit, see the *Netra t1 and Netra st D130 Rackmount Installation* guide, part number 806-3856-11.

Conclusion

This article examined several key remote management issues for server farms consisting of Netra t1 servers. The Netra t Alarms/LOMlite facilities were introduced, including the LOMlite automatic server restart (ASR) function and the watchdog process. This article examined the best ways to use these facilities to monitor and manage servers, and provided a sample script that makes calls to Netra t Alarms/LOMlite system utilities.

Consideration was also given to the power, cooling, and rack mounting issues that are involved with deploying densely populated racks of Netra t1 servers. Particular attention was paid to the effects of "in-rush" current during warm and cold starts and the importance of properly sizing the power sequencer capacity.

Acknowledgements

Warren Reid contributed to the article. Thanks to Cari Yuen, Sean Wrycraft, Bill Channell, David Machado, Neil Bird, Peter Wilson, Raj Natarajan, Chin Cheng, Richard Elling, John S. Howard, Mark Garner, and Bill Sprouse for their guidance and reviews.

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