Dell Technical Information Note (TIN UPS002)

Dell UPS Management Software: Common Software Installation Scenarios

This Dell Technical Information Note provides practical examples of common installation scenarios for Dell UPS Management Software Release 2.

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Contents

Scope of this document 4
Assumptions 5
The two components of Dell UPS Management Software 5
An overview of UPS shutdown 7
Scenario 1: Single UPS, multiple servers, USB or RS232 local communication 8
Scenario 1: Connectivity 8
Scenario 1: Installation notes 9
Scenario 2: Single UPS, multiple servers, Ethernet connectivity using the NMC 13
Scenario 2: Connectivity 13
Scenario 2: Installation notes 14
Scenario 2: Mass configuration of all ULNM agents and Dell UPSs on a network 15
Scenario 3: Redundant UPS, multiple servers, Network (Ethernet) Management Card (NMC) connection 17
Scenario 3: Connectivity 18
Scenario 3: Installation notes 18
APPENDIX I 21
Firewall configuration (software communication ports) 21
APPENDIX 2 22
Shutdown settings 22
Shutdown setting listing and description 22

Figures

Figure 1: Dell UPS management software connectivity scenarios 4
Figure 2: Dell's UPS Local Node Manager (ULNM) 6
Figure 3: Dell's Multi-UPS Management Console (MUMC) 7
Figure 4: Connectivity for Dell UPS with USB or RS232 connection to four Dell servers 9
Figure 5: ULNM edit modules settings 10
Figure 6: ULNM range scan 10
Figure 7: ULNM Settings ➲ Auto Discovery 10
Figure 8: ULNM edit power source 11
Figure 9: Power source information and status 11
Figure 10: Nodes settings ➲ Edit shutdown settings 12
Figure 11: Connectivity for Dell UPS with optional UPS NMC and four Dell Servers 13
Figure 12: ULNM range scan 14
Figure 13: ULNM edit power source 14
Figure 14: ULNM edit shutdown configuration 15
Figure 15: MUMC range scan 15
Figure 16: MUMC auto discovery ➲ node list 16
Figure 17: MUMC node settings 16
Figure 18: MUMC node configuration 17

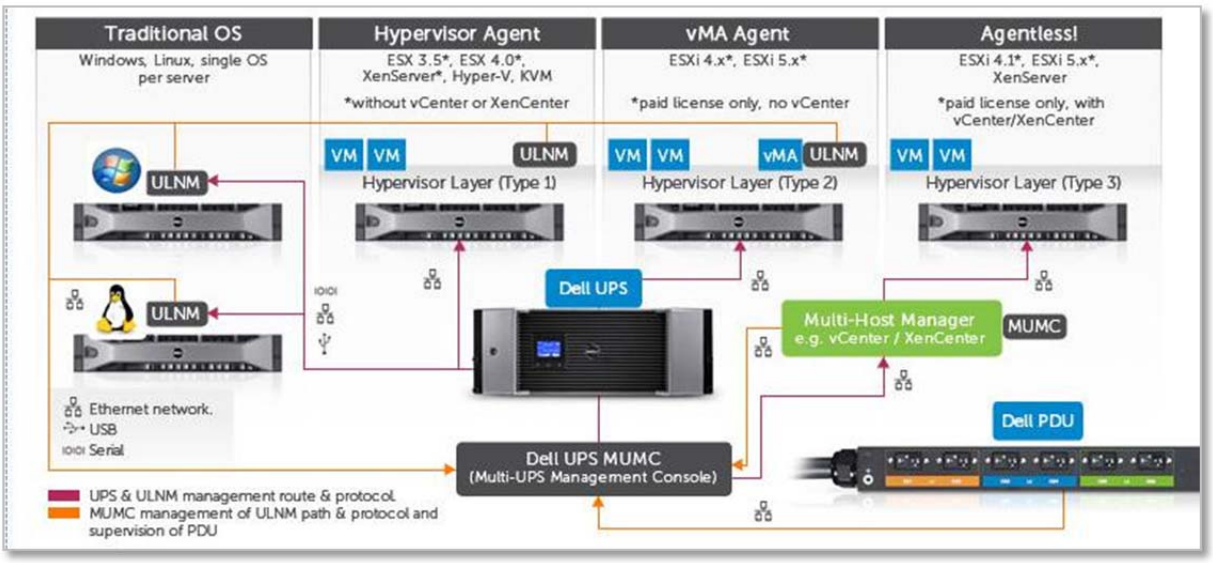
Figure 19: Connectivity diagram for redundant Dell UPS with LAN connection to four Dell servers 18
Figure 20: Enabling Redundancy in ULNM 19
Figure 21: ULNM range scan 19
Figure 22: Set node access parameters 19
Figure 23: Access parameters 19
Figure 24: Creating the Composite (Redundant) UPS Device in ULNM 20
Figure 25: Set composite device redundancy level 20
Figure 26: Node list with composite, redundant Dell UPS shown as Virtual Power Source 20
Figure 27: Power source composite redundant device 21
Figure 19: Firewall (software communication ports) configuration 21
Figure 28: Edit shutdown configuration 22
Figure 29: UPS Battery capacity over time 23
Figure 30: Shutdown Sequence 24

Scope of this document

This document provides reference information when installing Dell UPS Management Software, Release 2, 01.04.0010 (A02) with common installation scenarios.

- Scenario 1: Installing software to manage a single UPS protecting multiple servers, with USB or RS232 connectivity for local communication
- Scenario 2: Installing software for single UPS protecting multiple servers, with Ethernet connectivity via a Network Management Card (NMC) on the UPS
- Scenario 3: Installing software for redundant UPS protecting multiple servers, with Ethernet connectivity via a Network Management Card (NMC) on the UPS
- Appendix: Firewall settings (software communication ports) and shutdown settings

Figure 1: Dell UPS management software connectivity scenarios



This guide is designed for readers who have knowledge and experience of operating systems supported by Dell Multi-UPS Management Console (MUMC) and Dell UPS Local Node Manager (ULNM). It is intended to complement the full User's Guides that accompany the UPS management software.

Dell UPS Management Software User Guides

For full information about the Dell UPS Management Software suite — such as hardware and software prerequisites and details about activating, configuring and using UPS monitoring and management functions — refer to the complete users' guides for the software components.

English versions are available on the Dell support site:
ULNM: http://support.dell.com/support/edocs/ACC/UPSD/en/ulnmug.pdf
MUMC: http://support.dell.com/support/edocs/ACC/UPSD/en/mumcug.pdf
Versions in other languages are available at: http://support.dell.com/support/edocs/ACC/UPSD/

Assumptions

This document assumes that your deployment meets the following specifications:

Virtualization: For virtualized environments, the Dell UPS must be equipped with the optional Network Management Card (NMC, H910P) for Ethernet connectivity. (USB communications are not supported for managing UPSs in virtualized environments.)

Network: All servers supported by the UPS should be connected to the same local area network (LAN).

Firewalls: Firewalls should be configured to enable communication of the Dell software agents between networked servers. See the Appendix 1 of this Technical Information Note for information on the ports to use for the software and network card (if applicable).

Software versions: The user should be using the latest software version of the Dell UPS Management Software suite (Release 2, 01.04.0010 (A02)). For more information and to download the latest software, go to www.dellups.com ➲ Software and Technical Documentation ➲ Software Downloads.

Operating Systems: This guide is written primarily for Windows operating systems. For installation on other operating systems, refer to full Dell UPS Software Users Guide.

Firmware versions: This guide recommends updating the UPS Network Management Card (NMC) firmware if it uses any version earlier than version 12. For more information and to download this firmware, go to www.dellups.com ➲ Software & Technical Documentation ➲ Firmware Updates.

The two components of Dell UPS Management Software

The Dell UPS power management suite — Release 2, 01.04.0010 (A02) — is compatible with all Dell single-phase UPS products. The software suite includes two complementary and integrated offerings, both managed through a single, Web-based interface:

The Dell UPS Local Node Manager (ULNM):

- Acts as a local shutdown agent on local computers using traditional operating systems, for graceful, unattended UPS shutdown and restart.
- Acts as a local shutdown agent in virtualized environments, for virtualization host Hypervisor Agent and vMA Agent type.[1]
- Provides a local interface to view UPS power status, events and configurations.
- Is remotely managed by the Dell UPS supervisory console for simultaneous, centralized configuration and management of multiple ULNM agents.

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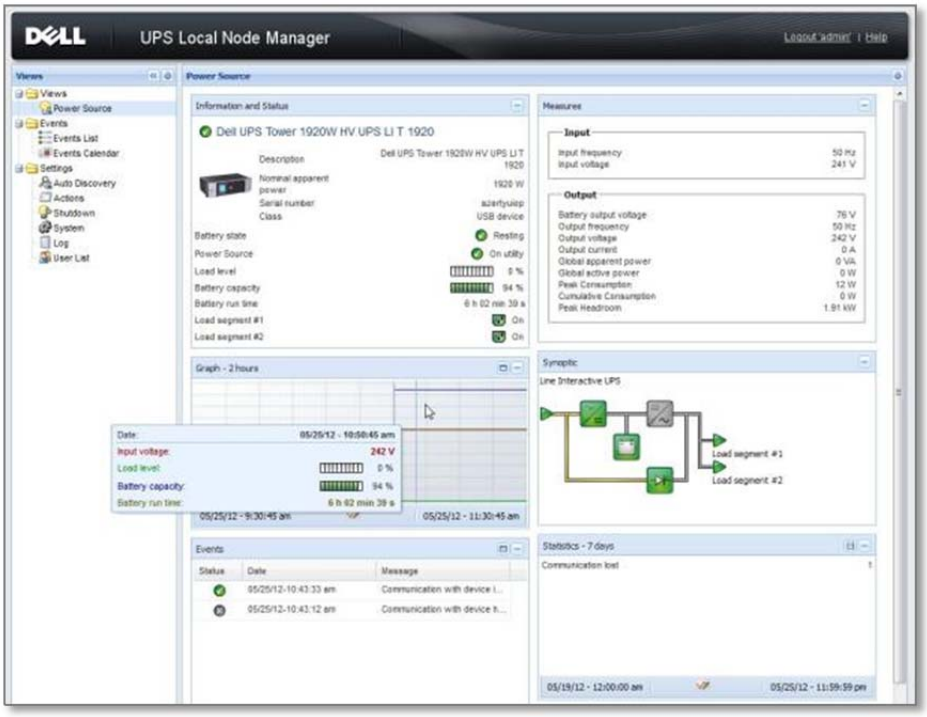
[1] Hypervisor Agent type: A host on which applications can be directly installed (such as Win2k8).
vMA Agent type: A host on which applications cannot be directly installed and instead use a management assistant to load applications (such as vMA).
For more information on Dell ULNM and MUMC interaction with virtualized hypervisors, contact your local Dell representative or refer to the appropriate User's Guide at dellups.com/soft-tech-doc.asp.

Figure 2: Dell's UPS Local Node Manager (ULNM)



The Dell Multi-UPS Management Console (MUMC):

- Discovers and supervises Dell UPSs and Dell intelligent power distribution units (PDUs) connected to the network.
- Provides a central control point for configuring, monitoring and reporting actions relating to UPS and PDU events.
- Provides mass configuration and firmware update for Dell UPS NMCs. The optional NMC is recommended for remote management and required for managing UPSs in virtualized IT environments.
- Provides centralized management of Dell UPS Local Node Manager applications running on remote traditional (Windows/Linux) or virtualized servers (Microsoft®, VMware®, Citrix®, Red Hat®).
- Provides an agent-less method for managing multiple hosts in clusters using VMware vCenter™ or Citrix XenCenter®.

Figure 3: Dell's Multi-UPS Management Console (MUMC)

The Dell Multi-UPS Management Console (MUMC) does not:

- Control virtual machine (VM) behavior. This is managed by the host and configured through vCenter or other host management interface.
- Assume responsibility for VM startup/shutdown/hibernation/VM migration. This is managed by the host management interface.
- Replace a user's need to understand VM behavior responding to a host entering maintenance mode or shutting down.
- Explain all possible scenarios according to the various virtualization vendors, license types and feature sets.

An overview of UPS shutdown

Dell UPS power management software can trigger the graceful shutdown of remote UPSs or *load segments*, which are groups of receptacles on a Dell UPS. This feature enables you to manage scheduled shutdowns and sequential startups of protected loads. During a power outage, you could shut down power to non-critical devices, thereby extending the available battery backup time for more critical devices. You can also use this feature to remotely restart locked-up equipment.

The ULNM local agent can gracefully shut down computers, servers (configured in both traditional and virtual machines) powered by a Dell UPS, and the UPS itself — to save all work in progress and ensure data integrity. The ULNM software enables authorized administrators to see into power status and manage shutdown configurations from any PC with a Web browser.

In an environment with multiple host servers, the centralized MUMC console enables safe shutdown of servers, even servers in virtualized clusters running vCenter or XenCenter. It integrates with hypervisors to manage multi-host virtualized installations. The software triggers migration applications to transparently move virtual machines to an available server on the network, for data integrity and zero downtime.

Configurations with just one physical server and one UPS would install one ULNM agent to support graceful server shutdown during a power outage. Multi-server installations would have a local ULNM agent on each physical server and the MUMC software on an administrator's desktop or laptop PC to monitor and manage power status, including remote or automatic shutdowns.

Scenario 1: Single UPS, multiple servers, USB or RS232 local communication

In this scenario:

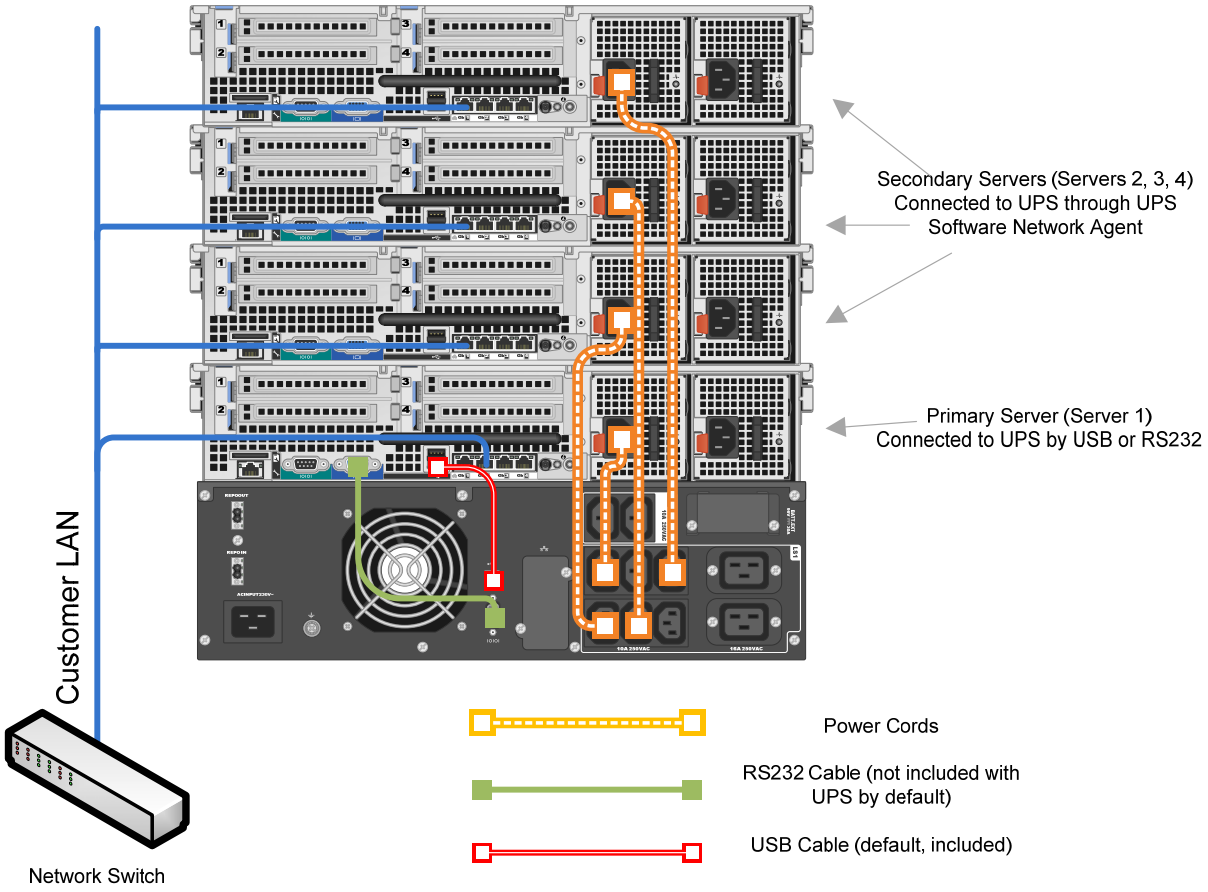
- Server 1 is powered by the Dell UPS and is connected to the Dell UPS by USB communications (valid only for non-virtualized IT environments).
- Servers 2, 3 and 4 are also powered by the Dell UPS.
- Servers 2, 3 and 4 monitor Server 1's agent for notification of events and shutdown.
- The Dell UPS Network Management card (NMC, Dell Part No. H910P) is not installed.

Scenario 1: Connectivity

Connect the Dell UPS to a server via either the USB cable (supplied) or DB-9 RS232 cable (customer purchase option). For the DB-9 option, configure pin 2 for outbound transmission from the UPS (Tx), pin 2 for inbound communication to the UPS (Rx), pin 5 to ground. The remaining pins — 1, 4, 6, 7, 8 and 9 — are unused.

The server to which you make this connection is called the "primary" server. All other servers are "secondary" servers and are assumed to be on the same customer LAN.

Figure 4: Connectivity for Dell UPS with USB or RS232 connection to four Dell servers



Power cables are shown for illustrative purposes only.
For best practices for cabling, refer to the Dell UPS Cabling Guide.

Scenario 1: Installation notes

Install the ULNM shutdown agent on each server.

Primary server ULNM configuration:

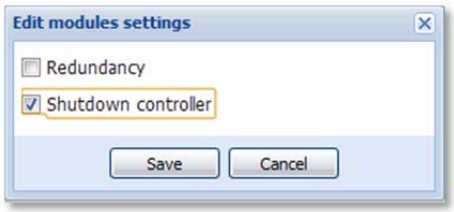
The ULNM software running on the primary server will automatically discover the UPS and assign it as the Power Source (the Status icon is green ✓).

To configure shutdown settings: Click "Shutdown" menu ➲ "Edit Shutdown Configuration" and make the appropriate settings. For an explanation of shutdown timer settings, refer to Appendix 2.

To support automatic server restart after a shutdown event, ensure that the "Outlet Shutoff Active" box is checked and check the server BIOS settings to ensure that "Auto Power On" or "Last State" is set as active.

To enable the primary ULNM agent to communicate with secondary ULNM agents:
Click "System" ➲ "Edit Modules Settings" ➲ check the "Shutdown controller" box.
This enables communication interaction between the primary and secondary ULNM applications.

Figure 5: ULNM edit modules settings



Secondary server ULNM configuration:

To perform a network scan for the primary ULNM server IP address:

"Auto Discovery" ➲ "Range Scan" ➲ Create a new range for the IP address of the primary ULNM server. For example, scan from 192.168.0.10 to 192.168.0.10 if your primary ULNM agent is running on a server with IP address 192.168.0.10). Enter Administrator password for the primary ULNM agent in this scan. Confirm the primary ULNM node is now shown in the "Auto Discovery" menu.

Figure 6: ULNM range scan

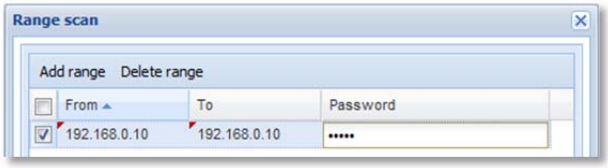
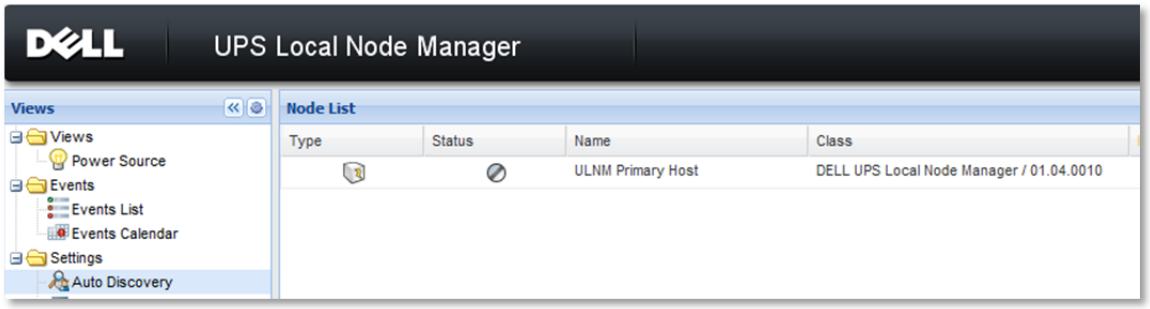


Figure 7: ULNM Settings ➲ Auto Discovery



To set the power source:

Click "Shutdown" menu ➲ "Edit Power Source" ➲ Select primary ULNM agent from drop-down menu, add primary ULNM credentials, and save the settings. Confirm that the Dell UPS is now seen in the "Power Source" menu item.

Figure 8: ULNM edit power source

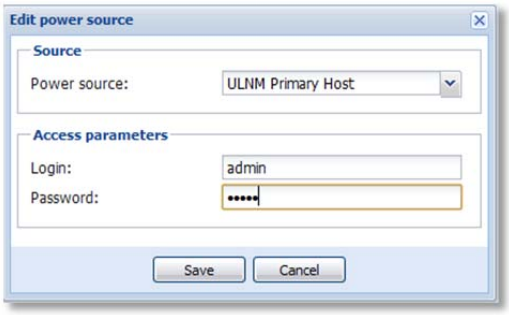
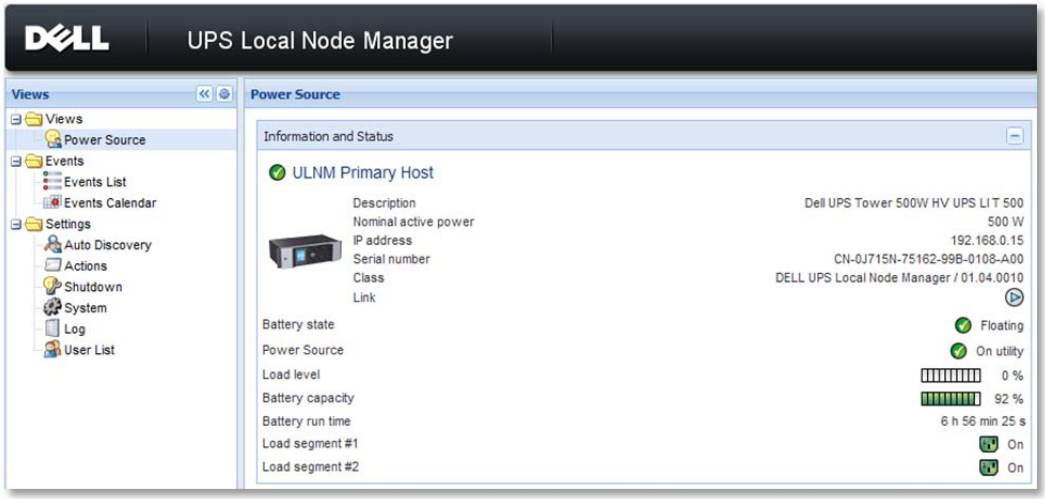


Figure 9: Power source information and status



To configure shutdown settings:

The procedure is the same as for the primary server ULNM.
Click "Shutdown" menu ➲ "Edit Shutdown Configuration" and make the appropriate settings. For an explanation of shutdown timer settings, refer to Appendix 2.

To support automatic server restart after a shutdown event, ensure that the "Outlet Shutoff Active" box is checked and check the server BIOS settings to ensure that "Auto Power On" or "Last State" is set as active.

Configuring multiple ULNM agents simultaneously

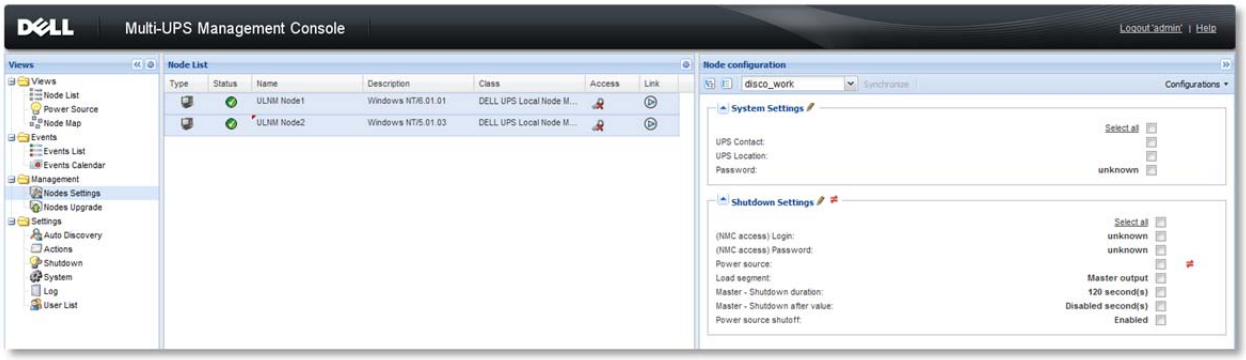
For large installations where individual ULNM configurations would be too time consuming, install the MUMC application on a remote computer and use it to configure multiple ULNM agents.

MUMC cannot be installed on a computer already running ULNM. If a remote computer is not available, MUMC can be used instead of ULNM as a shutdown agent. To do this, remove the ULNM software from the computer, install the MUMC software, and enable the Shutdown module in "System" ➲ "Module Settings." Note that the "Shutdown Controller" option is not available in MUMC, so it cannot be used as a main shutdown controller for multiple ULNM agents.

In the MUMC application:

- All ULNM agents on the same IP subnet are automatically added to the Node List. If they do not appear or are on a different subnet, perform a manual scan: "Auto Discovery" ➲ "Range Scan" ➲ "Range Scan."
- In the "Node Settings" menu ➲ Shift / Ctrl + click to select multiple ULNM agents.

Figure 10: Nodes settings ➲ Edit shutdown settings



- Edit Shutdown Settings in right hand Node Configuration menu panel:
  - Click the pencil icon .
  - Check the box for items you want to configure & enter required variables.
  - "Apply" the settings.
  - Click "Synchronize" at the top of the Node Configuration panel to send new settings to the ULNM agents. (A ≠ mark indicates values that have not been synchronized with the remote ULNM agent.)
- Click the Synchronize button to send settings.

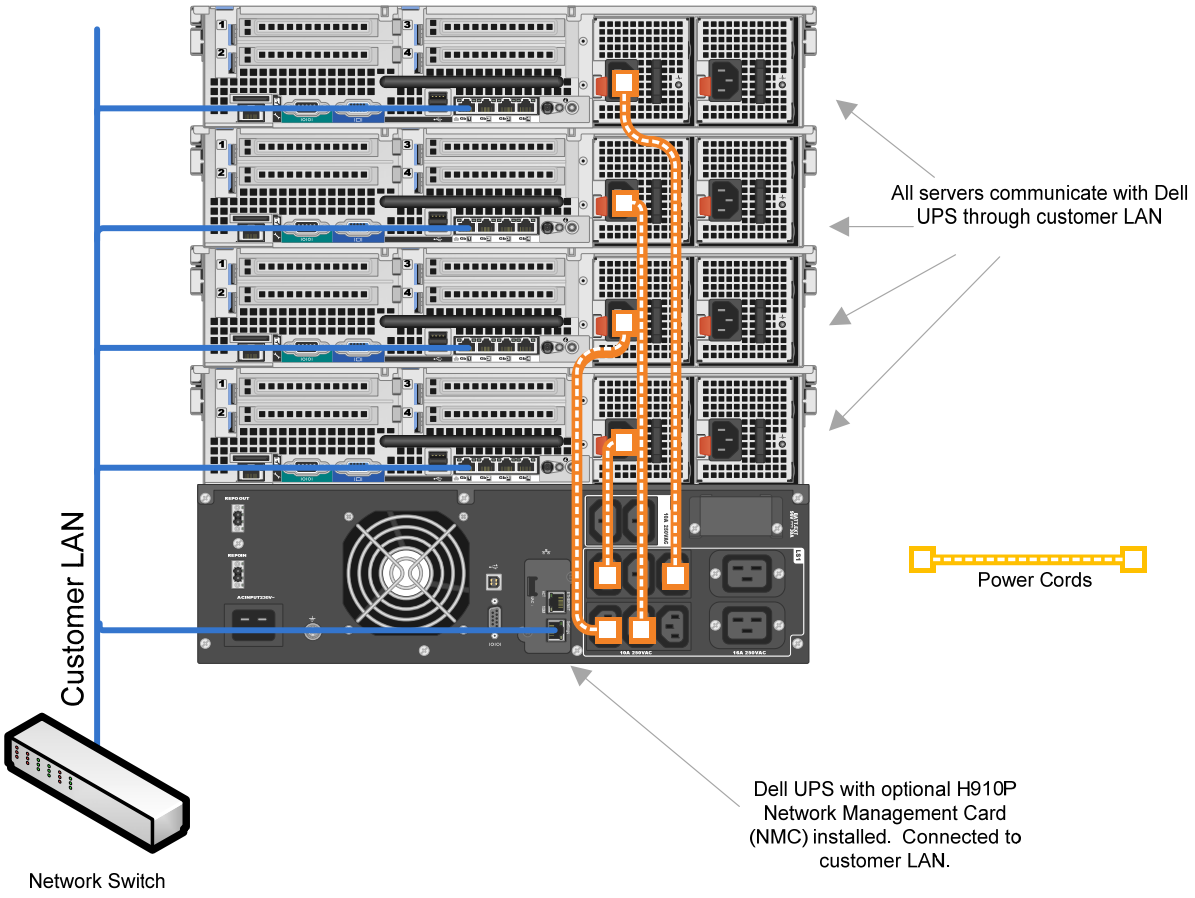
For a detailed explanation of shutdown timer settings, refer to Appendix 2.

Scenario 2: Single UPS, multiple servers, Ethernet connectivity using the NMC

In this scenario (the required scenario for managing UPSs in virtualized environments):

- All servers are powered by a single UPS.
- All servers communicate directly with the UPS for status and action information.
- UPS-to-server communication is through the Dell UPS Network Management Card.

Figure 11: Connectivity for Dell UPS with optional UPS NMC and four Dell Servers



Power cables are shown for illustrative purposes only.
For best practices for cabling, refer to the Dell UPS Cabling Guide.

Scenario 2: Connectivity

Connect the Dell UPS Network Management Card (NMC) to the customer network through a standard Ethernet cable. The NMC has DHCP enabled by default, so before proceeding, allocate a static IP address for the NMC. This can be done either through a terminal interface using the supplied serial cable, or through a Web browser (enter the NMC IP address in the address bar).

All servers should be connected to the same LAN as the Dell UPS Network Management Card.

Scenario 2: Installation notes

Ensure the Dell UPS Network Management Card has been assigned a static IP address. (See the NMC User Guide for full instructions).

Install the Dell ULNM application on all servers powered by the Dell UPS.

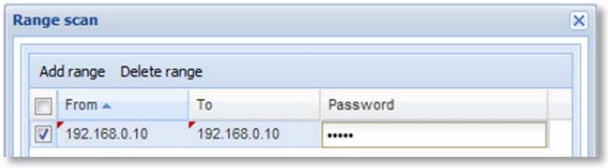
ULNM configuration:

If configuring servers individually, the steps below will be repeated for each server.
To configure multiple servers simultaneously through the MUMC (particularly desirable for larger installations) refer to the section, "Mass configuration of all ULNM agents and Dell UPSs on the network.

To connect to the Dell UPS:

After a polling process of up to a few minutes, the Dell UPS will automatically appear in the "Auto Discovery" menu within ULNM. If the UPS does not appear (or to accelerate the polling process), you can set a range within which the ULNM should scan. In "Auto Discovery," choose ➲ "Range Scan" ➲ enter a the IP address of the Dell UPS Network Management Card or a range that includes the IP address.

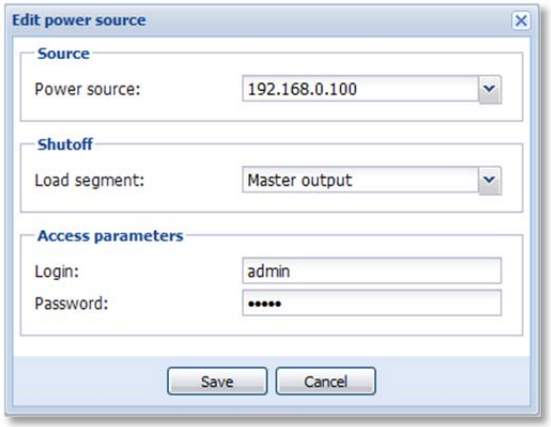
Figure 12: ULNM range scan



To define the UPS as a power source:

Right-click the UPS node within the Auto Discovery menu and choose "Set as Power Source."
Enter the access credentials to ensure the software can write new settings to the UPS NMC.

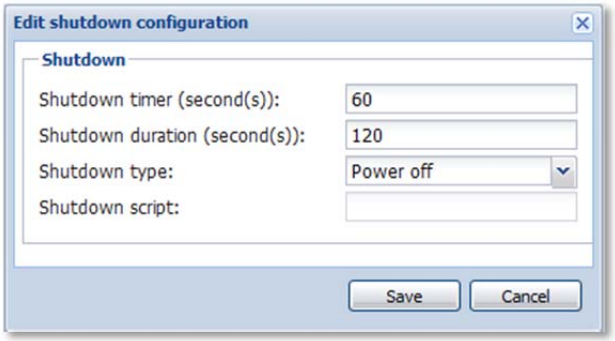
Figure 13: ULNM edit power source



To configure shutdown settings:

On the "Shutdown" menu, click ➲ "Edit Shutdown Configuration" and make the appropriate settings.
For a detailed explanation of shutdown timer settings, refer to Appendix 2.

Figure 14: ULNM edit shutdown configuration



Scenario 2: Mass configuration of all ULNM agents and Dell UPSs on a network

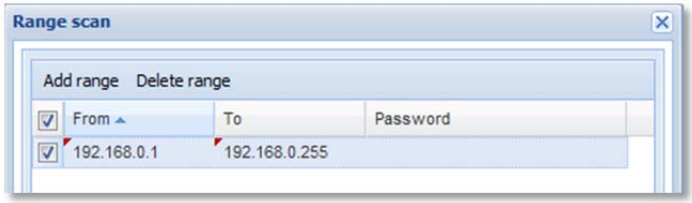
The Dell Multi-UPS Management Console (MUMC) can be used to manage, monitor and configure multiple instances of the ULNM application running on remote servers. MUMC can also manage multiple UPSs on a customer network, as well as monitor intelligent PDUs and non-Dell UPSs that conform with specific SNMP MIB specifications. (See the MUMC user guide for a complete list of supported MIBs and protocols.) Finally, MUMC can also be used as an agentless method to control VMware or Citrix virtualization hosts when used with vCenter or XenCenter. (Management of virtualization platforms is not covered in this Technical Information Note.)

To use MUMC for mass configuration of ULNM agents:

Install MUMC on a remote PC/server. MUMC cannot be installed on a computer already running ULNM. If a remote computer is not available, MUMC can be used instead of ULNM as a shutdown agent. To do this, remove the ULNM software from the computer, install the MUMC software, and enable the Shutdown module in "System" ➲ "Module Settings." Note that the "Shutdown Controller" option is not available in MUMC, so it cannot be used as a main shutdown controller for multiple ULNM agents.

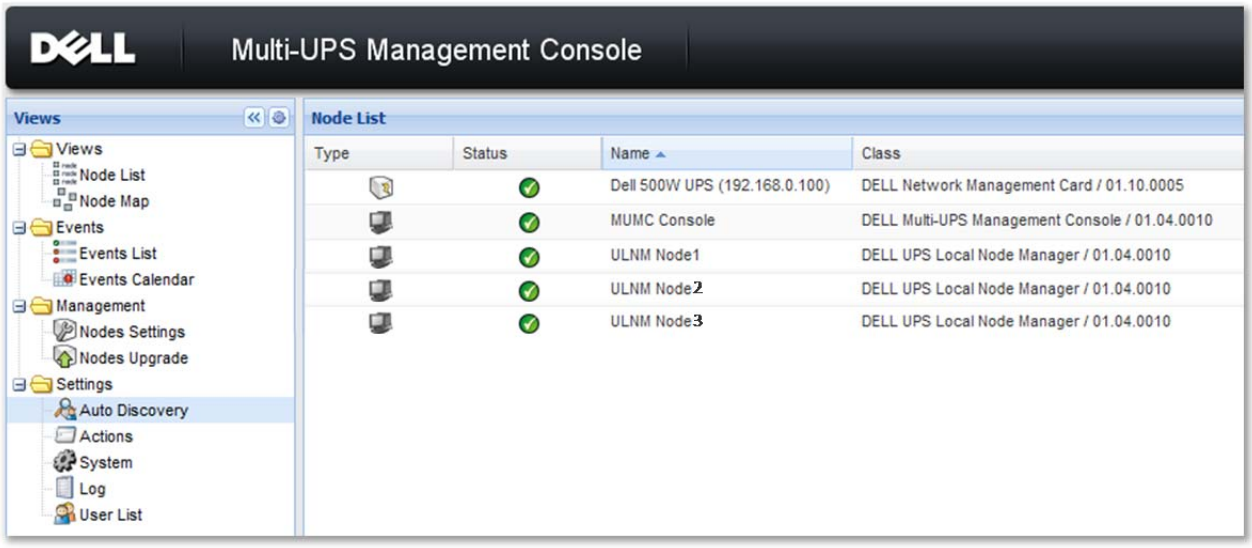
Perform a Range Scan to discover all ULNM agents and networked Dell UPSs on the network. Choose "Auto Discovery" ➲ "Range Scan" ➲ and then enter a range of IP addresses for the servers hosting the ULNM applications.

Figure 15: MUMC range scan



After the scan, confirm that all ULNM applications and the Dell UPS are shown in the Auto Discovery menu.

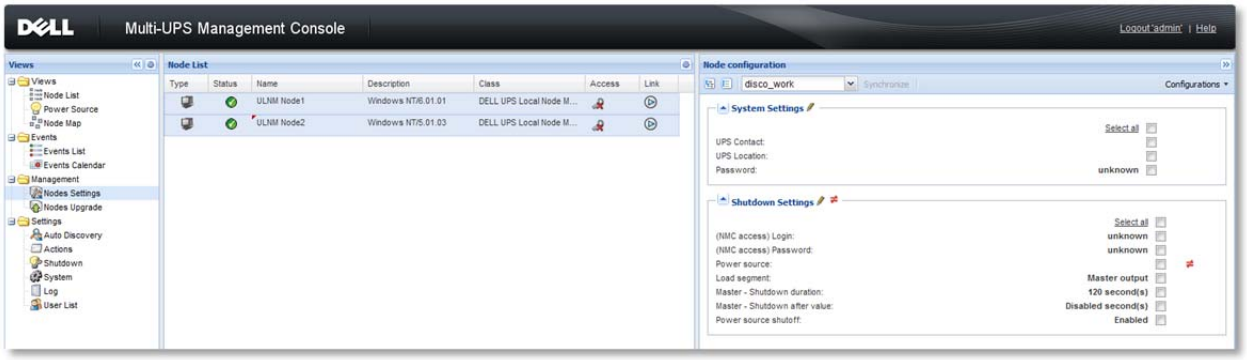
Figure 16: MUMC auto discovery ➲ node list



To perform a mass configuration of ULNM agents:

- Click "Node Settings" and Ctrl/Shift + click to select multiple ULNM nodes.

Figure 17: MUMC node settings



- Edit Shutdown Settings in right-hand Node Configuration menu panel:
  - Click the pencil icon .
  - Check the box for items you want to configure & enter required variables.
  - "Apply" settings.
  - Click "Synchronize" at the top of the Node Configuration panel to send new settings to the ULNM agents. (A ≠ mark indicated values that have not been synchronized with the remote ULNM agent.)
  - Click the "Synchronize" button to send the settings.

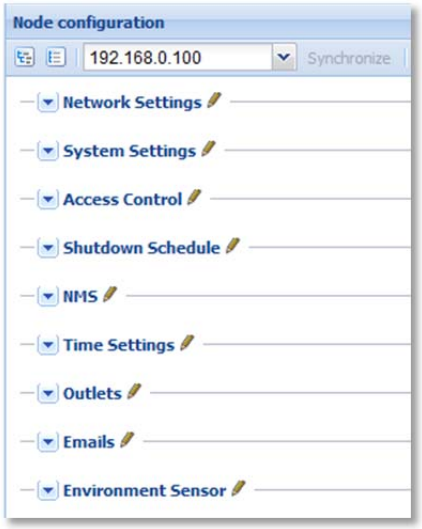
For a detailed explanation of shutdown timer settings, refer to Appendix 2.

To configure the Dell UPS:

Click on the Dell UPS node in the "Node Settings" menu.
This configuration process enables you to manage other parameters of the Dell UPS, such as:

- Network settings, such as IP address (for versions 4 and 6), SNMP and SMTP alert server settings
- System settings (language, log intervals, UPS name/contact)
- Access control (login credentials, security mode, remote firmware upload acceptance)
- Shutdown schedule (for example, shut down on weekends or weekdays after 5:30pm and turn back on by 9am the following day)
- Time settings
- Power outlet control
- Email alerts
- Environmental thresholds and alerting (with the optional Environmental Monitoring Probe (EMP)

Figure 18: MUMC node configuration

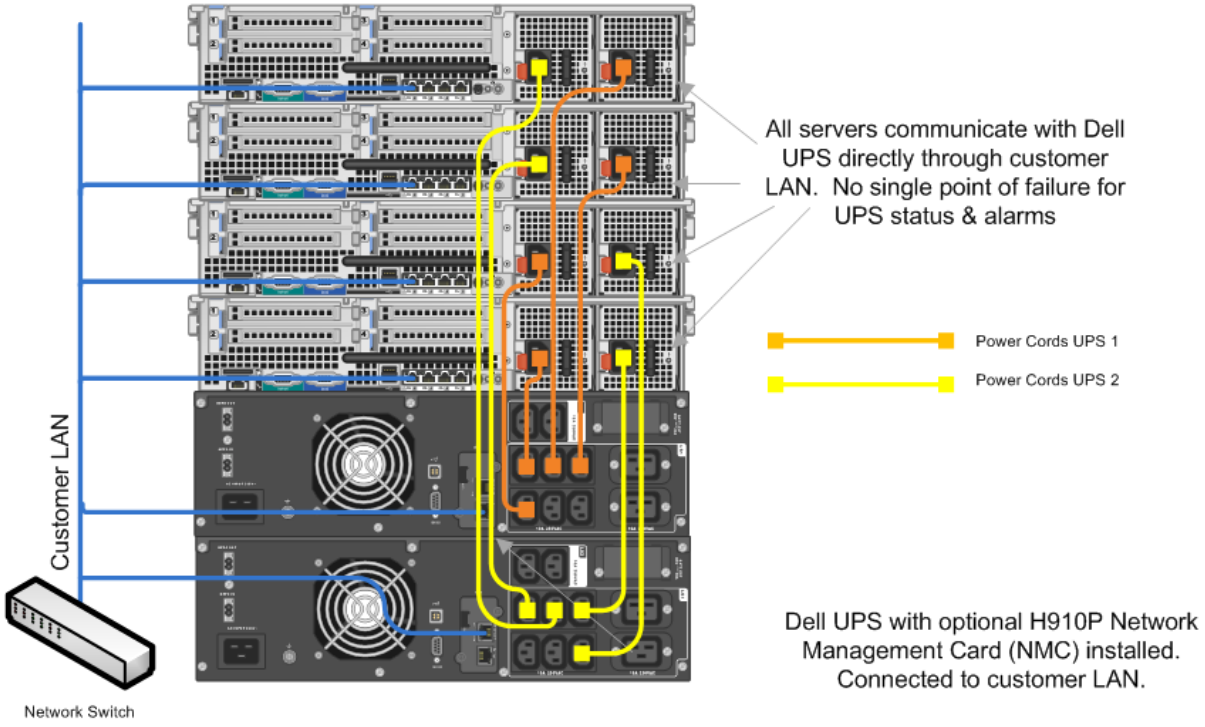


Scenario 3: Redundant UPS, multiple servers, Network (Ethernet) Management Card (NMC) connection

In this scenario:

- Server 1 is powered by Dell UPS #1 and Dell UPS #2. Server is connected by USB to Dell UPS #1.
- Server 2 is powered by Dell UPS #1 and Dell UPS #2. Server is connected by USB to Dell UPS #2.
- Server 3 connects to Dell UPS #1, Server 4 is connected to Dell UPS #2.

Figure 19: Connectivity diagram for redundant Dell UPS with LAN connection to four Dell servers



Power cables are shown for illustrative purposes only.
For best practices for cabling, refer to the Dell UPS Cabling Guide.

Scenario 3: Connectivity

Connect the Dell UPS #1 to the primary side (PSU) of servers 1 & 2 and the secondary side of servers 3 & 4.
Connect the UPS #2 to the primary side (PSU) of servers 3 & 4 and the secondary side of servers 1 & 2.

The Dell UPS in this example has the optional Network Management Card (NMC, H910P) installed, but the same setup and configuration can be applied to USB connectivity solutions. All servers and UPSs are connected to the customer LAN.

Scenario 3: Installation notes

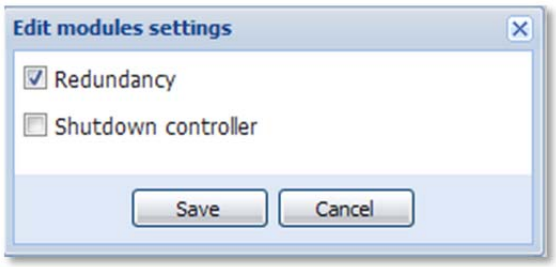
Ensure each Dell Network Management card has been assigned a static IP address (see NMC user guide for full instructions).

Install the Dell ULNM application on all servers powered by the Dell UPS.

ULNM Configuration (repeat for each server):

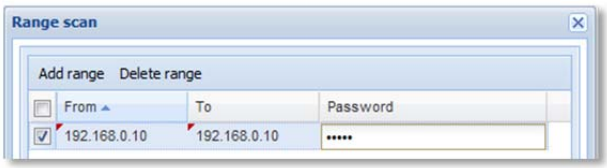
Enable Redundant UPS Support in ULNM: To turn on the support for redundant UPS configurations: System ➲ Edit Modules Settings ➲ Check "Redundancy"

Figure 20: Enabling Redundancy in ULNM



Connecting to the Dell UPSs: The Dell UPS(s) will automatically appear in the "Auto Discovery" menu within ULNM. This polling can take a few minutes. If the UPS does not appear (or to proceed more quickly), perform a "Range Scan" and enter the IP addresses of the Dell UPS Network Cards: "Auto Discovery" ➲ "Range Scan" ➲ Create new range for the IP address of the Dell UPS.

Figure 21: ULNM range scan



To set the access parameters for each Dell UPS: right click each UPS device and choose "Set Node Access Parameters" (default is admin/admin).

Figure 22: Set node access parameters

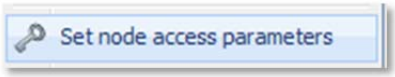
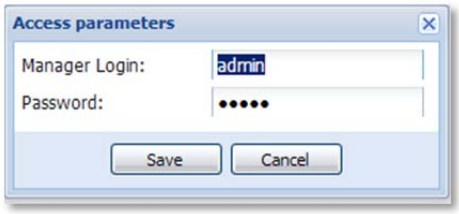
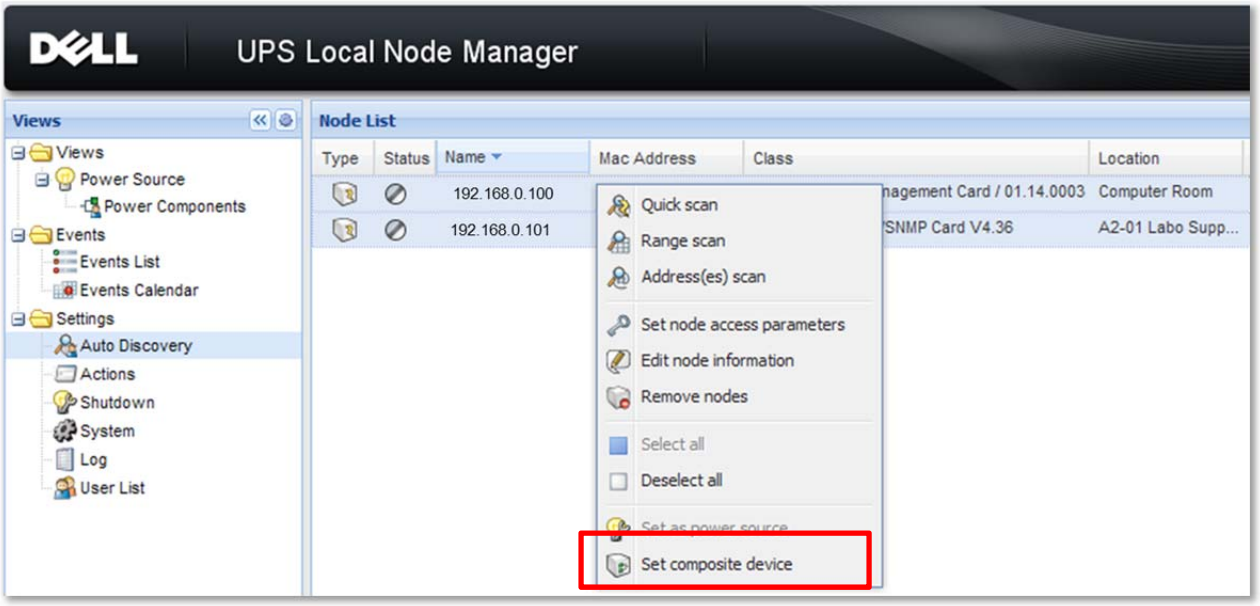


Figure 23: Access parameters



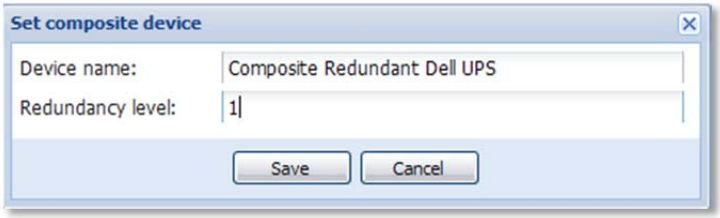
To create a redundant composite UPS device: Select the 2 (or more) Dell UPSs you wish to use in redundant configuration by Ctrl + Click the devices. Right click and choose "Set Composite Device".

Figure 24: Creating the Composite (Redundant) UPS Device in ULNM



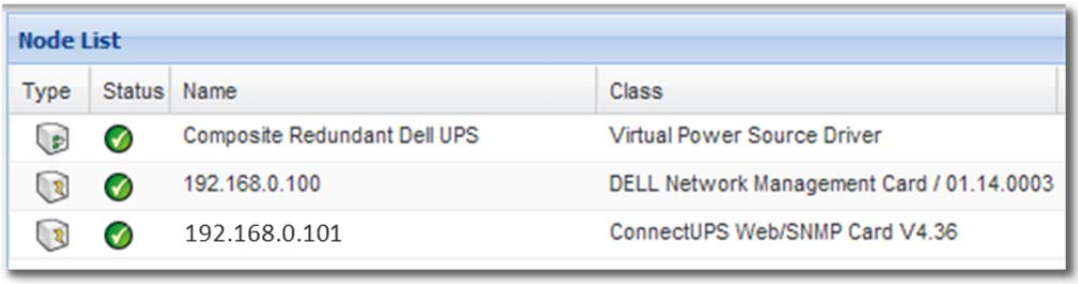
Create a name for the composite device and set the appropriate redundancy level (e.g. 1 for N+1)

Figure 25: Set composite device redundancy level



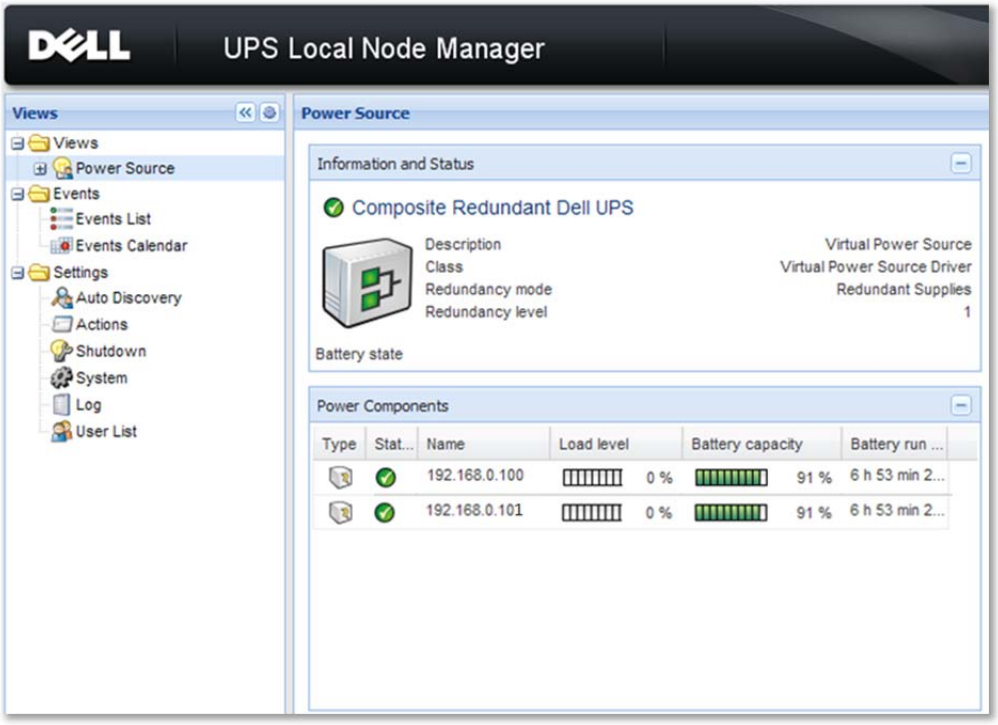
You will now see a new Composite node in the Auto Discovery Menu:

Figure 26: Node list with composite, redundant Dell UPS shown as Virtual Power Source



To set the composite redundant UPS device as a Virtual Power Source: Right click the new virtual composite device and choose "Set as Power Source". You will now be able to click on the Power Source menu view to see the composite device status:

Figure 27: Power source composite redundant device



APPENDIX I

Firewall configuration (software communication ports)

Figure 19: Firewall (software communication ports) configuration

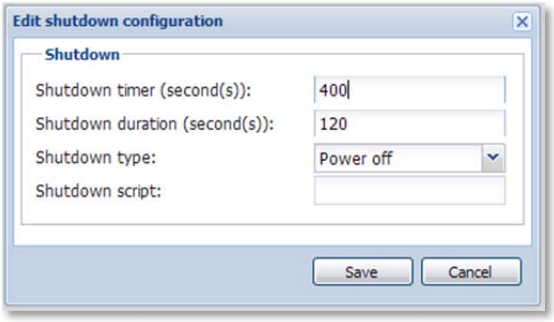
Protocol	Mode/Port	DELL MUMC	DELL ULNM	DELL ULNM with Shutdown controller	DELL NMC
SMTP	TCP/25	OUT	OUT	OUT	OUT
DHCP/BOOTP	UDP/67	x	x	X	OUT
TFTP	UDP/69	OUT	OUT	OUT	IN
HTTP	TCP/80	OUT	OUT	OUT	IN
NTP	UDP/123	x	x	x	OUT
SNMP	UDP/161	OUT	OUT	OUT	IN
SNMP Traps	UDP/162	x	x	x	OUT
UNMP	UDP/200	IN/OUT	IN/OUT	IN/OUT	x
HTTPS	TCP/443	OUT	OUT	OUT	IN
Dell Supervision	TCP/4679	IN/OUT	IN/OUT	IN/OUT	x
Dell Notification Broadcast	UDP/4679	IN/OUT	IN/OUT	IN/OUT	IN/OUT
Dell SSL Supervision	TCP/4680	IN/OUT	IN/OUT	IN/OUT	x
Dell Alarms Broadcast	UDP/4680	IN	IN	IN	OUT
Dell Connected Alarms	TCP/5000	OUT	OUT	OUT	IN
Dell Connected Alarms	TCP/5001	OUT	OUT	IN	x

APPENDIX 2

Shutdown settings

To configure shutdown settings: Specify how you want the server(s) to respond to a power failure by accessing the Shutdown menu ➲ Edit Shutdown Configuration. Refer to the MUMC, ULNM and NMC card user guides for detailed information about available settings and script options.

Figure 28: Edit shutdown configuration



Shutdown setting listing and description

The color-coded text below corresponds to Figure 29, "UPS battery capacity over time." Figure 30, "Shutdown Sequence" describes effect NMC card and UPS settings have on UPS operation.

The following information is from the MUMC client and Dell's node manager User's Guides. Text modified to include examples of settings.

A. **Remote Maintenance**: Choose "Enabled" to set the host(s) to "Maintenance Mode" in the event of a power outage. If your hosts have vMotion enabled then the VMs will automatically move from this host to another when power fails.

B. **Maintenance Timer:** This is the time between power failure and the command to set the host to maintenance mode. -1 = immediate action.

C. **Remote Shutdown:** Disabled will leave the host in maintenance mode. Enabled will shut down the hypervisor once all VMs have been evacuated.

D. **Remote Shutdown of Virtual Machines:** Use this setting in HA clusters where the normal host VM Startup/Shutdown settings are disabled. This feature will shut down VMs with VMTools running on an HA host but will not allow preferential VM startup. The MUMC client will poll the host to check the status of VMs, and once all are shut down (no VMTools devices still running), the MUMC client will issue the shutdown command to the host.

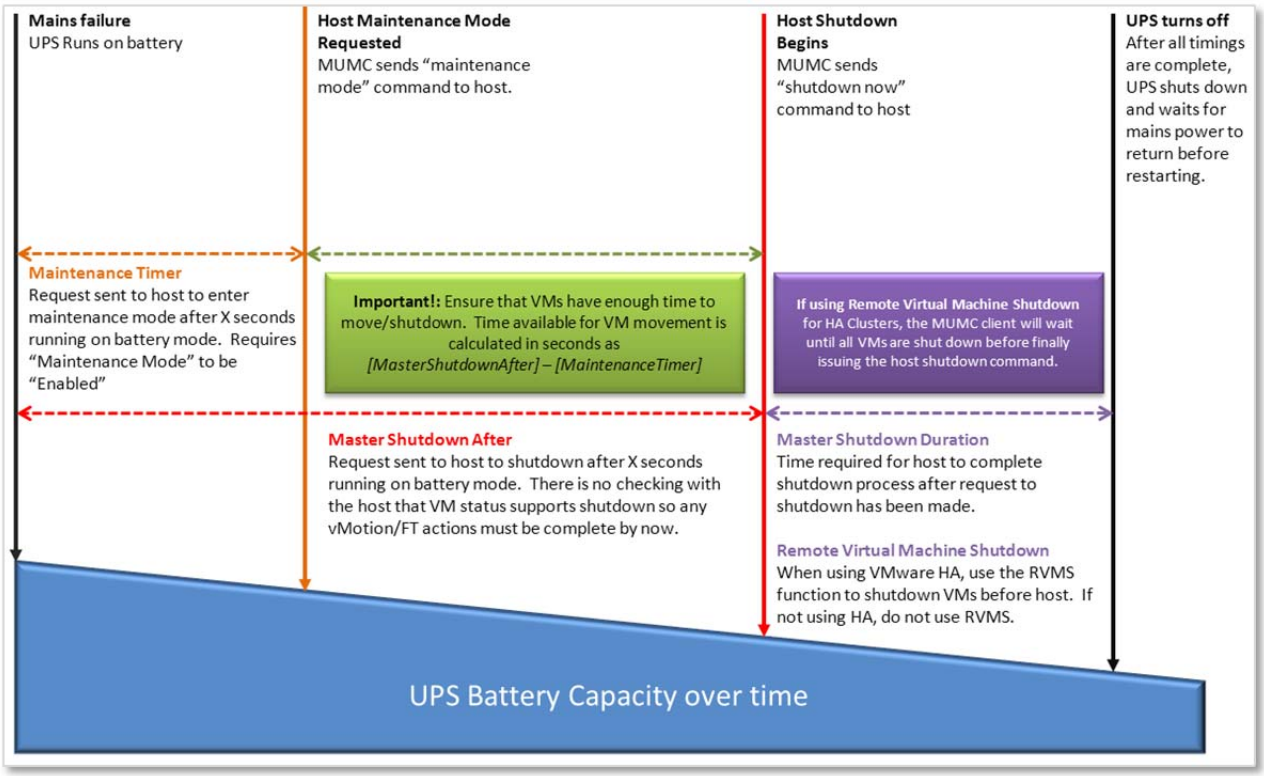
E. **Power Source:** Enter the IP address of your Dell UPS.

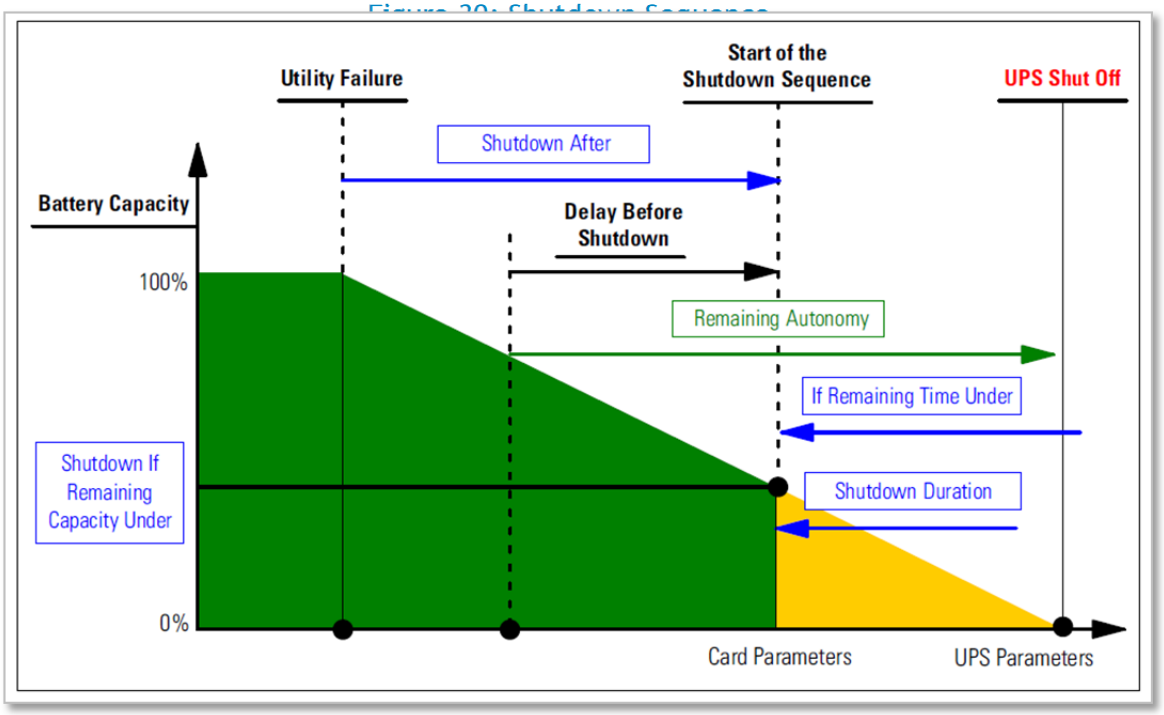
F. **Load Segment:** Only use this variable if you are using Load Segments to preferentially control hardware startup/shutdown behaviour (e.g. servers and storage on separate profiles).

G. **Master - Shutdown Duration:** The time (in seconds) it takes for the host to shut down (including any vMotion activities). Make sure that the time between "**Maintenance Timer**" and "**Master - Shutdown After**" gives enough time for any VM migrations to occur. Otherwise the migrations will fail and the VM will shut down on the original host location.

H. **Master - Shutdown After:** The time (seconds) following a power failure that the shutdown command should be sent to the host.

Figure 29: UPS Battery capacity over time




Utility Failure
Start of the Shutdown Sequence
UPS Shut Off
Shutdown After
Battery Capacity
Delay Before Shutdown
100%
Remaining Autonomy
If Remaining Time Under
Shutdown If Remaining Capacity Under
Shutdown Duration
0%
Card Parameters
UPS Parameters