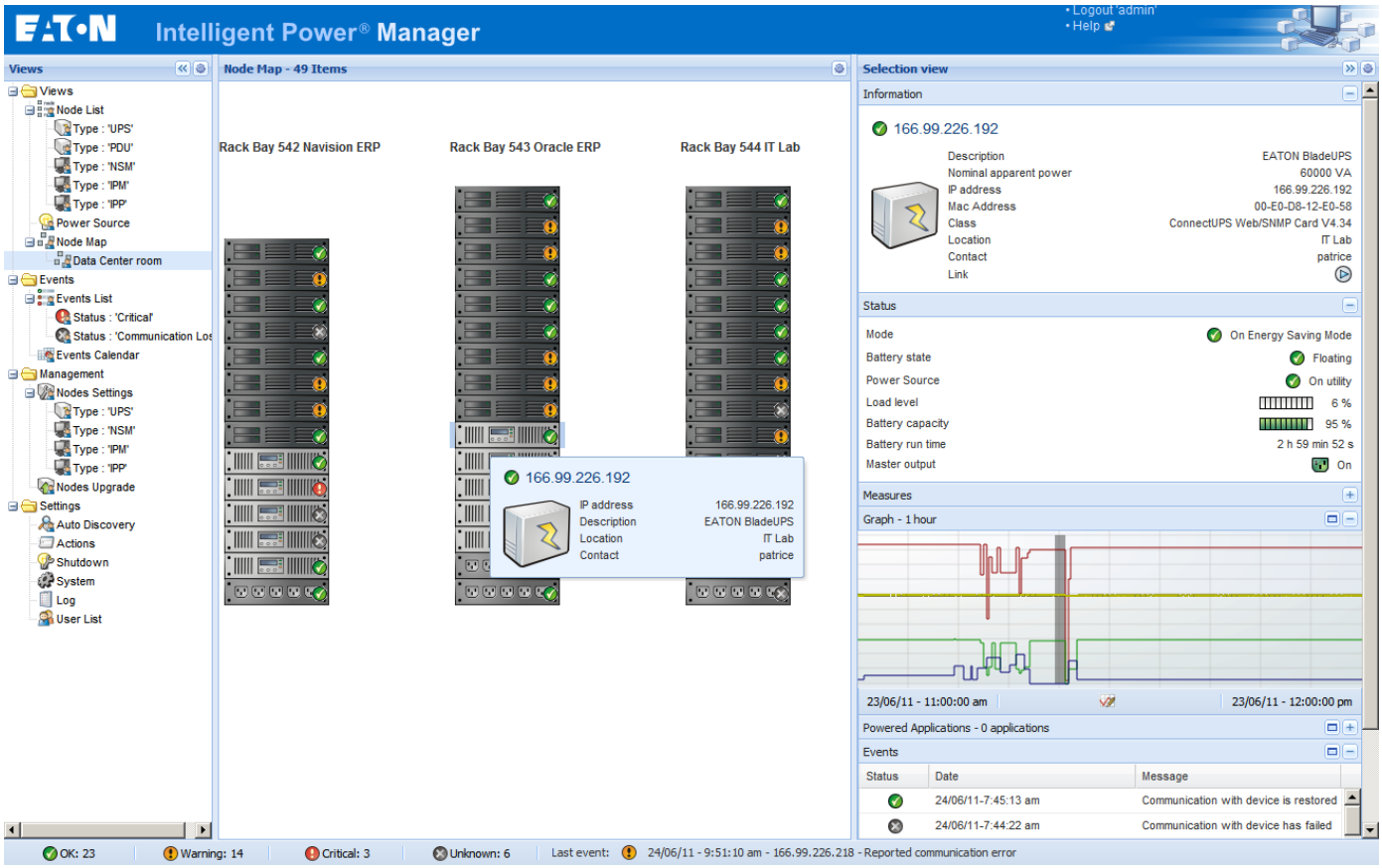
Eaton Intelligent Power® Manager

User's Guide



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1 Introduction

Intelligent Power® Manager is Eaton's power device supervision tool for IT environments.

Intelligent Power® Manager:

- Discovers and **supervises Eaton UPSs and ePDUs** connected to the network (either by means of a card or a proxy). For the detailed list of compatible solutions, please refer to the paragraph (Equipment Compatibility List) hereafter.
- **Supervises** the **remote servers** hosting the Intelligent Power Protector or Network Shutdown Module V3 application.
- Provides **advanced management feature** (mass configuration / mass upload/ …) with Network Management cards: Network-MS (ex 66102 / 103006826) and Modbus-MS (ex 66103)
- Provides **local computer graceful shutdown** (acquisition through Network-MS (ex 66102 / 103006826) and Modbus-MS (ex 66103) Network Management Cards.

2 Installation

2.1 Installation Prerequisites

2.1.1 On the System Hosting « Intelligent Power® Manager »

Intelligent Power® Manager can be installed on **Windows 2000 / XP / 2003 / Vista / 2008 / Windows 7**

Notes:

For better performance with multiple nodes, we recommend a Windows server OS (that doesn't have the limitation of 10 simultaneous network connections).

To avoid network access conflicts, we advise you against installing the Power Manager on a machine that also hosts:

- a Network Management System (e.g. HP-Openview, CA Unicenter, …)
- the Intelligent Power Protector
- the Eaton Enterprise Power Manager
- the Eaton Network Shutdown Module
- the Network Management Proxy

2.1.2 On the System that Displays Web-based Graphical User Interface

The Eaton Intelligent Power® Manager graphical interface can be accessed remotely using a simple Web browser. Access to this interface is secured through SSL connection (default configuration) and is also secured through Login & password.

The Intelligent Power® Manager graphical interface has been tested with:

- Google Chrome
- Mozilla Firefox 6
- Microsoft Internet Explorer (*) 7, 8, 9

  For optimal performance, Google Chrome or Firefox 6 is recommended.
  For good performance Internet Explorer 7, 8 are recommended.
  (*) IE6 should work, however, performance is limited

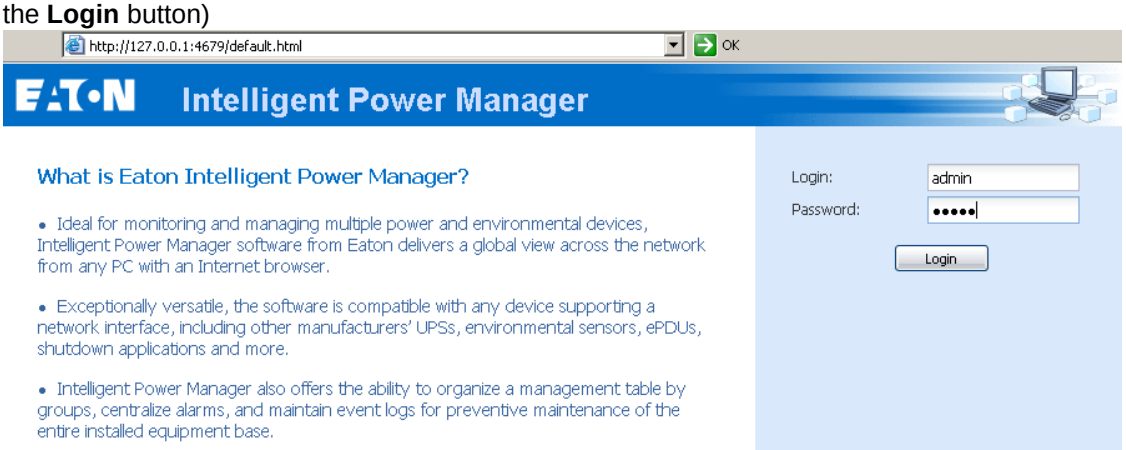
2.2 Quick Start & Installation

To start in 5 minutes, please perform the following steps:

Step 1 (Installation)

On a Windows 2000/XP/2003/Vista/2008/7 machine, run the “Intelligent Power® Manager” package under an administrator account.

A Web browser is automatically displayed (enter **admin** as Login **/ admin** as Password and click on the **Login** button)



Step 2 (Configuration)

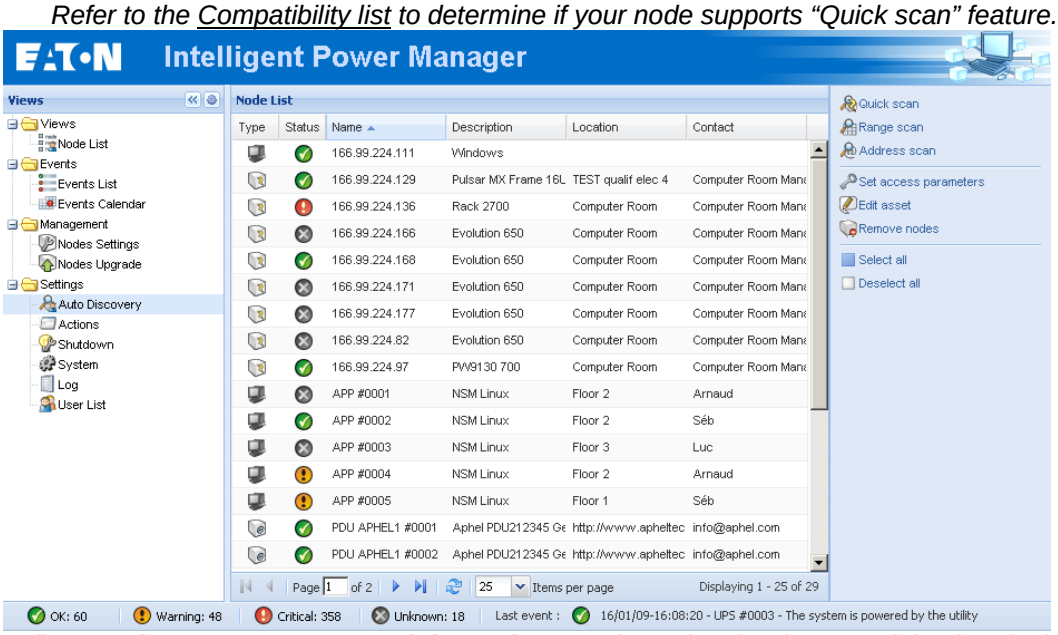
When started, the application automatically performs a **Quick scan**.

- *Using the Quick scan operation, you will discover through broadcast within a few seconds: Network Management Cards Network-MS (ex 66102 / 103006826) and Modbus-MS (ex 66103), PXGX2000, PXGX-UPS, ConnectUPS BD, ConnectUPS X, ConnectUPS MS, Intelligent Power Protector, Network Shutdown Module V3, new Eaton ePDU, new HP UPS Card, new Dell UPS Card, new IBM UPS Card.*

The discovered nodes are displayed in **Settings → Auto Discovery**

Some nodes might not be discovered by quick scan if they do not support that function or if they are not in the same subnet as IPM. To discover such nodes, please perform the discovery based on IP address ranges (**Range scan**)

- *Using the Range Scan operation you will discover the nodes that are outside of the Network segment and nodes that are not compatible with the "Quick scan" feature.*
  Refer to the Compatibility list to determine if your node supports "Quick scan" feature.



(Optional) In **Settings -> System-> Module Settings**, activate the shutdown module, then in the **Settings → Shutdown** page; assign the IP address of the UPS that powers the local Computer.

In the **Settings → User List** page, assign the access rights through "login and password"

Step 3 (Enter the License code)

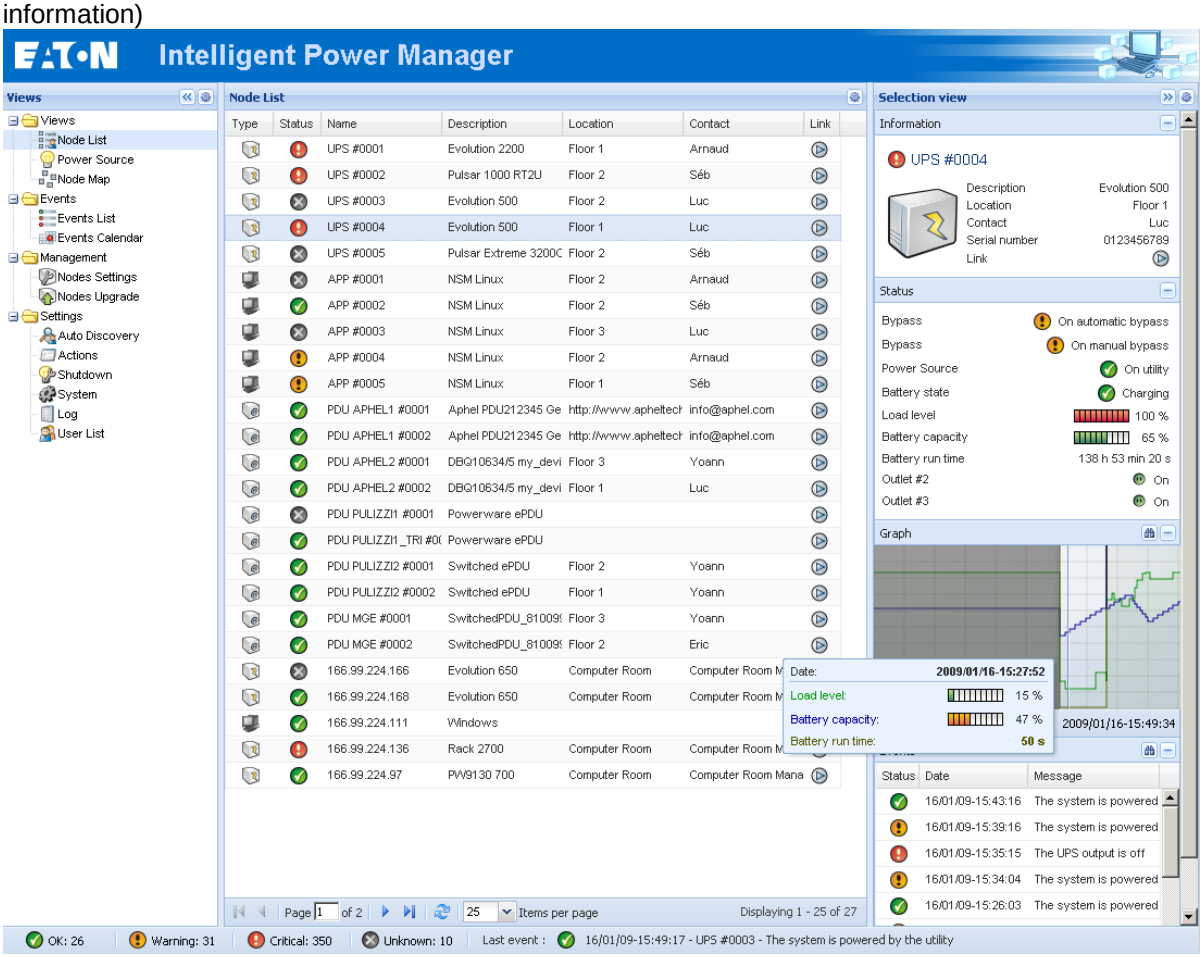
IPM monitors up to 10 devices ("UPS Web Card", "ePDU" or "IPP Shutdown Controller") without a license key. If there are more devices to be monitored an appropriate license is needed. License can be upgraded also later without reinstallation.

(Only for the "Silver" or "Gold" paid versions) In the **Settings → System → Edit system Information**, enter the license product key that is printed on the commercial CDs booklet (Inside the CD case):
=> ref 66925 Intelligent Power® Manager Silver License (11 to 100 device nodes)
=> ref 66926 Intelligent Power® Manager Gold License (101 to Unlimited devices nodes)

The nodes that are not managed due to license limitation will appear with this icon .

Step 4 (Operation)

The **Views → Node List** menu item allows you to supervise the current state of the compatible power devices & applications (select a line in the list and the panels are updated with selected device information)



The **Views → Power Source** menu item allows you to supervise the current state of the UPS that powers the server running Intelligent Power® Manager. This menu is available when the user has enabled the shutdown module is System Settings.

The **Events → Event List** view allows you to view the device events.

The **Management** section allows you to “mass configure” and “mass upgrade” cards.

2.3 Installation Result

- If you install a new Intelligent Power® Manager Release without uninstalling the old one you will keep your database and your product information.

- At the end of the installation, the following shortcuts are created in the group:
  Start → Programs → Eaton → Intelligent Power Manager

Name	Description
Open Eaton Intelligent Power Manager	Starts the main "Intelligent Power® Manager" graphical interface
Start Eaton Intelligent Power Manager	Starts the service
Stop Eaton Intelligent Power Manager	Stops the service
Uninstall Eaton Intelligent Power Manager	Uninstalls the Program

- A service called « Eaton intelligent Power Manager » is also created for the Database Acquisition Engine.
  This program continuously polls the status of Eaton devices and Applications connected on the network.
  This service automatically starts on machine boot-up.
  This service provides the Web Interface.

- A System Tray Icon displays the alarms on the local computer. A right click on this icon displays the same shortcuts as in the Windows Start menu.

2.4 Uninstalling the Product

- From the **Add/Remove** programs item of the control panel, execute the "Eaton Intelligent Power Manager Vx.xx" package.
- You can also uninstall from the shortcuts:
  Start → Programs → Eaton → Intelligent Power Manager → Uninstall Eaton Intelligent Power Manager.
  This will remove the database and the custom files if you confirm it.

2.5 Upgrading the Product

Please refer to the Checking for Upgrades Paragraph.

3 Configuration

3.1 Configure the Nodes

Each node (Network Management Card / Proxy / Application must have a valid IP address (or a DNS name) in the range that you have entered for auto-discovery. Refer to the compatibility list.

"Intelligent Power® Manager" automatically receives the alarms (through notification or polling) without specific configuration on the card, proxies or applications.

For SNMP communication, check the community name.
Default community name is configured in Settings → System → Default Community Name
A specific community name can be defined for each IP range in Settings → Auto Discovery → Range Scan → Password

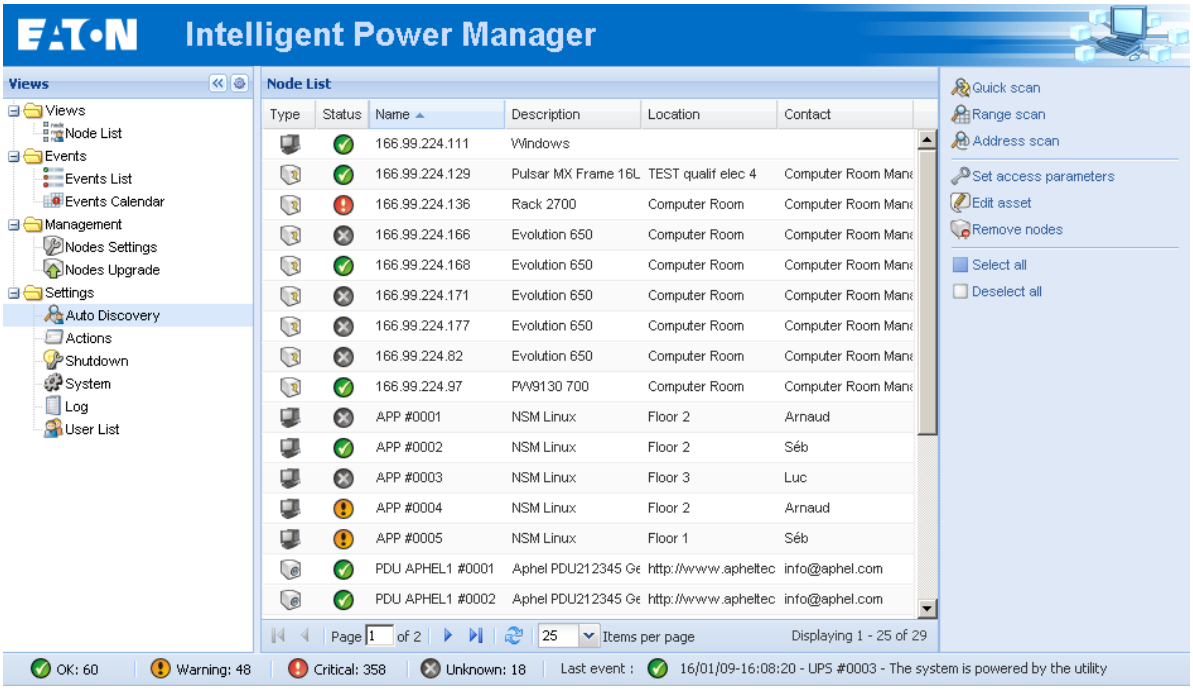
3.2 Intelligent Power® Manager Settings

Start the "**Intelligent Power® Manager**" main graphical interface from the previously created shortcut, and then click on the **Settings** menu item.

3.2.1 Discover the nodes Connected on the Network

From the **Settings → Auto Discovery** item; the following discovery methods are available:

- Quick Scan (automatically performed when application starts)
- Range Scan
- Address Scan



Notes:

- The Quick scan request is a Broadcast frame on 4679 IANA reserved port and 69 standard TFTP port.
  Using the Quick scan operation, you will discover through broadcast within a few seconds: Network Management Cards Network-MS (ex 66102 / 103006826) and Modbus-MS (ex 66103), PXGX2000, PXGX-UPS, ConnectUPS BD, ConnectUPS X, ConnectUPS MS and Intelligent Power Protector or Network Shutdown Module V3.

- For the other nodes, please perform the discovery based on IP address ranges (**Range scan**) Using the Range Scan operation you will discover the nodes that are outside of the Network segment and nodes that are not compatible with the ”Quick scan” feature.

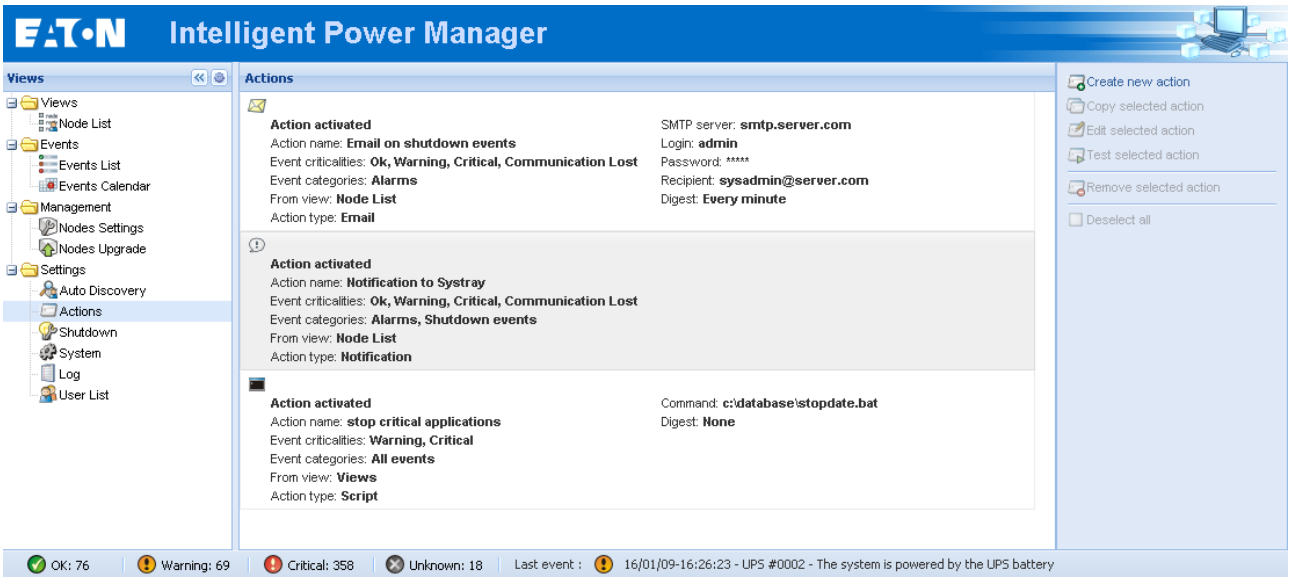
- Address Scan performs a single address scan (or several IP addresses separated by ; character)

3.2.2 Configure Actions

You can define the way users will be notified when node events happen.

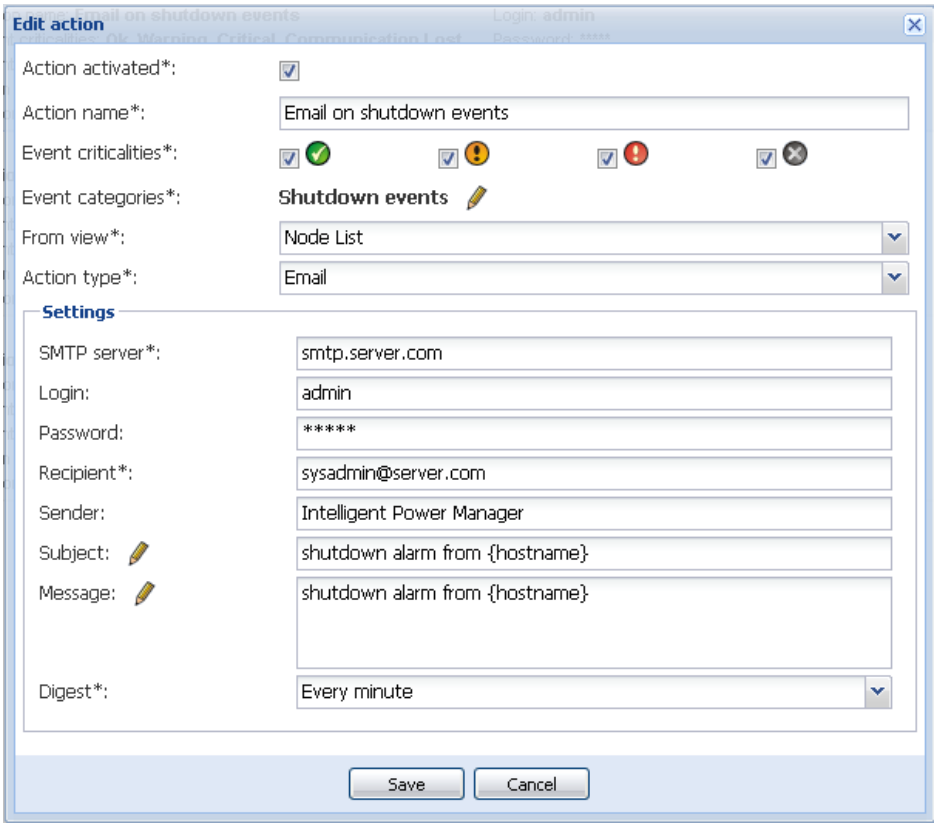
From the **Settings → Actions** item; the following channels are available:

- E-mail
- Execute script/program
- Notification to Alarm Box available through System Tray Icon



Notifications summary window

The **Create new action button** will display following interface:



Note: The "*" fields are required.

Events filter:

You can filter the e-mail notification according to:

- The event criticality. (Critical, Warning, Normal, Communication Lost).
- The event category (All Events, Alarms, Shutdown events, Power events, Measures). The pen icon allows editing and selecting the event category.
- The view that triggers the event.

Note on Event Criticality parameter:
With this parameter, you can filter the notification according to the event level. Refer to the event list provided below in this document. If you select "Critical" as filter you will not receive the associated "Normal" event informing that the device status changes from "Critical" to "Normal".

E-mail:

To receive emails on UPS events:

- You have to indicate the **SMTP server address** and **recipient e-mail address.**
  Login and password are used when SMTP server requests authentication.

For advanced use:

- You can **Customize the subject** e.g. if you use a third party service provider to translate e-mails into SMS.
- You can specify that you want to receive a consolidation of the alarms that occurred during a delay that you can choose (if you specify **no delay**, each alarm will generate an e-mail. With this settings you will receive more emails for the same number of events)

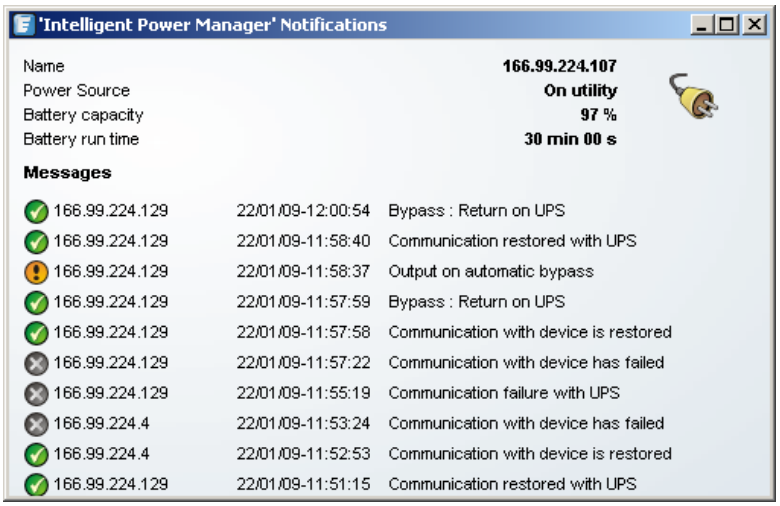
Execute script/program:

In order to execute a program on UPS events, the program path will be required.
Note: The program is executed under the SYSTEM account.

- If an action (script or program) can not be executed under SYSTEM account, it is necessary to modify the execution context before it can be run.
  To allow a user to run specific tools and programs with permissions that are different from those assigned to the user's account use the Windows “RunAs” Command which allows you to save the password (Windows XP Service Pac 2 and more recent versions).
  Use the following Microsoft command:
  ```
  runas /profile /user:<my login> /savecred <my_program.exe>
  ```
  On first execution a password is required; it is saved for subsequent executions.

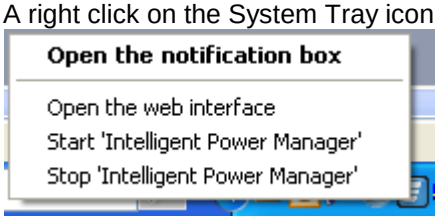
Alarm box notification:

The alarms are displayed on the local computer in an alarm box.
The status part of the alarm box is optional (It only appears if a Power Source has been declared in the Shutdown configuration)



The alarm notification box is accessible from the System Tray icon. Click on the icon to open the window that displays the alarms on the local computer.

A right click on the System Tray icon provides you a fast access to following functions:



If no Power source has been declared, the System Tray icon can have following states:

(blue)	System Tray Icon correctly receives alarms from Intelligent Power® Manager
(grey	Communication is lost between System Tray and Intelligent Power® Manager

If a Power source has been declared, the System Tray icon can have following states:

	System Tray Icon correctly receives alarms from Intelligent Power® Manager (AC is present on the

	Power source)
	System Tray Icon correctly receives alarms from Intelligent Power® Manager (The Power Source runs in battery mode)
	System Tray Icon correctly receives alarms from Intelligent Power® Manager (A Warning event occurred on Power Source)
	System Tray Icon correctly receives alarms from Intelligent Power® Manager (A critical event occurred on Power Source)
	Communication with Power source has failed

Advanced events and actions customization:

In Intelligent Power® Manager installation folder, you can see a *configs/scripts* folder containing a sample user-defined action script (*sample_user_script.js*).
You have the possibility to modify this script or create new scripts that define very specific events and actions. The sample script provides details about the expected structure and syntax for defining new actions and triggers.

Advanced sound alarm customization:

To configure sound alarms on events, please configure IPM like this:

Step 1)

In `C:\Program Files\Eaton\IntelligentPowerManager\configs\config.js`

Change the following configuration:

```
'systray':
{
'soundAlarm': false,
'notificationIcon': true,
'notificationBox': true
}
```

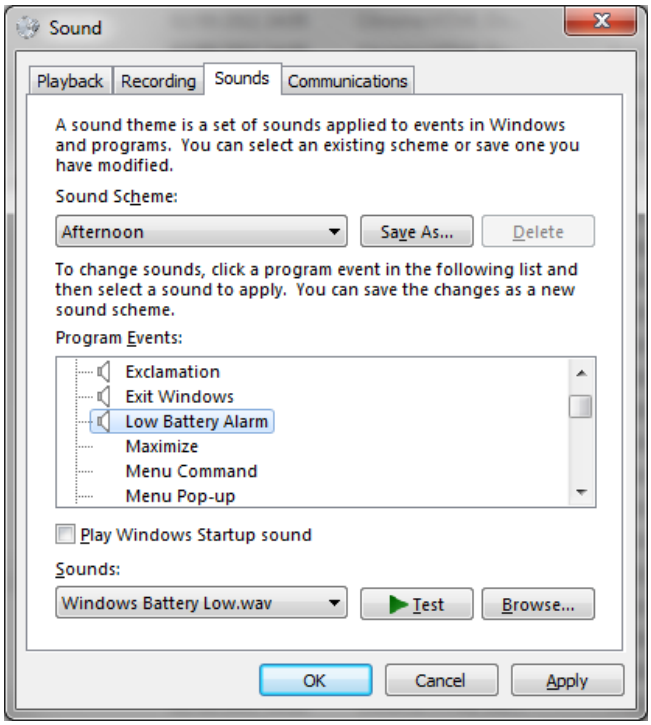
into this one:

```
'systray':
{
'soundAlarm': true,
'notificationIcon': true,
'notificationBox': true
}
```

Step 2)

Close and restart the Windows user session so that this configuration is taken into account

Note:
You can change the alarm sound by setting the Windows sound preferences from Control Panel.



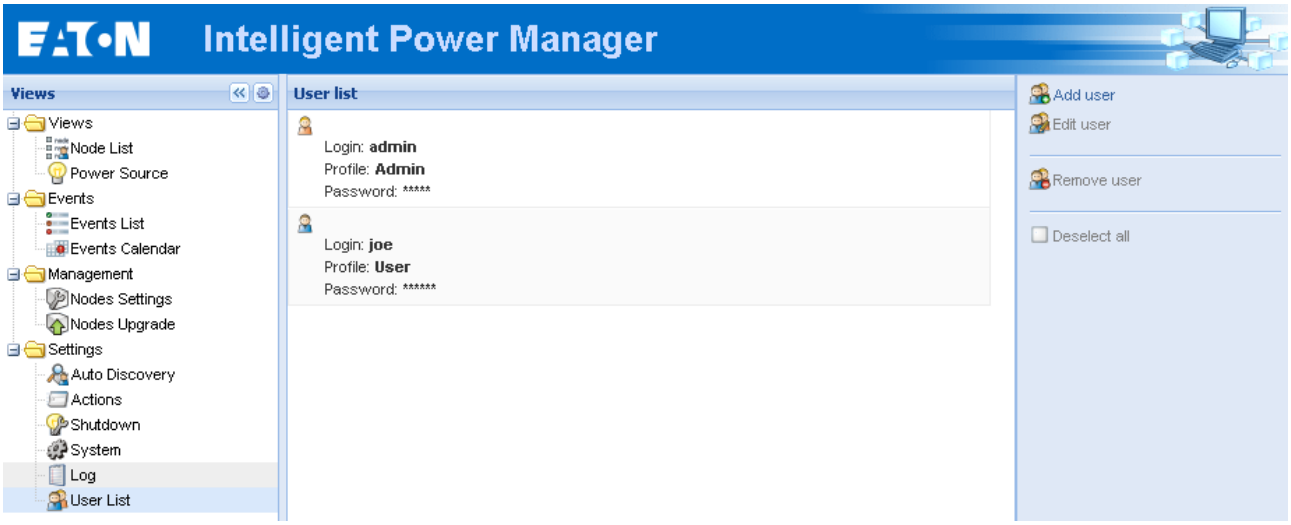
The IPM alarms are linked to the "Low Battery Alarm" sound that you can change by selecting another wav file.

3.2.3 Configure User Accounts

Multiple user accounts can be configured.

From the **Settings** menu Item, select the **User List** item, then perform the following steps:

- Click on Add user.
- Enter the **User Login** and the **User password**.
- Select the **User's Profile** level. The following levels are available:
  > **admin** (the user will be able to access all the features)
  > **user** (the user will only access the visualization and is not able to set changes to the system or nodes).
- Click on **Create new user** button.



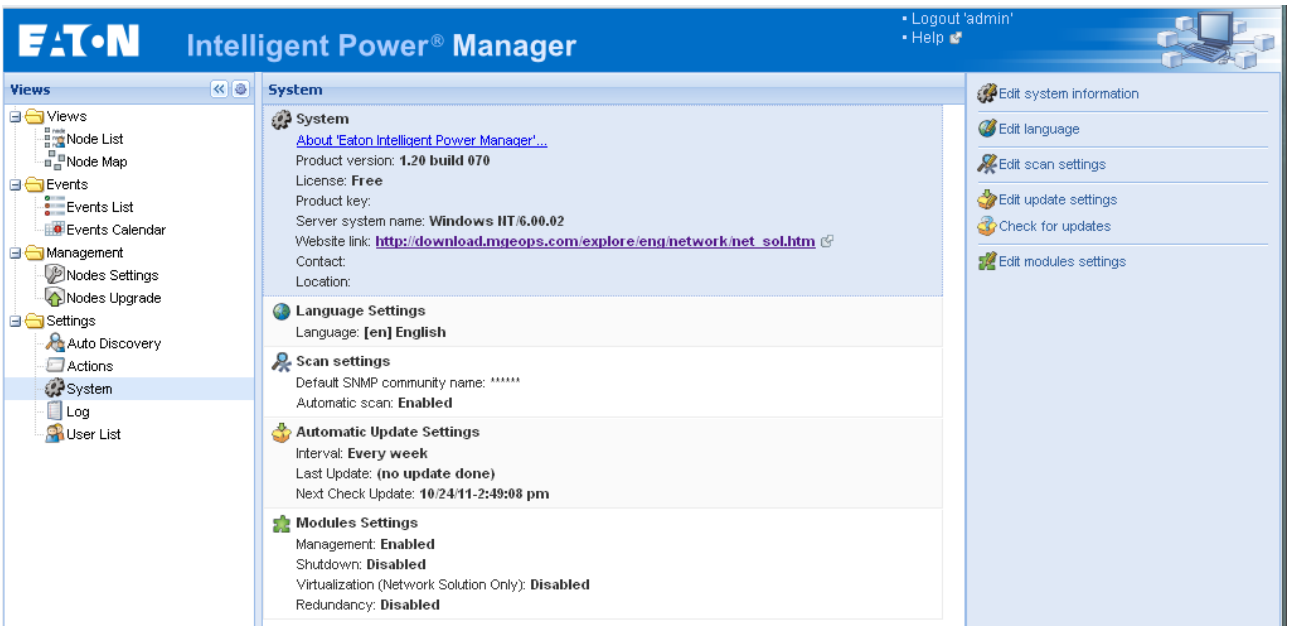
User Accounts window

Intelligent Power® Manager contains a default Administrator profile with

- admin as login
- admin as password

It is strongly recommended to change these settings immediately after installation.

3.2.4 System settings



System settings

Select one of the items, and then click on the corresponding button on the right.

- Edit language allows the user to change the user language. (Czech, English, French, German, Japanese, Korean, Polish, Portuguese, Russian, Simplified Chinese, Spanish, Traditional Chinese are currently supported)
- Edit community name changes the default SNMP community name for discovery (default community name is public)
- Edit updates & Check updates will provide Automatic Updates Features.
  This feature gives you access to Eaton software updates.
  Intelligent Power® Manager will always be up to date if you select the **Check automatically** option.
  When a new software version is detected on www.eaton.com, just follow the wizard instructions.
  Note: Database information will be retained with this operation.
- Modules settings will Enable / Disable the optional modules Management, Shutdown or Virtualization).

4 Supervision

4.1 Access to the monitoring interface

To monitor Eaton devices already discovered on the network, start the main “Intelligent Power® Manager” interface. You can access the same interface locally or remotely.

4.1.1 Local access

- From the system where the supervisor is installed, you can use the following shortcut:
  Start -> Programs -> Eaton -> Intelligent Power Manager ->Open Eaton Intelligent Power Manager

4.1.2 Remote access

- From a remote machine, you can type the following URL in a Web browser
  https://<name or IP address of computer hosting IPM>:4680/
  or
  http://<name or IP address of computer hosting IPM>:4679/

- In SSL mode, accept the certificate (by clicking on Yes)

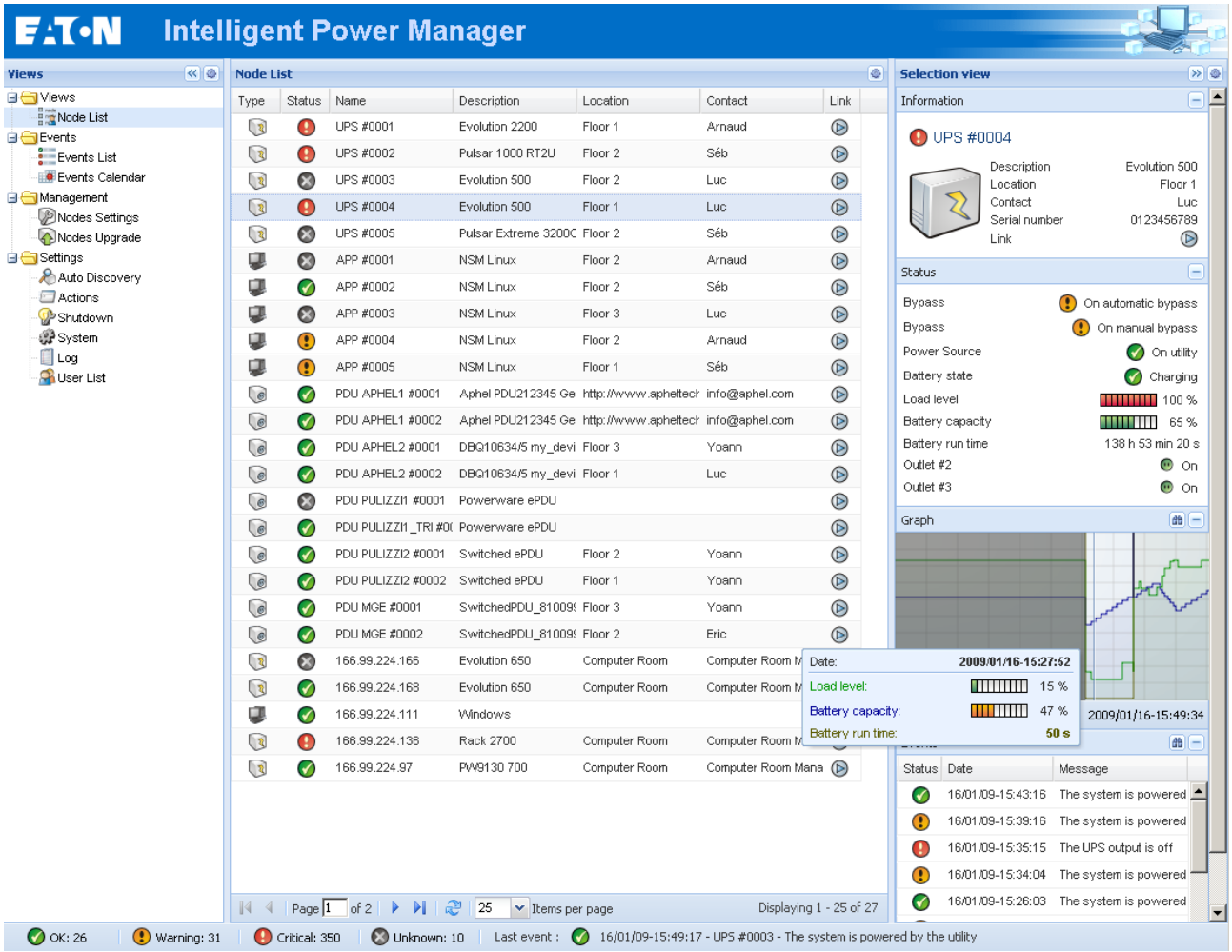
Accepting the SSL Certificate

To install the certificate on IE7 for Vista, you need to perform the following steps:

> Run IE as an administrator (Right-click the desktop icon)
> Visit the IPM site.
> Click through the certificate error
> Click the "Certificate Error" button in the address bar.
> Click View Certificate
> Click Install Certificate
> Click the “Place all certificates in the following store” radio button, and choose the “Trusted Root Certification Authorities” store. If you don’t do this, the certificate goes in your personal store, and it isn’t trusted by IE.

- Enter the Login and Password

4.2 Node List View



Node List

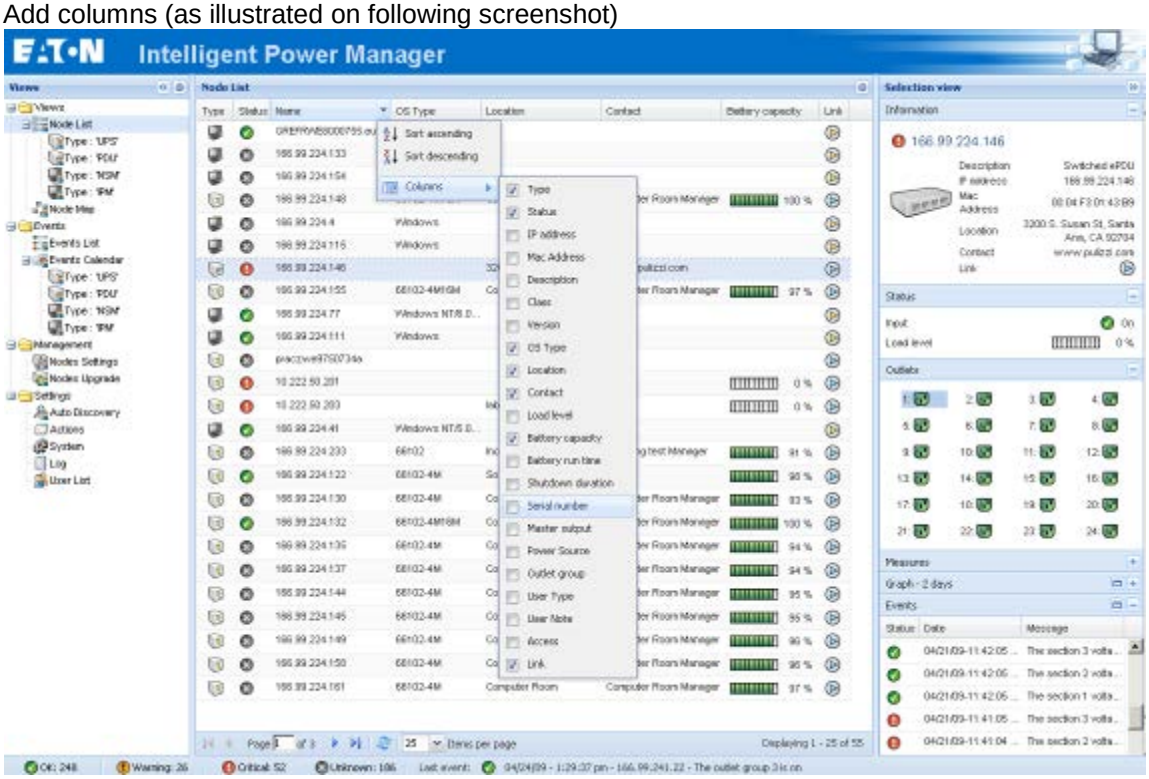
The following default columns are displayed in this page:

- Type — Graphical Icon to differentiate UPS, ePDU, and software applications
- Status — this icon represents the severity of the most critical event active on the monitored device;
- Name — the IP address, the DNS name or user defined name
- Description — the product name or description
- Location — the node location
- Contact — the node contact
- Link — link to the device Web site (if available)

Note: You can sort your device list by clicking on the column titles (Status / Name / Description/ Location / Load Level …).
The following possibilities are available:

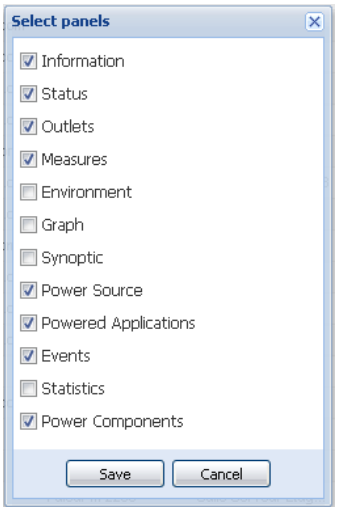
- Sort ascending
- Sort Descending

- Add columns (as illustrated on following screenshot)



4.3 Flexible Panels view:

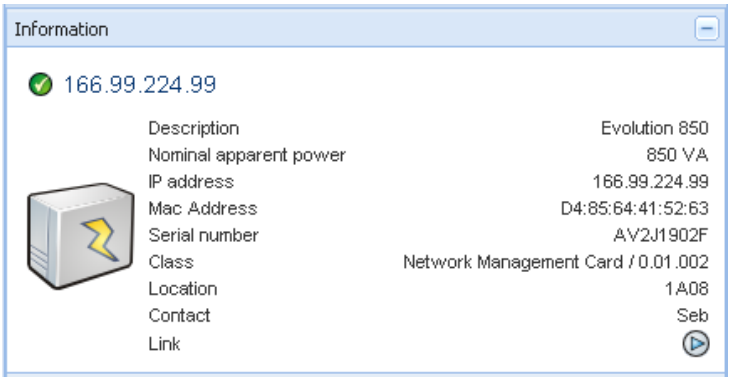
- Select one of the device/applications in the list and “detailed Panels” appears in the selection view (on the right).
- Clicking on the bar title allows you to collapse/extend the panel.
- These buttons will allow showing or hiding all the views menu or Selection view menu.
- This button allows selecting which panel you want to add in the Selection view.



Some of these panels are only available for specific node types.

4.4 Panels list:

4.4.1 Information



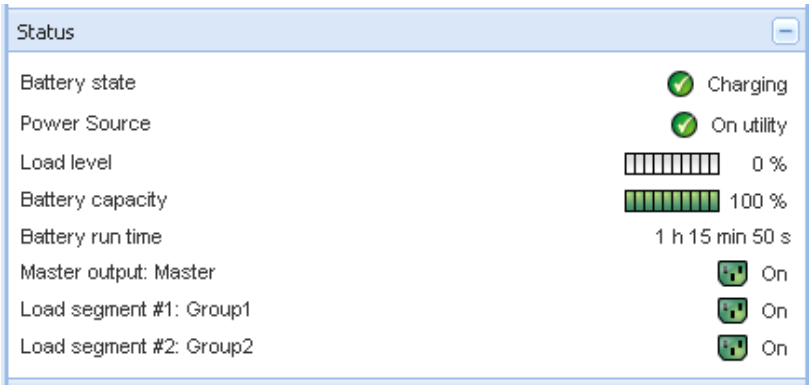
Information Panel

The following node information is displayed in this panel:

- 166.99.xx.yy — the DNS name (or IP address) is displayed near the “status icon”
- Description — the commercial product name
- Nominal apparent Power — the device load capacity in VA
- IP address — the device IP address
- Mac address — the device MAC address
- Serial Number — the device serial number (if available)
- Class — the type of the card
- Location — the device location (value of syslocation object or can also be configured in the Device page)
- Contact — the device contact (value of syscontact object or can also be configured in the Device page)
- Link — link to the device Web site (if available)

Note: The information displayed in this panel depends on the node capabilities.

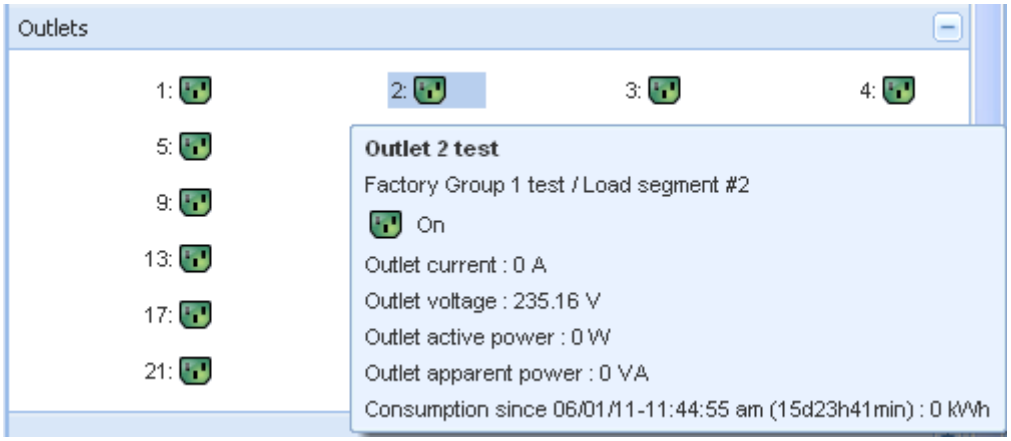
4.4.2 Status



- Power source — AC Power / Battery
- Battery state — Charging / Discharging / Default / Floating / Resting
- Load Level — the output load level of the device
- Battery capacity — Battery capacity of the device
- Battery run time — the device remaining backup time
- Master Output — Main output status (ON/OFF/Internal Failure/On Automatic Bypass/Manual By Pass/Overload)
- Outlet #x — output outlet status (ON/OFF)

Note: The information displayed in this panel depends on the node capabilities.

4.4.3 Outlets



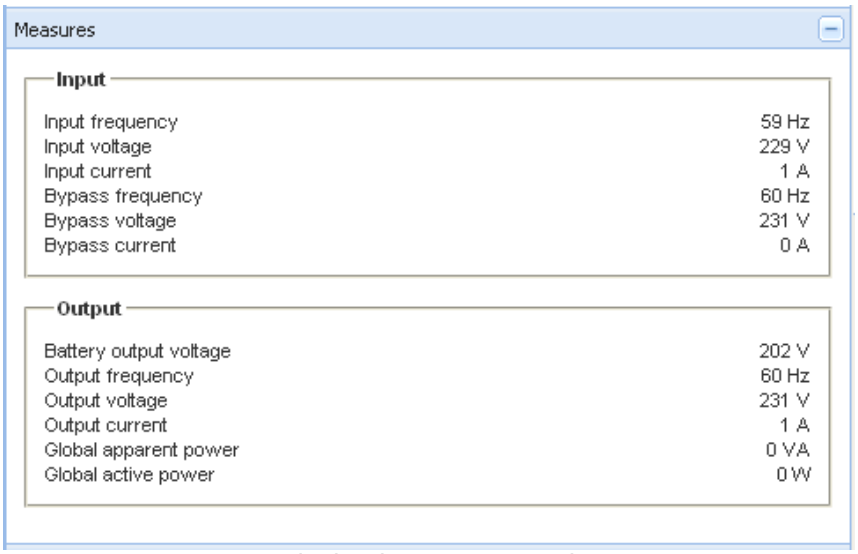
This panel displays outlet status of the selected ePDU.
Notes:

- Contextual information is provided when mouse is over the outlet
- When you select an outlet in this panel, the Graph panel displays the information for this outlet. You also have to select “Outlet” information in the “Graph settings” dialog (accessible through this button in the “Graph panel”)

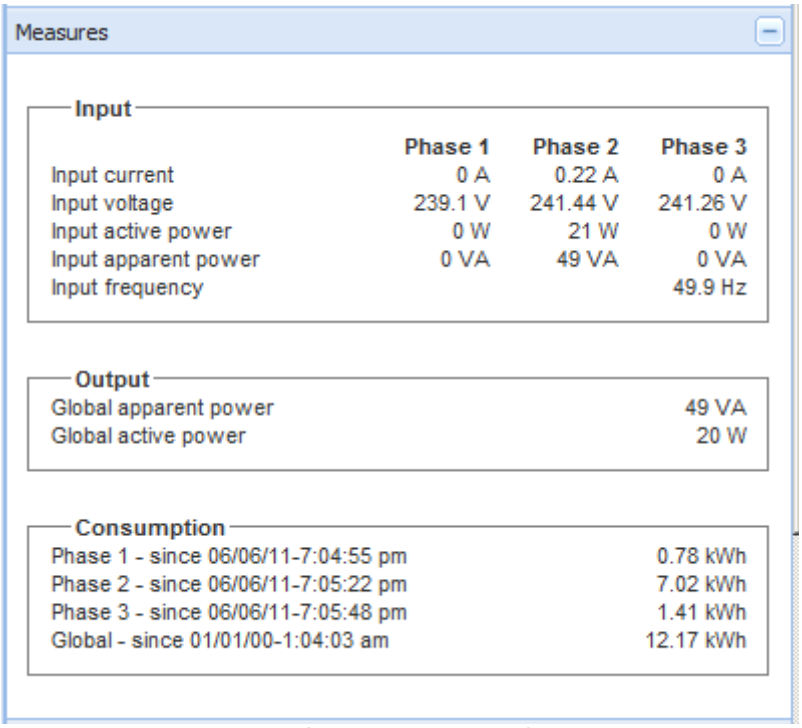
Outlets color codes:

Symbol	Color	Description
	Green	Powered (On)
	Red	Not powered (Off)

4.4.4 Measures



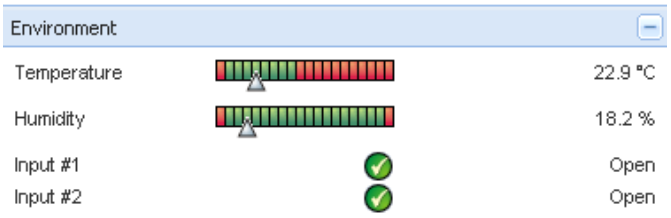
Single Phase UPS Panel



3 Phases ePDU Panel

This panel displays the selected device electrical parameters (UPS or ePDU and single phase or 3 phases) depending on the node capabilities.

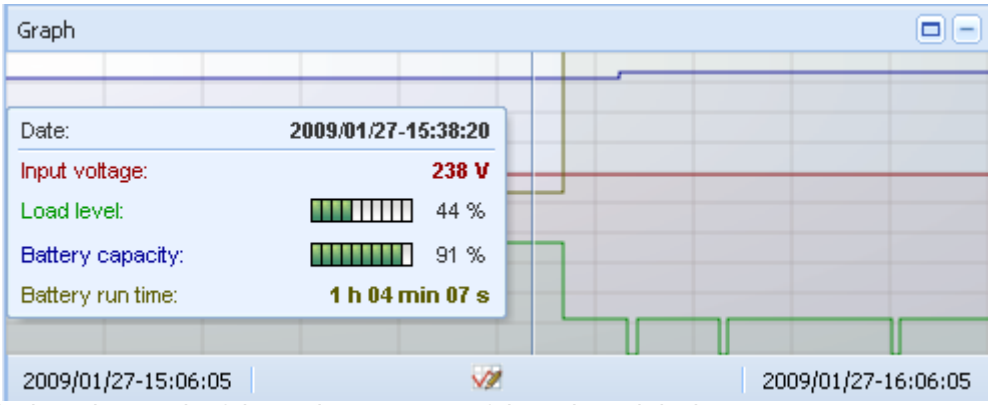
4.4.5 Environment



This panel displays the selected device sensor information: Temperature, Humidity level, Dry contact status (Open/Closed)

- Temperature — Sensor temperature (in °C)
- Humidity — Humidity level
- Input #1 — Status of first contact (open / closed)
- Input #2 — Status of second contact (open / closed)

4.4.6 Graph

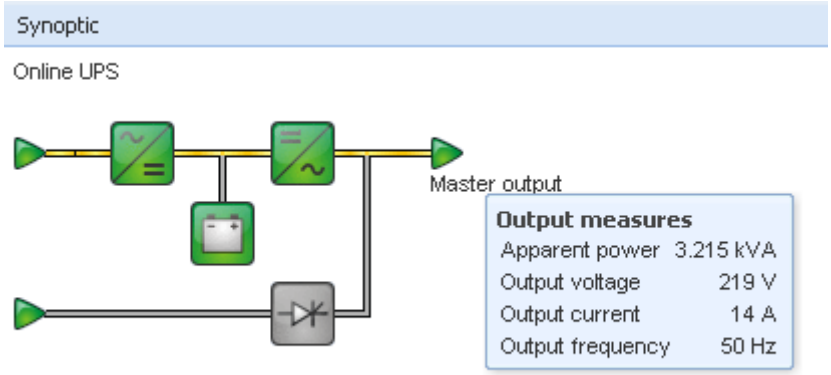


This panel displays the graph of the main measures of the selected device.

The button allows you to maximize the graph window for better visibility.

The button allows you to select the data you want to graph.

4.4.7 Synoptic



This panel displays the selected device synoptic. A tool tip is displayed when the mouse is over one of the functional block.

Synoptic Color codes:

- UPS modules:

AC/DC	DC/AC	By-Pass	Color	Description
			Green	Status OK & Active
			Red	Internal fault & Inactive
			Grey	Status OK & Inactive or Unknown

- Battery module:

Symbol	Color	Description
	Green	Status OK
	Orange	Battery charge is less than 50%
	Red	Battery fault or End-of-backup or End-of-battery-service-life pre-alarm
	Grey	Battery status unknown

- Electrical flows:

Symbol	Color	Description
	Yellow	Current flow through the cable Note: the object animation gives the direction of current flow
	Grey	No current flow through the cable (Warning the cable may still have voltage)

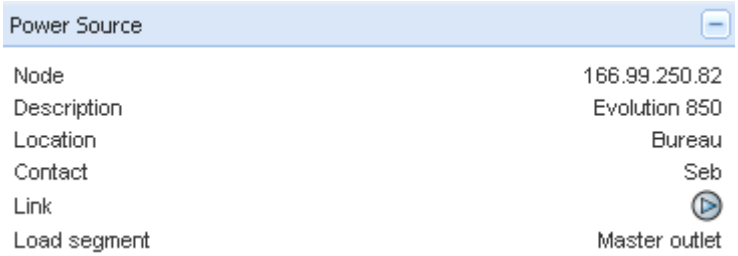
- Electrical power source at UPS input:

Symbol	Color	Description
	Green	Source powered. Status OK
	Grey	Source not powered or status unknown
	Examples of combinations between flow status and power source status:	
	Green/ Yellow	The electrical power source is powered and provides electrical flow
	Green/ Grey	The electrical power source is powered and does not provide electrical flow

- Load at UPS output: (its status is linked to that of the UPS output status)

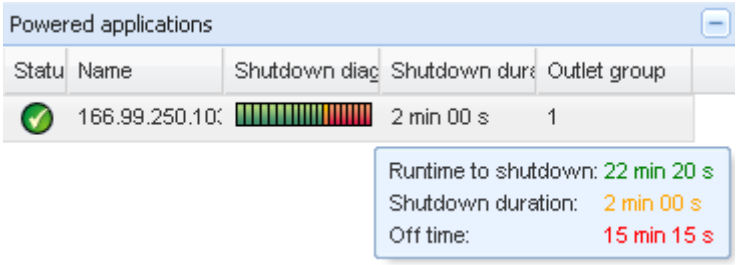
Symbol	Color	Description
	Green	Load powered and protected. Status OK
	Red	Load not powered
	Grey	Load status unknown
	Examples of combinations between flow status and load status:	
	Yellow/ Green	Load powered and protected
	Grey/ Red	Load not powered

4.4.8 Power Source



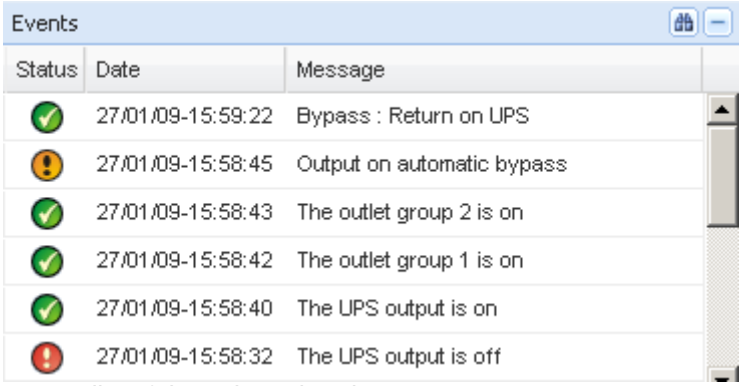
This panel displays information on the device that powers the selected application running on the server.

4.4.9 Powered applications



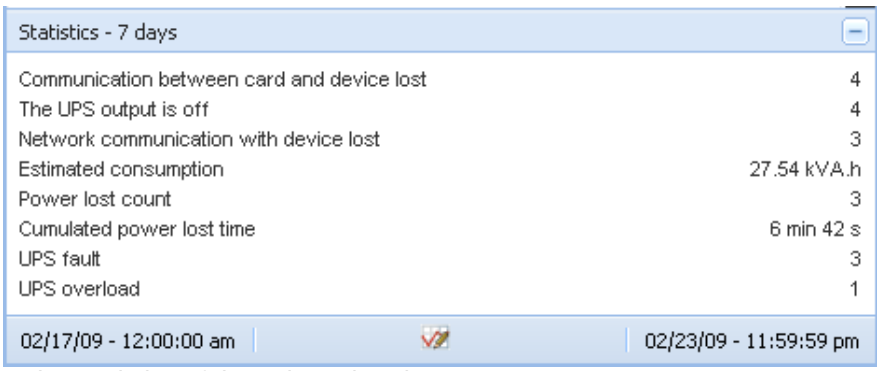
This panel displays information on the software applications (shutdown agents on the servers) that are powered by the selected device.

4.4.10 Events



This panel displays the events list of the selected node.

4.4.11 Statistics



This panel displays the statistics of the selected node.

The button allows you to select the time interval for the statistics.

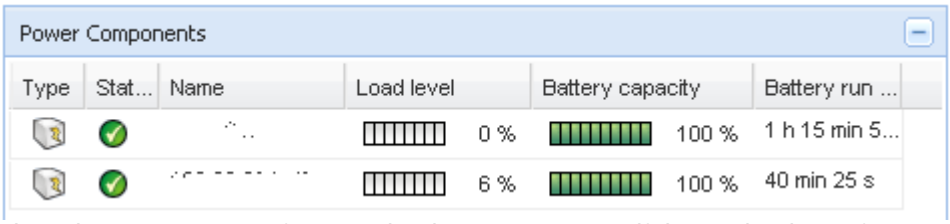
You can adjust the time interval by clicking on the 2 buttons with the “From” and “To” dates.

Here is the list of Statistics Computed Data:

- Apparent Consumption (or Active Consumption in next release)
- Average Apparent Power (or Average Active Power in next release)
- Power Failure Count
- Power Failure Cumulated Duration
- Battery Fault Count
- Internal Failure Count
- Overload Count
- Warning Alarm Count
- Critical Alarm Count
- Output Off Count
- Communication Lost Count

Note: This information depends on device capabilities

4.4.12 Power Components

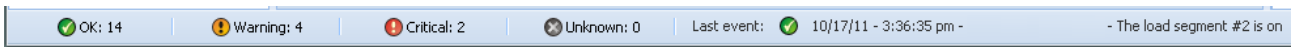


This panel displays the components of your redundant UPS system if the Redundancy feature is activated. (Refer to the Redundancy chapter)

4.5 Device Supervision

The bar at the bottom is the status of nodes.
For example, here:

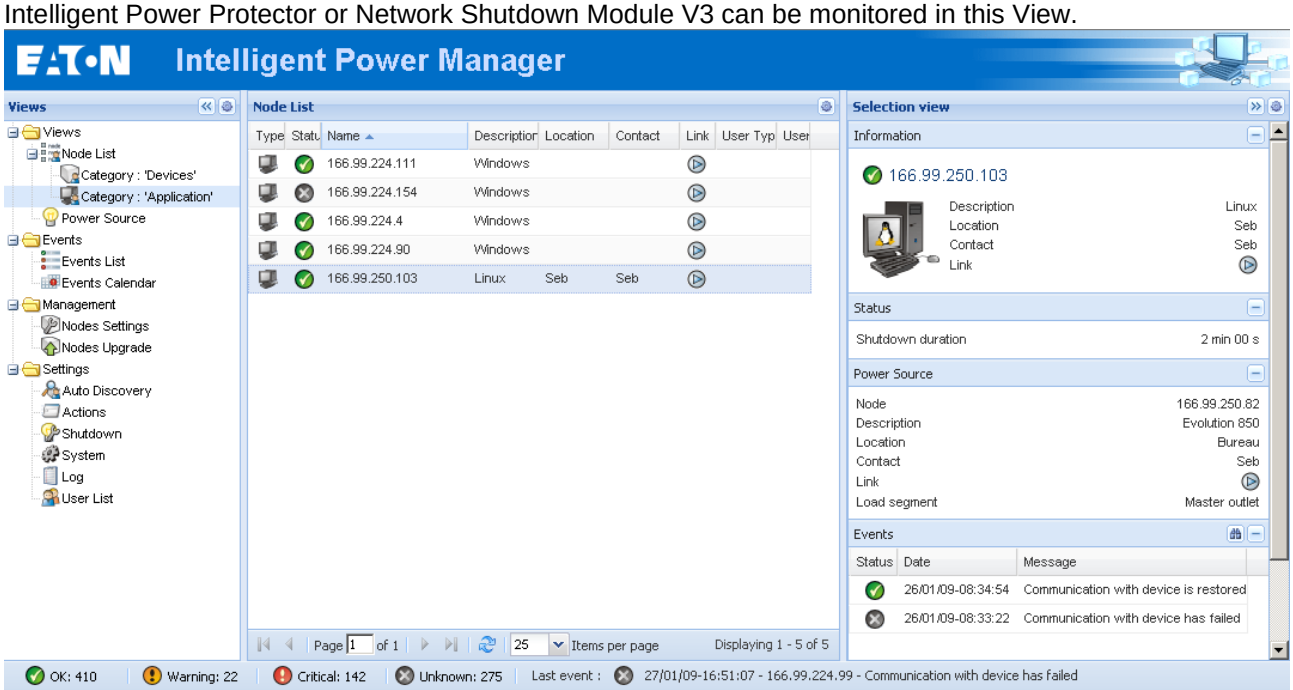
- 14 nodes OK,
- 4 are in Warning status
- 2 are in Critical status
- 0 are in Unknown status



4.6 Applications List View

To create a sub-view that filters applications, right click on **Node List**, then **create a Sub View** from and select **Category** as criteria to filter the nodes. It is possible to create sub views from the following information: “Category”, “Contact”, “Description”, “IP address”, “Location”, Name”, “Status”, “Type”, “User Note”, “User Type”.

Intelligent Power Protector or Network Shutdown Module V3 can be monitored in this View.



The following default information appears in this page:

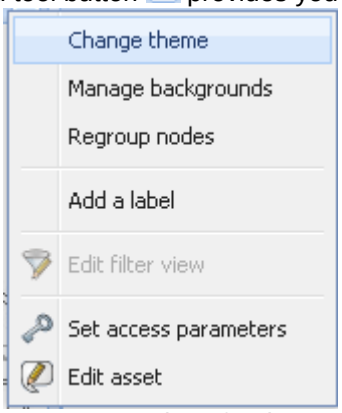
- Type — Application
- Status — This icon represents the status criticality of the server.
- Name — Value configured in the Applications screen (by default this is an IP address or a DNS name).
- Description — Machine operating system.
- Power source — the UPS that power the application
- Run time — Operating time in the event of a utility supply loss.
- Shutdown duration — Duration, in seconds, needed by the system to carry out its shutdown procedure.
- Link — Link to the Web supervision interface of the Intelligent Power Protector or Network Shutdown Module V3 module.

4.7 Map View

This graphical representation allows you to organize the supervision Map using the Drag & Drop feature
Select a node icon and the information will be updated on the right hand panel

4.7.1 Create a customized Map View

On the Left hand menu, Select **Views -> Node Map**
The Map is automatically generated (icons are automatically placed on the Map and IP address assigned)
On the Node Map bar title the contextual tool button provides you the tools to modify the Map.



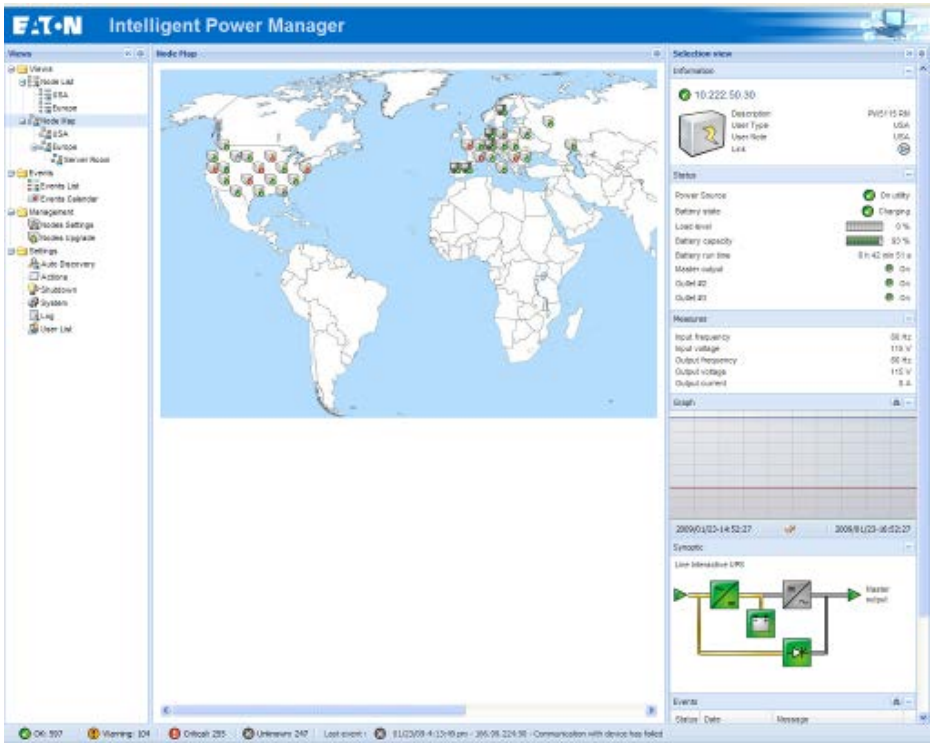
Change theme offers three kinds of icons representations for the user (small icons, large icons, and rack icons).
Manage backgrounds will offer you the possibility to:

- Import a new background image in the supervision tool.
- Select a background already in the supervision tool for the Map.
- Remove the background images.

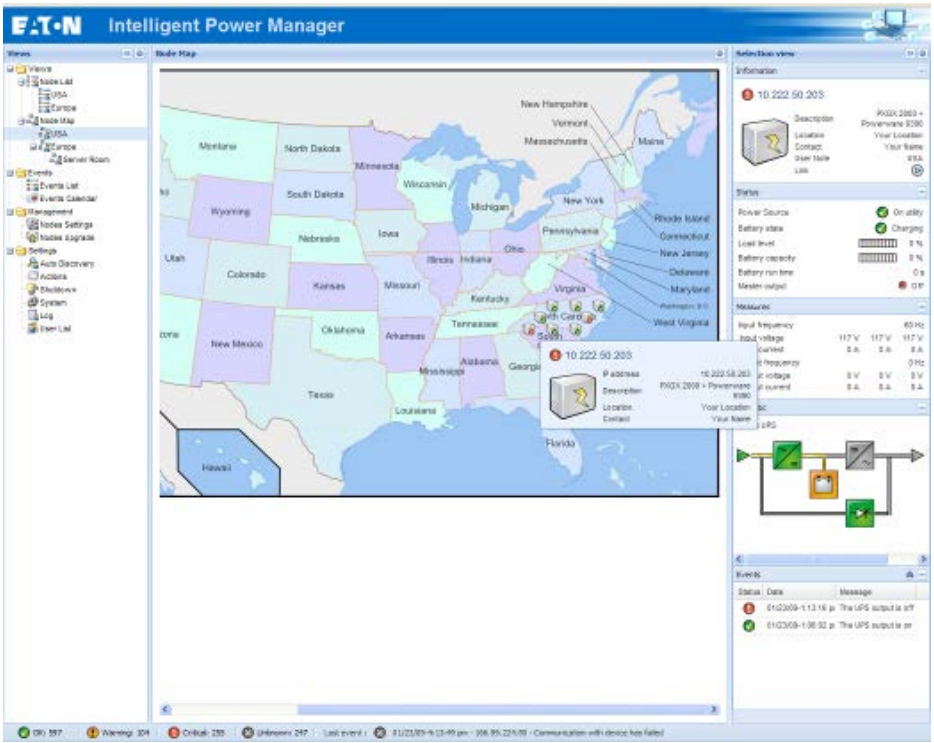
Regroup nodes will rearrange the icons position on the Map.
Add a label allows to create a user defined text and to place it on the Map through drag and drop.

Note: to delete a label, right click on it, then **Delete.**

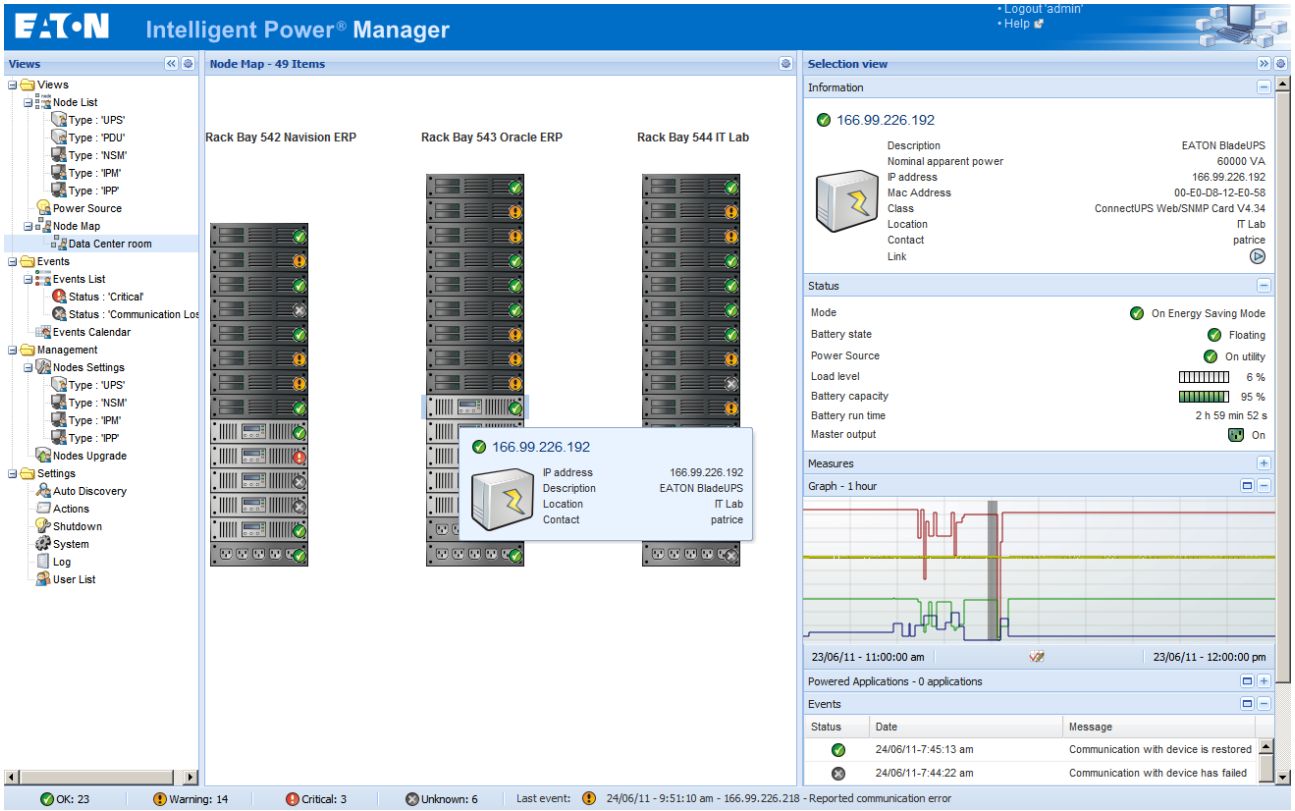
4.7.2 Maps examples



World Map view



Country Map view

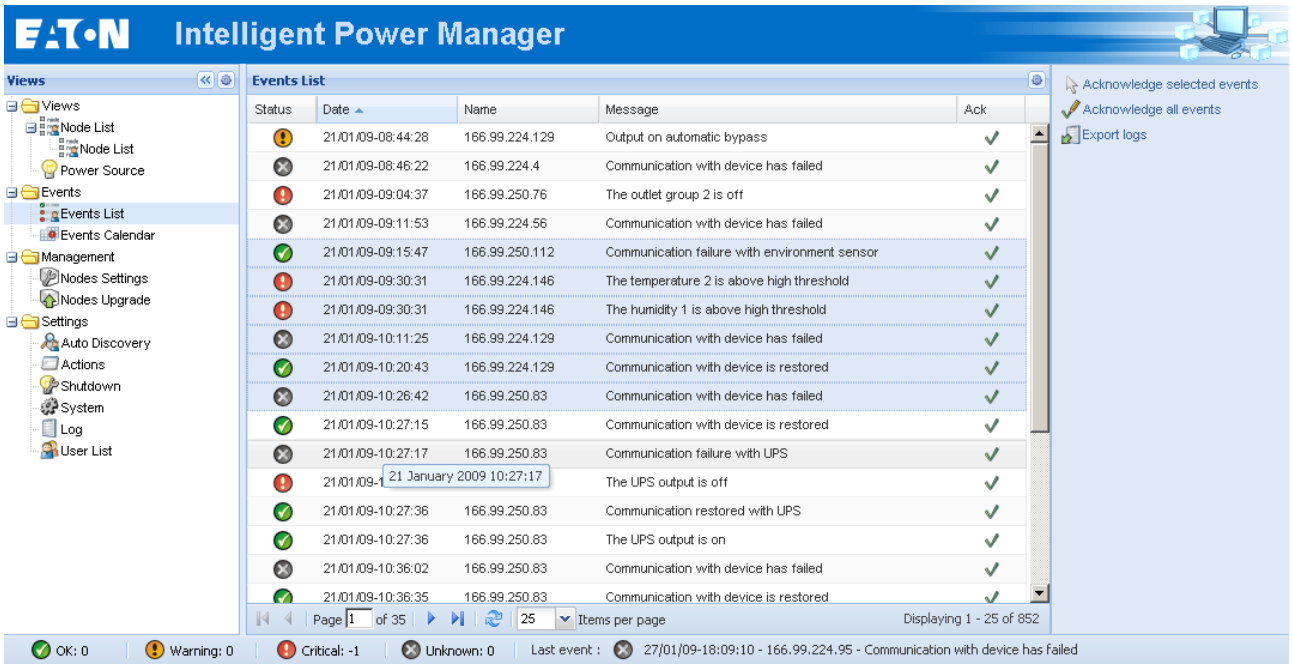


Server Room Map view

4.8 Events

4.8.1 List representation

Select the **Events -> Events List** and the following page appears:



Alarms list.

All new alarms are stored in this log.

You can sort the alarms according to **Status**, **Date, Name**, **Message and Ack.**

The following functions are available:
Acknowledge selected events will add a check box in the **Ack** column for selected events
Acknowledge all events will add a check box in the **Ack** column for all events
Export Logs will create a logs.csv file with the following syntax:

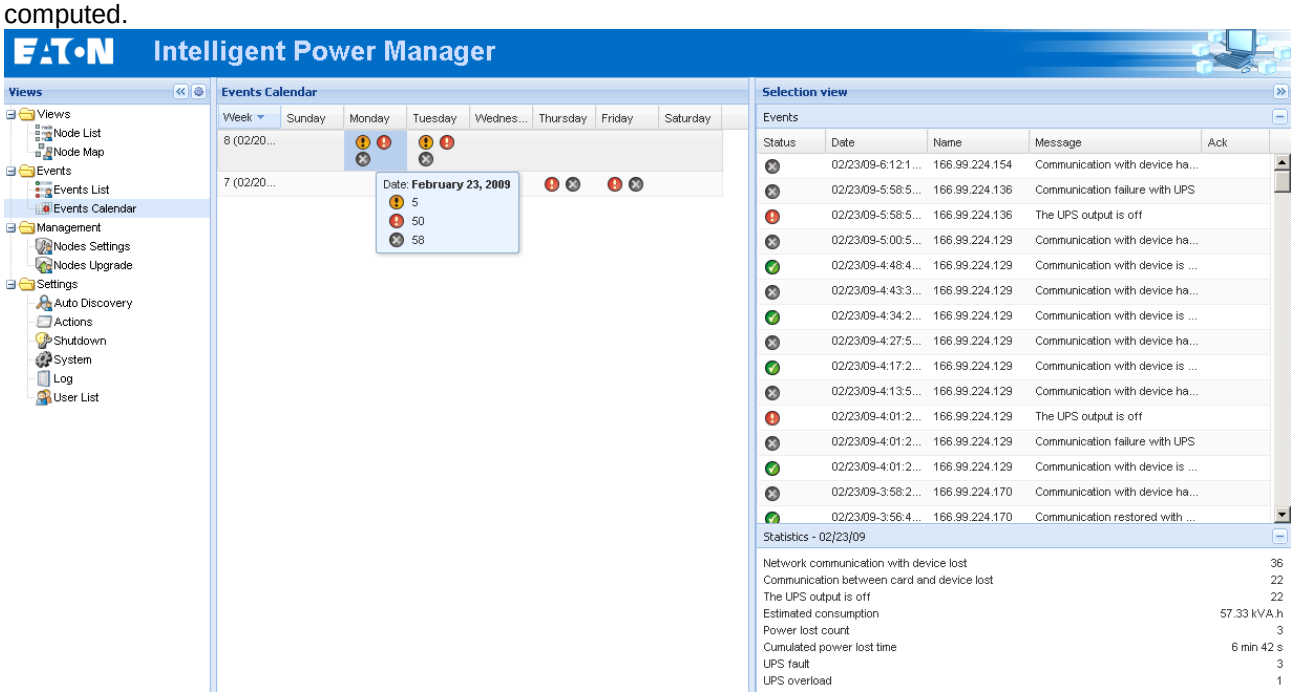
```
"Date";"Node";"Type";"Level";"Object";"Value";"Message";
"2009/01/27-18:35:20.840";"166.99.250.83";"Measure";"0";"UPS.PowerConverter.Input[1].Frequency";"49";"";
```

Note: Export command may take several seconds before allowing download to create logs file

Select all will select all displayed events.
Deselect all will deselect all selected events.

4.8.2 Calendar representation

Select the **Events -> Events Calendar** and the following page appears:
In this matrix representation, each line is a week and each column is a day of the week.
If you select a day or an interval (with date picker or shift+click command), events and statistics panels will give you all information for this selection and will automatically refresh when new statistics have been computed.



4.8.3 Nodes Events list

The icons in the different views represent the event severity.

Icon	Event status
	Normal. With this event, the device is coming back to a normal status. **Event list (UPSs, ePDUs, Applications, Generic devices):** ▪ Communication with device is restored ▪ Communication restored with UPS ▪ The system is powered by the utility ▪ The UPS output is on ▪ Communication restored with UPS ▪ Battery OK ▪ UPS returns to normal load ▪ UPS OK ▪ Bypass : Return on UPS ▪ End of low battery alarm ▪ The outlet group 1 is on ▪ The outlet group 2 is on ▪ Communication failure with environment sensor ▪ Communication restored with environment sensor ▪ Humidity is in normal range

- Temperature is in normal range
- Input #x on
- Input #x off
- End of warning alarm
- End of critical alarm
- Redundancy restored
- Protection restored

Event list (ePDUs specific):

- The input frequency is in normal range
- The input temperature is in normal range
- The input voltage is in normal range
- The input {x} is in normal load
- The section {x} current is in normal range
- The section {x} voltage is in normal range
- The outlet group {x} current is in normal range
- The outlet group {x} is in normal load
- The outlet group {x} is on
- The phase {x} output load is in normal range
- The output frequency is in normal range
- The output load is in normal range
- The output voltage is in normal range

Warning. A problem occurred on the device. Your application is still protected.

Event list (UPSs, ePDUs, Applications, Generic devices):

- The system is powered by the UPS battery
- Output on automatic bypass
- Output on manual bypass
- Humidity is below low threshold
- Humidity is above high threshold
- Temperature is below low threshold
- Temperature is above high threshold
- Warning Alarm *(a generic Warning alarm is active on the device)*
- The device is under its load alarm threshold
- The device is over its load alarm threshold
- Protection lost
- Redundancy lost
- Shutdown in {time}
- Remote Communication Error (remote communication or configuration issue is detected)

Critical. A serious problem occurred on the device. This problem requires an immediate action. Your application might NOT BE powered anymore.

Event list (UPSs, ePDUs, Applications, Generic devices):

- The UPS output is off
- The outlet group 1 is off
- The outlet group 2 is off
- Battery fault
- UPS overload
- UPS fault

- Low battery alarm
- Applications must stop immediately...
- System shutdown in progress...
- Critical alarm *(a generic Critical alarm is active on the device)*

Event list (ePDUs specific):

- The input frequency is out of range
- The input temperature is above high threshold
- The input temperature is below low threshold
- The input voltage is above high threshold
- The input voltage is below low threshold
- The input {x} is overload
- The section {x} current is too high
- The section {x} current is too low
- The section {x} voltage is too high
- The section {x} voltage is too low
- The outlet group {x} current is too high
- The outlet group {x} current is too low
- The outlet group {x} is overload
- The outlet group {x} is off
- The phase {x} output is overload
- The output frequency is out of range
- The output is overload
- The output voltage is above high threshold
- The output voltage is below low threshold

Communication lost

Event list:

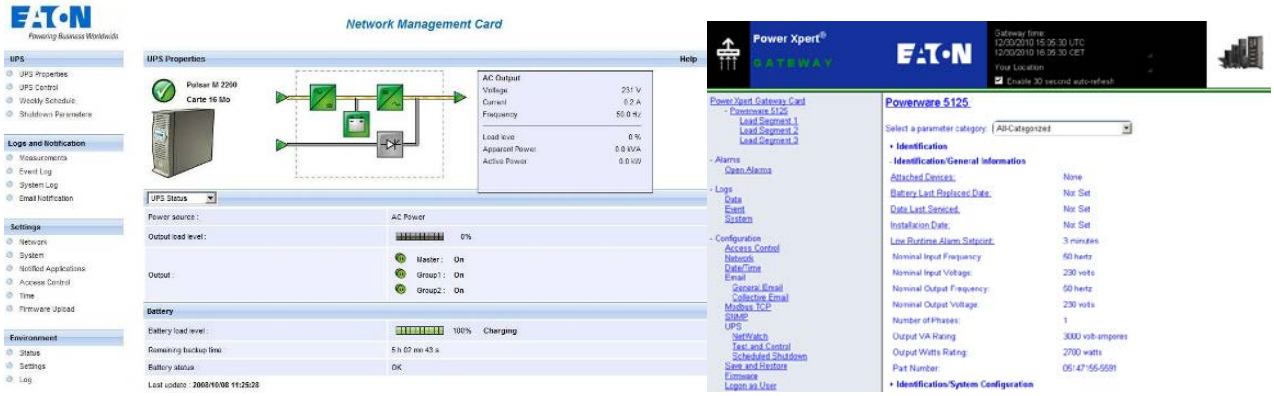
- Communication failure with Device or Application

Device is not managed

Your device is not managed due to license limitation. Please go to Settings -> System page to enter a Silver or Gold license code.

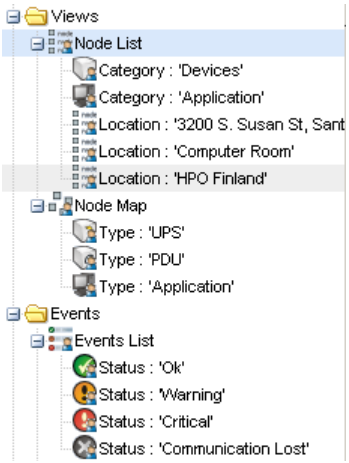
4.9 Launching Device or application Web interface

From the **Status** panel, you can access the Web Page for Eaton cards or applications including a built-in web server. Click on the web **Link** associated to this blue icon (http access) or this yellow one (https access).



Opening different Web interfaces from Intelligent Power® Manager

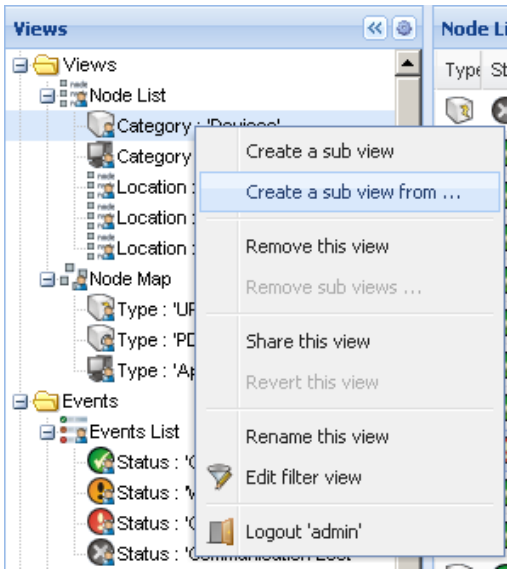
4.10 Defining sub views



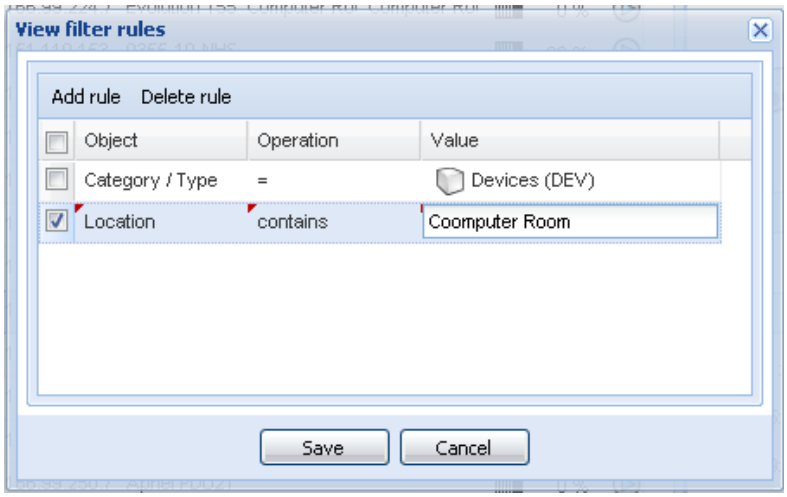
When you have to monitor large configurations, it is helpful to define several sub views and then filter the nodes or events in theses categories.

You can select many criteria in order to organize your tree (i.e. geographical, organizational, by status...).

- Select a view in the left menu (e.g. Devices)
- Right click on this view and the following contextual menu appears.



- Click on **Create a sub view from …** and follow the instructions.
- To filter the nodes in this sub view, right click on a line of the **Node List** area and edit a **Filter View**.

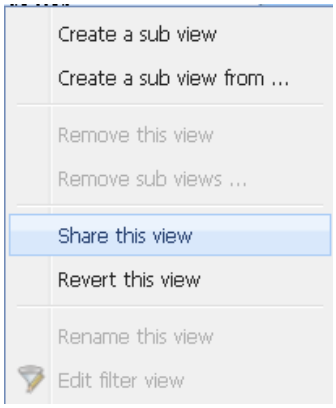


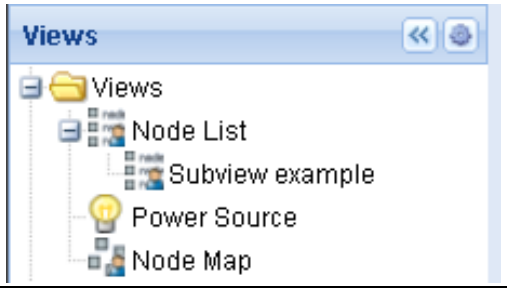
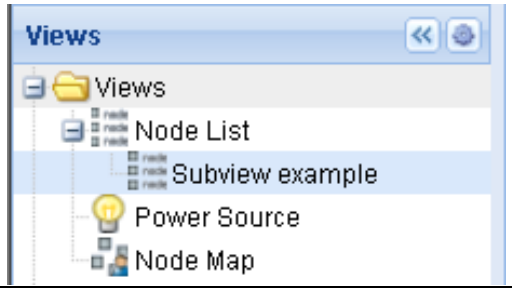
- To add a filtering rule, click on the **Add rule** button then key in the Object, Operation and Values.
- With this filter you will view the **Devices** whose **Location** field contains the value "**Computer Room**".

4.11 Sharing sub views

A customized sub view is "attached" to the user that created it. It is private (marked with a small man on the icon of the sub view). If the owner of the sub view wants to allow the use of the sub view by the other users, he needs to share the view.

A Right-Click on the view allows you to open the contextual menu:



“Subview example” is private (customized and not shared) “Node Map” is customized and not shared.	“Subview example” is public (customized and shared) “Node Map” is customized and not shared.
	

Customizing a view cancels the sharing of this view. For the use of this view by all the users, the owner of the view must share it again.

5 Shutdown

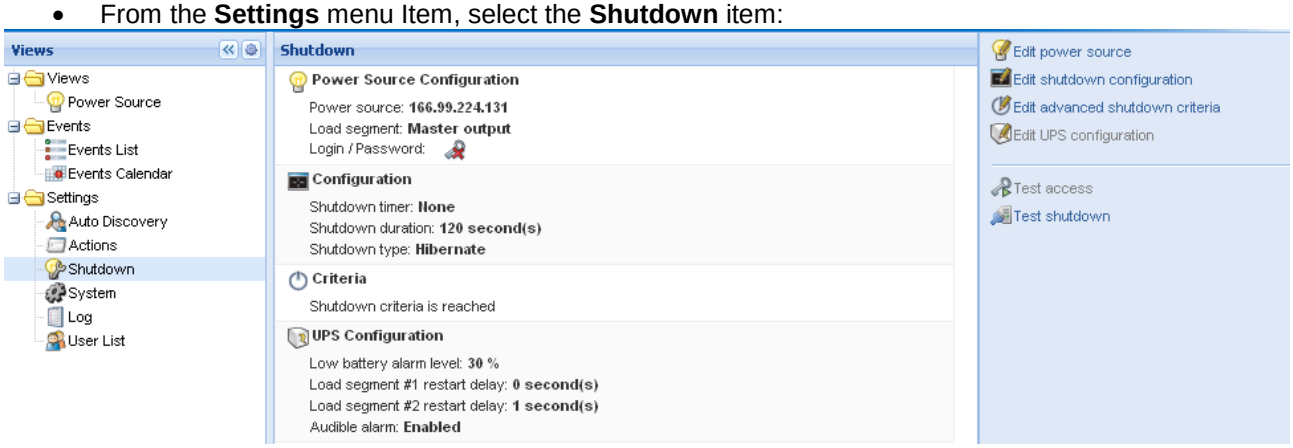
5.1 Introduction

Intelligent Power® Manager provides **local computer graceful shutdown** (acquisition through Network-MS (ex 66102 / 103006826) PXGX2000, PXGX-UPS, ConnectUPS BD, ConnectUPS X and Modbus-MS (ex 66103), USB, RS232)

This Shutdown feature can be Enabled / Disabled from the **Settings** -> **System -> Modules Settings**

5.2 Shutdown Configuration

- Login with an administrator user profile
- From the **Settings** menu Item, select the **Shutdown** item:



To configure, perform the following actions:

- Click on **Edit Power Source configuration**.
- In the **Power source** field select the UPS that powers the computer hosting Intelligent Power® Manager.
- Check other parameters.
- Click on Save.

Notes:

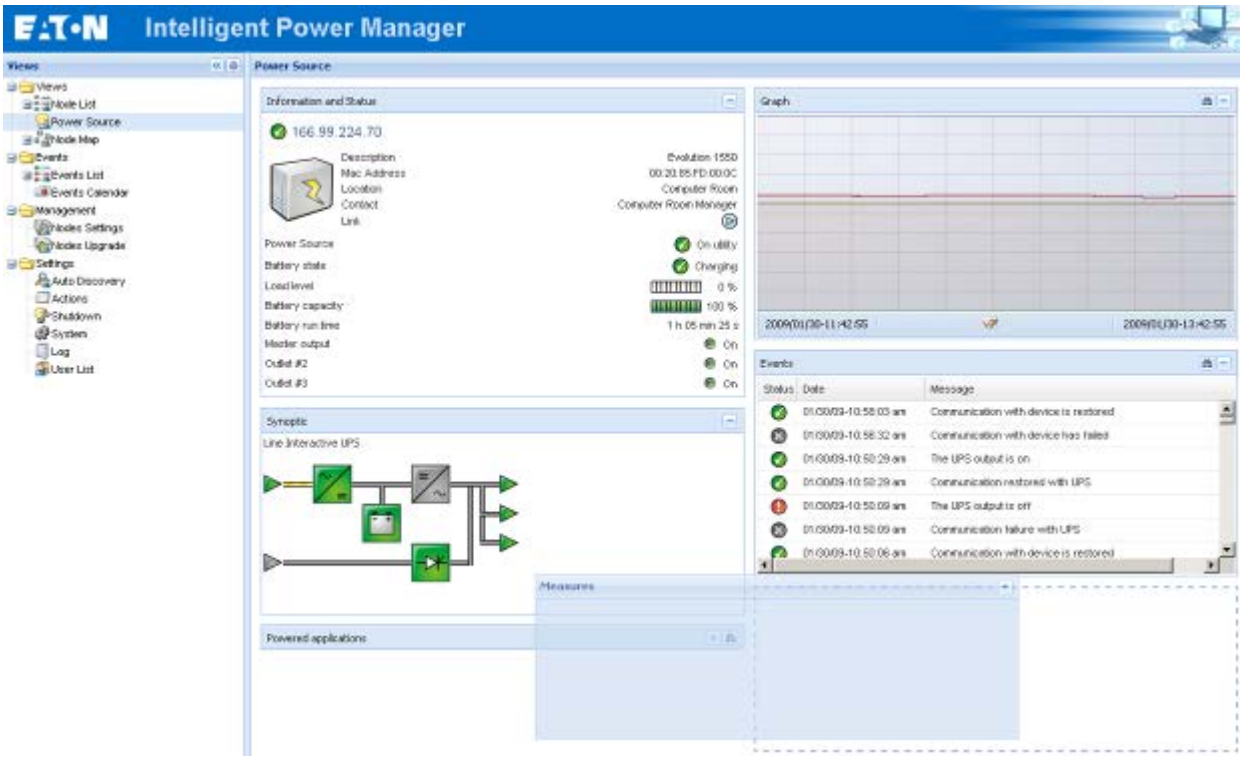
- Please refer to the Intelligent Power Protector User Manual for a detailed description of the shutdown feature.
- Shutdown through Hibernate: If available with your operating system, it is better to use the hibernation feature (available from Windows 2000) as there are a number of advantages. When the computer is shutting down all work in progress and system information are automatically saved to the disk. The computer itself is also de-energized. When mains power returns, all the applications re-open exactly as they were and the user placed back in their work environment…
  The Hibernate function must first have been activated in the operating system (In the power options on the Windows control panel -> Hibernate tab).
  Note: If you select hibernate, but your computer does not have this function, Intelligent Power® Manager will still protect the installation by carrying out the normal (default) shutdown.

5.3 Power Source View

When **Shutdown** feature is configured, from the **Views** menu Item, select the **Power Source** item.
You will be able:

- To supervise the information from the UPS that powers the Intelligent Power® Manager computer.

- To drag and drop the panels in this window.



5.4 Shutdown Sequence

You will find more details on “Shutdown Sequence” and “Shutdown Use case” in Intelligent Power® Protector user’s manual.

Notes:

- IPM can acquire shutdown alarms from IPP with the “Shutdown Controller” enabled.
- You can not enable the “Shutdown Controller” feature in IPM.

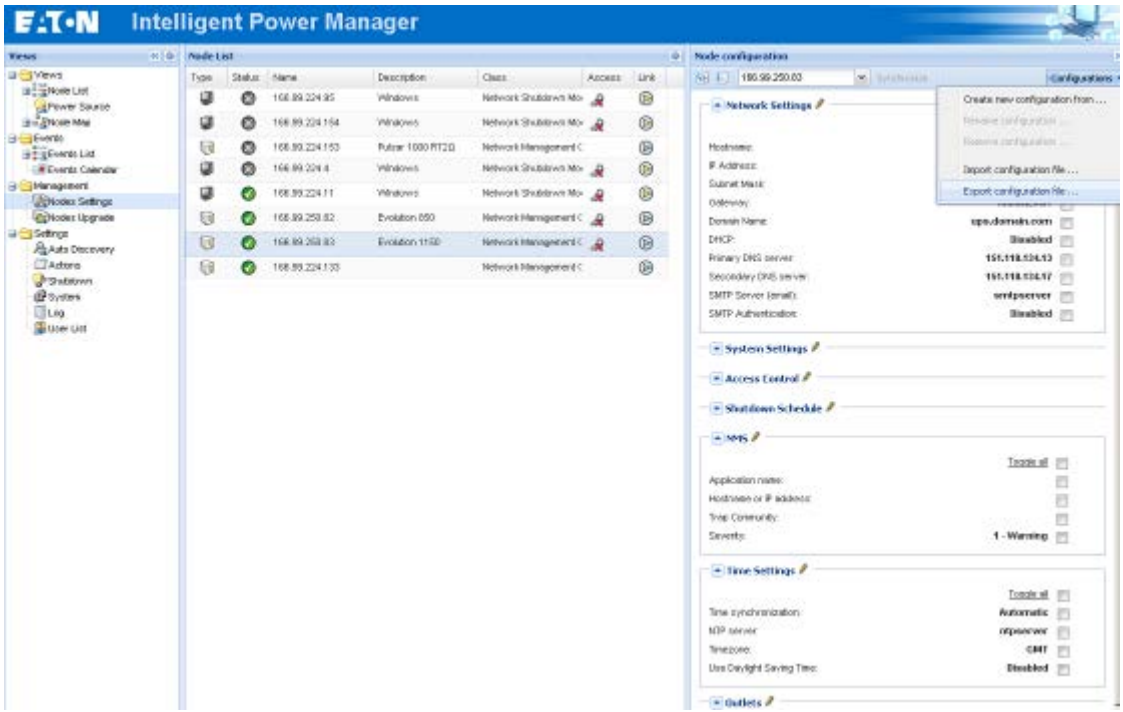
6 Advanced Management

6.1 Nodes Settings

6.1.1 Single node Configuration Display

Intelligent Power® Manager can display the card/application configuration. Proceed as follows:

- Select one card from the list.
- After a few seconds, on the right hand, the Node configuration panel is updated.
- Use the **Configurations**-> **Export Configuration file** to export this configuration to a file.



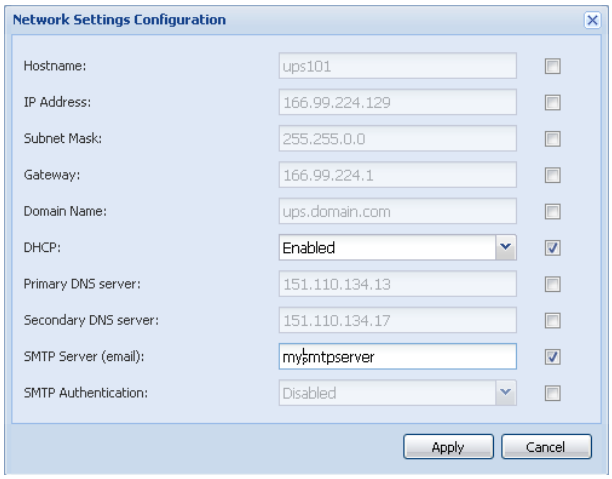
6.1.2 Single Card settings

Intelligent Power® Manager can configure a single card. Proceed as follows:

- Login with an **administrator** profile.
- Select one card from the list.
- From the Node List button -> **Set Login Parameters**, enter the card Login and Password.

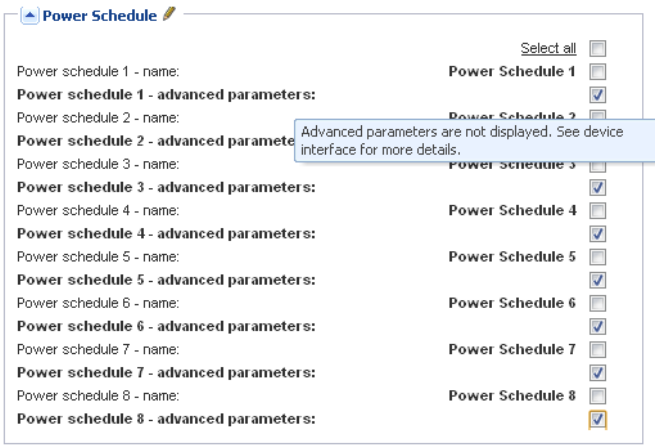
  The access status changes from **Access Denied** ( ) to **Access OK** ( ).
- After a few seconds, the Node configuration panel is updated.
  - Click on the Edit button [or load a previously created configuration].

  In the Configuration Window check the parameters you want to change and fill in the new values.



- **Apply** the changes.
- The parameters that have different values on the cards and on the configuration to apply have the following sign "≠".
- Then select the parameters you want to synchronize (with the check box).
- Then click on **Synchronize** button.

Note:
Some advanced parameters details are not displayed in the IPM **Node configuration** screen. You need to change the advanced parameters details directly on one device and then synchronize the configuration from this device to other devices.
On next screenshot, we provide a typical example with ePDU Power Schedule configuration. The details of Power Schedule1 to Power Schedule 8 are available from the device web interface. Checking all the "Power Schedule X- advanced parameters" will synchronize all the advanced parameters details of the category.



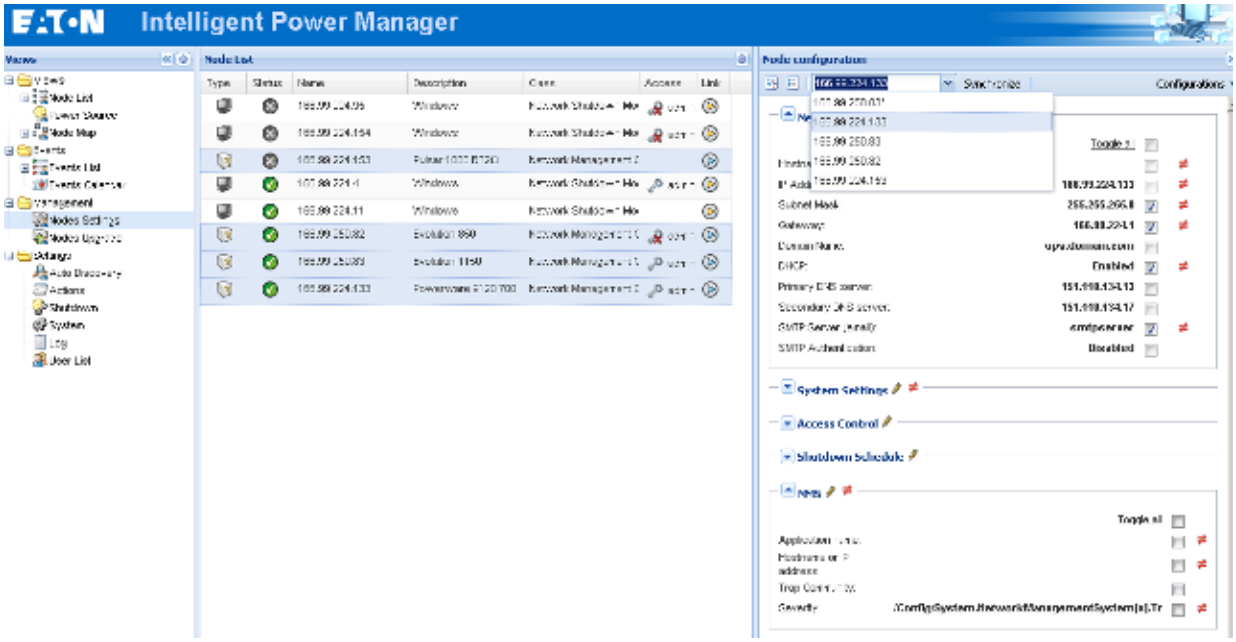
6.1.3 Multiple Cards Configurations Synchronization

Intelligent Power® Manager can synchronize multiple cards configurations. Proceed as follows:

- Select several cards from the list.
- From the Node List button -> **Set Login Parameters**, enter the card Login and Password.

  The access status changes from: **Access Denied** ( ) to **Access OK** ( ).
- After a few seconds, the **Node configuration** panel is updated.
- From the combo box select the configuration that will be the model [or Click on the Edit button].

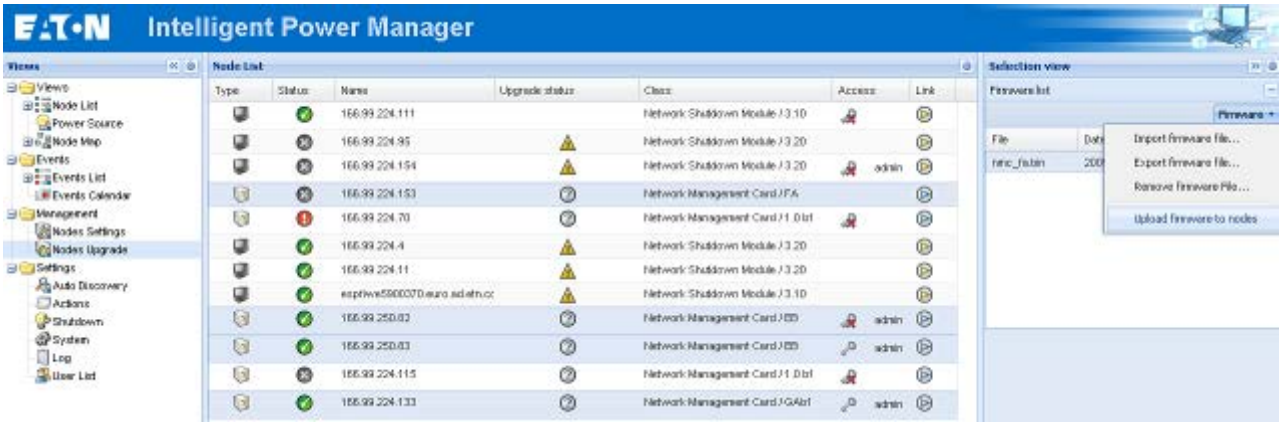
- The parameters that have different values on the cards have following sign "≠".
- Select the parameters you want to synchronize (with the check box).
- Click on **Synchronize** button.



6.2 Nodes Upgrade

6.2.1 Upload Device Firmware

From the **Management** menu Item, select the **Nodes Upgrade** item.
Refer to the Network cards release notes to determine the latest Firmware release compatible with the Hardware revision.



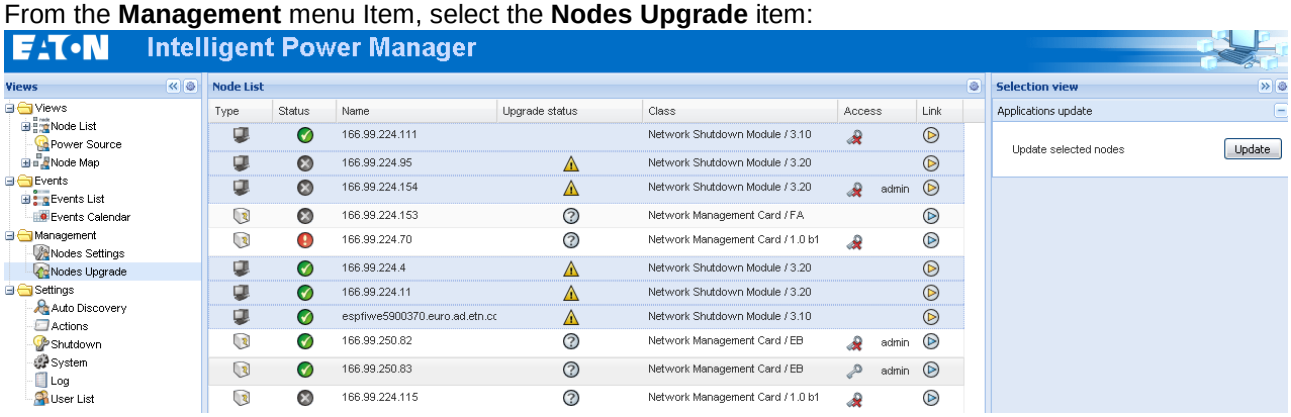
Perform this procedure to upload a Device firmware:

- Select the cards in the List.
- From the Node List button -> **Set Login Parameters**, enter the card Login and Password.

  The access status changes from: **Access Denied** ( ) to **Access OK** ( ).
- From the **Firmware -> Import Firmware File…** list box; the uploading window appears.
  > Click **Browse …** to select the firmware from a disk accessible from the computer.
  > Click **Import**.
- Click on **Firmware -> Upload Firmware to nodes**.
- The cards will be updated with the firmware selected.

6.2.2 Upgrade applications

From the **Management** menu Item, select the **Nodes Upgrade** item:



Perform this procedure to update the applications:

- Select the applications in the **Node List**
- from the Node List button -> **Set Login Parameters**, enter the access Login and Password

  The access status changes from: **Access Denied** to **Access OK**
- From the **Applications update** panel, click on **Update**
- The status of the Applications with respect to the version is updated.

7 Virtualization Module

7.1 Introduction

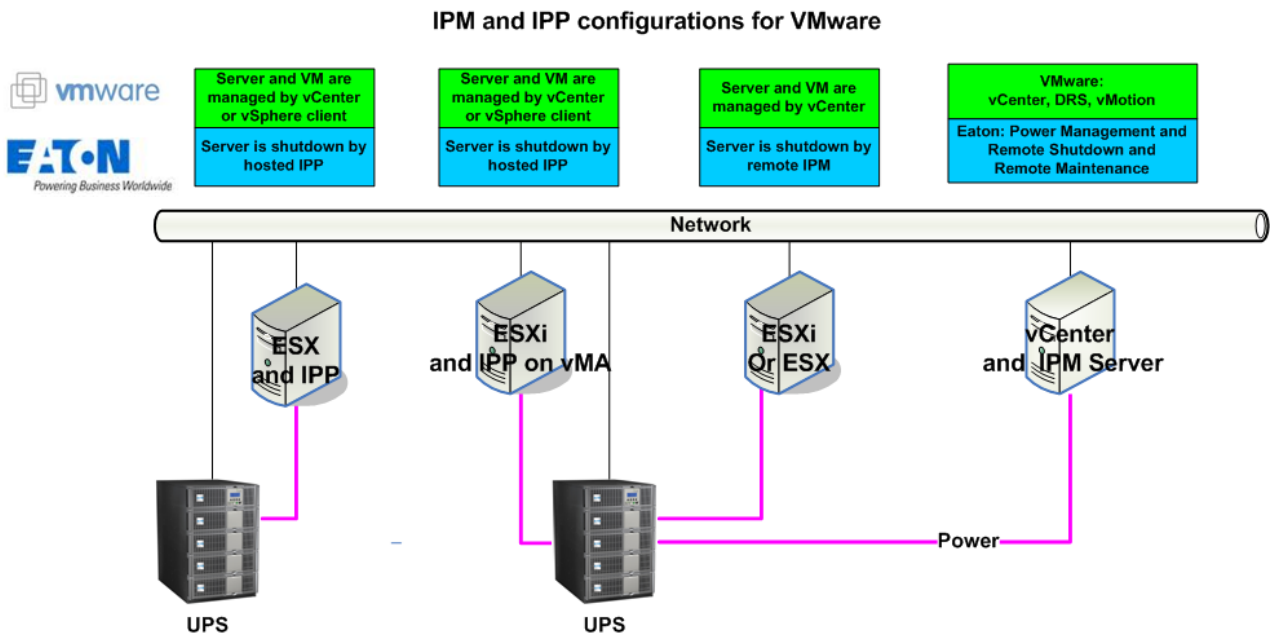
The IPM Virtualization Module for VMware, Microsoft and Citrix requires a network shutdown environment. The UPS has to be connected through a network interface (e.g. NMC) and the protection software (IPP) has to be configured in order to communicate with this network interface. Each peer-to-peer interface (i.e. USB/RS232) between IPP and the UPS doesn't allow using this virtualization module.

The IPM Virtualization Module will retrieve information from the Hypervisor (e.g. ESX, ESXi, XenServer, …) or Manager (vSphere, SCVMM, …).
IPM will execute advanced features on UPS Power Events:

- Trigger the move of the Virtual Machines to other servers (Put the VM host in maintenance mode).
  => The data center will benefit with this zero down-time feature.
- Trigger Shutdown of the VM Host with VCenter (With SCVMM this feature is done by IPP).
  => The data center will benefit from servers graceful shutdown.

7.2 Eaton Virtualization solutions for VMware, Microsoft, Citrix and Opensource Xen, KVM

7.2.1 Eaton solutions for VMware



Eaton provides 3 solutions for VMware that are illustrated on the above architecture diagram:

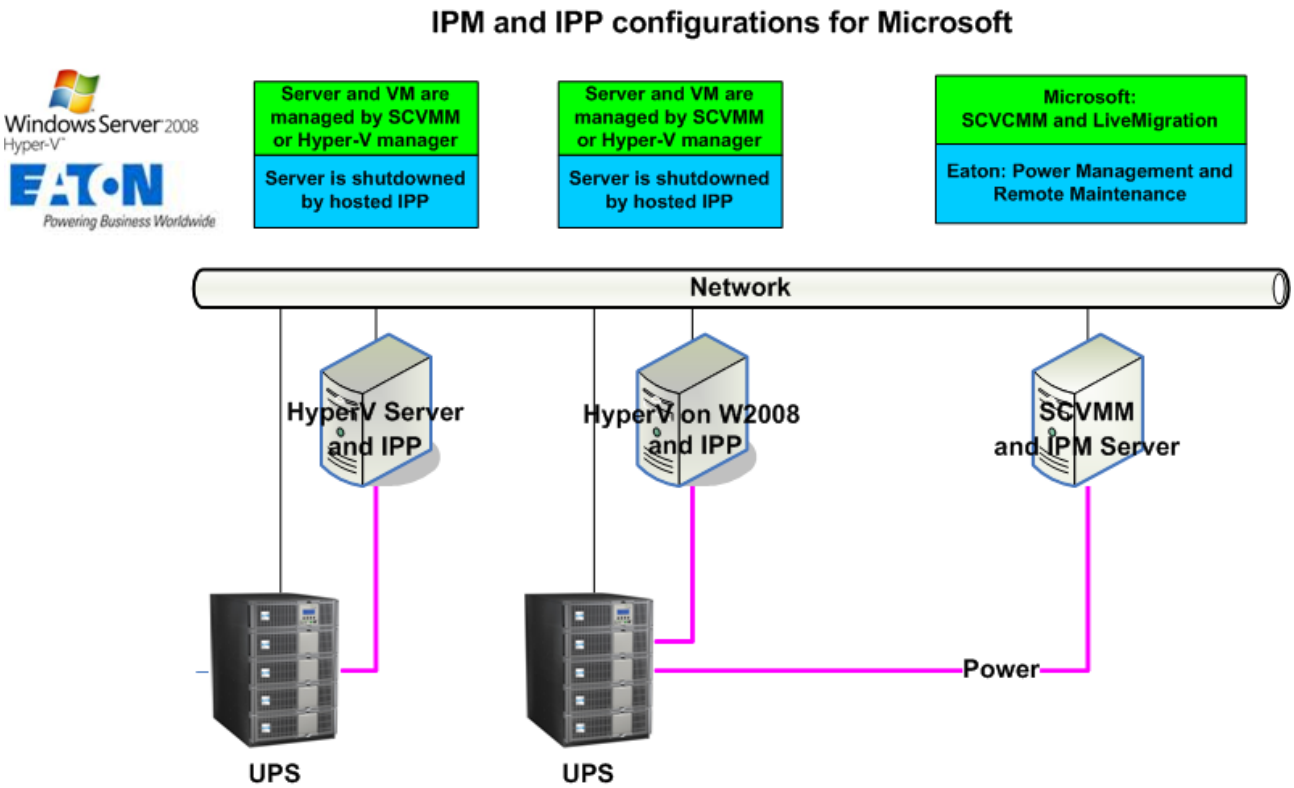
1. the first one provides ESXi * server graceful shutdown. IPP is installed on a VIMA/vMA (one instance of IPP per ESXi).
   This solution is the best one when
   => vCenter Server is not available for management of hosts

=> Number of ESXi is Limited
paid ESXi version only. Free version cannot be shutdown because of VMware restrictions.
(Refer to the IPP Appendix document: IPP Installation and Configuration Guide VMware ESXi virtual architecture).

2. the second one provides ESX server graceful shutdown. IPP is installed on each ESX operating system.
   This solution is the best one when:
   => vCenter Server is not available for management of hosts
   => Number of ESX is Limited
   (Refer to the IPP Appendix document: User manual extension for VMware ESX 4.0).

3. the third one is for multiple ESX and ESXi servers (paid version only).
   It provides following features
   => Remote graceful Shutdown of multiple ESX/ESXi servers and hosted VMs.
   => ESX/ESXi Remote maintenance (vMotion)
   => an IPM Plug-in is created in vCenter
   => UPS events are accessible through vCenter
   This solution is ideal for biggest infrastructures working through vCenter server
   This solution is described in this chapter of the IPM user manual.

7.2.2 Eaton solutions for Microsoft



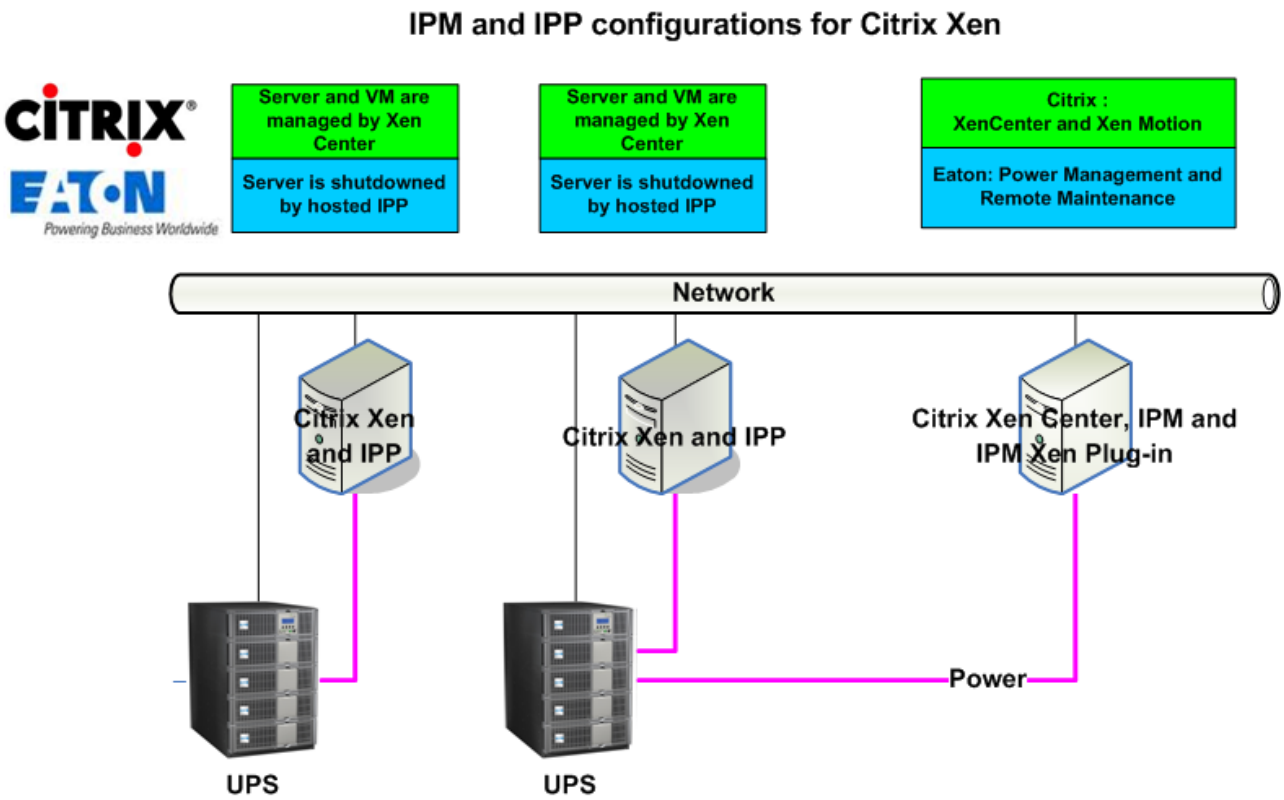
For Microsoft, Eaton provides 2 solutions that are illustrated on the above architecture diagram:

1. the first one provides graceful shutdown for Hyper V server or Hyper V on 2008. IPP is installed on each Microsoft operating system.
   This solution doesn't require SCVMM management software

(Refer to the IPP Appendix document: User manual extension for Hyper-V and HyperV server).

2. the second one is for multiple Hyper V and Hyper-V servers
   It provides following feature:
   => Hyper-V/Hyper-V server Remote maintenance to trigger VM Live Migration.
   This solution is ideal for biggest infrastructures working through SCVMM server
   This solution is described in this IPM user manual.

7.2.3 Eaton solutions for Citrix Xen

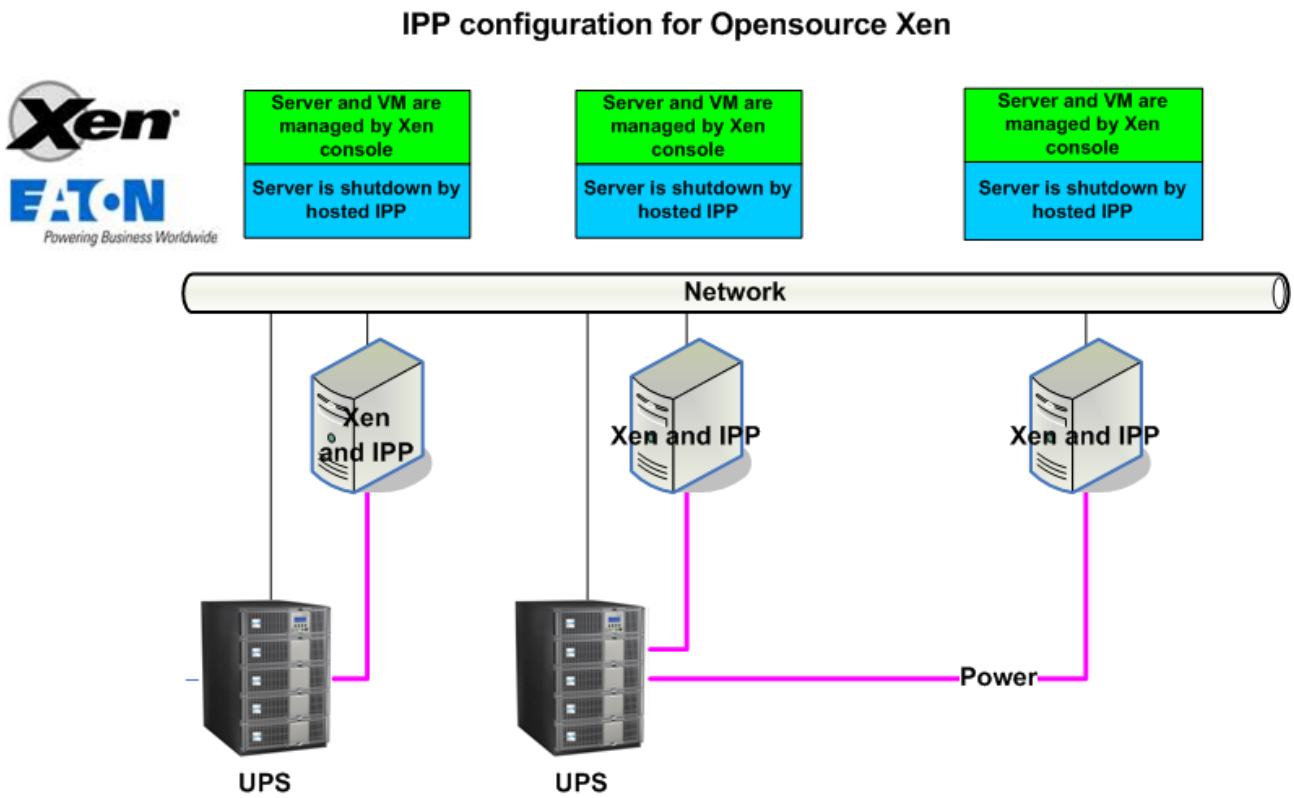


For Citrix, Eaton provides 2 solutions that are illustrated on the above architecture diagram:

1. the first one provides graceful shutdown for Citrix Xen. IPP is installed on each Citrix Xen system.
   This solution doesn't require Xen Center management software
   (Refer to the IPP Appendix document: Installing and configuring Intelligent Power® Protector On Xen Virtualized Architecture).

2. the second one is for multiple Xen servers
   It provides following feature:
   => Xen server Remote maintenance to trigger VM Xen Motion.
   => Xen server Remote shutdown
   This solution is ideal for biggest infrastructures working through Xen Center
   Since IPM1.25 this solution is now integrated in IPM and described in the appendix chapter of this manual.

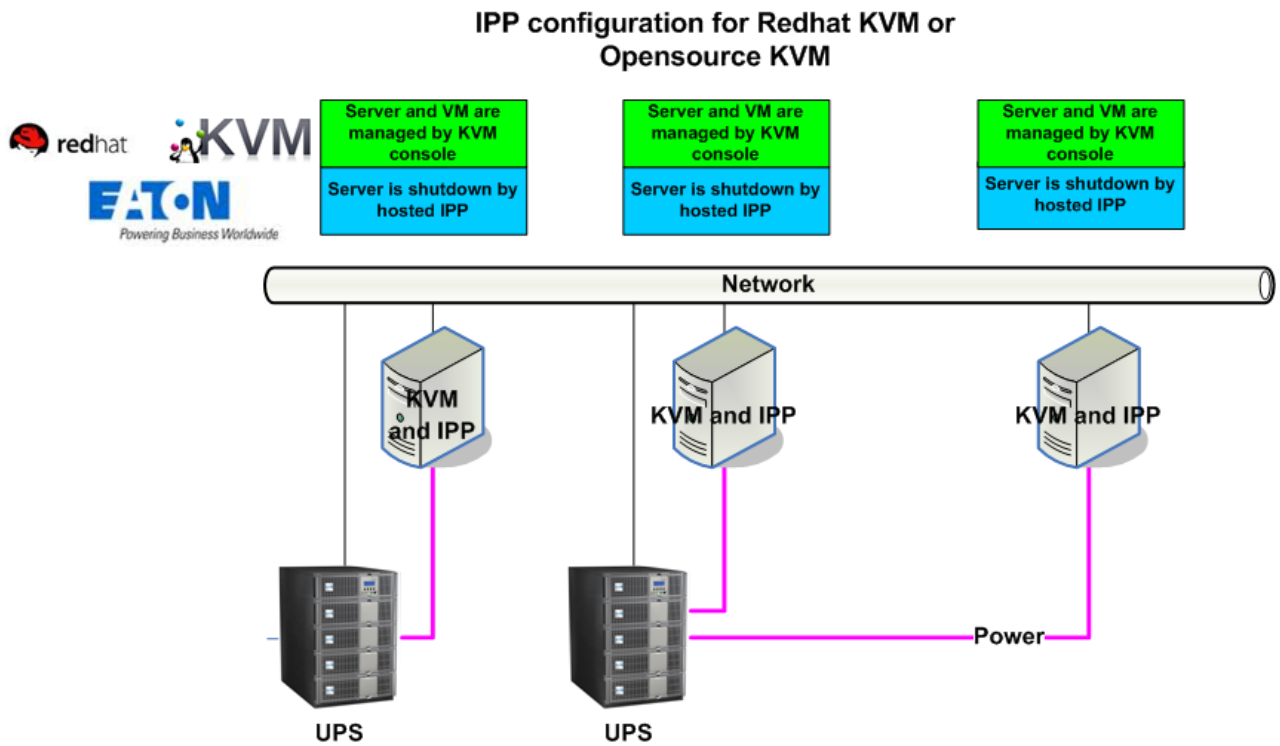
7.2.4 Eaton solutions for Opensource Xen



Eaton provides following solution for Open source Xen that is illustrated on the above architecture diagram:

- It provides graceful shutdown for Xen. IPP is installed on each Xen system.
  (Refer to the IPP Appendix document: Installing and configuring Intelligent Power® Protector On Xen Virtualized Architecture).

7.2.5 Eaton solutions for Redhat KVM or Opensource KVM

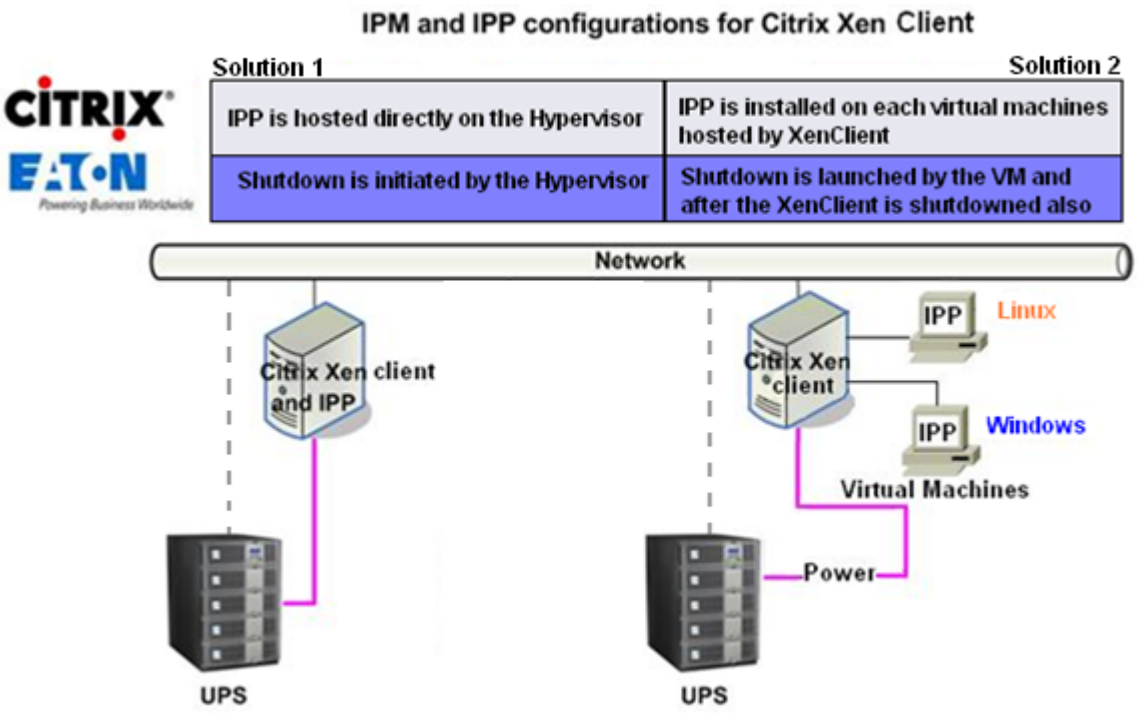


Eaton provides following solution for Redhat KVM and Open source KVM that is illustrated on the above architecture diagram:

- It provides graceful shutdown for KVM. IPP is installed on each KVM system.

  (Refer to the IPP Appendix document: Installing and configuring Intelligent Power® Protector On KVM Virtualized Architecture).

7.2.6 Eaton solutions for Citrix XenClient



Eaton provides following solution for Citrix XenClient that is illustrated on the above architecture diagram:

- It provides graceful shutdown for XenClient. IPP is installed on each XenClient system or on each Virtual Machine.
  (Refer to the IPP Appendix document: Installing and configuring Intelligent Power® Protector On XenClient Virtualized Architecture).

7.3 Tested environments

Eaton has validated the Virtualization Module in following environments. Other environment may also be compatible with Virtualization Module but are not officially tested.

7.3.1 VMware

- vCenter 5.0 on Windows server 2008 x64 and Windows server 2008 R2 x64, Windows server 2003 x64, Windows server 2003 R2 x64,
- vCenter Server 4.1/4.0 on Windows Server 2008 R2, 2008 Enterprise 64 bits, 2008 Standard 32 bits and 2003 64bits
- ESXi 5.0/4.1/4.0 (remote shutdown from IPM or with IPP on vMA)
- ESX 4.1/4.0 (shutdown with IPP on core OS)

Note: if your installation just has a limited number of ESXi Servers and if you don't use Cluster features, you don't need IPM remote shutdown feature. To protect your ESXi Server you can install IPP on a vMA/VIMA, please refer to the IPP Appendix.

7.3.2 Microsoft

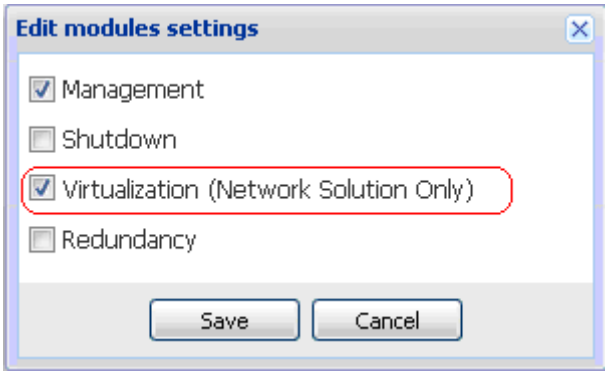
- SCVMM on Windows Server 2008 R2
- Windows Server 2008 R2 with IPP

7.3.3 Citrix

- XenServer 5.6 and 6.0.0
- XenCenter 5.6 and 6.0.0

7.4 Enabling the Virtualization Module

To enable the virtualization module you must go to the “System” -> “Module Settings” panel and enable it as shown in the following screenshot:



7.5 VMware Supervisors Prerequisites

The virtualization module requires the following prerequisites:

- VMware vCenter and vSphere Client installed.
  Note that vCenter and IPM could be installed on the same server (or on a VM/Server on the network)
- To provide the VM graceful shutdown, you have to install VMware tools on each VM
- Since IPM 1.25, the vSphere SDK for Perl is no more required.

You must also have a knowledge / experience with IPM software and VMware Infrastructure.

7.6 Citrix Supervisors Prerequisites

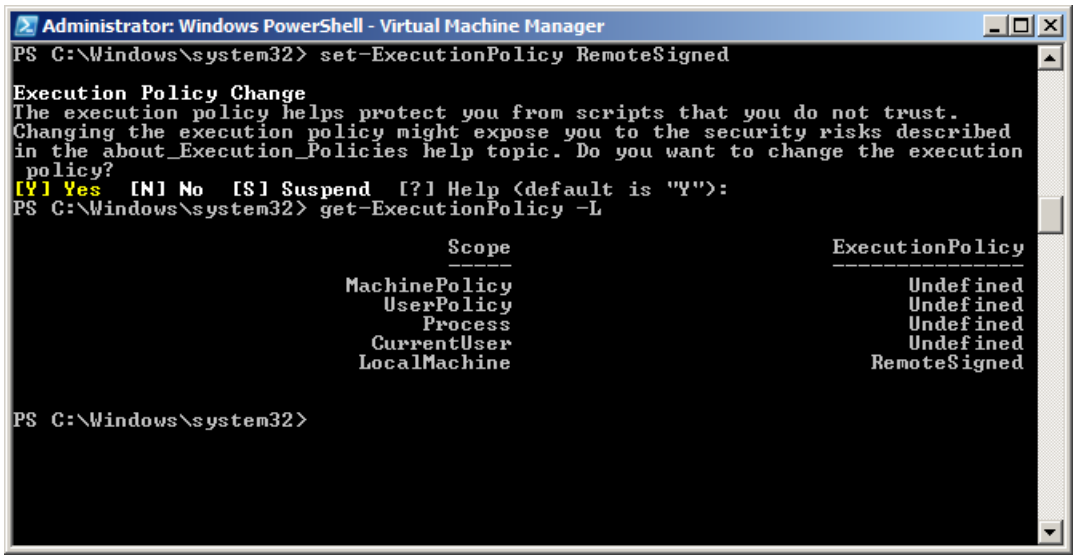
The virtualization module needs following prerequisites:

- XenCenter installed to manage the XenServers
- To provide the VM graceful shutdown, you have to install Xen tools on each VM

7.7 Microsoft Supervisors Prerequisites

The virtualization module needs following prerequisites:

- The Powershell Snapin for SCVMM. To get it, either
  => install the VMM console on the machine hosting IPM
  => or install IPM on the machine hosting SCVMM.
- The server hosting IPM must be on the same Windows Domain than SCVMM Server
- The server hosting IPM must enable the execution of third party scripts on the local machine (minimum access “Remote Signed”) (examples: Set-ExecutionPolicy RemoteSigned).
  The next screenshot displays the parameters after the configuration example.

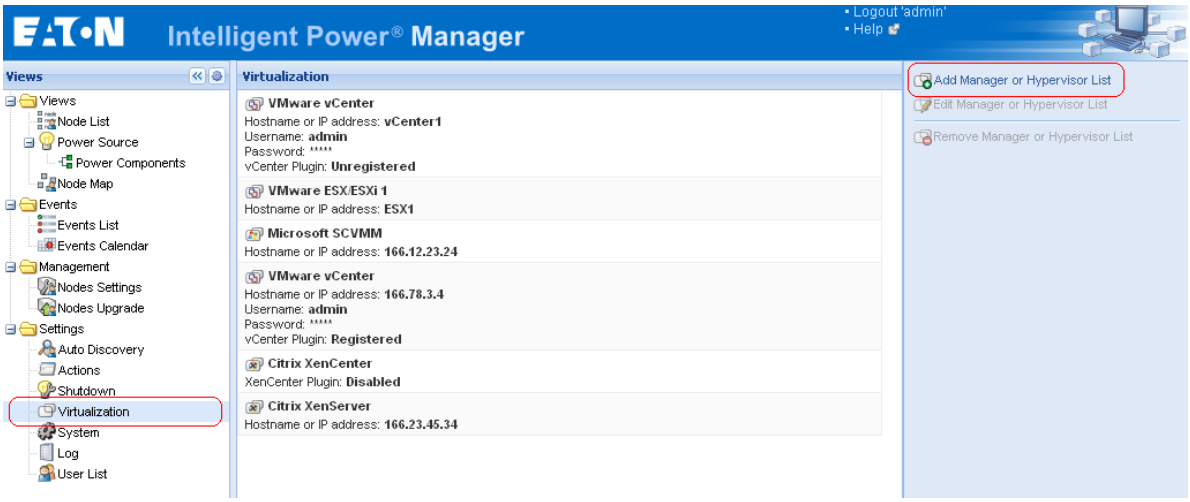

Administrator: Windows PowerShell - Virtual Machine Manager
PS C:\Windows\system32> set-ExecutionPolicy RemoteSigned
Execution Policy Change
The execution policy helps protect you from scripts that you do not trust.
Changing the execution policy might expose you to the security risks described
in the about_Execution_Policies help topic. Do you want to change the execution
policy?
[Y] Yes [N] No [S] Suspend [?] Help (default is "Y"):
PS C:\Windows\system32> get-ExecutionPolicy -L
Scope ExecutionPolicy
MachinePolicy Undefined
UserPolicy Undefined
Process Undefined
CurrentUser Undefined
LocalMachine RemoteSigned
PS C:\Windows\system32>

7.8 Adding Manager or Hypervisor List

7.8.1 Introduction

Steps:

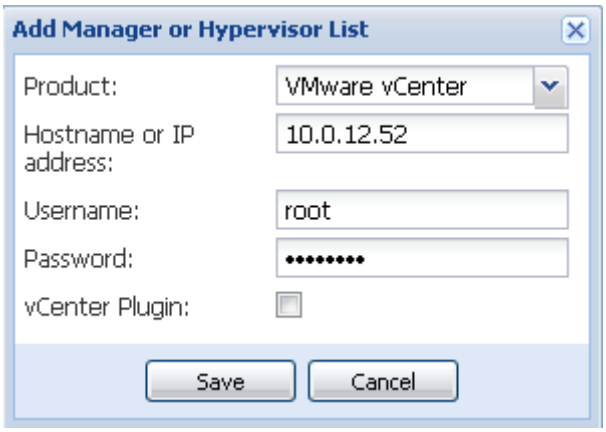
- Enable the virtualization module (as explained previously).
- Then a new **Virtualization** menu entry automatically appears in the “Settings” menu.
- Click on this new **Virtualization** menu entry
- You can **Add Manager or Hypervisor List** on the right panel.



- To Edit or Remove, Managers or Hypervisors, you have to select a line in the center panel first.
- In the next paragraphs, we explain how to add different kinds of Managers and Hypervisors.

7.8.2 Adding a vCenter Server Manager

To add a new VMware vCenter, complete the following fields.



- Product — The type (VMware vCenter)
- Hostname or IP address — The VMware vCenter Hostname or IP address.
- Username — The VMware vCenter Administrator Username
- Password — The VMware vCenter Administrator Password.

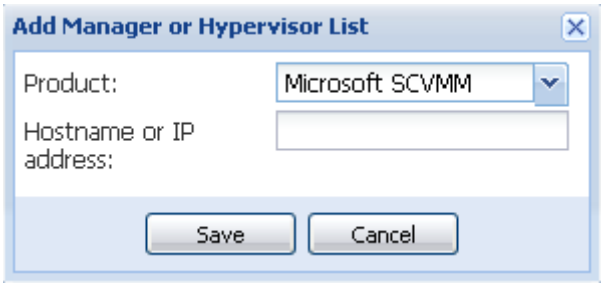
- vCenter Plugin — Installs and configures the Intelligent Power manager Plug-in into vCenter. Please consult the Appendix1 in this user manual when using this feature.

Click on **Save** after the fields are updated.

Note: When configuring the Login and Password, we recommend using the IPM Web interface through https. Using http is also possible but the Password is sent to the local or remote server in clear. In both cases, the password is stored encrypted in IPM and never resent on the Client side.
The encrypted password is stored in the following configuration file ($IPMFolder$\configs\vmconfig.js).

7.8.3 Adding a SCVMM Manager

To add a new Microsoft SCVMM, complete the fields below:

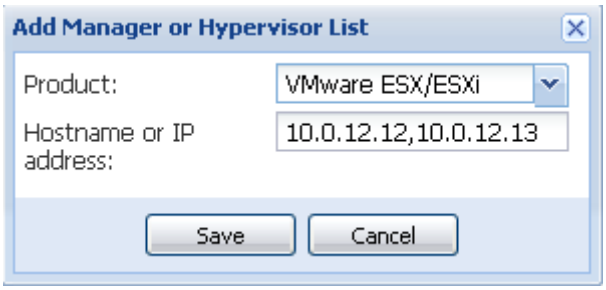


- Product — The type (Microsoft SCVMM)
- Hostname or IP address — The Microsoft SCVMM Hostname or IP address.

Click on Save after the fields are updated.

7.8.4 Adding a VMware ESX/ESXi Hypervisor List

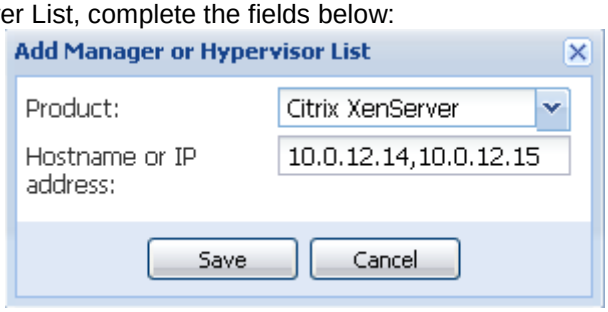
To add a new VMware ESX/ESXi List, complete the fields below:



- Product — The type (VMware ESX/ESXi)
- Hostname or IP address — The List of VMware ESX/ESXi Hostname or IP address.

7.8.5 Adding a Citrix XenServer Hypervisor List

To add a new Citrix XenServer List, complete the fields below:

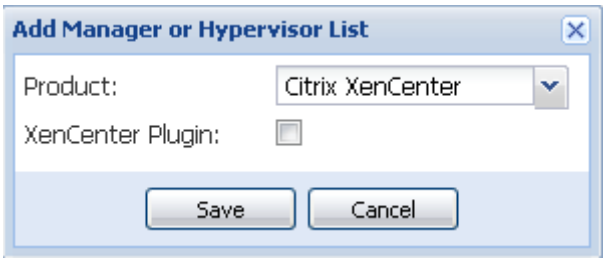


- Product — The type (Citrix XenServer)
- Hostname or IP address — The List of Citrix XenServer Hostname or IP address.

7.8.6 Adding a XenCenter

As Citrix XenCenter is a Client and not a Manager, we add the possibility to install a plug-in on the system where XenCenter is installed.

This plug-in enables the user to use IPM into XenCenter.



(Refer to the following appendix: “Configuring the XenCenter Plug-in)

7.9 Configuring Hypervisors (ESX/ESXi Server, XenServer)

7.9.1 Introduction

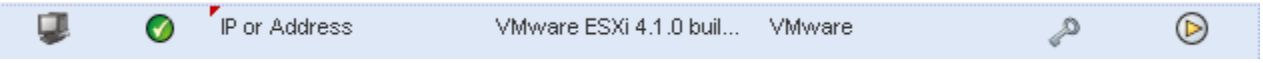
If you previously “Added a Manager” in IPM:

- Once you have entered the correct information for the manager, IPM connects to the manager (vCenter or SCVMM).
- IPM automatically retrieves the VMHost information and creates new nodes in IPM for each VMhost
- IPM automatically creates two different types of nodes that will be described after (you can see the new node in the Node List)
- You can now proceed to the Maintenance and Shutdown configuration step

If you previously “Added an Hypervisor List” in IPM:

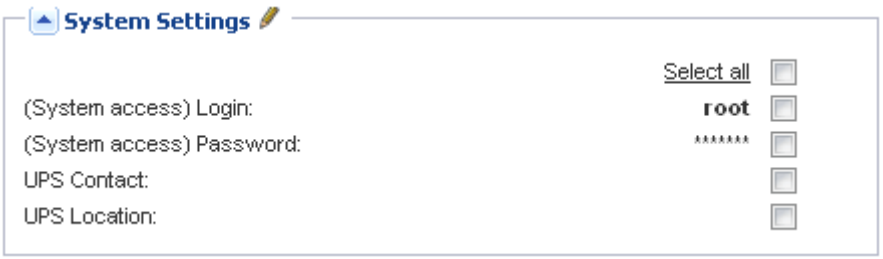
- Once you have “Added a new list of Hypervisor”, IPM creates new nodes and waits for the credential.

- We explain on the next chapter how to configure the credentials for hypervisors (ESX/ESXi, XenServer)
- IPM creates two different types of nodes that will be described after (you can see the new node in the Node List)



7.9.2 Credential configuration for the Hypervisors (ESX/ESXi, XenServer)

- You have to configure the node credential in the Node Configuration Panel.



- Once you have entered the correct information, IPM will retrieve Hypervisors information.
- You can now proceed to the Maintenance and Shutdown configuration step

7.10 Configuring Maintenance and Shutdown

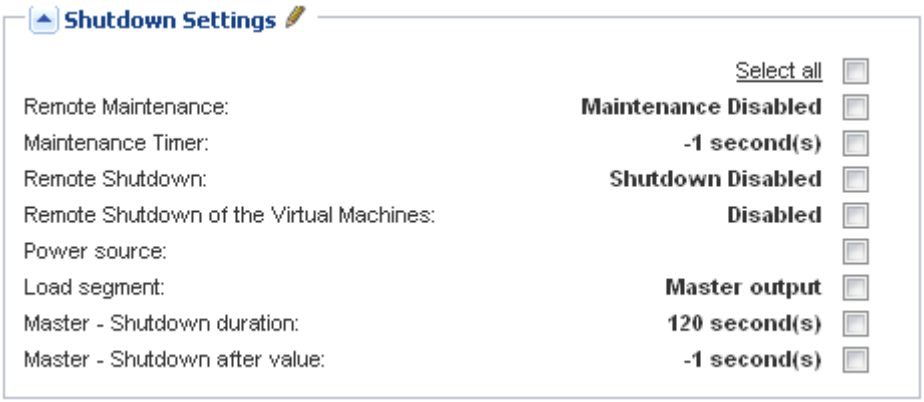
7.10.1 Introduction

- Once you have entered the correct credential information for your Managers and Hypervisors, you have to configure the Maintenance and Shutdown sequences according to the availability needs of your IT infrastructure when power fails. There are two types of VMHost nodes as explained in following sections.

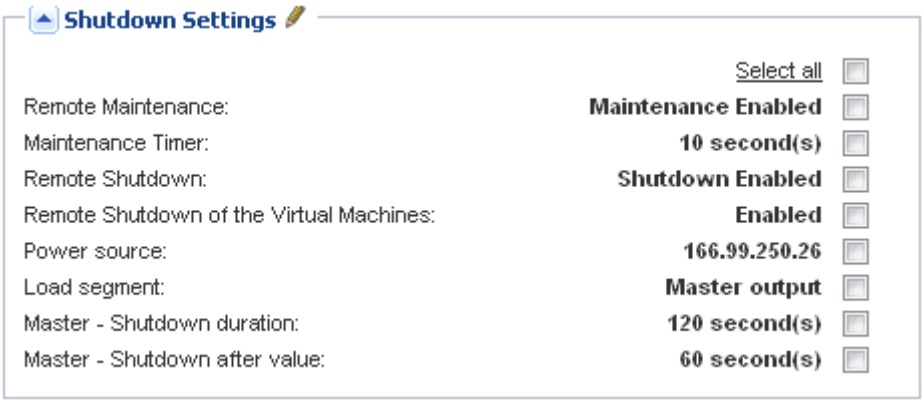
7.10.2 The VMhost has No IPP

There is no IPP installed on the server that is hosting the Hypervisor (VMHost). In such case the Shutdown is remotely done by IPM. **Only with VMware hypervisors and Citrix XenServer, this shutdown configuration is used**.

In this case, the node has both the functionalities of remote maintenance mode and remote shutdown . You can configure the node and add a Power Source in the Node Configuration Panel shown below.



After Configuration (Please, refer to Nodes Settings paragraph to use the configuration interface.)



Parameters	Values	Description
Remote Maintenance	Enabled, Disabled	When enabled, it allows the server management tool to move the virtual machines from this server to another server in case of "UPS on battery state" and "Maintenance Timer elapsed"
Maintenance timer	User to Type a value	Time elapsed "on battery state" before the IPM triggers the state of the Hypervisor to change to maintenance mode
Remote Shutdown	Enabled, Disabled	When enabled, it allows IPM to gracefully shutdown this server in case of "UPS on battery state" and Shutdown criteria reached
Remote Shutdown of the Virtual Machines	Enabled, Disabled	Enables the IPM to shutdown the Virtual Machines before host gets shutdown and restart the VMs when the host restarts

PowerSource	IP address of UPS	The UPS powering this server. This node should exist in IPM
Load segment	Master, Load Segment1, Load Segment2	UPS load segment powering the server
Master – Shutdown duration	User to Type a value	This is a Server Shutdown criteria is the time needed for the server to shutdown gracefully
Master – Shutdown after value	User to Type a value	This is a Server Shutdown criteria is the time elapsed “on battery state” before graceful Shutdown. This timer must be greater than the maintenance timer. “-1” value means that timer is disabled

Note:

- The Remote Shutdown functionality is reserved for VMware ESX/ESXi and Citrix XenServer nodes. (Microsoft Hyper–V benefits from local IPP shutdown).
- The Remote Shutdown of the Virtual Machines is supported on VMware ESX/ESXi
- The Maintenance Timer must be less than the Shutdown after value.

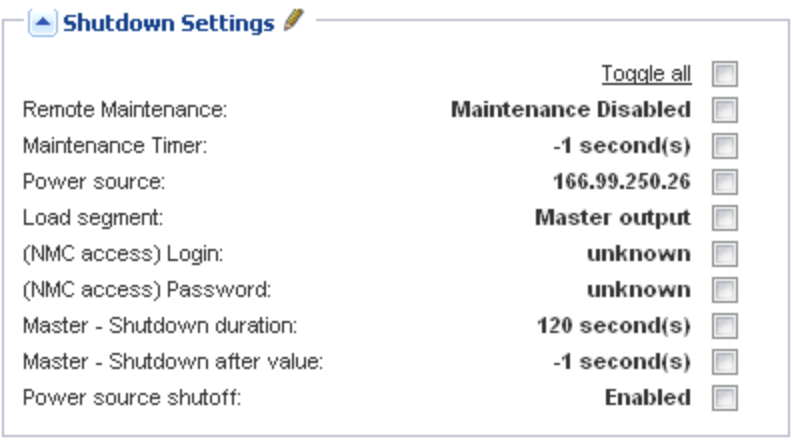
7.10.3 IPM detects IPP running on the VMHost

There is an IPP installed on the server that is hosting the Hypervisor (VMHost). In such case the Shutdown is done by this IPP.

In this case, the node contains both parameter types:

- The remote maintenance mode feature parameters.
- The IPP shutdown parameters (as an IPP will perform locally the shutdown).
  Note: all the parameters are retrieved from the IPP, and you will configure the IPP from IPM in this Node Configuration Panel.

Please, refer to Nodes Settings paragraph to use the configuration interface.



- Remote Maintenance — Enabled or Disabled (When enabled, it allows the server management tool to move the virtual machines from this server to another server in case of “UPS on battery state” and Maintenance Timer elapsed).
- Maintenance timer — Time elapsed “on battery state” before the IPM script changes the state of the Hypervisor to maintenance mode.
  “-1” value means that timer is disabled.
  Please refers to Appendix: Configuring Maintenance mode and vMotion with vCenter and Appendix: Configuring Maintenance mode and LiveMigration with SCVMM
- PowerSource — The UPS powering this server.
- Load segment — UPS load segment powering the server.
- (NMC access) Login/Password: — The Network Management Card Login/Password that allows IPP software to control NMC shutdown sequence.
- Master – Shutdown duration — Server Shutdown criteria (time needed for server graceful shutdown).
- Master – Shutdown after value — Server Shutdown criteria (time elapsed “on battery state” before graceful Shutdown) (This timer must be greater than the maintenance timer).
  “-1” value means that timer is disabled.
- Power source shutoff — Disabled (Enabled is used only for server connected with UPS though RS232 or USB. Virtualization behavior requires Ethernet connectivity (NMC card).

Note: If you install an IPP on the VMHost after the IPM node has been created:

- Delete the node in IPM,
- Rediscover the node with the “Address Scan” in the Auto Discovery panel,
- IPM will create the right node type and retrieve both the VMHost information and the IPP information.

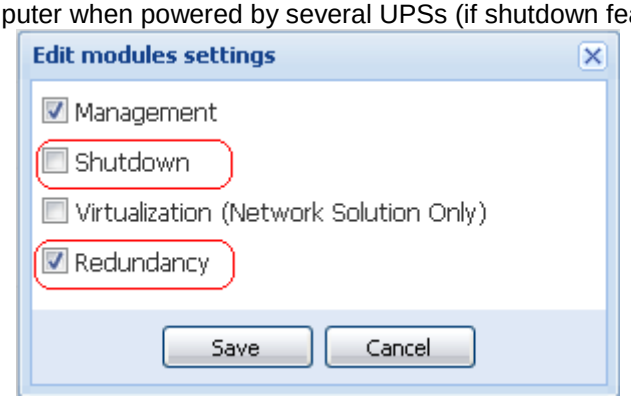
8 Redundancy

8.1 Introduction

Intelligent Power® Manager can supervise composite devices. Composite devices are virtual nodes composed of UPSs mounted with specific redundancy topologies (*Redundant Supplies*, *Hot Standby* or *Static Transfer Switch* for two components and *Parallel* for two or more components) and a dedicated redundancy level.

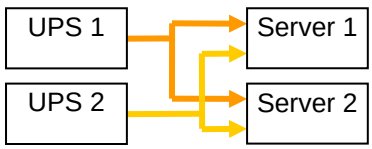
This Redundancy feature has to be Enabled from the **Settings** -> **System -> Modules Settings**
Intelligent Power Manager will then:

- Supervise composite devices (if Redundancy feature is activated)
- Shutdown IPM computer when powered by several UPSs (if shutdown feature is also activated).

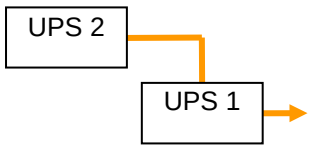


Here are illustrated the electrical redundancy topologies:

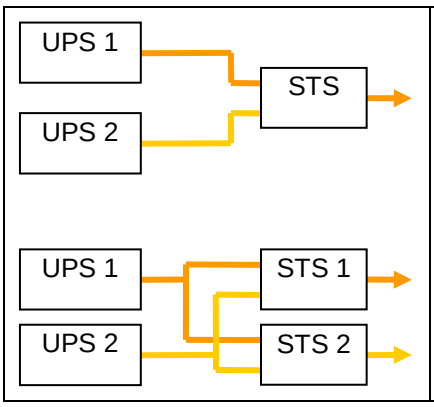
- Redundant Supplies (dual feed or triple feed or …)

	In this case the two UPSs provide power on one or several multiple feed servers.

- Hot Standby

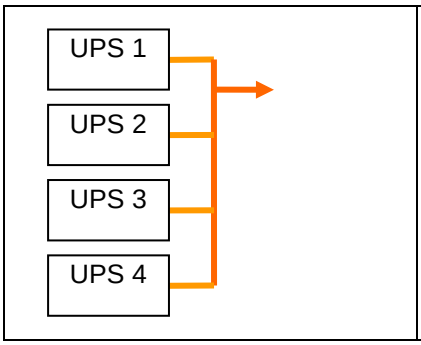
	For "Hot Standby" mode, when the upstream UPS powers the load, the downstream UPS is on bypass.

- Static Transfer Switch for two components



For "STS" mode there are several cases with single STS or multiple STSs.

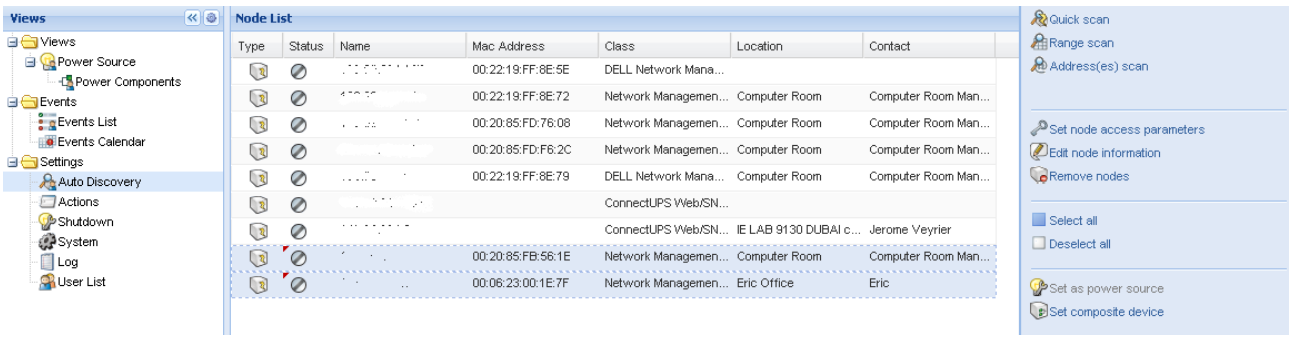
- Parallel for two or more components



All the UPSs power the load at the same time.

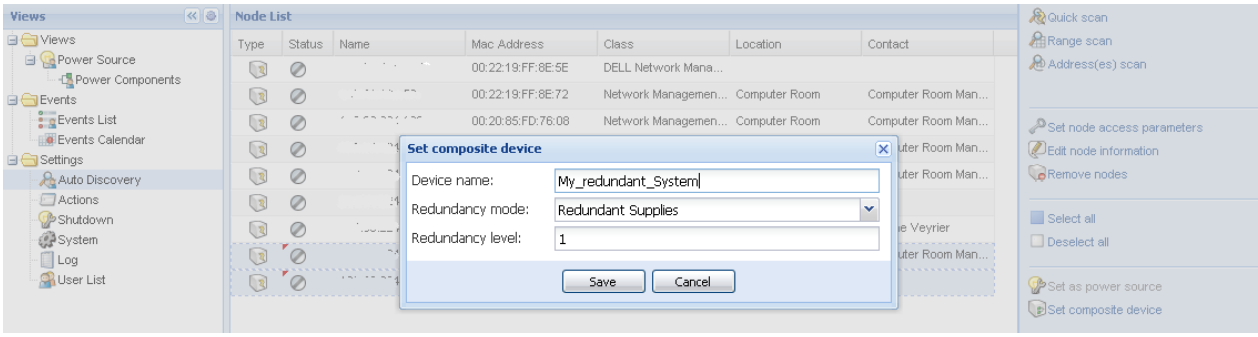
8.2 Redundancy configuration

- Login with an administrator user profile
- Select two or more nodes and click on the *"Set composite device"* menu item:



- In the dialog box, enter redundancy mode and level, eventually specify a device name
  Device name: User name of the composite device
  Redundancy mode: Refer to the Introduction chapter to select the correct electrical topology (Parallel / Redundant Supplies / Hot Standby / Static Transfer Switch)
  Redundancy Level: It is the minimal number of redundant UPSs powering your system:

The default value is 0.
If you set this parameter to a higher level you will receive the Redundancy Lost alarm when you don't have enough redundant UPSs.



- Then the new node is created.
- You can see it in the *"Auto discovery"* node list:

You can select it as power source.

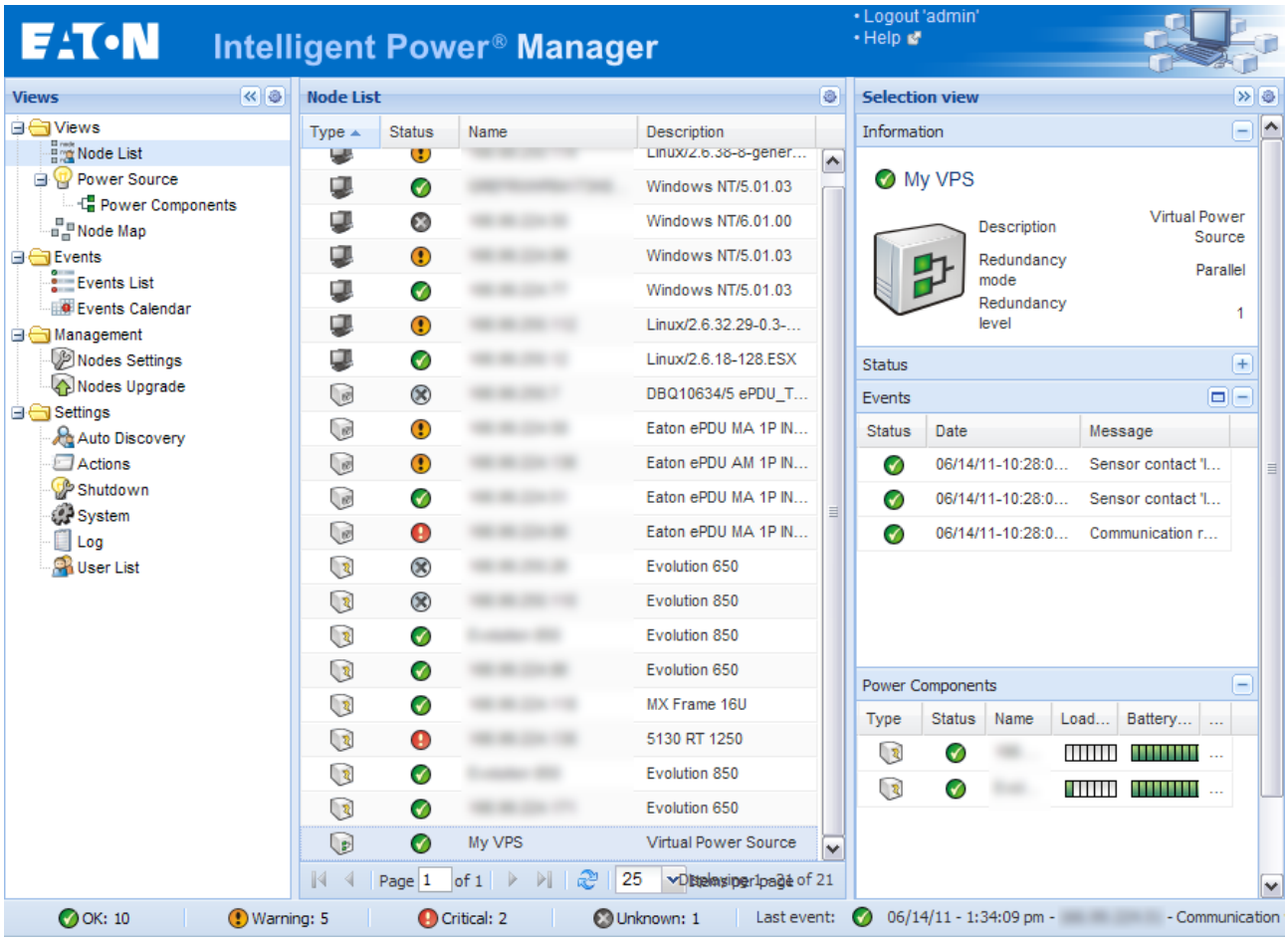
You can edit composite device properties by selecting it in the discovery view then click again on the *"Set composite device"* menu item.

If you select components of a composite device and click on the *"Set composite device"* menu item again, properties of existing composite device are shown; no new composite device is created so no composite device duplication is possible.

The created "Virtual Power Source" is counted as a node for the licensing node limitation.

8.3 Redundancy views

8.3.1 Redundancy view in *Node List*

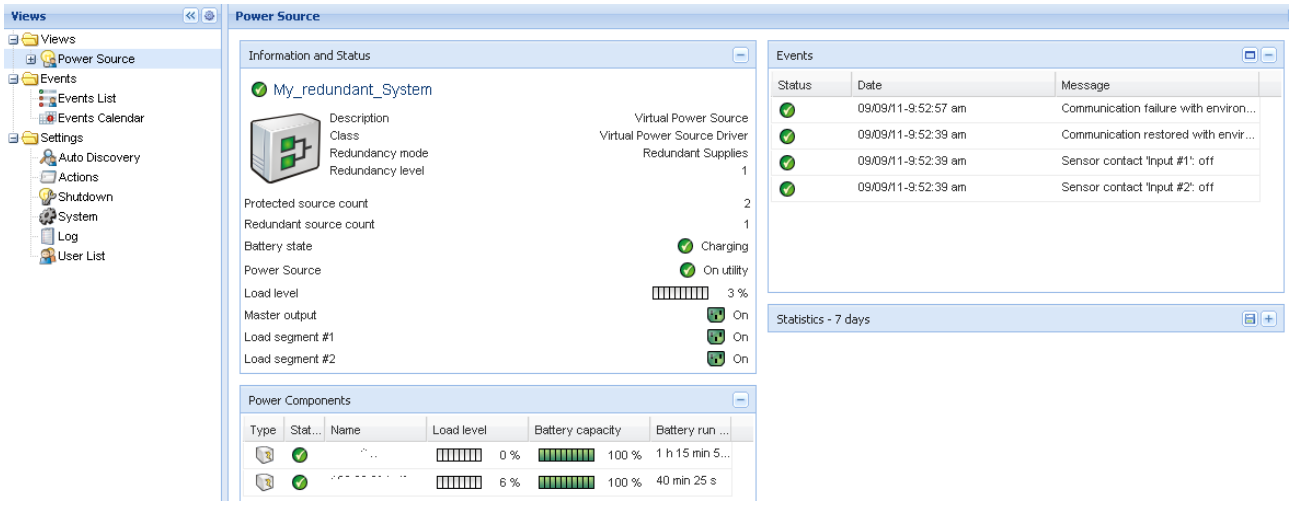


When a composite device is selected in the *node list*, the user can view it in the *selection view*, with following information:

- Dedicated states in "*Information"* and *"Status"* panels.
- The "*Events"* panel shows events from the composite devices and all its child components.
- A dedicated *"Power components"* panel displays component states including load level and battery run time.

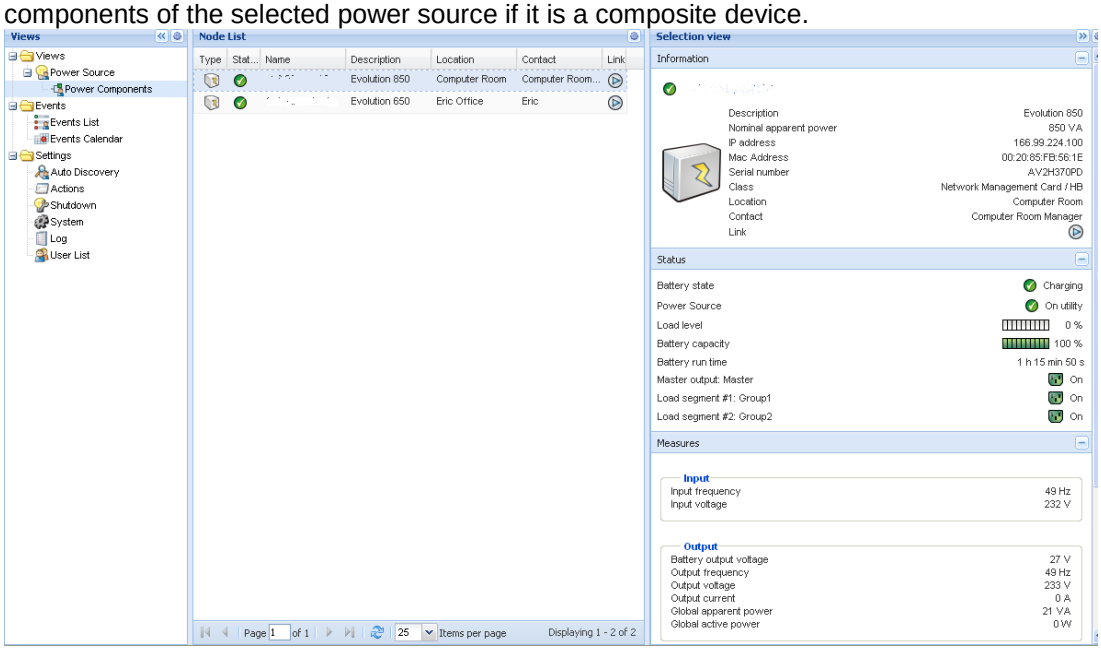
8.3.2 Composite device in *Power source view*

When *"Redundancy and shutdown"* module are activated, a composite device can be selected as power source. The user can show it in the *"Power Source"* view.
In this case, *Information"*, *"Status"*, "*Events"* and *"Power components"* panels are displayed with specifics data.



8.3.3 Power components sub view

When *"Redundancy and shutdown"* module are activated, a new view called *"Power components"* is available as a sub view of *"Power source"*. This view shows a list of nodes with their properties but just with components of the selected power source if it is a composite device.

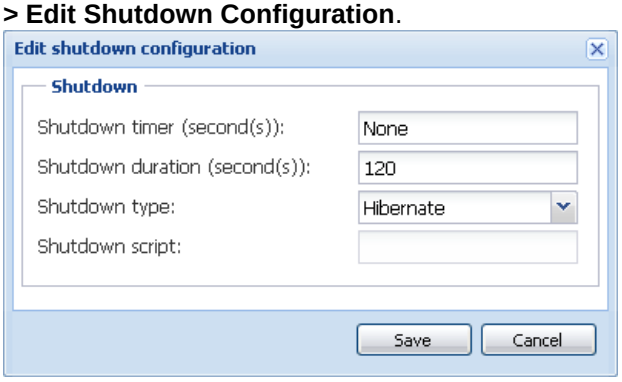


8.4 Redundancy use case (if shutdown is activated)

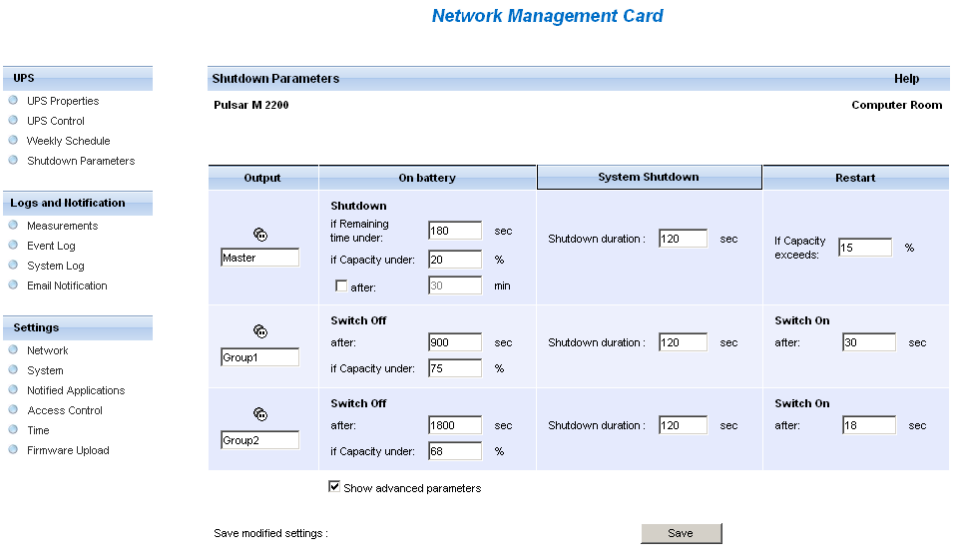
We describe several typical use cases that will help you to configure properly the redundant shutdown sequence according to your needs.

Use Case #1: The user wants to have the longest backup time with the redundant configuration

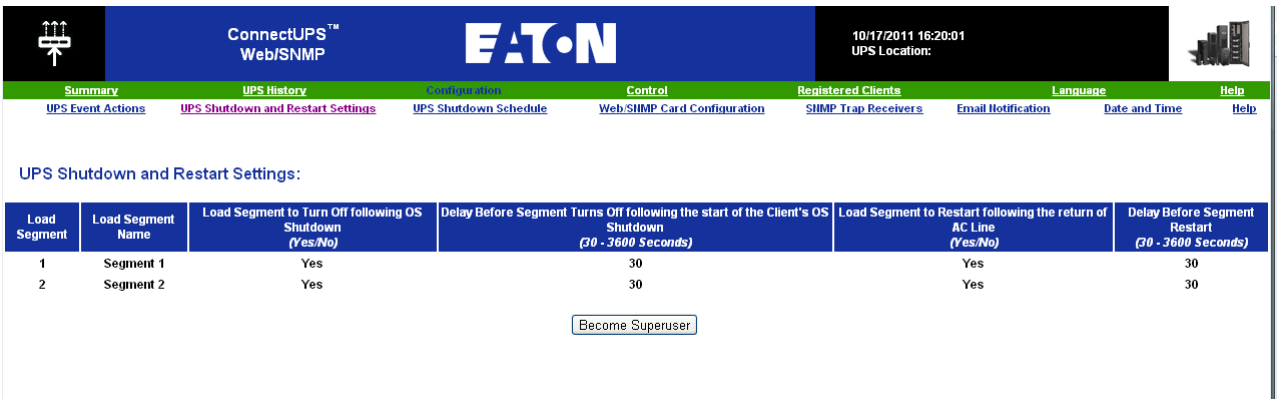
⇨ This is the default IPM configuration.
The next screenshot illustrates this IPM default configuration available from **Settings -> Shutdown -> Edit Shutdown Configuration**.



⇨ This is the default configuration on NMC
e.g. with Network-MS (ex 66102 / 103006826) and Modbus-MS (ex 66103), NMC default shutdown configuration is available from **UPS-> Shutdown Configuration** as illustrated on next screenshot:

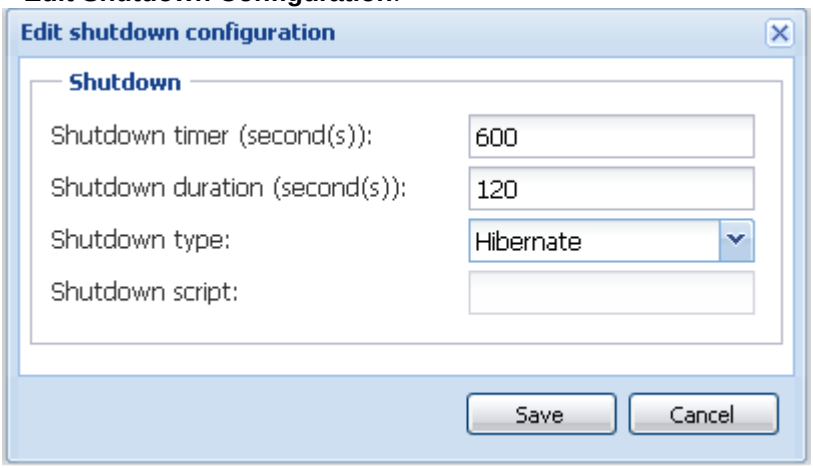


- ⇨ e.g. with ConnectUPS-X Slot or ConnectUPS-BD, NMC default shutdown configuration is available from **Configuration-> UPS Shutdown and Restart Settings** as illustrated on next screenshot:



Use Case #2: The user wants to have a shutdown after a predefined time of 10 mins. The shutdown has to occur even if only one UPS is on battery.
=> In this case, each server can have its own shutdown timer (10 mins, 8 mins, 6 mins…)

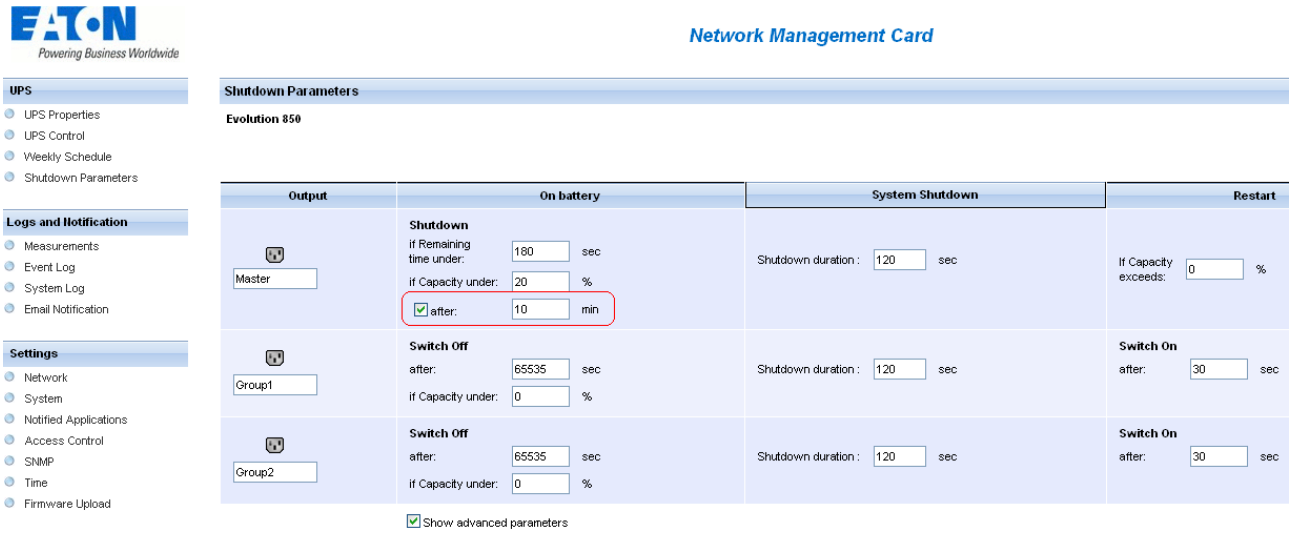
- ⇨ The user has to configure a shutdown timer of 10 mins in IPM
  The next screenshot illustrates this IPM default configuration available from **Settings -> Shutdown -> Edit Shutdown Configuration**.



- ⇨ this is the default configuration on NMC (refer to previous use case)

Use Case #3: The user wants to have a shutdown starting 10 mins from the last detected Utility failure event. (We have 2 UPSs, one of them is redundant)
=> In this case, all servers shutdown at the same time.

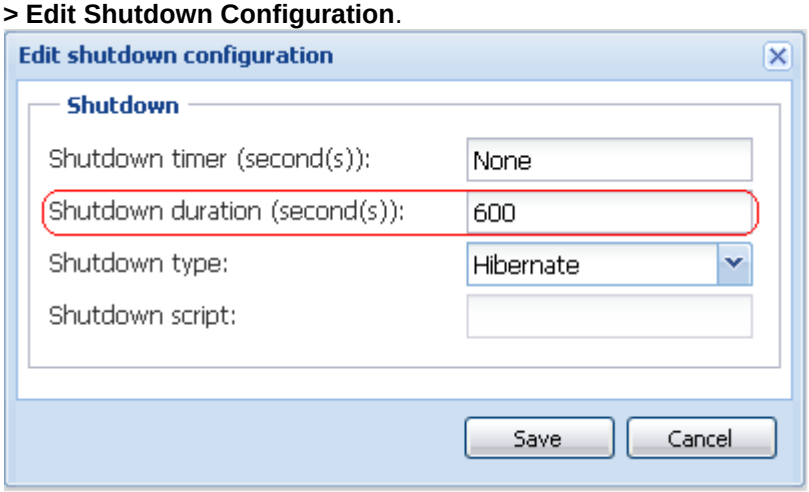
- ⇨ This is the default IPM configuration
- ⇨ The user has to configure a shutdown timer of 10 mins in all the NMCs
  In this case, the last UPS will send the shutdown order after 10 min. if it runs on battery. If the last UPS never run on battery, the first UPS will simply shutdown at the end of autonomy and the last UPS will take the load.(if it has the capacity, otherwise the shutdown will occur sooner)
  NMC Shutdown configuration is available from **UPS-> Shutdown Configuration** as illustrated on next screenshot:


Powering Business Worldwide
Network Management Card
UPS
UPS Properties
UPS Control
Weekly Schedule
Shutdown Parameters
Logs and Notification
Measurements
Event Log
System Log
Email Notification
Settings
Network
System
Notified Applications
Access Control
SNMP
Time
Firmware Upload
Shutdown Parameters
Evolution 850
Output
On battery
System Shutdown
Restart
Master
Shutdown
if Remaining time under: 180 sec
if Capacity under: 20 %
after: 10 min
Shutdown duration : 120 sec
If Capacity exceeds: 0 %
Group1
Switch Off
after: 65535 sec
if Capacity under: 0 %
Shutdown duration : 120 sec
Switch On
after: 30 sec
Group2
Switch Off
after: 65535 sec
if Capacity under: 0 %
Shutdown duration : 120 sec
Switch On
after: 30 sec
Show advanced parameters
Save modified settings :
Save


ConnectUPS™
Web/SNMP
10/17/2011 16:23:05
UPS Location:
Summary
UPS History
Configuration
Control
Registered Clients
Language
Help
UPS Event Actions
UPS Shutdown and Restart Settings
UPS Shutdown Schedule
Web/SNMP Card Configuration
SNMP Trap Receivers
Email Notification
Date and Time
Help
AC Fail Event Actions:
Delay Before First AC Fail Warning Message (0-999 Seconds, 0 =No Message) 10
Warning Interval (0-9999 Seconds, 0 =No Message Repeat) 60
Load Segment
Load Segment Name
Notify Client OS to Shutdown on an AC Failure (Yes/No)
Number of Seconds the AC Failure must last before Client is notified to start OS Shutdown (1 - 21600 Seconds)
1 Segment 1 Yes 600
2 Segment 2 Yes 600
Become Superuser

Use Case #4: The user wants to have a shutdown when the remaining time of the last UPS is 10 minutes => In this case, each server can have its own shutdown duration (10 mins, 8 mins, 3 mins…)

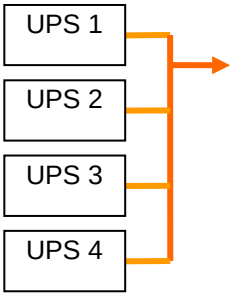
- ⇨ The user has to configure a shutdown duration of 10 mins in IPM
  The next screenshot illustrates this IPM default configuration available from **Settings -> Shutdown -> Edit Shutdown Configuration**.



- ⇨ This is the default configuration on NMC (refer to previous use case)

8.5 Redundancy advanced behavior example

For the following tables we take a parallel UPS configuration with 4 UPSs (Each UPS is 20 kW)
For this parallel topology, the Load can vary between 0 and 80 KW.



Redundancy alarm Management with 4 modules:

According to the user defined "Redundancy Level" and the "Load", we detail following information:

- R is the number of redundant UPSs
- Status of Redundancy lost alarm

Load / Redundancy Level	Load < 20 KW	20 KW < Load < 40 KW	40 KW < Load < 60 KW	60 KW < Load < 80 KW
0	R=3	R=2	R=1	R=0
1	R=3	R=2	R=1	R=0 → Redundancy Lost active
2	R=3	R=2	R=1 → Redundancy Lost active	R=0 → Redundancy Lost active
3	R=3	R=2 → Redundancy Lost active	R=1 → Redundancy Lost active	R=0 → Redundancy Lost active

Protection alarm Management with 4 modules:

According to the "Load" and the "Number of failed UPSs", we detail following information:

- P is the number of UPSs protecting the load
- R is the number of redundant UPSs
- Status of Protection lost alarm

Load / Failures	Load < 20 KW	20 KW < Load < 40 KW	40 KW < Load < 60 KW	60 KW < Load < 80 KW
No failure.	P=4; R=3	P=4; R=2	P=4; R=1	P=4; R=0
1 failure.	P=3; R=2	P=3; R=1	P=3; R=0	P=3; R=0 → Protection Lost active
2 failures.	P=2; R=1	P=2; R=0	P=2; R=0 → Protection Lost active	P=2; R=0 → Protection Lost active
3 failures.	P=1; R=0	P=1; R=0 → Protection Lost active	P=1; R=0 → Protection Lost active	P=1; R=0 → Protection Lost active
4 failures.	P=0; R=0 → Protection Lost active	P=0; R=0 → Protection Lost active	P=0; R=0 → Protection Lost active	P=0; R=0 → Protection Lost active

8.6 Redundancy compatibility list

Eaton has tested in redundant mode following UPSs and topologies
Other topologies or UPSs may work but have not been tested

UPS	Parallel	Multiple Feed	Hot Standby	STS
9120, 9130, 9135	NA	✓NET ✓USB	NA	✓NET ✓USB
Eaton 5PX, Evolution, Evolution S	NA	✓NET ✓USB	NA	✓NET ✓USB
Pulsar 700 / 1500 (Intl. & US)	NA	✓NET ✓USB	NA	✓NET ✓USB
Pulsar M / EX	NA	✓NET ✓USB	NA	✓NET ✓USB
Pulsar MX 1+1	✓NET	NA	NA	NA
Pulsar MX Frame 16 U	NA	✓NET ✓USB	NA	✓NET ✓USB
EX RT	NA	✓NET	✓NET (*)	✓NET

UPS Compatibility List for Redundancy on 1-phase UPSs

UPS	Parallel	Multiple Feed	Hot Standby	STS
Blade UPS	✓NET	✓NET	NA	NA
9x55 (9155 and 9355)	✓NET	✓NET	NA	NA
9390	✓NET	✓NET	NA	NA
9395	✓NET	✓NET	NA	NA
Eaton 9E Essential	NA	✓NET	NA	NA

UPS Compatibility List for Redundancy on 3-phases UPSs

✓NET: Acquisition through the Network Card
✓USB: Acquisition through USB
NA: Not Applicable
✓NET (*): Behavior has been implemented, but has not been tested

9 Compatibility List

Eaton has tested the compatibility of Eaton Power Manager with the following devices and applications.

Note: If a Device doesn't support the Quick Scan feature it can be supervised if "Address Scan" or "Range Scan" operations are performed.

9.1 Eaton Devices

Eaton equipment designation	Type	Features	Illustration
Network Management Card Minislot SNMP/Web – Network-MS (ex 66102) And associated Environment Sensor	UPS Option Card Eaton Pulsar	Quick Scan Supervision Management Shutdown	
Network Management Card & Modbus/JBus – Modbus-MS (ex 66103) (through Ethernet Network) And associated Environment Sensor 66846	UPS Option Card Eaton Pulsar	Quick Scan Supervision Management Shutdown	
ConnectUPS- Minislot Network Management Card / Network-MS (ex 103006826)	UPS Option Card Eaton Powerware	Quick Scan Supervision Management Shutdown	
ConnectUPS-BD Web /SNMP	UPS Option Card Eaton Powerware	Quick Scan Supervision Shutdown (**)	
ConnectUPS-XSlot Web /SNMP/xHubCard (*)	UPS Option Card Eaton Powerware	Quick Scan Supervision Shutdown (**)	
PXGX2000 (*)	UPS Option Card Eaton Powerware	Quick Scan Supervision Shutdown (**)	
PXGX-UPS Card	UPS Option Card Eaton	Quick Scan Supervision Shutdown	
Eaton Advanced ePDU (Europe = Switched (SW), Advanced Monitored (AM) and Managed (MA) / US= Advanced Monitored (AM) and Managed (MA))	ePDU Integrated Communication Card	Quick Scan (v 1.20) Supervision (v1.20) Management (v 1.25)	
Eaton ePDU Monitored & Advanced Monitored	PDU Integrated Communication Card	Supervision	

Eaton ePDU Managed	PDU Integrated Communication Card	Supervision	
Eaton ePDU Switched	PDU Integrated Communication Card	Supervision	
MGE Switched PDU NM - 68130 / 68134/56132/56134/56136/56138 MGE AmpMeter PDU NM - 68152/ 56134/56144	PDU Integrated Communication Card	Supervision	
MGE Midspan NM - 66892	Midspan Integrated Communication Card	Supervision	
Computers (Windows - Linux) hosting the IPP Shutdown Controller	UPS Proxy (Shutdown Controller)	Quick Scan Supervision Management Shutdown	
MGE Network Management Proxy(Windows) XML-Agent	UPS Proxy (legacy)	Supervision	
Computers (Windows) hosting the application LanSafe Web View	UPS Proxy (legacy)	Supervision	
MGE Network Management Card MiniSlot SNMP/Web – 66244 And associated Environment Sensor	UPS Option Card (legacy)	Supervision	
Network Management Card Transverse SNMP/Web – 66074 And associated Environment Sensor	UPS Option Card (Legacy)	Supervision	

(*)With Intelligent Power Manager 1.10, the Eaton Powerware 3 phase UPSs compatibility is officially available according to the following solution:

- ***Cards:*** *ConnectUPS-X v4.30 or PXGX2000 v1.20*
- ***UPSs:*** *Blade UPS, PW9155 Dual Phase, PW9355 10-30 kVA, PW9390 40-160kVA, PW9395 225-1100kVA & SBM*
- ***Known limitation:*** *PW9315 will not be supported by this 1.10 release.*

(**)This feature is only available if you install IPM 1.14 on a computer that is NOT hosting a previous IPM release.

If you have upgraded IPM from 1.XX to 1.14 release and want to use this feature, please proceed as follows:
=> Stop IPM service
=> Remove (or rename) the configuration file: configs/config.js
=> Start IPM service
=> If needed, reconfigure system parameters

9.2 Applications on Computers

Applications designation	Features	
Computers (Windows/Linux) hosting the application Intelligent Power Protector	Quick Scan Supervision Management	
Computers (Windows/Linux/Mac) hosting the application Network Shutdown Module V3.xx	Quick Scan Supervision Management	

9.3 Eaton Serial line Devices

Eaton Equipment designation	Connectivity
Eaton **Powerware** series: 3105, 5110, 5115, 5130, 9130, 9135, 9140 and legacy 9120, 9125	USB or RS232
Eaton **Powerware** series: BladeUPS, 5125, 9155, 9355, 9390, 9395	RS232 only
Eaton **Pulsar** Series: Evolution 650 / 850 / 1150 / S 1250 / 1550 / S 1750 / 2000 / S 2500 / S 3000 Pulsar 700 / 1000 / 1500 / 1000 RT2U / 1500 RT2U (intl. & US Models) Pulsar M / EX Eaton 5PX Pulsar MX & Pulsar MX Frame 16 U / MX	USB or RS232
Eaton **Pulsar** Series: EX RT Comet EX RT 1:1 / 3:1 / EX 5 RT (Asia/Pacific)	RS232 only

Notes:

- XSlot-USB Module for Powerware series is unsupported by Intelligent Power® Manager 1.12
- Ellipse ASR 600/750/1000/1500 USBS, Ellipse MAX, Protection Station, Protection Center, NOVA AVR, are currently supported by Personal Solution Pac software.

9.4 Other Devices

Equipment designation	Card/ proxy	Features	
HP UPS Network Module Minislot (AF465A)	Network Card	Quick Scan Supervision	
Dell Network UPS Card (H910P)	Network Card	Quick Scan Supervision	

IBM UPS Network Management Card (46M4110)	Network Card	Quick Scan Supervision	
APC UPSs	APC Network Management Card	Supervision	
All IETF MIB enabled UPSs (RFC1628) e.g. Liebert, …		Supervision	**STANDARD IETF UPS MIB 1.3.6.1.2.1.33.xx**
PowerDsine series 6000	Card		
Servertech sentry models	PDU Integrated Communication Card		

9.5 Performances

To provide a performance evaluation Eaton has tested the following two configurations:

Test with Machine 1 (server Dell PowerEdge 2900)

- CPU: Intel Xeon 5130 Dual Core @2GHz
- Memory: 2Go DDR2 @666MHz
- HDD: 2 HDDs 67GB 7200 rpm RAID 0 (Mirroring)
- OS: Windows Server 2008 64 bits

Test conditions during 40 hours:

- 1300 nodes (including ~50 real), mainly IPMs, and some NSM and NMC.
- Average CPU load: 20~30%
- Memory load: 200~300MB

Test with Machine 2 (typical PC)

- CPU : Intel Core2 Duo 6600 @2.4GHz
- Memory: 2Go DDR2
- HDD: 1 HDD 220 GB 7200 rpm
- OS : Windows Vista Enterprise 32 bits

Test conditions during 40 hours:

- 1000 nodes (including ~50 real), mainly IPMs, and some NSM and NMC.
- Average CPU load: ~ 60%
- Memory load: 200~300MB

Note that these tests have been performed on Windows server Operating System. The Windows 2003 or 2008 Operating Systems don’t have the limitation of 10 simultaneous connections.

9.6 Network Ports

Here is the list of Network ports used by IPM and IPP:

Protocol	Mode/Port	NMC	PXGX2000, PXGX-UPS, Connect UPS BD, Connect UPS XSlot	IPP with Shutdown controller	IPP	IPM
SMTP	TCP/25	OUT	OUT	OUT	OUT	OUT
DHCP/BOOTP	UDP/67	OUT	OUT	x	x	x
TFTP	UDP/69	IN	x	OUT	OUT	OUT
HTTP	TCP/80	IN	IN	OUT	OUT	OUT
NTP	UDP/123	OUT	OUT	x	x	x
SNMP	UDP/161	IN	IN	OUT	OUT	OUT
SNMP Traps	UDP/162	OUT	OUT	x	x	x
UNMP	UDP/200	x	OUT	IN/OUT	IN/OUT	IN/OUT
HTTPS	TCP/443	IN	IN	OUT	OUT	OUT
EATON Supervision	TCP/4679	x	x	IN/OUT	IN/OUT	IN/OUT
EATON Notification Broadcast	UDP/4679	IN/OUT	x	IN/OUT	IN/OUT	IN/OUT
EATON SSL Supervision	TCP/4680	x	x	IN/OUT	IN/OUT	IN/OUT
EATON Alarms Broadcast	UDP/4680	OUT	x	IN	IN	IN
EATON Connected Alarms	TCP/5000	IN	x	OUT	OUT	OUT
EATON Connected Alarms	TCP/5001	x	x	IN	OUT	OUT

10 FAQ and Error messages

In the HTML pages

Cannot display the UPS properties page. HTTP 404 error with IE.
Solution: Check the URL entered. > https://<name or IP of the computer hosting IPM>:4680/ or > http://<name or IP of the computer hosting IPM>:4679/

11 Glossary

IP address
When TCP/IP is installed on a computer, an address is assigned to the system. Each address is unique and is made up of four numbers, each between 0 and 256 (e.g. 168.8.156.210).

Network Management Proxy
Network Management Proxy is used to control a UPS and connect it to the TCP/IP network.

NMS (Network Management System)
The NMS supervises SNMP devices connected to the TCP-IP Network.

Network Shutdown Module
The Network Shutdown Module is a software module that uses the information transmitted by the Network Management Card/Proxy to inform computer users on the current status of the electrical power supplied to the computer.
If the supply of the electrical power from the UPS is at risk, the Network Shutdown Module initiates an orderly shutdown of the computer under the most secure conditions possible.

SSL (Secure Socket Layer, created by Netscape):
A solution for securing transactions over the internet. SSL is a communication protocol that authenticates the data exchanged, as well as ensuring its confidentiality and integrity. The protocol uses a recognized encryption method, the **RSA algorithm with a public key** (where RSA means Rivest, Shamir and Adleman, the inventors). An RSA key is the result of operations involving prime numbers. SSL is built into the Internet browsers on the market. The padlock in the bottom of your browser screen is automatically displayed if the server sending information uses SSL.

TCP/IP (Transmission Control Protocol / Internet Protocol):
Family of protocols for the transport and network layers.

12 Acknowledgements

Huge thanks from the Eaton software development team to the following projects:

Spider Monkey

Ext JS

SQLite
The SQLite Project http://www.sqlite.org/.
Their generous donation of the source code to the public domain helped us for this project.

Open SSL
- This IPM product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (http://www.openssl.org/)"
- This IPP product includes cryptographic software written by Eric Young (eay@cryptsoft.com)
- This IPP product includes software written by Tim Hudson (tjh@cryptsoft.com)

Lib USB

Net SNMP

The full License version for each of these projects is available from Intelligent Power Protector (Settings -> System -> About)

13 Appendix 1: Configuring the IPM vCenter Plug-in

13.1 Introduction

VMware's vCenter Server platform forms the foundation for virtualization management. It provides management of hosts and Virtual machines from a single console. To further unlock the power of VMware's management system, VMware has provided a facility to extend the functionality of VMware vCenter.

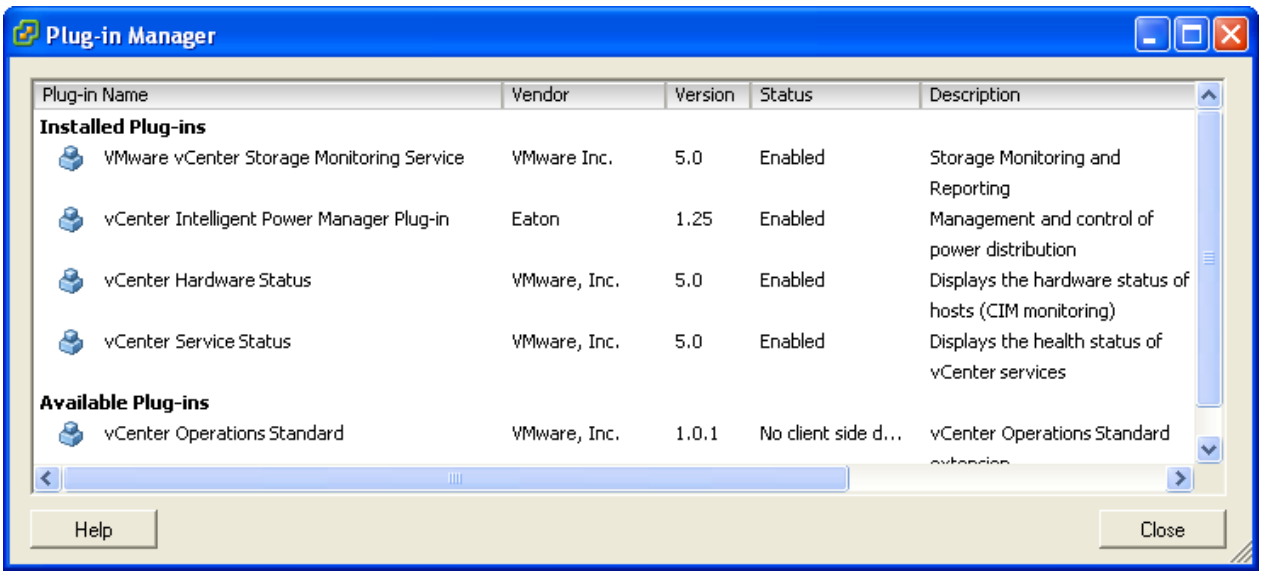
Various useful applications can be attached to vCenter to make it more useful. **Eaton vCenter Plug-in also called "vCenter Intelligent Power Manager Plug-in"** is a very easy to use and deploy Plug-in to manage IPM from vCenter. This plug-in provides the possibility to integrate Intelligent Power Manager (IPM) with vCenter environment. Once the plug-in is registered, a tab in vCenter will open IPM and allow users to configure and manage IPM from vCenter environment.

The VMware plug-in allow also the creation of new type of events that can be trig type of alarms.

13.2 Checking that IPM Plug-in is registered in vCenter

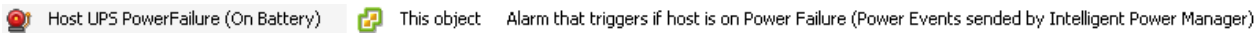
In the vSphere Client, click on Plug-ins -> Manage Plug-in …

Intelligent Power Plug-in vCenter can be seen in the Plug-in Manager



13.1 Events and Alarms

Once the **"vCenter Intelligent Power Manager Plug-in"** is registered, IPM creates a new alarm **"Host UPS PowerFailure (On Battery)"** that is triggered from power event.



13.2 Using IPM through vCenter

The "Eaton Power Manager" tab will now be visible in the vCenter Server Console and in the root folder . IPM is now available and is fully functional with the vSphere Client. To learn more about the features and usage of IPM, please consult the IPM User Manual. The IPM screen is shown below, note the "Eaton Power Manager" tab on the top is selected.

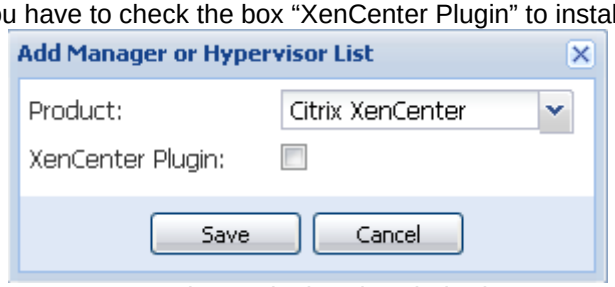
14 Appendix 2: Configuring the XenCenter Plug-in

14.1 Prerequisites

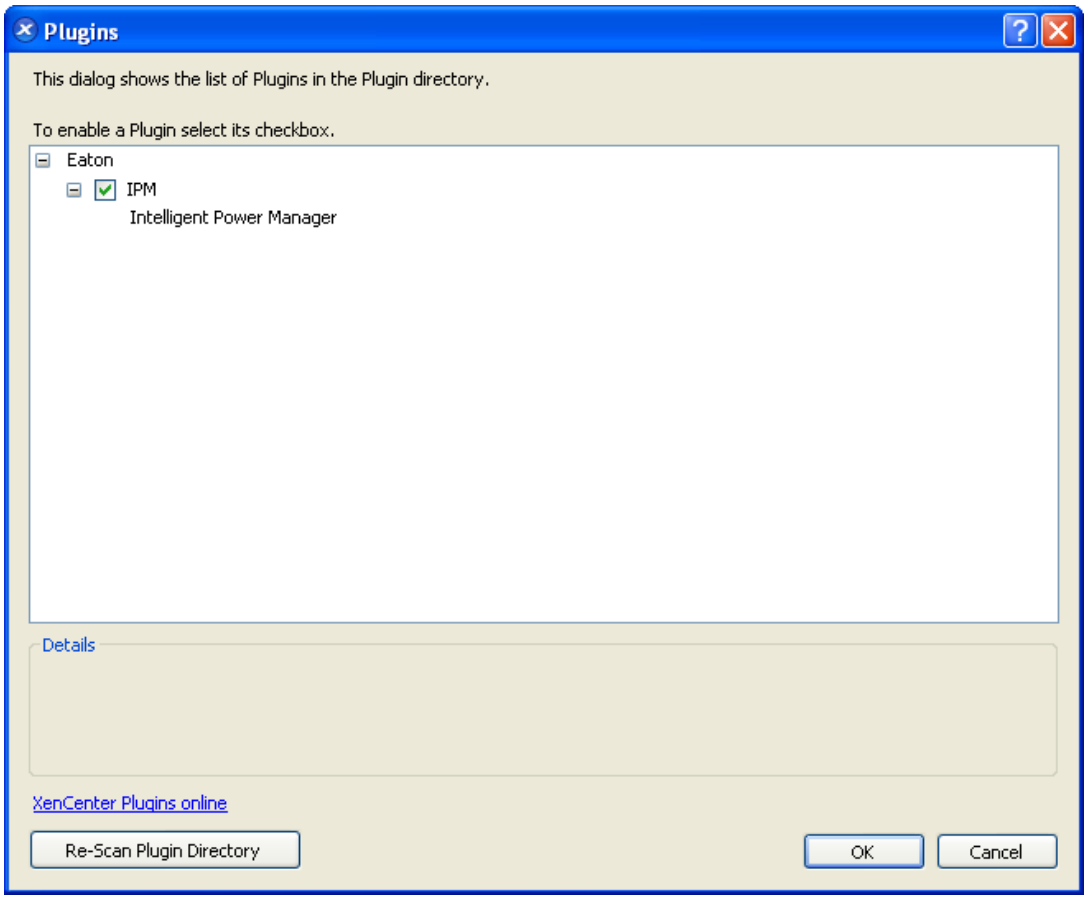
The only prerequisite is to have IPM installed on the same machine as XenCenter.

14.1 Check XenCenter Plug-in Installation

In the virtualization panel, you have to check the box “XenCenter Plugin” to install XenCenter Plug-in.

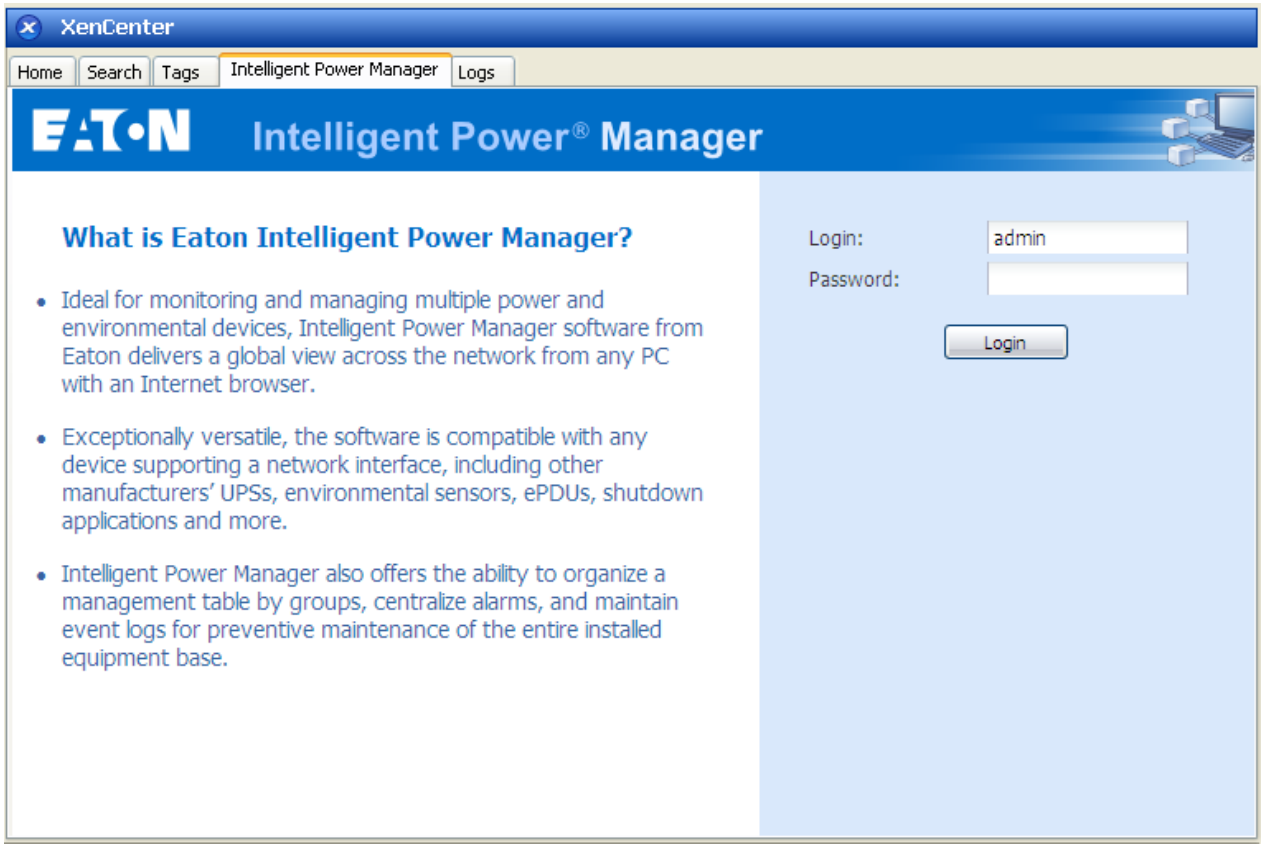


You will see the Plugin in XenCenter => Tools => Plugins. (see below)
If not, please Scan the Plug-in directory.



14.1 Using IPM through XenCenter

Once the Plug-in is installed, you can see on the XenCenter level a tab named **"Intelligent Power Manager"**



15 Appendix 3: Configuring Maintenance mode and vMotion with vCenter

15.1 Prerequisites

All Virtual Machine images have to be installed and configured on a file server. (Please refer to VMware user documentation listed in Appendix VMware references)

15.2 Introduction

The Dynamic Resource Scheduler (DRS) application from VMware is used to provide load balancing within the IT network. In particular, DRS is used to ensure the right resource capacity is available for the data center load. A second application called vMotion in conjunction with DRS will enact movement of Virtual machines from physical server to physical server in order to provide the best load balance.

The DPM application (Distributed Power Manager) will help maximize data center electrical power efficiency by checking DRS for physical server utilization then using vMotion, will move Virtual machines to servers in order to fully unload servers than idle them or power them down for maximum power savings.

Eaton uses the same vMotion capability when a UPS is in a critical power situation to move virtual machines off of a server that has a critical power situation. Intelligent Power Manager will now write alarms/alerts into vCenter, which, in turn, will trigger vMotion.

VMware uses the term ‘setting a server into Maintenance mode’ to trigger the vMotion. It is called this because before performing maintenance on server, the data center manager needs to clear the Virtual Machines from the server.

15.3 Concept of Maintenance Mode

Both standalone hosts, and hosts within a cluster, support the maintenance mode. Only ESX/ESXi Server 3.0 and later supports maintenance mode for standalone hosts.

A host enters or leaves maintenance mode only as the result of a user request. If the host is in a cluster when it enters maintenance mode, the user is given the option to evacuate powered-off virtual machines. If this option is selected, each powered-off virtual machine is migrated to another host, unless there is no compatible host available for the virtual machine in the cluster. While in maintenance mode, the host does not allow deployment or ‘power-on’ of a virtual machine. Virtual machines that are running on a host entering maintenance mode need to be either migrated to another host or shut down (either manually or automatically by DRS).

When no more running virtual machines are on the host, the host’s icon changes to include ‘under maintenance’ designation and the host’s Summary panel indicates the new state. The default automation mode of a virtual machine determines its behavior when the host (in a DRS cluster) it is running on enters maintenance mode:

- Any fully automated virtual machine is migrated automatically.
- For a partially automated or manual virtual machine, a recommendation for further user action is generated and displayed.

15.4 Configuring maintenance mode behavior in vCenter

To configure the maintenance mode feature behavior, we provide here a simple configuration example:

Enable the DRS in “Fully Automated” automation level with following steps:

- Open the vCenter server in a vSphere client.
- Right click on your Cluster > Edit Setting > Turn on VMware DRS. Click on next with all default values and finish.

Notes:

- With this example you choose to migrate all the virtual machines from this server to another server of the same cluster.
- You have the possibility to define other behaviors according to your needs

15.5 Configuration Test

To test the installation, please perform a power failure on the UPS and check on vSphere client that the corresponding ESX/ESXi host enters in Maintenance mode after the “Maintenance mode timer”.
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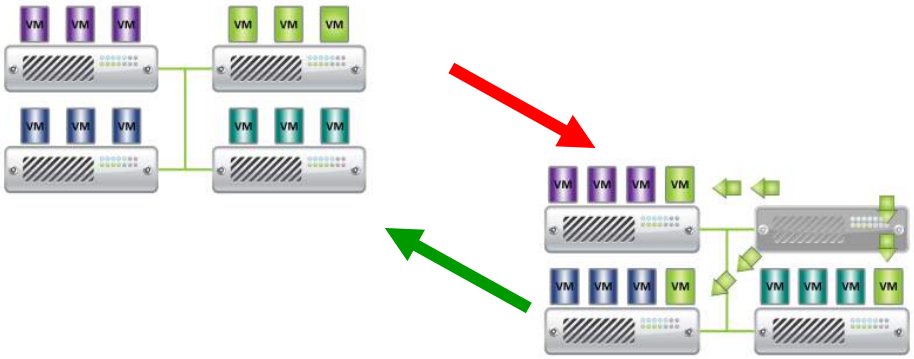
16 Appendix 4: VMware vCenter HA (High Availability)

Once the HA Cluster feature is enabled, VMware disables the automatic startup and shutdown functionality when a Hypervisor is shutdown.

IPM features for HA mode:

- IPM will continue to move the VM from one server to the others, if the all the servers are powered by different UPSs with different power source. (as illustrated on below picture)



- IPM continues to protect the Hypervisor also when power fails.

- Due to the deactivation of the automatic startup and shutdown, at the end of Utility failure sequence, all the virtual machine will “Power Off”.
  => To prevent this VM “Power off”, you have two solutions:

  1) Configure the VMware ESX/ESXi nodes in IPM to shutdown the VMs (Remote Shutdown of the Virtual Machines Setting) **(Recommended solution)**
  2) Install an IPP on each VM **(This is not an optimized solution).**
     You have to take care that when VMs move, the IPP still links to the same UPS power source.

Table configuration/behavior:

Case	Remote Shutdown	Remote Shutdown Type of the Virtual Machines	HA in vCenter	What happens to VMs	What happens to Hypervisor	Comments
1	Enabled	Enabled	Enabled	Shutdown	Shutdown	Valid configuration
2	Enabled	Enabled	Disabled	Shutdown	Shutdown	Valid configuration (anyway, more reliable to let VMware shutdown its own VMs)
3	Enabled	Disabled	Enabled	Crash	Shutdown	Hypervisor will shutdown without the VMs
4	Enabled	Disabled	Disabled	Crash/Shutdown	Shutdown	Depending if the Startup/shutdown of the virtual machines is configured
5	Disabled	Enabled	Enabled	Crash	Crash	IPM do nothing
6	Disabled	Enabled	Disabled	Crash	Crash	IPM do nothing
7	Disabled	Disabled	Enabled	Crash	Crash	IPM do nothing
8	Disabled	Disabled	Disabled	Crash	Crash	IPM do nothing

Reference:

- You can see on the link below the VMware note about the deactivation of the Automatic Startup/Shutdown when creating a VMware HA Cluster.

  Creating a vSphere HA Cluster

17 Appendix 5: Configuring Maintenance mode and LiveMigration with SCVMM

17.1 Maintenance Mode

In Virtual Machine Manager (VMM) 2008 R2, you can start *maintenance mode* for a virtual machine host anytime that you need to perform maintenance tasks on the physical host, such as applying security updates or replacing hardware on the physical host computer.

When you start maintenance mode on a Windows-based host, VMM automatically does the following:

- On a stand-alone host, places all running virtual machines into a saved state.
- On a Windows-based host cluster that is capable of live migration, gives you the option to do one of the following:
    - Live migrate all running highly available virtual machines to other hosts in the cluster, and place any running virtual machines that are not highly available in a saved state.
    - Place all running virtual machines into a saved state.

(Please refer to Microsoft user documentation listed in Appendix Microsoft references)

17.2 What is Live Migration

Live migration is a Hyper-V feature in Windows Server 2008 R2, which requires the failover clustering feature to be added and configured on the servers running Hyper-V. Live migration allows you to transparently move running virtual machines from one node of the failover cluster to another node in the same cluster without a dropped network connection or perceived downtime. In addition, failover clustering requires shared storage for the cluster nodes. This can include an iSCSI or Fiber-Channel Storage Area Network (SAN). All virtual machines are stored in the shared storage area, and the running virtual machine state is managed by one of the nodes. (Please refer to Microsoft user documentation listed in Appendix Microsoft references)

17.3 Configuration Test

To test the installation, please perform a power failure on the UPS and check on SCVMM console that the corresponding Hyper-V host enters in Maintenance mode after the “Maintenance mode timer”.

Hyper-V machines have to be started before the machine that is hosting the SCVMM.

SCVMM service needs some time to refresh its status. If the starting sequence is not correct, the Hyper-V will stay in Maintenance mode

18 Appendix 6 VMware references

18.1 Eaton and Virtualization

Please visit http://www.eaton.com/virtualization

18.2 VMware ESX configuration

Please visit http://www.vmware.com/support/

18.3 vCenter Server (VMware Supervisor)

Please visit http://www.vmware.com/products/vcenter/ for more information about download and installation of vCenter Server

Please visit also http://www.vmware.com/products/drs/ for more information about Distributed Resource Scheduler

18.4 vSphere SDK for Perl

Please visit http://www.vmware.com/support/developer/viperltoolkit/ for more information about download and installation of vSphere SDK for Perl.

19 Appendix 7 Microsoft Hyper-V references

19.1 Eaton and Virtualization

Please visit http://www.eaton.com/virtualization

19.2 Microsoft TechNet Library

See the Microsoft TechNet Library for more information

http://technet.microsoft.com/en-us/library/default.aspx

19.3 About Maintenance Mode

http://technet.microsoft.com/en-us/library/ee236481.aspx

19.4 Requirements for using live migration

See the link below about "Hyper-V Live Migration FAQ"

http://technet.microsoft.com/en-us/library/ff715313%28WS.10%29.aspx