LCIT 5.1
Installation and User Guide

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1. About LCIT v5.1

LCIT (Linux Cluster Installation Tool) version 5.1 introduces several new features, as well as refinements to existing features as requested by those who have worked closely with the development team. Starting with the complete overhaul which began with LCIT version 5.0, it is primarily intended as a service and support tool and provides many methods for gathering cluster information and troubleshooting a cluster.

2. Installation

2.1. Live Version

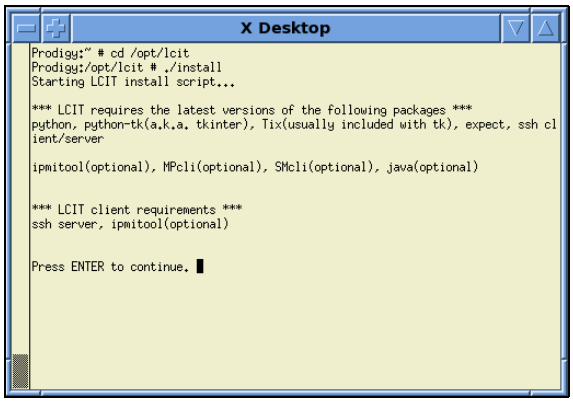
LCIT is a Live CD, so using it is simple and no Operating System is required.

1. Place CD into the management node (1 GB RAM minimum requirement).
2. Boot management node from CD ROM.
3. Wait for LCIT to load, this may take some time as the file system is compressed on the CD ROM.
4. LCIT will automatically login and boot into an X Windows session. From there, the tool can be used normally (see sections 3 and 4).

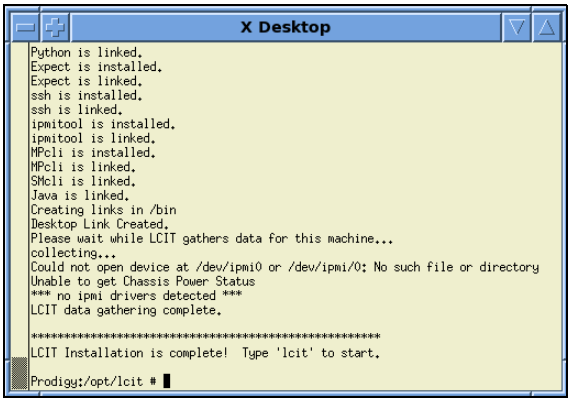
2.2. Installable Version

NOTE: The installable version of LCIT is recommended for advanced users only.

1. Extract the latest archive (downloaded or from the Live CD in the `lcit` directory) for the LCIT installable version into an empty directory.



2. Using a terminal, change directory to the location of the extracted archive and type `./install` as root from the command prompt.
3. Assuming all necessary packages are properly installed, the install script will finish and LCIT will be ready to run by typing `lcit` from the command prompt. All files are automatically installed to `/opt/lcit`.



2.3. Troubleshooting

1. If the CD fails to boot, you may need to check the system BIOS to make sure that the CD ROM is set before the Hard Drive in the boot order.
2. If some 'Failed' messages appear during the CD boot process, this does not necessarily mean LCIT will fail to load. Wait a few more minutes for the system to fully load.
3. If the installable version fails to install or properly load after installation, make sure the following packages are installed:
   - python (version 2.4+ with python-tk, Tix)
   - expect
   - ssh client
   - ipmitool (optional)
   - java runtime (optional)
   - MPcli (optional)
   - SMcli (optional)

3. Running LCIT

Once LCIT has booted into X Windows, it is ready to be run. LCIT can be started one of three ways:

1. Left click on the desktop and select "LCIT" from the menu

2. Click on the "Tools" button in the top panel and select "LCIT" from the resulting menu.

3. Optionally, the tool can be run by typing the following in a terminal:

   ```
   # lcit
   ```

3.1. Troubleshooting

If the LCIT program does not appear after clicking on a LCIT button, type

```
# killall -KILL python
```

This will terminate any existing instances of LCIT and then allow LCIT to be started once more.

3.2. Resetting to Defaults

If needed, all the log files and IP tables can be reset to default (deleted) by issuing the following command:

```
# cd /opt/lcit
# ./reset_defaults
```

4. Discovery

When LCIT is first loaded, the currently viewed cluster will only contain the management node. There are two ways to begin discovering the cluster: **Auto Discovery** or the **Discovery Wizard**. Both are found in the *Options* menu from the manager screen.

4.1. Auto Discovery

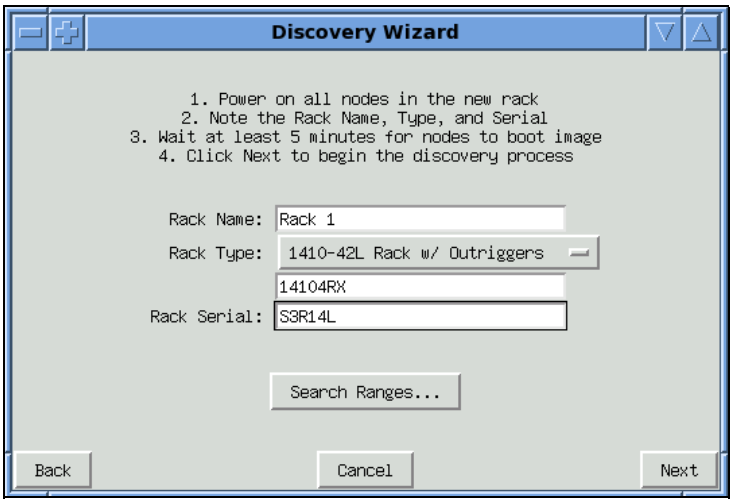
This method of discovery simply uses all defaults for IP range searches and automatically places all newly discovered nodes into 'Unracked'. This can be accessed by selecting *Auto Discovery* from the *Options* menu in the manager, and requires no further interaction from the user. When using this method it is recommended to only turn on one rack at a time and to make sure that after each discovery all new nodes are placed into their appropriate racks through the manager.

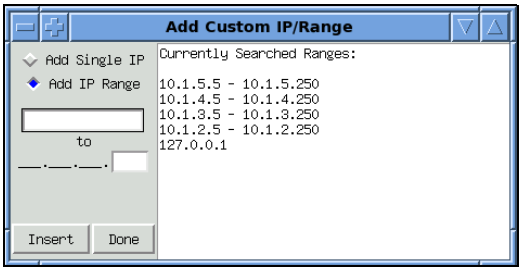
4.2. Discovery Wizard

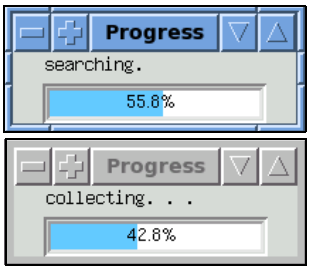
This method of discovery is the recommended method for discovering new nodes and can be accessed by selecting *Discovery Wizard* from the *Options* menu in the manager. The wizard presents a few options for discovery: discovery of a new rack, discovery of an existing rack, and importing rack data from external sources.

4.3. New Rack Discovery

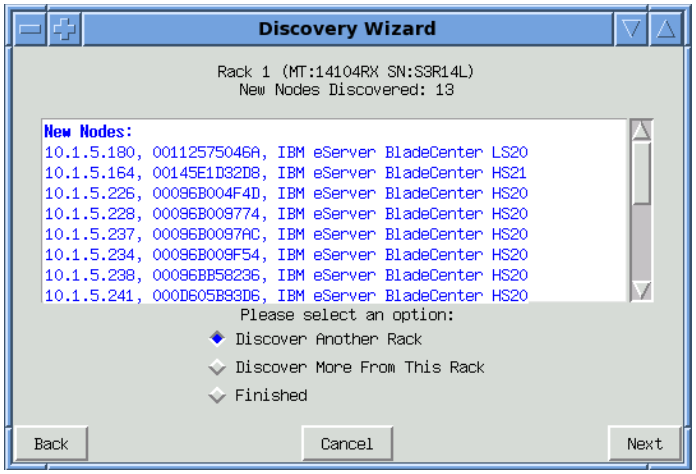
By selecting this option, the wizard presents a few instructions for discovering the new rack and entry fields for name, serial, and type of rack. The *Search Ranges* button will allow the user to enter static IP addresses which do not appear in the default IP search ranges. After following the on-screen directions, pressing *Next* will begin the automated search and collection process.







After both progress bars have shown completed searching and collecting, the wizard will display a summary of nodes that were collected and ask the user to select what action to do next.



4.4. Existing Rack Discovery

This option allows newly discovered nodes to be placed into an existing rack, and/or to re-collect node information from nodes currently in the selected rack. The desired rack must be selected from the drop-down box in the center. The *Search Ranges* button works similarly to the previous step for new rack discovery and the checkbox titled *Update Rack Data*, if selected, will re-collect all node information for the selected rack. Pressing *Next* will begin the automated search and collection process, then the wizard will display a summary of nodes that were collected and ask the user to select an action.

4.5. **xCAT Tab Import** (currently limited functionality)

NOTE: *Starting with LCIT v5.1, some xCAT functions may be utilized by LCIT. However, this portion is still mostly in development and only contains a very limited function set.*

In order to import xCAT tabs for use with LCIT, you must place the following pre-configured xCAT files into the `/opt/lcit/xcat-ext` directory manually:

```
hosts
ipmi.tab
nodemodel.tab (optional)
```

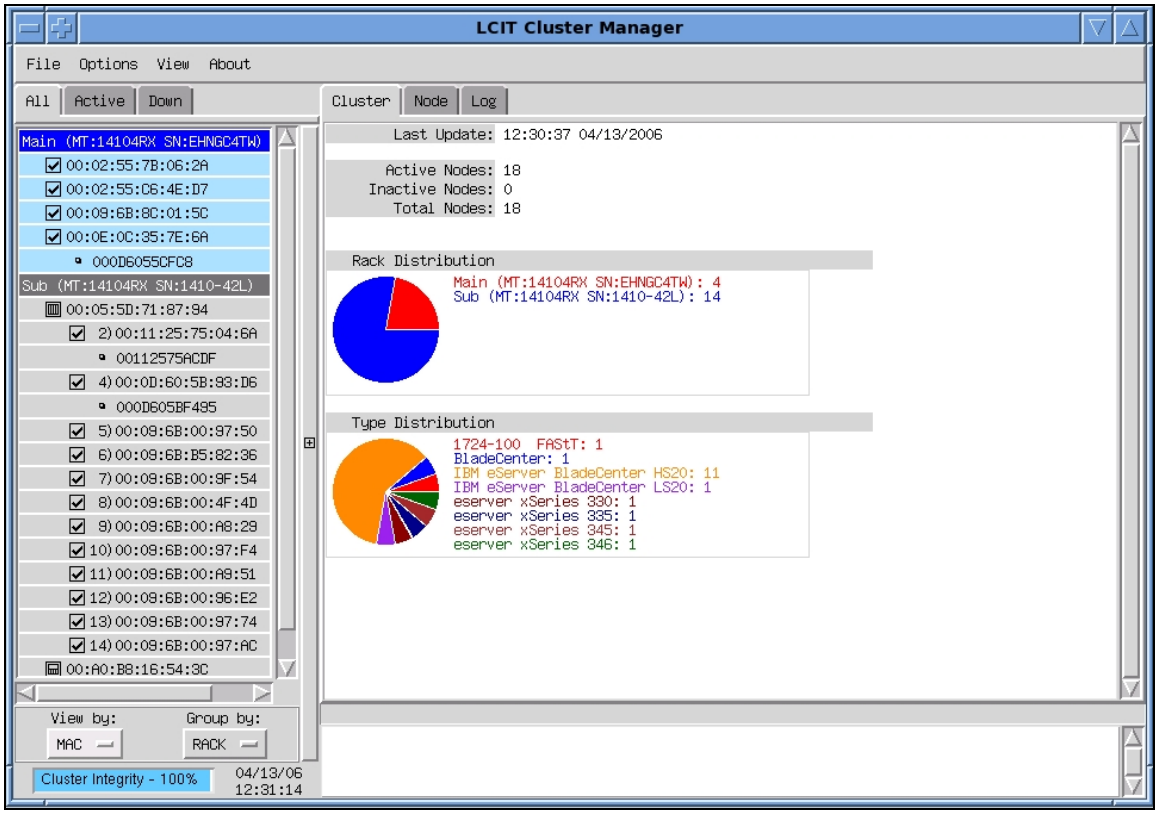
Once these files are in place, all address, racking, and alias names will be placed into the manager with empty node information. Once the nodes are turned on, the manager will be able to collect their actual information (see the *Manager* section of this document for more on this).

4.6. Troubleshooting

If some new nodes do not appear after a successful discovery, please be sure to check all physical connections, make sure each node is properly set to boot off the network on the correct interface, and that each node is turned on.
Furthermore, make sure that each node has loaded their client images and have been assigned an IP address.

5. Management

The Manager Interface is loaded when LCIT starts up and is where you'll be able to interact with nodes after they are discovered.



The left-hand side of the window contains a tree with all discovered nodes in their assigned rack groups. Under the tree are some viewing options, a cluster integrity indicator, and a clock. To the right of the tree is a long vertical button which allows the user to expand the tree to display more information about each node.

The right-hand side of the window is where cluster, node, and logging information may be found. When the LCIT manager is first loaded, a cluster summary screen displaying cluster node distribution is shown. Directly below the information page is a status bar, which shows important message pertaining to actions that have been performed by the user, as well as a message box which contains critical information regarding the status of an individual node.

5.1. Node Tree

The node tree contains all nodes which have been discovered, listed by their MAC (or IP) and grouped by their rack (or machine type). BladeCenters will contain the nodes underneath them and at which slot they are located. There is also an icon containing node responsiveness, node type, or whether there is an update available for that node.


Active Node


Active BladeCenter


Active Storage


Update Available


Inactive Node


Inactive BladeCenter


Inactive Storage

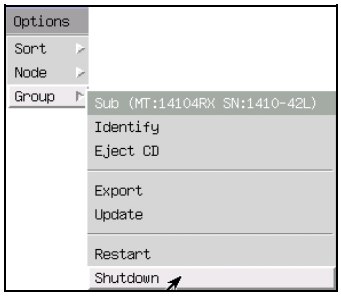

BMC or Alternate Address

The tree can also be viewed by IP Address instead of MAC, as well as Machine Name(Type) instead of Rack. These can be selected via the "View by:" and "Group by:" menus, respectively.

Additionally, the tree can show only Active or Inactive (Down) nodes by selecting the appropriate tab above the node tree.

5.2. Node Tree Options Menu

By right clicking on any node in the tree, an options menu will appear with some node, group, and general options.



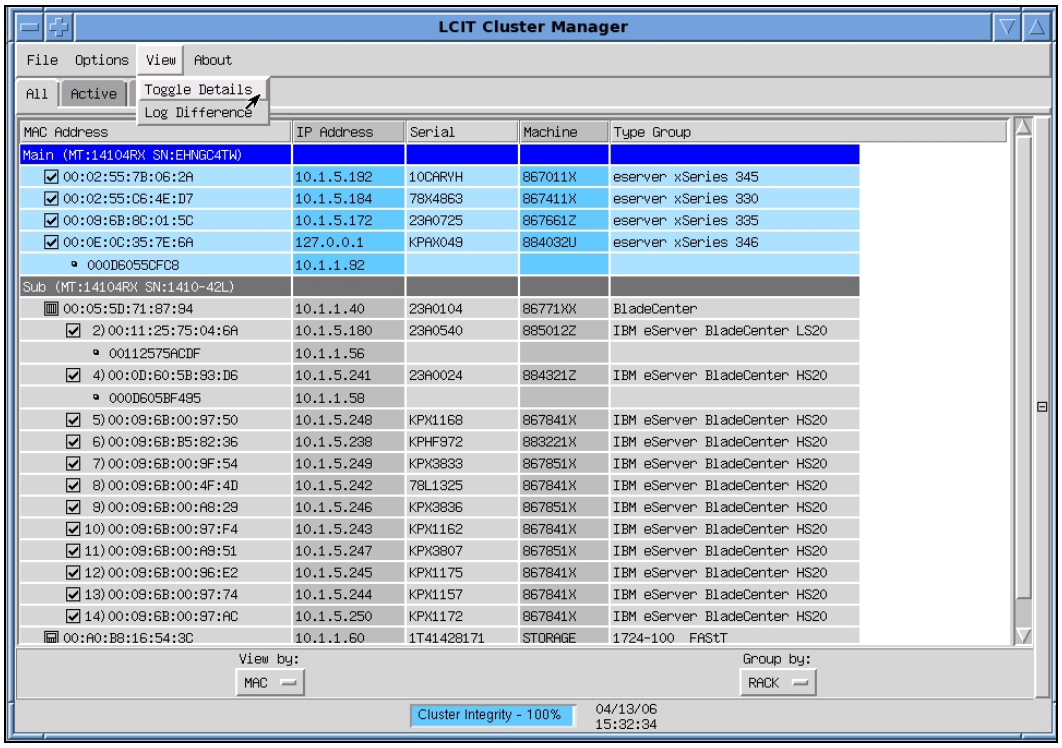
The "Sort" sub-menu allows for the tree to be resorted ascending or descending based on the node's identifying value currently on the tree.

The "Node" sub-menu allows for the node which was right clicked on to be identified or for its information log to be exported. The currently selected node will appear above these options.

The “Group” sub-menu lets the user Export information logs, send Identify, Eject CD ROM, Update, Restart, or Shutdown commands for an entire group (or type, depending on which view is selected). The currently selected group will appear above these options.

5.3. Detailed Tree View

To see a more detailed version of the Node Tree, either click the vertical bar to the right of the tree with the plus[+] symbol, or select *Toggle Details* from the *View* menu.

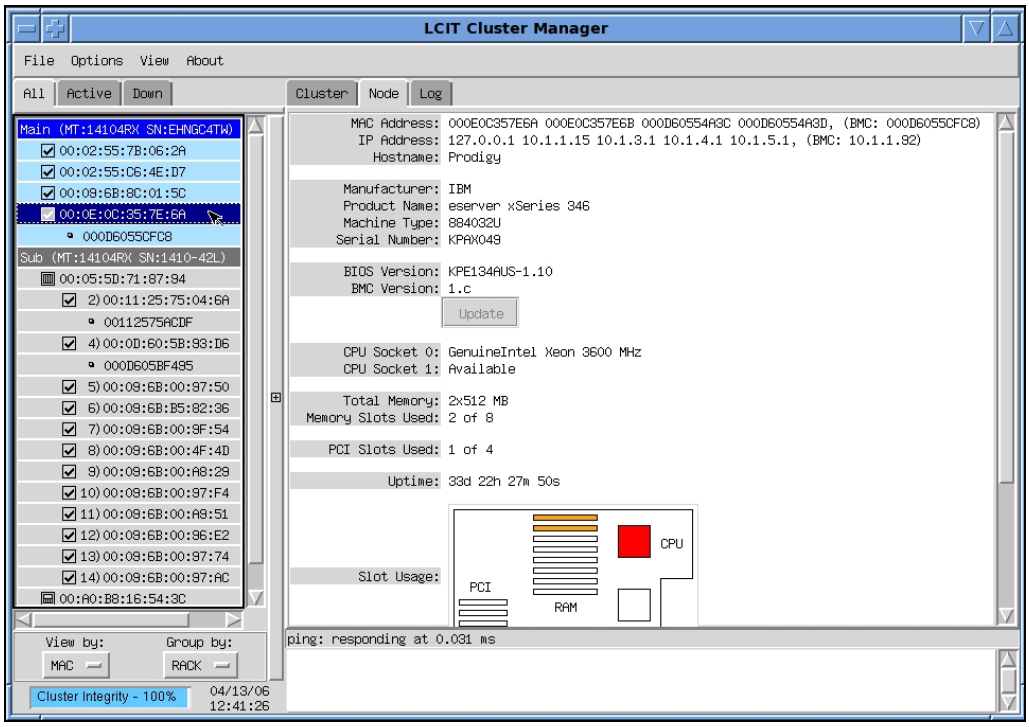


This view shows MAC Address, IP Address, Serial Number, Machine Type, and Machine Name(Type Group) as columns in the expanded tree. Items can be interacted with exactly the same as in the collapsed tree. Double clicking on an item will collapse the tree and open the node’s information page.

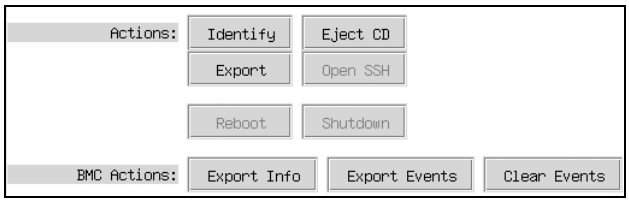
To collapse the tree, either click the vertical bar to the right of the window with the minus[-] symbol, or by selecting *Toggle Details* again from the *View* menu.

5.4. Looking at Node Information

Double clicking on a node listed in the node tree will bring up the Node Information tab.



Information about the selected node is displayed in the right side of the window. For most node types, several functions can be performed from this page:



Update: This will update the firmware of this node to the version on the CD (only if the CD contains a newer version)

Identify: This will turn on the identify light for this particular node and will also cause it to blink at a user specifiable rate

Eject CD: Ejects the CD ROM drive tray

Export: Exports the current node's information to a log

Open SSH: Opens a terminal automatically logged in to the node

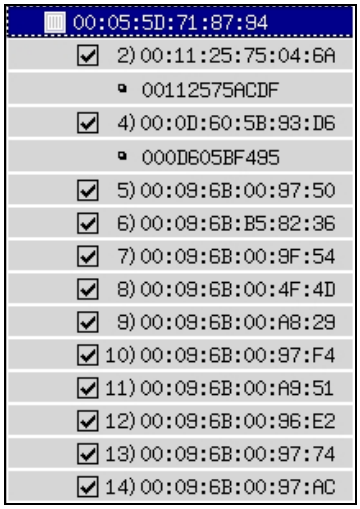
Reboot: Reboots the node

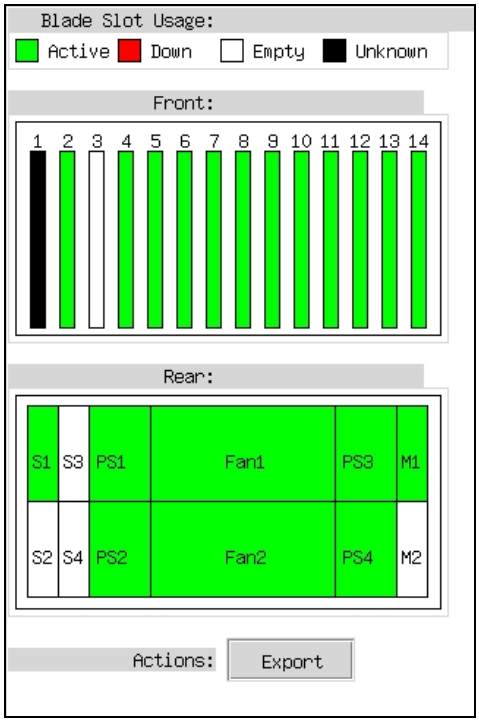
Shutdown: Turn the node off safely

Furthermore, if the node contains a BMC, additional actions will be available:
Export Info: Exports the information currently contained by the manager about this BMC
Export Events: Connects to the BMC and exports the entire Sensor Event Log
Clear Events: Connects to the BMC and clears the entire Sensor Event Log

5.5. Looking at BladeCenter Information

If a BladeCenter is double clicked, the Node Information page will show a report containing which nodes are in which slot, their current response status, as well as which fan, power supply, switch, and management slots are in use.

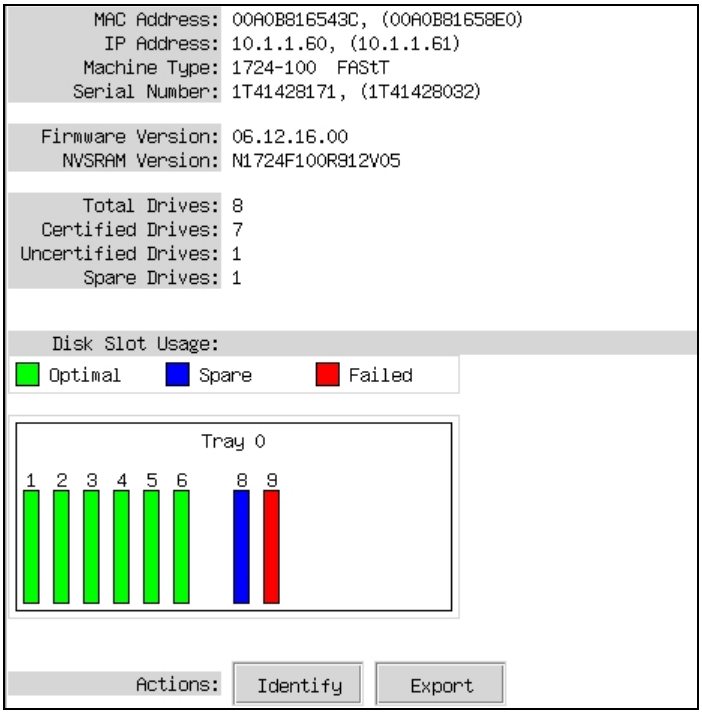




The only action available for BladeCenters is the ability to export their node information log.

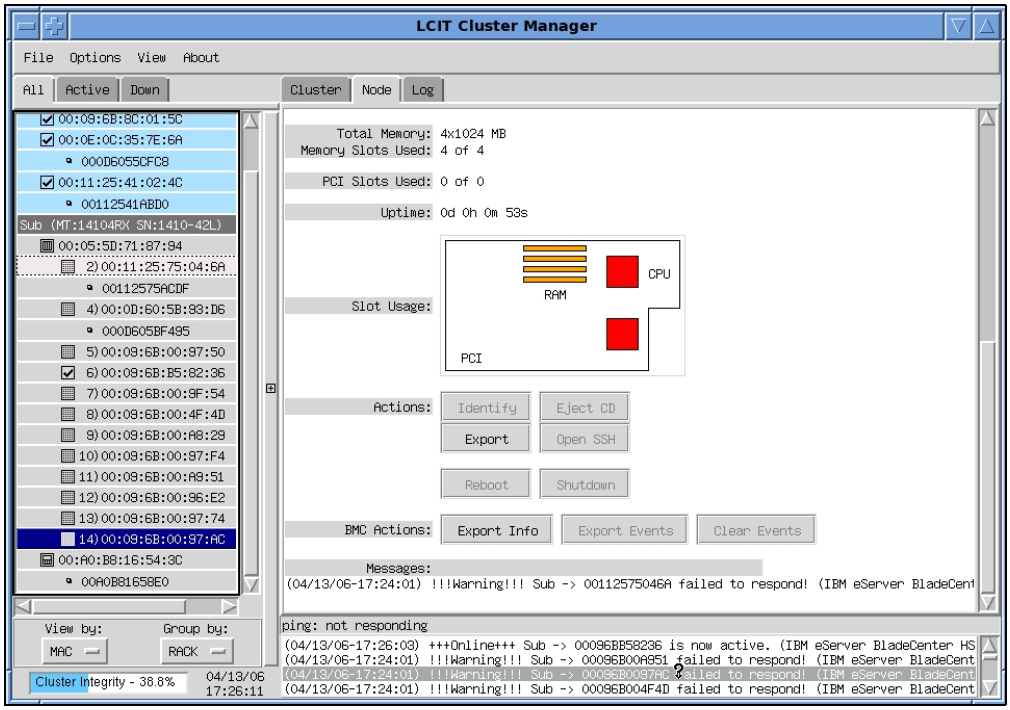
5.6. Looking at Storage Node Information

When a Storage node is double clicked, the Node Information page shows information regarding the size and status of each hard drive slot. Actions include being able to identify one drive at a time or exporting the storage node's information log.



5.7. Node Message Box

Located at the very bottom of the right side of the manager window is the message box which contains time-stamped information about a node when it goes offline, comes back online, or has an updated information file after coming back online. Scrolling over each entry will highlight the appropriate node on the tree, clicking the entry will bring up that node's information page. These messages will also appear on their respective node's information page at the very bottom.

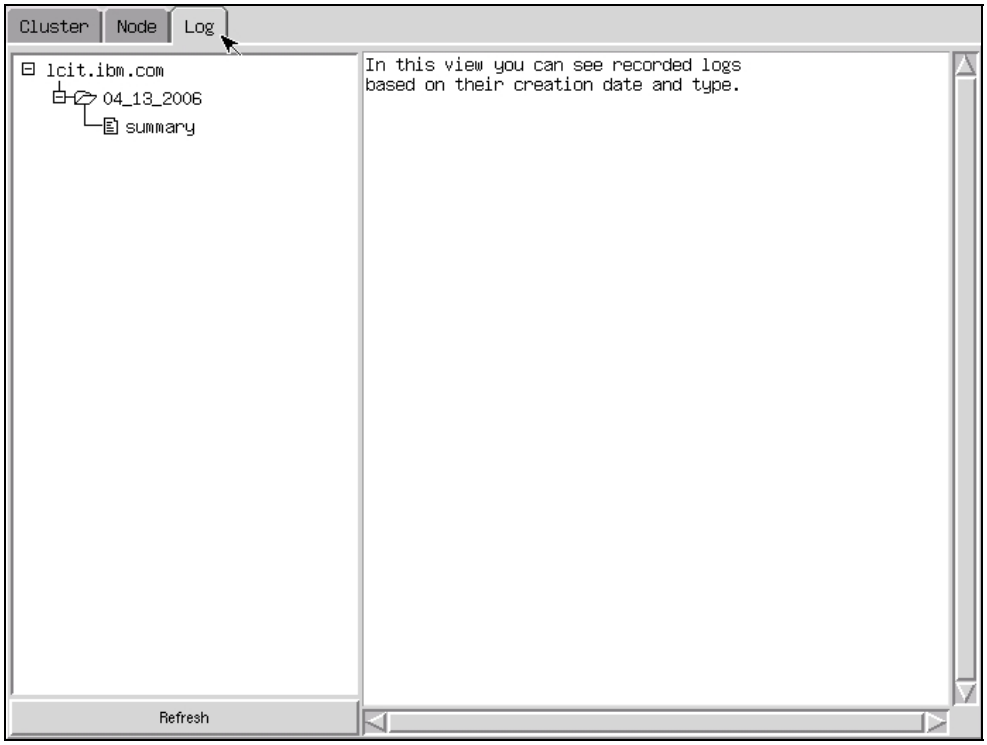


5.8. Help Screen

To bring up a brief help screen from inside the manager, select *Help* from the *About* menu.

6. Logging Cluster Information

There are several different types of logs, and different ways to go about accessing each of them. All logs exported within the program will appear in the "Log" tab over the Information page and will automatically be opened upon export. These logs are sorted by date, then by node (or other log type), and then by time of export.



Double clicking on any log file, represented by a file icon, will open the log file in the log window to the right of the log tree.

6.1. Summary Log

Summary logs are appended to at every refresh interval (5 minutes by default). Each entry in the log contains a timestamp, followed by a short report on the current status of the cluster, as well as the status of any nodes which have recently gone offline, or come back online.

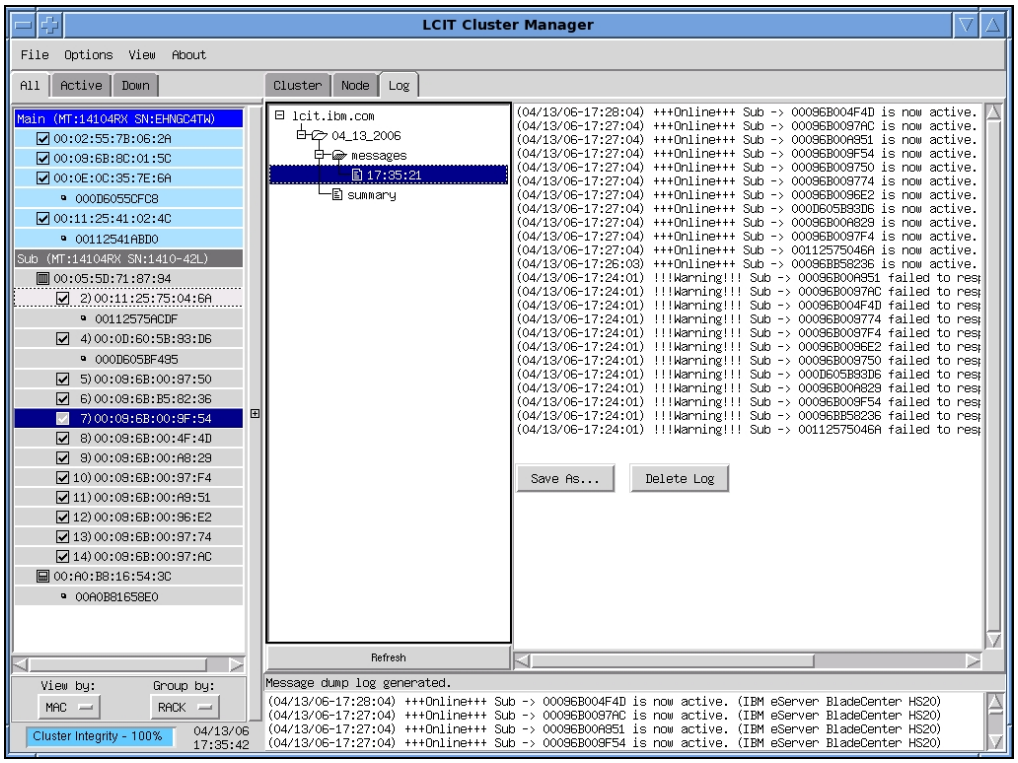
```
####Begin Cluster Summary Log Entry####
Log Time:04/13/2006 17:24:01
Last Update:17:24:01 04/13/2006
Active Nodes:6
Inactive Nodes:12
Total Nodes:18
---Changed Node States---
[Sub (MT:14104RX SN:1410-42L)] 00096B004F4D,10.1.5.242,78L1325,IBM e
[Sub (MT:14104RX SN:1410-42L)] 00096B0096E2,10.1.5.245,KPX1175,IBM e
[Sub (MT:14104RX SN:1410-42L)] 00096B009750,10.1.5.248,KPX1168,IBM e
[Sub (MT:14104RX SN:1410-42L)] 00096B009774,10.1.5.244,KPX1157,IBM e
[Sub (MT:14104RX SN:1410-42L)] 00096B0097AC,10.1.5.250,KPX1172,IBM e
[Sub (MT:14104RX SN:1410-42L)] 00096B0097F4,10.1.5.243,KPX1162,IBM e
[Sub (MT:14104RX SN:1410-42L)] 00096B009F54,10.1.5.249,KPX3833,IBM e
[Sub (MT:14104RX SN:1410-42L)] 00096B00A829,10.1.5.246,KPX3836,IBM e
[Sub (MT:14104RX SN:1410-42L)] 00096B00A951,10.1.5.247,KPX3807,IBM e
[Sub (MT:14104RX SN:1410-42L)] 00096BB58236,10.1.5.238,KPHF972,IBM e
[Sub (MT:14104RX SN:1410-42L)] 000D605B93D6,10.1.5.241,23A0024,IBM e
[Sub (MT:14104RX SN:1410-42L)] 00112575046A,10.1.5.180,23A0540,IBM e
####End Cluster Summary Log####

####Begin Cluster Summary Log Entry####
Log Time:04/13/2006 17:25:02
Last Update:17:25:02 04/13/2006
Active Nodes:6
Inactive Nodes:12
Total Nodes:18
####End Cluster Summary Log####

####Begin Cluster Summary Log Entry####
Log Time:04/13/2006 17:26:03
Last Update:17:26:03 04/13/2006
Active Nodes:7
Inactive Nodes:11
Total Nodes:18
---Changed Node States---
[Sub (MT:14104RX SN:1410-42L)] 00096BB58236,10.1.5.238,KPHF972,IBM e
####End Cluster Summary Log####
```

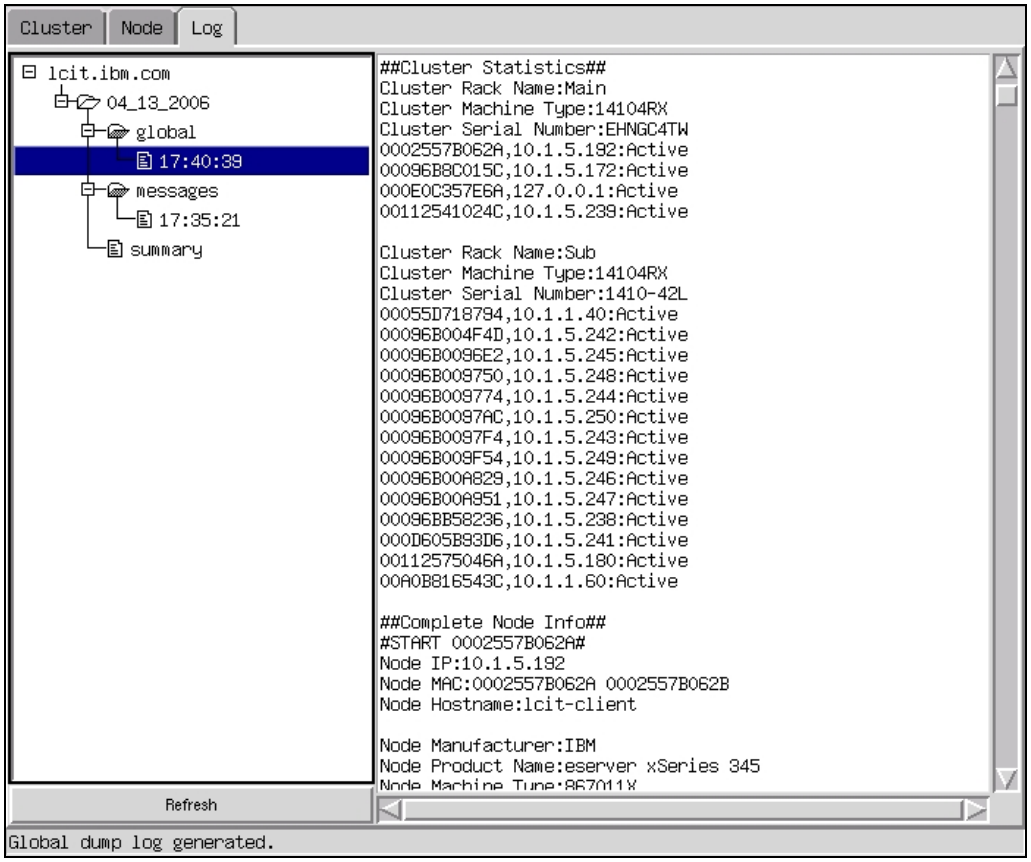
6.2. Message Box Log

If any messages appear in the Messsage Box, these messages may be exported to a log by selecting the *File* menu, then *Export*, *Messages*.



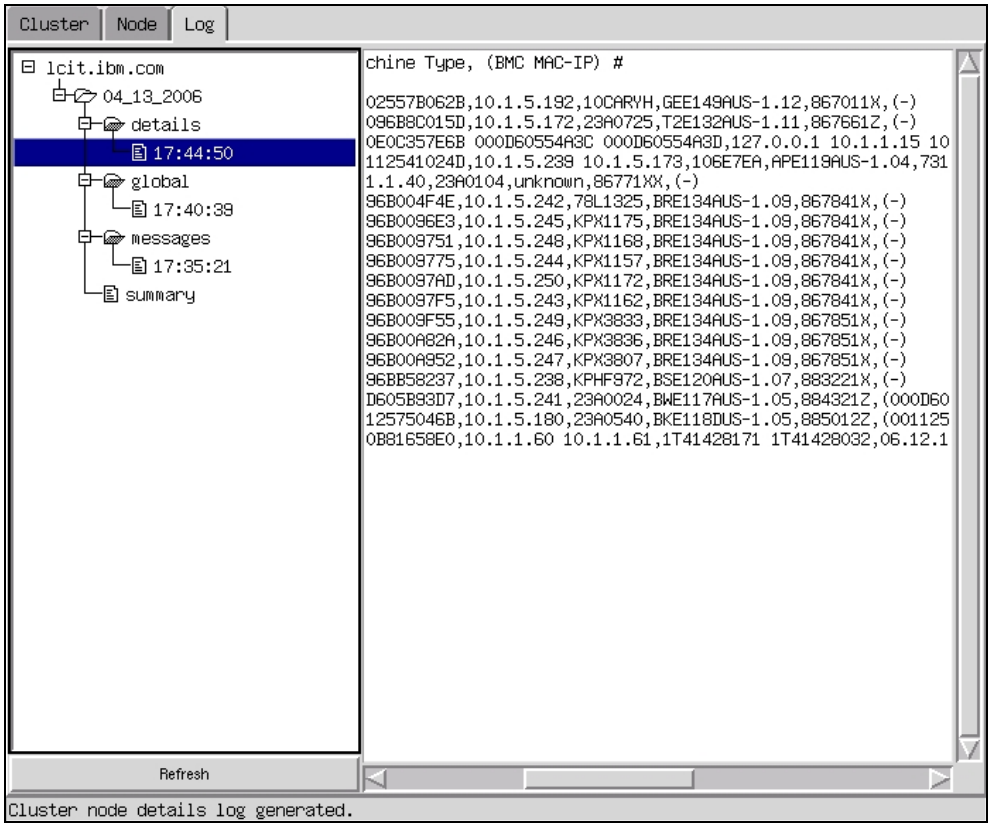
6.3. Global Log

The global log contains all information accessible to the manager about the cluster, including the distribution of nodes among each rack group, and a listing of each node's information log. To export a global log, select *Global* from the *File*, *Export* menu.



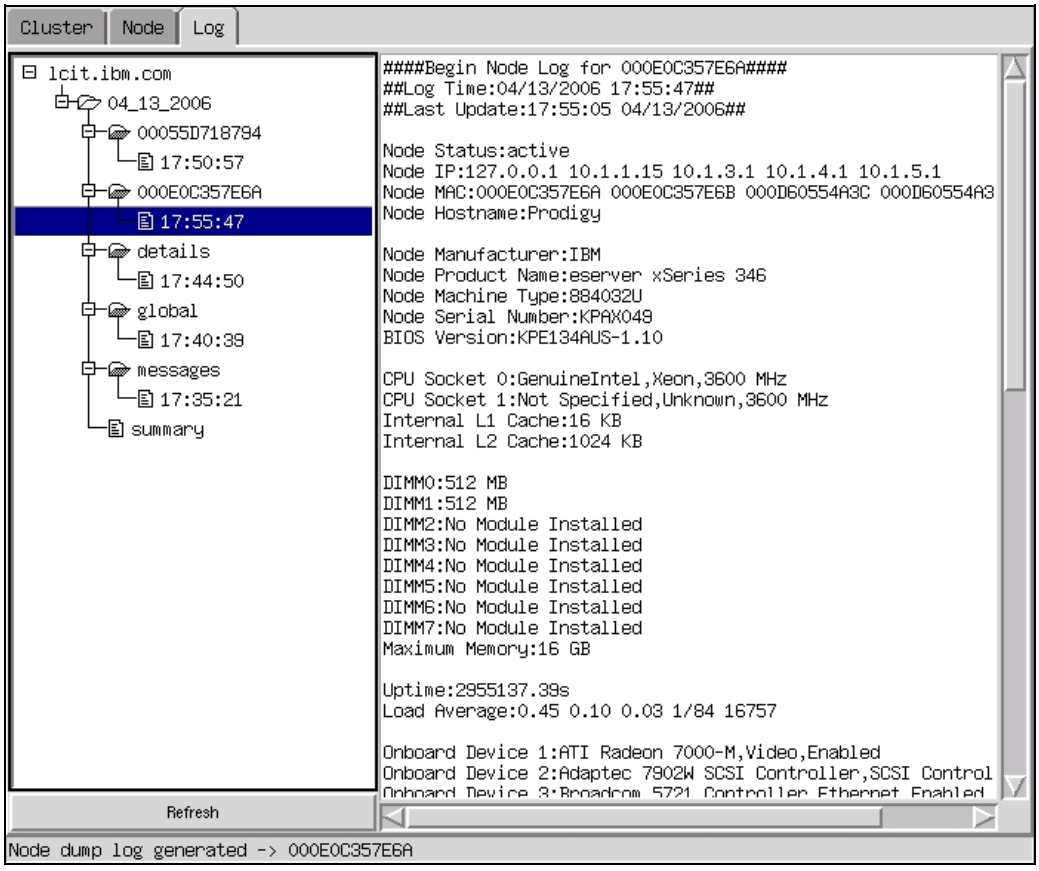
6.4. Details Log

To export a details log, select *Details* from the *File*, *Export* menu. This log show a condensed detailed information log which contains all nodes sorted by rack group, listed with their MAC addresses, IP addresses, Serial numbers, Machine Type, Firmware versions (also BMC MAC and IP if they exist).

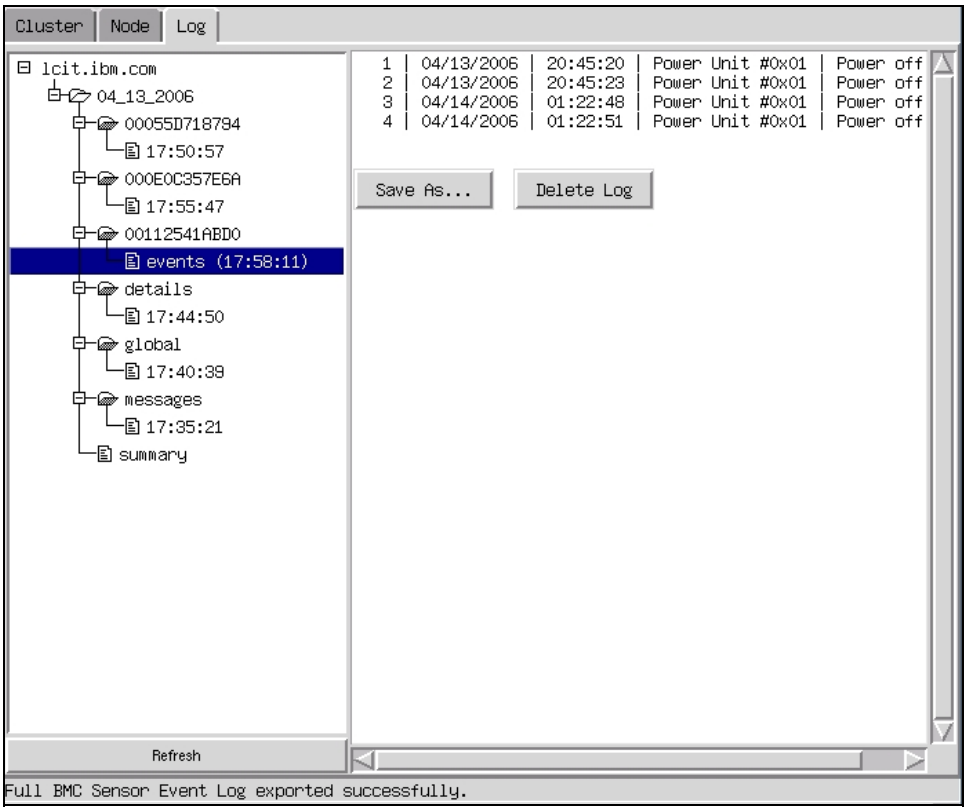


6.5. Node and BMC Logs

All nodes, regardless of type, can export an information log. This log may contain more information not shown in the node information page. This can be done in two ways, either by right clicking on the node in the node tree, then selecting *Node* and then *Export*, or by double clicking on the node, and then clicking the *Export* button at the bottom of the page under the "Actions:" heading.



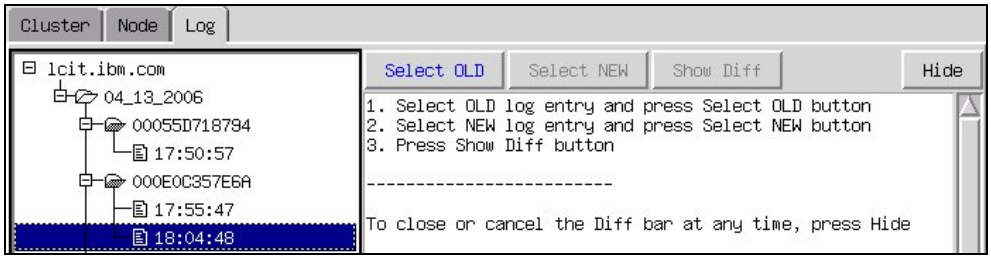
If a node contains a BMC, this can only be exported by first double clicking on the node which owns it, and then scrolling to the bottom of the information page under the "BMC Actions:" heading and clicking *Export Info*. Another BMC log available is a Sensor Event Log, which is accessed by clicking *Export Events*. To clear a Sensor Event Log, click on the *Clear Events* button.



To save a log to another location or delete a log, scroll down to the bottom of the desired log after opening it and click on the *Save As…* or *Delete Log* button, respectively.

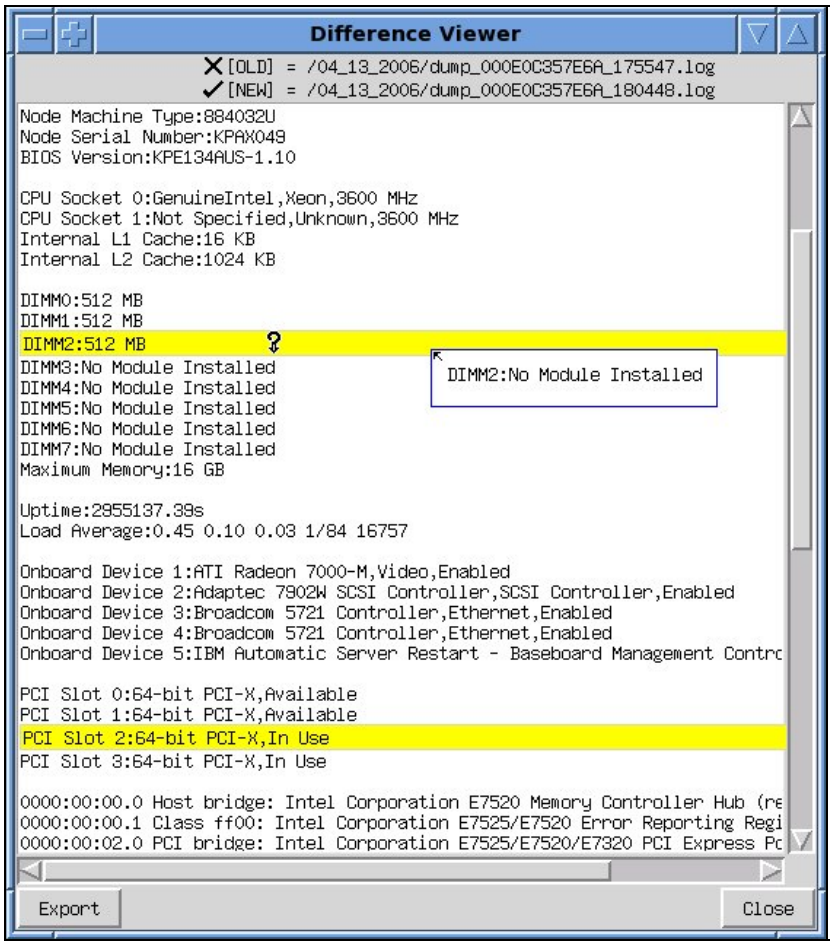
6.6. Difference Log Viewer and Diff Logs

To view the difference between two logs, whether they are different nodes, or the same node exporting at two different times, you must first open the log difference selector. This is done by selecting *Log Difference* from the *View* menu. This will bring up a new pane above the log display itself.



After opening, the user will be able to select which two nodes to compare. First, select which file is to be the “Old” file, by first selecting it from the tree, then clicking on the *Select OLD* button. The “Old” log will now appear with a Cross next to it. Next, select which file is to be the “New” file, by selecting it from the

tree and clicking on the *Select NEW* button. The "New" log will show a Check next to it. Click the *Show Diff* button to open the Difference viewer.



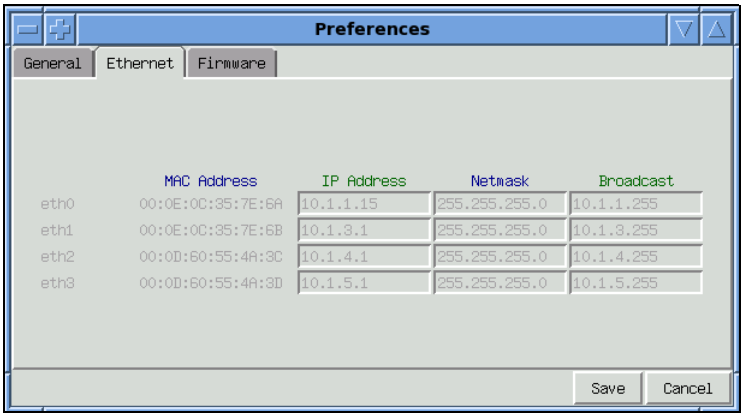
In the Difference Viewer window, the text shown will be that of the "New" file. Anything highlighted will display what was in the "Old" file when the mouse is positioned over the line. The difference can also be exported to a human readable text file by clicking on the *Export* button and can be closed by clicking the *Close* button.

7. LCIT Options

A few handy options are available from the *Options* menu, such as user configurable intervals and automated discovery.

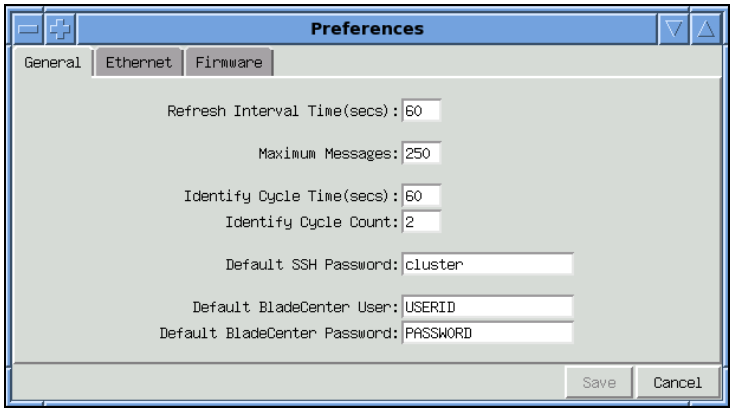
7.1. Configurable Preferences

By clicking on *Preferences* under the *Options* menu, the user will be able to change the refresh interval time (how often all nodes are pinged), change the maximum number of messages shown in the message box, and change the Identify Cycle parameters (how long the light stays on and how many times it blinks).



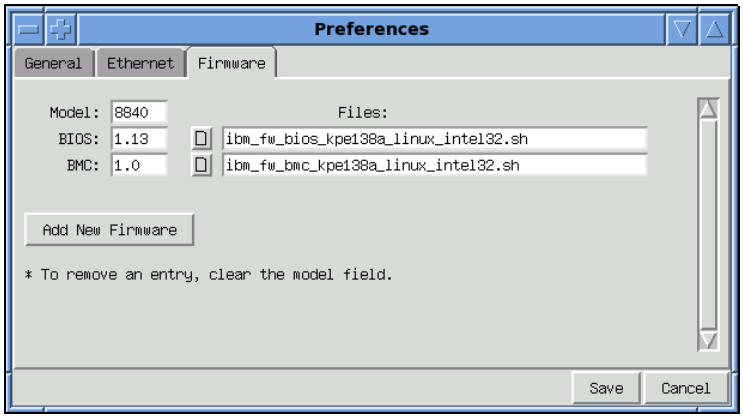
7.2. Network Preferences

The Preferences dialog will also contain a Networks tab which will allow the user to specify other static IP addresses for connection to other networks.



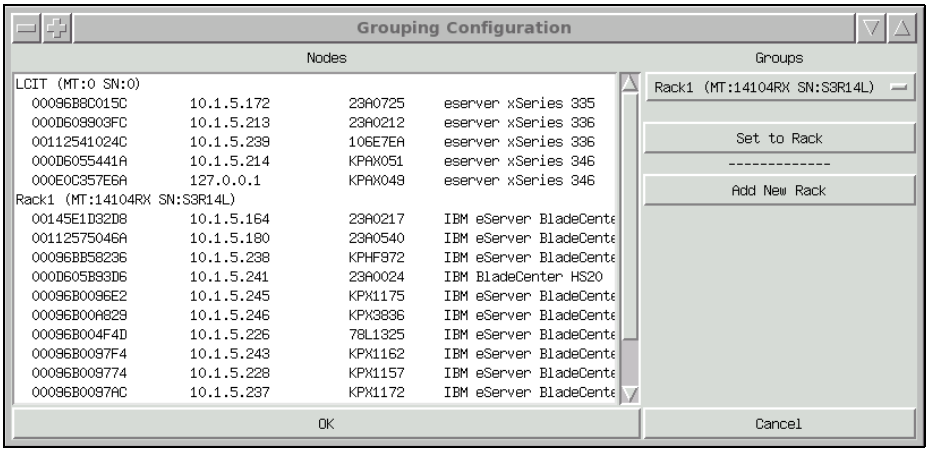
7.3. Firmware

The final tab in the Preferences dialog will allow Firmware files (.sh flash installers only) to be used by the appropriate nodes specified by their machine type designation.



7.4. Racking

Nodes can be grouped into other racks from the manager as well as the discovery wizard. The *Racking* button under the *Options* menu will contain this dialog.



7.5. Discovery Wizard and Auto Discovery

The *Discovery Wizard* can be run at any time by the user after being inside the manager. This will exit the manager program and re-enter the wizard. The *Auto Discover* option allows the wizard to be run without any kind of user interaction using all defaults to discover new nodes. Any new found nodes will appear as "Unracked" in the manager and will need to be grouped via the *Racking* window available from the *Options* menu.

NOTE: Nodes that were previously rack will keep their same racking configurations.

8. Troubleshooting

This section will detail any known problems which may be encountered and possible solutions to these problems.

8.1. Booting Problems

1. *The designated "Manager" node is not booting from the CD.*
   Make sure CD ROM is higher in the boot order than the Hard Disk, and reboot the node. If failure persists, check the CD for scratches and verify the burn was successful (if burned from an ISO).

2. *During boot process, "Failures" appear.*
   Some Failure messages may appear but will not affect LCIT in any adverse way. However, if the boot process hangs for more than 5 minutes without any indication of process, it is possible that the CD may have errors. If failure persists, check the CD for scratches and verify the burn was successful (if burned from an ISO).

8.2. Discovery/First Run Problems

3. *All nodes that have been turned on are not shown as having responded after running the pinging process.*
   There are several possibilities, here are a few of them:

   -The node may not be set to boot from the network (PXE). Change the boot order for that node to make sure a network boot comes first.

   -The node has not yet fully loaded the network image. Try pinging again in a few minutes.

   -If after several minutes all nodes are still not responding, check network connections.

4. *The Collection process is taking too long.*
   For large clusters, this can be expected to happen. Each compute node takes about a second to process, storage nodes can take up to ten seconds each, and BladeCenter controllers can take around a minute. As long as the "dots" in the progress meter are constantly moving, the Collection process should be moving along shortly. However, if this process is stuck on a single IP for more than a few minutes, there could be further issues (see below).

5. *A single node has been on Collection for more than a few minutes.*
   This could indicate a bad network connection or some other kind of network error. The best solution may be to clear the IP Range list of this IP and be sure it is not included the next time. This can be done either by

removing all ".list" files from the */opt/lcit* directory, or by clearing out all data that has been obtained by entering `./reset_defaults` from the */opt/lcit* directory. (Be warned, issuing this command will delete all logs, lists, and node information files, resetting LCIT to a factory default state)

6. *Some nodes do not show any collected information.*
   It is possible that the node has just recently booted into the network image and has not yet had time to generate its information file. This tends to be completed about one minute after a node has acquired an IP address. Other possibilities include unsupported hardware or a failure to completely load the network image after being assigned an IP address.

7. *In the Grouping Configuration dialog, some nodes do not appear in the list.*
   If a node which is shown in the tree does not show in the grouping list, it is likely considered to be a Blade owned by a discovered BladeCenter. If this is the case, those Blades will always be placed in the same rack group as its BladeCenter. Blades which are in a discovered BladeCenter will appear in the tree in a branch just under which one the Blade belongs to.

8. *The Discovery Wizard was exited and the Manager failed to load properly.*
   Each time the Discovery Wizard is run, every step must be finished for the Manager to properly run without errors. This is especially true the first time LCIT is run without any configuration files, or after a reset to defaults. If the Manager fails to load and there is no option to re-run the discovery wizard, you may need to use the reset defaults command. This can be done either by removing all ".list" files from the */opt/lcit* directory, or by clearing out all data that has been obtained by entering `./reset_defaults` from the */opt/lcit* directory. (Be warned, issuing this command will delete all logs, lists, and node information files, resetting LCIT to a factory default state)

8.3. Cluster Manager Problems

9. *The Manager hangs after first being loaded, or during operation.*
   First, try closing the manager. If this fails, click on the "Minus" symbol at the very top left of the window and select "Kill" from this menu. Next, use the LCIT button to bring up the Manager again. If the program hangs at the loading screen for more than a minute, there may be some problems in the configuration files and discovery may have to be run again. See the last item in the previous section of troubleshooting for how to fix this.

10. *A Node Identify command was issued and failed.*
    Either the node is currently not able to use the Identify feature (no BMC attached, faulty BMC, or is a BladeCenter controller) or the node is no longer responding on the network. To test if a node is responding, double click on it from the node free and look to the status bar to see if the ping was successful.

11. *A Group (Identify, Eject CD, Update, Restart, or Shutdown) command was issued and some nodes failed.*
    See the above answer. Additionally, Restart and Shutdown commands are not available on the local management node (the node running LCIT). Eject CD, Update, Restart, and Shutdown commands are not available for Storage nodes and BladeCenter controllers.

12. *A node which reported a successful Update did not appear to actually update firmware.*
    If, after restarting from having reported a successful Update, the node did not change firmware revisions as is reported in the node's information file, the update may have suffered from some other type of error. To see the output from this, first open an SSH terminal to the node by first double clicking on it, then scrolling to the bottom of its information page and clicking "Open SSH". From the new terminal window type: "`update`" at the command prompt. Some errors, such as a "syntax error" only mean that there was not a firmware update available for that system. Other messages may help determine the cause for the inability to update the firmware.