Dell OpenManage™ Baseboard Management Controller

User's Guide

Notes and Notices

NOTE: A NOTE indicates important information that helps you make better use of your computer.

NOTICE: A NOTICE indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

May 2004

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Introduction

The Dell™ PowerEdge™ systems baseboard management controller (BMC) monitors the system for critical events by communicating with various sensors on the system board and sends alerts and log events when certain parameters exceed their preset thresholds. The BMC supports the industry-standard Intelligent Platform Management Interface (IPMI) specification, enabling you to configure, monitor, and recover systems remotely. The BMC provides the following features:

- Allows access through the system's serial port and integrated NIC
- Fault logging and SNMP alerting
- Access to system event log (SEL) and sensor status
- Control of system functions including power on and off
- Support that is independent of the system's power or operating state
- Text console redirection for system setup, text-based utilities, and operating system consoles
- Access to the Microsoft EMS/SAC and Red Hat Linux serial console interfaces by using serial over LAN (SOL).

Dell provides several distinct utilities and programs for accessing the BMC to perform management activities. The following BMC interfaces allow users to configure and manage your system through the BMC.

- The BMC Management Utility allows remote, out-of-band LAN and/or serial port power control, event log access, and console redirection.
- The System Maintenance Utility (SMU) is an EFI-based configuration tool that provides the ability to configure the BMC.
- Dell OpenManage Server Administrator allows remote, in-band access to event logs, power control, and sensor status information and provides the ability to configure the BMC.
- In addition, the BMC can be accessed by standard, off-the-shelf terminal or terminal emulator utilities that allow access to sensor status information, and power control.

Supported System

The BMC-management features documented in this guide are supported on the following Dell PowerEdge system:

- 7250

BMC Configuration and Management Tasks

This user's guide documents the basic tasks needed to set up and configure the BMC on a managed system in preparation for using the BMC Management Utility. These basic tasks can be broken down into the two following sections:

- Configuring a managed system's BMC
- Managing a remote managed system by accessing its BMC

Configuring the BMC

To configure the BMC in a pre-boot environment, you can use the System Maintenance Utility. Alternately, you can configure the BMC on a managed system with a running operating system using the Sever Administrator home page GUI or CLI.

Managing the BMC

To manage a remote managed system by accessing its BMC in a pre-boot environment, or by accessing the BMC of a nonresponsive system, you must use the BMC Management Utility. To configure the BMC on a system with a running operating system or to preform everyday BMC management tasks, you can use the Server Administrator home page GUI.

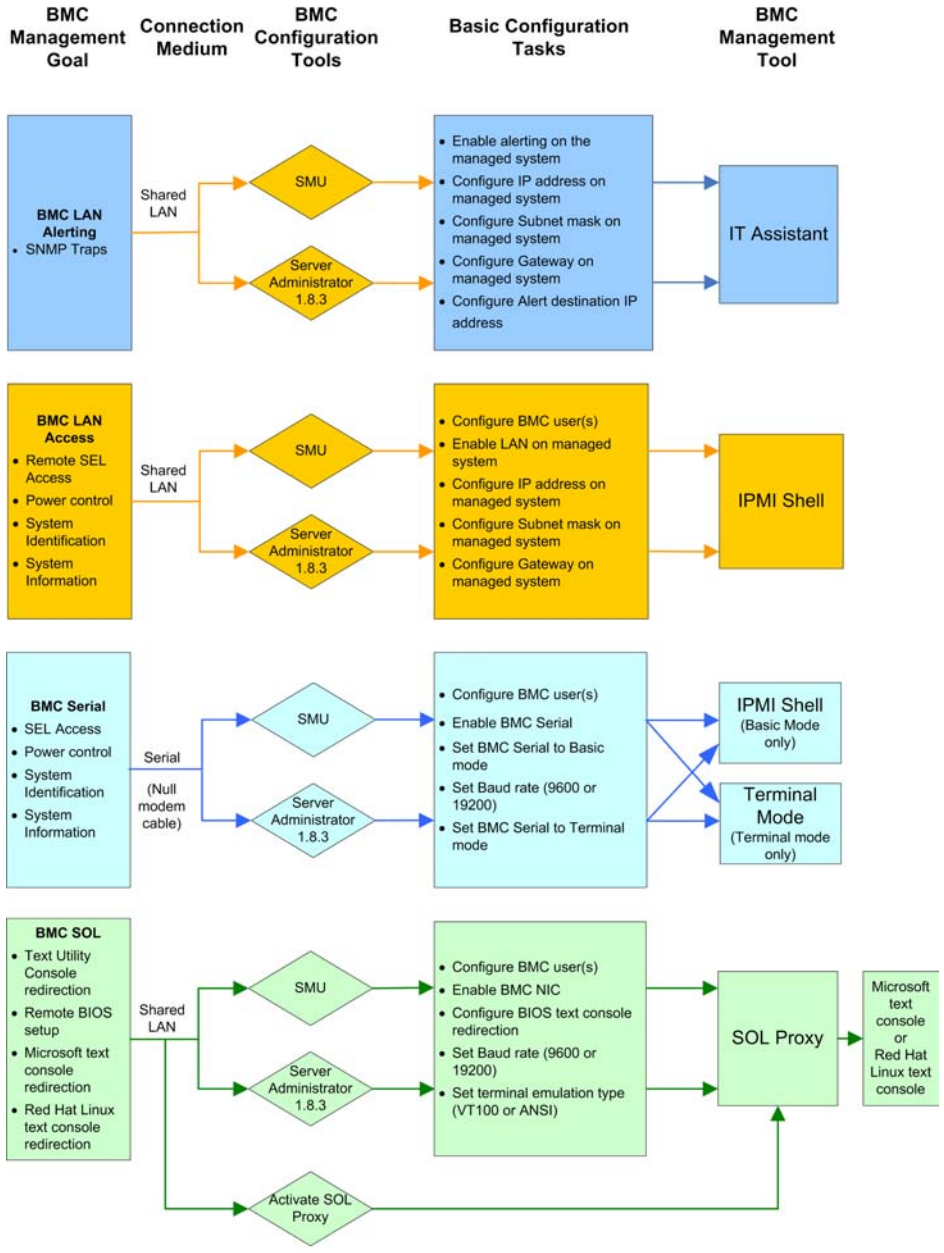
Planning for Using Your System's BMC

How you plan to use the BMC to manage your system dictates the configuration procedures you will need to perform. The following are some likely configuration scenarios:

- Configure BMC LAN alerting so that you can monitor your managed system using IT Assistant.
- Configure BMC LAN Access so that you can use the BMC Management Utility's IPMI Shell to access your system's BMC over a shared LAN.
- Configure BMC Serial Access so that you can use the BMC Management Utility's IPMI Shell or a text console redirection to access your system's BMC over a serial cable.
- Configure BMC Serial Over LAN Access so that you can use the BMC Management Utility's SOL Proxy to access your system's BMC over a shared LAN to activate console redirection.

Consult the **BMC Configuration Matrix** (Figure 1-1), as well as the sections describing each likely configuration scenario, before moving on to the next chapter "Configuring Your Managed System."

Figure 1-1. BMC Configuration Matrix



Basic BMC Alerting Over a Shared LAN

If you plan to only use your system's BMC functionality to monitor BMC Alerts using IT Assistant, you will need follow the BMC configuration guidelines listed in Table 1-1.

Table 1-1. BMC LAN Alerting Configuration Guidelines

Features	Connection Medium	BMC Configuration Tools	Basic Configuration Tasks	BMC Management Tools
SNMP Traps	Accessed over a Shared LAN	• SMU (pre-operating system environment) • Server Administrator	• Enable alerting on the managed system • Configure IP address on managed system • Configure Subnet mask on managed system • Configure Gateway on managed system • Configure Alert destination IP address	IT Assistant

IPMI Shell Over a Shared LAN

If you plan to use the BMC Management Utility's IPMI Shell to access your system's BMC over a shared LAN, you will need follow the BMC configuration guidelines listed in Table 1-2.

Table 1-2. BMC LAN Access Configuration Guidelines

Features	Connection Medium	BMC Configuration Tools	Basic Configuration Tasks	BMC Management Tools
• Remote SEL Access • Power control • ID • System Information	Accessed over a shared LAN	• SMU (pre-operating system environment) • Server Administrator	• Configure BMC user(s) • Enable LAN on managed system • Configure IP address on managed system • Configure Subnet mask on managed system • Configure Gateway on managed system	IPMI Shell

IPMI Shell Over the Serial Cable

If you plan to use the BMC Management Utility's IPMI Shell or a text console redirection to access your system's BMC over a serial cable, you will need follow the BMC configuration guidelines listed in Table 1-3.

Table 1-3. BMC Serial Configuration Guidelines

Features	Connection Medium	BMC Configuration Tools	Basic Configuration Tasks	BMC Management Tools
• SEL Access • Power control • ID • System Information	Accessed through the serial channel by using a null modem cable	• SMU (pre-operating system environment) • Server Administrator (to enable BMC serial only)	• Configure BMC user(s) • Enable BMC Serial in BIOS • Set BMC serial to either Basic mode or Terminal mode • Set Baud rate (9600 or 19200)	• IPMI Shell (Basic Mode only) • Terminal emulation (Terminal Mode only)

SOL Proxy Over a Shared LAN

If you plan to use the BMC Management Utility's SOL Proxy to access your system's BMC over a shared LAN, you will need follow the BMC configuration guidelines listed in Table 1-4.

Table 1-4. BMC SOL Configuration Guidelines

Features	Connection Medium	BMC Configuration Tools	Basic Configuration Tasks	BMC Management Tools
• Text Utility Console redirection • Remote BIOS setup • Microsoft text console redirection • Red Hat Linux text console redirection	Accessed over a shared LAN	• SMU (pre-operating system environment) • Server Administrator (to enable BMC serial only)	• Configure BMC user(s) • Enable BMC NIC in BIOS • Configure BIOS text console redirection – Enable – Set Baud rate (9600 or 19200) – Set terminal emulation type (VT100 or ANSI)	• SOL Proxy • Microsoft text console redirection • Red Hat Linux text console redirection

BMC Configuration and Management Tools

Using the System Maintenance Utility

The System Maintenance Utility is an EFI-based program that provides the ability to view or modify the systems management firmware configuration, which is maintained by the BMC.

The SMU lets you:

- Configure the serial channel for remote systems management over a direct serial connection.
- Configure the LAN channel for remote systems management over the network.
- Configure users and associated passwords for channel access. Users and channels can be assigned privilege levels to further define the access levels.
- Configure platform events to define the actions that should take place when specific events occur.
- Configure serial over LAN and terminal mode capabilities.
- Configure the power restore policy for the system.
- View, save, and clear the BMC System Event Log.
- View and save the BMC Sensor Data Records.
- View and save the Field Replaceable Unit records.

Using the BMC Management Utility

The BMC Management Utility provides a command-line, remote management station to manage all supported BMC functions. Use the BMC Management Utility to manage your system from a remote management station and as your managed system's emergency management console. The utility gives you the option of using either a command line interface (IPMI Shell) or a serial over LAN proxy (SOL Proxy) to access and manage the BMC. To use the BMC Management Utility, you will need to perform the following basic tasks:

NOTE: You must first configure your BMC using the SMU or Server Administrator before you can use the BMC Management Utility.

- Configure BIOS setting to allow console redirection
- Configure the BMC using the SMU or Server Administrator.
- Install the BMC Management Utility to a management station

See "Configuring Your Managed System" for instructions on configuring your managed system in preparation for using the BMC Management Utility, and see "BMC Management Utility" for complete instructions on using the BMC Management Utility to manage your system BMC.

Using Sever Administrator

Server Administrator Version 1.8.3 provides a convenient and easy-to-use graphical user interface for remotely configuring or managing your system's BMC on a system running a supported operating system. The Server Administrator Instrumentation Service can be used to configure the most relevant BMC features. In addition, Server Administrator can be utilized as command line interface. Server Administrator requires that the system has an operating system installed and functioning. As a result, Server Administrator is best suited for everyday BMC management tasks, and is not an option for performing pre-boot setup or accessing the BMC as a emergency management console. To use Server Administrator, you will need to perform the following basic tasks:

- Install Server Administrator on the managed system.
- Remotely access the Server Administrator home page from a supported browser on a management station.
- Remotely configure BMC on the managed system.

See the *Server Administrator Version 1.8.3 User's Guide* and *Command line Interface User's Guide* for more information about using Server Administrator to configure and manage your system BMC.

Other Dell Documents You Might Need

In addition to this *User's Guide*, you can find the following guides either on the Dell Support website or on the *Systems Management and Documentation* CD:

- The *Dell OpenManage Software Quick Installation Guide* provides additional information about installing the BMC Management Utility on a management station.
- The *Dell OpenManage Server Administrator Version 1.8.3 User's Guide* provides additional information about using Server Administrator to manage your system's BMC.
- The *Dell PowerEdge 7250 Systems Product Guide* provides supplemental information about configuring your BIOS settings to allow console redirection.

Additionally, you can find the following guide on the *Resource* CD:

- The *Dell PowerEdge 7250 System Software Guide* provides information about using the System Maintenance Utility to configure and manage your system.

The Server Administrator version 1.8.3 **readme.txt** file provides the latest available information for the installation and operation of the programs and utilities used to manage your system through the BMC. The readme is available on the *Systems Management and Documentation* CD and on the Dell Support website at **support.dell.com**.

Obtaining Technical Assistance

If at any time you do not understand a procedure described in this guide or if your product does not perform as expected, help tools are available to assist you. For more information about these help tools, see "Getting Help" in your system's *Installation and Troubleshooting Guide*.

Additionally, Dell Enterprise Training and Certification is available; see **www.dell.com/training** for more information. This service may not be offered in all locations.

2

Configuring Your Managed System

In order to use the BMC Management Utility, you must first configure the necessary system BIOS, network, and serial connection settings to enable access to the BMC.

In addition, to utilize the BMC Management Utility IPMI Serial functions, you must have a working connection between the management station and the correct serial I/O port of the managed system, using a null modem cable.

This section describes the basic procedures you must perform in order to prepare your BMC to be accessed and managed using the BMC Management Utility. The following procedures are described:

- BIOS Configuration
- Configuring Your BMC with the System Maintenance Utility (SMU)
- Configuring Your BMC with Server Administrator

BIOS Configuration

For most configurations you will need to configure specific BIOS settings before you can use the BMC Management Utility. To configure the necessary system BIOS settings, your must enter the System Setup utility.

NOTE: For more information about configuring BIOS settings, see your system's Product Guide.

Starting the System Setup Utility

To start Setup during the power-on sequence, follow these steps:

1. Press the power button on the front control panel of the system.
2. When POST shows the message `Hit <F2> if you want to run SETUP`, press <F2>. If the system has an administrator password configured, the system prompts you to enter the password. If the system does not have a password configured, the main screen of the BIOS Setup utility appears.

Navigating Setup Utility Screens

The BIOS Setup utility consists of five primary menus: **Main**, **Advanced**, **Security**, **System Management**, and **Exit**. Each menu occupies a single screen and presents a list of menu items. Some menu items are submenus, while others are settings that you can change from the screen. Table 2-1 describes how to navigate the utility screens and menus.

Table 2-1. Using Setup Screens

Key	Action
Left arrow	Scroll left through the main menu screens
Right arrow	Scroll right through the main menu screens
Enter	Select a submenu item or accept a drop-down choice
Tab	Select a field within a value (for example, date field)
F9	Select the default value
F10	Save your changes and exit Setup
ESC	Go back to a previous screen
Up arrow	Scroll up through menu items or value lists
Down arrow	Scroll down through menu items or value lists

Using the System Setup Utility

1. Navigate to the **Systems Management** menu.
2. Navigate to the **Console Redirection** menu item and press <Enter>.
3. Configure all **Setup Console Redirection** submenu items necessary for the method you have chosen to access your managed system's BMC. See Table 2-2 for a list of all valid **Setup Console Redirection** submenu items. Default values, if applicable, are enclosed in brackets. See Figure 1-1 for an overview of the necessary setup procedures.
4. Navigate to the **Exit** menu and select **Exit Saving Changes**. When prompted, select **Yes** to save your changes and exit the utility.

Table 2-2. Setup Console Redirection Submenu Items

Submenu Item	Default Value	Description
Serial Console Redirection	Enabled Disabled	When enabled, Console Redirection uses only COM2. Choosing **Disabled** completely disables Console Redirection.
Baud Rate	9600 [19.2K] 38.4K 57.6K 115.2K	When Console Redirection is enabled, use the baud rate specified. When the BMC Management Utility is sharing the COM port as console redirection, the baud rate must be set to 19.2K to match the utility's baud rate.

Table 2-2. Setup Console Redirection Submenu Items *(continued)*

Submenu Item	Default Value	Description
Flow Control	No Flow Control [CTS/RTS] CTS/RTS + CD XON/XOFF	No flow control. CTS/RTS = Hardware-based flow control. CTS/RTS +CD = Hardware-based + carrier-detect flow control. When the BMC Management Utility is sharing the COM port as console redirection, the flow control must be set to CTS/RTS or CTS/RTS+CD depending on whether a modem is used. Xon/Xoff = Software-based flow control.
Terminal Type	[PC-ANSI] VT100+ VT-UTF8	Select terminal type. VT100+ only available when English selected as the language. VT-UTF8 uses UNICODE. PC-ANSI is the standard PC-type terminal.
Serial Port	COM2 2F8 IRQ3	Hardcoded – no selection available. Note that if Console Redirection is enabled, then the Base I/O address and IRQ selection of Serial Port B (under Menu Advanced, submenu Peripheral Configuration) should match this Serial Port setting under the Console Redirection submenu.
Remote Console Reset	Enabled/Disabled	Enables remote reset using escape key sequence; <ESC> <R> <ESC> <r> <ESC> <R>
ACPI OS Headless Operation	Disabled Same as BIOS Serial Port	Used to pass information about serial redirection to ACPI OS.
ACPI OS Baud Rate	9600 19.2k 38.4K 57.6k 115.2k	Only available when ACPI OS Headless Operation is same as BIOS or Serial Port.
ACPI OS Flow Control	No Flow Control CTS/RTS XON / XOFF CTS/RTS + CD	Only available when ACPI OS Headless Operation is same as BIOS or Serial Port.
ACPI OS Terminal Type	PC-ANSI VT100+ VT-UTF8	Only available when ACPI OS Headless Operation is same as BIOS or Serial Port.

Configuring Your Managed System with the System Maintenance Utility (SMU)

NOTE: The SMU can be run from both the Resource CD and from the system's utility partition (UT). See the *System Software Guide* on the *Resource* CD for instructions on running the SMU from the UT.

The managed system must have a CD drive. A network connection is not required.

The following sequence of steps is followed to start the SMU locally (using the system *Resource* CD):

1. Insert the system Resource CD into the CD drive on the managed system and boot the system to the EFI shell. The *Resource* CD menu program begins running automatically and displays a splash screen followed by the main menu.
2. Use the arrow keys to move to the **Utilities** menu item. Press the <Enter> key.
3. Use the down arrow key to highlight the **System Maintenance Utility** menu item. Press the <Enter> key to start the local SMU application.

The server management configuration task appears in the task pane of the SMU. This task allows you to configure server management settings maintained by the BMC. The server management configuration task supports configuring of the following, which are displayed as sub-tasks:

- Users
- LAN Channel
- Serial/Modem
- Platform Event Filtering (PEF)
- Power Settings

Upon selecting one of the above sub-tasks, a screen is displayed that contains some or all of the configuration items that pertain to the selected sub-task. The data that is initially displayed is read from the server management controller of the system. You can update the settings and save them back to the system.

Sub-tasks can be made up of one or more screens, depending on the server management configuration settings you enabled. Buttons that are common to the server management configuration tasks are:

Save — Causes the current values of the settings in the current subtask to be stored in non-volatile memory on the system.

Edit — Causes a screen to be displayed that allows you to change settings related to a single entry in a table.

User Configuration Subtask

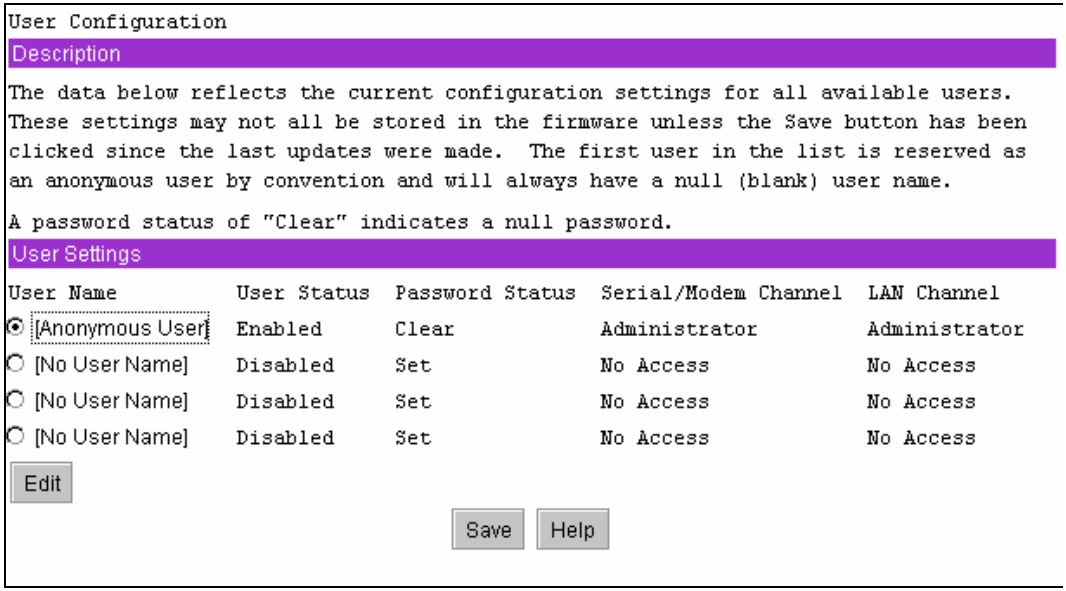
The **User Configuration** subtask provides a way to configure the user access to the LAN and Serial channels. Up to four users are allowed. Some of the options presented in these screens depend on how the channels have been configured; therefore, the channels should be configured before you access these settings.

Sessions allow a framework for user authentication and allow multiple IPMI messaging streams on a single channel.

After clicking on the **User Configuration** subtask, the screen displayed below is shown. This screen displays an entry for each possible user that can be configured. This screen shows:

- Whether a particular user is enabled or disabled for channel access
- Whether a password is set for the user
- The BMC privilege level the user has for each of the available channels that supports sessions (users can only access channels that support sessions)

Figure 2-1. User Configuration Screen



The first user is always present and is used to support an anonymous login. The username for this user is null (blank) and cannot be changed; the user name displays the text Anonymous User. The password can be set to a desired value.

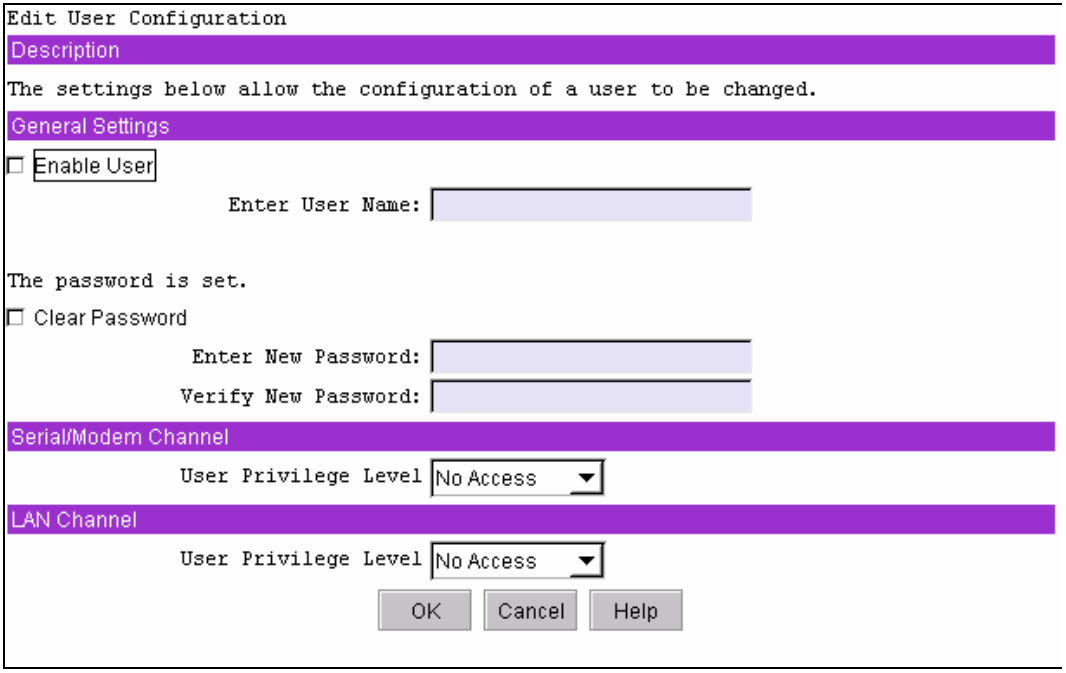
It is possible for multiple user entries to have the same username. This occurs if a different password is needed for the same user on different channels. In this case, the privilege level for the channel that is not to be accessed with the associated password should be set to No Access.

Otherwise, the firmware attempts to use the first entry in the user table that it finds that allows access to the specified channel and would expect the password associated with that entry to be the one entered to gain access to the specified channel.

The figure below shows the screen that is displayed when a User Name is selected and then the **Edit** button is clicked. Changes made to user settings do not take effect until the next time that the user establishes a session.

After configuring the user information, click **Save** to complete this sub-task.

Figure 2-2. Edit User Configuration Screen



After editing the user information, click **OK** to return to the **User Configuration** screen.

Enable User

This check box is used to enable you to attempt to have access to the available channels. Leaving the box unchecked disables the user, preventing that user from accessing the channels.

Enter Username

This edit box is used to enter an out-of-band username. If the anonymous user is selected for modification, the screen displayed does not include this edit box because the user name cannot be changed.

The password can be from 1 to 16 ASCII characters long. The characters accepted by the SMU for usernames are the ASCII printable characters in the range 0x21 through 0x7e, except for left and right bracket characters ('[' and ']'). These characters are reserved for framing packets for terminal mode sessions.

Clear Password

This check box is used to clear the password for the user. If this box is checked, the Enter and Verify New Password edit boxes are disabled.

Enter/Verify New Password

These edit boxes allow you to enter the password for the user. The Verify New Password edit box ensures that the password entered in the Enter New Password edit box is correct. As a user enters a password, asterisks are displayed. If a password already exists, these fields show ******** when you enter this screen.

This password can be between 1 and 16 ASCII characters in length. The characters accepted by the SMU for user passwords are the ASCII printable characters in the range 0x21 through 0x7e, except for left and right bracket characters ([and]), since those characters are used for framing packets for terminal mode sessions.

NOTE: If the **Clear Password** check box is checked, these two edit boxes are disabled.

If a user password is currently set, the SMU user is not required to enter the current password before changing it.

User Privilege Level for LAN Channels

This combo box allows you to select the privilege level for LAN channel. The global privilege level set for LAN channel access takes precedence over the user privilege level. For example, if the LAN channel is configured for user access only, then users are limited to user operations regardless of the user privilege level.

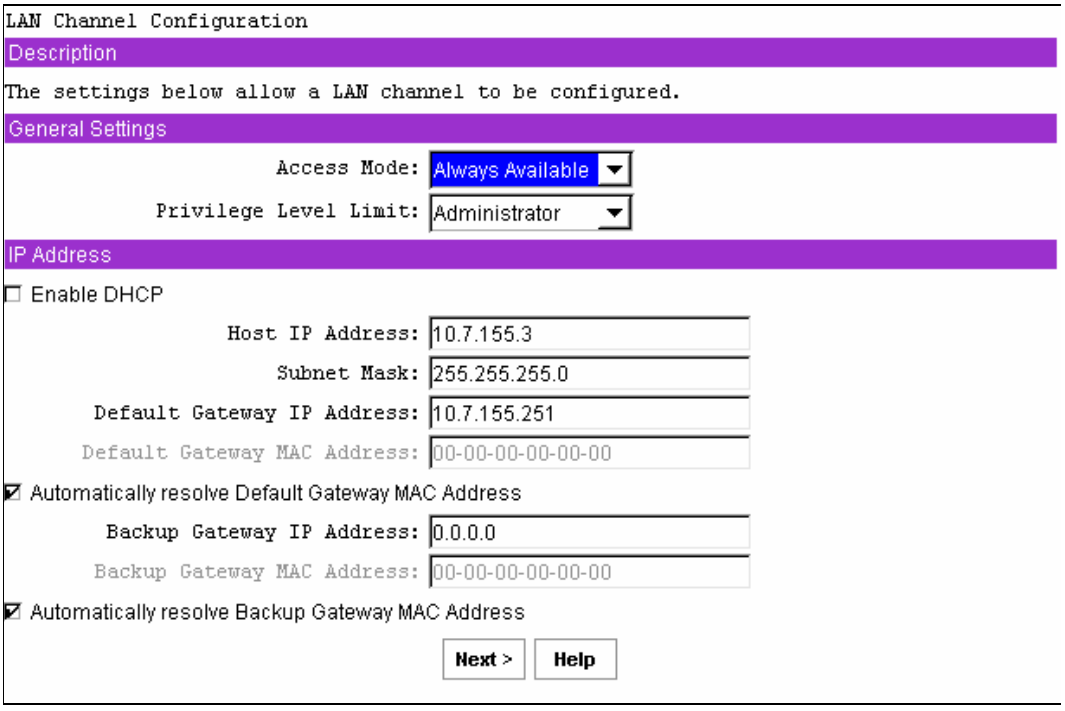
User Privilege Level for Serial Channel

This combo box allows you to select the privilege level for serial channel access. The privilege level set for the serial channel takes precedence over the user privilege level. For example, if the serial channel is configured for user access only, then users are limited to user operations regardless of the user privilege level.

LAN Channel Configuration Subtask

The LAN channel configuration subtask allows you to modify settings related to the LAN channel. The initial screen for configuring the LAN channel and the configuration settings are described in Figure 2-3.

Figure 2-3. LAN Channel Configuration Screen



After completing this screen, click **Next** to move to the next screen to continue this sub-task.

Default LAN Configuration Settings Set by the SMU

The SMU automatically configures some server management firmware settings. These are not displayed on the screen above, but are listed below. Before these settings are set by the SMU, you must click through each LAN configuration screen by clicking the Next button until you reach the Save button on the final LAN configuration screen.

- **Gratuitous ARPs may be enabled:** This setting allows the BMC to generate gratuitous ARPs, which provide a mechanism for IP devices to locate the hardware addresses of other devices on the local network. If the system has a valid IP address and the LAN channel is enabled for messaging (the access mode is not set to Disabled) or alerting, then gratuitous ARPs are enabled.
- **Authentication enables are enabled:** These bits define what types of authentication are enabled to authenticate messages sent to the BMC by users of different privilege levels. The SMU enables authentication of type straight password, MD2, MD5, and none.
- **User-level authentication is disabled:** The SMU disables user-level authentication so that if a user is attached with a privilege level of User, no authentication is done on messages sent to or from the BMC. This improves the session performance.

Access Mode

This drop-down box configures the access mode for the LAN channel. The available options are:

- **Always Available:** The channel is dedicated to communication with the BMC and is available during all system states (powered-down, powered-up, pre-boot, sleep, run-time, etc.).
- **Disabled:** The channel is not allowed to communicate with the BMC.

BMC Privilege Level Limit

This drop-down box determines the maximum privilege level at which communication on the channel can take place. It is a global privilege level that takes precedence over user privilege levels. For example, if a channel privilege level is set to the user level then only user-level commands can be executed, regardless of the user privilege level.

The meanings of the different privilege levels are described below:

- **Callback:** Only commands needed to initiate a callback session are allowed. Although Dell OpenManage system management software does not support callback as a connection mechanism, it is still a valid privilege level because it defines a set of BMC commands that can be executed by a user.
- **User:** Only "benign" commands are allowed. These are primarily commands that read data structures and retrieve status. Commands that can be used to alter BMC configuration, write data to the BMC or other management controllers, or perform system actions such as resets, power on/off, and watchdog activation are disallowed.
- **Operator:** All BMC commands are allowed, except for configuration commands that can change the behavior of the out-of-band interfaces. For example, Operator privilege does not allow the capability to disable individual channels, or to change user access privileges.
- **Administrator:** All BMC commands are allowed, including configuration commands. An administrator can execute configuration commands that would disable the channel that the Administrator is communicating over.

Enable DHCP

The Enable Dynamic Host Configuration Protocol (DHCP) check box enables or disables the dynamic host configuration protocol to allow the system to automatically assign the Host IP address, Default Gateway address, and Subnet mask. The IP address is assigned by the DHCP server as a part of the system boot process. If an IP Address lease expires after the system boots, the BMC will continue to use the expired address. It is recommended that IP addresses be assigned with permanent leases.

When this option is enabled, the Host IP address, Subnet Mask, and Default Gateway IP Address fields are disabled.

Host IP Address

This edit box is for the logical or Internet address of the host. The IP address is required when DHCP is disabled. The IP address is entered as a dotted notation, such as 192.168.0.2.

Subnet Mask

The edit box is for the host's subnet mask. The system uses this to decide if alert destinations are in the local subnet or in another subnet relative to the client console. The Subnet Mask is entered as a dotted notation, such as 255.255.0.0.

Default Gateway IP Address

This edit box is for the IP address of the router used when the BMC sends a message or an alert to a system on a different subnet than the BMC is on. The IP address is entered as a dotted notation, such as 192.168.0.2.

Default Gateway MAC Address

This edit box allows you to enter the MAC address of the default gateway router. The MAC address is entered as a series of six pairs of hex digits separated by dashes, such as 00-01-62-d0-3e-66. Alphabetic hex digits (a-f) can be entered in uppercase or lowercase. This edit box is disabled by default and is only activated if the check box for **Automatically resolve Default Gateway MAC address** is not checked. If the edit box is cleared (no address is supplied), a message is displayed asking that a valid address be entered.

Automatically Resolve Default Gateway MAC Address

This check box allows you to specify whether the BMC should automatically attempt to resolve the MAC address of the default gateway router. This box is checked by default unless the MAC address edit box appears to include a valid MAC address.

If this box is not checked, you must provide the MAC address in the **Default Gateway MAC Address** field.

When the **Next** button is clicked, the firmware attempts to resolve the gateway MAC address. If the BMC cannot resolve the address, the screen is redisplayed with the box unchecked and you are asked to provide the MAC address in the Default Gateway MAC Address field. If the screen is redisplayed due to a MAC address resolution issue, any user data previously entered, other than the MAC address information, remains in place.

Backup Gateway IP Address

This edit box allows you to enter the IP address of a backup gateway router. The IP address is entered as a dotted notation, such as 192.168.0.2.

Backup Gateway MAC Address

This edit box allows you to enter the MAC address of the backup gateway router. The MAC address is entered as a series of six pairs of hex digits separated by dashes, such as 00-01-62-d0-3e-66. Alphabetic hex digits (a-f) can be entered in uppercase or lowercase. This edit box is disabled by default and is only activated if the check box for **Automatically resolve Backup Gateway MAC address** is not checked.

Automatically Resolve Backup Gateway MAC Address

This check box allows you to specify whether the BMC should automatically attempt to resolve the MAC address of the backup gateway router. This box is checked by default unless the **MAC address** edit box appears to include a valid MAC address.

If this box is not checked, you must provide the MAC address in the **Backup Gateway MAC Address** field.

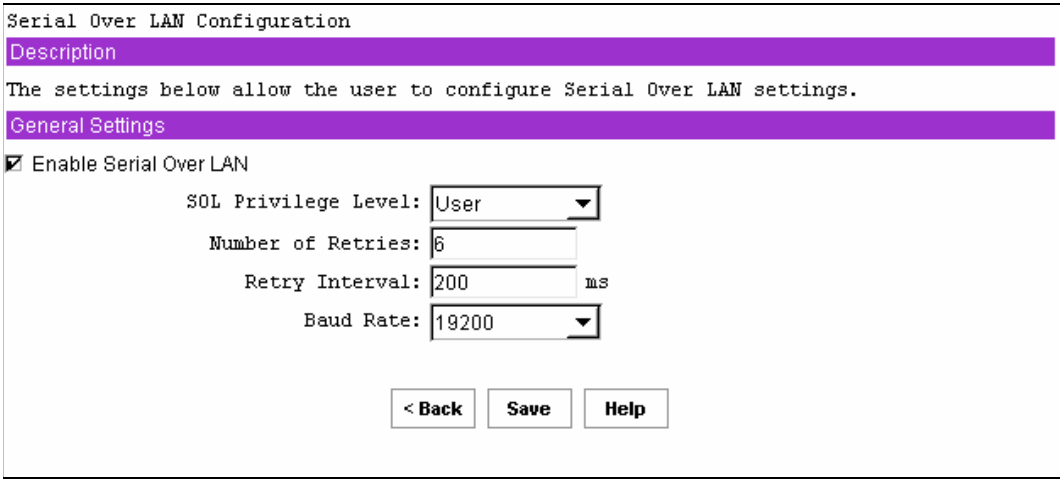
When the **Next** button is clicked, the firmware attempts to resolve the gateway MAC address. If the BMC cannot resolve the address, the screen is redisplayed with the box unchecked and you are asked to provide the MAC address in the **Backup Gateway MAC Address** field. If the screen is redisplayed due to a MAC address resolution issue, any user data previously entered, other than the MAC address information, remains in place.

Serial Over LAN Configuration Subtask

The **Serial Over LAN** screen, shown in Figure 2-4, allows you to configure the operation of the serial over LAN capability of the BMC.

The SMU sets up the SOL configuration such that SOL packets do not have to be authenticated. This enhances the performance of an SOL session.

Figure 2-4. Serial Over LAN Configuration Screen



After configuring the SOL information, click **Save** to complete this subtask.

Enable Serial Over LAN

This check box is used to enable or disable the serial over LAN capability.

SOL Privilege Level

This setting is used to select the minimum BMC privilege level that is required to be able to activate SOL. The choices are User, Operator, and Administrator. For the best performance, User should be selected.

Number of Retries

This field sets the number of times that the BMC tries to resend a SOL message to a remote console.

The number of retries must between 0 and 7.

Retry Interval

This field sets the number of milliseconds that the BMC waits between trying to send SOL messages to a remote client.

The value entered must be between 0 and 2559. The SMU truncates the digit in the ones column from any input number because the firmware maintains this value in 10 millisecond intervals. Therefore, any value that is entered between 0 and 9 is displayed as 0.

Baud Rate

This field sets the baud rate at which serial data is transferred by the BMC when SOL is active. The choices are **Default IPMI**, **9600 bps**, **19.2 kbps**, **38.4 kbps**, **57.6 kbps**, and **115.2 kbps**. If **Default IPMI** is selected, the baud rate used is the rate currently set for BIOS serial redirection. When SOL is active, serial communication with the BMC always occurs with 8 data bits, no parity, 1 stop bit, and RTS/CTS (hardware) flow control.

LAN Alert Configuration

See the *System Software Guide* on the *Resource* CD for information about configuring BMC LAN alerts. Click **Next** to move to the **Serial Over LAN** screen.

Configuring Your Managed System with Server Administrator

You can also configure the BMC options using Server Administrator Version 1.8.3. Server Administrator is a one-to-one system management software program that must be installed on the managed system. Once installed, Server Administrator can be remotely accessed from a management station with a supported browser to perform BMC configuration tasks. See the *Sever Administrator User's Guide* for more information about installing and using the Server Administrator.

You can configure the BMC settings from either the Server Administrator home page or from its command line interface. Users must have Administrator privileges to access the BMC settings. Users logged in with User or Power User group privileges can view the BMC information but cannot change the settings.

See the *Server Administrator Version 1.8.3 Command Line Interface User's Guide* for information about configuring the BMC from the command line.

When using Server Administrator, you can click **Help** on the global navigation bar for more detailed information about the specific window you are viewing. Server Administrator help is available for all windows accessible to the user based on user privilege level and the specific hardware and software groups that Server Administrator discovers on the managed system.

Configuring Your Managed System to Access its BMC

The Server Administrator Instrumentation Service allows you to manage Baseboard Management Controller (BMC) features such as general BMC information, configuration of the LAN and serial port, and BMC users. To use Server Administrator to configure the BMC on a managed system, perform the following steps:

NOTE: You must be logged in with Admin privileges to configure the BMC settings.

1. Log in to the Server Administrator home page for the target system.
2. Click the **System** object.
3. Click the **Main System Chassis** object.

4. Click the **BMC** object.
5. The **BMC Information** window appears.
6. Click the **Configuration** tab.

   Under the **Configuration** tab, you can configure LAN, Serial Port, and Serial Over LAN.
7. Click the **Users** tab.

   Under the **Users** tab, you can modify the BMC user configuration.

3

BMC Management Utility

The BMC Management Utility is comprised of a collection of software applications that enable remote management and configuration of systems equipped with a BMC. The BMC Management Utility includes the following components:

- Command Line Interface (IPMI Shell)

  The IPMI Shell is a scriptable console application program for the control and management of remote systems using the IPMI 1.5 protocol. The IPMI Shell supports both serial access and LAN access to the BMC. It allows administration of one or more managed systems from a command line shell, rather than a graphical user interface (GUI). The IPMI Shell is used to perform the following tasks:

  – System power management
  – System identification
  – Access to the event log
  – System identifier control

- Serial Over LAN Proxy (SOL Proxy)

  The SOL Proxy is a telnet daemon that allows LAN-based administration of remote systems using the Serial Over LAN (SOL) and IPMI 1.5 protocols. Any standard telnet client application, such as HyperTerminal on Microsoft® Windows® or telnet on Red Hat® Linux, can be used to access the daemon's features. The SOL protocol coupled with the remote system's BIOS console redirection allows administrators to remotely view and change a managed system's BIOS settings over a LAN. The Red Hat Linux serial console and Microsoft's EMS/SAC interfaces can also be accessed over a LAN using SOL.

NOTICE: All versions of the Microsoft Windows operating system include Hilgraeve's HyperTerminal terminal emulation software. However, the included version does not provide many functions required during console redirection. Instead, you can use any terminal emulation software that supports VT100 or ANSI emulation mode. One example of a full VT100 or ANSI terminal emulator that supports console redirection on your system is Hilgraeve's HyperTerminal Private Edition 6.1 or later.

NOTE: See "Using Console Redirection" for more information about console redirection, including hardware and software requirements and instructions for configuring host and client systems to use console redirection.

NOTE: HyperTerminal and telnet settings must be consistent with the settings on the managed system. For example, the baud rates and terminal modes should match.

Installing the BMC Management Utility

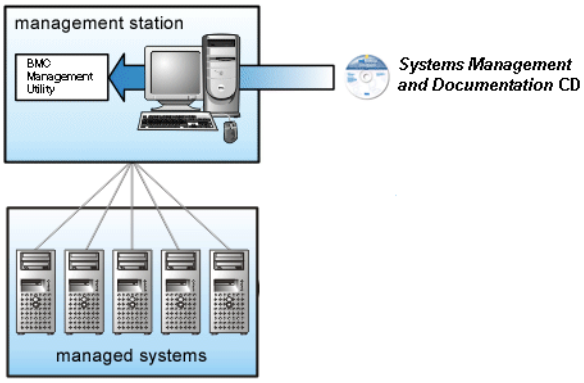
The BMC Management Utility is installed on a management station system in order to remotely connect to the managed system's BMC. See Figure 3-1.

Installation Prerequisites

Before using the BMC Management Utility, you must perform at least the basic BIOS and BMC configuration tasks described in "Configuring Your Managed System."

In addition, to access the BMC using the IPMI serial feature, you must have a working connection between the management station and the correct serial I/O port of the managed system's BMC using a null modem cable.

Figure 3-1. Installing on a Management Station



Supported Operating Systems

The management station must be running one of the following supported operating systems:

- Red Hat Enterprise Linux 2.1 AS
- Red Hat Enterprise Linux 3 AS, ES, WS
- Microsoft Windows 2000
- Microsoft Windows XP
- Microsoft Windows Server 2003 Web, Standard, and Enterprise Editions

Installation

To install the BMC Management Utility on the management station, perform the following steps:

1. Log on with administrator privileges to the system where you want to install the system management software components.
2. Exit any open application programs and disable any virus-scanning software.
3. Insert the *Systems Management and Documentation* CD into your system's CD drive.

   The setup program should start automatically. If it does not, click the **Start** button, click **Run**, and then type **x:autorun.exe** (where *x* is the drive letter of your CD drive).
4. Click **Install BMC Management Utilities.**
5. Click **OK**.
6. Click **Open** to proceed through the installation process and respond to the prompts, as required.

   The setup program automatically installs all of the management station software for your hardware configuration.
7. When the installation is complete, close the installation window.

   See the for more information.

See the *Dell OpenManage™ Version 1.8.3 User's Guide* for additional information about installing the BMC Management Utility on a management station.

Windows Operating Systems

By default, the installation program copies the files to the following directory:
C:\ProgramFiles\ Dell\OpenManage\bmcconsole.

Uninstalling the BMC Management Utility

To uninstall the BMC Management Utility, use the Add/Remove Programs utility in the Control Panel.

Red Hat Linux Operating Systems

By default, the installation program copies the files to the following locations:

/etc/init.d/solproxy

/etc/solproxy.cfg

/usr/sbin/solproxyd

/usr/bin/solconfig

/usr/bin/ipmish

The SOL Proxy will start automatically during system startup. Alternatively, you can go to directory **/etc/init.d** and use the following command to manage the SOL Proxy service:

```
solproxy status

solproxy start

solproxy stop

solproxy restart
```

Uninstalling the BMC Management Utility

To uninstall the BMC Management Utility, perform the following procedures:

1. Log in as `root`.
2. Enter the following command to remove all the installed packages.

   ```
   rpm -e osabmcutil
   ```

3. If you receive a success message, it shows that the BMC Management Utility is uninstalled.

IPMI Shell

IPMI Shell is a CLI console application and has no graphical user interface. Its commands and options are specified using command line arguments only.

IPMI Shell supports out-of-band (OOB) access (over a LAN or through the serial port) to a single system at a time, however, multiple IPMI Shell sessions can run simultaneously on the same managed system. SeeFigure 3-2.

IPMI Shell allows a user with user-level BMC user privileges to:

- Display the current power status
- Display the 16-byte system GUID of the managed system
- Display all field replaceable units (FRU) present in the system
- Display the BMC firmware information
- Display summary information about the event log
- Display the logged events

In addition to the operations that can be performed by a user with user-level BMC user privileges, IPMI Shell allows a user with operator-level BMC user privileges to:

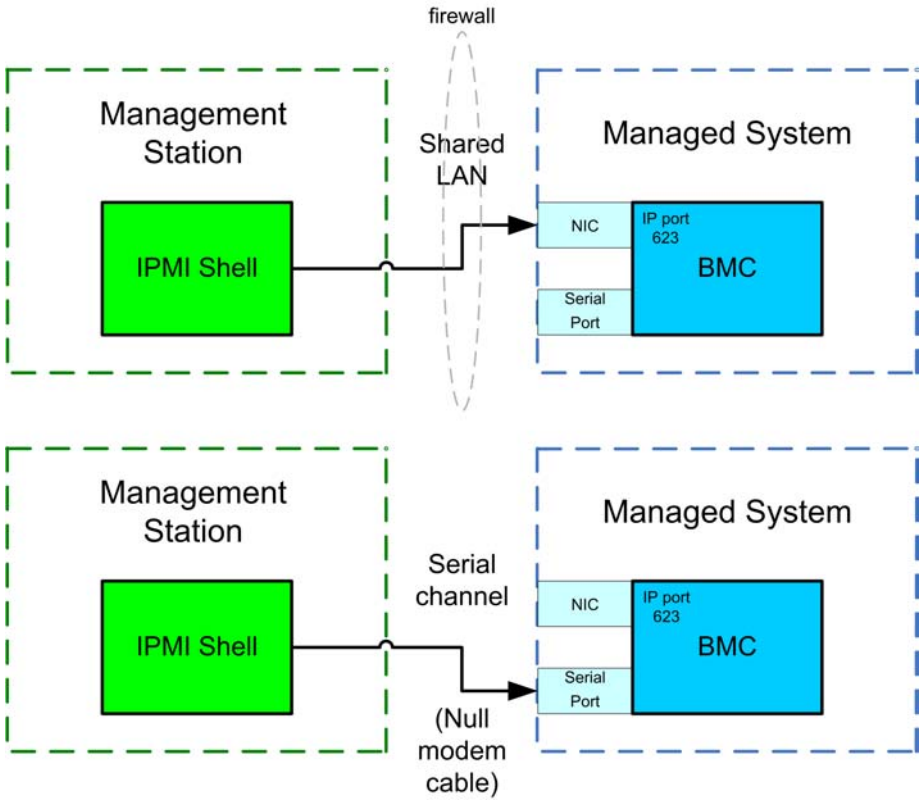
- Power on, reset, or cycle a managed system
- Simulate a hard power off a managed system (forcing the system to turn off without shutting down the operating system)
- Delete the system event log (SEL)
- Turn on/off the blinking system identification LED

In addition to the operations that can be performed by a user with operator-level BMC user privileges, IPMI Shell allows a user with administrator-level BMC user privileges to:

- Set and change user privileges.

To facilitate command scripting, upon successful execution IPMI Shell terminates with an exit code of zero, and will output the execution results in a parsable format. If an error is encountered, the program exits with a non-zero error code and output the error in a parsable format. See "BMC Management Utility Error Codes" for a complete list of possible BMC Management Utility error codes.

Figure 3-2. IPMI Shell Diagram



Using IPMI Shell

To use IPMI Shell, perform the following steps:

On systems running a supported Microsoft Windows operating system:

1. Start a **Command Prompt** window.
2. Go to the directory where the file **ipmish.exe** is located. By default, **ipmish.exe** is located at the directory: **C:\ProgramFiles\ Dell\OpenManage\bmcconsole.**
3. Enter IPMI Shell commands (see "IPMI Shell Command Syntax") to manage the remote system. Go to "IPMI Shell Commands" for a complete list of valid options, commands, subcommands, and arguments.

On systems running a supported Red Hat Linux operating system:

1. Start an operating system (OS) shell.
2. Enter IPMI Shell commands (see "IPMI Shell Command Syntax") to manage the remote system. Go to "IPMI Shell Commands" for a complete list of valid options, commands, subcommands, and arguments.

IPMI Shell Command Syntax

The general syntax of IPMI Shell CLI commands is as follows:

ipmish [*global-option*] … *command* [*; command*] …

where a command is :

command [*subcommand*] [*command option and argument*] …

Both global options and command-specific options are always in the form of:

-option argument

For example:

-help

-max 20

-u John

Arguments with embedded tabs or spaces must be enclosed in matching double quotation marks ("). For example:

-user "John Smith"

Every command has one default action. The default action is typically, but not always, the equivalent of reading and displaying the current setting or status for the command.

IPMI Shell Global Options

IPMI Shell has the following global options:

IPMI Session Option `-ip`

Synopsis

ipmish -ip *bmc_ip_address | bmc_hostname* **-u** *username* **-p** *password*

Description

This option is used to establish a connection to a remote managed system using the LAN channel. The IP port specified in installation (default value is 623) is used unless another port has been configured.

Options

NOTE: The following options cannot be used independently. One or more IPMISH command must follow the option.

`-ip` *bmc_ip_address | bmc_hostname*

Specifies the IP address or hostname of the remote managed system.

`-u` *username*

Specifies the BMC username used to connect to the system.

`-p` *password*

Specifies the BMC user password used to connect to the system.

IPMI Session Option `-com`

Synopsis

ipmish -com *serial_port* **-baud** *baud_rate* **-flow** *flow_control*
-u *username* **-p** *password*

Description

This option is used to establish a connection to a remote managed system using the serial channel.

Options

NOTE: The following options cannot be used independently. One or more IPMISH command must follow the option.

`-com serial_port`

Specifies the serial port used when establishing an IPMI session to the managed system. For a system running Windows, the management station port can be 1, 2, 3, and so on. For systems running Red Hat Linux, the management station port can be ttyS0, ttyS1, ttyS2, and so on.

`-baud baud_rate`

Specifies the communication baud rate over the serial channel, such as 9600 or 19200. The baud rate for the serial channel should match the baud rate set in the managed system.

`-flow flow_control`

Specifies the data flow control method. There are two flow control options: CTS (hardware flow control) and NONE (no flow control).

`-u username`

Specifies the BMC username used to connect to the managed system.

`-p password`

IPMI Help Option `-help`

Synopsis

`ipmish -help` [*command*]

Description

This option is used to display the following information:

- A summary page for all commands
- A summary of all subcommands for a single command
- A detailed description of a command-subcommand combination

Options

`-help command`

A command list and a capsule description of options are printed if no argument is given. When there is an argument specifying a valid command, the **help** option displays a detailed description of the command. See Figure 3-3 and Figure 3-4.

Figure 3-3. IPMI Help Option Example 1

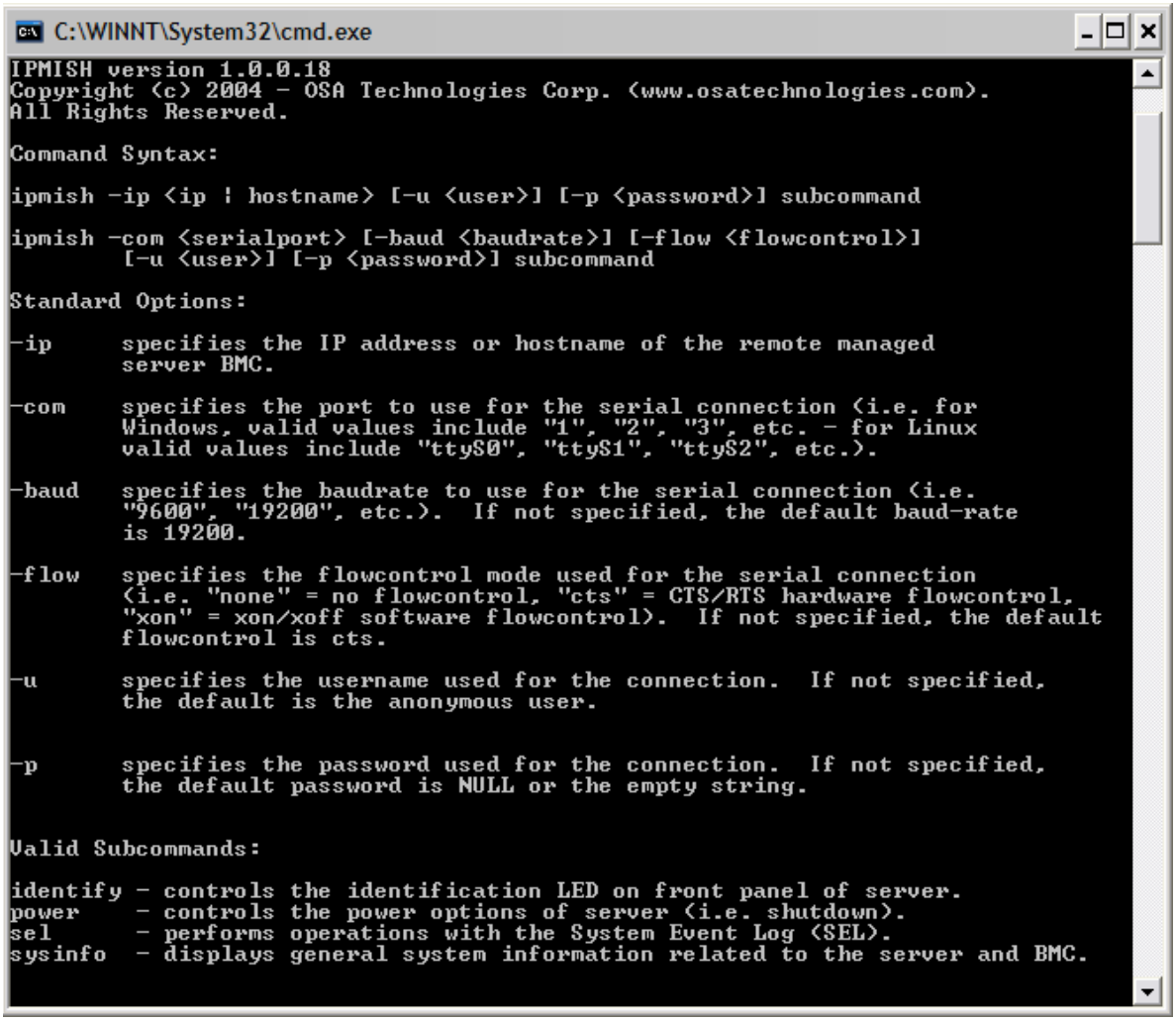
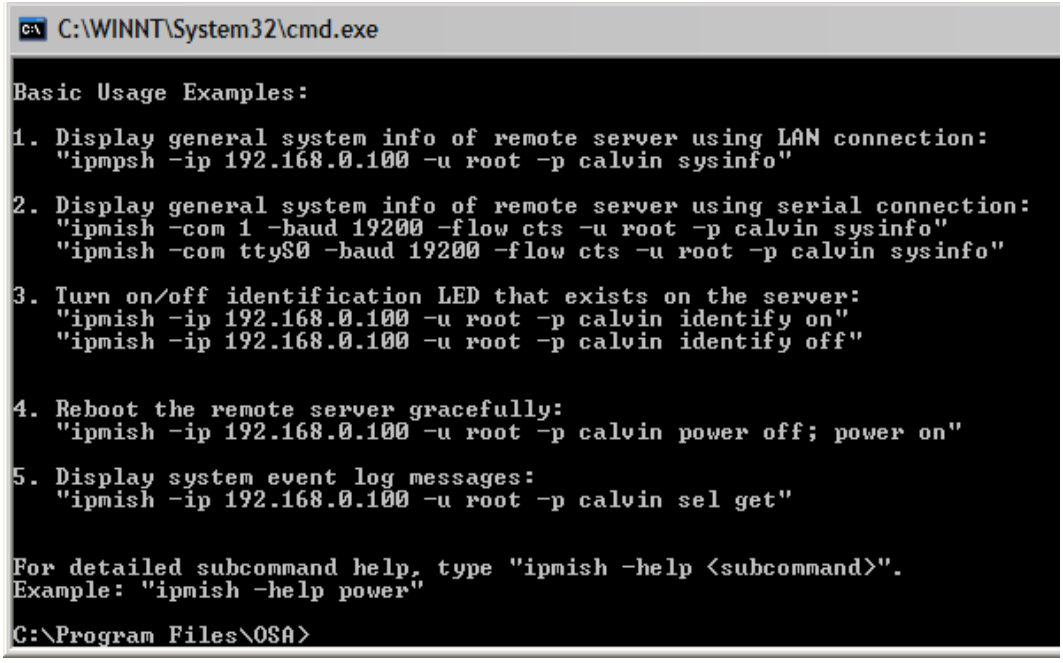


Figure 3-4. IPMI Help Option Example 2



IPMI Shell Commands

The table below lists IPMI Shell commands with a brief description.

Table 3-1. IPMI Shell Commands

Command	Description
identify	Controls the identification LED on the front panel.
sysinfo	Retrieves and displays managed system information.
power	Controls the power state of the managed system.
sel	Displays or deletes information from the SEL.

identify

Synopsis

identify [**on** [**-t** *seconds*] | **off**]

Description

This command is used to control the identification LED on the front panel. See Figure 3-5.

Subcommands

`on`

`off`

Turns the managed system's front panel LED on or off. If the BMC supports the IPMI extension **Chassis Identify On** command, then the **identify on** command turns the LED on indefinitely until the **identify off** command is used to turn the LED off. Otherwise, the LED will be turned on for the maximum allowed time of 255 seconds.

Options

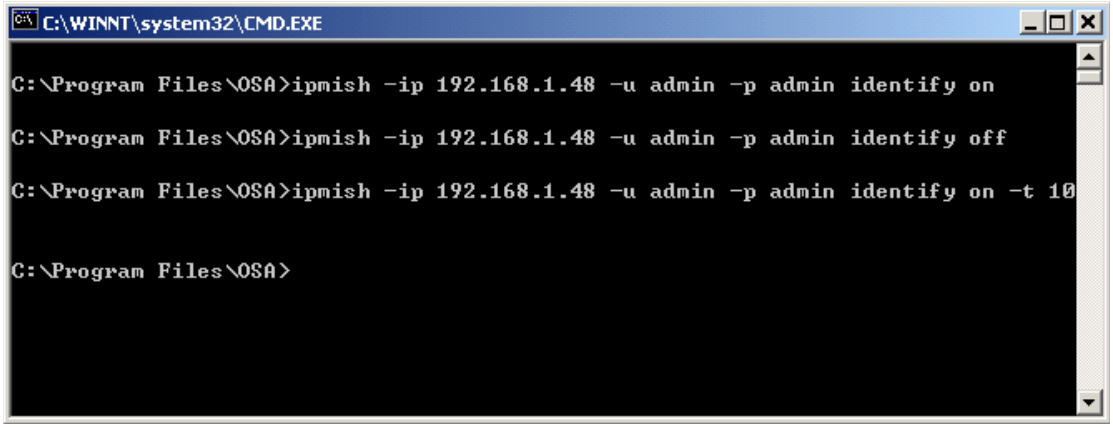
`-t seconds`

Specifies how long the LED is on. It should be no longer than 255 seconds.

Default Subcommand

If a subcommand is not specified, this command acts the same as the **identify on** command.

Figure 3-5. identify Option Example



sysinfo

Synopsis

`sysinfo [fru | id]`

Description

This command retrieves and displays the system information, including field replaceable unit (FRU) and BMC information for the managed system. See Figure 3-6.

Subcommands

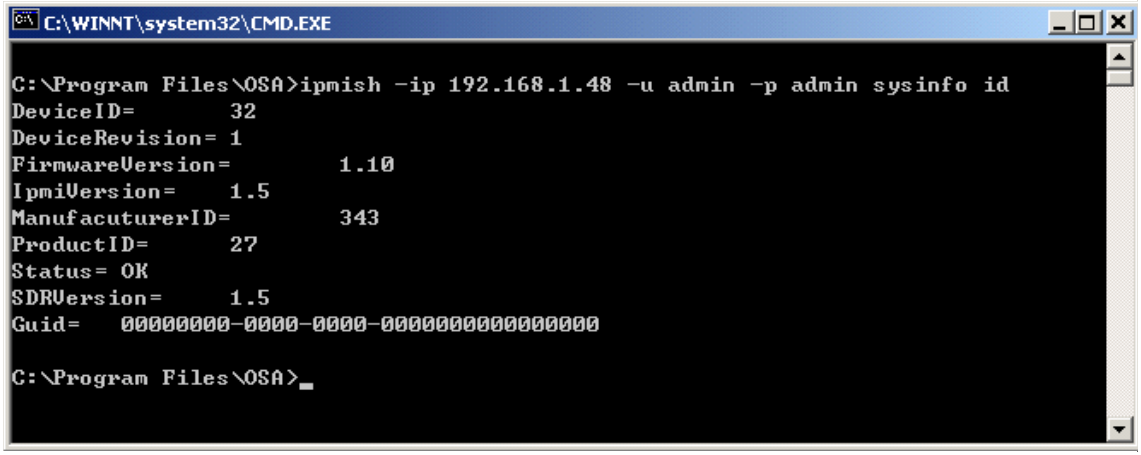
`fru` — Returns FRU related information

`id` — Returns BMC related information

Default Subcommand

If a subcommand is not specified, this command acts the same as **sysinfo id**. See Figure 3-6.

Figure 3-6. sysinfo Option Example



power

Synopsis

`power status`

`power off [-force] | on | cycle | reset`

Description

This command is used to display the current power status of the managed system, turn the system on or off, or reset the system. See Figure 3-7.

Subcommands

`status` — Displays the current power status of the system, the returned value is "on" or "off".

`on` — Turns on the managed system.

`off` — Issues a "graceful shutdown" IPMI command.

NOTE: The **off** subcommand is not supported on the PowerEdge 7250. You must use the **force** option to turn off the system.

`cycle` — Turns off the system, pauses, then turns the system back on.

`reset` — Pulses the system reset signal, regardless of the power state.

Options

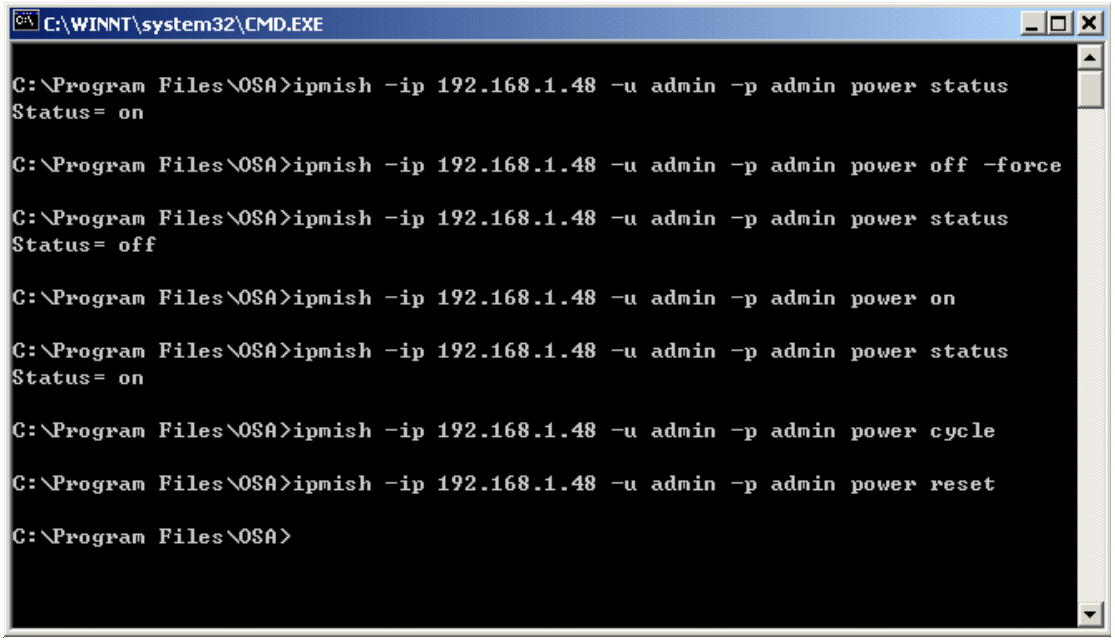
`-force`

This option simulates pressing the power button, forcing the system to turn off without shutting down the operating system.

Default Subcommand

If a subcommand is not specified, this command acts the same as **power status**.

Figure 3-7. power Option Example



sel

Synopsis

```
sel status
sel get [ [-begin index1 ] [-end index2 | -max count] ] | [-last n]
sel clear
```

Description

This command is used to display event log information, display the contents of the event log, and delete all the event log records. See Figure 3-8.

Subcommands

`status` — Displays the total number of system event log records.

`get` — Prints all or part of the event log.

`clear` — Deletes all the records in the event log.

Options

`-begin index1`

Specifies the first record to display.

`-end index2`

Specifies the last record to display.

`-max count`

Specifies the maximum number of the records to display.

If the value of the argument **count** is bigger than the total number of the records, the last record displayed will be the last one in the event log.

`-last n`

Specifies the number of records to be displayed, starting from the last record and counting backwards.

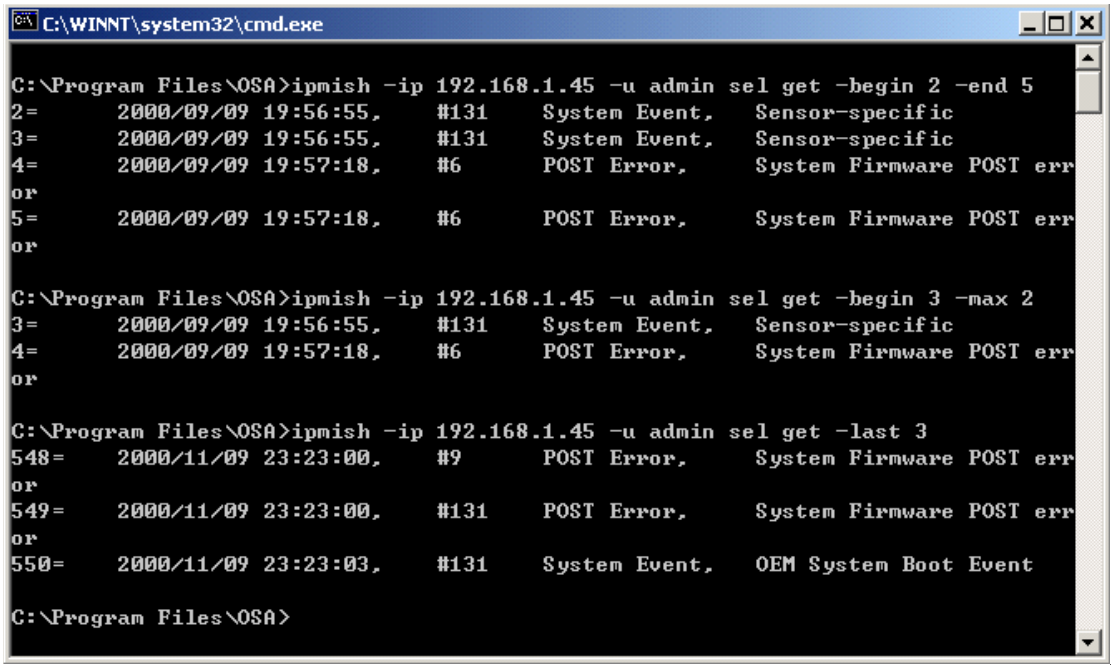
Default Subcommand

If a subcommand is not specified, this command acts the same as **sel status**.

Display Format

System event log records are displayed using a tabular format. The column headers are: **Ordinal Number**, **Sensor Number**, **Sensor Type**, and **Brief Description**. See Figure 3-8.

Figure 3-8. sel Option Example



SOL Proxy

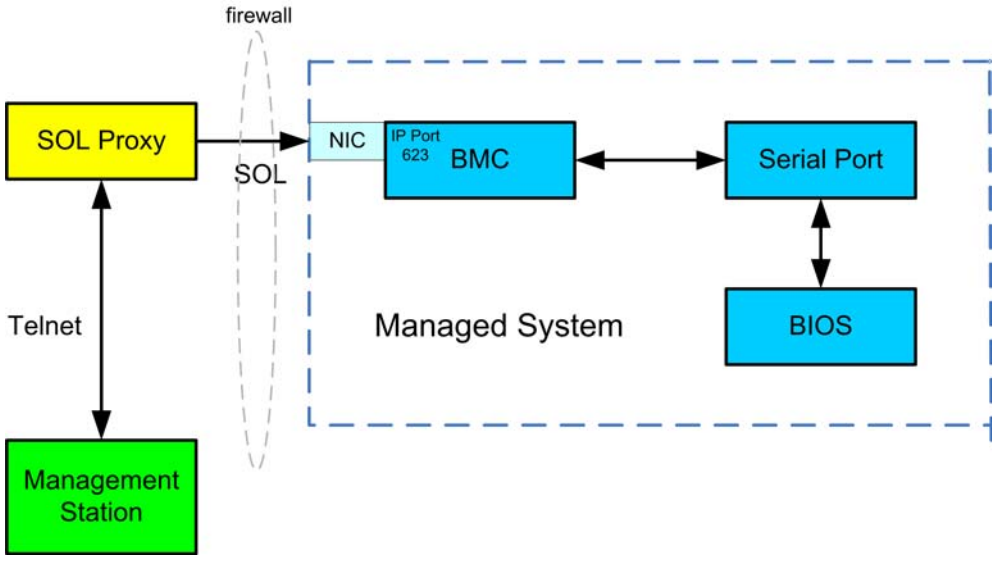
SOL Proxy is a simple telnet server. It allows a telnet client to interact with the hardware-designated serial port of a remote managed system using the LAN communication channel. See Figure 3-9. With SOL Proxy, administrators can view and change the BIOS settings over a shared LAN. In addition, you can also access your managed system's BMC using SOL Proxy using the Red Hat Linux serial console and Microsoft's EMS/SAC interfaces. SOL Proxy does not support in-band or serial connection to the managed system's BMC.

When BIOS console redirection to serial port is enabled on the remote managed system, any application that uses the BIOS to read from or write to the system console will have its I/O redirected to the designated serial I/O port. When SOL is activated, the BMC firmware reads any data written to the serial port and transmits it to the SOL Proxy as LAN packets. SOL Proxy then forwards the data to the telnet client as TCP/IP packets.

Conversely, any keyboard activity at the telnet client is sent to the BMC by SOL Proxy. BMC then writes the packets to the system serial I/O port.

NOTE: See "Using Console Redirection" for more information about console redirection, including hardware and software requirements and instructions for configuring host and client systems to use console redirection.

Figure 3-9. SOL Proxy Diagram



The SOL Proxy communication scheme enables the viewing and configuration of the BIOS settings of a managed system, as well as resetting the managed system remotely using a telnet client. SOL Proxy is installed as a daemon service and automatically starts each time the system boots. SOL Proxy can accommodate only one telnet session at a time.

A variety of telnet clients can be used to access SOL Proxy features. For example:

- In a Windows environment, you can use a Command Prompt window as your console. However, function keys such as <F1> and <F2> will not operate correctly with this client except on systems running Windows Server 2003.
- In a Windows environment, you can also use any telnet application that supports VT100 or ANSI emulation mode (such as HyperTerminal) as your console. HyperTerminal key mappings are based on the supported terminal emulation modes and do not support some useful terminal types. For example, HyperTerminal does not support the "Linux" terminal mode (a modified VT100 terminal). If you use HyperTerminal to connect to a Red Hat Linux console (redirected by SOL) the function and arrow keys may not work, based on the "tty" settings of the remote application.

NOTICE: All versions of the Microsoft Windows operating system include Hilgraeve's HyperTerminal terminal emulation software. However, the included version does not provide many functions required during console redirection. Instead, you can use any terminal emulation software that supports VT100 or ANSI emulation mode. One example of a full VT100 or ANSI terminal emulator that supports console redirection on your system is Hilgraeve's HyperTerminal Private Edition 6.1 or later.

NOTE: When using HyperTerminal, uncheck the **Wrap lines that exceed terminal width** check box to avoid console redirected data that may appear to be corrupted or garbled. To uncheck this feature, click **File→ Properties→ Settings→ ASCII Setup…→ Wrap lines that exceed terminal width**.

NOTE: See "Using Console Redirection" for more information about console redirection, including hardware and software requirements and instructions for configuring host and client systems to use console redirection.

- In a Red Hat Linux environment, you can use a shell such as **csh** or **ksh** as your console, or you can use any telnet application supporting VT100 or ANSI emulation mode.

NOTE: HyperTerminal and telnet settings must be consistent with the settings on the managed system. For example, the baud rates and terminal modes should match.

Using SOL Proxy

Depending on the console you use, there are different steps for accessing SOL Proxy. Throughout this section, the managed system that SOL Proxy is accessing is referred to as the SOL Proxy Server.

Using the Windows Command Prompt

To connect and use SOL Proxy:

1. Open a Command Prompt window on your management station.
2. Enter the **telnet** command in the command-line and provide the IP address of the SOL Proxy Server and the port number you have specified in the SOL Proxy installation (the default value is 623). Such as:

   ```
   telnet 192.168.1.24 623
   ```

   NOTE: The IP address and port number you provide should conform to the ones defined in the SOL Proxy configuration file. For more details, see "Configuring SOL Proxy with the SOL Proxy Configuration File."
3. If prompted for a username, provide the operating system login credentials of SOL Proxy Server.
4. Provide a password when prompted. SOL Proxy will use this combination of operating system username and password to authenticate you on SOL Proxy Server. The specific authentication scheme will depend on the operating system configuration for the SOL Proxy Server. However, if **localhost** or an IP address of 127.0.0.1 is used, it is assumed that the user has login privileges to the current host, and is not prompted for a username and password.
5. After authentication is performed, you will see a login successful message and the SOL Proxy main menu prompt. You are ready to use SOL Proxy. See "SOL Proxy Main Menu" for further instructions.

Using Windows HyperTerminal Console

To connect and use SOL Proxy:

1. Open a HyperTerminal session on your management station.
2. Create a new TCP/IP connection, providing the IP address of SOL Proxy Server and the port number you have specified in SOL Proxy installation (the default value is 623). The Emulation mode is VT100 and ANSI.

   NOTE: The IP address and port number you provide should conform to the ones defined in the SOL Proxy configuration file. For more details, see "Configuring SOL Proxy with the SOL Proxy Configuration File."
3. Try the newly defined connection by clicking the **connect** button in the tool bar.
4. If prompted for a username, provide the operating system login credentials of SOL Proxy Server.
5. Provide a password when prompted. SOL Proxy will use this combination of operating system username and password to authenticate you on SOL Proxy Server. The specific authentication scheme will depend on the operating system configuration for the SOL Proxy Server. However, if **localhost** or an IP address of 127.0.0.1 is used, it is assumed that the user has login privileges to the current host, and is not prompted for a username and password.
6. After authentication is performed, you will see a login successful message and the SOL Proxy main menu prompt. You are ready to use SOL Proxy. See "SOL Proxy Main Menu" for further instructions.

Using a Red Hat Linux Shell

To connect and use SOL Proxy:

1. Open a Red Hat Linux shell on your management station.
2. Enter the **telnet** command and provide the IP address of the SOL Proxy Server and the port number you have specified in SOL Proxy installation. Such as:

   ```
   telnet 192.168.1.24 623
   ```

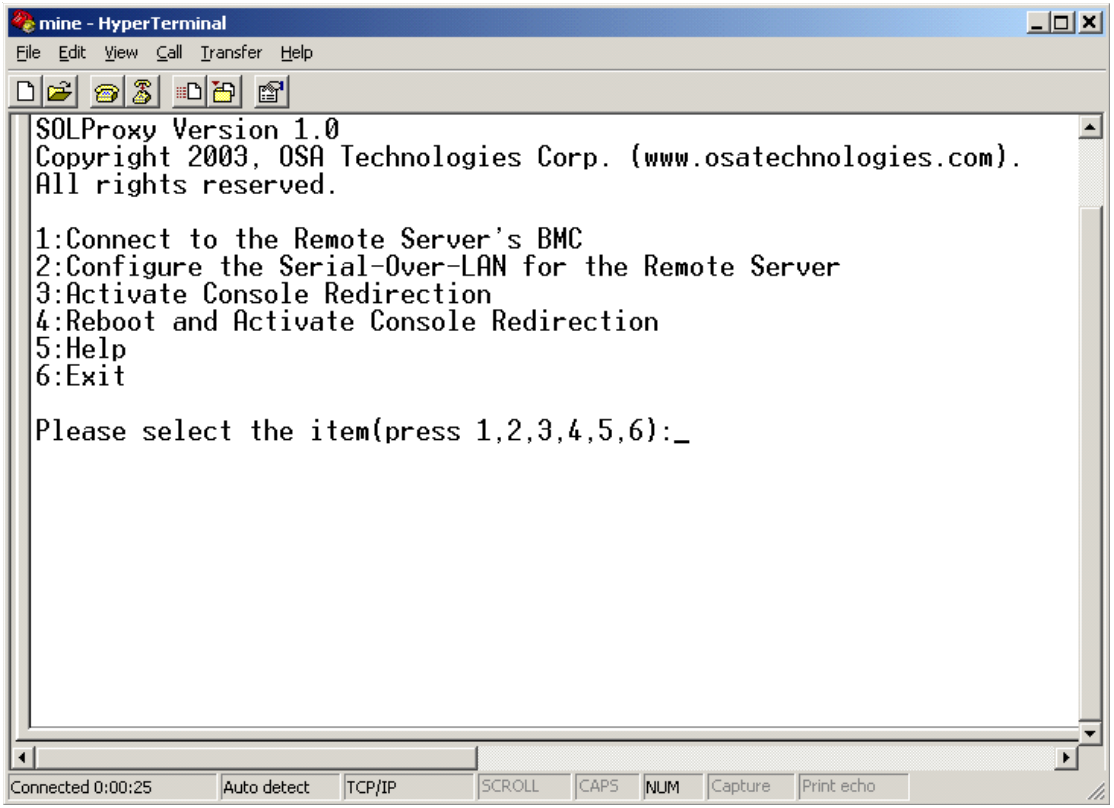
   NOTE: The IP address and port number you provide should conform to the ones defined in the SOL Proxy configuration file. For more details, see "Configuring SOL Proxy with the SOL Proxy Configuration File."
3. If prompted for a username, provide the operating system login credentials of SOL Proxy Server.
4. Provide a password when prompted. SOL Proxy will use this combination of operating system username and password to authenticate you on SOL Proxy Server. The specific authentication scheme will depend on the operating system configuration for the SOL Proxy Server. However, if **localhost** or an IP address of 127.0.0.1 is used, it is assumed that the user has login privileges to the current host, and is not prompted for a username and password.

5 After authentication is performed, you will see a login successful message and the SOL Proxy main menu prompt. You are ready to use SOL Proxy. See "SOL Proxy Main Menu" for further instructions.

SOL Proxy Main Menu

After the telnet connection with SOL Proxy is successfully established, you are presented with the following menu of choices. See Figure 3-10.

Figure 3-10. SOL Proxy Main Menu Example



The SOL Proxy main menu allows you to change the SOL settings of a remote managed system's BMC, reboot the remote BMC, or activate console redirection.

Selecting menu option 1, **Connect to the Remote Server's BMC**, prompts you for the BMC IP address and BMC login. After entering the required information and making a successful connection, the internal state SLP is changed to "connected." If you select menu options 2, 3, or 4, and the application state is not "connected," the you are prompted to connect to a BMC.

Menu option 2 allows you to enable, disable, and configure the SOL defaults, including the minimum user privilege level required for activating SOL and the communication baud-rate.

Menu options 3 and 4 allow you to establish a SOL remote console session through the SOL Proxy main menu. Menu option 3 establishes a SOL session without changing the remote system's state. This option is ideal for connecting to the Microsoft SAC/EMS or the Red Hat Linux console. Menu option 4 reboots the remote managed system and establishes a SOL session. This option best suited for performing BIOS setup and system configuration tasks.

To exit an active SOL session, use the <~><.> character sequence. The sequence is used to terminate SOL and return you back to the top-level menu.

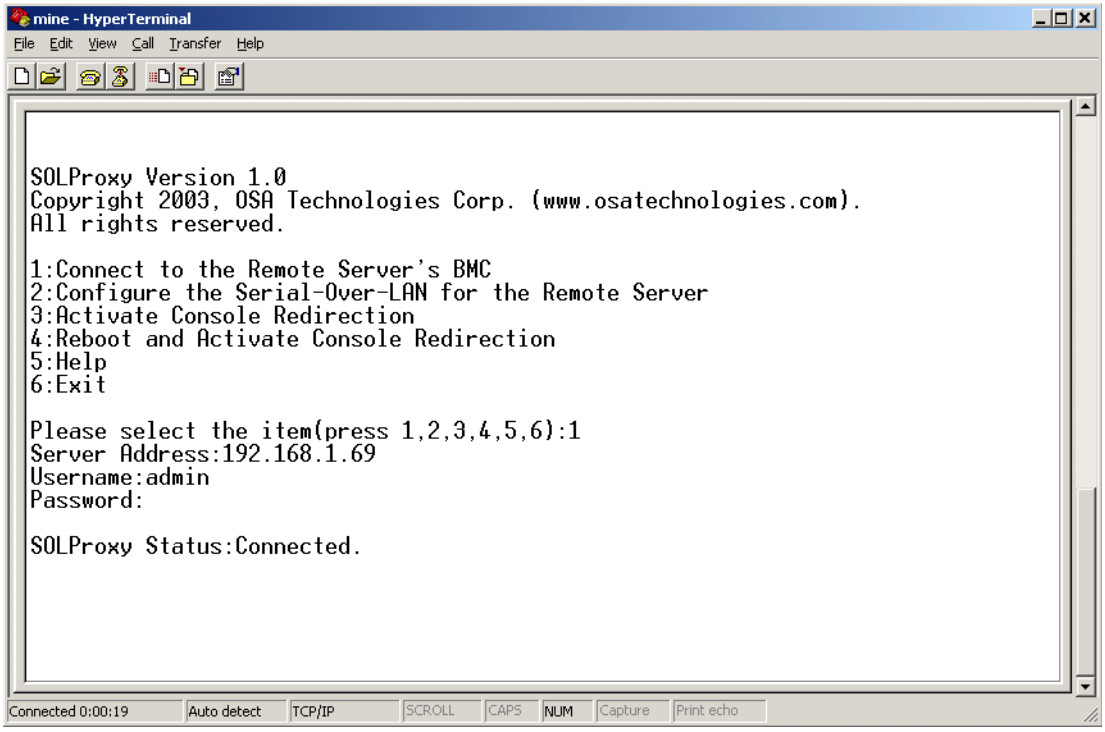
Connecting to the Remote Managed System's BMC

NOTE: While multiple SOL sessions can be active at the same time, only one console redirection session can be active at any given time for a managed system.

1. Select option 1 in the main menu.
2. Enter the IP address of the remote managed system.
3. Provide the BMC username and password for the BMC on the managed system. The BMC username and password must be assigned and stored in the BMC non-volatile storage. See "Configuring Your Managed System" for more information about configuring BMC users. Only one SOL session with one BMC is permitted at one time.

   The connection status displays on the main menu. See Figure 3-11.

Figure 3-11. Connecting to the Remote System's BMC



Configuring the SOL for the Remote Managed System

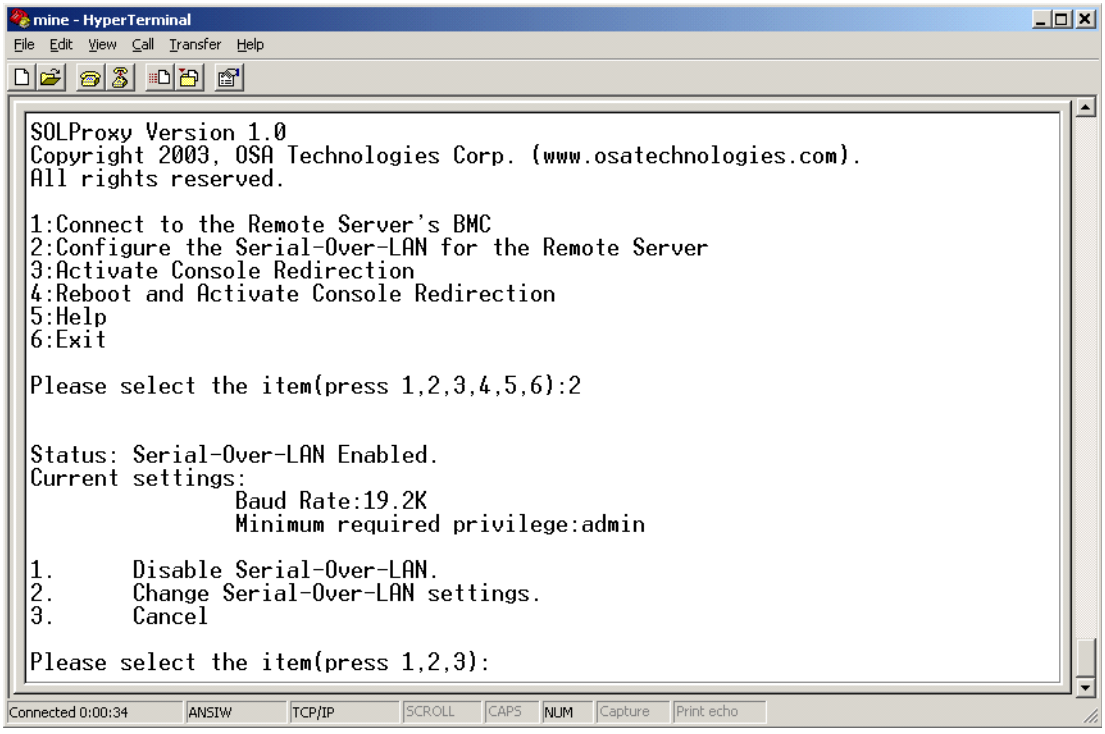
Select option 2 in the main menu.

NOTE: You must be connected to the managed system's BMC before you can configure the SOL features. If SOL Proxy is not yet connected to the managed system's BMC, you are prompted for an IP address and a username/password combination. See "Connecting to the Remote Managed System's BMC" for more information.

The SOL configuration menu appears. According to the current SOL status, the content of the SOL configuration menu varies:

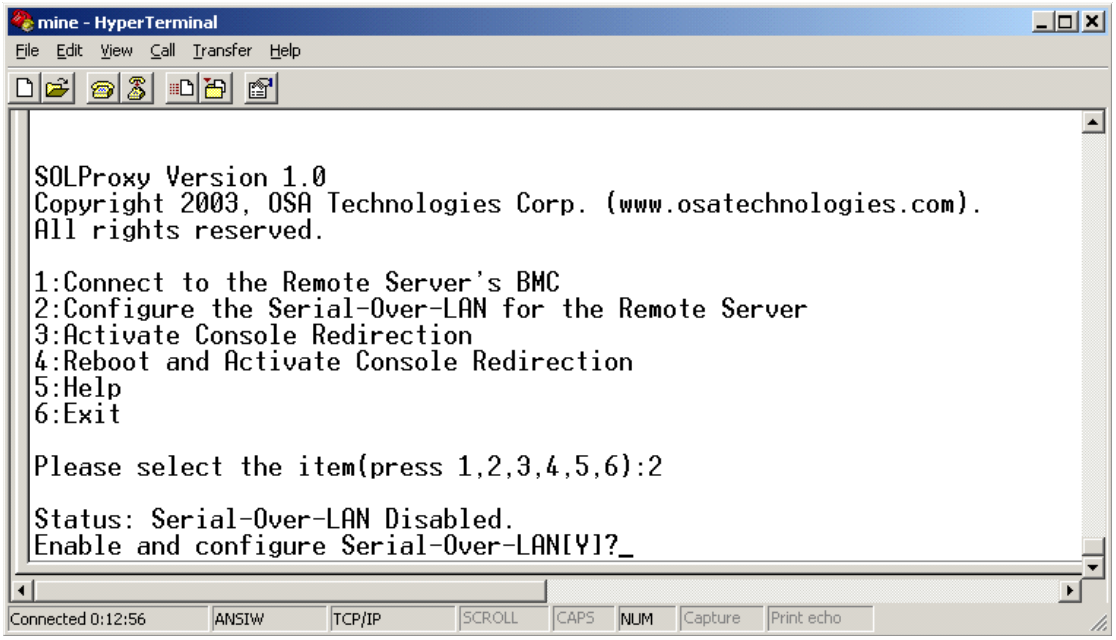
- If SOL is already enabled, the current settings are displayed and the user will be presented with three choices. See Figure 3-12.

Figure 3-12. Configuring the Serial-Over-LAN for the Remote System, Example 1



- If SOL is currently disabled, the options shown in Figure 3-13 are displayed. Type `Y` to enable SOL or `N` to keep SOL disabled. See Figure 3-13.

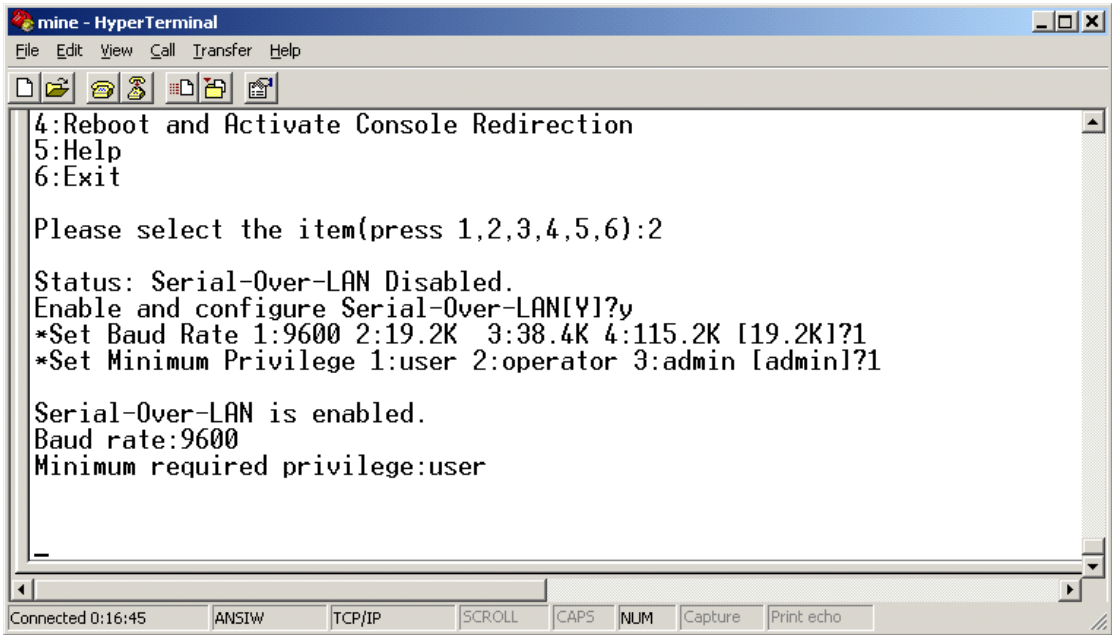
Figure 3-13. Configuring the Serial-Over-LAN for the Remote System, Example 2



- If SOL is enabled, two BMC settings are displayed:
  - The communication baud-rate between the system serial port and the BMC.
  - The minimum BMC user privilege level required for activating console redirection.

  SOL Proxy displays a list of valid values for each feature, as well as the current value of the feature enclosed in a pair of brackets. You can select the number before a value to set it as the new setting, or press <Enter> to leave the BMC settings unchanged. If changes are made to the BMC settings, you are asked to confirm your changes. The new BMC settings are then displayed. See Figure 3-14.

Figure 3-14. Configuring the Serial-Over-LAN for the Remote System, Example 3



Activating Console Redirection

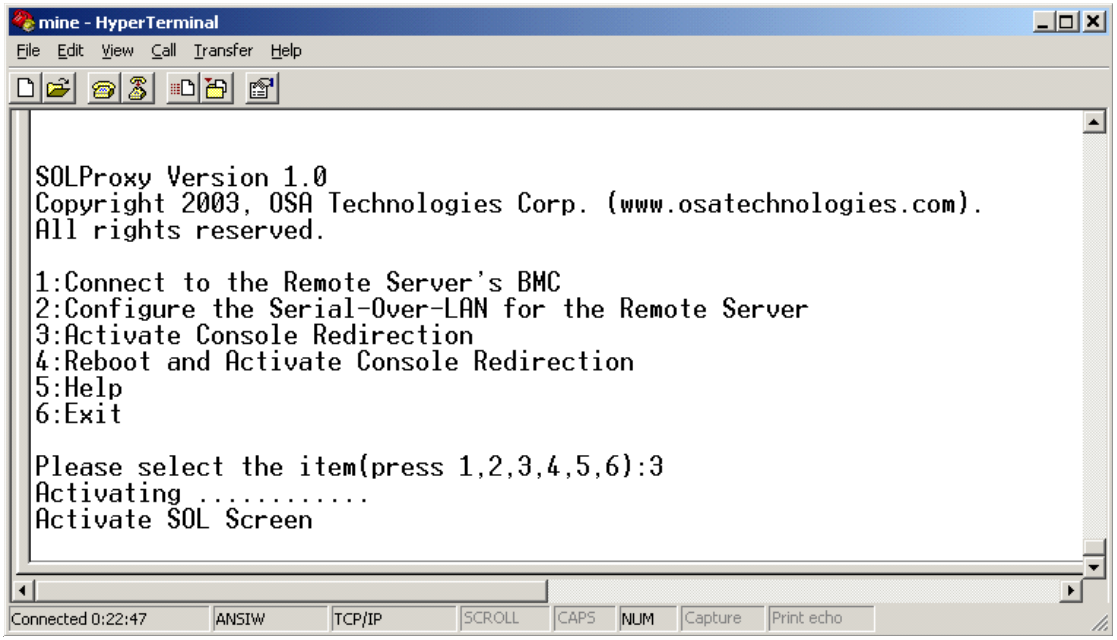
Select option 3 in the main menu.

NOTE: You must be connected to the managed system's BMC before you can configure the SOL features. If SOL Proxy is not yet connected to the managed system's BMC, you are prompted for an IP address and a username/password combination. See "Connecting to the Remote Managed System's BMC" for more information.

The remote manages system's text console is redirected to your management station. See Figure 3-15.

NOTE: BIOS Console Redirection must be enabled on the managed system and correctly configured before SOL can be successfully activated. See "Configuring Your Managed System" for more information.

Figure 3-15. Console Redirection Example



Rebooting the Managed System and Activating Console Redirection

Select option 4 in the main menu.

NOTE: You must be connected to the managed system's BMC before you can configure the SOL features. If SOL Proxy is not yet connected to the managed system's BMC, you are prompted for an IP address and a username/password combination. See "Connecting to the Remote Managed System's BMC" for more information.

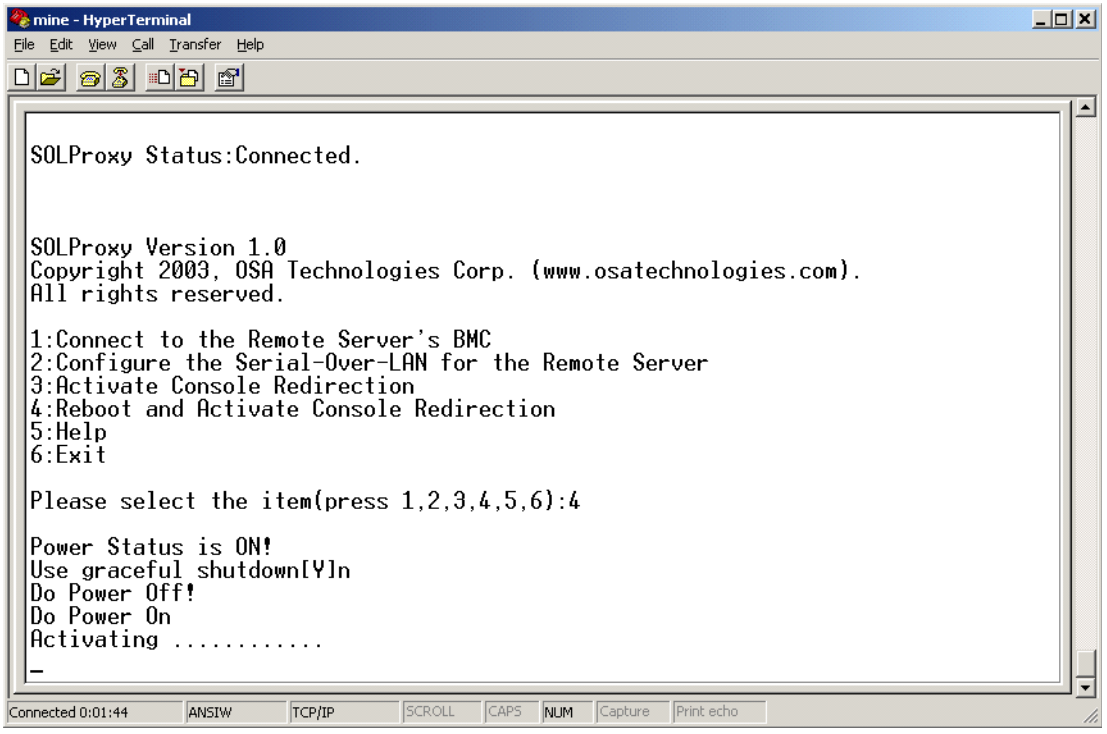
The power state of the remote managed system is checked. If power is on, you are asked to decide between a graceful or forceful shutdown.

Next, the power state is monitored until the status changes to off. Console redirection begins, and the remote managed system text console is redirected to your management station. Use the escape character sequence <~><.> to terminate it and return to the top-level menu.

While the manages system reboots, you can enter the BIOS system setup program to view or configure BIOS settings. See Figure 3-16.

NOTE: Before activating the console redirection, you must first enable the console redirection features. See "Configuring Your Managed System" for more information.

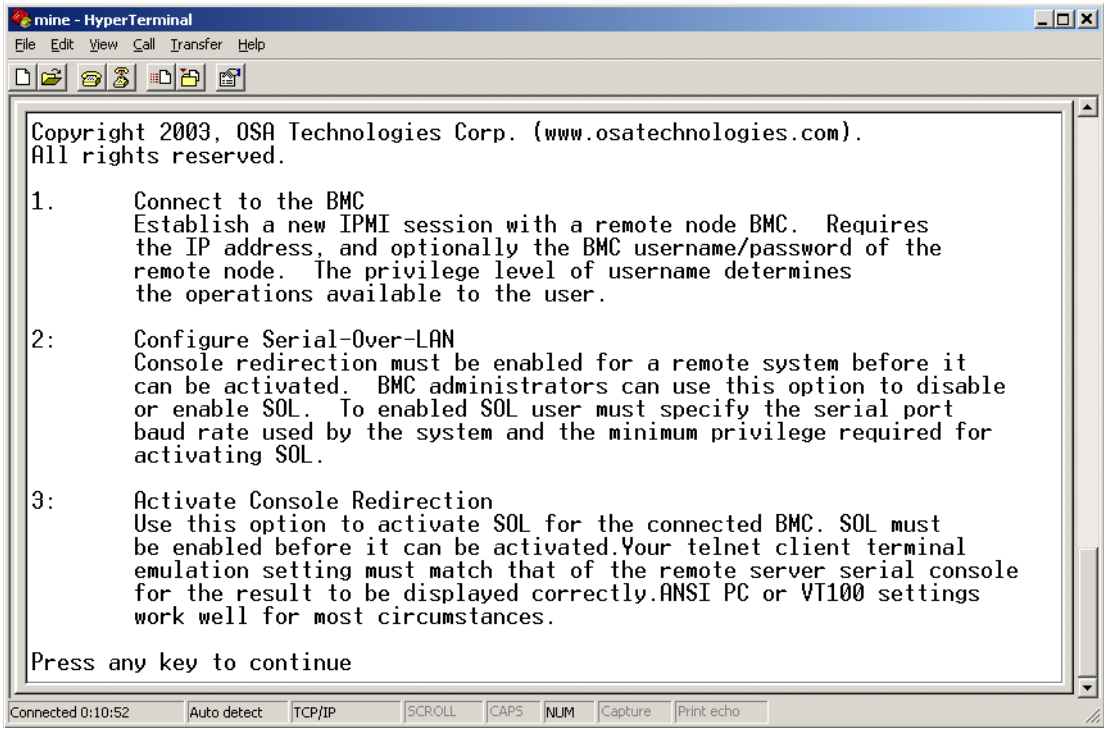
Figure 3-16. Reboot Example



Getting Help

Select option 5 in the main menu to display detailed descriptions for each option. See Figure 3-17.

Figure 3-17. Sample Help Screen



Exit

Select option 6 to end your telnet session and disconnect from SOL Proxy.

Configuring SOL Proxy with the SOL Proxy Configuration File

SOL Proxy must be correctly configured and running before establishing telnet connection.

There are certain SOL parameters that the user can set by modifying the **solproxy.cfg** file. The parameters and their descriptions are as follow:

Comments

Any line starting with a "#" is treated as a comment. For example:

```
#The file is an example.
```

IP address

ip — specifies the specific IP address used to connect to the SOL Proxy. This item defines what kind of connection can be accepted to establish a SOL Proxy telnet session. There are three possible values:

- **INADDR_ANY** — SOL Proxy accepts the telnet request to any system.
- **127.0.0.1** — SOL Proxy accepts the telnet request to the localhost.
- ***IP address*** — SOL Proxy accepts the telnet request to the specified IP address.

For example:

```
ip=INADDR_ANY
```

Port binding

port — specifies the port at which the SOL Proxy listens for incoming connections. By default, the port is set to 623 and can be modified by the user.

This item defines the port when you telnet SOL Proxy. If this item is absent, 623 is set as the default port. For example:

```
port=623
```

Session Timeout

session_timeout — specifies the time in minutes before the SOL Proxy session times out.

If there is no keyboard activity for the specified timeout period, the telnet session and the SOL session will be closed. The timeout value is specified in minutes and can be changed during SOL Proxy installation. For example:

```
session_timeout=30
```

Power-off Timeout

power_off_timeout — specifies the time in seconds before the SOL Proxy gives up polling for the managed system's power status. If the SOL Proxy issues the power off command and the system does not power off within the specified interval, the SOL Proxy returns with a message, indicating that the SOL Proxy was unable to power off the system due to the timeout interval.

NOTE: When **Reboot and Activate Console Redirection** is selected and power for the remote managed system is on, a **power off** IPMI command is issued. The power status is then continually monitored until the power status reports "off." If power status remains "on" longer than this timeout period, **Reboot and Activate Console Redirection** reports an error and returns to the top-level menu. This timeout value is specified in seconds and can be changed during SOL Proxy installation.

For example:

```
power_off_timeout=60
```

Retry Interval

retry_interval — specifies the period of time in seconds that the BMC waits before it retries sending a packet. The **retry_interval** unit is half a second. Therefore, a value of 2 means that the software waits one second for the BMC to respond before it tries to resend the packet, a value of 4 means that it waits two seconds, and so on. For example:

```
retry_interval=2
```

Retry Count

retry_count — specifies the maximum number of times that the software retries sending a packet if it does not receive a response from the BMC. Before each retry, the software waits for the interval specified by the **retry_interval** parameter. For example:

```
retry_count=10
```

4

Known Issues and Frequently Asked Questions

Q: Do IPMI Shell commands correspond one-to-one to IPMI commands?

A: IPMI Shell provides only the most useful IPMI commands. It includes a definitive set of commands that can be used to accomplish the most common management tasks. Therefore, IPMI Shell commands may not correspond one-to-one to IPMI commands.

Q: Can I manage a system by accessing multiple IPMI instances simultaneously?

A: Yes, you can manage a system by accessing multiple IPMI instances at the same time as long as your system's BMC supports more than one concurrent connection.

Q: Can I manage a system by accessing multiple SOL Proxy connections simultaneously?

A: No, a system can have only one SOL Proxy connection at any time. This connection is established when you choose either option **3** or **4** in the main menu. However, if you select option **1** to connect to the remote system, only an IPMI connection is established. In this case, multiple clients can simultaneously use option **1** in the SOL proxy main menu to connect to the same system (See the previous question).

Q: How do I unlock an SOL session occupied by another user?

A: Your system's BMC only supports one SOL session at a time. To unlock a SOL session, you must reboot the system to terminate the other user's session. Only BMC users with operator or Administrator IPMI privileges can reboot the system.

Q: Why can't I enter the BIOS setup interface during the process of remote system rebooting?

A: When you select item **2**, **Reboot and activate console redirection**, in the **SOL Proxy** main menu, the managed system is rebooted first. Press <F2> to enter the BIOS setup interface, if the telnet client you are using supports VT100 or ANSI.

Q: Why can't I connect to a console using the terminal emulation software included with my Microsoft Windows operating system?

A: The version of HyperTerminal included with Windows does not provide many functions required during console redirection. Either upgrade to HyperTerminal Private Edition 6.1 or later, or select any other terminal emulation software that supports VT100 or ANSI emulation mode.

Q: I performed a **Reboot and Activate Console Redirection** command using SOL Proxy, but the option to press <F2> to enter the BIOS setup never appeared.

A: When the network switch has spanning-tree enabled, it takes about 30-40 seconds for the spanning-tree check to make sure there are no loops in the network. During this time, packet forwarding by the switch is blocked. Therefore, the software cannot communicate with the BMC until the spanning tree check is complete.

Disable spanning-tree on the network switch and try performing a **Reboot and Activate Console Redirection** command using SOL Proxy again. You should now be able to enter BIOS setup by pressing <F2>.

A

BMC Management Utility Error Codes

In case of a functional failure, an error message will be printed to **stderr**. The text of the error message is listed in the **Message** column in Table A-1. Errors will always be printed in a parsable format. For example:

`Error (<hex-code>):<message>!`

Example: `Error(0xC1):Invalid Command!`

Table A-1. BMC Management Utility Error Codes

Code	Classification	Message	Description	IPMI Error
A1h	Connection errors.	Connection timeout.	BMC not responding.	
		Invalid authentication type.	Authentication Type Error.	
A2h	Communication errors.	Communication Error.	Network stack or serial communication error.	
		Data Error.	Data packet format error.	0xC6, 0xC7, 0xC8, 0xCA
		Not connected.	Not connected to a remote server yet.	
A3h	Authorization errors.	Insufficient privilege for command.	Insufficient privilege level to execute command.	0xD4
		Login not authorized.	Invalid BMC username/password.	0x86
A5h BDh	Initialization errors.	Authentication failure.	Request for a session from the local or remote proxy was rejected.	
		Access denied.	Trying to access the proxy from a forbidden IP address.	
		Unknown language.	Unknown Language code.	

Table A-1. BMC Management Utility Error Codes *(continued)*

Code	Classification	Message	Description	IPMI Error
		Invalid IP address.	IP resolving error.	
		Session buffer limit exceeded.	Length exceeds the limit of telnet input.	
A6h A8h	Syntax errors.	Command syntax error.	Unable to parse command.	
		Unrecognized command.	Unrecognized Command.	
		Time format is incorrect.	The time is not correct.	
		Conflicting option.	Conflicting option (**-last** and **-max**).	
		Invalid parameter.	Invalid Parameter.	
A7h	Parameter value errors.	Parameter out of range.	Parameter out of range.	0xC9
		Parameter out of range (1-255)	The value is out of range (1-255).	
		Parameter out of range(1-65535).	The value is out of range (1-65535).	
		Invalid data field.	Invalid data field.	0xCC
		Invalid index value.	Index cannot be zero or a negative number.	
		First index larger than the last.	The first index is larger than the last.	
		First index larger than total SEL records.	The first index is larger than the total SEL records.	
A8h	H/W or F/W errors.	Unsupported command.	Unsupported Operation.	0xC1
		Sensor not present.	Request sensor, data, or record not present.	0xCB
		Sensor command error.	Command illegal for specified sensor or record type.	0xCD
		Firmware error.	Command response could not be provided.	0xCE

Table A-1. BMC Management Utility Error Codes *(continued)*

Code	Classification	Message	Description	IPMI Error
		Destination error.	Cannot deliver request to destination.	0xD3
		Device error.	Device specific (OEM) errors.	0x01–0x7E
A9h	Processing errors (transient errors that may disappear upon retry of command).	BMC busy.	BMC out of processing resources.	0xC0
		Destination timeout Error.	BMC timeout while processing command	0xC3
		BMC out of storage space.	BMC out of storage space required to process command.	0xC4
		Invalid reservation ID.	Invalid reservation ID.	0xC5
		Duplicate command.	Cannot execute duplicated request.	0xCF
		SDR busy.	Sensor Data Record Repository in update mode.	0xD0
		Device busy.	Device in firmware update mode.	0xD1
		BMC unavailable.	BMC initialization in progress.	0xD2
		Bad BMC state.	Request not supported in present BMC state.	0xD5
		BMC out of sessions.	No session slots are available for connection request.	0x81, 0x82, 0x83
AEh	Unexpected IPMI errors.	Invalid LUN.	Invalid Logical Unit Number (LUN) in request.	0xC2
		Unspecified error.	Unspecified error.	0xFF
AFh	Unknown error	Unknown error.	Unknown error.	

B

Using Console Redirection

Console redirection allows you to manage a host (local) system from a client (remote) system by redirecting keyboard input and text output through a serial port. You cannot redirect graphic output. You can use console redirection for tasks such as configuring BIOS settings.

You can also connect the client system to a port concentrator that can access numerous host systems using a shared modem. After logging into the port concentrator, you can select a host system to manage using console redirection.

This section describes the most basic connection possible: connecting systems using a null-modem serial cable, which directly connects the serial ports on two systems.

Hardware Requirements

- An available serial (COM) port on the host system
- An available serial (COM) port on a client system

  This port must not conflict with any other ports on the client system.
- A null-modem serial cable to connect the host system to the client system

Software Requirements

- VT 100/220 or ANSI terminal emulation with a window size of 80 x 25 characters
- 9600, 19.2 K, 57.6 K, or 115.2 K bps using serial (COM) ports
- Ability to create keyboard command macros (recommended)

All versions of the Microsoft® Windows® operating system include Hilgraeve's HyperTerminal terminal emulation software. However, the included version does not provide many functions required during console redirection. Either upgrade to HyperTerminal Private Edition 6.1 or later, or select any terminal emulation software that supports VT100 or ANSI emulation mode.

Configuring the Host System

Configure console redirection on the host (local) system through the System Setup utility (see "BIOS Configuration"). The **Console Redirection** screen allows you to enable or disable the console redirection feature, select the remote terminal type, and enable or disable console redirection after booting.

Configuring the Client System

After configuring the host system, configure the ports and terminal settings for the client (remote) system.

NOTE: The examples in this section assume that you have upgraded to Hilgraeve's HyperTerminal Private Edition 6.1 or later. If you are using other terminal emulation software, see the documentation for that software.

Configuring the Serial Port

1. Click the **Start** button, point to **Programs**→ **Accessories**→ **Communications**, and then click **HyperTerminal**.
2. Enter a name for the new connection, select an icon, and then click **OK**.
3. From the **Connect to** dropdown menu, select an available COM port, and then click **OK**.

   After you select an available COM port, the COM port properties window appears.
4. Configure the port with the following settings:
   - Set **Bits per second**.

     Console redirection supports only 9600, 19.2 K, 57.6 K, or 115.2 K bps.
   - Set **Data bits** to 8.
   - Set **Parity** to **None**.
   - Set **Stop bits** to 1.
   - Set **Flow control** to **Hardware**.
5. Click **OK**.

Configuring the Terminal Settings

1. In HyperTerminal, click **File**, click **Properties**, and then click the **Settings** tab.
2. Ensure that the **Function, arrow, and Ctrl keys act as** field is set to **Terminal Keys**.
3. Ensure that the **Backspace key sends** field is set to **Ctrl+H**.
4. Change the **Emulation** setting from **Auto detect** to **ANSI** or **VT 100/220**.

   Ensure that this setting is the same as the setting you selected for the **Console Redirection** option on the host system.
5. Click **Terminal Setup**.

   A setting for the number of rows and columns appears.
6. Change the number of rows from **24** to **25** and leave the number of columns at **80**.

   If you do not have these settings, you must upgrade your terminal emulation software.
7. Click **OK** twice.

Managing the Host System Remotely

After you configure the host and client systems (see "Configuring the Host System" and "Configuring the Client System"), you can use console redirection to restart a host system or to change a host system's configuration settings.

1. Reboot the host system using the client system.

   See "Configuring Special Key Functions" for instructions.

2. When the host system begins to boot, use console redirection to:
   - Enter the System Setup utility
   - Enter the SCSI setup menus
   - Update firmware and BIOS (flash the system)
   - Run utilities on the utility partition

Configuring Special Key Functions

Console redirection uses ANSI or VT 100/220 terminal emulation, which is limited to basic ASCII characters. Function keys, arrow keys, and control keys are not available in the ASCII character set, and most utilities require function keys and control keys for ordinary operations. However, you can emulate a function key or control key using a special key sequence, called an escape sequence.

An escape sequence starts with an escape character. You can enter this character in different ways, depending on the requirements of your terminal emulation software. For example, `0x1b` and <Esc> each represent the escape character. In HyperTerminal, you can create macros by selecting **Key Macros** from the **View** menu. You can assign a macro to almost any key for almost any key combination. Create a macro to represent each function key.

Table B-1 lists the escape sequences that represent a special key or function.

NOTE: When creating macros in HyperTerminal, press <Insert> before <Esc> to signify that you are sending an escape sequence rather than escaping out of the dialog box. If you do not have this function, you must upgrade HyperTerminal.

NOTE: Escape-sequence key combinations listed in Table B-1 are case-sensitive. For example, to generate the character <A> you must press <Shift><a>.

Table B-1. Supported Escape Sequences

Key(s)	Supported Sequence	Terminal Emulation
<Up arrow>	<Esc><[><A>	VT 100/220, ANSI
<Down arrow>	<Esc><[><B>	VT 100/220, ANSI
<Right arrow>	<Esc><[><C>	VT 100/220, ANSI
<Left arrow>	<Esc><[><D>	VT 100/220, ANSI

Table B-1. Supported Escape Sequences *(continued)*

Key(s)	Supported Sequence	Terminal Emulation
<F1>	<Esc><O><P>	VT 100/220, ANSI
<F2>	<Esc><O><Q>	VT 100/220, ANSI
<F3>	<Esc><O><R>	VT 100/220, ANSI
<F4>	<Esc><O><S>	VT 100/220, ANSI
<F5>	<Esc><O><T>	VT 100, ANSI
<F6>	<Esc><O><U>	VT 100, ANSI
	<Esc><[><1><7><~>	VT 100/220
<F7>	<Esc><O><V>	VT 100, ANSI
	<Esc><[><1><8><~>	VT 100/220
<F8>	<Esc><O><W>	VT 100, ANSI
	<Esc><[><1><9><~>	VT 100/220
<F9>	<Esc><O><X>	VT 100, ANSI
	<Esc><[><2><0><~>	VT 100/220
<F10>	<Esc><O><Y>	VT 100, ANSI
	<Esc><[><2><1><~>	VT 100/220
<F11>	<Esc><O><Z>	VT 100, ANSI
	<Esc><[><2><3><~>	VT 100/220
<F12>	<Esc><O><A>	VT 100, ANSI
	<Esc><[><2><4><~>	VT 100/220
<Home>	<Esc><[><1><~> <Esc><h>	VT 220 ANSI
<End>	<Esc><[><4><~>	VT 220
	<Esc><k>	ANSI
<Delete>	<Esc><[><3><~>	VT 220
	<Esc><–>	ANSI
<Delete>	<Esc><[><3><~>	VT 220
	<Esc><–>	ANSI
<Page Up>	<Esc><[><5><~>	VT 220
	<Esc><Shift><?>	ANSI
<Page Down>	<Esc><[><6><~>	VT 220
	<Esc></>	ANSI

Table B-1. Supported Escape Sequences *(continued)*

Key(s)	Supported Sequence	Terminal Emulation
<Shift><Tab>	<Esc><[><Z>	VT 100
	<Esc><[><0><Z>	VT 220
	<Esc><[><Shift><z>	ANSI

After creating macros for the keys listed in Table B-1, press <F1> on the client system's keyboard during terminal emulation to send the escape sequence <Esc><O><P> to the host system. The host system then interprets the sequence as <F1>.

Additional escape sequences may be required by certain utilities or functions on the host system. Create macros for the additional sequences listed in Table B-2.

NOTE: Escape-sequence key combinations listed in Table B-2 are case-sensitive. For example, to generate the character <A> you must press <Shift><a>.

Table B-2. Additional Escape Sequences

Key(s)	Supported Sequence
<Ctrl><Alt><Del> (Reboot host system)	<Esc><R><Esc><r><Esc><R>
<Alt><*x*>	<Esc><*X*><*X*>
<Ctrl><H>	<Esc><Ctrl><H>
<Ctrl><I>	<Esc><Ctrl><I>
<Ctrl><J>	<Esc><Ctrl><J>
<Ctrl><M>	<Esc><Ctrl><M>
<Ctrl><2>	<Esc><Ctrl><2>

C

Terminal Mode Commands

Terminal mode allows you to directly interface to the server's Baseboard Management Controller (BMC) using a serial port connection and execute text-based commands. Two types of text commands are supported:

- A limited selection of text commands
- Standard binary IPMI 1.5 hex-ASCII commands

Using the terminal mode feature you can do the following:

- Power the server on or off
- Reset the server
- Retrieve the server's health status
- Configure and retrieve the server management subsystems boot options
- Configure and retrieve the BMC's terminal mode configuration
- Execute any platform supported binary command specified in the Intelligent Platform Management Interface (IPMI) version 1.5 specification using the hex-ASCII format

NOTE: Many of the Terminal Mode features described in this section require an extensive knowledge of IPMI to use. It is strongly recommended that Terminal Mode users have an advanced understanding of IPMI before using the commands documented in this section.

Security Information

Access to the BMC using terminal mode is governed by the proper setup of user names and password in the SMU. A session must be established with the BMC prior to accepting any terminal mode commands. A limited selection of text commands and binary hex-ASCII commands that are assigned the lowest IPMI privilege level are available prior to session establishment with the BMC. See "Configuring Your Managed System with the System Maintenance Utility (SMU)" for more information.

Since the terminal mode password is sent using clear text, it is highly desirable that the terminal mode session takes place in a secure location over a secure link, preferably via a direct connection. Connection via a modem is supported but not recommended.

Syntax

Terminal mode messages follow the general syntax below:

```
[<message data>]<newline sequence>
```

Each terminal mode message must be preceded with the left bracket "start" character and must be ended with a right bracket “stop” character and the appropriate input new-line sequence.

No input characters are accepted until the start character has been received.

Terminal mode text commands are case sensitive, but hex-ASCII commands can either use upper or lower case letters for ASCII representations of hex digits.

Command Length

Terminal mode messages are limited to a maximum length of a 122 characters. This includes the left and right brackets, but not control characters.

Character Support

Terminal mode messages are allowed to be composed of standard printable ASCII characters. All other characters are treated as illegal characters.

Special Character Handling — <ESC> character

The <ESC> character can be used to delete an entire message prior to submission to the BMC for processing. If line editing is enabled, and the <ESC> key is followed by an input newline sequence, the BMC responds by outputting an output newline sequence. Otherwise, the BMC goes back to looking for the start character.

Special Character Handling — <DEL> or <BKSP> character

The <BKSP> or <DEL> key can be used to delete the last character entered if the message has not been submitted to the BMC yet.

Special Character Handling — Line Continuation character

Long IPMI messages can be split across multiple lines by using the line continuation <BACKSLASH> character followed immediately by an input newline sequence. Line continuation character usage is supported for both text and hex-ASCII commands.

Special Character Handling — Illegal characters

Any illegal characters received by the BMC clears the message in progress and forces the BMC back to looking for the start character.

Hex-ASCII Command Format

Binary IPMI commands are sent and received as a series of case insensitive hex-ASCII pairs, where each is optionally separated from the preceding pair by a single <space> character. The following is an example of a binary IPMI request message:

```
[18 00 22]<newline sequence>
```

The software ID and LUN for the remote console are fixed and implied by the command. The SWID for messages to the remote console is always 47h, and the Logical Unit Number (LUN) is 00b.

Instead, there is a "bridge" field that is used to identify whether the message should be routed to the BMC's bridged message tracking or not. See "Terminal Mode IPMI Message Bridging" for more information.

Table C-1. Terminal Mode Request to BMC

Byte	Explanation
1	[7:2] – Net Function (even) [1:0] – Responder's LUN
2	[7:2] – Requester's Sequence Number [1:0] – Bridge field
3	Command Number
4:N	Data

Table C-2. Terminal Mode Response from BMC

Byte	Explanation
1	[7:2] – Net Function (odd) [1:0] – Responder's LUN
2	[7:2] – Requester's Sequence Number [1:0] – Bridge field
3	Command Number
4	Completion Code
5:N	Data

Text Command Format

Text commands do not support the bridging and sequence number fields present in the hex-ASCII commands, are case sensitive, and are preceded by a prefix consisting of the string `SYS`.

Examples

Hex-ASCII command example (IPMI Reset Watchdog Cmd):

[18 00 22]<CR>

[1C 00 22 00]<CR-LF>

Text command example:

[SYS TMODE]<CR>

[OK TMODE]<CR-LF>

Terminal Mode IPMI Message Bridging

Terminal mode supports the ability to bridge IPMI messages to another interface when binary hex-ASCII IPMI commands are used. The message bridge is determined by the following: the bridge field, whether the message is a request or a response, the message direction with respect to the BMC and the LUN. Table C-3 lists the supported BMC combinations for IPMI message bridging. Any other combinations are unsupported.

Note that IPMI messages to and from the system interface are transferred using the BMC SMS (System Management Software) LUN, 10b, and with the bridge field set to 00b.

Table C-3. Supported BMC Combinations for IPMI Message Bridging

Bridge Field	Request/ Response	Message Direction (to BMC)	LUN	Message Interpretation
00b	Request	In	00b, 01b, 11b	Remote Console request to BMC functionality Message is a request from the remote console to the BMC.
00b	Response	Out	00b, 01b, 11b	Response to Remote Console from BMC functionality Message is a response to an earlier request from the remote console to the BMC.
00b	Request	In	10b	Remote Console request to SMS Message is a request from the remote console to SMS via the Receive Message Queue.
00b	Response	Out	10b	SMS Response to Remote Console Message is a response to an earlier request from SMS.
01b	Response	Out	Any	Response to earlier Bridged Request from Remote Console Message is the asynchronous response from an earlier bridged request that was encapsulated in a Send Message command issued to the BMC by the remote console.

Table C-4. Terminal Mode Text Commands

Command	Switches	Description
SYS PWD	-U USERNAME <*password*>	Used to activate a terminal mode session. USERNAME corresponds to the ASCII text for the username. <*password*> represents a printable password (up to 16 characters). If <password> is not provided, then a Null password (all binary 0's) is submitted. Passwords are case sensitive. Either the **SYS PWD** command (or Activate Session IPMI message) must be successfully executed before any command or IPMI messages are accepted. Note that a modem connection may be automatically dropped if multiple bad passwords are entered.
	-N <*password*>	-N represents a Null username. <*password*> represents a printable password (up to 16 characters). If <*password*> is not provided, then a Null password (all binary 0's) is submitted. Passwords are case sensitive. Either the **SYS PWD** command (or Activate Session IPMI message) must be successfully executed before any command or IPMI messages are accepted. Note that a modem connection may be automatically dropped if multiple bad passwords are entered.
	-X	**-X** immediately logs out any presently active session. Entering an invalid password with **-U** or **-N** also has the same effect.
SYS TMODE		Used as a no-op confirm that Terminal Mode is active. The BMC returns an `OK` response followed by `TMODE`.
SYS SET BOOT XX YY ZZ AA BB		Sets the boot flags to direct a boot to the specified device following the next IPMI command or action initiated reset or power-on. XX…BB represent five hex-ASCII encoded bytes, which are the boot flags parameter in the Boot Option Parameters. See Table C-5 for more information. Upon receiving this command, the BMC automatically sets the valid bit in the boot options and sets all the Boot Initiator Acknowledge data bits to 1b.

Table C-4. Terminal Mode Text Commands *(continued)*

Command	Switches	Description
SYS SET BOOTOPT XX YY…NN		This is essentially a text version of the IPMI **Set System Boot Options** command. It allows any of the boot option parameters to be set, not just the boot flags. XX YY…NN represent the hex-ASCII encoding for the data bytes that are passed in the Set System Boot Options request. See Table C-5 for more information. XX — Parameter valid. [7] — 1b = Mark parameter invalid / locked. 0b = Mark parameter valid / unlocked. [6:0] — Boot option parameter selector . YY…NN — Boot Option Parameter Data. Passing 0-bytes of parameter data allows the parameter valid bit to be changed without affecting the present parameter setting. See Table C-5 for more information.
SYS GET BOOTOPT XX YY ZZ		This is essentially a text version of the IPMI Get System Boot Options command. It allows any of the boot option parameters to be retrieved. XX YY ZZ represents the hex-ASCII for the data bytes that are passed in the Get System Boot Options request. The BMC returns the data from the command in hex-ASCII format. See Table C-5 for more information. XX—Parameter selector. [7]—Reserved. [6:0]—Boot option parameter selector. YY—Set Selector. [7:0]—Selects a particular block or set of parameters under the given parameter selector. Write as 00h if parameter does not use a Set Selector. ZZ—Block Selector. Selects a particular block within a set of parameters Write as 00h if parameter does not use a Block Selector. **NOTE:** There are no IPMI-specified Boot Options parameters that use the block selector. However, this field is provided for consistency with other configuration commands and as a placeholder for future extension of the IPMI specification.

Table C-4. Terminal Mode Text Commands *(continued)*

Command	Switches	Description
SYS SET TCFG		Returns the Terminal Mode Configuration bytes where XX and YY represent hex-ASCII encoding for the volatile version of data bytes 1 and 2 as specified in Table C-6, and AA BB represent hex-ASCII encoding of the non-volatile version.
		V:XX Output termination sequence>
		N:AA BB <output termination sequence>
	-V XX YY	This command sets the volatile Terminal Mode Configuration. XX and YY represent hex-ASCII encoding for data bytes 1 and 2 as specified in Table C-6. The BMC returns the same output as for SYS SET TCFG, above.
	-N XX YY	This command sets the non-volatile Terminal Mode Configuration. XX and YY represent hex-ASCII encoding for data bytes 1 and 2 as specified in Table C-6. The BMC returns the same output as for SYS SET TCFG, above.
SYS RESET		Directs the BMC to perform an immediate system hard reset.
SYS POWER OFF		Directs the BMC to perform an immediate system power off.
SYS POWER ON		Causes the BMC to initiate an immediate system power on.

Table C-4. Terminal Mode Text Commands *(continued)*

Command	Switches	Description
SYS HEALTH QUERY		Causes the BMC to return a high level version of the system health status in "terse" format. The BMC returns a string with the following format if the command is accepted. PWR:zzz H:xx T:xx V:xx PS:xx C:xx D:xx S:xx O:xx Where: PWR is system POWER state. H is overall Health. T is Temperature. V is Voltage. PS is Power Supply subsystem. F is cooling subsystem (Fans). Dis Hard Drive / RAID Subsystem. S is physical Security. O is Other (OEM). zzz is: **ON**, **OFF** (soft-off or mechanical off), **SLP** (sleep - used when sleep level cannot be distinguished), **S4**, **S3**, **S2**, **S1**, **??** (unknown). and xx is: ok, nc, cr, nr, uf, or ?? where: **ok** = OK (monitored parameters within normal operating ranges). **nc** = non-critical (`"warning": hardware outside normal operating range`). **cr** = critical (`"fatal": hardware exceeding specified ratings`). **nr** = non-recoverable (`"potential damage": system hardware in jeopardy or damaged`). **uf** = unspecified fault (fault detected, but severity unspecified). **??** = status not available/unknown (typically because system power is OFF).

Table C-4. Terminal Mode Text Commands *(continued)*

Command	Switches	Description
SYS HEALTH QUERY	-V	Causes the BMC to return a high level version of the system health status in multi-line "verbose" format. The BMC returns a string of the following format: SYS Health:xx<output termination sequence>. Power: ON, OFF (soft-off or mechanical off), SLEEP (sleep - used when can't distinguish sleep level), S4, S3, S2, S1, Unknown. Temperature:xx<output termination sequence>. Voltage:xx<output termination sequence>. PowerSystem:xx<output termination sequence>. Cooling:xx<output termination sequence>. Drives:xx<output termination sequence>. Security:xx<output termination sequence>. Other:xx<output termination sequence>. Where xx is: **OK** (monitored parameters within normal operating ranges). **Non-critical** ("warning": hardware outside normal operating range). **Critical** ("fatal" :hardware exceeding specified ratings). **Non-recoverable** ("potential damage": system hardware in jeopardy or damaged). **Unspecified fault** (fault detected, but severity unspecified). **Unknown** (status not available/unknown (typically because system power is OFF).

Boot Option Parameters

The designation, semi-volatile means that the parameter will be kept across system power cycles, resets, system power on/off, and sleep state changes, but will not be preserved if the management controller loses standby power or is cold reset. Parameters designated as semi-volatile are initialized to 0's upon controller power up or hard reset, unless otherwise specified.

IPMI allows software to use the boot initiator mailbox as a way for a remote application to pass OEM parameters for additional selection of the boot process and direction of the startup of post-boot software. If additional parameters are not included, the system boots the primary/first-scanned device of the type specified.

Table C-5. Boot Option Parameters

Parameter	Number	Parameter Data (non-volatile unless otherwise noted)
Set In Progress (volatile)	0	Data 1 - This parameter is used to indicate when any of the following parameters are being updated, and when the updates are completed. The bit is primarily provided to alert software that some other software or utility is in the process of making changes to the data. The change shall take effect when the write occurs. [7:2] -Reserved. [1:0] -00b = Set complete. If a system reset or transition to powered down state occurs while "set in progress" is active, the BMC goes to the "set complete" state. If rollback is implemented, going directly to "set complete" without first doing a "commit write" causes any pending write data to be discarded. 01b = Set in progress. This flag indicates that some utility or other software is presently doing writes to parameter data. It is a notification flag only, it is not a resource lock. The BMC does not provide any interlock mechanism that would prevent other software from writing parameter data while. 10b = Reserved. 11b = Reserved.
Service partition selector (semi-volatile)[	1	Data 1 [7:0] - Service partition selector. This value is used to select which service partition BIOS should boot using. This document does not specify which value corresponds to a particular service partition. 00h = Unspecified.
Service partition scan (semi-volatile)[	2	Data 1 [7:2] - Reserved. [1] -1b = Request BIOS to scan for specified service partition. BIOS clears this bit after the requested scan has been performed. [0] -1b = Service Partition discovered. The BIOS sets this bit to indicate it has discovered the specified service partition. The BIOS must clear this bit on all system resets and power ups, except when a scan is requested.

Table C-5. Boot Option Parameters *(continued)*

Parameter	Number	Parameter Data (non-volatile unless otherwise noted)
BMC boot flag valid bit clearing (semi-volatile)	3	Data 1 - BMC boot flag valid bit clearing. Default = 0000b. [7:5] - Reserved. [4] - 1b = Do not clear valid bit on reset/power cycle caused by PEF. [3] - 1b = Do not automatically clear boot flag valid bit if IPMI *Chassis Control* command not received within 60-second time-out (countdown restarts when a IPMI *Chassis Control* command is received). [2] - 1b = Do not clear valid bit on reset/power cycle caused by watchdog timeout. [1] - 1b = Do not clear valid bit on pushbutton reset / soft-reset (for example, <Ctrl>-<Alt>-<Del>). [0] - 1b = Do not clear valid bit on power up via power pushbutton or wake event.

Table C-5. Boot Option Parameters *(continued)*

Parameter	Number	Parameter Data (non-volatile unless otherwise noted)
Boot info acknowledge (semi-volatile)	4	These flags are used to allow individual parties to track whether they have already seen and handled the boot information. Applications that deal with boot information should check the boot info and clear their corresponding bit after consuming the boot options data. Data 1: Write Mask (write-only—This field is returned as 00h when read. This is to eliminate the need for the BMC to provide storage for the **Write Mask** field.) [7] - 1b = enable write to bit 7 of Data field. [6] - 1b = enable write to bit 6 of Data field. [5] - 1b = enable write to bit 5 of Data field. [4] - 1b = enable write to bit 4 of Data field. [3] - 1b = enable write to bit 3 of Data field. [2] - 1b = enable write to bit 2 of Data field. [1] - 1b = enable write to bit 1 of Data field. [0] - 1b = enable write to bit 0 of Data field. Data 2: Boot Initiator Acknowledge Data. The boot initiator should typically write FFh to this parameter prior to initiating the boot. The boot initiator may write 0s if it wants to intentionally direct a given party to ignore the boot info. This field is automatically initialized to 00h when the management controller is first powered up or reset. [7] - reserved. Write as 1b. Ignore on read. [6] - reserved. Write as 1b. Ignore on read. [5] - reserved. Write as 1b. Ignore on read. [4] - 0b = OEM has handled boot info. [3] - 0b = SMS has handled boot info. [2] - 0b = OS / service partition has handled boot info. [1] - 0b = OS Loader has handled boot info. [0] - 0b = BIOS/POST has handled boot info.

Table C-5. Boot Option Parameters *(continued)*

Parameter	Number	Parameter Data (non-volatile unless otherwise noted)
Boot flags (semi-volatile)	5	Data 1 [7] - 1b = Boot flags valid. The bit should be set to indicate that valid flag data is present. This bit may be automatically cleared based on the boot flag valid bit clearing parameter. [6:0] - Reserved BIOS support for the following flags is optional. If a given flag is supported, it must cause the specified function to occur in order for the implementation to be considered to be in conformity with this specification. The following parameters represent temporary overrides of the BIOS default settings. BIOS should only use these parameters for the single boot where these flags were set. If the bit is 0b, BIOS should use its default configuration for the given option. Data 2 [7]—1b = CMOS clear. [6]—1b = Lock Keyboard. [5:2] - Boot device selector. 0000b = No override. 0001b = Force PXE. 0010b = Force boot from default Hard-drive. 0011b = Force boot from default Hard-drive, request Safe Mode. 0100b = Force boot from default Diagnostic Partition. 0101b = Force boot from default CD/DVD. 0110b–1110b = Reserved. 1111b = Force boot from diskette/primary removable media. [1]—1b = Screen Blank. [0]—1b = Lock out Reset buttons.

Table C-5. Boot Option Parameters *(continued)*

Parameter	Number	Parameter Data (non-volatile unless otherwise noted)
Boot flags (semi-volatile) (continued)	5	Data 3
		[7] - 1b = Lock out (power off/ sleep request) using the Power Button.
		[6:5] - Firmware (BIOS) Verbosity (Directs what appears on POST display).
		00b = System default.
		01b = Request quiet display.
		10b = Request verbose display.
		11b = Reserved.
		[4] - 1b = Force progress event traps. When set to 1b, the BMC transmits PET traps for BIOS progress events to the LAN or serial/modem destination for the session that set the flag. Since this capability uses PET traps, this bit is ignored for connection modes that do not support PET such as Basic Mode and Terminal Mode.
		[3] - 1b = User password bypass. When set to 1b, the managed client's BIOS boots the system and bypasses any user or boot password that might be set in the system.
		[2] - 1b = Lock Sleep Button. When set to 1b, directs BIOS to disable the sleep button operation for the system, normally until the next boot cycle.
		[1:0] -00b = Console redirection occurs per BIOS configuration setting.
		01b = Suppress (skip) console redirection if enabled.
		10b = Request console redirection be enabled.
		11b = Reserved.

Table C-5. Boot Option Parameters *(continued)*

Parameter	Number	Parameter Data (non-volatile unless otherwise noted)
Boot flags (semi-volatile) (continued)	5	Data 4 [7:4] - Reserved. [3] - BIOS Shared Mode Override. Can be used to request BIOS to temporarily place the channel into shared access mode. Per the recommendations in the IPMI specification, "Shared" access would cause the baseboard serial controller to both remain enabled after POST/start of OS boot, while also allowing the BMC to be accessible. This can be useful when booting to an alternative device such as a Diagnostic Partition since it means the partition can use the serial port but that communication with the BMC can remain available if the partition software fails. 1b = Request BIOS to temporarily set the access mode for the channel specified in parameter #6 to "Shared." This is typically accomplished by sending a **Set Channel Access** command to set the *volatile* access mode setting in the BMC. 0b = No request to BIOS to change present access mode setting [2:0] - BIOS Mux Control Override. Can be used to request BIOS to force a particular setting of the serial/modem mux at the conclusion of POST / start of operating system boot. This override takes precedence over the mux settings for the access mode even if the BIOS Shared Mode Override is set. 000b = BIOS uses recommended setting of the mux at the end of POST. 001b = Requests BIOS to force mux to *BMC* at conclusion of POST/start of operating system-boot. If honored, this overrides the recommended setting of the mux at the end of POST. 010b = Requests BIOS to force mux to *system* at conclusion of POST/start of operating system-boot. If honored, this overrides the recommended setting of the mux at the end of POST. Data 5 - Reserved.

Table C-5. Boot Option Parameters *(continued)*

Parameter	Number	Parameter Data (non-volatile unless otherwise noted)
Boot initiator info (semi-volatile)	6	Address and Identity information for the party that initiated the boot. The party that initiates the boot writes this parameter and the boot info acknowledge parameter prior to issuing the command that causes the system power up, power cycle, or reset. This data is written by the remote console application, not the BMC. Boot Source Data 1- Channel Number. Channel that delivers the boot command (for example, chassis control). BIOS and boot software (e.g. service partition or operating system loader) can use the *Get Channel Sessions* to find out information about the party that initiated the boot [7:4]—Reserved. [3:0]—Channel Number. Data 2:5 - Session ID. Session ID for session that the boot command will be issued over. This value can be used with the *Get Channel Sessions* command to find out information about the party that initiated the boot. Data 6:9 - Boot Info Timestamp. This timestamp is used to help software determine whether the boot information is "stale" or not. A service partition or OS loader may elect to ignore the boot information if it is older than expected. The boot initiator should load this field with the timestamp value from the IPMI *Get SEL Time* command prior to issuing the command that initiates the boot.

Table C-5. Boot Option Parameters *(continued)*

Parameter	Number	Parameter Data (non-volatile unless otherwise noted)
Boot initiator mailbox (semi-volatile)	7	This parameter is used as a "mailbox" for holding information that directs the operation of the operating system loader or service partition software. **NOTE:** Since this information is retained by the BMC and may be readable by other software entities, care should be taken to avoid using it to carry "secret" data. Data1: Set Selector = Block selector. Selects which 16-byte info block to access. 0-based. Data 2: (17) Block data. The first three bytes of block #0 are required to be an IANA Enterprise ID Number (least significant byte first) for the company or organization that has specified the loader. Up to 16-bytes per block of information regarding boot initiator, based on protocol and medium. The BMC supports five blocks of storage for this command. Previous values are overwritten. The BMC does not automatically clear any remaining data bytes if fewer than 16 bytes are written to a given block.
All other parameters	All Others	Reserved.

Table C-6. Terminal Mode Configuration

Byte	Explanation
1	[7:6] - Reserved . [5]—Line Editing. 0b = Disable. 1b = Enable (Factory default). [4]—Reserved. [3:2]—Delete control (only applies when line editing is enabled). 00b = BMC outputs a <DEL> character when <BKSP> or < DEL > is received. 01b = BMC outputs a < BKSP >< SP >< BKSP > sequence when < BKSP > or < DEL > is received (Factory default). [1]—Echo control0b = No echo 1b = Echo (BMC echoes characters it receives) (Factory default). [0]—Handshaking—BMC outputs a [SYS]<*newline*> after receiving each terminal mode IPMI message and is ready to accept the next message. 0b = Disable. 1b = Enable (Factory default).
2	[7:4] - Output newline sequence (BMC to console). Selects what characters the BMC uses as the <*newline*> sequence when the BMC writes a line to the console in Terminal Mode. 0h = no termination sequence. 1h = <CR-LF> (Factory default) 2h = <NULL> 3h = <CR> 4h = <LF-CR> 5h = <LF> All other = reserved [3:0] - Input newline sequence (Console to BMC). Selects what characters the console uses as the <*newline*> sequence when writing to the BMC in Terminal Mode. 0h = reserved 1h = <CR> (Factory default) 2h = <NULL> All other = reserved

Glossary

The following list defines or identifies technical terms, abbreviations, and acronyms used in your system documents.

adapter card
An expansion card that plugs into an expansion-card connector on the system's system board. An adapter card adds some specialized function to the system by providing an interface between the expansion bus and a peripheral device. Examples of adapter cards include network cards, sound cards, and SCSI adapters.

ANSI
Abbreviation for American National Standards Institute.

API
Abbreviation for application program interface, which is a set of routines, protocols, and tools for building software applications that act as an interface between the operating system and application programs.

Argument
The value supplied with an option, such as in the following command line instance:

```
utilname --option=argument
```

ARP
Acronym for Address Resolution Protocol, which is a method for finding a host's Ethernet address from its Internet address.

ASCII
Acronym for American Standard Code for Information Interchange. A text file containing only characters from the ASCII character set (usually created with a text editor, such as Notepad in Microsoft® Windows®), is called an ASCII file.

asset tag code
An individual code assigned to a system, usually by a system administrator, for security or tracking purposes.

autoexec.bat file
The **autoexec.bat** file is executed when you boot your system (after executing any commands in the **config.sys** file). This start-up file contains commands that define the characteristics of each device connected to your system, and it finds and executes programs stored in locations other than the active directory.

backup
A copy of a program or data file. As a precaution, you should back up your system's hard drive on a regular basis. Before making a change to the configuration of your system, you should back up important start-up files from your operating system.

baud rate
A measurement of data transmission speed. For example, modems are designed to transmit data at one or more specified baud rate(s) through the COM (serial) port of a system.

binary
A base-2 numbering system that uses 0 and 1 to represent information. The system performs operations based on the ordering and calculation of these numbers.

BIOS
Acronym for basic input/output system. Your system's BIOS contains programs stored on a flash memory chip. The BIOS controls the following:

- Communications between the microprocessor and peripheral devices, such as the keyboard and the video adapter
- Miscellaneous functions, such as system messages

bit
The smallest unit of information interpreted by your system.

BMC
Abbreviation for baseboard management controller, which is a controller that provides the intelligence in the IPMI structure.

boot routine
When you start your system, it clears all memory, initializes devices, and loads the operating system. Unless the operating system fails to respond, you can reboot (also called warm boot) your system by pressing <Ctrl><Alt><Del>; otherwise, you must perform a cold boot by pressing the reset button or by turning the system off and then back on.

bootable diskette
You can start your system from a diskette. To make a bootable diskette on a system running Windows, insert a diskette in the diskette drive, type `sys a:` at the command line prompt, and press <Enter>. Use this bootable diskette if your system will not boot from the hard drive.

bus
An information pathway between the components of a system. Your system contains an expansion bus that allows the microprocessor to communicate with controllers for all the various peripheral devices connected to the system. Your system also contains an address bus and a data bus for communications between the microprocessor and RAM.

byte
Eight contiguous bits of information, the basic data unit used by your system.

cache
A fast storage area that keeps a copy of data or instructions for quicker data retrieval. For example, your system's BIOS may cache ROM code in faster RAM. Or, a disk-cache utility may reserve RAM in which to store frequently accessed information from your system's disk drives; when a program makes a request to a disk drive for data that is in the cache, the disk-cache utility can retrieve the data from RAM faster than from the disk drive.

CD-ROM
Abbreviation for compact disc read-only memory. CD drives use optical technology to read data from CDs. CDs are read-only storage devices; you cannot write new data to a CD with standard CD drives.

CHAP
Acronym for Challenge-Handshake Authentication Protocol, an authentication scheme used by PPP servers to validate the identity of the originator of the connection upon connection or any time later.

CLI
Abbreviation for command line interface.

Command
The combination of an option and argument or just an option if no argument is required, such as in the following command line instances:

`utilname` **`--option`**

`utilname` **`--option=argument`**

command line instance
A series of valid commands, options, and arguments typed in the command line. For example, the DTK utility name and all necessary options and arguments as they are entered through the OS shell:

```
A:>utilname --option --option=argument
```

COM*n*
The device names for the first through fourth serial ports on your system are COM1, COM2, COM3, and COM4. The default interrupt for COM1 and COM3 is IRQ4, and the default interrupt for COM2 and COM4 is IRQ3. Therefore, you must be careful when configuring software that runs a serial device so that you don't create an interrupt conflict.

config.sys file
The **config.sys** file is executed when you boot your system (before running any commands in the **autoexec.bat** file). This start-up file contains commands that specify which devices to install and which drivers to use. This file also contains commands that determine how the operating system uses memory and controls files.

console redirection
Console redirection is a function that directs a managed system's display screen, mouse functions, and keyboard functions to the corresponding devices on a management station. You may then use the management station's system console to control the managed system.

controller
A chip that controls the transfer of data between the microprocessor and memory or between the microprocessor and a peripheral device such as a disk drive or the keyboard.

control panel
The part of the system that contains indicators and controls, such as the power switch, hard drive access indicator, and power indicator.

conventional memory
The first 640 KB of RAM. Conventional memory is found in all systems. Unless they are specially designed, MS-DOS® programs are limited to running in conventional memory.

CPU
Abbreviation for central processing unit. See also microprocessor.

device driver
A program that allows the operating system or some other program to interface correctly with a peripheral device, such as a printer. Some device drivers—such as network drivers—must be loaded from the config.sys file (with a device= statement) or as memory-resident programs (usually, from the autoexec.bat file). Others—such as video drivers—must load when you start the program for which they were designed.

DHCP
Abbreviation for Dynamic Host Configuration Protocol, a protocol that provides a means to dynamically allocate IP addresses to computers on a LAN.

DIMM
Acronym for dual in-line memory module. A small circuit board containing DRAM chips that connects to the system board.

directory
Directories help keep related files organized on a disk in a hierarchical, "inverted tree" structure. Each disk has a "root" directory; for example, a **C:\>** prompt normally indicates that you are at the root directory of hard drive C. Additional directories that branch off of the root directory are called subdirectories. Subdirectories may contain additional directories branching off of them.

DKS
Abbreviation for dynamic kernel support.

DMA
Abbreviation for direct memory access. A DMA channel allows certain types of data transfer between RAM and a device to bypass the microprocessor.

DRAC II
Acronym for Dell™ OpenManage Remote Assistant Card, version 2.

DRAC III
Acronym for Dell Remote Access Card III.

DRAC III/XT
Acronym for Dell Remote Access Card III/XT.

DRAM
Acronym for dynamic random-access memory. A system's RAM is usually made up entirely of DRAM chips. Because DRAM chips cannot store an electrical charge indefinitely, your system continually refreshes each DRAM chip in the system.

EEPROM
Acronym for electrically erasable programmable read-only memory.

EIDE
Abbreviation for enhanced integrated drive electronics. EIDE devices add one or more of the following enhancements to the traditional IDE standard:

- Data transfer rates of up to 16 MB/sec
- Support for drives other than just hard drives, such as CD and tape drives
- Support for hard drives with capacities greater than 528 MB
- Support for up to two controllers, each with up to two devices attached

EMM
Abbreviation for expanded memory manager. A utility that uses extended memory to emulate expanded memory on systems with an Intel386™ or higher microprocessor.

EMS
Abbreviation for Expanded Memory Specification.

EPROM
Acronym for erasable programmable read-only memory.

ERA
Abbreviation for embedded remote access.

ERA/MC
Abbreviation for embedded remote access modular computer. See modular system.

ERA/O
Abbreviation for embedded remote access option.

ESM
Abbreviation for embedded systems management, which is a set of instruction coding in system software and firmware that notifies a user about potential hardware problems on a system.

expanded memory
A technique for accessing RAM above 1 MB. To enable expanded memory on your system, you must use an EMM. You should configure your system to support expanded memory only if you run application programs that can use (or require) expanded memory.

extended memory
RAM above 1 MB. Most software that can use it, such as the Windows operating system, requires that extended memory be under the control of an XMM.

external cache memory
A RAM cache using SRAM chips. Because SRAM chips operate at several times the speed of DRAM chips, the microprocessor can retrieve data and instructions faster from external cache memory than from RAM.

FAT
Acronym for file allocation table. FAT and FAT32 are file systems that are defined as follows:

- **FAT** — A file system used by MS-DOS, Windows 3.*x*, Windows 95, and Windows 98. Windows NT® and Windows 2000 also can use the

FAT file system. The operating system maintains a table to keep track of the status of various segments of disk space used for file storage.

- **FAT32** — A derivative of the FAT file system. FAT32 supports smaller cluster sizes than FAT, thus providing more efficient space allocation on FAT32 drives.

FEPROM
Acronym for flash erasable programmable read-only memory. Flash memory is a kind of nonvolatile storage device similar to EEPROM, but the erasing is done only in blocks or the entire chip.

firmware
Software (programs or data) that has been written onto read-only memory (ROM). Firmware can boot and operate a device. Each controller contains firmware which helps provide the controller's functionality.

flash bios
A BIOS that is stored in flash memory rather than in ROM. A flash BIOS chip can be updated in place, whereas a ROM BIOS must be replaced with a newer chip.

flash memory
A type of EEPROM chip that can be reprogrammed from a utility on diskette while still installed in a system; most EEPROM chips can only be rewritten with special programming equipment.

format
To prepare a hard drive or diskette for storing files. An unconditional format deletes all data stored on the disk.

FRU
Abbreviation for field replaceable unit, which identifies a module or component that will typically be replaced in its entirety as part of a field service repair operation.

function commands
Commands that specify an action to be performed.

GB
Abbreviation for gigabyte(s). A gigabyte equals 1024 megabytes or 1,073,741,824 bytes.

graphics mode
A video mode that can be defined as x horizontal by y vertical pixels by z colors.

GUI
Acronym for graphical user interface.

GUID
Abbreviation for Globally Unique Identifier, which is a random number used in software applications. Each generated GUID is supposed to be unique.

h
Abbreviation for hexadecimal. A base-16 numbering system, often used in programming to identify addresses in the system's RAM and I/O memory addresses for devices. The sequence of decimal numbers from 0 through 16, for example, is expressed in hexadecimal notation as: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, 10. In text, hexadecimal numbers are often followed by h.

HBA
Abbreviation for host bus adapter. A PCI adapter card that resides in the system whose only function is to convert data commands from PCI-bus format to storage interconnect format (examples: SCSI, Fibre Channel) and communicate directly with hard drives, tape drives, CD drives, or other storage devices.

HMA
Abbreviation for high memory area. The first 64 KB of extended memory above 1 MB. A memory manager that conforms to the XMS can make the HMA a direct extension of conventional memory. Also see XMM.

host adapter
A host adapter implements communication between the system's bus and the controller for a peripheral device. (hard drive controller subsystems include

integrated host adapter circuitry.) To add a SCSI expansion bus to your system, you must install or connect the appropriate host adapter.

HPFS
Abbreviation for the High Performance File System option in the Windows NT operating systems.

HTTP
Abbreviation for Hypertext Transfer Protocol. HTTP is the client-server TCP/IP protocol used on the World Wide Web for the exchange of HTML documents.

HTTPS
Abbreviation for HyperText Transmission Protocol, Secure. HTTPS is a variant of HTTP used by Web browsers for handling secure transactions. HTTPS is a unique protocol that is simply SSL underneath HTTP. You need to use "https://" for HTTP URLs with SSL, whereas you continue to use "http://" for HTTP URLs without SSL.

ID
Abbreviation for identifier, commonly used when referring to a user identifier (user ID), object identifier (object ID), or hardware identifier (controller ID).

IDE
Abbreviation for Integrated Drive Electronics. IDE is a computer system interface, used primarily for hard drives and CDs.

I/O
Abbreviation for input/output. The keyboard is an input device, and a printer is an output device. In general, I/O activity can be differentiated from computational activity. For example, when a program sends a document to the printer, it is engaging in output activity; when the program sorts a list of terms, it is engaging in computational activity.

internal microprocessor cache
An instruction and data cache built in to the microprocessor. The Intel Pentium microprocessor includes a 16-KB internal cache, which is set up as an 8-KB read-only instruction cache and an 8-KB read/write data cache.

IP address
Abbreviation for Internet Protocol address. See TCP/IP.

IPMI
Abbreviation for Intelligent Platform Management Interface, which is an industry standard for management of peripherals used in enterprise systems based on Intel® architecture. The key characteristic of IPMI is that inventory, monitoring, logging, and recovery control functions are available independent of the main processors, BIOS, and operating system.

IRQ
Abbreviation for interrupt request. A signal that data is about to be sent to or received by a peripheral device travels by an IRQ line to the microprocessor. Each peripheral connection must be assigned an IRQ number. For example, the first serial port in your system (COM1) is assigned to IRQ4 by default. Two devices can share the same IRQ assignment, but you cannot operate both devices simultaneously.

KB
Abbreviation for kilobyte(s), 1024 bytes.

key combination
A command requiring you to press multiple keys at the same time. For example, you can reboot your system by pressing the <Ctrl><Alt><Del> key combination.

LAN
Acronym for local area network. A LAN system is usually confined to the same building or a few nearby buildings, with all equipment linked by wiring dedicated specifically to the LAN.

local bus
On a system with local-bus expansion capability, certain peripheral devices (such as the video adapter circuitry) can be designed to run much faster than they would with a traditional expansion bus. Some local-bus designs allow peripherals to run at the same speed and with the same width data path as the system's microprocessor.

LPT*n*
The device names for the first through third parallel printer ports on your system are LPT1, LPT2, and LPT3.

LRA
Abbreviation for local response agent.

MB
Abbreviation for megabyte(s). The term megabyte means 1,048,576 bytes; however, when referring to hard drive storage, the term is often rounded to mean 1,000,000 bytes.

memory
A system can contain several different forms of memory, such as RAM, ROM, and video memory. Frequently, the word memory is used as a synonym for RAM; for example, an unqualified statement such as "a system with 16 MB of memory" refers to a system with 16 MB of RAM.

memory address
A specific location, usually expressed as a hexadecimal number, in the system's RAM.

memory manager
A utility that controls the implementation of memory in addition to conventional memory, such as extended or expanded memory.

memory module
A small circuit board containing DRAM chips that connects to the system board.

MHz
Abbreviation for megahertz.

microprocessor
The primary computational chip inside the system that controls the interpretation and execution of arithmetic and logic functions. Software written for one microprocessor must usually be revised to run on another microprocessor. CPU is a synonym for microprocessor.

modem
A device that allows your system to communicate with other systems over telephone lines.

modular system
A system that can include multiple server modules. Each server module functions as an individual system. To function as a system, a server module is inserted into a chassis which includes power supplies, fans, a system management module, and at least one network switch module. The power supplies, fans, system management module, and network switch module are shared resources of the server modules in the chassis. See server module.

MS-DOS
Acronym for Microsoft Disk Operating System.

NIC
Acronym for network interface controller.

NTFS
Abbreviation for the Windows NT File System option in the Windows NT operating system. NTFS is an advanced file system designed for use specifically within the Windows NT operating system. It supports file system recovery, extremely large storage media, and long file names. It also supports object-oriented applications by treating all files as objects with user-defined and system-defined attributes. See also FAT and FAT32.

NVRAM
Acronym for nonvolatile random-access memory. Memory that does not lose its contents when you turn off your system. NVRAM is used for maintaining the date, time, and system configuration information.

option
An argument to a command that modifies its function rather than providing data and is usually set off by a delimiter such as - or /. Some options may or must be followed by a value, for example:

```
utilname -option=argument
```

parameter
A value or option that you specify to a program. A parameter is sometimes called a switch or an argument.

partition
You can divide a hard drive into multiple physical sections called partitions with the fdisk command. Each partition can contain multiple logical drives. After partitioning the hard drive, you must format each logical drive with the format command.

PCI
Abbreviation for Peripheral Component Interconnect. The predominant 32-bit or 64-bit local-bus standard developed by Intel Corporation.

PCMCIA
Personal Computer Memory Card International Association. An international trade association that has developed standards for devices, such as modems and external hard drives, that can be plugged into portable computers.

PERC
Acronym for Expandable RAID controller.

peripheral device
An internal or external device—such as a printer, a disk drive, or a keyboard—connected to a system.

Plug and Play
An industry-standard specification that makes it easier to add hardware devices to personal computers. Plug and Play provides automatic installation and configuration, compatibility with existing hardware, and dynamic support of mobile computing environments.

POST
Acronym for power-on self-test. Before the operating system loads when you turn on your system, the POST tests various system components such as RAM, the disk drives, and the keyboard.

pre-operating system environment
A shell environment, such as DOS, used to configure system hardware before a major operating system, such as Microsoft Windows or Red Hat® Linux, is installed.

program diskette set
The set of diskettes from which you can perform a complete installation of an operating system or application program. When you reconfigure a program, you often need its program diskette set.

PXE
Abbreviation for Pre-boot eXecution Environment.

RAC
Acronym for remote access controller.

RAID
Acronym for redundant array of independent drives.

RAM
Acronym for random-access memory. A system's primary temporary storage area for program instructions and data. Each location in RAM is identified by a number called a memory address. Any information stored in RAM is lost when you turn off your system.

RAM disk
A memory-resident program that emulates a hard drive.

read-only file
A read-only file is one that you are prohibited from editing or deleting. A file can have read-only status if:

- Its read-only attribute is enabled.
- It resides on a physically write-protected diskette or on a diskette in a write-protected drive.
- It is located on a network in a directory to which the system administrator has assigned read-only rights to you.

readme file
A text file included with a software package or hardware product that contains information supplementing or updating the documentation for the software or hardware. Typically, readme files provide installation information, describe new product enhancements or corrections that have not yet been documented, and list known problems or other things you need to be aware of as you use the software or hardware.

ROM
Acronym for read-only memory. Your system contains some programs essential to its operation in ROM code. Unlike RAM, a ROM chip retains its contents even after you turn off your system. Examples of code in ROM include the program that initiates your system's boot routine and the POST.

RPM
Abbreviation for Red Hat Package Manager.

schema
A collection of class definitions that describes managed objects in a particular environment. A CIM schema is a collection of class definitions used to represent managed objects that are common to every management environment, which is why CIM is called the Common Information Model.

SCSI
Acronym for small computer system interface. An I/O bus interface with faster data transmission rates than standard ports. You can connect up to seven devices (15 for some newer SCSI types) to one SCSI interface.

server module
A modular system component that functions as an individual system. To function as a system, a server module is inserted into a chassis which includes power supplies, fans, a system management module, and at least one network switch module. The power supplies, fans, system management module, and network switch module are shared resources of the server modules in the chassis. See modular system.

service tag number
A bar code label that identifies each system in the event that you need to call for customer or technical support.

SMART
Acronym for Self-Monitoring Analysis and Reporting Technology. A technology that allows hard drives to report errors and failures to the system BIOS, which then displays an error message on the screen. To take advantage of this technology, you must have a SMART-compliant hard drive and the proper support in the system BIOS.

SMBIOS
Acronym for system management BIOS.

SNMP
Abbreviation for Simple Network Management Protocol. SNMP, a popular network control and monitoring protocol, is part of the original TCP/IP protocol suite. SNMP provides the format in which vital information about different network devices, such as network servers or routers, can be sent to a management application.

SNMP trap
A notification (event) generated by the RAC or ESM that contains information about state changes on the

managed system or about potential hardware problems.

SOL
Abbreviation for Serial Over LAN. SOL enables suitably designed servers to transparently redirect the serial character stream of a baseboard UART to/from a remote client over a shared LAN. The architecture requires software running on the managed system's BMC and client software running on a management station and/or a central network proxy.

support commands
Commands that specify how an action should be performed.

syntax
The rules that dictate how you must type a command or instruction so that the system understands it. A variable's syntax indicates its data type.

system configuration information
Data stored in memory that tells a system what hardware is installed and how the system should be configured for operation.

system diskette
System diskette is a synonym for bootable diskette.

system memory
System memory is a synonym for RAM.

System Setup utility
A BIOS-based utility that allows you to configure your system's hardware and customize the system's operation by setting such features as password protection and energy management. Some options in the System Setup utility require that you reboot the system (or the system may reboot automatically) in order to make a hardware configuration change.

system.ini file
A start-up file for the Windows operating system. When you start Windows, it consults the **system.ini** file to determine a variety of options for the Windows operating environment. Among other things, the **system.ini** file records which video, mouse, and keyboard drivers are installed for Windows.

Running the Control Panel or Windows Setup program may change options in the **system.ini** file. On other occasions, you may need to change or add options to the **system.ini** file manually with a text editor, such as Notepad.

TCP/IP
Abbreviation for Transmission Control Protocol/Internet Protocol. A system for transferring information over a computer network containing dissimilar systems, such as systems running Windows and UNIX.

text editor
An application program for editing text files consisting exclusively of ASCII characters. Windows Notepad is a text editor, for example. Most word processors use proprietary file formats containing binary characters, although some can read and write text files.

text mode
A video mode that can be defined as x columns by y rows of characters.

UART
Acronym for universal asynchronous receiver-transmitter. The UART is a system component that handles asynchronous serial communication by converting parallel bytes from the processor into serial bits for transmission (and vice versa).

unicode
A fixed width, 16-bit world wide character encoding, developed and maintained by the Unicode Consortium.

upper memory area
The 384 KB of RAM located between 640 KB and 1 MB. If the system has an Intel386 or higher microprocessor, a utility called a memory manager can create UMBs in

the upper memory area, in which you can load device drivers and memory-resident programs.

URL
Abbreviation for Uniform Resource Locator (formerly Universal Resource Locator).

USB
Abbreviation for Universal Serial Bus. A USB connector provides a single connection point for multiple USB-compliant devices, such as mice, keyboards, printers, and computer speakers. USB devices can also be connected and disconnected while the system is running.

utility
A program used to manage system resources—memory, disk drives, or printers, for example.

utility partition
A bootable partition on the hard drive that provides utilities and diagnostics for your hardware and software. When activated, the partition boots and provides an executable environment for the partition's utilities.

UUID
Abbreviation for Universal Unique Identification.

variable
A component of a managed object. A temperature probe, for example, has a variable to describe its capabilities, its health or status, and certain indexes that you can use to help you in locating the right temperature probe.

VESA
Acronym for Video Electronics Standards Association.

virtual memory
A method for increasing addressable RAM by using the hard drive. For example, in a system with 16 MB of RAM and 16 MB of virtual memory set up on the hard drive, the operating system would manage the system as though it had 32 MB of physical RAM.

VT-100
Abbreviation for Video Terminal 100, which is used by the most common terminal emulation programs.

WAN
Abbreviation for wide area network.

Web server
A secure port server that makes Web pages available for viewing by Web browsers using the HTTP protocol.

WH
Abbreviation for watt-hour(s).

win.ini file
A start-up file for the Windows operating system. When you start Windows, it consults the **win.ini** file to determine a variety of options for the Windows operating environment. Among other things, the **win.ini** file records what printer(s) and fonts are installed for Windows. The **win.ini** file also usually includes sections that contain optional settings for Windows application programs that are installed on the hard drive. Running the Control Panel or Windows Setup program may change options in the **win.ini** file. On other occasions, you may need to change or add options to the **win.ini** file manually with a text editor such as Notepad.

write-protected
Read-only files are said to be write-protected. You can write-protect a 3.5-inch diskette by sliding its write-protect tab to the open position or by setting the write-protect feature in the System Setup program.

XMM
Abbreviation for extended memory manager, a utility that allows application programs and operating systems to use extended memory in accordance with the XMS.

XMS
Abbreviation for eXtended Memory Specification.

X Windows system
The graphical user interface used in the Red Hat Linux environment.

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