Personal Systems Group

IBM

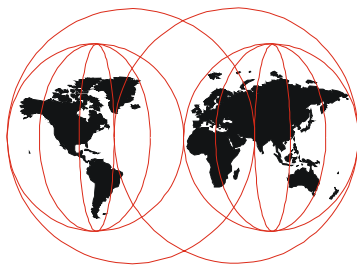# Examples Implementing
IBM Netfinity Server Management:
Air Conditioning Failure

Getting the Most out of IBM Netfinity

July 1998

Executive Summary

This paper gives you an example of how to use Netfinity Manager and the Advanced Systems Management Adapter to monitor the temperature around your server and how to configure these products to alert you if the temperature rises beyond certain thresholds.

Netfinity Manager is IBM's hardware systems management software used to manage PCs and Intel processor-based servers. It provides monitoring and alerting functions that allow administrators to be notified when problems occur. The Advanced Systems Management Adapter is an ISA adapter that can be installed in most IBM Netfinity and PC Server systems. It provides additional management functions that allow the administrator to be notified of faults that are likely to cause system failure. It also allows management of the server via a serial link even when the server is powered off.

This paper explains how to configure these two products so that the administrator will be notified at three separate temperature thresholds:

1. At 40ºC, issues a warning message through Netfinity Manager to the administrator's pager
2. At 50ºC, issues an error message through Netfinity Manager to the administrator's pager
3. At 64ºC, issues a failure message through the Advanced Systems Management Adapter then powers off the server.

It also describes how to additionally alert users of an imminent server shutdown so that they can save their work.

This paper is extracted from the IBM Redbook *Netfinity Server Management*, SG24-5208, covering Netfinity Manager, the Advanced Systems Management Adapter and the management functions built into the IBM Netfinity and PC Server systems.

Advanced Systems Management Adapter

The IBM Advanced Systems Management Adapter (part 94G5570) is a full-length ISA card designed to provide comprehensive systems management capability to IBM Netfinity and PC Servers.

The Advanced Systems Management Adapter integrates fully with Netfinity Manager to provide both local and remote management of the full range of servers, including the Netfinity 3000 and Netfinity 3500:

• Dial in to the systems management card even when the system is down to reset the server, browse a log of events detected by the service processor, check voltages and temperature, and control system power.

• Dial out to a pager or Netfinity Manager, via an external modem, to alert the system administrator if an error is detected.

- Full exploitation of the I^{2}C bus of the Netfinity 7000, Server 325, Server 330 and other servers for additional systems management functions such as power control, fan, power, security and temperature monitoring.
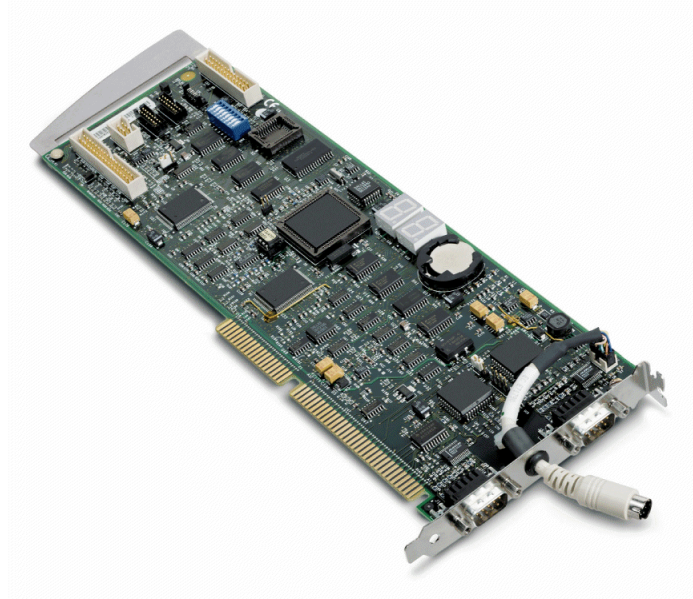

Figure 1: The Advanced Systems Management Adapter. The top connector is COM B and the bottom connector is COM A. A connector for an external power supply is in between the two COM ports.

- Remote POST Console support on the Server 325, 330 and Netfinity 7000 which echoes text data during system startup to Netfinity Manager or a remote ANSI terminal.

- Additional remote diagnostics on some models of the PC Server 325 and 330 that feature ROM-based diagnostics.

The adapter has two DB9 serial ports, one of which (COM B) supports attachment of a modem for dial-in/dial-out functions. The other serial port (COM A) can be used as an additional system serial port by standard communications packages.

A connector is also provided to connect an external power supply option (part 94G5571). This power supply is required for servers that do not have an internal continuous power feature and it provides continuous power even if the system is powered off or is down due to a mechanical malfunction.

The Advanced Systems Management Adapter can generate the following alerts:

- Operating system hung
- POST sequence timeout (325 and 330 only)
- Loader timeout (325 and 330 only)
- Non-critical temperature threshold exceeded
- Critical temperature threshold exceeded (automatic operating system shutdown)
- Temperature near Advanced Systems Management Adapter exceeded threshold

- Temperature near CPUs exceeded threshold (325, 330 and 7000 only)
- Temperature on planar exceeded threshold (325 and 330 only)
- Voltage thresholds exceeded
- Six incorrect attempts to enter Advanced Systems Management Adapter dial-in password
- Single fan failure
- Multiple fan failure (automatic operating system shutdown)
- Power on
- Power off
- Power supply failure (for redundant power supplies)
- Hard disk failure

The configuration utility is supplied on diskette with your Advanced Systems Management Adapter. For the latest version go to the Web at **http://www.pc.ibm.com/us/searchfiles.html** and search on "Management Adapter".

To start the configuration utility insert the floppy disk and restart the server. After the welcome screen showing the version number of the utility, you will see the utility's main menu that allows you to view and modify the adapter's configuration including the assignment of COM ports and the enabling of the OS WatchDog Timer.

Note: Although this paper focuses on the use of the Advanced Systems Management Adapter, implementation using the Advanced Remote Management processor built into the latest Netfinity products like the Netfinity 5500 is very similar. The Advanced Remote Management processor offers capabilities superior to that of the Advanced Systems Management Adapter:

- Additional dial-out alerts: VRM failure, PFA alert, non-critical voltage alert
- Remote diagnostics using ROM-based diagnostic utilities
- Remote POST Console to view and manage POST functions remotely
- Enhanced dial-in functions
- Enhanced monitoring of temperature, voltage and fan speed
- Enhanced dial-out functions when alerts occur

See Chapter 4 of *Netfinity Server Management* for more information about the management functions of current Netfinity and PC Server systems.

COM Ports

The Advanced Systems Management Adapter has two COM ports on the card: COM A (the bottom connector) and COM B (the top connector) as shown in Figure 1 on page 2.

Enabling a COM port means the port is available to the operating system once it boots as well as to the Advanced Systems Management Adapter. Disabling a COM port means only the adapter can use the port. By default, both COM ports are disabled and we recommend you keep them disabled.

Enabling COM ports lets you assign IRQ and I/O Address for COM A and COM B. COM A is not used by the Advanced Systems Management Adapter, so can you assign resources to the port to be used as an additional COM port, such as COM 3.

COM B is used by the adapter to communicate via modem to another machine. Enabling COM B means the port is shared between the adapter and the operating system. While the server is off, the COM B port is owned by the Advanced Systems Management Adapter. After the operating system boots, the COM port acts as a normal serial port.

If you do enable COM B, make sure the IRQ and I/O Address are not used by any other device. For example, if you assign IRQ 4 and I/O 3F8, you need to disable COM 1 in your server's setup, as these values are used for COM 1.

Note: When an operating system starts, it loads its serial port driver for each COM port, but only for those ports that are *not in use*. Sharing the COM ports only really works if, at the time the operating system starts, no active serial connection (dial-in or dial-out) exists. If a connection is active, the operating system will ignore the adapter COM port; however, you will still be able to dial into the Advanced Systems Management Adapter using that port.

See Chapter 3 of *Netfinity Server Management* for more information about the Advanced Systems Management Adapter.

Netfinity Manager

Netfinity Manager is IBM's comprehensive hardware systems management environment for IBM Netfinity and PC Servers. It provides an easy-to-use graphical set of local and remote services designed to make the server and client systems simple and affordable to manage. It is shipped with all IBM Netfinity and PC Server systems as part of ServerGuide. The whole aim of Netfinity Manager is to give you, the network administrator, a suite of tools designed to assist in the management and monitoring of your server platform both remotely and locally from the server console.

Netfinity Manager operates in a peer-to-peer mode that minimizes the need for expensive system management hardware. All that is required is the presence of a physical network or a serial link. Netfinity Manager has its own interprocess communication system that is used for communication between Netfinity Manager modules and services, locally and when operating remotely over a network. It has a very flexible modular design that allows for a variety of system-specific installations and plug-in options to be used.

There are two "flavors" of Netfinity Manager:

1. IBM Netfinity Manager
2. Client Services for Netfinity Manager

Whenever you want to manage some other PC or server, you would use Netfinity Manager. Whichever machines you want to be manageable remotely or only want that machine to be able to manage itself and no other machines, you would install Client Services for Netfinity Manager.

Netfinity Manager is included with every IBM PC Server and Netfinity system. One license of the manager code and 10 licenses of the Client Services are included.

What do I Install on my servers? There are two schools of thought. If you do all your administration from your own workstation and not from the server keyboard, then it makes sense to install Client Services on your servers. If you administer your servers while sitting at the server keyboard, then you will need to install Netfinity Manager on your servers.

Netfinity Manager is divided up into functions, each of which has an icon in the main window as shown in Figure 2.
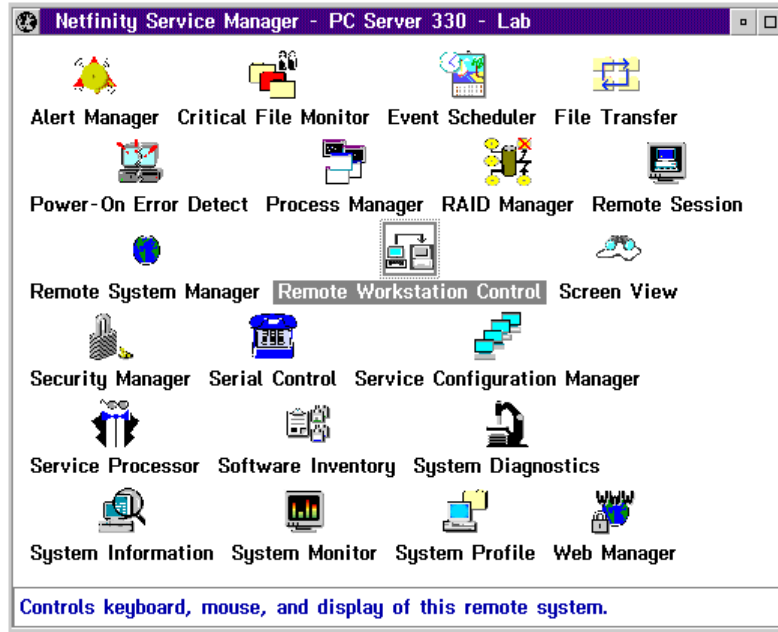

Figure 2: Netfinity Manager Main Window

Alert Manager

The Alert Manager is an extendible facility that allows receiving and processing of application-generated alerts. These alerts can be the result of informational, warning or error messages and can originate from a variety of hardware and software sources both within and outside of Netfinity Manager.

A variety of actions can be taken in response to alerts, including logging alerts, notifying the user, forwarding the alert to another system, executing a program, playing a WAV file, generating an SNMP alert message, dialing out to a digital pager service, or taking an application-defined action.

The base service that is at the heart of the alerting function is Alert Manager -- all alerts that are generated by Netfinity base services are sent to it. Alert Manager matches an incoming alert against one of its default and user-definable filters (called profiles) and then if matching, carries out the appropriate action.

To start Alert Manager, double-click on its icon in the Netfinity Manager Main Window. You will then see Figure 3 which also doubles as the alert log.
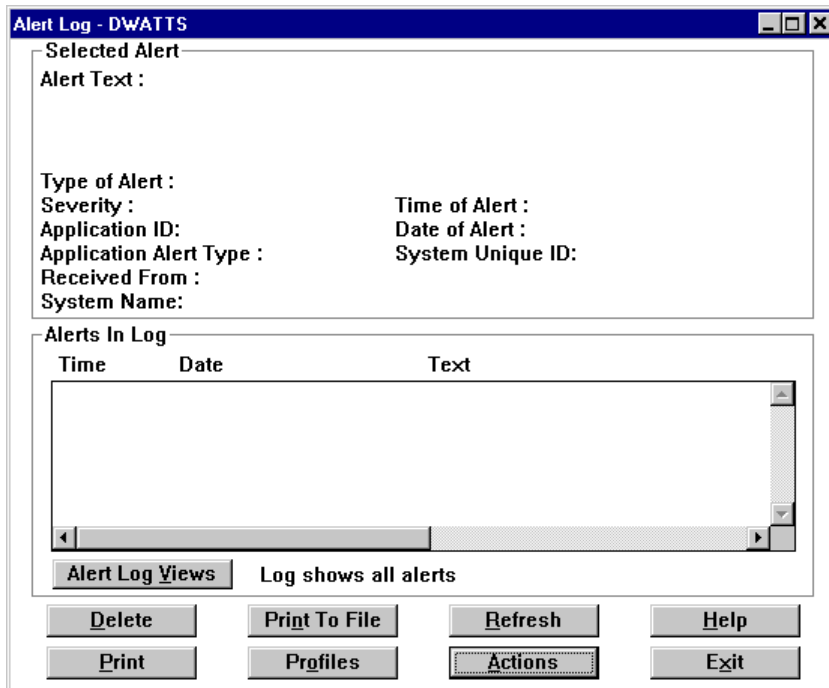

Figure 3: Alert Manager Main Window

As stated above, alerts can be the result of informational, warning or error messages and can originate from a variety of sources. In fact, there is a constant stream of these messages being generated. You would normally only want to be made aware of a subset of these. You do this by defining an alert action.

There are two ways to define an alert/action combination:

1. Define a filter (called a profile) which specifies the criteria as to when an alert will be generated, followed by defining an action to perform as a result of that profile being met (called binding the action to a profile); or

2. Simply define the action by specifying the criteria directly (called binding the action to an alert condition).

There is no significant difference between these two methods except that defining a profile before binding it to an action gives you a little more control over the alerts and allows you to give each action a name. If you plan to have multiple actions as a result of a single alert, it will be easier if you use the first method.

See Chapter 2 of *Netfinity Server Management* for more information about Netfinity Manager and Alert Manager.

Setting up the Scenario

In this example, the air conditioning in the server room has failed. We have a Server 330 with an Advanced Systems Management Adapter installed and we want certain events to occur as the temperature rises, including contacting the administrator. Ultimately, we want the server to shut down when the temperature reaches an extreme value.

The specific actions we want are listed in Table 1.

Table 1: Temperature Threshold for our Scenario		
Description	**Temperature**	**Action to perform**
Hot	40ºC	Send a warning alert to the administrator
Too Hot	50ºC	Send an error alert to the administrator
Danger	64ºC	Power off the machine

Note: The values you set these thresholds to will depend on the location and the environment your server is working in. For example, if your server is in a chilled server room the temperature thresholds will be different from a regular office environment.

At the 40ºC mark, we want the administrator to be paged with an information message. On the second event, the 50ºC mark, we want her to be paged again with an error message. The final event will be at 64ºC, which will power down the machine. The 64ºC threshold is hard-coded in the microcode in the Advanced Systems Management Adapter.

These are the steps involved in setting up the scenario:

1. Install the Advanced Systems Management Adapter

    Configure the adapter and install the device driver before installing Netfinity Manager. If you do not install the driver first, Netfinity Manager will not be able to communicate with the service processor.

2. Configure a modem

    The scenario calls for the server to dial out to a remote pager so a modem is required to do this. Install your modem so that the operating system can communicate with it. We set this example up so that the Advanced Systems Management Adapter uses Port B and it is also shared with the operating system (see "COM Ports" on page 3). We connected the modem to COM B of the adapter and gave it port address 2F8 and IRQ 3 which the operating system assigned as COM2:.

3. Install Netfinity Manager

    See *Netfinity Manager Quick Beginnings* (available in the Book Factory in ServerGuide) for information on how to set up Netfinity Manager under your chosen operating system. Ensure you install service processor support when prompted.

4. Configure the Advanced Systems Management Adapter

Using the installed Netfinity Manager, configure the dial-out settings for the service processor. When configuring the Advanced Systems Management Adapter, set it to dial out on a critical temperature. This will allow a pager to be called when the system is powered off. The configuration can be seen in Figure 4.

Figure 4: Service Processor Dial-Out Setup. In our scenario, we need to have the Critical Temperature option set.

5. Configure System Monitor

The Service Processor Operational Parameters window shows five temperature sensors on the Server 330 as shown in Figure 5. The Advanced Systems Management Adapter has a threshold associated with each of these temperature sensors. If the temperature exceeds any one of these thresholds for more that one minute then the system will be powered off by the Advanced Systems Management Adapter card.
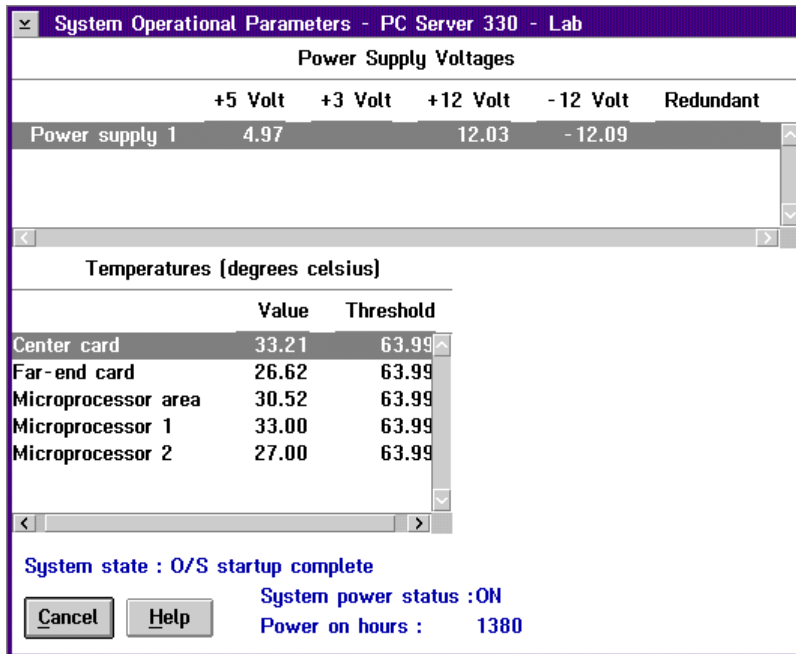
Figure 5: Service Processor Operational Parameters

System Monitor will display three of these temperatures as monitors which you can set thresholds on:

- • CPU 1 temperature
- • CPU 2 temperature
- • System Temperature (this directly relates to the Advanced Systems Management Adapter card center temperature sensor)

6. Create a threshold for the system temperature

    The threshold can be set up for each of the monitors and allows you to set a limit, above which it will generate an alert. We use System Monitor to configure the thresholds as per "Configuring Thresholds" on page 9.

7. Set up Alert Manager profiles

    System Monitor will send a set of alerts to Alert Manager when the conditions are met. We need to configure Alert Manager to perform the required actions. This is discussed in detail in "Configuring Actions" on page 11.

Configuring Thresholds

To configure the threshold in Netfinity Manager, do the following:

1. Start System Monitor and select **Windows > Show Monitor...** This will show a list of all the available monitors.

2. Select the **System Temperature** monitor and select **OK**.

    Note: If the System Temperature monitor is not in the list of available monitors, then it is likely you installed the Advanced Systems Management Adapter after you installed Netfinity Manager. You will need to reinstall Netfinity Manager.

3. Open the threshold settings window by either double-clicking on the monitor or right-clicking on the monitor and selecting **Open > Threshold**. Figure 6 appears.
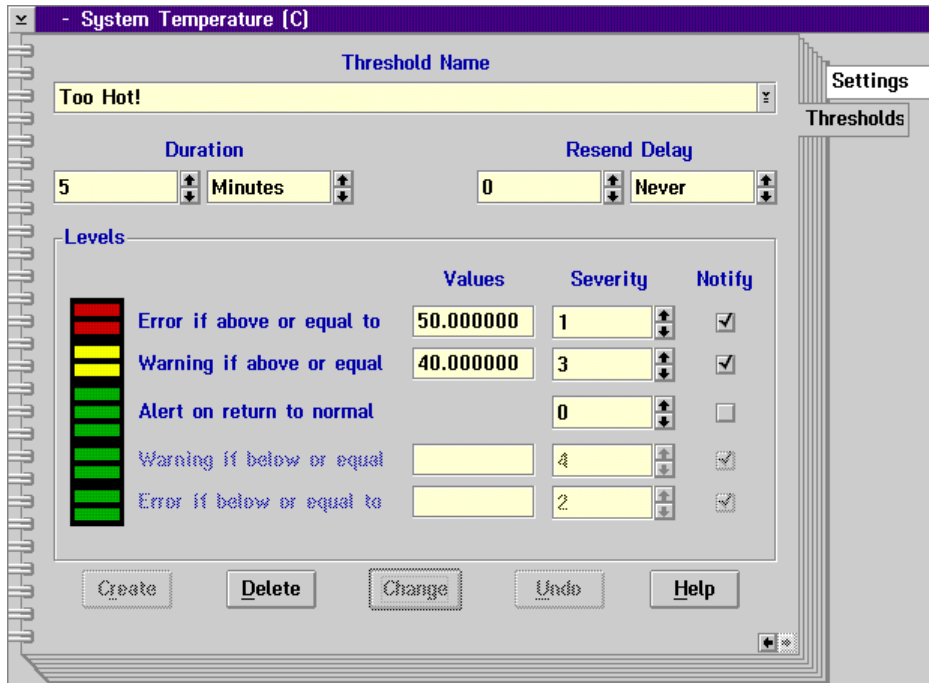

Figure 6: System Temperature Threshold Settings

    You now need to configure the threshold, as shown in Figure 6.

4. Name the threshold.

    This can be any name or phrase you would like but it does get passed to alert manager and does appear in the alert text. We called ours "Too Hot!" Once you start typing in this box the Create button becomes active and you can then set the thresholds in the level boxes.

    > **NT User Interface Tip!** Under Windows NT you will need to press Enter in the Threshold Name box to cause the Create button to become active.

5. Set the threshold's duration.

    Specify the length of time that the monitor's threshold value must be exceeded before an alert is generated.

6. Set the resend delay.

This will specify the length of time that the System Monitor will wait, after sending an alert, before resending a duplicate alert if the threshold value continues to be exceeded. For our example, we want only one alert to be sent.

7. Set the threshold's values.

   You can set up to four different threshold values, each of which will generate a different Netfinity alert.

8. Set the threshold's severity.

   A default severity is set for each of the threshold values. The values can be adjusted for your own requirements.

9. Select notify values.

   If you want an alert to be sent locally on the threshold you have to select the **Notify** check box. We do want this to be sent so leave this as shown in Figure 6 on page 10.

   The **Local Notify** checkbox is only seen if accessing from a remote manager and is useful if you want all alerts to be handled by one machine. If you want the threshold to generate a Netfinity alert on the system on which the threshold is being configured (thus enabling the local system to use its Alert Manager to respond to the alert), select the **Local Notify** check box.

   We shall neither use this option nor see this option as we are configuring the alert locally.

10. Select alert on a return to normal temperature

   This will generate a separate alert to notify you that threshold values that were previously exceeded are no longer being exceeded. Select the **Alert on Return to Normal** checkbox. We will not be using this option but it may be a useful item in your environment.

11. Save the threshold by clicking on **Create**.

   If the Create button is not highlighted then put the cursor in the Threshold Name field and press Enter. The button will then become active. If you have been editing a previously configured threshold, select **Change** to save the new threshold values.

System Monitor has now been configured to send alerts when the various temperatures are reached. We now need to configure Alert Manager to react to those alerts.

Configuring Actions

System Monitor will send a set of alerts to Alert Manager when the conditions are met. These alerts will be very similar as the Application ID and the Application Alert Type will be the same for both alerts.

As we want to have a different message sent to the administrator's pager when different conditions apply, we will set up the actions using profiles and not just Alert Conditions. This will allow us to name and group the alerts.

To enable Alert Manager to automatically respond to received alerts, you must associate (or *bind*) an alert profile to an action. Once an alert profile is bound to an alert action, the alert action will be performed automatically whenever Alert Manager receives an alert that fits the profile. See "Alert Manager" on page 5 for more information on alerts and alert profiles.

Configuring Alert Profiles

To configure the alert profiles do the following:

1. Open the Alert Manager on the Server 330.

2. Click the **Profiles** button.

    We need to define an alert profile for each of the three alerts that will be coming in to the Alert Manager on the server. Based on the thresholds we sent in "Configuring Thresholds" on page 9, System Monitor will issue alerts for the 40°C and 50°C marks, and the Service Processor will issue an alert when the temperature reaches the critical 64°C point. The specifics of the alerts are shown in Table 2:

Table 2. Details for the Three Alerts			
Alert Data	**40°C Alert**	**50°C Alert**	**Power-off Alert**
Alert Type	Warning	Error	Device Information
Severity	3	1	0
Application ID	MonitorB	MonitorB	SysMgt
Application	0	0	102
SenderID	Any	Any	Any

For the 40°C alert, we would get a severity 3 warning and at 50°C mark we would get a severity 1 error. The alert conditions for the 40°C mark can be seen in Figure 7.
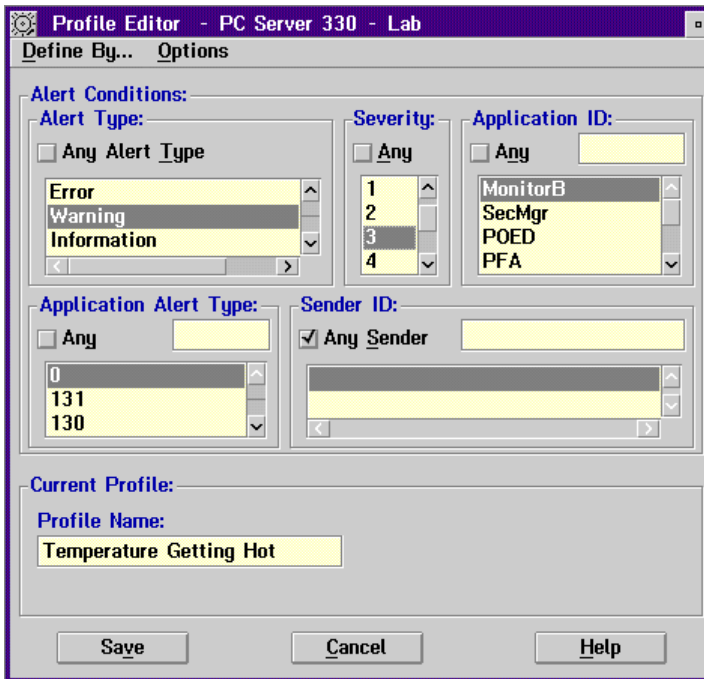
Figure 7: Profile Editor for 40ºC Alert

3. Click the **New** button to open a new profile in the Profile Editor. The Profile Editor enables the user to define profiles that match classes of alerts received by the Alert Manager.

4. From the Profile Editor window, ensure that Alert Conditions is selected in the menu and not Profiles Composition. Select **Define By... > Alert Conditions**.

5. Select an Alert Type.

    As per Table 2 on page 12, for the 40ºC profile this is Warning.

6. Select a Severity.

    For the 40ºC profile this is 3.

7. Select an Application ID.

    For the 40ºC profile this is **MonitorB**. If the Application ID required is not available from the list, you may add it to the list by entering the ID in the entry field above the selection list and pressing Enter.

8. Select an Application Alert Type.

    For the 40ºC profile this is 0 as per Table 2 on page 12. If the Application Type required is not available from the list, you may add it to the list by entering the type in the entry field above the selection list and pressing Enter.

9. Select a Sender ID.

   For the 40ºC profile this is blank as it comes from the local machine. So we can set the check box to specify that it is from any sender. If we wanted the local machine only, we would either select the network address of the local machine or the blank line.

10. Name the Profile.

    You must select a name for the profile. For the 40ºC profile we set this to **Temperature Getting Hot**.

11. Save the defined profile. This action will now appear in the Profile List window of the Alert Profiles window. The profile editor will look like Figure 7 on page 13 at this point.

12. Repeat Steps 3 to 11 but this time for the 50ºC Alert and the Power Off Alert. Refer to Table 2 on page 12 for the settings.

    We also want to log all temperature alerts so we now set up a new profile based on all previously defined alert profiles as shown in Figure 8. To get to the window shown in Figure 8, from the Alert Profiles window select **New**, then the menu option **Define By... > Profile Composition**.
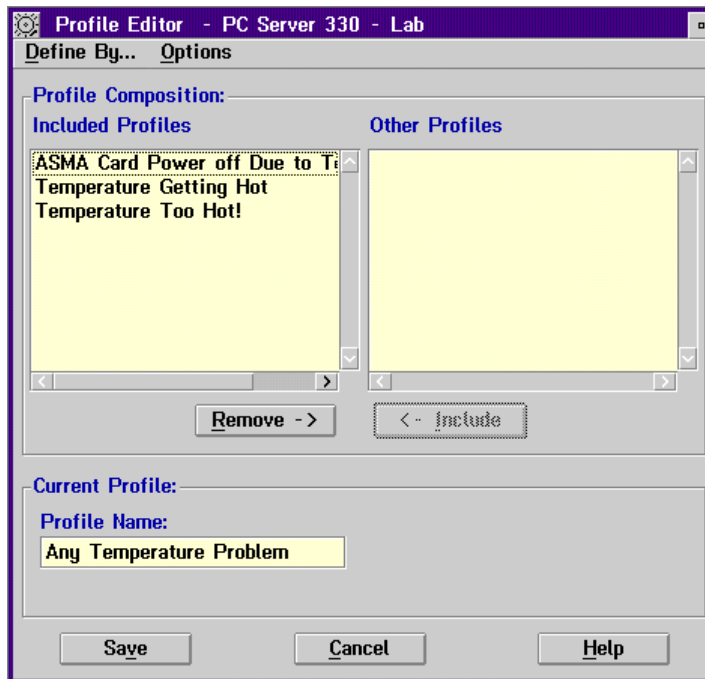

Figure 8: Creating a Profile to Log All Temperature Alerts

Configuring Alert Actions

Now that we have set up the profiles, we need to set up the actions. The Action Editor enables the user to create and configure actions that the Alert Manager will take in response to specific alerts. It uses a series of user-defined triggering profiles like those we have set up to determine which alerts will trigger a defined action.

14

When it receives an alert, Alert Manager checks each of the alert conditions to see if it meets the specifications for a defined action. For this example we are only using profiles.

1. Select the **Actions** button from the Alert Log window and then select **New**.

2. Select the menu option **Bind To... > Profiles**. This allows us to select the predefined profile list and to select the action we want to use.

3. To configure an action to execute on a profile:

   • Select the Triggering Profiles you want the action to be triggered by as per Figure 9.

   • Set an Action Definition.

     In this case we want to set the action **Alert An Alphanumeric Pager through TAP Using Modem**. See the online help and Chapter 2 of the *Netfinity Manager User's Guide* (from ServerGuide Book Factory) for more information.

   • Give the action a name by filling out the Action Label field.

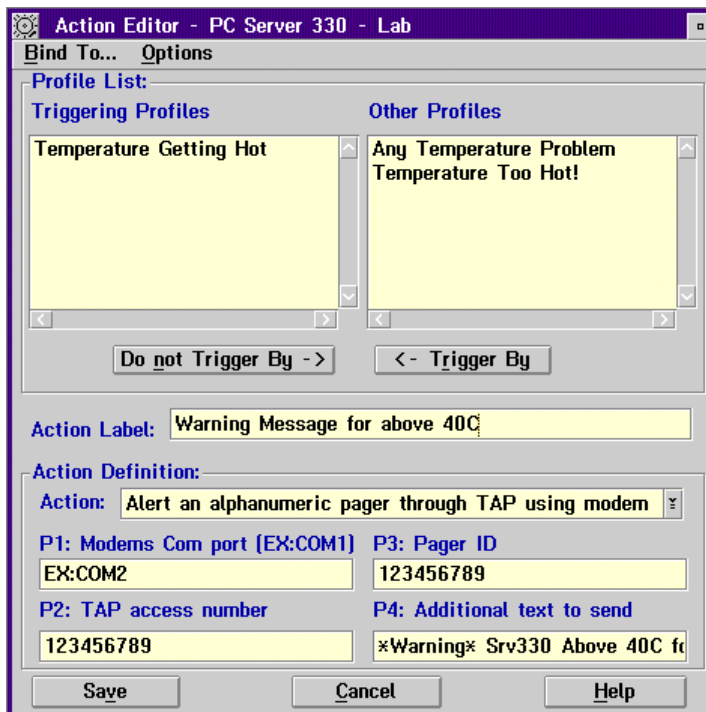   • Save the defined action.

Figure 9: Profile Editor Setup for the 40°C setup

4. Set up the Triggering Profiles and Action Definition as shown in Figure 9 for the first profile.

5. Repeat for the 50°C profile but with a different description and text message to send.

6. Add a new action "Log Temperature Problem" and set the action to **Add Alert to Log File**. Figure 10 shows the three profiles now bound to these actions.
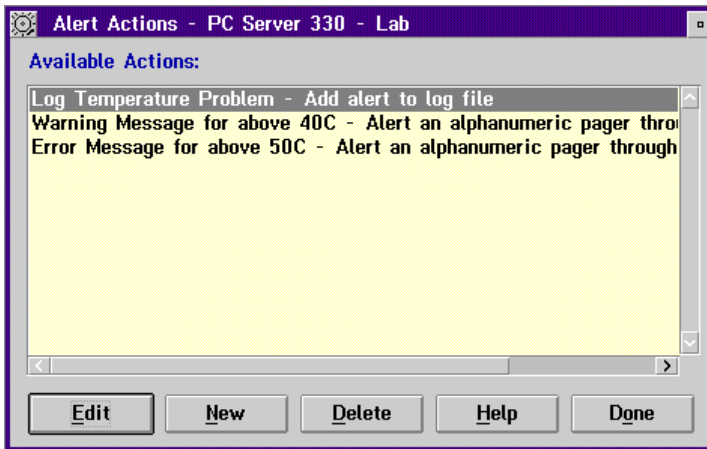
Figure 10: Alert Actions Defined

Alerting Users

With this example, the administrator is being notified about temperature rises. It would be pertinent to inform the user community as well about an imminent server outage. To do this, you could configure Netfinity Manager to issue a broadcast message to all users when the 50°C threshold is reached. This can be achieved by using the "Execute Command" action in Alert Manager to run the NET SEND command:

```
NET SEND /BROADCAST The server is getting too hot and may shut down. Save your work.
```

Of course, if the server does not shut down due to a recovery of the air conditioning, you may also want to notify the users that the server's temperature has returned to normal.

Conclusion

The server has now been configured to send alerts to the administrator's pager as the temperature rises. Table 3 shows the actions of the machine as the temperature rises.

Table 3: Temperature Thresholds	
Threshold Reached	**Action Taken**
40ºC	Alert from System Monitor is picked up by Alert Manager and two actions are performed: 1. The alert is logged in the Alert Manager log. 2. Netfinity Manager dials out on COM2 and sends a warning text message to a pager.

50°C	Alert sent from System Monitor to the local system. This is picked up by Alert Manager and two actions are performed: 1. The Netfinity Alert is logged in the Alert Manager Log. 2. Netfinity Manager dials out on COM2 and sends an error text message to a pager.
64°C	The following actions are performed: 1. The adapter sends an alert to the local system that the system is over temperature. 2. The Netfinity Alert is logged in the Alert Manager Log. 3. The error is logged in the adapter's own error log. 4. The system is powered off. 5. The adapter dials out to the predefined Pager after the machine has been powered off. **Note**: Netfinity Manager does not dial out as there is no time to make the connection before the machine will power off.

Additional Information

For more information on IBM Netfinity Manager, see the IBM Redbook *Netfinity Server Management*, SG24-5208 available from the IBM International Technical Support Organization's Web site at **http://www.redbooks.ibm.com**.

For more information on IBM Netfinity directions, products and services, refer to the following papers and briefs, available from the Technical Library on our Web site at **http://www.ibm.com/netfinity**.

- *IBM Netfinity PCI Hot-Plug Solutions*
- *IBM Netfinity Technology Trends and Directions*
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Printed in the United States of America
4-98

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