TECHNOLOGY BRIEF

February 1998

Compaq Computer Corporation

ECG Technology Communications

CONTENTS

Compaq Solutions for Remote Server Management

Compaq offers a range of hardware- and software-based server management tools that can be used to reduce downtime and increase productivity. This technology brief uses examples to describe how an administrator can use the tools to meet customer needs for remote server management. A short introduction discusses why a customer should consider server management tools and what types of factors should be considered in selecting a tool. Three sample server configurations are given, each having a different set of management tools. The tools include Automatic Server Recovery, Compaq Insight Manager, Asynchronous Insight Management, Compaq System Partition Utilities, Integrated Remote Console, and the Compaq Remote Insight Board. This technology brief discusses various failure scenarios and differentiates between each server configuration in those scenarios. The failure examples range from a LAN failure to a server power loss. This technology brief assumes the reader understands server management terminology such as online, offline, inband, out-of-band, remote console, and management console.

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Compaq Solutions for Remote Server Management

First Edition (February 1998)
ECG053/0298

WHY CONSIDER SERVER MANAGEMENT?

Customers are increasingly concerned about total cost of ownership. An effective system administrator must understand all costs required to buy and maintain distributed enterprise computer systems, not just capital costs to implement the systems. The total cost of ownership includes the cost of server administration, cost of server and software downtime, and the cost of troubleshooting and resolving the problems that cause downtime.

Compaq offers a range of server management tools that can help reduce these costs. Among them are tools applicable to departmental servers or critical application servers. These server management tools can remotely access a server, monitor that server's activity, and take control of its activities as needed to ensure optimum functionality. The administrator can reduce server downtime costs by proactively monitoring performance, browsing event logs, adjusting parameters, or scheduling upgrades. With troubleshooting features such as videotext replay of Microsoft Windows NT "blue screens" or Novell IntranetWare "abends," the administrator can quickly debug problems and bring the server back up after a failure, reducing downtime even further.

FACTORS TO CONSIDER

Compaq designs hardware and software server management tools with a wide range of functionality, because no single solution is right for all customers. When selecting a tool to manage servers, an administrator must evaluate the type of server environment, the sensitivity level to application or server downtime, and the management requirements.

Server Environment

A server environment is typically categorized as either a data center or a remote site, but it could be both. Some companies replicate a data center in a remote location without any personnel. This environment is both remote and a data center. In any case, the administrator must be able to manage the servers from a set of central management consoles.

In a data center environment, an administrator can manage the servers over the network. Typically, when a server or its application software fails in a data center environment, the administrator goes to the data center to resolve the problem. However, Compaq server management tools allow the administrator to diagnose and resolve problems while remaining at a management console outside the data center.

Compaq remote management tools also enable an administrator to manage servers in a remote environment via a dial-up networking connection. An administrator can access many remote servers from a single management console, regardless of the operating system running on the server, the server conditions, or server location.

A customer must decide what level of protection is best, given the type of server environment. There may be more risk of expensive downtime in a remote environment than in a data center environment. A remote server in a location without administrator support may require a very robust server management solution.

Sensitivity to Application or Server Downtime

Another factor to consider is the sensitivity level to application software failure or server failure. For example, a web server that holds all the catalog and sales information for ordering from an online catalog of a global company is a critical application server. If the server were to go down, a lost sale and a lost customer is only a mouse click away. Since access to the desired website is not available, the customer goes to a competitor's site and orders a similar product. The cost to the business in lost sales and lost customers can be significant. Such a server requires a very

robust management solution. A failed file and print server, in contrast, may temporarily prevent a group of users from printing documents, but is unlikely to critically hinder the business. This type of server would require a cost-effective management tool that covers the basics, but not every contingency.

Management Requirements

The administrator must also consider how the server will be accessed remotely. Will it be accessed through a network connection, through a phone connection, or either? Must the server be available at all times? Does the administrator need to maximize personnel resources so that one person can perform multiple tasks from a single management console? Finally, what types of management functions does the administrator need to perform? Only after these questions are answered can the administrator make a good decision about what tools are required.

COMPAQ TOOLS FOR SERVER MANAGEMENT

As industry-standard (x86-based) servers have made inroads into the traditionally mid-range and mainframe environments, Compaq has led the way in integrating management features to increase server reliability. Compaq meets growing server management needs by offering multiple tools:

- Automatic Server Recovery (ASR)
- System Partition Utilities
- Compaq Insight Manager
- Asynchronous Insight Management
- Integrated Remote Console (IRC)
- Compaq Remote Insight Board

This technology brief uses different examples of failures to explain the various tools and how each tool can be used for remote server management.

In the failure examples, a company has three servers at a remote site. Each server is configured differently, as shown in Figure 1.

- Server A is configured to use the standard tools available to all Compaq servers: ASR, System Partition Utilities, Compaq Insight Manager, and Asynchronous Insight Management.
- Server B has the IRC feature built into the system board. The server also has all the functionality of server A.
- Server C has the optional Remote Insight board installed. This server has all the functionality of server A and server B.

Server A:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management

Server B:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management
Integrated Remote Console

Server C:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management
Remote Insight Board

Figure 1: Three sample servers configured with different sets of Compaq server management tools

Server A:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management

Server A Solution: Compaq Standard Tools

The administrator configured this file and print server to take advantage of all the standard tools available from Compaq. With the addition of a modem, the server becomes much more robust than a typical x86-based server.

Automatic Server Recovery

Every Compaq server since the original Compaq ProSignia (1992) incorporates the ASR feature. ASR automatically resets the server after a critical hardware or software error. ASR can reset the server to the operating system (OS) or to the system partition utilities.

The ASR reset function is based on a hardware timer working in conjunction with the Server Health Drivers. If the Server Health drivers can no longer reset the hardware timer after some user-specified amount of time, the server is automatically reset. Using ASR alone, the administrator has no ability to interactively reset the server on demand. However, ASR can be configured so the administrator is paged when an ASR event occurs.

System Partition Utilities

The Compaq System Partition Utilities include the following:

- System Configuration Utility
- Drive Array Advanced Diagnostics
- Server Diagnostics
- INSPECT
- ROMPaq Utility

These utilities assist the administrator in diagnosing server problems, configuring new hardware, and upgrading ROMs. For example, an administrator can analyze the system configuration files to verify that no interrupts or other conflicts are causing system failures.

The system partition utilities are available when the server is reset. ASR can be configured to reset automatically to the system partition utilities; or the administrator can reboot to the system partition utilities through Compaq Insight Manager.

Compaq Insight Manager and Asynchronous Insight Management

Compaq Insight Manager is a software-based management tool that ships standard with every Compaq server. This tool monitors more than 1,000 management parameters to allow fault prediction and alerting, asset and configuration inventory, and performance monitoring. Compaq Insight Manager is composed of two parts: Insight Manager Agents and a Microsoft Windows-based console application. Compaq Insight Manager Agents are standards-based; they deliver alerts and performance data through the Simple Network Management Protocol (SNMP). See the white paper *Compaq Insight Manager*, document number ECG051.1097 or the *Compaq Insight Manager User Guide* for more details.

Through Compaq Insight Manager, a remote administrator can request an OS console operation, reset the server, view utilities, and view system configuration information. Insight Manager Agents deliver SNMP alerts to the management console whenever a subsystem goes past a threshold of normal operating parameters. Thus, the administrator is warned of degrading server conditions as well as failed conditions.

The functionality of Insight Manager is also available through an out-of-band connection if a network connection is not available. Asynchronous Insight Management provides access to Compaq Insight Manager via a dial-up networking, or asynchronous, connection. This gives an administrator additional flexibility in troubleshooting problems. If the server OS is still functioning, an administrator can dial in remotely and access Insight Manager via a Point-to-Point Protocol (PPP) connection.

Asynchronous Insight Management provides the same troubleshooting features as Compaq Insight Manager. Asynchronous Insight Management uses the standard PPP dial-in mechanisms to ensure secure access to the remote server. For more information about Asynchronous Insight Management, see the *Insight Asynchronous Management User Guide*.

Table 1 outlines the troubleshooting features that server A has available with ASR, system partition utilities, Compaq Insight Manager, and Asynchronous Insight Management.

Table 1: Troubleshooting features available with server A

Feature	Description
Diagnostics	• System partition utilities.
Problem Notification	• Dual Tone Multi-Frequency (DTMF) paging after an ASR reset event. • SNMP alerts to management console if OS is up and network or asynchronous connection exists.
Remote Console	**OS-based access:** • *Text-based* console through NetWare Virtual Terminal (NVT) host services or Telnet host services. ANSI terminal emulation is used to communicate with the host system. • *Graphics-based* remote console for Windows NT servers enabled by Compaq Carbon Copy or Symantec pcANYWHERE. These run over same standard PPP connection as Asynchronous Insight Management.
Remote Reset	**If OS is up:** • Perform normal (“warm”) reset, cold reset or a reset to system utilities through Insight Manager (network connection) or Asynchronous Insight Management **If OS is down:** • ASR reset to OS or system partition utilities (if configured to do so)
Security Features	Standard PPP authentication mechanisms

Server B Solution: Integrated Remote Console

This server has all the capabilities associated with server A, plus the additional IRC function (Table 2).

Server B:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management
Integrated Remote Console

IRC is an integrated hardware function that is OS-independent and provides remote access and remote control to interactively diagnose server failures. IRC enables the administrator to access the server, view the previous ASR reset sequence, perform diagnostics, reset the system interactively, and watch the reset process. All ProLiant servers since the Compaq ProLiant 2500, announced in 1996, include IRC as standard hardware. Consult the user documentation provided with the server or the product information on http://www.compaq.com/ to determine if IRC is included in a specific Compaq server model.

IRC allows remote access to and control of the server independent of the server OS. It is available remotely through an asynchronous connection via Compaq Insight Manager or an ANSI terminal emulation program. Automatic password authentication, supervisor level rights for specific functions, and an optional dial-back feature provide security against unauthorized users. For more information, see the technology brief *Remote Server Management with Integrated Remote Console*, document number 582A/1096.

Table 2: Troubleshooting features of server B with Compaq Integrated Remote Console. These features are in addition to those mentioned in Table 1.

Feature	Description
Diagnostics	• Captures video text of last reset sequence • Captures snapshot of failure screen just before an ASR reset (Novell IntranetWare abends and Windows NT blue screens)
Problem Notification	• None inherent to IRC (notified through ASR or Asynchronous Insight Management)
Remote Console	**Hardware-based access:** • *Text-based* console through IRC **OS-based access:** • *Graphics-based* remote control for Windows NT servers is enabled by Compaq Carbon Copy or Symantec pcANYWHERE. These run over same standard PPP connection as Asynchronous Insight Management
Remote Reset	• Interactive server reset or complete power cycle. After a complete power cycle, the IRC connection is automatically reestablished when power returns.
Security Features	• Username and password identification • Optional dial-back • Variable user access rights • IRC event log (administrator knows who accesses IRC application)

Server C Solution: Remote Insight Board

Server C includes the optional Remote Insight board (Table 3). Like server B, it also includes all the functionality of server A with its "built-in" management features.

The optional Remote Insight board provides seamless remote access and control independent of both the server OS and the server hardware. The Remote Insight board is also fully integrated with Compaq Insight Manager. An administrator can remotely access the Remote Insight menu

through the Insight Manager interface, through an ANSI terminal emulation program, or through a web browser. The web browser uses the PPP dial-in connection with its user authentication and security features, rather than an unsecured Internet web connection.

Server C:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management
Remote Insight Board

Like IRC, the Remote Insight board can be used when the server OS is not functioning. Unlike IRC, Remote Insight can be used even when the server hardware is not functioning or power is lost. If a server power loss occurs, Remote Insight's battery backup provides power for at least 30 minutes.

Remote Insight provides several important troubleshooting features that none of the other Compaq tools can. Remote Insight provides both numeric and alphanumeric paging. Other essential troubleshooting features are provided by Remote Insight through its multiple diagnostic capabilities. It captures videotext of the last two reset sequences in addition to the last failure sequence. It can also access several management logs that are unavailable through IRC. For additional information about the Remote Insight Board, see the white paper *Remote Insight Product Overview*, document number 042A/0797 or the *Compaq Remote Insight User Guide*.

Table 3: Troubleshooting features available to server C with the optional Remote Insight Board

Feature	Description
Diagnostics	• Videotext sequences: Captures the two most recent reset sequences. Captures last failure sequence. • Copies of the server's Critical error log and Integrated management log • Event log time stamps key events • Survey utility provides snapshot of server configuration • Seamless integration with Insight Manager
Problem Notification	• SNMP traps and alerts even if network is down • Numerical and alphanumeric paging even if server has no power
Remote Console	**Hardware-based access:** • *Text-based* console through Remote Insight **OS-based access:** • *Graphics-based* remote control for Windows NT servers is enabled by Compaq Carbon Copy or Symantec pcANYWHERE.
Remote Reset	• Interactive server reset if OS goes down. • Seamless connection to OS-based, third-party programs after reset (such as graphics remote console).
Seamless Connectivity	Simultaneous access using the same PPP modem connection • Text-based console • Graphics-based console • SNMP/Insight Manager • Web browser access
Security Features	• Username and password identification (up to 12 users) • Optional dial-back • Variable user access rights • Access restriction: authenticated PPP vs. terminal emulator

The appendix summarizes additional information for each of the management tools used in servers A, B, and C. It includes how the tools are accessed, their primary purpose, the hardware and software required to implement each tool, and availability of each tool.

COMPLEMENTARY PRODUCTS FOR SERVER MANAGEMENT

The remote console feature is normally available only in text mode. However, with the use of a program such as Compaq Carbon Copy or Symantec pcANYWHERE, a graphical console feature is also available. If the server OS is up and running, the graphical console gives the administrator the ability to view and control remotely a graphical OS such as Microsoft Windows NT.

To use a graphical console, the OS must be functional on the managed server. If the server OS is up, the administrator can connect to Carbon Copy via the same PPP connection as used with Asynchronous Insight Management or Remote Insight. The administrator can manage the server through Insight Manager and also view what is on the server's console simultaneously.

If the server OS is not functional, the administrator must bring the OS back up using the hardware-based tools of IRC or Remote Insight. If the administrator uses IRC to bring the OS back up, and then wants to access Carbon Copy, the administrator must disconnect the modem connection from IRC, then dial back in to the OS. Only one modem is used for both functions. This modem-sharing function of IRC allows the same modem to be used for connections to the OS as well as a connection directly to IRC and the server hardware.

Remote Insight provides the advantage of seamless integration with OS applications. After the OS is functional, there is no need to disconnect from the Remote Insight board. Through RI's internal PPP connection and direct access to the server OS, the administrator can move directly from the Remote Insight menu to OS-based programs such as Carbon Copy.

USAGE EXAMPLES

The following examples describe how an administrator can use Compaq tools to remotely manage servers. The examples begin with one of the least severe types of problems: a failure in the LAN. They progress toward increasingly critical server failures. In each example, all three servers exhibit the same failure mode. The examples describe how an administrator resolves the problem, depending on the server configuration (A, B, or C).

Example 1: LAN Failure

When a server OS is up and the network is functioning, an administrator can manage servers using OS-dependent applications, such as Compaq Insight Manager or Carbon Copy. It is when the server OS is down, some element of the network is down, and/or the server is no longer attached to the network that the administrator with a remote server faces a real challenge. In this scenario, the network is compromised so that the remote administrator can no longer access the server through a network connection (Figure 2).

Server A:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management

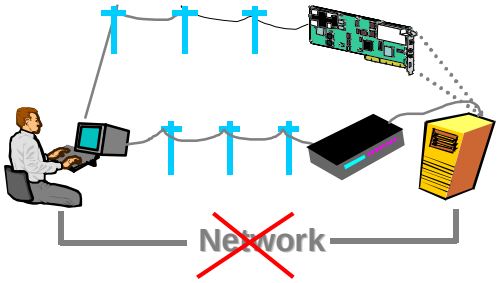

Figure 2: Representation of administrator that can no longer remotely manage through a network connection

Server A

Through Insight Manager, the administrator sees that the remote server is inaccessible through the network connection. The green dot representing server A on the Insight Manager Device List has turned black (Figure 3). Unfortunately, the administrator does not know whether the server is down or whether there is a problem with the network. No SNMP alert has been received through the network because some element of the network is down.

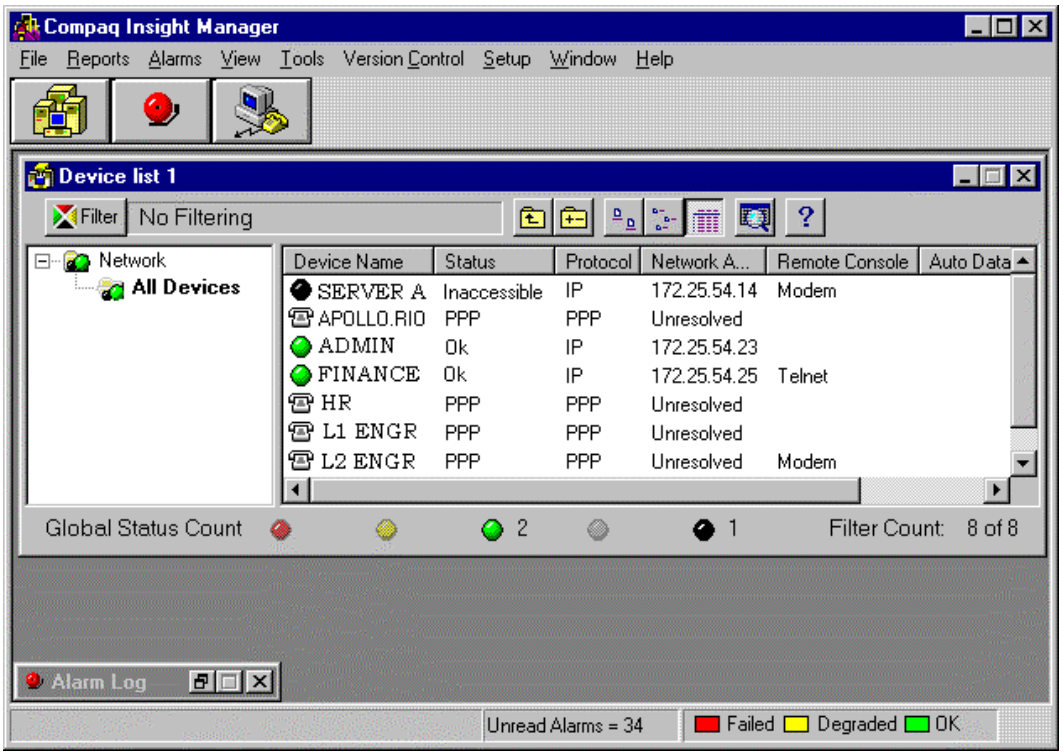

Figure 3: This figure shows that Compaq Insight Manager has lost the network connection with server A. Server A is inaccessible and therefore represented by the black dot.

The administrator dials in to the server modem using Asynchronous Insight Management. Now that the administrator is actually accessing server A directly via the asynchronous connection, the administrator sees that server A has a failed network card (Figure 4). Although an SNMP alert couldn't go through the network, an SNMP alert could go through the Asynchronous Insight Management connection (the PPP connection) to the management console.

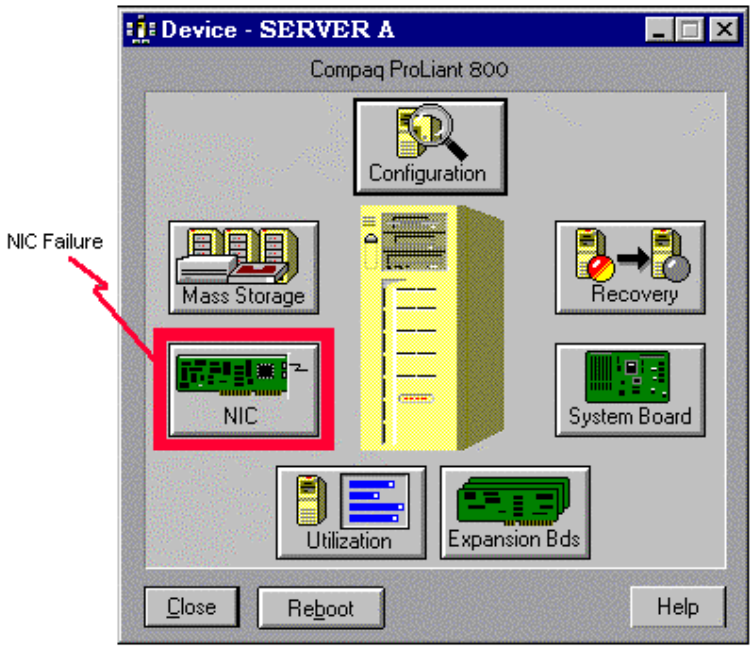

Figure 4: Insight Manager menu highlighting the network board failure

Through Asynchronous Insight Management, the administrator can confirm that the server is functional otherwise and that someone must replace the network board in the server to bring the network clients back up. When a failure of this type occurs, Asynchronous Insight Management gives sufficient information to resolve the problem successfully.

Server B

With IRC installed in server B, the administrator would perform the same types of actions as described for server A. The administrator sees that server B is now represented by a black dot in the Insight Manager software. No SNMP alert has been sent through the network because some element of the network is down. The administrator dials in to the modem in server B. This modem is shared between the hardware-based IRC and the OS. Since the OS is up, IRC allows the call to go to the OS so Asynchronous Insight Management can be accessed. Because Asynchronous Insight Management runs over a PPP connection, all SNMP alerts will be available through that link. IRC, in this case, gives the administrator no benefit over the existing Asynchronous Insight Management tools. The benefit of using IRC becomes clear when the operating system fails, as in examples 2 and 3.

Server B:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management
Integrated Remote Console

Server C

The administrator sees that server C is now represented by a black dot in the Insight Manager software. No SNMP alert has been sent through the network because some element of the network is down. The administrator dials in to the internal modem on the Remote Insight board in server C. After accessing Remote Insight, the administrator can access the server information and determine the same things as with servers A and B. The administrator receives the SNMP alert of the network board failure via the Remote Insight console. In this case, having Remote

Server C:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management
Remote Insight Board

Insight gives the administrator no advantage over the existing Asynchronous Insight Management tools.

Figure 5 illustrates the benefit that asynchronous connections bring to remote servers. Once the network connection has been severed, the administrator can no longer diagnose failures through the LAN with Compaq Insight Manager. By connecting asynchronously either to an external modem or the Remote Insight board, the administrator can reconnect with Insight Manager and determine that the network board has failed. The administrator can then take appropriate action.

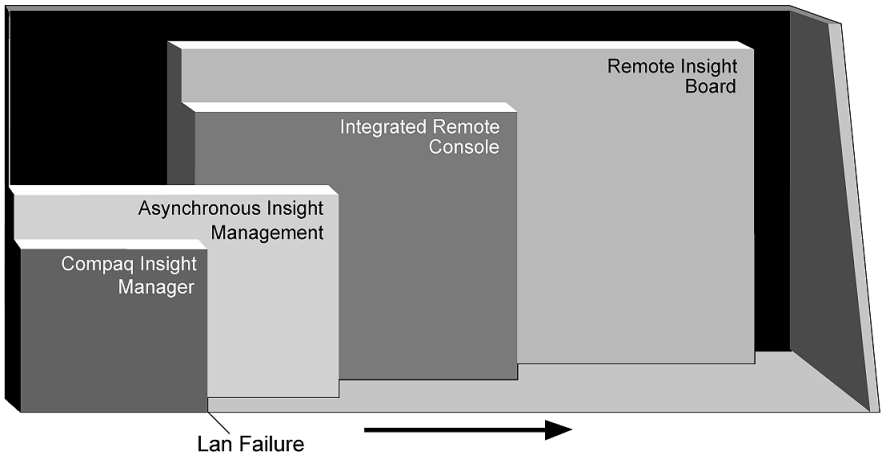

Figure 5: The asynchronous connections in Asynchronous Insight Management, IRC, and Remote Insight allow a LAN failure to be detected. The arrow indicates increasing severity of failure.

Example 2: OS Failure Caused by Software

Software problems often cause a server OS to stop functioning. For a critical server, the administrator must have a tool for resolving such OS failures. Although Compaq Insight Manager and Asynchronous Insight Management are excellent tools, they no longer function when the server's agents are no longer running or when the OS is down. Hardware-based remote management tools are required.

Server A:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management

Server A

Insight Manager is loaded on the management console. It shows that remote server A is inaccessible through the network. Just as in the LAN failure example, the administrator does not know whether this is a server issue or a network issue. No SNMP alerts have been received because the OS is locked up. When the administrator dials in to Server A's modem and tries to access Asynchronous Insight Management, the connection will fail because the OS is not functioning. Neither Compaq Insight Manager nor Asynchronous Insight Management will help at this point since they are OS-dependent.

The administrator must depend on ASR to reset the server. After the normal timeout period, ASR resets the server. In the majority of cases, the server recovers from an OS crash after the ASR reset. After the server restarts successfully, ASR will send a page alerting the administrator of the event.

Because ASR cannot detect some OS or application crashes, the administrator needs a remote tool that is independent of the OS or any application (Figure 6). Without a hardware-based solution such as IRC or Remote Insight, the administrator must physically go to the server to diagnose and

correct the problem. The resulting downtime could significantly impact business operations and revenue when a critical server goes down.

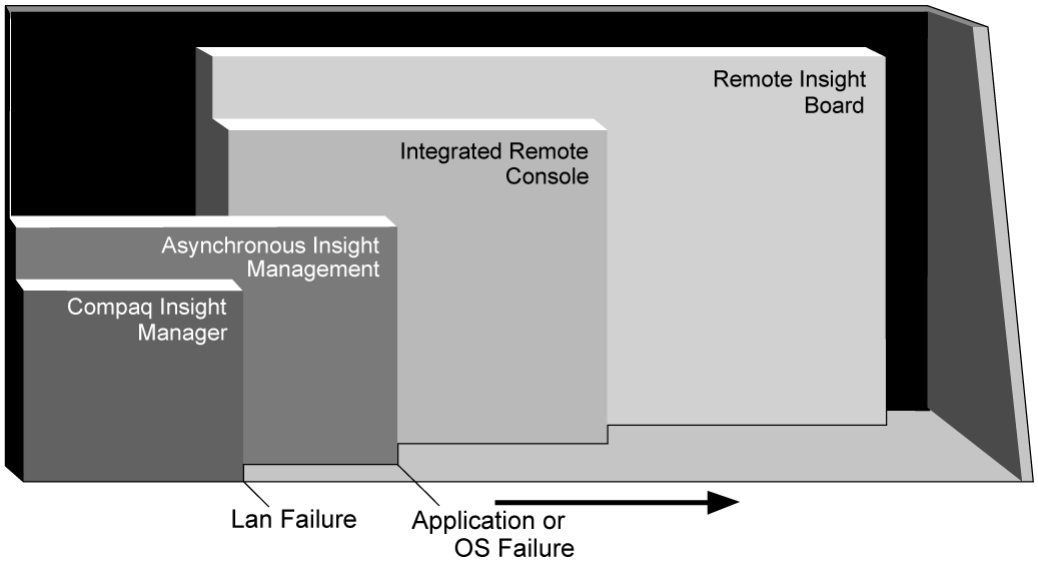

Figure 6: When an OS failure occurs, the hardware-based IRC and Remote Insight tools are required because OS-based tools such as Insight Manager and Asynchronous Insight Management can no longer function. The arrow indicates increasing severity of failure.

Server B:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management
Integrated Remote Console

Server B

The administrator sees that server B is now represented by a black dot in the Insight Manager software. No SNMP alerts have been received because the OS is locked up. The administrator dials into the server modem and directly accesses the server hardware by directing the call to IRC, rather than to the OS.

If an ASR reset has already occurred, the administrator can in many cases review the last text screen captured before the ASR reset (for example, a Windows NT blue screen or Novell IntranetWare abend) and replay the subsequent reset sequence.

If an ASR reset has not already occurred, the administrator can perform a server reset. During the reset, the administrator has complete control over the server. If necessary, the administrator can select F10 to access the system partition utilities, make any changes required, bring the server up in safe mode, and watch the entire reset process including Power-On Self-Test (POST), hardware controller initialization, and software driver loading. IRC is capable of remaining connected through this process which resets the server hardware and internal peripherals. The administrator can watch the entire reset process until the server OS comes back up and goes into graphics mode. At this point, a program such as Carbon Copy or pcANYWHERE is needed for the remote console.

If the server doesn't reboot properly, IRC can do a complete power cycle with most servers. When a complete power cycle is performed, the IRC connection is suspended. When the server power comes back on, the IRC hardware automatically re-establishes the remote connection. The administrator can view the remaining initialization process until the server OS goes back into graphics mode. As an integrated, hardware-based tool, IRC provides the first step in remotely managing servers that do not have a functional OS. It provides remote console and reset abilities without the additional cost of the Remote Insight board.

Server C:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management
Remote Insight Board

Server C

Server C is also represented by a black dot in the Insight Manager software. No SNMP alerts have been received because the OS is locked up. The administrator dials in to the Remote Insight board, which is also a hardware-based remote management tool like IRC. However, the optional Remote Insight board provides enhancements over and above what IRC does. If an ASR reset has already occurred:

- Remote Insight forwards the SNMP alert of the server reset to the management console. This is done asynchronously through Remote Insight's internal PPP connection capability.
- The administrator can review the last two reset sequences in addition to the last failure sequence. This helps the administrator to determine what led to the failure.
- The administrator can also access copies of the server's critical error logs, integrated management log, and latest Survey utility snapshot through the Remote Insight board.
- A continuous modem connection is available for seamless integration of OS-based applications such as Insight Manager and Carbon Copy. This eliminates the need for the administrator to redial to use Carbon Copy or pcANYWHERE.

If an ASR event has not already occurred, the administrator can still reset the server interactively and have access to all the enhancements just mentioned. The administrator can review the reset process until the OS comes back up in graphics mode, after which a program like Carbon Copy is needed for the remote console.

Example 3: OS Failure Caused by Peripheral Hardware

Although most OS failures are caused by software problems, some are caused by a hardware problem that cannot be fixed by a simple server reset. In this example, a hardware failure occurs on a non-redundant subsystem, such as a memory controller or a SCSI controller. The hardware failure causes the server OS to stop functioning and prevents successful rebooting of the OS.

Server A:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management

Server A

The administrator has Insight Manager loaded on the management console and sees that server A is inaccessible. Just as in the previous two examples, the administrator does not know whether this is a server issue or a network issue. Again, no SNMP alerts have been sent because the OS is locked up.

ASR will reset the server once the timeout duration is exceeded. Because the OS requires functioning hardware, it is unlikely that the OS will recover even after the ASR reset. Because the OS has stopped functioning, the administrator can gather no information from the server or bring the server back up with the standard software-based management tools. The administrator must physically go to the site to diagnose and resolve the problem.

Server B:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management
Integrated Remote Console

Server B

The administrator sees that server B is now represented by a black dot in the Insight Manager software. No SNMP alerts have been received because the OS is locked up. The administrator dials into the server modem and directly accesses the server hardware by directing the call to IRC, rather than to the OS.

Through the IRC remote console feature, the administrator can view what is on the server console. After the ASR event occurs, the administrator reviews the last video sequence before the OS crash and replays the reset sequence of the ASR event. A message during POST shows that a hardware component or particular device driver did not load successfully, causing the OS failure.

The administrator can then perform another reset of the server to bring up the system partition utilities. The administrator reconfigures the system to remove the offending hardware problem and then resets the server again. Reconfiguring the server may be enough to successfully bring the OS back up and allow the server to function. If not, the administrator is now fully aware of the problem that caused the failure and can quickly dispatch personnel with the proper hardware and associated drivers.

In an OS failure situation caused by a software fault or most hardware faults, IRC provides sufficient troubleshooting and control to recover the server. At the very least, IRC provides specific information about the failure so that administrator response time is shortened considerably. However, IRC access is not *guaranteed* after certain hardware faults, as will be shown in example 4.

Server C

Server C is also represented by a black dot in the Insight Manager software. No SNMP alerts have been received because the OS is locked up.

The administrator can perform a server reset by dialing in to the Remote Insight board. The administrator can gain additional information about the hardware component failure through the Integrated Management Log or through reviewing the two reset sequences and the failure sequence leading up to the server ASR reset. The Remote Insight board also provides access to the latest server configuration snapshot copied to Remote Insight by the Survey Utility. This is helpful to diagnose the current hardware information and details about the OS parameters. Access to the server is guaranteed as long as the Remote Insight board's battery power and internal modem remain functional. For the business-critical server, these extra capabilities may be a requirement.

Server C:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management
Remote Insight Board

Example 4: Server Failure

A server failure may be caused by something more catastrophic than a non-redundant component failure. For example, the system board itself may fail in an extreme case.

Server A

Server A is inaccessible through Insight Manager. Just as in the previous examples, the administrator does not know whether this is a server issue or a network issue. No SNMP alerts have been sent because the server has failed.

If the system board has crashed, the administrator can gather no useful information from the server or bring the server back up. This would be true even if the administrator were physically present in front of the server. The administrator must not only dispatch someone to the site but must also configure a back-up server until the failed system board can be diagnosed and replaced.

Server A:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management

Server B

Server B is also inaccessible through Insight Manager. No SNMP alerts have been sent because the server has failed.

The administrator attempts to dial in to the server through the asynchronous connection, but no connection to IRC can be established. Since IRC relies on the system board for functionality, the administrator can gather no information. If this were a business-critical server, the administrator would be required to dispatch someone to the site, as with server A.

Server B:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management
Integrated Remote Console

Server C

Server C:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management
Remote Insight Board

Server C is also inaccessible through Insight Manager. No SNMP alerts have been sent because the server has failed. The administrator dials in to Remote Insight. Although the connection to Remote Insight is established normally, no remote console can be established, indicating that the server has crashed.

Because of Remote Insight's complete independence from the server hardware, the error logs, failure sequences, and reset sequences can be accessed. The administrator is able to determine from these logs that the system board has crashed. In this example, only Remote Insight can provide any information, since it is the only tool completely independent of the server hardware (Figure 7).

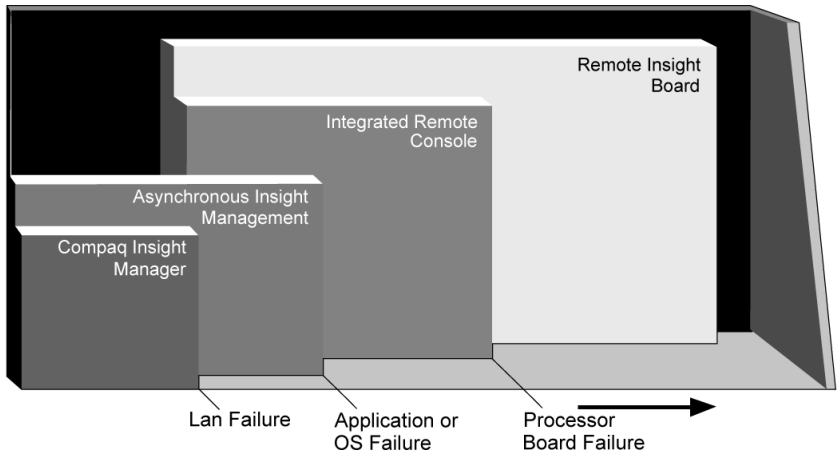

Figure 7: Catastrophic hardware failures such as a system board failure eliminate the usefulness of all tools except Remote Insight. The arrow indicates increasing severity of failure.

Example 5: Server Power Loss

If a server loses its network connection, an administrator can step in with Asynchronous Insight Management and resolve the problems. If a server loses OS functionality, IRC or Remote Insight can help the administrator diagnose and resolve problems. Although Remote Insight has more features than IRC, both can effectively handle many server failures. If the system board fails, IRC can no longer function. From a troubleshooting perspective, only one example could possibly be worse than a catastrophic system board failure: a power loss to the server. Only the Remote Insight board can provide any management functions if a server power outage occurs.

Server A

Server A:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management

From the management console, the administrator sees that server A is inaccessible. The administrator does not know whether this is a server issue or a network issue. No SNMP alerts have been sent because there is no power to the server.

The administrator has no information from the server at the remote site. The administrator tries to dial in through Asynchronous Insight Management, but cannot access the server's modem since the power is off. At this point, the administrator must send someone to the remote site to determine the problem.

Server B:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management
Integrated Remote Console

Server C:
ASR/System Partition Utilities
Insight Manager
Asynchronous Insight Management
Remote Insight Board

Server B

Server B is also inaccessible through Insight Manager. No SNMP alerts have been sent because the server has failed.. The administrator tries to dial in to the server through IRC, but cannot access the server's modem since the power is off. The administrator has no information from server B, either. Again, someone must go to the remote site to determine the problem.

Server C

Server C is also inaccessible through Insight Manager. No SNMP alerts have been sent because the server has failed. As explained in example 4, the Remote Insight board is still available even if a power failure occurs. Since it has its own modem and battery power, it is completely independent of the server hardware. The Remote Insight board sends a paging alert to the administrator with the power outage notification. Remote Insight can also forward SNMP alerts through its PPP connection to the administrator's Insight Manager console. The SNMP alerts and other information are available for at least 30 minutes after a server power failure. If configured to do so, Insight Manager can also page the administrator with a power failure alert.

Responding to the SNMP or the page alert, the administrator can dial in to the Remote Insight board and access all the available information about the server (blue screens, reset sequences, critical error log, integrated management log, and Survey utility snapshot). The administrator can also cancel delivery of Remote Insight alerts queued up for any other administrators. If additional servers are in the same facility, the administrator can dial in to these servers to determine if the power failure is a single server or if this is a campus-wide power outage. This example shows Remote Insight's ultimate value. No matter what happens to the OS or server hardware, including a power outage, Remote Insight remains available for at least 30 minutes to send alerts and allow the administrator to access information (Figure 8).

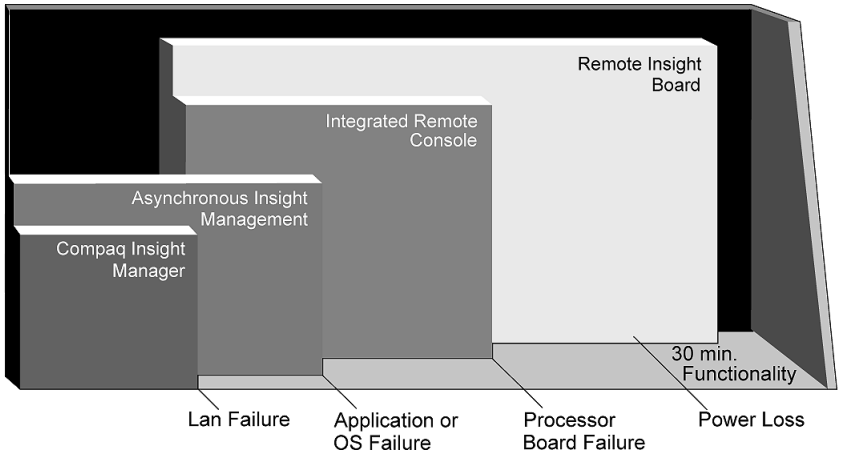

Figure 8: The Remote Insight board has features above and beyond other management tools, and these features are available in the most extreme server failure: a power outage.

CONCLUSION

Compaq has delivered leading server management tools for years. As the options and features continue to grow, administrators must determine their server management needs and select which tool provides the optimum solution from a cost:benefit standpoint. This brief has used various failure examples with three different server configurations: a server that uses existing baseline tools (Asynchronous Insight Management, ASR, system partition utilities, and Insight Manager), a server that uses IRC, and a server that includes the optional Remote Insight board. Each successive server configuration provides an increasing set of capabilities to remotely access, diagnose, and recover from failures. Compaq delivers comprehensive tool sets with integrated functionality that cover the entire scope of server management needs, from a file and print server to a business-critical application server.

APPENDIX: DETAILS ON COMPAQ SERVER MANAGEMENT TOOLS

Table A1: Purpose and availability

	Purpose	Available when:	How to access remotely:
ASR	To reboot server automatically after critical hardware or software errors	• Hardware or software fault occurs and user-configured countdown timer runs out. • Server power is available.	ASR is configured through System partition utilities. Using ASR alone, the administrator has no ability to interactively reset the server on demand.
System Utilities	Perform diagnostics, configuration of server; ROMPaq upgrades.	• Server hardware is available.	Through ANSI terminal emulation program or Insight Manager via a user-supplied modem
Insight Manager	To monitor more than 1,000 management parameters proactively. To control the operation of Compaq servers and clients based on the management data.	• Both the network and OS are up and running	Network connection (IP or IPX)
Asynchronous Insight Management	To provide the capabilities of Insight Manager over an asynchronous connection.	• OS is up and running • Modem connection is available	PPP connection via a user-supplied modem
IRC	To provide integrated remote console and remote reset function.	• Server has power (whether OS is up or down), • Core chipset is functional, • A modem connection is available.	Through Insight Manager or ANSI terminal emulation program via a user-supplied modem
Remote Insight	To provide remote server management independent of server OS, server hardware, or network connection.	• Anytime server power up • After a server power loss for at least 30 minutes.	PPP connection via ANSI terminal emulation program, Insight Manager, or web-browser via internal modem

Table A2 shows whether each tool is integrated into the server hardware (or software); other equipment needed to install the management tool; and the supported environments (servers, OSs).

Table A2: Supported environments

Tool	Benefit	Description
ASR	Standard/Optional:	Standard hardware integrated into server
	Installation Requires: (additional hardware or software)	Configuration via server configuration (F10) User-supplied modem if needed remotely and/or for paging alerts OS-specific Health Driver loaded
	Supported Environments:	All Compaq servers
System Partition Utilities	Standard/Optional:	Standard Partition is set up on boot drive.
	Installation Requires : (additional hardware or software)	Configuration via Server Configuration Utility (F10) User-supplied modem and phone line if needed remotely
	Supported Environments:	All Compaq servers
Compaq Insight Manager	Standard/Optional:	Software shipped with all Compaq servers
	Installation Requires: (additional hardware or software)	On management console: OS (see below) with Insight Manager installed On managed server: Insight Manager Agents loaded
	Supported Environments:	Server OSs : NetWare 3.12, 4.10, 4.10SMP, IntranetWare; Windows NT 3.51, 4.0; SCO OpenServer 5, 5.02, 5.04, Unix 3.24, UnixWare 2.11, 2.12; IBM OS/2, Warp version 3 and 4 All Compaq servers
Asynchronous Insight Management	Standard/Optional:	Software shipped with all Compaq servers
	Installation Requires: (additional hardware or software)	User-supplied modem and phone line On management console: OS (see below) with Insight Manager installed On managed server: Insight Manager Agents loaded
	Supported Environments:	Server OSs : NetWare 3.12, 4.10, 4.10SMP, IntranetWare; Windows NT 3.51, 4.0; SCO OpenServer 5, 5.02, 5.04, Unix 3.24, UnixWare 2.11, 2.12; IBM OS/2, Warp version 3 and 4 All Compaq servers
IRC	Standard/Optional:	Hardware integrated onto system board for certain servers
	Installation Requires: (additional hardware or software)	User-supplied Hayes Compatible, UART-based modem and phone line Configured via Server Configuration Utility (F10)
	Supported Environments:	Compaq Proliant family servers after 1996
Remote Insight	Standard/Optional:	Optional board
	Installation Requires: (additional hardware or software)	Phone line EISA slot
	Supported Environments:	Compaq servers with EISA slot