

ICT SYSTEM SUPPORT

Diagnose and fix problems

By the end of this topic, you should demonstrate knowledge in relation to:

- Define diagnostic terms
- Identify diagnostic and repair tools and their functions
- Tools to diagnose and fix the problems
- Hardware related problems
- Software related problems
- Internet/network related problems
- User related problems
- Role of ICT Policies in organizations

Definition;

Diagnostic terms means identification of a condition, disease, disorder, or problem by systematic analysis of the background or history, examination of the signs or symptoms, evaluation of the research or test results, and investigation of the assumed or probable causes. Effective prognosis is not possible without effective diagnosis.

Diagnostics is a method of testing a computer hardware device or software program to ensure it is working as it should be.

System diagnostic is a computer utility which is used to test a computer system for the purpose of identifying weak points, determining the cause of the problem, or assisting with setup.

Diagnostic tools

There are two different types of diagnostic tools: **Hardware and Software**

A. Hardware diagnostic tools

The tools ensure you that different parameters of your system are in the optimal zone, and thus optimize the way you can use your device.

The level of troubleshooting most often performed on PC hardware is exchanging Field Replaceable Units (FRUs). Due to the relative low cost of computer components, it is normally not practical to troubleshoot failed components to the IC level. The cost of using a technician to diagnose the problem further, and repair it, can quickly exceed the cost of the new replacement unit.

However, a few hardware diagnostic tools can be very helpful in isolating defective hardware components. These tools include;

- ✓ Software diagnostic disk
- ✓ Multimeter
- ✓ Cable tester
- ✓ POST card

i. Software Diagnostic Packages

Several commercially available disk-based diagnostic routines can check the system by running predetermined tests on different areas of its hardware. The diagnostic package evaluates the response from each test and attempts to produce a status report for all of the system's major components. Like the computer's self-tests, these packages produce visual and beep-coded error messages.

The main menu is the gateway to information about the system's makeup and configuration, as well as the entryway to the program's Advanced Diagnostic Test functions. You can find utilities for performing low-level formats on older hard drive types and for managing small computer system interface (SCSI) devices through this menu. In addition, options to print or show test results are available here, as is the exit point from the program.

The most common software-troubleshooting packages test the system's memory, microprocessor, keyboard, display monitor, and the disk drive's speed. If at least the system's CPU, disk drive, and clock circuits are working, you might be able to use one of these special software-troubleshooting packages to help localize system failures. They can prove especially helpful when trying to track down non-heat-related intermittent problems.

If a diagnostic program indicates that multiple items should be replaced, replace the units one at a time until the unit starts up. Then replace any units removed prior to the one that caused the system to start. This process ensures that there are not multiple bad parts. If you have replaced all the parts, and the unit still does not function properly, the diagnostic software is suspect.

ii. Using a Multimeter in a PC

A number of test instruments can help you isolate computer hardware problems. One of the most basic pieces of electronic troubleshooting equipment is the multimeter. These test instruments are available in both analog and digital readout form and can be used to directly measure electrical values of voltage (V), current in milliamperes (mA) or amperes (A), and resistance in ohms. Therefore, these devices are referred to as VOMs (volt-ohm-milliammeters) for analog types, or DMMs (digital multimeters) for digital types.

Figure above depicts a digital multimeter. With a little finesse, you can use this device to check diodes, transistors, capacitors, motor windings, relays, and coils. This particular DMM contains

facilities built in to the meter to test transistors and diodes. These facilities are in addition to its standard functions of current, voltage, and resistance measurement; however, in computer repair work, only the voltage and resistance functions are used extensively.

The first step in using the multimeter to perform tests is to select the proper function. For the most part, you never need to use the current function of the multimeter when working with computer systems; however, the voltage and resistance functions can be very valuable tools.

In computer troubleshooting, most of the tests are DC voltage readings. These measurements usually involve checking the DC side of the power-supply unit. You can make these readings between ground and one of the expansion-slot pins, or at the system board power-supply connector. It is also common to check the voltage level across a system board capacitor to verify that the system is receiving power. The voltage across most of the capacitors on the system board is 5V (DC). The DC voltages that can normally be expected in a PC-compatible system are +12V, +5V, -5V, and -12V. The actual values for these readings might vary by 5% in either direction.

It is normal practice to first set the meter to its highest voltage range to be certain that the voltage level being measured does not damage the meter.

The DC voltage function is used to take measurements in live DC circuits. It should be connected in parallel with the device being checked. This could mean connecting the reference lead (black lead) to a ground point and the measuring lead (red lead) to a test point to take a measurement, as illustrated in Figure

As an approximate value is detected, you can decrease the range setting to achieve a more accurate reading. Most meters allow for overvoltage protection; however, it is still a good safety practice to decrease the range of the meter after you have achieved an initial value.

The second most popular test is the resistance, or continuity test.

Unlike voltage checks, resistance checks are always made with power removed from the system.

Failure to turn off the power when making resistance checks can cause serious damage to the meter and can pose a potential risk to the technician. Resistance checks require that you electrically isolate the component being tested from the system. For most circuit components, this means desoldering at least one end from the board.

The resistance check is very useful in isolating some types of problems in the system. One of the main uses of the resistance function is to test fuses. You must disconnect at least one end of the fuse from the system. You should set the meter on the 1k ohm resistance setting. If the fuse is good, the meter should read near 0 ohms. If it is bad, the meter reads infinite.

The resistance function also is useful in checking for cables and connectors. By removing the cable from the system and connecting a meter lead to each end, you can check the cable's continuity conductor by conductor to verify its integrity.

You also use the resistance function to test the system's speaker. To check the speaker, simply disconnect the speaker from the system and connect a meter lead to each end. If the speaker is good, the meter should read near 8 ohms (although a smaller speaker might be 4 ohms). If the speaker is defective, the resistance reading should be 0 for shorts or infinite for opens.

Only a couple of situations involve using the AC voltage function for checking microcomputer systems. The primary use of this function is to check the commercial power being applied to the power-supply unit. As with any measurement, it is important to select the correct measurement range; however, the lethal voltage levels associated with the power supply call for additional caution when making such measurements.

The second application for the AC voltage function is to measure ripple voltage from the DC output side of the power-supply unit. This particular operation is very rarely performed in field-service situations.

iii. Cable Testers

The most frequent hardware-related cause of network problems involves bad cabling and connectors. Several specialized, handheld devices designed for testing the various types of data communication cabling are available. These devices range from inexpensive continuity testers, to moderately priced data cabling testers, to somewhat expensive time domain reflectometers (TDR).

Although inexpensive continuity testers can be used to check for broken cables, data cabling testers are designed to perform a number of different types of tests on twisted-pair and coaxial cables. These wiring testers normally consist of two units—a master test unit and a separate load unit, as illustrated in Figure below;



The master unit is attached to one end of the cable and the load unit is attached to the other. The master unit sends patterns of test signals through the cable and reads them back from the load unit. Many of these testers feature both RJ-45 and BNC connectors for testing different types of cabling. When testing twisted-pair cabling, these devices can normally detect such problems as broken wires, crossed-over wiring, shorted connections, and improperly paired connections.

TDRs are sophisticated testers that can be used to pinpoint the distance to a break in a cable. These devices send signals along the cable and wait for them to be reflected. The time between sending the signal and receiving it back is converted into a distance measurement. The TDR function is normally packaged along with the other cable testing functions just described. TDRs used to test fiber-optic cables are known as optical time domain reflectometers (OTDRs).

iv. POST Cards

A POST card is a diagnostic device that plugs into the system's expansion slot and tests the operation of the system as it boots up. These cards can be as simple as interrupt and direct memory access (DMA) channel monitors, or as complex as full-fledged ROM BIOS diagnostic packages that carry out extensive tests on the system.

POST cards are normally used when the system appears to be dead, or when the system cannot read from a floppy or hard drive. The firmware tests on the card replace the normal BIOS functions and send the system into a set of tests. The value of the card lies in the fact that the tests can be carried out without the system resorting to software diagnostics located on the hard disk or in a floppy drive.

The POST routines located in most BIOS chips report two types of errors—fatal and nonfatal. If the POST encounters a fatal error, it stops the system. The error code posted on the indicator corresponds to the defective operation.

If the POST card encounters a nonfatal error, however, it notes the error and continues through the initialization routine to activate as many additional system resources as possible. When these types of errors are encountered, the POST card must be observed carefully because the error code on its indicator must be coordinated with the timing of the error message or beep code produced by the BIOS routines.

Simple POST cards come with a set of light-emitting diodes (LEDs) on them that produce coded error signals when a problem is encountered. Other cards produce beep codes and seven-segment LED readouts of the error code.

v. Toner probe

A toner probe is used to trace network cables between two different locations. For example, if you have 50 cables going from an office to a wiring closet, you sometimes need to identify both ends of the same cable. You can connect the component that creates the tone to one end of the wire in the office.



Punch down tool

It is used for inserting wire into insulation-displacement connectors on punch down blocks, patch panels, keystone modules, and surface mount boxes (also known as biscuit jacks).

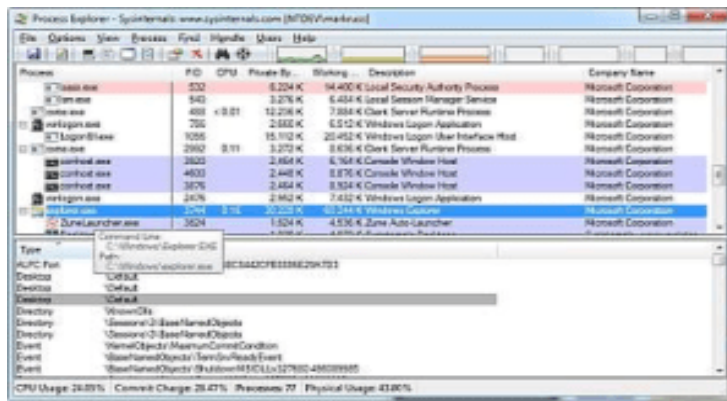


B. Software diagnostic tools

Best technicians tools to diagnose a computer

Below are some tools which technicians use to troubleshoot the windows PC. These tools are useful in diagnosing a PC to find out the exact issue.

1. Process Explorer

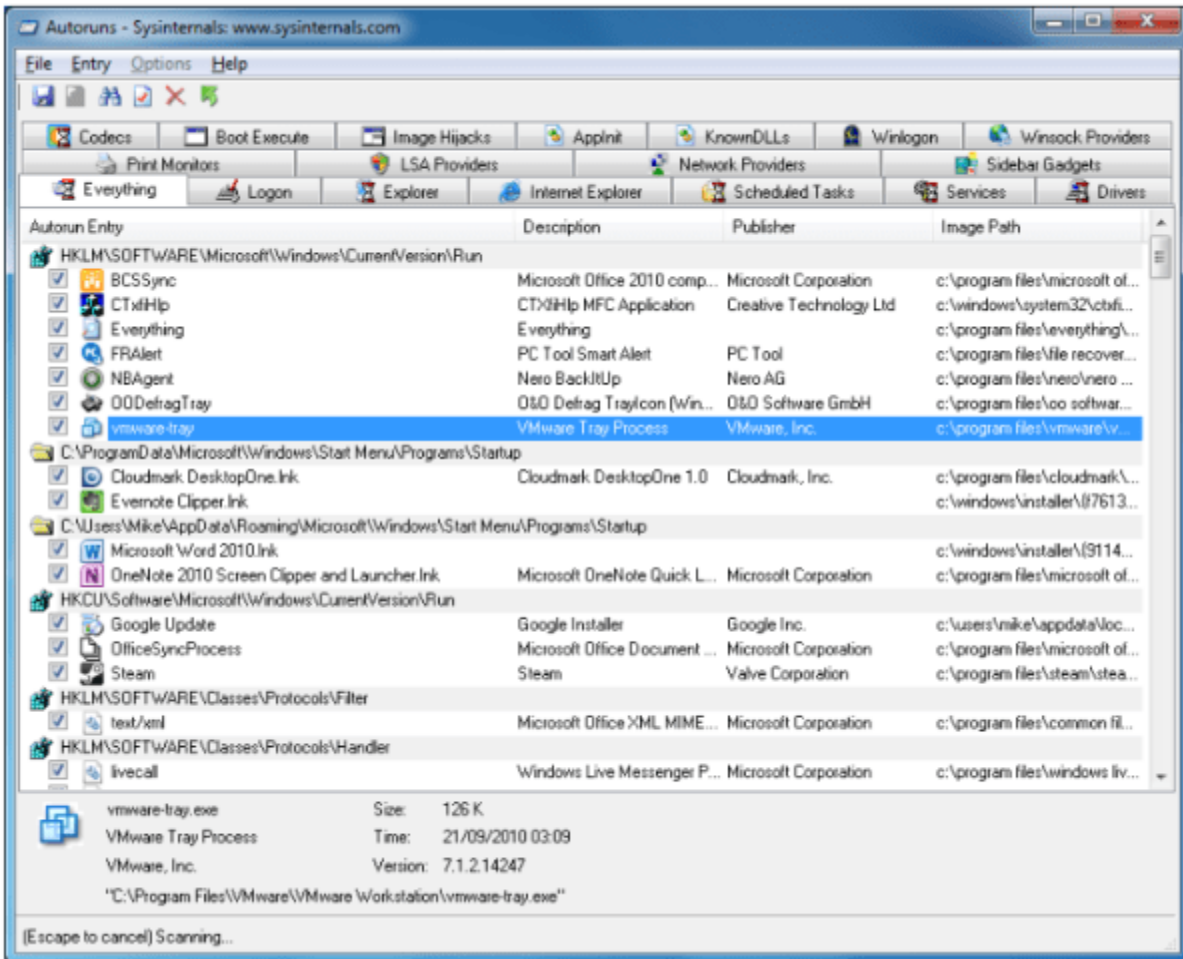


Process Explorer is a small utility available for free. It can help to find out the files and directory opened by a program. If you need information that what file or folder is using a process then this tool is very helpful. It is useful to track the DLL version problems or handle leaks.

You can download: [ProcessExplorer.zip](#)

How to run: Unzip the ProcessExplorer.zip file and then run procexp.exe file from the extracted folder to start the ProcessExplorer.

2. Windows Sysinternals Suite



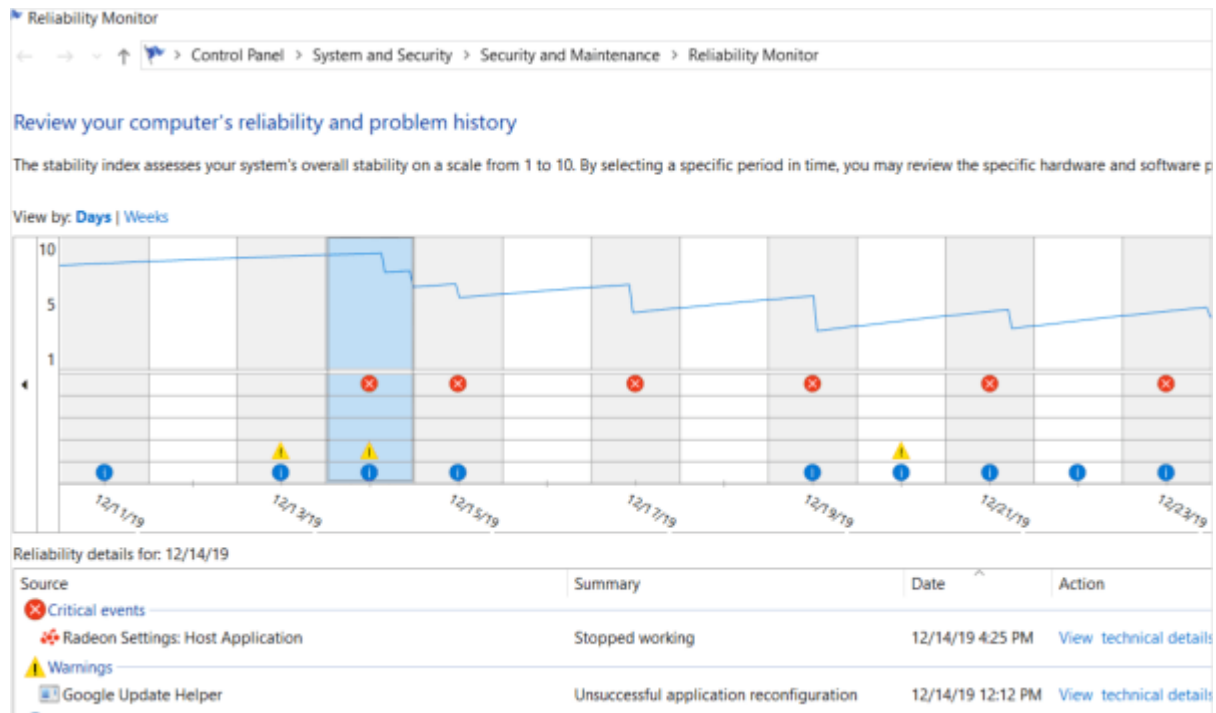
Sysinternals suite is collection of diagnostic and troubleshooting utilities provided by Microsoft for Free. So it includes all the utilities which can help to troubleshoot a PC. Process explorer and other useful tools like Autoruns, PsTools, desktops etc are bundled with this.

Download: [SysinternalsSuite.zip](#)

How to run: Unzip the SysinternalsSuite.zip file and then run autorun.exe file from the extracted folder to start the Sysinternals Suite.

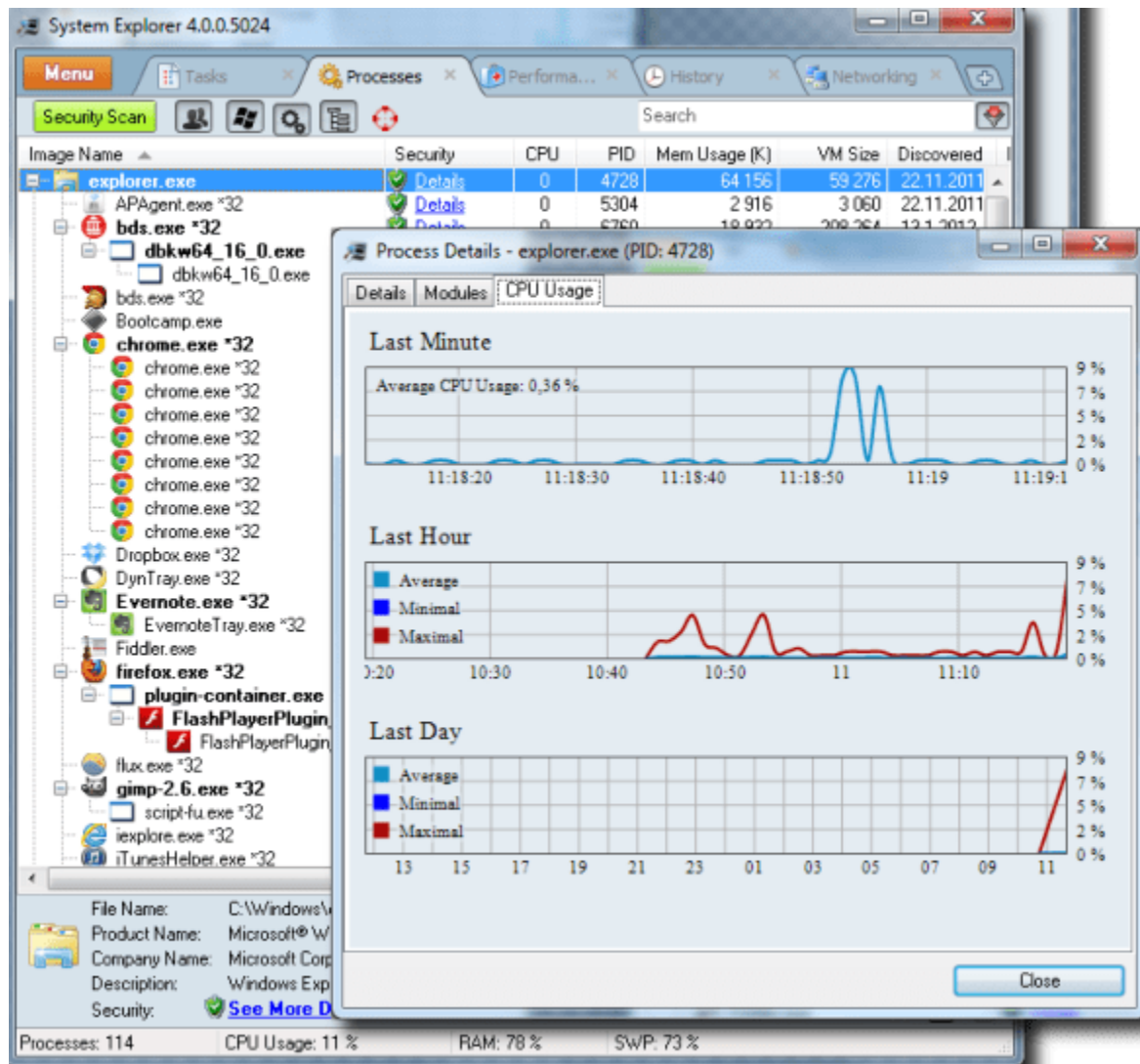
3. Reliability Monitor

Windows 10 has an inbuilt tool named as Reliability monitor history. This tool is available since Windows vista but very few people know about this tool. Actually it is a Reliability Monitor History, which show a timeline of history of events and errors occurred in the system. You check for the solution of a error.



To open it either go to Control Panel -> System & Security -> Security & maintenance -> Reliability Monitor. Or search in the search bar and select the option View Reliability Monitor.

4. System Explorer



It is also a free software tool to get the detailed system information. It is an award-winning software which can explore the internal system and processes running on the computer.

Download: SystemExplorerSetup.exe

Main Features:

- ✓ Get details about tasks, processes services, drivers and opened files.
- ✓ File database can help to find out the suspicious files.
- ✓ System resources detailed graphs.
- ✓ WMI browser and more.

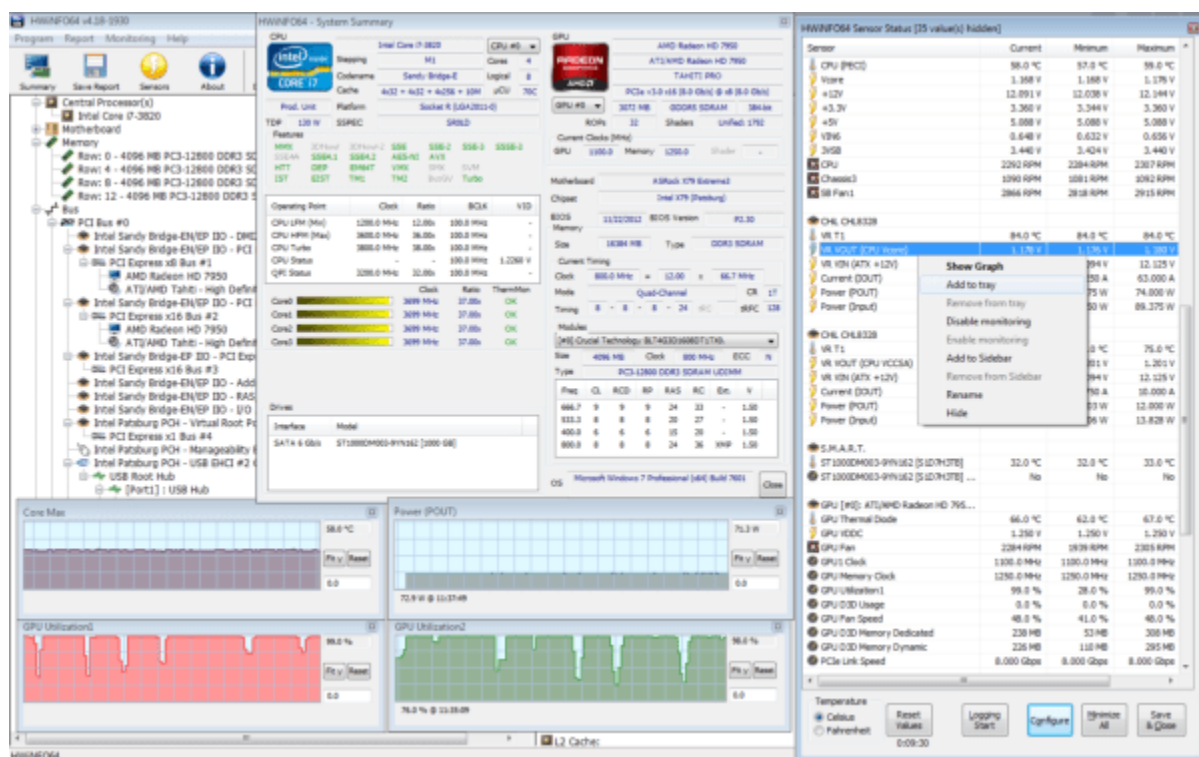
5. SIW (System Information for Windows)

SIW technician's version is a portable utility which can be run from USB to analyze and gather all the detailed information of the system. Check out some great features of it. It comes as home edition and technician edition. It is a paid utility. Below are some of its features.

Official Website: SIW official

- ✓ It can create a report file in many popular formats like HTML, XML, TXT etc.
- ✓ SIW can gather software information like product keys, serial numbers, AV Codecs, services, processes etc.
- ✓ It can gather all hardware information like CPU, sensors, chipset, memory video card, disk drives and other connected devices.
- ✓ Network configuration and open ports.
- ✓ Show the lost passwords hidden behind asterisks, mac address changer and many other useful tools.

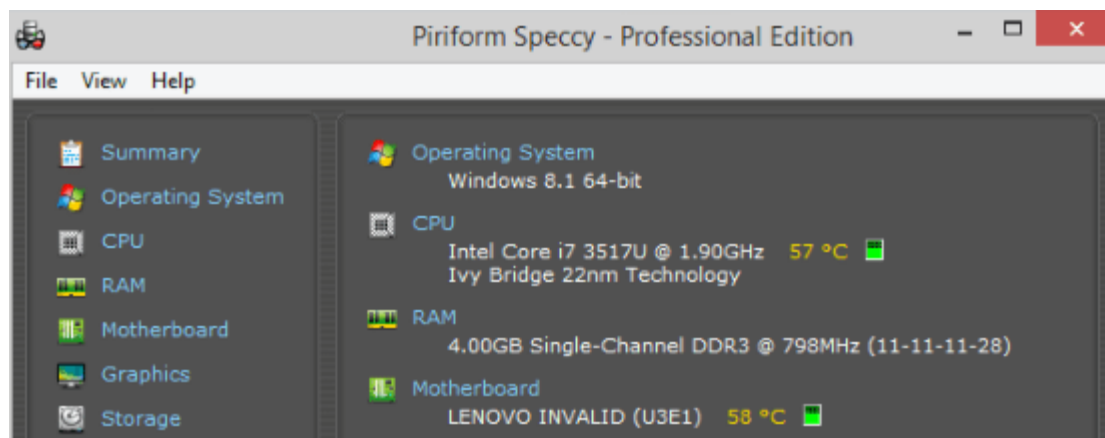
6. HWINFO



Popular and award-winning hwinfo is a free software utility for hardware monitoring and reporting with detailed analysis. It can generate reports and log files in XML, CSV and HTML Formats. It alerts about the system health by real-time monitoring. Customized tables and graphs option.

Download: HWinfo.exe

7. Speccy



Speccy is a hardware information tool by Piriform. It gives detailed information about motherboard, graphics card, CPU, RAM etc. It is a free utility. There are some more advanced features are available in its Pro version.

Download: Speccy.exe

8. hddscan

S.M.A.R.T. attributes for ST3400820AS

Save to File Print

Model: ST3400820AS
Firmware: 3.AAD
Serial:
LBA: 781422768

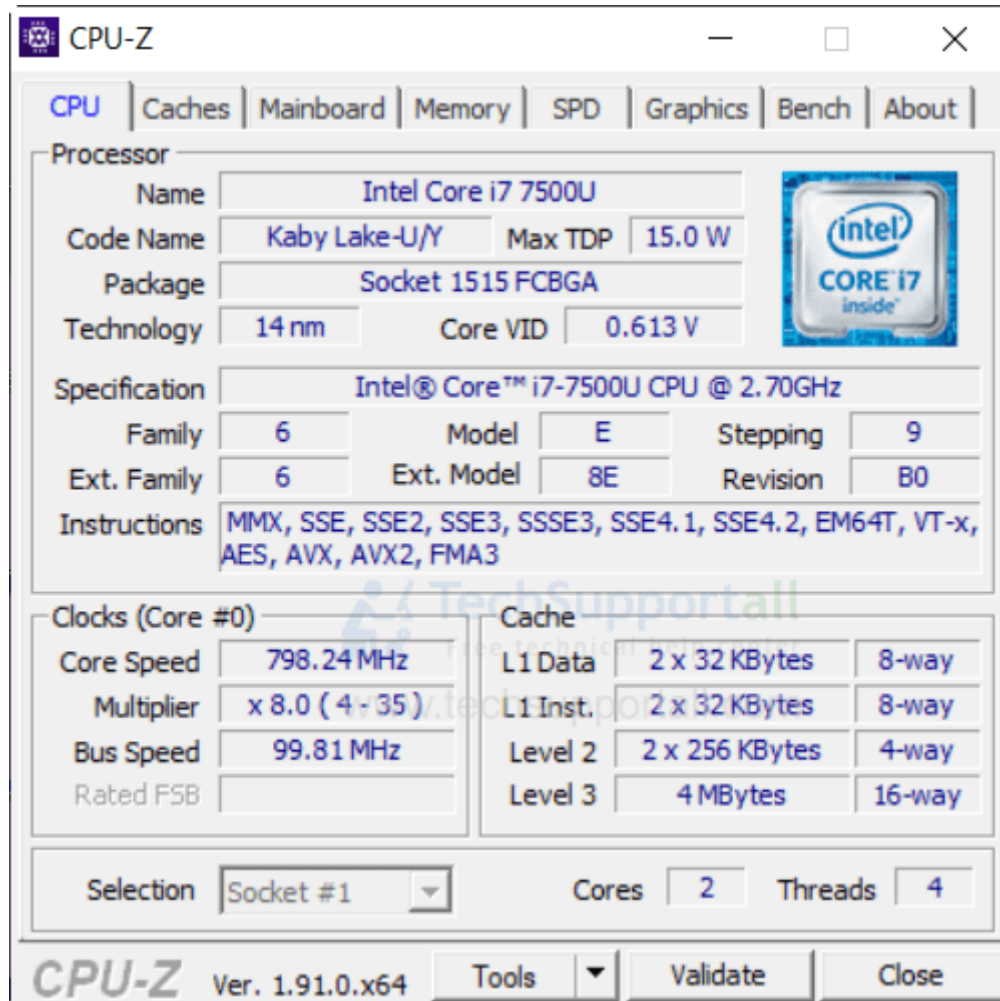
Report By: HDDScan for Windows version 3.2
Report Date: 12.06.2009 22:00:26

	Num	Attribute Name	Value	Worst	Raw(hex)	Threshold
●	001	Raw Read Error Rate	116	099	000006EB-0250	006
●	003	Spin Up Time	093	093	00000000-0000	000
●	004	Start/Stop Count	100	100	00000000-02C0	020
●	005	Reallocation Sector Count	100	100	00000000-0000	036
●	007	Seek Error Rate	076	060	000002B8-DDB4	030
●	009	PowerOn Hours Count	098	098	00000000-070A	000
●	010	Spin Retry Count	100	100	00000000-0000	097
●	012	Device Power Cycle Count	100	100	00000000-02CD	020
●	187	Reported Uncorrectable Error	100	100	00000000-0000	000
●	189	High Fly Writes	100	100	00000000-0000	000

It is a disk drive diagnostic tool. HDDScan is available free to download. It can check storage devices including USB drives for bad sectors. You can change Some HDD parameters like AAM and APM. It shows the SMART information in detail. Temperature of the disk is also monitored by this utility. It is very helpful to get alert before your disk drive get damaged.

Download: HDDScan

9. CPU-Z



It is a useful small utility which gather the system information like processor name, processor number, memory type and size, memory frequency, processor core frequency, motherboard, chipset, graphics card information, Cache size etc.

Download : CPU-Z

Internet/ Network problems

How to troubleshoot Internet connection problems

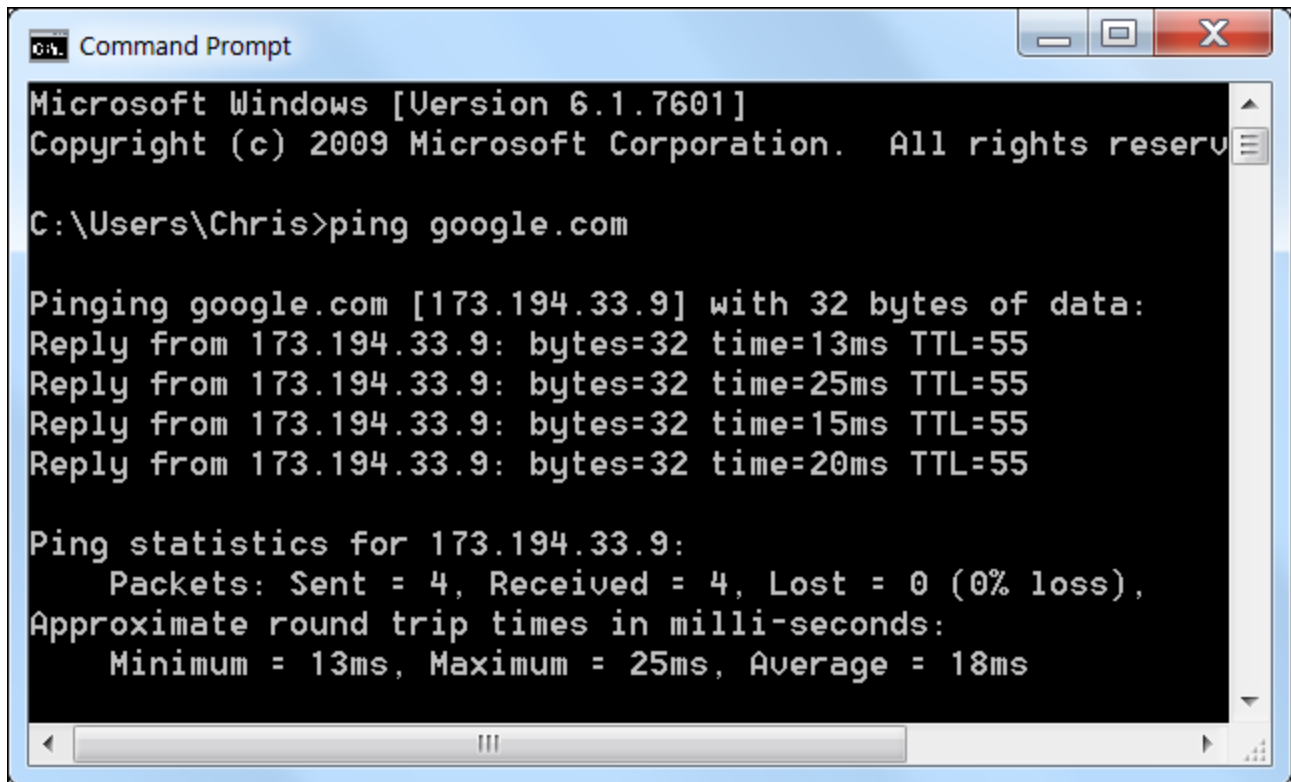
Internet connection problems can be frustrating. Rather than mashing F5 and desperately trying to reload your favorite website when you experience a problem, here are some ways you can troubleshoot the problem and identify the cause.

Ensure you check the physical connections before getting too involved with troubleshooting. Someone could have accidentally kicked the router or modem's power cable or pulled an Ethernet cable out of a socket, causing the problem.

Ping

One of the first things to try when your connection doesn't seem to be working properly is the ping command. Open a Command Prompt window from your Start menu and run a command like *ping google.com* or *ping howtogeek.com*.

This command sends several packets to the address you specify. The web server responds to each packet it receives. In the command below, we can see that everything is working fine – there's 0% packet loss and the time each packet takes is fairly low.

A screenshot of a Windows Command Prompt window. The title bar says "Command Prompt". The text inside shows the Windows version (6.1.7601) and copyright information. The user has entered the command "ping google.com". The output shows four successful replies from IP address 173.194.33.9 with varying response times (13ms, 25ms, 15ms, 20ms) and a TTL of 55. Ping statistics are also displayed, showing 4 packets sent, 4 received, and 0% loss, with an average round trip time of 18ms.

```
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Chris>ping google.com

Pinging google.com [173.194.33.9] with 32 bytes of data:
Reply from 173.194.33.9: bytes=32 time=13ms TTL=55
Reply from 173.194.33.9: bytes=32 time=25ms TTL=55
Reply from 173.194.33.9: bytes=32 time=15ms TTL=55
Reply from 173.194.33.9: bytes=32 time=20ms TTL=55

Ping statistics for 173.194.33.9:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 13ms, Maximum = 25ms, Average = 18ms
```

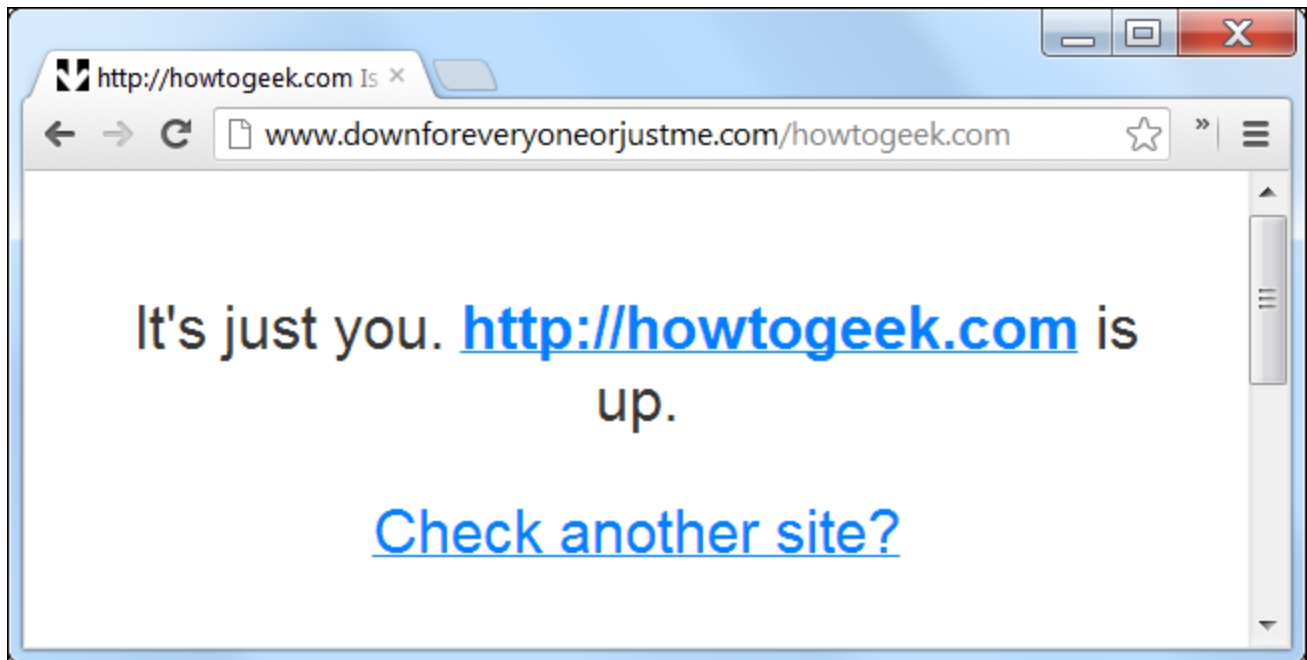
If you see packet loss (in other words, if the web server didn't respond to one or more of the packets you sent), this can indicate a network problem. If the web server sometimes takes a much longer amount of time to respond to some of your other packets, this can also indicate a network problem. This problem can be with the website itself (unlikely if the same problem occurs on multiple websites), with your Internet service provider, or on your network (for example, a problem with your router).

- ❖ Note that some websites never respond to pings. For example, **ping microsoft.com** will never results in any responses.

Problems With a Specific Website

If you're experiencing issues accessing websites and ping seems to be working properly, it's possible that one (or more) websites are experiencing problems on their end.

To check whether a website is working properly, you can use [Down For Everyone Or Just For Me](#), a tool that tries to connect to websites and determine if they're actually down or not. If this tool says the website is down for everyone, the problem is on the website's end.



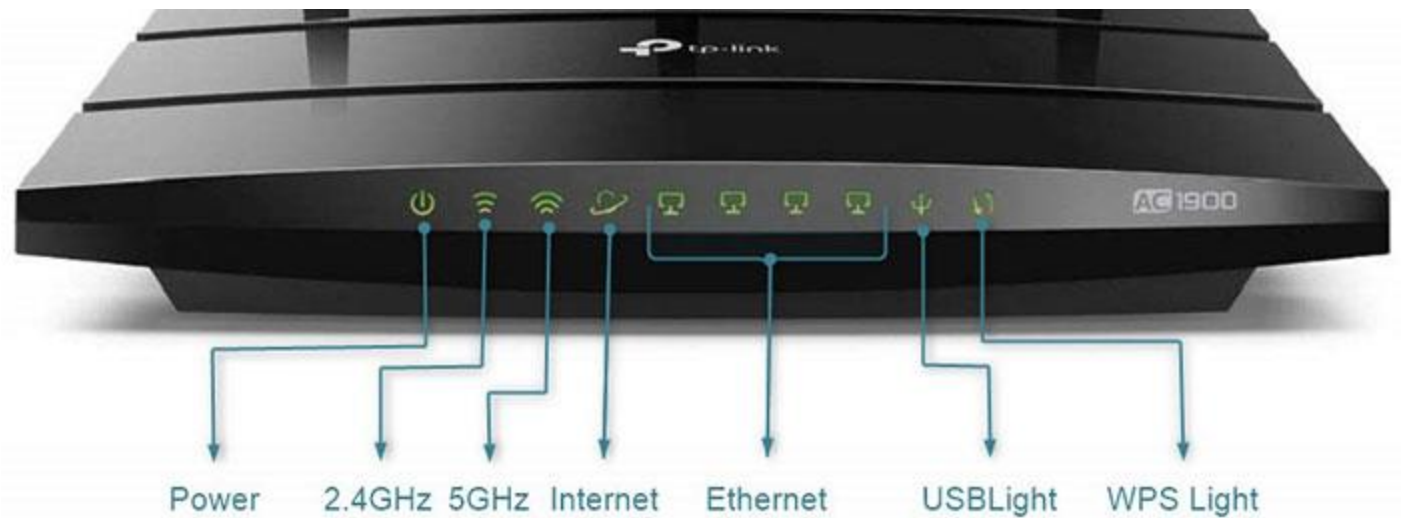
If this tool says the website is down for just you, that could indicate a number of things. It's possible that there's a problem between your computer and the path it takes to get to that website's servers on the network. You can use the traceroute command (for example, **tracert google.com**) to trace the route packets take to get to the website's address and see if there are any problems along the way. However, if there are problems, you can't do much more than wait for them to be fixed.

Modem & Router Issues

If you are experiencing problems with a variety of websites, they may be caused by your modem or router. The **modem** is the device that communicates with your Internet service provider, while the **router** shares the connection among all the computers and other networked devices in your household. In some cases, the modem and router may be the same device.

Take a look at the router. If [green lights](#) are flashing on it, that's normal and indicates network traffic. If you see a steady, blinking [orange light](#), that generally indicates the problem. The same applies for the modem – a blinking orange light usually indicates a problem.

For example, a TP-Link router working properly;



If the lights indicate that either devices are experiencing a problem, try unplugging them and plugging them back in. This is just like restarting your computer. You may also want to try this even if the lights are blinking normally – we’ve experienced flaky routers that occasionally needed to be reset, just like Windows computers. Bear in mind that it may take your modem a few minutes to reconnect to your Internet service provider.

If you still experience problems, you may need to perform a factory reset on your router or upgrade its firmware. To test whether the problem is really with your router or not, you can plug your computer’s Ethernet cable directly into your modem. If the connection now works properly, it’s clear that the router is causing you problems.



RESET BUTTON

Issues With One Computer

If you're only experiencing network problems on one computer on your network, it's likely that there's a software problem with the computer. The problem could be caused by a virus or some sort of malware or an issue with a specific browser.

Do an antivirus scan on the computer and try installing a different browser and accessing that website in the other browser. There are lots of other software problems that could be the cause, including a misconfigured firewall.

DNS Server Problems

When you try to access Google.com, your computer contacts its DNS server and asks for Google.com's IP address. The default DNS servers your network uses are provided by your Internet service provider, and they may sometimes experience problems.

You can try accessing a website at its IP address directly, which bypasses the DNS server. For example, plug this address into your web browser's address bar to visit Google directly:

If the IP address method works but you still can't access google.com, it's a problem with your DNS servers. Rather than wait for your Internet service provider to fix the problem, you can try using a third-party DNS server like OpenDNS or Google Public DNS.

Ultimately, most connection problems you'll run into are probably someone else's problem – you can't necessarily solve them yourself. Often, the only thing you can do is wait for your Internet service provider or a specific website to fix the problem you're experiencing. (However, restarting a flaky router can solve lots of problems.)

If you are experiencing problems, you can always try calling your Internet service provider on the phone – you're paying them for this service, after all. They will also be able to tell you whether it's a problem that other users are also having — or whether it's a problem on your end.

Summary

A **protocol analyzer** is a tool used to capture and analyze signals and data traffic over a communication channel. Such a channel varies from a local computer bus to a satellite link, that provides a means of communication using a standard communication protocol.

What is SolarWinds Security Event Manager agent?

SolarWinds Security Event Manager (formerly Log & Event Manager), is a security information and event management (SIEM) virtual appliance that adds value to existing security products and increases efficiencies in administering, managing, and monitoring security policies and safeguards on your network.

Power-on self-test (POST), progress codes (checkpoints), error codes, and isolation procedures: The POST checks out the hardware at system initialization. IPL diagnostic functions test some system components and interconnections. The POST generates eight-digit checkpoints to mark the progress of powering up the blade server.

Light path diagnostics: Use the light path diagnostic LEDs on the system board to identify failing hardware. If the system error LED on the system LED panel on the front or rear of the BladeCenter unit is lit, one or more error LEDs on the BladeCenter unit components also might be lit.

Troubleshooting tables: Use the troubleshooting tables to find solutions to problems that have identifiable symptoms.

Dump data collection: In some circumstances, an error might require a dump to show more data. The Integrated Virtualization Manager (IVM) or Hardware Management Console (HMC) sets up a dump area. Specific IVM or HMC information is included as part of the information that can optionally be sent to IBM® support for analysis.

Stand-alone diagnostics: The AIX-based stand-alone diagnostics CD is in the ship package and is also available from the IBM Web site. Boot the diagnostics from a CD drive or from an AIX network installation manager (NIM) server if the blade server cannot boot to an operating system, no matter which operating system is installed.

Functions provided by the stand-alone diagnostics include:

- Analysis of errors reported by platform, such as microprocessor and memory errors
- Testing of resources, such as I/O adapters and devices
- Service aids, such as firmware update, format disk, and Raid Manager

Hardware troubleshooting is the process of reviewing, diagnosing and identifying operational or technical problems within a hardware device or equipment. It aims to resolve physical and/or logical problems and issues within a computing hardware. Hardware or technical support technician does hardware troubleshooting.

Internet connection problems can be frustrating. Ensure you check the physical connections before getting too involved with troubleshooting. Someone could have accidentally kicked the router or modem's power cable or pulled an Ethernet cable out of a socket, causing the problem.

As the ICT department tries to meet the needs of the workforce, it also needs to develop policies to ensure the acceptable uses of ICTs within the organization. Developing an ICT policy for an organization is as important as having any other policy within the organization.