Module 13

Troubleshooting Theory

Objectives

1. 4.1 Troubleshooting Theory
2. 4.4 Troubleshooting Video
3. 4.5 Network Troubleshooting
4. Troubleshooting Mobile Devices

TROUBLESHOOTING THEORY

Troubleshooting

1. The art and science of quickly and accurately determining what is wrong with a computer system
2. Windows generates several log files during routine use that can be useful for determining what is wrong
3. Event Viewer:
   A. To view, right-click Computer/My Computer > click Manage > Event Viewer
   B. Captures three types of information:
      - Application errors
      - Security audits
      - System errors

Troubleshooting

1. Two factors that make for successful troubleshooting:
   A. Extensive computer knowledge – How hardware and software work together
   B. An understanding of human psychology – How to read and treat customers with respect
2. To become a successful troubleshooter, you need to:
   A. Learn as much as possible during the client interview
   B. Evaluate the client's environment
   C. Use testing and reporting software to gather information about the system
   D. Form a hypothesis (a theory you will try to prove or disprove)
   E. Use the troubleshooting cycle and the CompTIA six-step troubleshooting process to isolate and solve the problem

Troubleshooting Process

CompTIA six-step process:

- Step 1 - Gather data from the customer
- Step 2 - Establish a theory of probable causes
  - Identify the problem
  - Verify the obvious issues
- Step 3 - Test the theory to determine cause
- Step 4 - Establish a “Plan of Action” to resolve the problem and implement the solution
  - Try quick solutions first
- Step 5 - Verify full system functionality and implement preventative measures
- Step 6 – Document your findings, actions, and outcomes
  - Close with the customer

Step 1 - Gather Data from the Customer

1. Gather customer information – Contact name and phone number
2. Computer configuration – OS, protection software, network environment, connection type
3. Determine what tasks the customer was performing on the PC. You can determine this by asking the customer questions, reviewing system log files or browser history. Depending on the type of customer you can ask different types of questions:
   A. Open-ended questions
   B. Closed-ended questions
4. Carefully observe the customer's environment to look for potential causes of computer problems (interference sources, power problems, user error)
5. Ask the customer if anything has changed recently about the computer or its environment

Type	Questions
Open-ended Questions	What is your name and phone number? What is the make and model of you computer? What is the problem you are experiencing? What have you install recently?
Closed-ended Questions	Has this problem happened before? Does the computer connect to the Internet? Does anyone else use this computer? Have you added applications recently? Have you modified the system recently?

Step 2 - Establish a Theory of Probable Causes

1. Examine the most obvious causes of a problem first:
   A. A visual inspection:
      - Check that all cables are connected to the proper locations
      - Unseat and then reconnect cables and connectors
      - Power on and equipment turned on
   B. Reboot the computer or network device
   C. Check that the anti-virus and spyware signature files are up-to-date
   D. Scan computer with protection software
   E. Check computer for the latest OS patches and updates
   F. Disconnect from the network
   G. Login as a different user
   H. Change your password

Problem	Causes
Computer won't start	Power cable plugged in Power off Surge protector or UPS on Power supply switch on
Email not working	Cable unplugged Modem on Internet online Correct IP address

Step 3 - Test the Theory to Determine cause

1. Gather data from the computer
   A. Replicate the problem
   B. Examine cabling
   C. Examine lights
   D. Test equipment
   E. Protection applications can report on the files that have been infected
   F. There are several tools available in the operating system that a technician can use:
      - Verify that the signature file is current
      - Check the security software log file for entries.
      - Task Manager is used to check for unknown applications that are running
      - Command line tools

Problem	Theory (after obvious)
Computer won't start	Can you replicate the problem? Do you see the power light on the motherboard? Test the power supply Test the UPS Manufacturer's FAQs
Email not working	Verify account settings Check for Internet problems Check for ISP problems

Step 4 - Establish a Plan of Action to Resolve the Problem and Implement the Solution

1. Evaluate the information gathered from the customer and from the computer
2. Determine possible solutions
3. Determine the steps to implement
    A. What parts to buy?
    B. What tools are needed?
    C. Do I need help?
4. Implement the best solution

Problem	Solution
Computer won't start	Replace the power supply Replace the surge protector or UPS
Email not working	Reset the account Reset the password

Step 5 - Verify Full System Functionality and Implement Preventative Measures

1. Is the problem fixed?
2. Can you replicate the problem again?
3. Did the solution cause another problem?
4. If a proposed solution doesn't correct the problem, reset the computer back to the original state and try another proposed solution
5. What measure can you implement to stop the problem from happening again:
   A. Automate virus updates and scans
   B. Automate defrag

Solution	How did you fix it?
Computer won't start	Replaced power supply
Email not working	Power cycled modem Reboot the device Renewed IP address

Step 6 - Document Findings, Actions, and Outcomes

1. Discuss the solution with the customer
2. Have the customer confirm that the problem has been solved
3. Give the customer all appropriate paperwork
4. Document the process in the work order and in your technician's journal:
    A. Problem description
    B. Solution
    C. Components used
    D. Amount of time spent in solving the problem
    E. Cost of the job

A Call Center

1. Usually very professional and fast-paced
2. A help desk system
3. Customers call in and are placed on a callboard
4. Available technicians take the customer calls

Call Center (1)

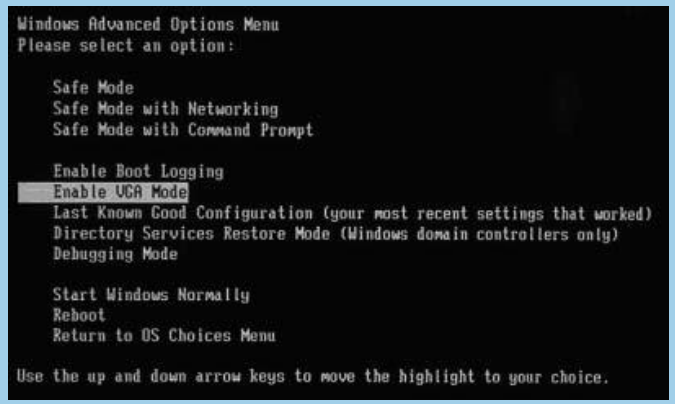
Help Desk Software

Uses	Software
Log and track incidents	Software to manage call queues, set call priorities, assign calls, and escalate calls
Record contacts	Software to store, edit, and recall customer information
Research products	Database of supported products, including features, limitations, versions, constraints, bugs, availability, and online help files
Run diagnostics	Diagnostic utility software, including remote access to customer's computer
Research a knowledge base	Database of common problems and their solutions
Collect customer feedback	Software to collect customer feedback

TROUBLESHOOTING VIDEO AND DISPLAYS

VGA Mode

1. Necessary if video is unable to load due to issues with a video card (bad video card driver or wrong resolution)
2. Only the minimal video drivers are loaded (resolution of 640x480).
3. Can be accessed by pressing the F8 key during the initial POST



Advanced Startup Menu

Display Problems

1. **No Image on Screen** – You see an image briefly when POST runs but the screen goes black
   A. Solution – Video card is set to an unsupported monitor resolution. Reboot in Safe Mode and adjust the resolution to one supported by the monitor.
2. **Dead Pixels** –There are actually three distinct categories:
   A. A stuck pixel is when one or two subpixels remain on
      - Solution – Rub the effected area to compress the layers and move the affect area (could damage monitor) or run a third-party app like UDPixel or JScreenFix
   B. A hot pixel is when all three subpixels are stuck on
      - Solution – Same as stuck pixel
   C. Dead pixels are either whole pixels or subpixels that do not turn on
      - Solution – None, too many faulty pixels can render a monitor worthless
3. **Artifacts** – Caused by faulty video card or video cable
   A. Solution – Try a different video card and/or cable to see if it resolves the issue

Display Problems

4. **Dim Image** – Monitor is too dark to use.
   A. Solution – Backlight is damaged; replace. Loose or damaged cable; replace. Wrong drive; update. Bad video card; replace.
5. **Flickering Image** – Image flashes
   A. Solution - The refresh rate is set too low, adjust. Loose or damaged cable; replace. Bad or loose video card; replace or reseat. Wrong video driver; update. Power issue or faulty surge protector; plug directly into wall or replace surge protector.
6. **Distorted Image** – Images appear distorted or skewed.
   A. Solution - Windows issue; reboot. Resolution issue; adjust. Loose or defective cable; tighten or replace. Refresh rate issue; adjust. Interference; check for magnet or appliance interference. Bad monitor; replace.
7. **Discoloration** – Color variations cause by age or magnetic interference.
   A. Solution – Degauss the monitor. Try a different monitor. Faulty video card; replace.

NETWORK TROUBLESHOOTING

Network Problems

1. **No or Limited Connectivity** – Results from many different technical glitches or configuration problems
   A. Solutions:
      - Bad Cable; replace
      - Configuration error; reboot the broadband modem, router, and computer (in that order)
      - Bad IP; release and renew IP or change from dynamic to static IP address configuration
      - Internal error; run the Windows Network Repair utility
      - Bad router; connect the computer directly to your broadband modem
      - Wireless problem; re-authenticate and reset security key

Network Problems

2. **Intermittent Connectivity** – Connection goes up and down.
    A. Solution – Check the network cable for problems
3. **Local Connectivity** – No Internet.
    A. Solution – Check you are getting a valid IP address and DNS; DNS sever is working; proxy setting correct; logged in correctly.
4. **IP Conflicts** – Multiple devices have the same IP address.
    A. Solution – Renew the DHCP (ipconfig /renew); statically set the IP address.
5. **Slow Transfer Speeds** – Slow intranet connection.
    A. Solution – Some process is hogging the connection; use Task Manger to find and end the process. NIC card failure; replace. Speed mismatch; Be sure the NICs and switches are using the same speed. Wrong network Driver; update from manufacturer.

Testing Equipment

1. **Cable Tester** – Tests the wire map, length, and throughput of cables
2. **Loopback Plug** – Tests the NIC card
3. **Toner Probes** – Trace cabling through wall, ceilings, and other spaces

Command Line Tests

1. **Ping** – Test end-to-end connectivity
   A. `ping` *`Hostname`* `-a` (Resolves to IP address)
   B. `Ping` *`Hostname`* `-t` (`Continuous ping`)
2. **Ipconfig** – Test the internal configuration of your computer: IP address, subnet mask, default gateway, DHCP server, DNS server
   A. `ipconfig /all` (show entire configuration)
   B. `ipconfig /release` (release the IP configuration)
   C. `ipconfig /renew` (renew the IP configuration)
3. **Tracert** - Displaying the route (path) and measuring transit delays of packets
   A. `tracert` *`Hostname`* or *`IPaddress`*

Command Line Tests

4. **Netstat** – Displays both incoming and outgoing network connections, routing tables, network interfaces, and network protocol statistics. Common uses:
   A. `netstat -a` (Displays **a**ll active connections and the TCP and UDP ports on which the computer is listening)
   B. `netstat -o` (Displays active TCP connections and includes the process ID (PID) for each connection)
   C. `netstat -p` (Shows connections for the protocol: tcp, udp, tcpv6, or udpv6. If this parameter is used with **`-s`** to display statistics by protocol, *protocol* can be tcp, udp, icmp, ip, tcpv6, udpv6, icmpv6, or ipv6)

Command Line Tests

5. **Nbtstat** – Designed to help troubleshoot NetBIOS name resolution problems. Common uses:
   A. `nbtstat -c` (displays the contents of the NetBIOS name cache, the table of NetBIOS names and their resolved IP addresses)
   B. nbtstat –n (displays the names that have been registered locally on the `system`)
   C. `nbtstat -r` (displays the count of all NetBIOS names resolved by broadcast and querying a WINS server)
   D. `nbtstat -R` (purges and reloads the remote cache name table)
   E. `nbtstat -RR` (sends name release packets to WINs and then starts Refresh.
   F. `nbtstat -s` (lists the current NetBIOS sessions and their status, including statistics)
   G. `nbtstat -S` (lists sessions table with the destination IP addresses)

Command Line Tests

6. **Net** – Used to manage almost every aspect of a network and its settings.
   - A. `Net Accounts` (Used to set password and logon requirements for users)
   - B. `Net Config` (Used to show information about the configuration of the *Server* or *Workstation* service)
   - C. `Net File` (Used to show a list of open files on a server)
   - D. `Net Localgroup` (Used to add, delete, and manage local groups on computers)
   - E. `Net Print` (Used to display and manage network print jobs)
   - F. `Net Send` (Used to send messages to other users, computers, or net name created messaging aliases)
   - G. `Net Session` (Used to list or disconnect sessions between the computer and others on the network)
   - H. `Net Share` (Used to create, remove, and otherwise manage shared resources on the computer)
   - I. `Net Start` (Used to start a network service or list running network services)
   - J. `Net Stop` (Used to stop a network service)
   - K. `Net Use` (Used to display information about shared resources on the network that you're currently connected to)
   - L. `Net User` (Used to add, delete, and otherwise manage the users on a computer)
   - M. `Net View` (Used to show a list of computers and network devices on the network)

TROUBLESHOOTING MOBILE DEVICES

Mobile Device Problems

1. Can result from a combination of hardware, software, and network issues
   A. Check the warranty
   B. Determine if a repair is cost-effective

Summary

In this module we discussed:

1. Troubleshooting theory and process
2. Call Center and software
3. Troubleshooting video
4. Troubleshooting networks
5. Command line troubleshooting tools
6. Troubleshooting mobile devices

Glossary and Terms

1. **Troubleshooting** – The art and science of quickly and accurately determining what is wrong with a computer system.
2. **Event Viewer** – A Windows generated log file that will record errors and issues that can be useful determining problems.
3. **CompTIA six-step troubleshooting process** –

   Step 1 - Gather data from the customer

   Step 2 - Establish a theory of probable causes

   Step 3 - Test the theory to determine cause

   Step 4 - Establish a “Plan of Action” to resolve the problem and implement the solution

   Step 5 - Verify full system functionality and implement preventative measures

   Step 6 – Document your findings, actions, and outcomes

Glossary and Terms

4. **Open-ended questions** – Cannot be answered with “yes” or “no” answers. The purpose of open-ended questions is to allow the customer to explain the history of the problem and the details of when the problem happened in their own words.
5. **Closed-ended questions** – Can usually be answered with “yes” or “no” answers. Closed-ended questions guide the customer to the specific details about the computer and the error messages. This type of question can help a technician focus in on an error and locate the exact problem once a potential solution is being tested. However the technician may not ask the exact question needed to obtain the details of the problem.
6. **VGA Mode** - Resolution of 640x480 and limited driver. Basic operations that are accessed by
pressing the F8 key during the initial POST.
7. **Stuck pixel** – When one or two subpixels remain on.
8. **Hot pixel** – When all three subpixels are stuck on.
9. **Dead pixels** – Either whole pixels or subpixels that do not turn on.
10. **Artifacts** – Caused by faulty video card or video cable.

Glossary and Terms

11. **Degauss** – The process of decreasing or eliminating a residual magnetic field.
12. **Cable Tester** – Tests the wire map, length, and throughput of cables.
13. **Loopback Plug** – Tests the NIC card.
14. **Toner Probes** – Trace cabling through wall, ceilings, and other spaces.
15. **Ping** – Test end-to-end connectivity.
16. **Ipconfig** – Test the internal configuration of your computer: IP address, subnet mask, default gateway, DHCP server, DNS server.
17. **Tracert** - Displaying the route (path) and measuring transit delays of packets.
18. **Netstat** – Displays both incoming and outgoing network connections, routing tables, network interfaces, and network protocol statistics.
19. **Nbtstat** –Designed to help troubleshoot NetBIOS name resolution problems.
20. **Net** – Used to manage almost every aspect of a network and its settings.

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(1) https://commons.wikimedia.org/wiki/File:CFW_Information_Services_call_center_people_at_workstations.jpg