CompTIA Network+ Exam N10-008

Lesson 4

Troubleshooting Ethernet Networks

Objectives

- Explain network troubleshooting methodology
- Troubleshoot common cable connectivity issues

Lesson 4

Topic 4A

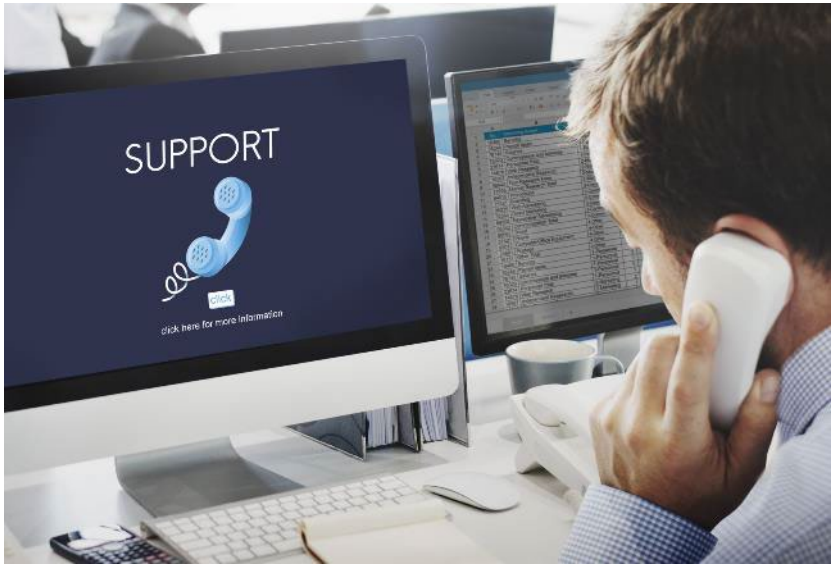
Explain Network Troubleshooting Methodology

Network Troubleshooting Methodology

- Identify the problem
- Establish a theory of probable cause
- Test the theory to determine cause
- Establish a plan of action to resolve the problem and identify potential effects
- Implement the solution or escalate as necessary
- Verify full system functionality, and if applicable, implement preventive measures
- Document findings, actions, and outcomes

Identify the Problem (Gather Information)

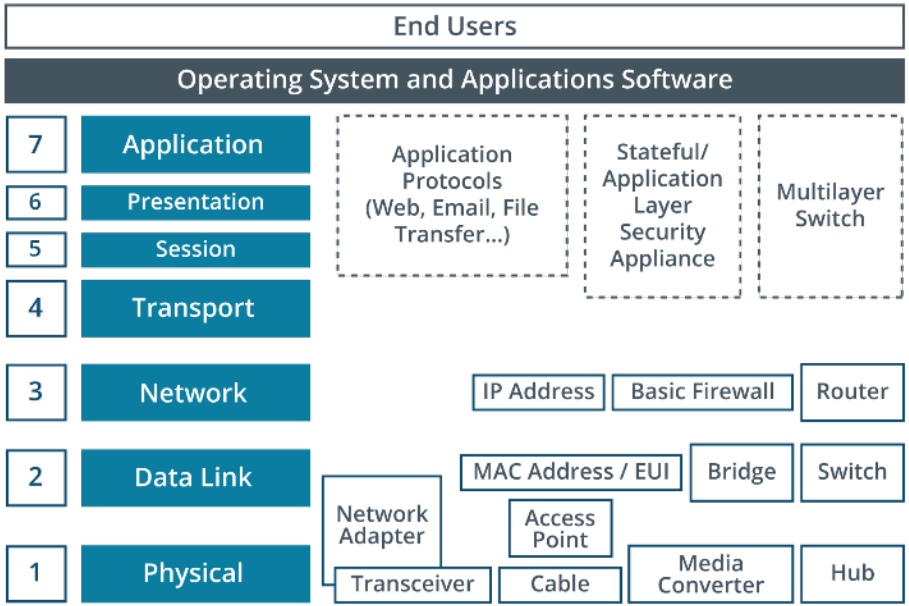
- Gather information
  - Identify scope and prioritization
  - Analyze logs/change documentation
  - Verify with other technicians
- Identify symptoms and duplicate the problem



Identify the Problem (Question Users)

- Question users
  - Open questions invite explanations and user opinions/observations
  - Closed questions invite Yes/No/Fixed answers
- Determine if anything has changed
- Approach multiple problems individually

Establish a Theory of Probable Cause



- Establish theory from known symptoms
  - Question the obvious
  - Prove functionality systematically
- OSI model approach
  - Layer-by-layer
  - Top-to-bottom
  - Bottom-to-top
  - Divide and conquer

Test the Theory to Determine the Cause

- Isolate the problem to a single component or system
- Run tests to prove the theory
- Escalate if necessary
  - Problem too difficult
  - Warranty/supplier issue
  - Scope too large
  - Customer issues

Establish a Plan of Action

- Typical generic solutions
  - Repair
  - Replace
  - Ignore
- Plan changes carefully
- Try to anticipate effects

Implement the Solution

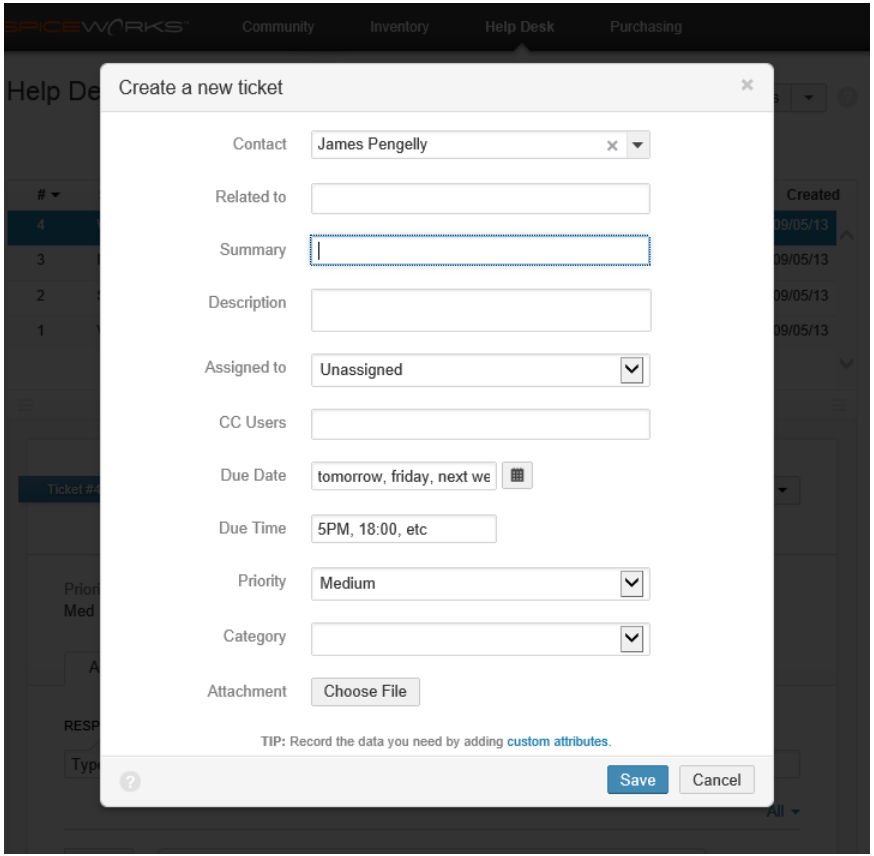
- Change management and authorization
  - Is escalation required?
- Notification and scheduling
- Change control

Verify Full System Functionality …

- Consider impact on overall system functionality
- Test that the problem is fixed AND that the system functions normally
- Identify preventive measures that will prevent the problem from reoccurring

Document Findings, Actions, and Outcomes

- Ticket system
- Categorize problems and identify trends
- Add known issues to a knowledge base
- Complete notes fields professionally



Review Activity: Network Troubleshooting Methodology

- Network Troubleshooting Methodology
- Identify the Problem (Gather Information)
- Identify the Problem (Question Users)
- Establish a Theory of Probable Cause
- Test the Theory to Determine the Cause
- Establish a Plan of Action
- Implement the Solution
- Verify Full System Functionality …
- Document Findings, Actions, and Outcomes

Lesson 4

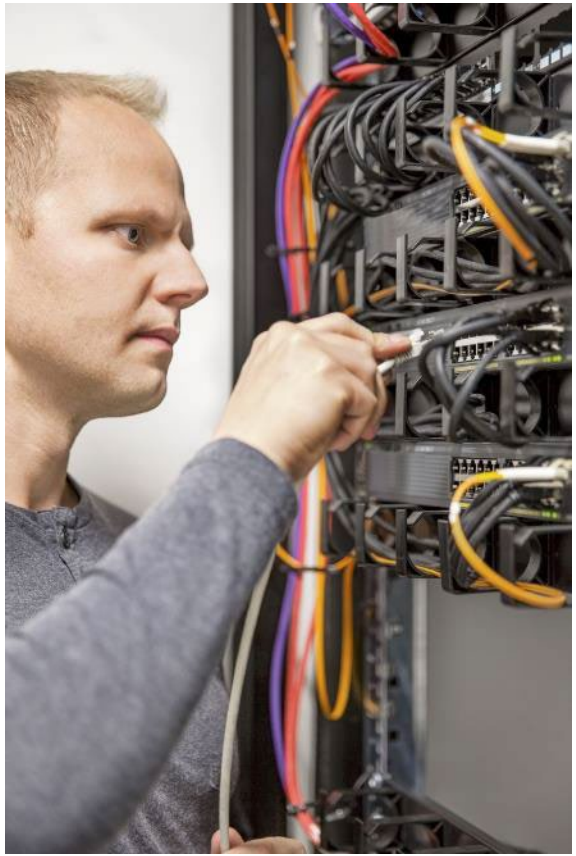
Topic 4B

Troubleshoot Common Cable Connectivity Issues

Specification and Limitations

- Speed versus throughput
  - Baud rate (Hertz) measures symbol rate
  - Data link layer bit rate/speed – can be more than one bit per symbol
  - Network or transport layer throughput
  - Application layer goodput
- Distance limitations, attenuation, and noise
  - Decibel (dB) units
  - Signal to noise ratio (SNR)

Cable Issues



- Channel link
  - End system transceiver > patch cord
  - Permanent link wall port > patch panel
  - Patch cord > intermediate system port
- Test each component
  - Known good patch cords
  - Port tester
  - Structured cabling test tools

Loopback Plugs, Status Indicators, and Interface Config

- Loopback adapter/plug
  - Test port by transmitting to itself
- Status indicators
  - LEDs on NIC and switch port
- Interface configuration
  - Check for static configuration on switch port

```
cumulus@cumulus:mgmt:~$ net show interface swp5
    Name  MAC                Speed  MTU   Mode
--  ----  -----------------  -----  ----  ---------
DN  swp5  0c:7a:75:b5:c8:05  1G     9216  Access/L2

All VLANs on L2 Port
--------------------
100

Untagged
--------
100

cl-netstat counters
-------------------
RX_OK  RX_ERR  RX_DRP  RX_OVR  TX_OK  TX_ERR  TX_DRP  TX_OVR
-----  ------  ------  ------  -----  ------  ------  ------
   66       0       0       0   1227       0       0       0

Routing
-------
  Interface swp5 is up, line protocol is down
  Link ups:       2    last: 2021/08/06 18:20:21.82
  Link downs:     8    last: 2021/08/06 18:35:42.62
  PTM status: disabled
  vrf: default
  index 7 metric 0 mtu 9216 speed 1000
  flags: <UP,BROADCAST,MULTICAST>
  Type: Ethernet
  HWaddr: 0c:7a:75:b5:c8:05
  Interface Type Other
  Master interface: bridge
  protodown: off
```

Cable Testers

- Verify cable category is appropriate for application (bandwidth and cable length)
- Consider whether screened/shielded cable is required
- Use a cable tester to report detailed characteristics of the link
- Use a time domain reflectometer (TDR) to measure length and locate installation problems or faults

Wire Map Testers and Tone Generators

- Multimeter
  - Test continuity
- Wire map tester
  - Check pinouts are correctly wired
  - Opens and shorts
  - Reversed, crossed, and split pairs
- Tone generator
  - Trace cable path
  - Identify cable within a bundle

Attenuation and Interference Issues

- Attenuation
  - Reduces link speed and causes errors and retransmissions
  - Measure using cable certifier and compare to tolerance for cable category
- dB insertion loss (signal is too weak at the destination)
  - Ratio of input to output using logarithms
  - dBm is the ratio to 1 mw
  - Absolute value (smaller better) versus margin (larger better)
- Interference
  - Cable placement and electromagnetic interference (EMI) sources
  - Alien crosstalk

Crosstalk Issues

- Interference within cable due to faulty wiring or termination
- Near End (NEXT)
  - Check termination
- Attenuation to Crosstalk Ratio (ACRN)
  - Check link distance, cable quality/faults, and external interference
- Attenuation-to-Crosstalk Ratio, Far End (ACRF)
  - Check cable quality/faults
- Power sum
  - Check cable suitability for Gigabit Ethernet and higher

Cable Application Issues

- Straight through cable
  - Terminated with either T568A at both ends or T568B at both ends
  - Used for an uplink (MDI port to MDI-X port)
- Crossover cable
  - Terminated with T568A at one end and T568B at the other
  - Used to connect an end system (host) to another host or a hub to a hub
  - Auto MDI/MDI-X supported by most modern equipment
- Rollover/console cable
  - Used to connect to serial interface of switches and routers
- Power over Ethernet
  - Cable must be sufficient quality

Fiber Optic Cable Testing Tools

- Test cable length using optical power meter
- Identify fault locations using optical time domain reflectometer (OTDR)
- Dirty optical cables
  - Ensure clean environment when splicing/terminating
- Incorrect transceivers
  - Match transceiver wavelength and type at both ends

Review Activity: Common Cable Connectivity Issues

- Specification and Limitations
- Cable Issues
- Loopback Plugs, Status Indicators, and Interface Config
- Cable Testers
- Wire Map Testers and Tone Generators
- Attenuation and Interference Issues
- Crosstalk Issues
- Cable Application Issues
- Fiber Optic Cable Testing Tools

Lesson 4

Summary