

CompTIA Network+ Exam N10-008

# Lesson 4



## Troubleshooting Ethernet Networks

# Objectives

- Explain network troubleshooting methodology
- Troubleshoot common cable connectivity issues

## Lesson 4

# Topic 4A

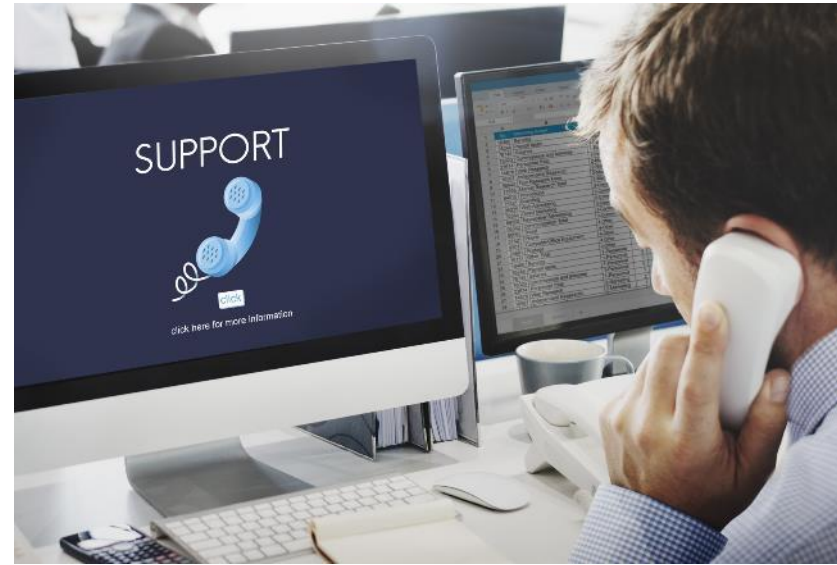
## Explain Network Troubleshooting Methodology

# 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)

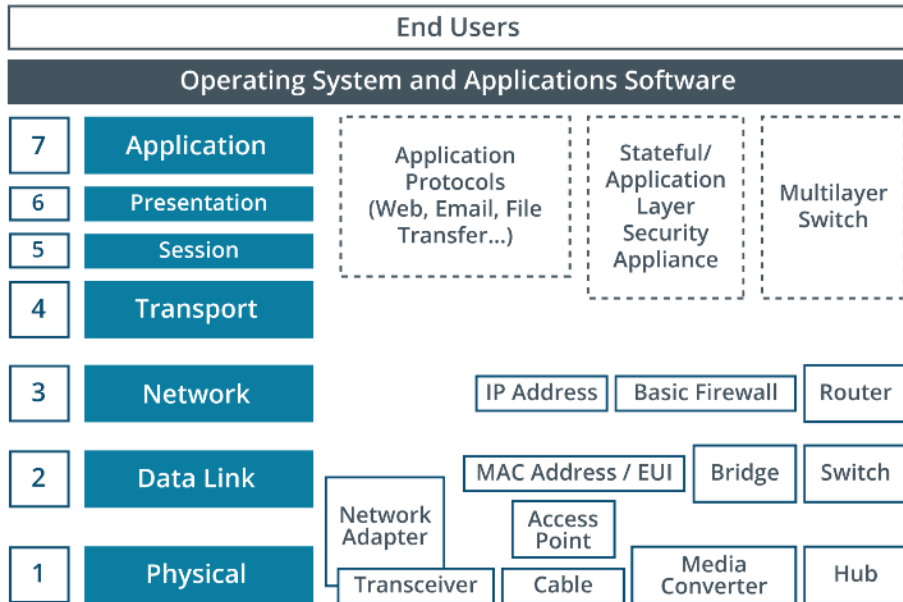
- Gather information
  - Identify scope and prioritization
  - Analyze logs/change documentation
  - Verify with other technicians
- Identify symptoms and duplicate the problem



# 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

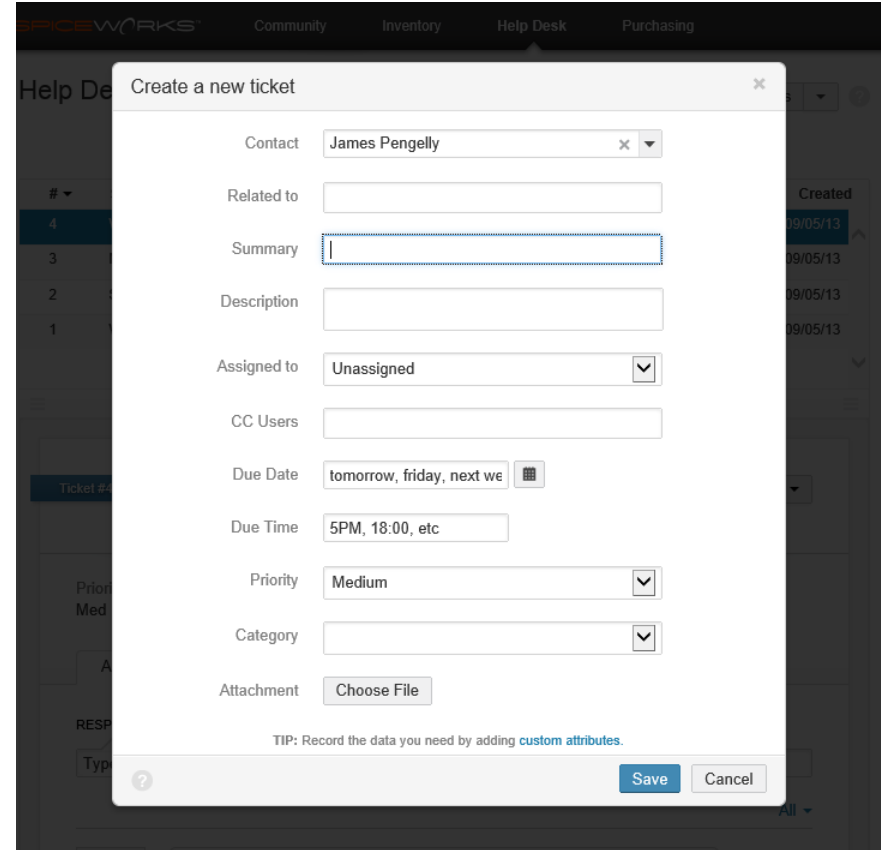
- Change management and authorization
  - Is escalation required?
- Notification and scheduling
- Change control

# 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



The screenshot shows a 'Create a new ticket' modal form. The form fields are as follows:

- Contact:** James Pengelly (dropdown menu)
- Related to:** (empty text field)
- Summary:** (empty text field)
- Description:** (empty text field)
- Assigned to:** Unassigned (dropdown menu)
- CC Users:** (empty text field)
- Due Date:** tomorrow, friday, next we (calendar icon)
- Due Time:** 5PM, 18:00, etc (text field)
- Priority:** Medium (dropdown menu)
- Category:** (empty dropdown menu)
- Attachment:** Choose File (button)

At the bottom of the form, there is a tip: "TIP: Record the data you need by adding [custom attributes](#)." and two buttons: "Save" and "Cancel".

# 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



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## Summary