CompTIA Network+ Exam N10-008

Lesson 12

Ensuring Network Availability

Objectives

- Explain the use of network management services
- Use event management to ensure network availability
- Use performance metrics to ensure network availability

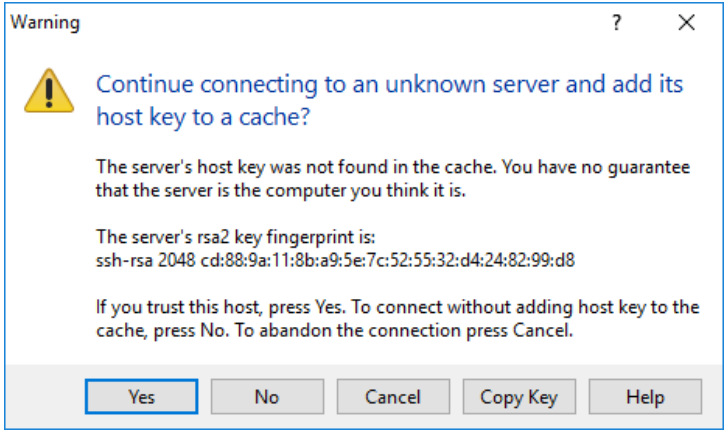
Lesson 12

Topic 12A

Explain the Use of Network Management Services

Secure Shell Servers and Terminal Emulators

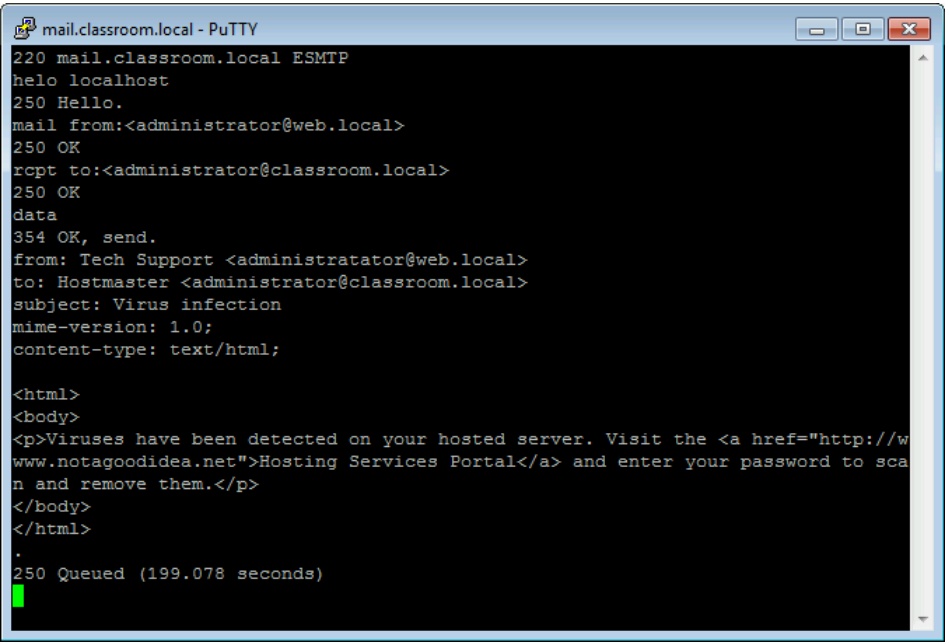
- Command line terminal emulation
- Secure Shell (SSH)
  - Secure terminal emulation over port TCP/22
  - Tunnel other traffic over SSH
- Server authenticated by a host key
- Client authentication
  - User name/password
  - Public key authentication
  - Kerberos
- Ensure secure management of keys used for non-interactive logon



Secure Shell Commands

- sshd
- ssh-keygen
- ssh-agent
- ssh Host
- ssh Username@Host
- ssh Host “Command or Script”
- scp Username@Host:RemoteFile /Local/Destination
- sftp

Telnet



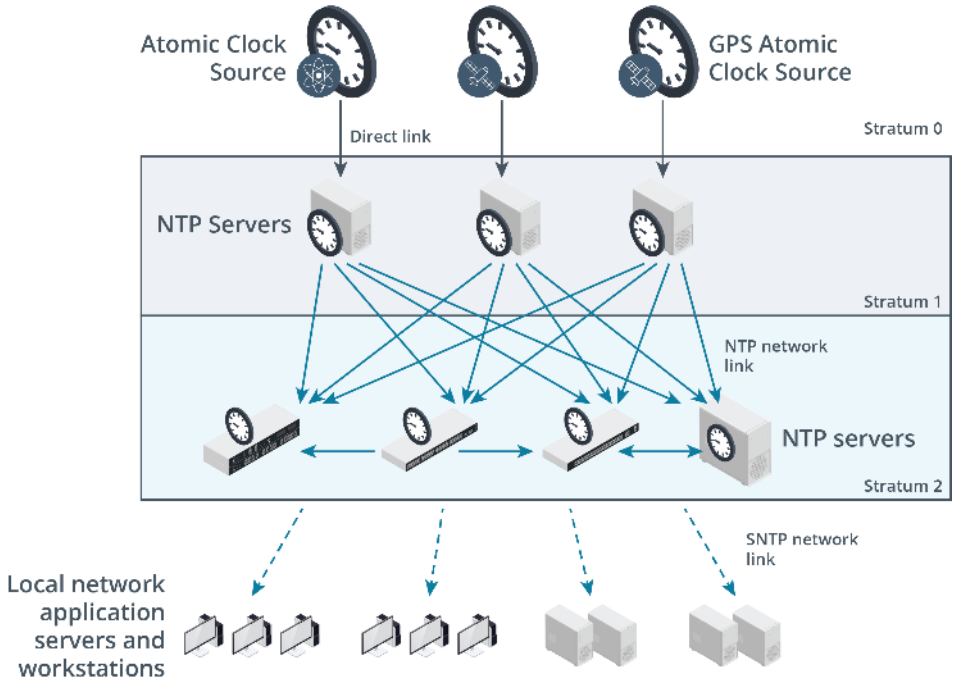
- Unsecure CLI terminal emulation over port TCP/23
- Plaintext protocol – no security
- Typically disabled

Remote Desktop Protocol

- GUI remote administration over TCP/3389
- Session can be encrypted
- Range of clients for different PC and mobile operating systems

Network Time Protocol

- Time critical services
  - Authentication, logging, task scheduling/backup, …
- Network Time Protocol (NTP)
  - Stratum 1 servers have direct physical link to accurate time source
  - Lower stratum servers sample multiple sources
  - Clients use simple NTP to obtain correct time
- Diagnosing errors due to incorrect time



Review Activity: Network Management Services

- Secure Shell Servers and Terminal Emulators
- Secure Shell Commands
- Telnet
- Remote Desktop Protocol
- Network Time Protocol

Lab Activity

Assisted Lab: Configure Secure Access Channels

- Lab types
  - Assisted labs guide you step-by-step through tasks
  - Applied labs set goals with limited guidance
- Complete lab
  - Submit all items for grading and check each progress box
  - Select “Grade Lab” from final page
- Save lab
  - Select the hamburger menu and select “Save”
  - Save up to two labs in progress for up to 7 days
- Cancel lab without grading
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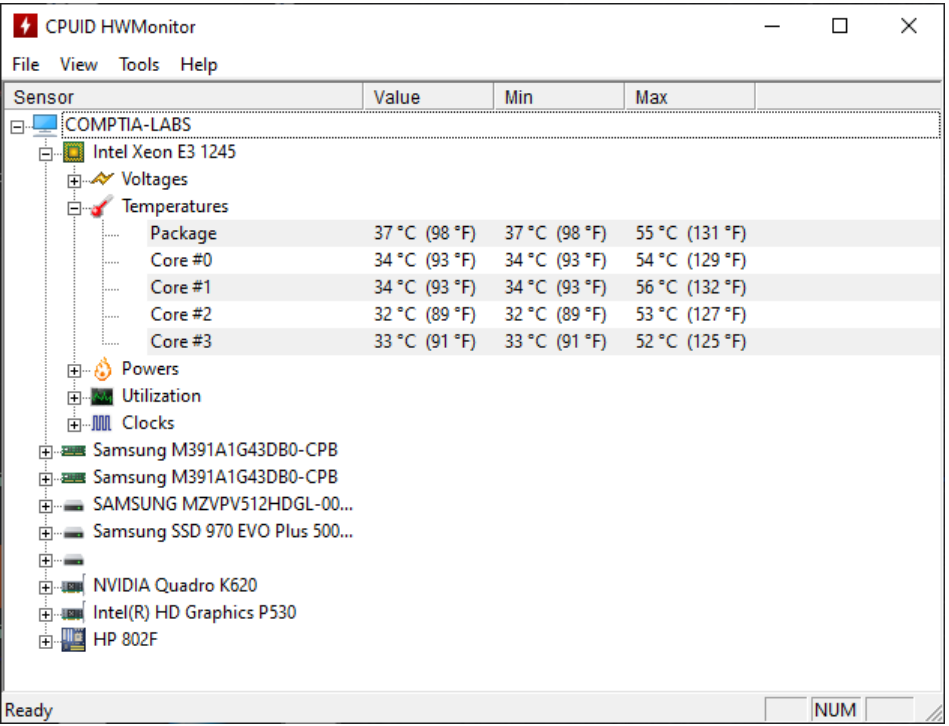
Topic 12B

Use Event Management to Ensure Network Availability

Performance Metrics, Bottlenecks, and Baselines

- Performance metrics
  - Bandwidth/throughput, CPU and memory resource, storage resource
- Bottlenecks
  - “Pinch points” that cause whole system to underperform
- Performance baselines
  - Record metrics as comparison
  - Update baselines

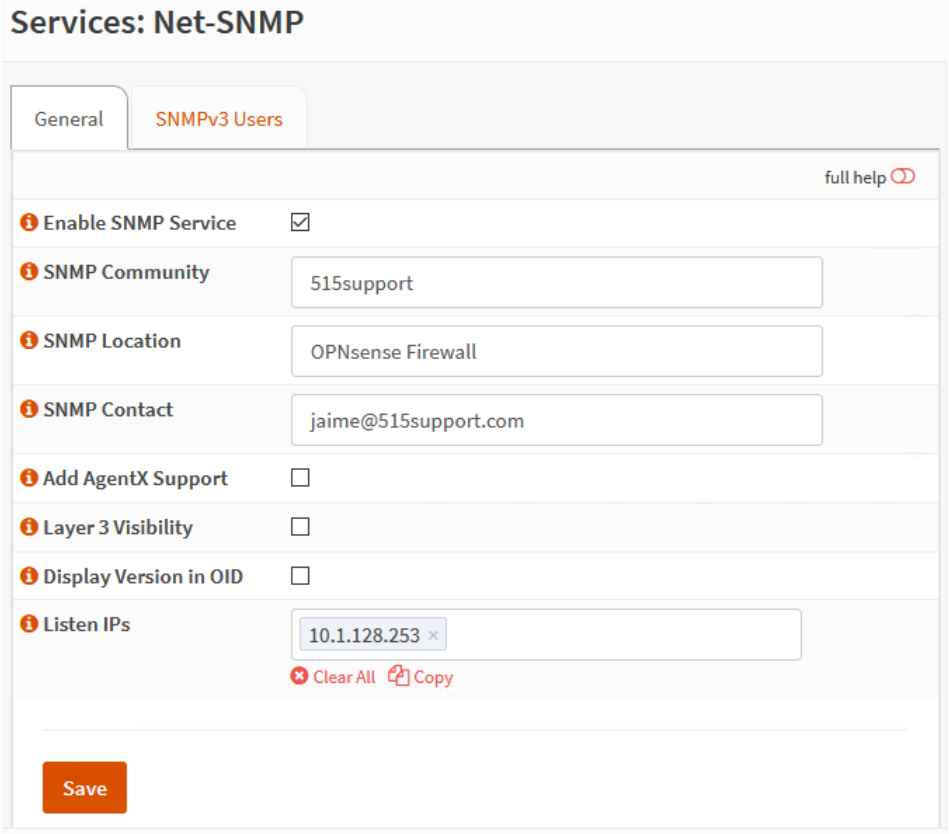
Environmental Monitoring



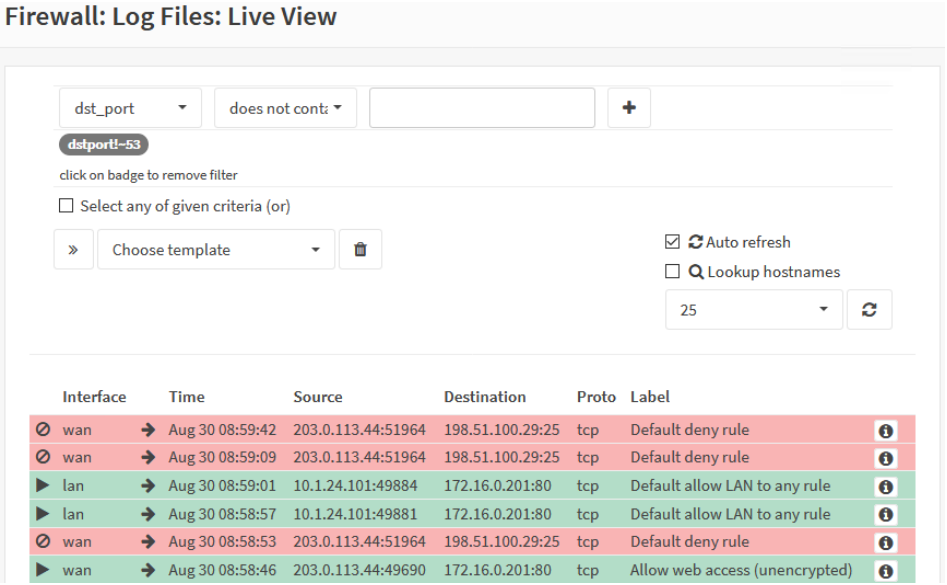
- Environmental sensors detect factors that could affect integrity/reliability
- Device chassis sensors
  - Temperature, fan speed, voltage fluctuation, intrusion
- Ambient sensors
  - Temperature, humidity, electrical, flooding

Simple Network Management Protocol

- Agents
  - Management Information Base (MIB)
  - Object Identifier (OID)
  - Community name
  - Read/only or read/write access
  - Traps
- SNMP monitor
  - Get, Trap, Walk
  - Ports UDP/161 (queries) and UDP/162 (traps)



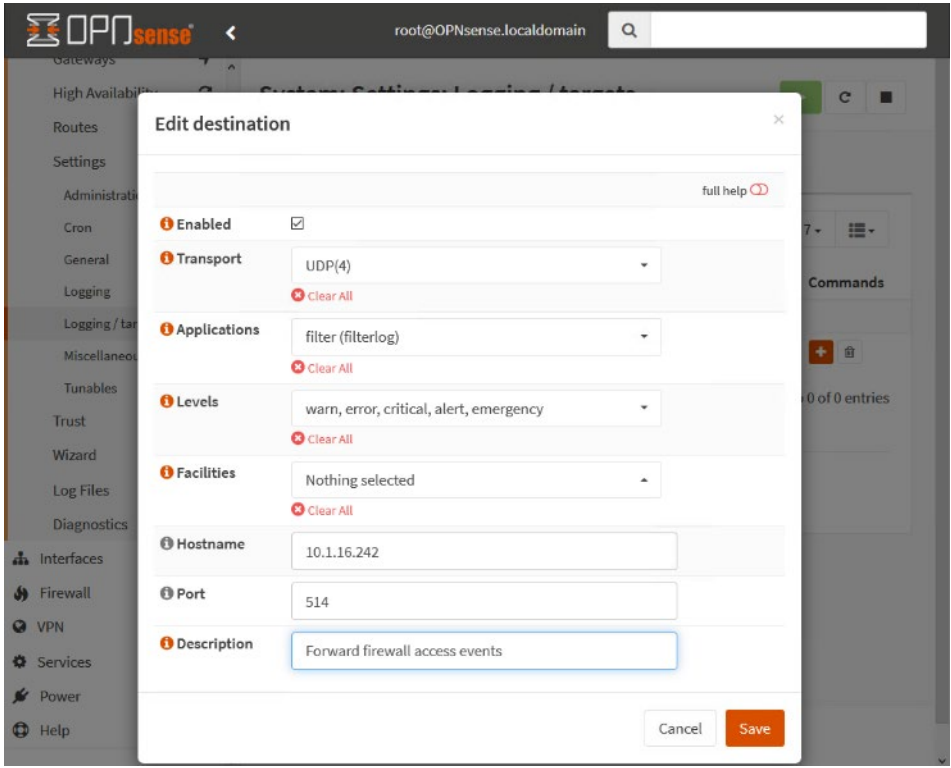
Network Device Logs



- Performance, troubleshooting, and security (auditing) information
  - Metadata plus event description
- Log types
  - System and application logs
  - Audit logs
  - Performance/traffic logs

Log Collectors and Syslog

- Centralized collection of events from multiple sources
- Syslog protocol for forwarding over UDP/514
- Syslog open format for log messages
  - PRI code
  - Header
  - Message

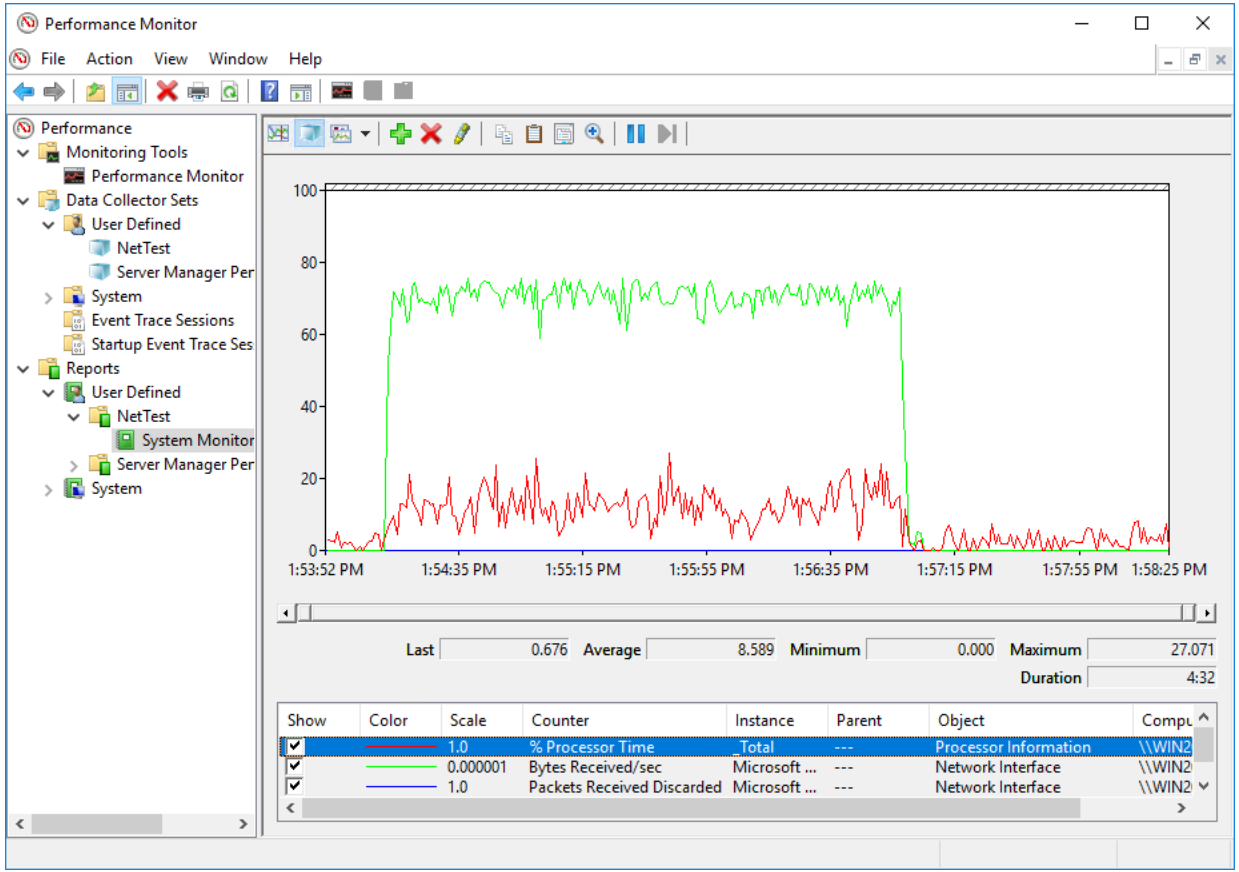


Event Management

- Event categorization
- Windows
  - Informational, warning, or critical
  - Audit success or fail
- Syslog severity levels
  - 0 (emergency) down to 7 (debug)
- Logging level and alert configuration
  - Threshold
  - Alert versus notifications and alarms
  - Ticket systems

Log Reviews

- Monitoring versus review/analysis
- Trends
- Graphing



Review Activity: Event Management

- Performance Metrics, Bottlenecks, and Baselines
- Environmental Monitoring
- Simple Network Management Protocol
- Network Device Logs
- Log Collectors and Syslog
- Event Management
- Log Reviews

Lab Activity

Assisted Lab: Configure Syslog

- Lab types
  - Assisted labs guide you step-by-step through tasks
  - Applied labs set goals with limited guidance
- Complete lab
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Topic 12C

Use Performance Metrics to Ensure Network Availability

Network Metrics

- Application requirements for high bandwidth and sensitivity to delay
- Bandwidth
  - Speed, throughput, and goodput
  - Calculating requirements for audio and video
- Latency and jitter
  - Signal delay measured in milliseconds (ms)
  - Variation in delay
  - Measurement tools (pathping and mtr)
  - One-way versus Round Trip Time (RTT)

Bandwidth Management

- Provision higher bandwidth links or prioritize traffic classes
- Differentiated Services (DiffServ)
  - Type of Service field in the IPv4 header/Traffic Class in IPv6
  - 6-byte DiffServ Code Point (DSCP)
- IEEE 802.1p
  - 3-bit priority field in 802.1Q VLAN header
  - Mapping DSCP to 802.1p
    - Network control (highest priority)
    - Expedited forwarding
    - Assured forwarding
    - Best effort (lowest priority)

Traffic Shaping

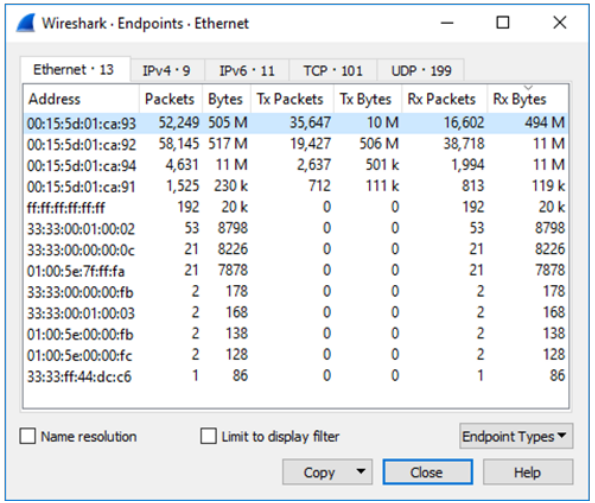
- Quality of Service (QoS) versus Class of Service (CoS)
  - Privilege real-time data over bursty data
  - CoS tags data with priority type
  - QoS allows control over network link parameters
  - Multiprotocol Label Switching (MPLS)
- Traffic policing enforces bandwidth limits
- Traffic shaping
  - Reserve link bandwidth
  - Prioritize traffic
  - Filter/deprioritize unwanted traffic

Traffic Analysis Tools

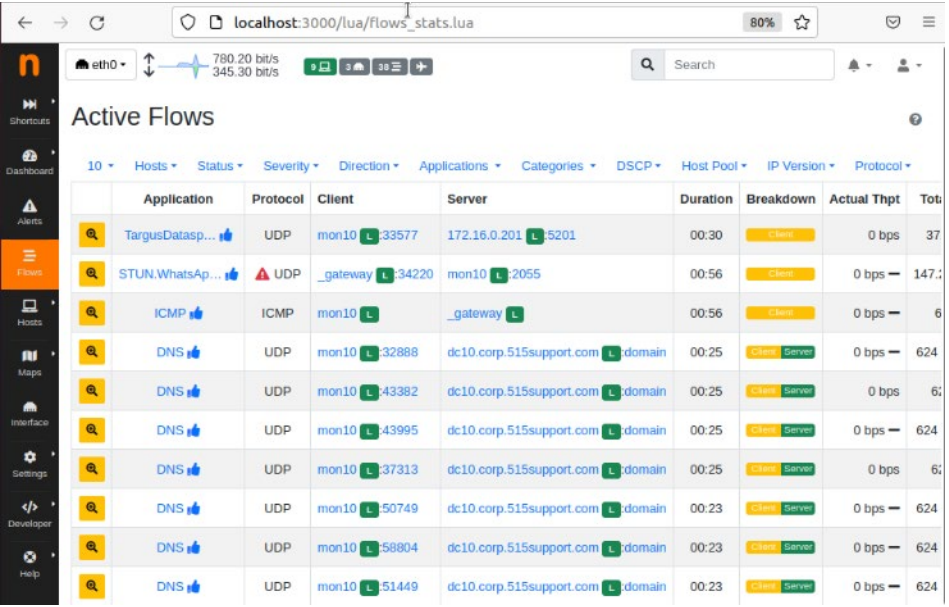
- Throughput testers
  - Assess goodput
  - iperf
- Top talkers/listeners
- Bandwidth speed testers
  - Broadband speed checkers
  - Test website performance/ monitor availability

```
non@non10:~/Desktop$ iperf3 -c 172.16.0.201 -u -b100M -t 30 -i 10
Connecting to host 172.16.0.201, port 5201
[  5] local 10.1.16.242 port 35889 connected to 172.16.0.201 port 5201
[ ID] Interval           Transfer     Bitrate         Total Datagrams
[  5]   0.00-10.00  sec   119 MBytes   100 Mbits/sec  86319
[  5]  10.00-20.00  sec   119 MBytes   100 Mbits/sec  86325
[  5]  20.00-30.00  sec   119 MBytes   100 Mbits/sec  86326
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bitrate         Jitter    Lost/Total Datag
rams
[  5]   0.00-30.00  sec   358 MBytes   100 Mbits/sec  0.000 ms  0/258970 (0%)  s
ender
[  5]   0.00-30.00  sec   358 MBytes   100 Mbits/sec  0.016 ms  0/258970 (0%)  r
eceiver

iperf Done.
```



Netflow



- Gather traffic metadata only and report it to a structured database
- NetFlow and IP Flow Information Export (IPFIX) IETF standard
- NetFlow exporters
  - Traffic flow defined by packets that share the same characteristics
  - 5-tuple and 7-tuple
- NetFlow collectors
- NetFlow analyzers

Interface Monitoring Metrics

- Link state
  - Uptime and downtime
- Resets
- Speed
- Duplex
- Utilization
  - Send versus receive
  - Bits per second or percentage of link bandwidth
  - Overall versus peak
- Per-protocol utilization
  - Packet/byte counts
- Error rate
- Discards/drops
- Retransmissions

Troubleshooting Interface Errors

- Cyclic Redundancy Check (CRC) errors
- Encapsulation errors
  - Frame type
  - Ethernet trunks
  - WAN framing
- Runt Frame errors
- Giant Frame errors

Review Activity: Performance Metrics

- Network Metrics
- Bandwidth Management
- Traffic Shaping
- Traffic Analysis Tools
- Netflow
- Interface Monitoring Metrics
- Troubleshooting Interface Errors

Lab Activity

Assisted Lab: Analyze Network Performance

Applied Lab: Verify Service and Application Configuration

- Lab types
  - Assisted labs guide you step-by-step through tasks
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Summary