

CompTIA A+ Core 1 Exam 220-1101

Lesson 6



Supporting Network Services

Objectives

- Summarize services provided by networked hosts
- Compare Internet and embedded appliances
- Troubleshoot networks

Lesson 6

Topic 6A

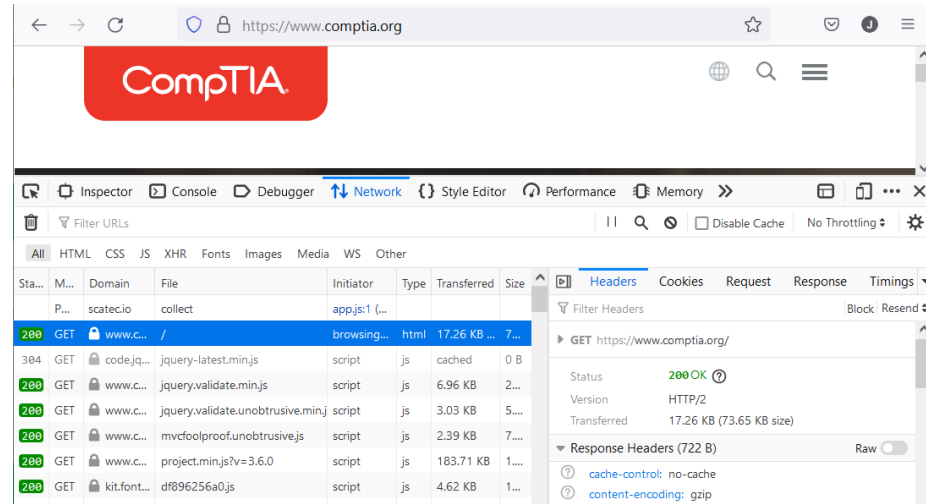
Summarize Services Provided by Networked Hosts

File/Print Servers

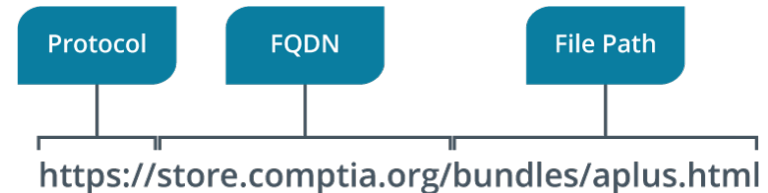
- Server Message Block (SMB)
 - TCP/445
 - Only SMB3 or SMB2 should be used
 - Common Internet File System (CIFS) references
- Network Basic Input/Output System (NetBIOS) and NetBIOS over TCP/IP (NetBT)
 - TCP-UDP/137-139
 - Only required to support legacy Windows versions (earlier than Windows 2000)
- File Transfer Protocol (FTP)
 - TCP/21 control connection and TCP/20 data transfer connection
 - Secure versions use FTP over SSH (SFTP) or with TLS (FTPS)

Web Servers

- Websites and web applications
- Hypertext Transfer Protocol (HTTP)
 - TCP/80
- HyperText Markup Language (HTML), forms, and web applications
- Uniform Resource Locators
- Web server deployment

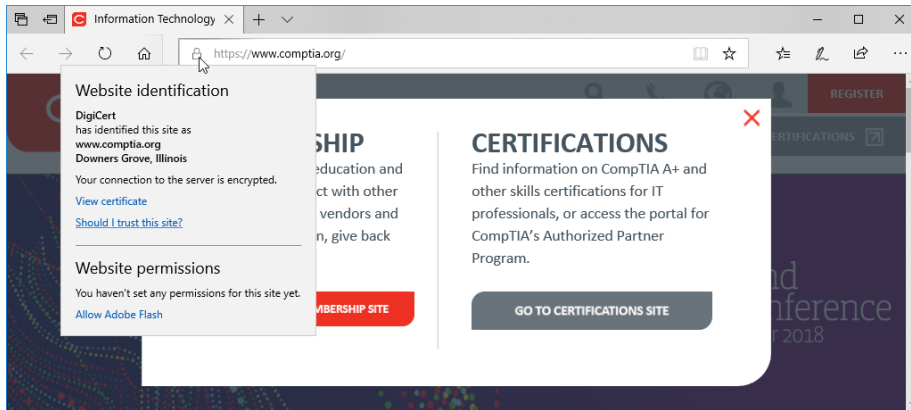


Screenshot courtesy of Mozilla



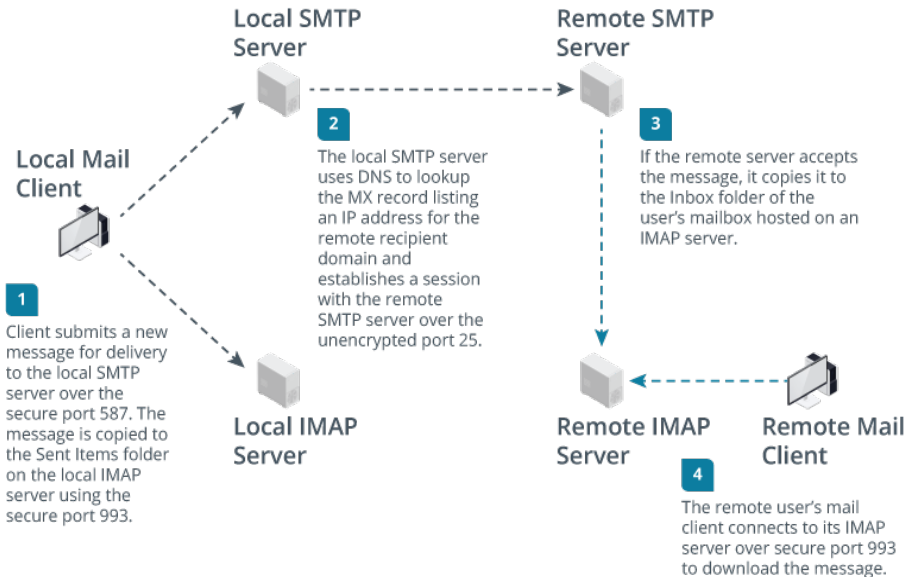
Hypertext Transfer Protocol Secure

- Transport Layer Security (TLS)
- Hypertext Transfer Protocol Secure (HTTPS)
 - TCP/443
- Digital certificates and certificate authorities (CAs)
- Browser indicators of secure operation



Screenshot courtesy of Microsoft

Mail Servers



Images © 123RF.com

- Mail servers
 - Mail transfer
 - Mailbox storage
- mailto URLs
- Simple Mail Transfer Protocol (SMTP)
 - TCP/25 for transfers between servers
 - TCP/587 for secure submission of messages by clients for delivery by server

Mailbox Servers

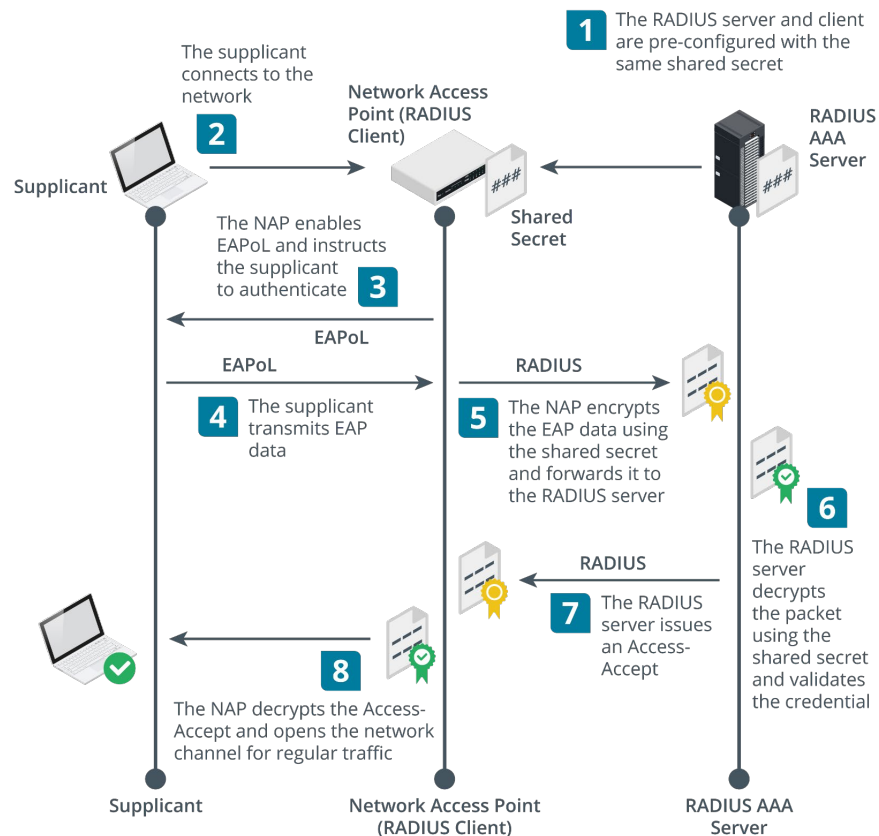
- Mailbox access
- Post Office Protocol 3 (POP3)
 - Only allows download to client
 - TCP/110 or TCP/995 (secure)
- Internet Mail Access Protocol (IMAP)
 - Allows client to manage mail folders
 - TCP/143 or TCP/993 (secure)

The screenshot shows the 'Add Account' dialog box in Microsoft Outlook. The title bar says 'Add Account' with a close button. Below the title bar, it says 'POP and IMAP Account Settings' and 'Enter the mail server settings for your account.' The dialog is divided into several sections: 'User Information' with fields for 'Your Name' (David Martin) and 'Email Address' (david@davidmartin.me); 'Server Information' with a dropdown for 'Account Type' (POP3), and fields for 'Incoming mail server' (pop3.mysisp.net) and 'Outgoing mail server (SMTP)' (smtp.mysisp.net); 'Logon Information' with fields for 'User Name' (david) and 'Password' (masked with asterisks), and a checked checkbox for 'Remember password'; 'Test Account Settings' with a 'Test Account Settings ...' button and a checked checkbox for 'Automatically test account settings when Next is clicked'; and 'Deliver new messages to:' with radio buttons for 'New Outlook Data File' (selected) and 'Existing Outlook Data File', and a 'Browse' button. At the bottom right, there is a 'More Settings ...' button. At the very bottom, there are three buttons: '< Back', 'Next >' (highlighted with a blue border), and 'Cancel'.

Screenshot courtesy of Microsoft

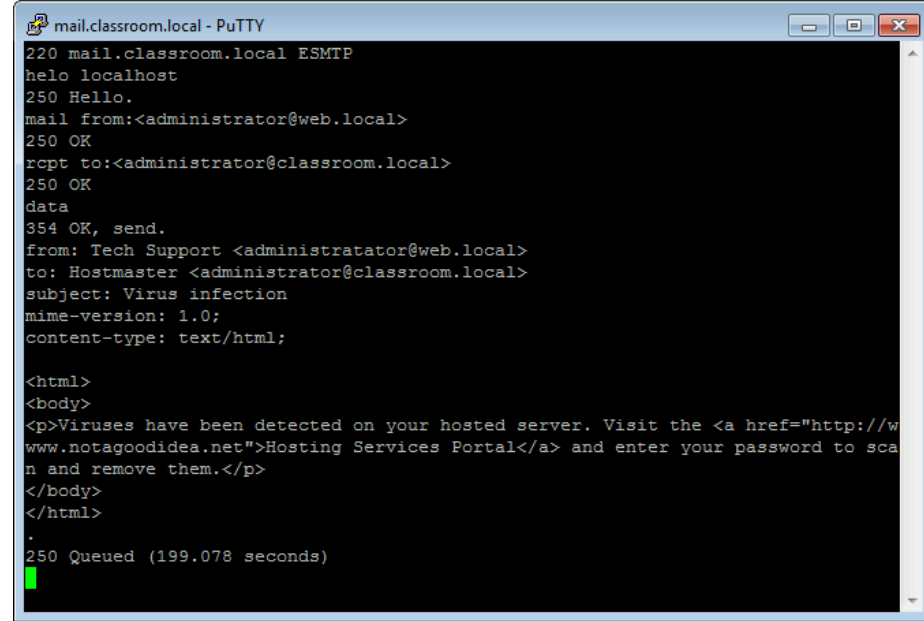
Directory and Authentication Servers

- Access control systems
- Lightweight Directory Access Protocol (LDAP)
 - Manage directory of network users and resources
 - TCP/389
- Authentication, authorization, and accounting (AAA)
 - Supplicants
 - Network access devices
 - AAA servers



Remote Terminal Access Servers

- Secure Shell (SSH)
 - Encrypted remote terminal emulation
 - TCP/22
- Telnet
 - Unsecure remote terminal emulation
 - TCP/23
- Remote Desktop Protocol (RDP)
 - GUI-based host access and control
 - TCP/3389

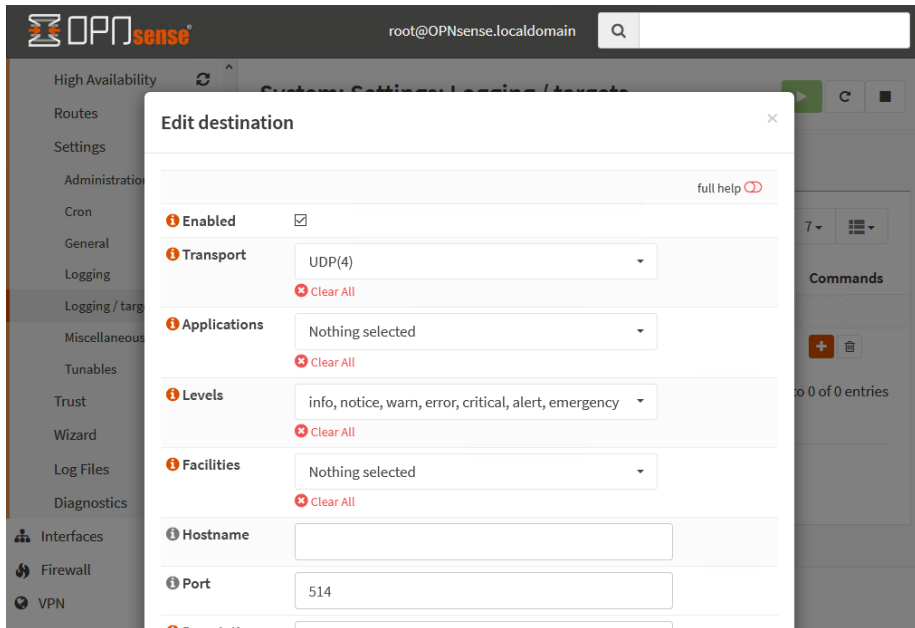
A screenshot of a PuTTY terminal window titled 'mail.classroom.local - PuTTY'. The window shows an SMTP session between a client and a server. The client sends 'helo localhost', and the server responds with '220 mail.classroom.local ESMTP'. The client then sends 'mail from:<administrator@web.local>', and the server responds with '250 Hello.'. The client sends 'rcpt to:<administrator@classroom.local>', and the server responds with '250 OK'. The client sends 'data', and the server responds with '354 OK, send.'. The client then sends an email header and body. The header includes 'from: Tech Support <administratator@web.local>', 'to: Hostmaster <administrator@classroom.local>', 'subject: Virus infection', 'mime-version: 1.0;', and 'content-type: text/html;'. The body contains a paragraph about viruses and a link to 'http://www.notagoodidea.net'. The client ends the session with a period, and the server responds with '250 Queued (199.078 seconds)'.

```
mail.classroom.local - PuTTY
220 mail.classroom.local ESMTP
helo localhost
250 Hello.
mail from:<administrator@web.local>
250 OK
rcpt to:<administrator@classroom.local>
250 OK
data
354 OK, send.
from: Tech Support <administratator@web.local>
to: Hostmaster <administrator@classroom.local>
subject: Virus infection
mime-version: 1.0;
content-type: text/html;

<html>
<body>
<p>Viruses have been detected on your hosted server. Visit the <a href="http://w
www.notagoodidea.net">Hosting Services Portal</a> and enter your password to sca
n and remove them.</p>
</body>
</html>
.
250 Queued (199.078 seconds)
```

Screenshot courtesy of PuTTY

Network Monitoring Servers



Screenshot courtesy of OPNsense

- Simple Network Management Protocol (SNMP)
 - Management Information Base (MIB)
 - GET versus TRAP
 - UDP/161 + UDP/162
- Syslog
 - Logging and event management server role
 - UDP/514

Review Activity: Services Provided by Networked Hosts

- File/Print Servers
- Web Servers
- Hypertext Transfer Protocol Secure
- Mail Servers
- Mailbox Servers
- Directory and Authentication Servers
- Network Monitoring Servers

Lab Activity

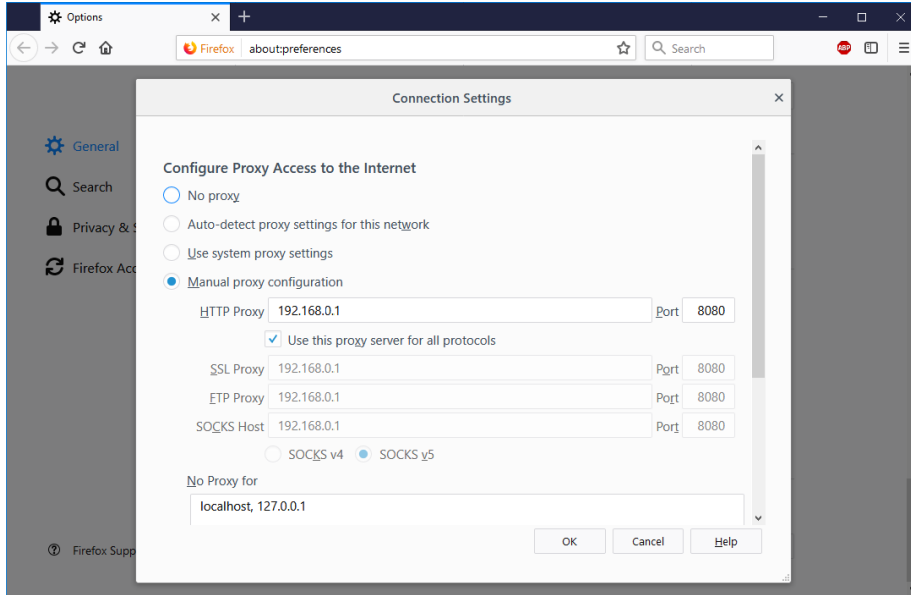
- Assisted Lab: Compare Protocols and Ports
 - Analyze network traffic to identify the features of protocols and ports

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Topic 6B

Compare Internet and Embedded Appliances

Proxy Servers



Screenshot courtesy of Mozilla

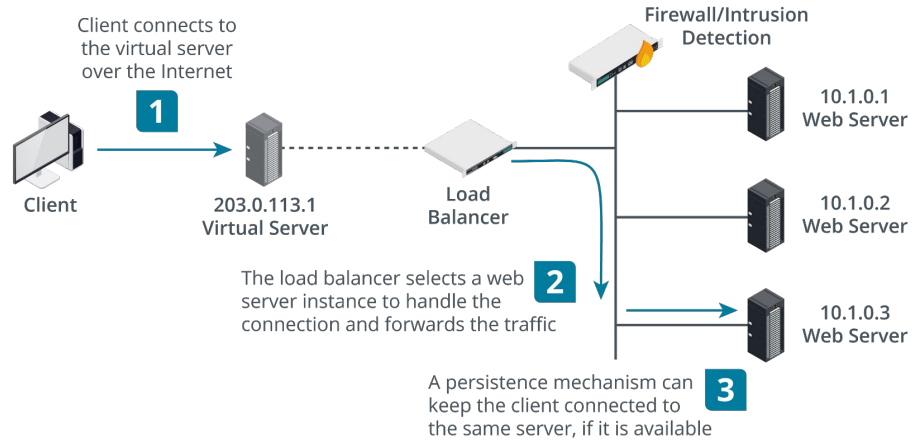
- Manages user access from local network to Internet/websites
 - Transparent proxy automatically intercepts requests
 - Non-transparent proxy requires client configuration with server IP address and proxy service port
- Can apply content filtering and time restrictions
- Caching function to improve performance

Spam Gateways and Unified Threat Management

- Network security functions
 - Firewalls
 - Intrusion detection systems (IDS)
 - Anti-virus/anti-malware solutions
 - Spam gateways
 - Content filters
 - Data leak/loss prevention (DLP) systems
- Unified Threat Management (UTM)
 - Single appliance/gateway that performs multiple security functions

Load Balancers

- Distribute client requests between processing nodes
- Inbound client requests
 - Web, DNS, and mail servers and filtering
 - Virtual server address



Images © 123RF.com

Legacy Systems

- Legacy systems
 - Vendor is no longer active
 - Product is deprecated by vendor as End of Life (EOL)
- Lack of support
- Risks from unpatchable vulnerabilities

Embedded Systems and SCADA

- Workflow and process automation systems
 - Industrial control system (ICS)
 - Programmable logic controller (PLC) plus mechanical components and sensors
 - Operational technology (OT) network
 - Human-machine interfaces (HMI) and data historian
- Supervisory control and data acquisition (SCADA)
 - PCs used to monitor multiple-site ICSs

Internet of Things Devices

- Hub/control system
 - Smart speaker
 - Smartphone app or web management
- Smart device functions

Review Activity: Internet and Embedded Appliances

- Proxy Servers
- Spam Gateways and Unified Threat Management
- Load Balancers
- Legacy Systems
- Embedded Systems and SCADA
- Internet of Things Devices

Lesson 6

Topic 6C

Troubleshoot Networks

Troubleshoot Wired Connectivity

- Identify the problem
 - NIC port > Patch Cord > Wall Port > Structured Cable > Patch Panel > Patch Cord > Switch Port
 - Complete loss of connectivity or intermittent loss of connectivity
- Establish a theory
 - Verify patch cords using known good examples or cable tester
 - Verify network ports using a loopback adapter
 - Verify permanent link using a cable tester
 - Verify switch interface configuration or consider updating NIC driver
- Port flapping between up and down states

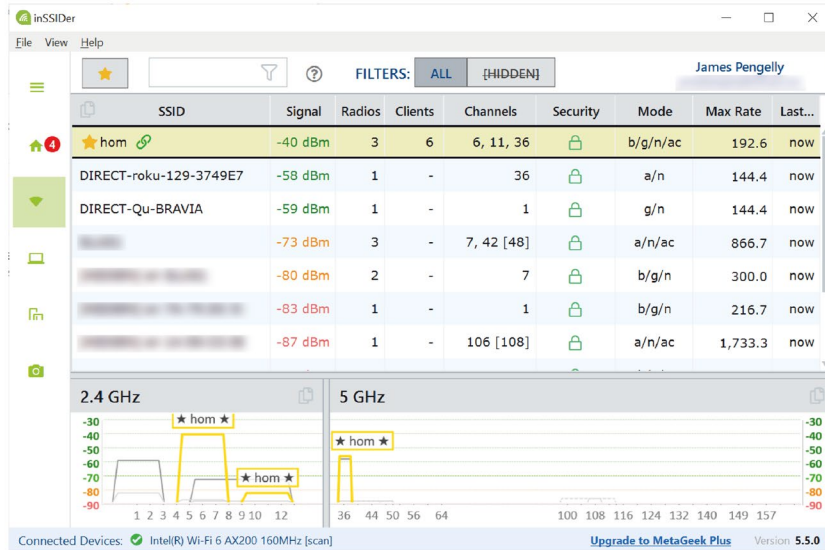
Troubleshoot Network Speed Issues (Slide 1 of 2)

- Verify switch port and NIC configuration
 - Duplex mismatch
- Verify reported issue and link speed
- Test for external interference
 - Nearby power lines, fluorescent lighting, motors, and generators
 - Improper termination (incorrect pin outs and untwisting more than ½" or 13mm)
 - Analyze traffic from network tap or switch interface reporting tool for excessive damaged frames

Troubleshoot Network Speed Issues (Slide 2 of 2)

- Check for driver update
 - Check if problem is common to all hosts with same driver version
- Consider malware or faulty software as the cause
 - Isolate host for scanning
 - Try to reproduce the issue with different host
- Establish problem scope
 - Do multiple users experience the same issue?
 - Is the issue restricted to a switch, affects Internet access, ...?

Troubleshoot Wireless Issues



*Screenshot courtesy of MetaGeek, LLC ©
2005-2021*

- Wireless configuration
 - Verify network name/SSID
 - Verify support for Wi-Fi or 802.11 standard
- Low RF signal strength/RSSI
 - Check signal strength and check for flapping between two access points
 - Move closer to access point
- Wireless signal issues
 - Scan for channel overlap by other WLANs
 - Assess environment for interference sources

Troubleshoot VoIP Issues

- Symptoms of poor Voice over Internet Protocol (VoIP) quality
 - Delay, echo, drop-outs, disconnections, ...
- Bursty data transfer versus real-time sensitive data transfer
- Measure latency
 - Delay in milliseconds (ms)
- Measure jitter
 - Variation in delay (ms)
- Configure Quality of Service (QoS) mechanism

The screenshot displays the TP-Link Archer VR900 web management interface. The top navigation bar includes the TP-LINK logo, the device model 'Archer VR900', and tabs for 'Quick Setup', 'Basic', and 'Advanced'. The 'Advanced' tab is selected, and the language is set to 'English'. On the left sidebar, there are icons for 'NAT Forwarding', 'USB Settings', 'Parental Controls', 'Bandwidth Control' (which is highlighted), 'Security', and 'System Tools'. The main content area is titled 'Bandwidth Control' and contains the following settings:

- Bandwidth Control:** ☒ Enable
- Line Type:** ☒ ADSL ☐ Other
- Current Upstream Rate:** 36333 Kbps
- Current Downstream Rate:** 100013 Kbps
- Total Upstream Bandwidth:** 36333 Kbps
- Total Downstream Bandwidth:** 100013 Kbps
- IPTV Bandwidth Guarantee:** ☐ Enable

A green 'Save' button is located at the bottom right of the settings section. Below this, the 'Controlling Rules' section features a table with columns for 'Description', 'Priority', 'Up (min/max)', 'Down (min/max)', 'Enable', and 'Modify'. There are 'Add' and 'Delete' buttons above the table. The table currently contains one row with dashes ('--') in all columns.

At the bottom of the interface, the footer shows 'Firmware Version: 0.1.0 0.9.1 v0069.0 Build 160525 Rel.38143n' and 'Hardware Version: Archer VR900 v2 00000000'. A 'Support' link is also present.

Screenshot courtesy of TP-Link

Troubleshoot Limited Connectivity

- Notification of connection error in OS (such as limited connectivity or no internet)
 - Physical link is operational but IP configuration faulty
 - Static address versus automatic IP addressing (APIPA) 169.254.x.y range
- Establish scope of network problem
 - Single host versus switch/router
 - Host can access local network but not Internet
- Verify which local network host is in
 - Connection to correct switch or switch port via patch cord from patch panel
 - Switch port configured with correct virtual LAN (VLAN) ID
- Verify SOHO router Internet configuration and status
 - Link speed/status
 - Servers configured to resolve DNS queries

Review Activity: Network Troubleshooting

- Troubleshoot Wired Connectivity
- Troubleshoot Network Speed Issues
- Troubleshoot Wireless Issues
- Troubleshoot VoIP Issues
- Troubleshoot Limited Connectivity

Lab Activity

- Assisted Lab: Troubleshoot a Network Scenario #1
 - Troubleshoot a network issue in a simulated network topology
- Assisted Lab: Troubleshoot a Network Scenario #2
 - Troubleshoot a problem on a home router network
- APPLIED Lab: Troubleshoot a Network Scenario #3
- APPLIED Lab: Troubleshoot a Network Scenario #4
 - Work independently to diagnose and remediate issues with a home router network

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Summary