EXAM 642-825

ISCW

Mega Guide

Prepare With Confidence

This PrepLogic Mega Guide was written by certified subject matter experts and published authors to provide you accurate, in-depth exam coverage. All exam objectives are covered in detail, giving you the knowledge and confidence you need to pass your exam.

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Implement Basic Teleworker Services

Describe Cable (HFC) Technologies

As can be seen in figure 1, the cable system has many components. Starting from the antenna site, where the broadcast signals are received, everything is processed, formatted and distributed at the headend. The signal is sent from the headend over the transportation network using broadband. As the signals proceed farther from the headend, amps are used to boost the signal. The distribution network is used to get the signal in the area of the subscriber. A node converts the optical signal to the RF signal for the feeder lines in the neighborhood. Taps are used to provide multiple outlets for the signal. From there, a subscriber drop provides the connection from the system to the subscriber's building.

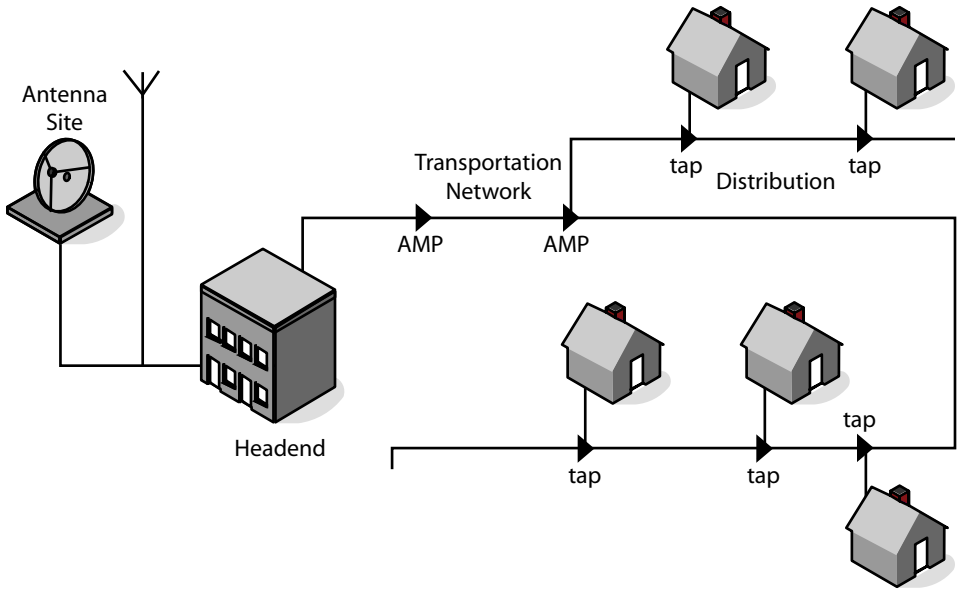

Figure 1

DOCSIS – Data Over Cable Service Interface Specifications

The specification for cable Internet and modems is DOCSIS, which you can see below. Each brought new enhancements for cable Internet. Currently, DOCSIS 2.0 is being used.

DOCSIS 1.0 – Developed in 1997
DOCSIS 1.1 – Developed in 1999
DOCSIS 2.0 – Developed in 2002, implemented QoS and VoIP
DOCSIS 3.0 – Currently in development but will include channel bonding. This is tying together multiple channels to make a larger pipe.

Downstream uses 50 Mhz – 860 Mhz in the RF spectrum and can be divided up in 6 MHz chunks.
Upstream uses 5 Mhz – 42 MHz in the RF spectrum.

Cable Modem Boot Process

After power-up, the cable modem scans the frequencies for the downstream signal. Once it finds the downstream, it negotiates the upstream frequency. Once these are established, the layer 1 and 2 OSI path is completed. Now the modem asks for an IP through DHCP and is assigned one by the headend. Once the IP is assigned, then TFTP (trivial FTP) takes place and the DOCSIS config is downloaded to the modem. This provides downstream and upstream frequencies, TV sections, VoIP and QoS settings. Now the cable modem will register its MAC address with the service and completes the layer 3 section.

Describe xDSL Technologies

The DSL technologies have two transmission modes, synchronous (same upstream and downstream speeds) and asynchronous (faster downstream speed and slower upstream speed). DSL is transmitted over the same copper wires your voice phone operates on, as voice traffic only uses up a small portion of the frequency on the line. DSL uses the unused portion above the voice area, allowing both phone calls and Internet service. A filter is used to keep the data signals from interfering with the voice calls. The filter can be installed either where the phone line enters the building, effectively filtering all phones, or by installing a filter on each phone.

Due to running DSL over the same copper wires, there is a distance limitation. A DSLAM (DSL Access Multiplexer) is used to extend the distance from the central office (CO) to provide service to more customers.

DSL Frequency Ranges

The phone system uses 300 Hz to 3 kHz for voice and DSL uses the unused portion from 3 kHz to 1.1 MHz. This allows broadband Internet over existing phone lines.

DSL Variants

Variant	Downstream	Upstream	Max Distance
ADSL (a)	8 Mbps	1 Mbps	18,000 ft
G.SHDSL (s)	2.3 Mbps	2.3 Mbps	28,000 ft
IDSL (s)	144 kbps	144 kbps	18,000 ft
SDSL (s)	768 kbps	768 kbps	22,000 ft
VDSL (a/s)	52 Mbps	13 Mbps	4,500 ft

a – asynchronous; s – synchronous; G.SHDSL is an international standard maximum distance is measured from the CO to the subscriber's premises

DSL Limitations

Apart from the distance limitations above, there are other factors that would preclude a customer from getting DSL server. If there is an older two wire system in the house, the wire can act as an antenna and pick up AM broadcast signals, causing interference with the DSL signal. This type of wiring can also cause cross-talk, the bleeding of one signal onto the other wire, degrading the signal. If the phone wires have been installed for a long time, there could be corrosion on the wires which would cause an impedance mismatch causing the signal to degrade.

Connection Methods

ADSL is the most popular and widely used type of DSL. It uses the entire frequency range on the phone line and requires the use of phone filters. A filter can be installed at each phone or device not using DSL, or you can install the filter at the phone box on the side of the building. Once this is done, all phones will be filtered inside the building and a separate line can be run just for the DSL modem.

RFC 1483 Bridged – This type of connection passes the connection directly to the PC. The PC will initiate a DHCP request and get an IP from the head end. This is not a secure connection as any device attached could get an IP without requiring authentication.

PPPoE – This is the most typical method of connecting to DSL. The PPP header is spliced into an Ethernet frame which adds the PPP features to the DSL connection. The only feature that is used is the authentication portion. A software install is needed on the PC to use the PPPoE authentication which is why it's easier to use a router. Cisco routers allow you to setup PPPoE connections on their routers.

PPPoA – This method has you connect the router directly to the ATM router. It still uses the PPP authentication but provides VPI/VCI information as well. The VPI/VCI information is like DLCI for frame relay or a MAC address on a network card.

Configuring PPPoE

To use DSL as your connection, the router has to have a dialer interface configured along with PPP settings. Below are the settings that are needed.

PPPoE on Ethernet Interfaces – On a router with two interfaces, PPPoE functionality is configured on the provider facing interface.

Configure a Dialer Interface

```
interface Dialer1
 ip address negotiated
 ip mtu 1492
 ip nat outside
 encapsulation ppp
 dialer pool 1
 ppp authentication pap callin
 ppp pap sent-username mydslconn@isp.com password 0 123456
```

Interface dialer 1 is a virtual interface that will handle the PPPoE authentication and actually get the IP address from the ISP by use of the **ip address negotiated** line. Since this is PPPoE, the connection has to be authenticated before an address can be handed out. By setting the MTU to 1492, this will allow you to use the full MTU of 1500, since PPPoE has an 8k header. IP nat outside is used to translate the private address to the public address when someone goes to the Internet. Encapsulation ppp tells the interface it is using the PPP protocol for this connection. Dialer pool 1 will be used to virtually connect this interface with a physical interface. PPP authentication pap callin tells the interface that we are using PAP (password authentication protocol) to send the username and password by connecting to the DSL provider. PPP pap sent-username and password is the line where you would insert the username and password for the DSL connection.

Configure an Ethernet Interface

```
interface FastEthernet0
 no ip address
 duplex auto
 speed auto
 pppoe enable
 pppoe-client dial-pool-number 1
```

There are only two commands you have to apply to the Ethernet Interface: pppoe enable and pppoe-client dial-pool-number 1. The first command enables PPPoE on the interface and the second ties the interface to the dialer interface. An IP address will not be assigned to the interface since the dialer interface will get the address from the provider.

Configure Port Address Translation

This is set by using the command ip nat outside on the WAN interface and ip nat inside on the LAN interface. Here is an example:

```
interface Dialer1
 ip address negotiated
 ip mtu 1492
 ip nat outside
 encapsulation ppp
 dialer pool 1
 ppp authentication pap callin
 ppp pap sent-username mydslconn@isp.com password 0 123456
!
interface Vlan1
 ip address 10.10.10.254 255.255.255.0
 ip nat inside
```

Since the statements are applied to the interfaces, we need to tell the interfaces what to NAT. This is done by setting up an access list and globally assigning NAT to the access list.

```
ip access-list extended NAT_ADDRESSES
 permit ip 10.10.10.0 0.0.0.255 any

ip nat inside source list NAT_ADDRESSES interface Dialer1 overload
```

The overload command allows many internal users to get to the Internet. If the overload command is not applied, then only one device on the LAN will be allowed to the Internet.

Configure DHCP for LAN Users

You can setup the DSL router as a DHCP server for the LAN users. You will need to exclude the Ethernet interface of the router from the range by using:

```
ip dhcp excluded-address 10.10.10.254
```

The pool will be setup using the following commands:

```
ip dhcp pool PCLAN
 import all
 network 10.10.10.0 255.255.255.0
 default-router 10.10.10.254
```

Configure Static Default Route on the Router

In order to get to the Internet, a default route needs to be added to the router. By using the following command this can be obtained. It is always best to assign it to an Interface in case the IP address changes. This will prevent, or limit, the amount of reconfiguration and down time if changing ISPs.

```
ip route 0.0.0.0 0.0.0.0 Dialer1
```

Configuring PPPoA

PPPoA is Point-to-Point Protocol over ATM and will be configured on the ATM interface of the router.

VCMultiplexed PPP over AAL5 Known as VC-MUX or AAL5MUX, this provides the capability to create a per-protocol virtual circuit to transport payloads for differing routed protocols.

LLC Encapsulated PPP over AAL5 This uses a single virtual circuit to transport all protocols.

Configuration Using AAL5MUX

```
interface ethernet0/0
 ip address 10.10.10.254 255.255.255.0

interface ATM0/0
 no ip address
 dsl operating-mode auto
 pvc 8/35
encapsulation aal5mux ppp dialer
 dialer pool-member 1
```

Configuration Using AAL5SNAP

```
interface ATM0/0
 no ip address
 dsl operating-mode auto
interface ATM0/0.1 multipoint
 class-int ppp-default
 pvc 8/35
```