1/15/2025

Week 1 quiz review:

1. Based on destination address, the router consults the routing table to find the longest match to decide where it gets forwarded
2. Uniquely identify devices on a layer 2 level and gets assigned to an IP address
3. Give subnet mask to support a subnet with a maximum of 25 host addreses

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Subnet | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 |
| Host | 258 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| CIDR | /24 | /25 | /26 | /27 | /28 | /29 | /30 | /31 | /32 |

Question 5:

Instructed to create a subnet using a /29 prefix and that the first host address is to be used for the subnet router. How many addresses are available for additional hosts.

8-3 = 5 🡪 /32

Good practice if possible to use /31 for point to point links making it easier to manage hosts.

Module 2: Understanding the Data plane

MPLS Label Stack Implementation:

* A single data packet or frame can carry multiple MPLS labels
* When it happens, the encapsulated data carries a label stack
* Inserted between OSI Layer 2 and the encapsulated data (Payload)
* A close-up of a label

  Description automatically generatedUsed to differentiate different types of services and/or customers from each other.

MPLS also supports VPN services and IGP and BGP tunnels.

A label stack can be formed by encapsulating labels with other labels, each providing a specific function within the network. Stacked labels support a wide range of MPLS-based services, including VPN LAN Services, VPRN, MPLS Fast-Reroute, trace, ping or Traffic Engineering applications.

A diagram of a network

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Figure above is the logical service construct for point-to-point connectivity services. Within this model only the edge (PE) routers are service aware.

Service instance: Virtual software entity in the service router.

* Each instance provide isolation between different customers providing inherent security and the ability to apply local, customized settings per customers.
* Allows for granular and scalable allocation of resources across different customers.

MPLS transport tunnel can multiplex and transport several service tunnels. Intermediate routers (P) are only aware of the tunnel itself as it encapsulates the service tunnels from the P routers. Improves network performance and scalability.

A diagram of a network

Description automatically generated

Diagram assumes routers have already signaled the tunnels and their associated label values prior to the arrival of data traffic at iLER.

Based on the figure above:

1. R1 processes each customer’s data traffic into a dedicated service
2. Data is delivered to corresponding service tunnels
3. R1 pushes a separate, previously signaled service label on top of each packet.

Same edge-to-edge transport tunnel forwards the labeled packets to the core.

As an LSR, R2 processes only the top label in the stack:

* It then swaps transport label T1 with transport T2 and sends the packet to R3
* Leaves the remaining parts of the packet, service label X and the encapsulated customer data.

This process repeats between each router until it reaches the intended destination.

A diagram of a server

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2 main Layer 2 VIP I services:

1. Virtual Private Wire Services (VPWS)
2. Virtual Private LAI I Services

Characteristics:

* Transparent to the customer
* Forwards the entire customer-generate L2 payload transparently between the two CE devices

The egress LER extracts the customer’s payload from the service provider’s headers and forwards the original Layer 2 frame to CE2. It is accepted since its own L2 MAC address is the destination.

A diagram of a server

Description automatically generated

Layer 3 (IP) VPI I service solution is Virtual Private Routed I Ietwork

In this model, service instances maintain isolated routing tables and decide on a per service basis how to forward the packets to their destinations. PE routers form peer relationships with the CE routers inside respective service instances.

A screenshot of a computer

Description automatically generated

Fields:

1. Field (20 bits) – Most significant 20 bits is the label that contains the value information. Can range from 0 to 1,048,575
2. EXP (3 bits) – Experimental bits as when introduced there wasn’t a clear idea. They are now used for QoS marking in all implementations.
3. S (1 bit): Bottom of stack
4. TTL (3 bits): Functions like an IP TTL field (As soon as TTL = 0 the packet is discarded)