



TNE10006/TNE60006: Networks and Switching



IPv4 Subnetting – VLSM

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Outline

- VLSM Subnetting Review
- Example
- Spotting Mistakes



VLSM Subnetting Review

- Requirements tell us the number of hosts per network
- This tells us how many bits are needed in the host portion
- The remaining bits are all network bits
 - Some of those MUST be network bits because that is the originally allocated network
 - The others were originally host bits which we change into network bits
- The rest of the network (Internet) doesn't know about our subnetting
 - Routing tables route traffic to our original network to our gateway router
- We divide the binary address tree of the Internet into allocated networks
- We divide the binary address tree of our network (Internet node) into our subnets
 - Subnetted nodes cannot overlap



VLSM Subnetting

Review – Example

- Want to maximise remaining addresses for future expansion
- Best approach is to allocate subnets in order from largest to smallest
- Example
 - Start with a **/16** network – 134.29.0.0/16
 - Need 3 subnets with 4,036 hosts
 - 2 subnets with 1,006 hosts
 - 1 subnet with 240 hosts
 - 3 subnets with 100 hosts
 - 4 subnets with 2 hosts



VLSM Subnetting

Review – Example Solution

- 4,096 hosts – 12 bits for hosts, /20
 - 134.29.0.0/20
 - Next subnet starts at 134.29.0.0 + 4,096 (16.0) = 134.29.16.0
 - 134.29.16.0/20
 - 134.29.32.0/20
 - Next subnet starts at 134.29.48.0
- 1,024 hosts – 10 bits, /22
 - 134.29.48.0/22
 - 134.29.52.0/22
- 256 hosts – 8 bits, /24
 - 134.29.56.0/24
- 128 hosts – 7 bits, /25
 - 134.29.57.0/25
 - 134.29.57.128/25
 - 134.29.58.0/25
- 4 hosts – 2 bits, /30
 - 134.29.58.128/30
 - 134.29.58.132/30
 - 134.29.58.136/30
 - 134.29.58.140/30
- Rest unused
 - 134.29.58.144 – 134.29.255.255



Why from largest to smallest ?

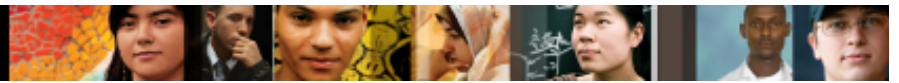
- This ensures that all subnets can immediately follow another subnet
 - No small unused ranges between subnets
- All unused addresses at end of original network



VLSM Subnetting

Guidelines to Spot Mistakes

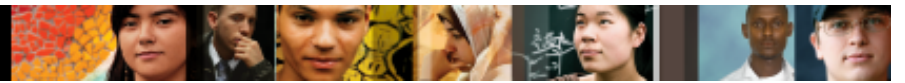
- All subnets begin at a multiple of the subnet size
- All subnets have a power of 2 hosts
- Any subnet between /17 to /24 must have network address of A.B.C.0 (Broadcast – A.B.X.255)
- Any subnet between /8 to /16 must have network address of A.B.0.0 (Broadcast – A.X.255.255)
- Broadcast addresses are last address



VLSM Subnetting

Guidelines to Spot Mistakes

- Once you have completed your subnetting
 - Allocated networks (network address/subnet mask)
 - Allocated interface addresses (IP address/subnet mask)
- Configure router and allocate IP Address/subnet mask to each interface
- `sh ip route`
 - Will display the routing table of directly connected networks
 - If network address/subnet mask is not what you allocated – mistake



IPv4 Subnetting – VLSM

Summary

In this lecture, we covered:

- VLSM Subnetting Review
- Example
- Spotting Mistakes