CT2108 Lab – IPv4 Subnetting

Part A
Assume that you are working for a large multinational company that wants to use the private IP address range 10.0.0.0/8 for its global internal network. The company management wants the network to be able to accommodate operations in up to 64 locations worldwide where each location has its own routed subnet. You are requested to design the network layout. Answer the following questions and try to understand fully the logic behind each answer:

1. If we did not subnet this network, then how many individual host addresses would be available in the full /8 network?

The /8 netmask leaves 24 bits for the hostid part, so this gives 2^24 possible host ip addresses (over 16 million) in the full /8 network.

2. What subnet mask will need to be used to fulfill the goal of having up to 64 routed global subnets?

We need 6 bits to be able to address 64 subnets, as 2^6 = 64. So, we need to take 6 bits from the hostid part of the address to represent the subnetid. We are starting with a /8 so adding 6 to this give a /14 or 255.252.0.0

3. How many host IP addresses will then be potentially available at each global location?

Using a /14 still leaves 18 bits of the 32-bit IPv4 address for the hostid. This means that each global subnet can have up to 2^18 or 262142 hosts.

4. What are the valid host and broadcast addresses for the first and second global subnets?

As per ipcalc output:

Network: 10.0.0.0/14   (First Subnet)
Broadcast: 10.3.255.255
HostMin: 10.0.0.1
HostMax: 10.3.255.254
Hosts/Net: 262142

Network: 10.4.0.0/14   (Second Subnet)
Broadcast: 10.7.255.255
HostMin: 10.4.0.1
HostMax: 10.7.255.254
Hosts/Net: 262142

Part B
Assume that the company has one of its worldwide locations in Galway and that the internal network in the Galway location needs to be further subdivided into 16 different Departments where each Department has its own routed subnet. The Galway location is routed the third of the available global subnets. Answer the following questions and try to understand fully the logic behind each answer:

5. What subnet mask will need to be used locally, at the Galway location, to fulfill the goal of having a local subnet for each of the 16 Departments?

We need 4 bits to be able to address 16 subnets, as 2^4 = 16. So, we need to take 4 bits from the hostid part of the address to represent the local subnetid. We are starting with a /14 so adding 4 to this gives a /18 or 255.255.192.0

6. How many host IP addresses will then be potentially available for each Department in Galway?

Using a /18 still leaves 14 bits of the 32-bit IPv4 address for the hostid. This means that each global subnet can have up to 2^14 or 16382 hosts.

7. What are the valid host and broadcast addresses for the first and second local subnets at the Galway location?

As per ipcalc output:

Network: 10.8.0.0/18   (First Subnet)
Broadcast: 10.8.63.255
HostMin: 10.8.0.1
HostMax: 10.8.63.254
Hosts/Net: 16382

Network: 10.8.64.0/18   (Second Subnet)
Broadcast: 10.8.127.255
HostMin: 10.8.64.1
HostMax: 10.8.127.254
Hosts/Net: 16382