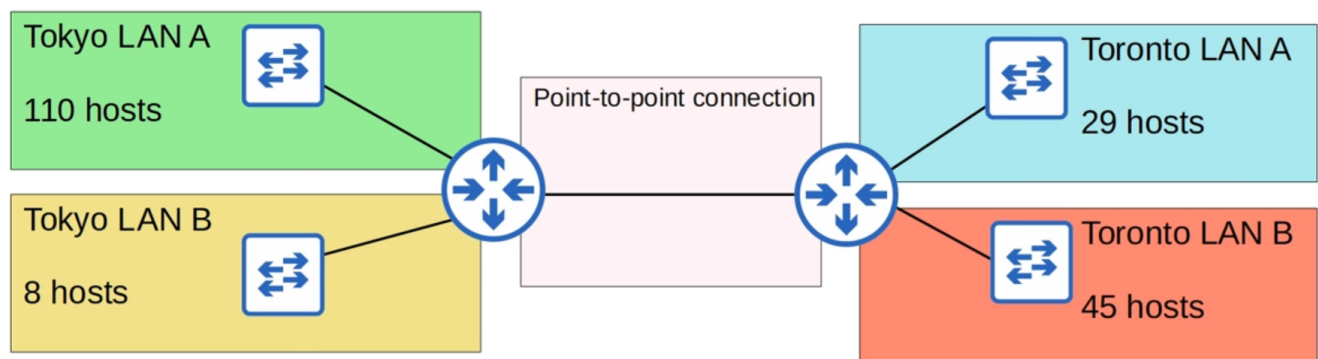


# DAY 15 - VLSM

## Variable-Length Subnet Mask

- Up to this point, we've been using **FLSM (Fixed-Length Subnet Mask)** for subnetting.
  - This means that all of the subnets use the same prefix length & share the same number of hosts. (e.g. Subnetting a Class C network into four subnets *of equal size* using /26)
  - **VLSM (Variable-Length Subnet Masks)** is the process of creating subnets of *different sizes*, to make your use of network addresses more efficient.
  - **VLSM** is more complicated than FLSM, but doable.
- 

### Example:



**192.168.1.0/24**

Using **FLSM**, we need to borrow 3 bits to get 8 subnets, which leave each subnet with only 32 IPs (30 Hosts), which is not enough.

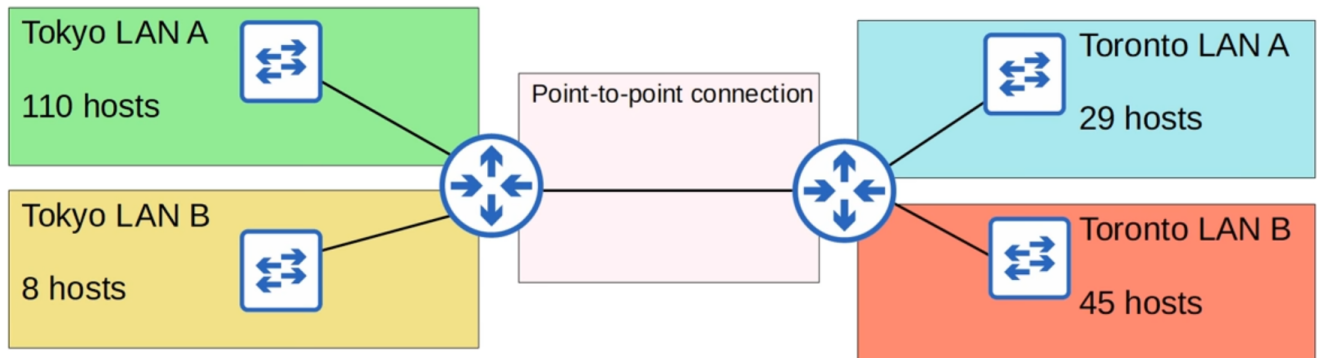
---

### Steps:

1. Assign the **Largest Subnet** at the **Start** of the address space.
2. Assign the second-largest subnet after it.

- Repeat the process until all subnets have been assigned.

## From the Example:

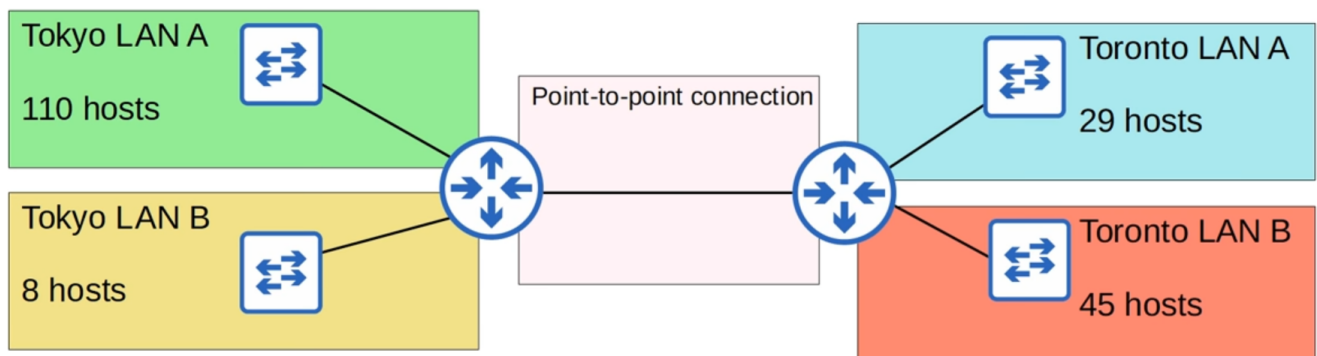


192.168.1.0/24

### Order:

1. Tokyo LAN A (110)
2. Toronto LAN B (45)
3. Toronto LAN A (29)
4. Tokyo LAN B (8)
5. **Point-to-Point** Connection (2)

## Tokyo LAN A



192.168.1.0/24

- **Network Address:** 192.168.1.0/25
- **Broadcast Address:** 192.168.1.127/25
- **First Host:** 192.168.1.1/25

- **Last Host:** 192.168.1.126/25
- **No. of Hosts:** 126

## Toronto LAN B

- **Network Address:** 192.168.1.128/26
- **Broadcast Address:** 192.168.1.191/26
- **First Host:** 192.168.1.129/26
- **Last Host:** 192.168.1.190/26
- **No. of Hosts:** 62

## Toronto LAN A

- **Network Address:** 192.168.1.192/27
- **Broadcast Address:** 192.168.1.223/27
- **First Host:** 192.168.1.193/27
- **Last Host:** 192.168.1.222/27
- **No. of Hosts:** 30

## Tokyo LAN B

- **Network Address:** 192.168.1.224/28
- **Broadcast Address:** 192.168.1.239/28
- **First Host:** 192.168.1.225/28
- **Last Host:** 192.168.1.238/28
- **No. of Hosts:** 14
  - Using /29 gives 8 addresses but 6 usable addresses.

## Point-to-Point Connection:

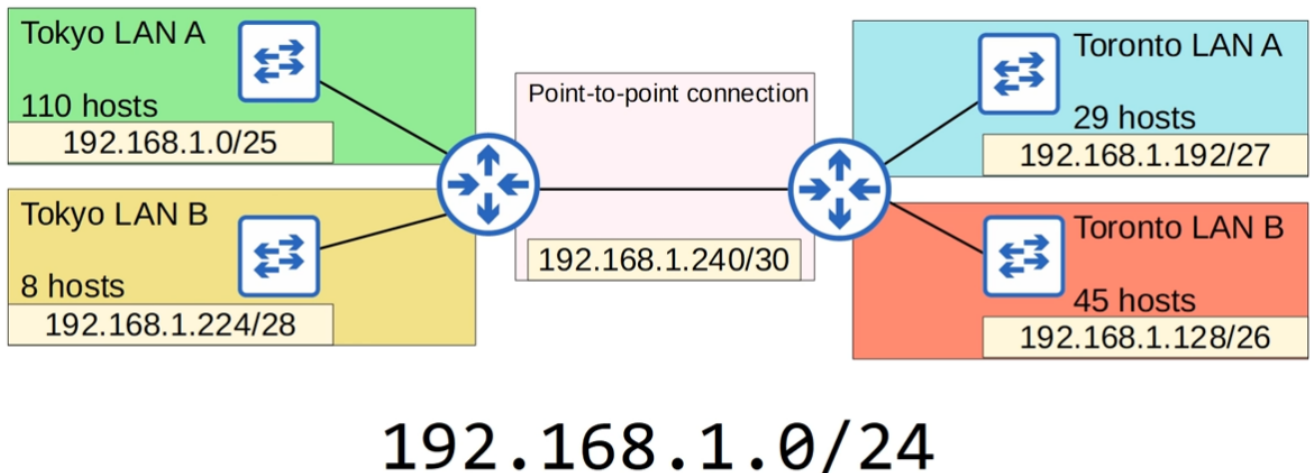
- **Network Address:** 192.168.1.240/31
- **Broadcast Address:** 192.168.1.241/31
- **First Host:** 192.168.1.240/31 (R1)
- **Last Host:** 192.168.1.241/31 (R2)
- **No. of Hosts:** 0

- But this is for **Point-to-Point** connection, where exactly **Two IPs** are valid.

**BUT...** /31 is generally *discouraged* for CCNA.

## Point-to-Point Connection (CCNA):

- **Network Address:** 192.168.1.240/30
- **Broadcast Address:** 192.168.1.243/30
- **First Host:** 192.168.1.241/30
- **Last Host:** 192.168.1.242/30
- **No. of Hosts:** 2



## Additional Practice:

- <http://www.subnettingquestions.com>
- <http://subnetting.org>
- <https://subnettingpractice.com>