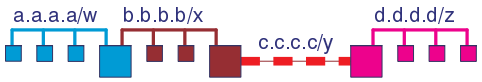
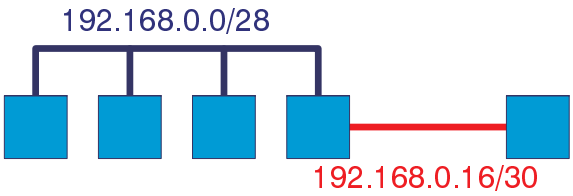
Allocating IP numbers on an Internetwork

- Easy: follow the Golden Rules!
  1. Give each network its own prefix
  2. Give each machine an IP number using this prefix plus a host number
  3. Don't use the first and last host numbers (all 0's and all 1's)



IP allocation example

- Allocate IP numbers to the following devices



Subdividing prefixes

- Every network must have its own network number (prefix)
  - See the Golden Rules
- You will most likely only get one prefix from your provider
- So if you have more than one network, you have to divide a large prefix into several smaller ones

Subdividing prefixes: example

- You have been allocated 195.176.112.0/25
- How many IP numbers is this?

- What is the smallest IP number available? The largest IP number available?

Example (contd)

- We have decided we need 8 separate networks, linked by routers
- Each network needs its own prefix
- So we need *more* prefixes but each with *fewer* IP numbers available

Example (contd)

- Prefix we have been given

195.176.112.0/25

11000011 10110000 01110100 0hhhhhhh

195.176.112.0 to 195.176.112.127

(195.176.112.1 to 195.176.112.126 usable)

Example (contd)

- Now let's make the prefix longer

11000011 10110000 01110100 0nnnhhhh

- What is the new prefix length?
- Now we have 3 more bits of network number and 3 less bits of host number
- How many combinations of nnn are there?

Example (contd)

- We have created these new prefixes

11000011 10110000 01110100 0000hhhh
11000011 10110000 01110100 0001hhhh
11000011 10110000 01110100 0010hhhh
11000011 10110000 01110100 0011hhhh
11000011 10110000 01110100 0100hhhh
11000011 10110000 01110100 0101hhhh
11000011 10110000 01110100 0110hhhh
11000011 10110000 01110100 0111hhhh

Example (contd)

- How many hosts can each network have?
- What are the network numbers we have created?

Dividing Prefixes - class example

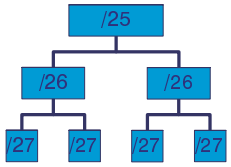
- Here is a prefix:

  192.168.34.0/24

- What is the smallest and largest IP number in this range?
- Turn this into two /25 prefixes
- What are the smallest and largest IP numbers in each of the new ranges?

Aggregation Tree

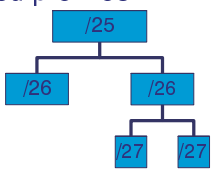
- A useful tool for dividing prefixes



- "Aggregation" is the process of combining smaller prefixes into larger ones - the reverse of what we have been doing

Aggregation Tree (contd)

- You don't have to divide your space into equal sized prefixes



This is OK: one /26 network and two /27 networks

- But check your work - work out the ranges of IP numbers and see that they don't overlap