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)

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

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
  \[11000011\ 10110000\ 01110100\ 0\]

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 0
nn|hhh
- 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 0000
nn|hhh
  11000011 10110000 01110100 0001
nn|hhh
  11000011 10110000 01110100 0010
nn|hhh
  11000011 10110000 01110100 0011
nn|hhh
  11000011 10110000 01110100 0100
nn|hhh
  11000011 10110000 01110100 0101
nn|hhh
  11000011 10110000 01110100 0110
nn|hhh
  11000011 10110000 01110100 0111
nn|hhh

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

\[
\begin{array}{c}
/25 \\
/26 \\
/27 \\
/27 \\
/26 \\
/27 \\
/27 \\
\end{array}
\]

- "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

\[
\begin{array}{c}
/25 \\
/26 \\
/27 \\
/27 \\
\end{array}
\]

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