CIDR: Classless
Interdomain Routing

Surasak Sanguanpong
nguan@ku.ac.th
http://www.cpe.ku.ac.th/~nguan

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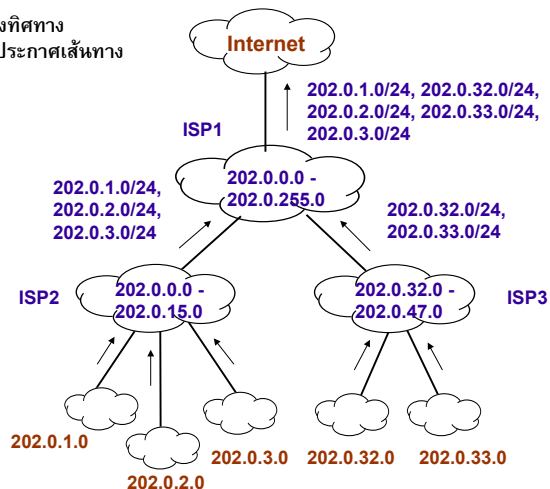# Address allocation problem

- **Exhaustion of the class B network address space.**

- **The lack of a network class of a size which is appropriate for mid-sizes organization;**
  - **class C, with a max of 254 hosts, is too small,**
  - **while class B, with a max of 65534 hosts, is too large.**

- **Allocate blocks of class C instead and downside is more routes entry in routing table**
  - **1) requires fewer than 256 addresses   1 class C network**
  - **2) requires fewer than 512 addresses   2 contiguous class C networks**
  - **3) requires fewer than 1024 addresses   4 contiguous class C networks**
  - **4) requires fewer than 2048 addresses   8 contiguous class C networks**
  - **5) requires fewer than 4096 addresses   16 contiguous class C networks**
  - **6) requires fewer than 8192 addresses   32 contiguous class C networks**
  - **7) requires fewer than 16384 addresses 64 contiguous class C networks**
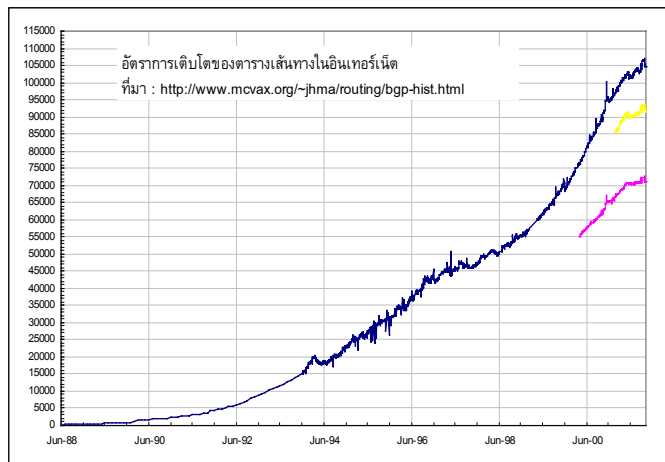
Routing Table problems

- **Issue multiple (block) class C addresses (instead single class B address) solves a running out of class B address but...**

- **Introduces a problem of routing table**
  - **By default, a routing table contains an entry for every network**
  - **How large a routing table should be for all Class C networks?**

- **Growth of routing table in the Internet routers beyond the ability of current software and hardware to manage**

Route Non-Aggregation

BGP routing Table

อัตราการเติบโตของตารางเส้นทางในอินเทอร์เน็ต
ที่มา : http://www.mcvax.org/~jhma/routing/bgp-hist.html

Applied Network Research Group   Department of Computer Engineering, Kasetsart University

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How to Solve

- **Topological allocate IP address assignment**
- **We divide the world into 8 regions like this : (RFC1466)**

Multi-regional	**192.0.0.0 - 193.255.255.255**
Europe	**194.0.0.0 - 195.255.255.255**
Others	**196.0.0.0 - 197.255.255.255**
North America	**198.0.0.0 - 199.255.255.255**
Central/South America	**200.0.0.0 - 201.255.255.255**
Pacific Rim	**202.0.0.0 - 203.255.255.255**
Others	**204.0.0.0 - 205.255.255.255**
Others	**206.0.0.0 - 207.255.255.255**
IANA reserved	**208.0.0.0 - 223.255.255.255**

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Route Aggregation
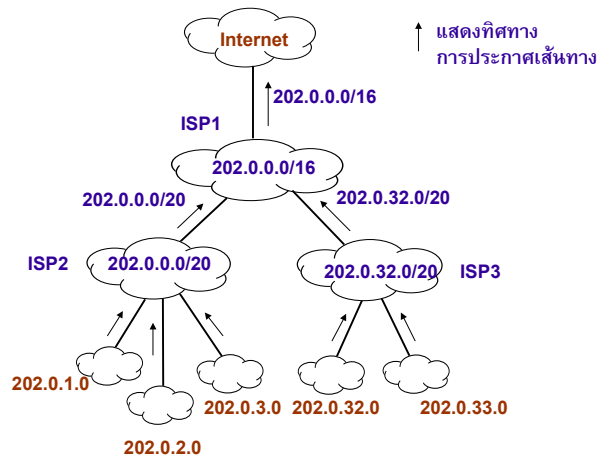
Classless Interdomain Routing

- **Class C address's concept becomes meaningless on these route between 'domains', the technique is called Classless Interdomain Routing or CIDR (pronounce cider)**

- **Key concept is to allocate multiple IP addresses in the way that allow summarization into a smaller number of routing table (route aggregate)**

- **CIDR is supported by BGP4 and based on route aggregation**
  - **e.g 16 class C addresses can be summarized to a single routing entry (router can hold a single route entry for the main trunks between these areas**

Supernetting

- **CIDR is also called Supernetting in contrast to subnetting**

- **an organization has been allocated a block of class C addresses in 2^n with contiguous address space**
  - **archive by using bits which belongs to the network address as host bits**
  - **class C example : altering the default class C subnet mask such that some bit change from 1 to 0**

(Super) netmask
4 class C networks appear
to networks outside as
a single network

11111111   11111111   111111**00****   00000000**

255.255.252.0

Supernetting Sample

- **an organization with 4 class C**
  - **190.0.32.0, 190.0.33.0, 190.0.34.0 190.0.35.0**

```
11111111  11111111  1111110 0 00000000    mask = 255.255.255.252.0
11000010  00000000  0010000 0 00000000    net  = 190.0.32.0
11000010  00000000  0010000 1 00000000    net  = 190.0.33.0
11000010  00000000  0010001 0 00000000    net  = 190.0.34.0
11000010  00000000  0010001 1 00000000    net  = 190.0.35.0
        Bit wise AND results 190.0.32.0
```

- ***This organization's network has changed from 4 net to a single net with 1022 hosts***

The Longest Match Supernetting

- **Europe has 194.0.0.0 - 195.255.255.255 with mask 254.0.0.0**

- **A case of one organization (195.0.16.0-195.0.36.0 mask 255.255.254.0) needs different routing entry**

- **datagrams 195.0.20.1 matches both Europe's and this organization. How to do?**

- **Routing mechanism selects the longest mask (255.255.254.0 is longer than 254.0.0.0), then route to the organization**

Summary

- **routing decisions are now made based on masking operations of the entire 32 bit address, hence the term "classes"**
- **No existing routes is changed**
- **CIDR slows down the growth of routing tables (current ~ 50K entries in core routers)**
- **Short term solution to solve routing problem**
- **limitation : not all host/router software allows supernet mask**