Getting Started

From TCP/IP functions to configurations

First step: planning

- For each host
  - Default gateway address
  - Name server address
  - Domain Name
  - Subnet mask
- For new network, will the new network connect to Internet?
  - Connected network – accessible to other networks
  - Non-connected network – not directly attached to the Internet.

Connected and Non-connected Networks

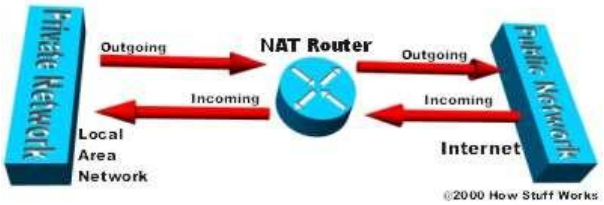
- Not-connected networks
  - Private networks
  - Enterprise networks – interconnect various part of an organization
  - Intranets – internal service application, such as web servers, browsers
- Why not connected networks
  - Security
  - Cost
    - For example, Only for email Exceed the benefit
- Mixed both types:
  - A non-connected enterprise network before firewall
  - A small connected network providing customer services and proxy service

Basic Info

- Obtaining a IP
  - Public IP, unique on Internet
  - RPC 1918, private network numbers
    - 10/8
    - 172.16/12
    - 192.168/16
- Can you access Internet if you are using the private network numbers?
  - Network address translation (NAT)
  - Proxy server

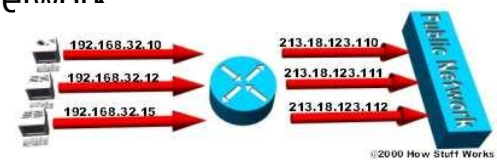
NAT

- http://computer.howstuffworks.com/nat1.htm



NAT

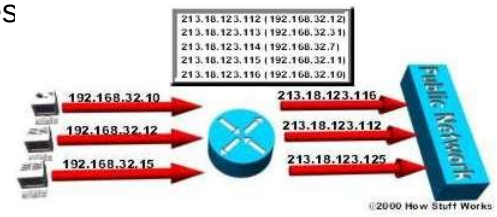
- **Static NAT** - Mapping an unregistered IP address to a registered IP address on a one-to-one basis. Particularly useful when a device needs to be accessible from outside the network



In static NAT, the computer with the IP address of 192.168.32.10 will always translate to 213.18.123.110.

NAT

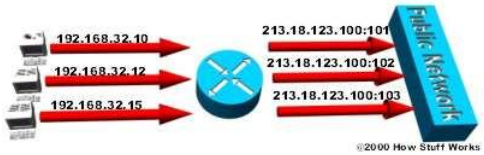
- **Dynamic NAT** - Maps an unregistered IP address to a registered IP address from a group of registered IP addresses



In dynamic NAT, the computer with the IP address 192.168.32.10 will translate to the first available address in the range from 213.18.123.100 to 213.18.123.150.

NAT

- **Overloading** - A form of dynamic NAT that maps multiple unregistered IP addresses to a single registered IP address by using different ports. This is known also as PAT (Port Address Translation), single address NAT or port-level multiplexed NAT.



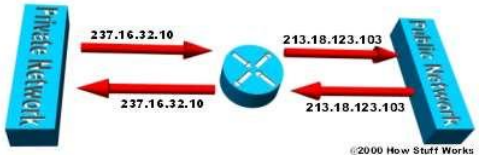
- **In overloading, each computer on the private network is translated to the same IP address (213.18.123.100), but with a different port number assignment.**

How overloading works

Source Computer	Source Computer's IP Address	Source Computer's Port	NAT Router's IP Address	NAT Router's Assigned Port Number
A	192.168.32.10	400	215.37.32.203	1
B	192.168.32.13	50	215.37.32.203	2
C	192.168.32.15	3750	215.37.32.203	3
D	192.168.32.18	206	215.37.32.203	4

NAT

- **Overlapping** - When the IP addresses used on your internal network are registered IP addresses in use on another network, the router must maintain a lookup table of these addresses so that it can intercept them and replace them with registered unique IP addresses.



NAT

- NAT is transparent
  - Proxy, end users have to configure it.
    - Application based
- Advantages:
  - Conserves IP
  - Reduce address spoofing
  - Eliminate the reconfigure when connecting to Internet
- Disadvantages
  - Cost
  - Performance
  - Reliability
  - Security

Get a public address

- How many do you need? RFC 2901.
  - Internet end user
  - High-volume end user
  - Internet Service Provider
  - Local Internet Registry
- Work your way out from bottom :Local ISP -> ISP's upstream provider -> Internet registry, which will need:
  - Detailed network topology
  - Routing plan
  - Subnetting plan
  - Formal commitment of resources – who to be blamed.
  - … …

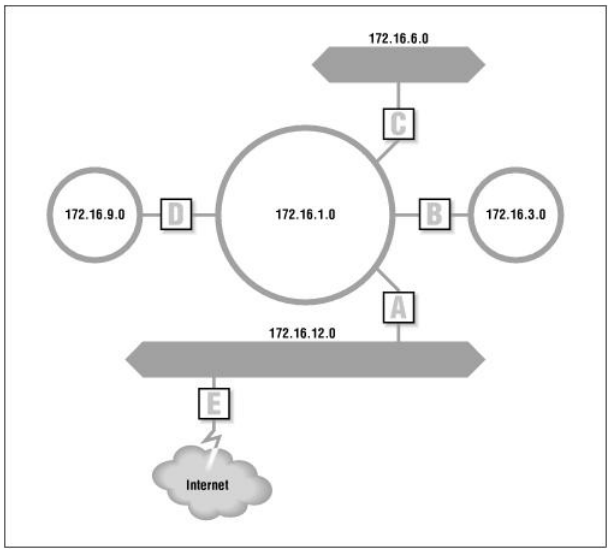
Get a public address

- Three-level Internet registry
  - IANA http://www.iana.org/
  - Regional Internet Registry
    - APNIC www.apnic.net
    - ARIN www.arin.net
    - RIPE www.ripe.net
  - Local Internet Registry
- Get an IN-ADDR.ARPA domain
  - Reverse domain – map IP to name

- Assign host addresses
  - One address at a time
  - Groups of addresses
  - Statically
  - Dynamically
    - Many remote dial-in clients to PPP server
    - Mobile systems
    - Desktops
- Defining a Subnet Mask
  - Topological reasons for subnetting:
    - Overcoming distance limitations
    - Interconnecting dissimilar physical networks
    - Filtering traffic between networks
  - Organizational purpose

Planning Routing

- Two ways:
  - Static routing table
  - Dynamic routing table
- Guidelines for
  - A network with no gateways to other TCP/IP network
  - A network with a single gateway
  - A network with internal gateways to other subnet and a single gateway to the world
  - A network with multiple gateways to the world.



Routing Plan

- an autonomous system number (ASN)
  - BGP requires ASN
- Could be
  - ASN of your ISP
  - Private one 64512-65535
  - Get official ASN from Regional Internet Registry
    - you are ISP
    - Multi-homed site
- Registering in a Routing Database
  - Validate routing

Naming Service

- Basic request for name service
  - Domain name
  - System's hostname
  - Name server's IP address.
- Obtaining a Domain Name
  - Get one from your ISP
  - Apply for a domain name yourself
  - Check out http://www.icann.org http:/www.internic.net for official registrars.
- Before you register,
  - Names and IP addresses of two servers
    - master and slave

Choosing a hostname

- Unique within your domain.
- RFC 1178 guidelines:
  - Use real words
  - Use theme names
  - Avoid using
    - project names,
    - personal names,
    - Acronyms
    - Numeric names
    - Technical jargon

Other Service

- File servers
  - Provide clients hostnames of the NFS and location, contents.
  - showmount –e host
  - showmount –a host
- Print Servers
  - lp, lpd, samba, etc.
  - IP, hostname and the name of printer
- Mail System
  - Mail server

Communicate with Users

- All the info has to be passed to end users/system administrators
- Configuration instructions

Summary

- Internet connection
- Base info for network
- Routing
- Network services

Next:

Action!