Campus Network Best Practices: IP Addressing

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Who Needs Public IP Space?

- Every campus must have Public IP address space
  - Where do you get it?
- A REN needs must have IP address space
- If the REN becomes ISP, it must have address space for its “customers”
- Any University can get their own IP address space that is independent of the ISP

Provider Independent IP Addresses

- What are provider independent IP addresses?
  - Public IP addresses that are not allocated to you by your Internet Service Provider.
- Can move between service providers without changing IP addresses
- If your REN gets space, then addresses provided to you by your REN is not provider independent

NAT is a reality

- NAT is common technique to reduce number of public IP addresses required
- NAT makes some things hard
  - NAT breaks some things
    - SIP (standard-based VoIP)
    - H.323 Video Conferencing
  - Makes it harder to track down viruses and hackers

Who Needs Provider independent IP and ASN?

- REN
  - Must have both ASN and Provider Independent IP
- Campus Network
  - All campuses must have Public IP, doesn't have to be provider independent
  - Only need ASN if campus is multi-homed
- How much IP address space?

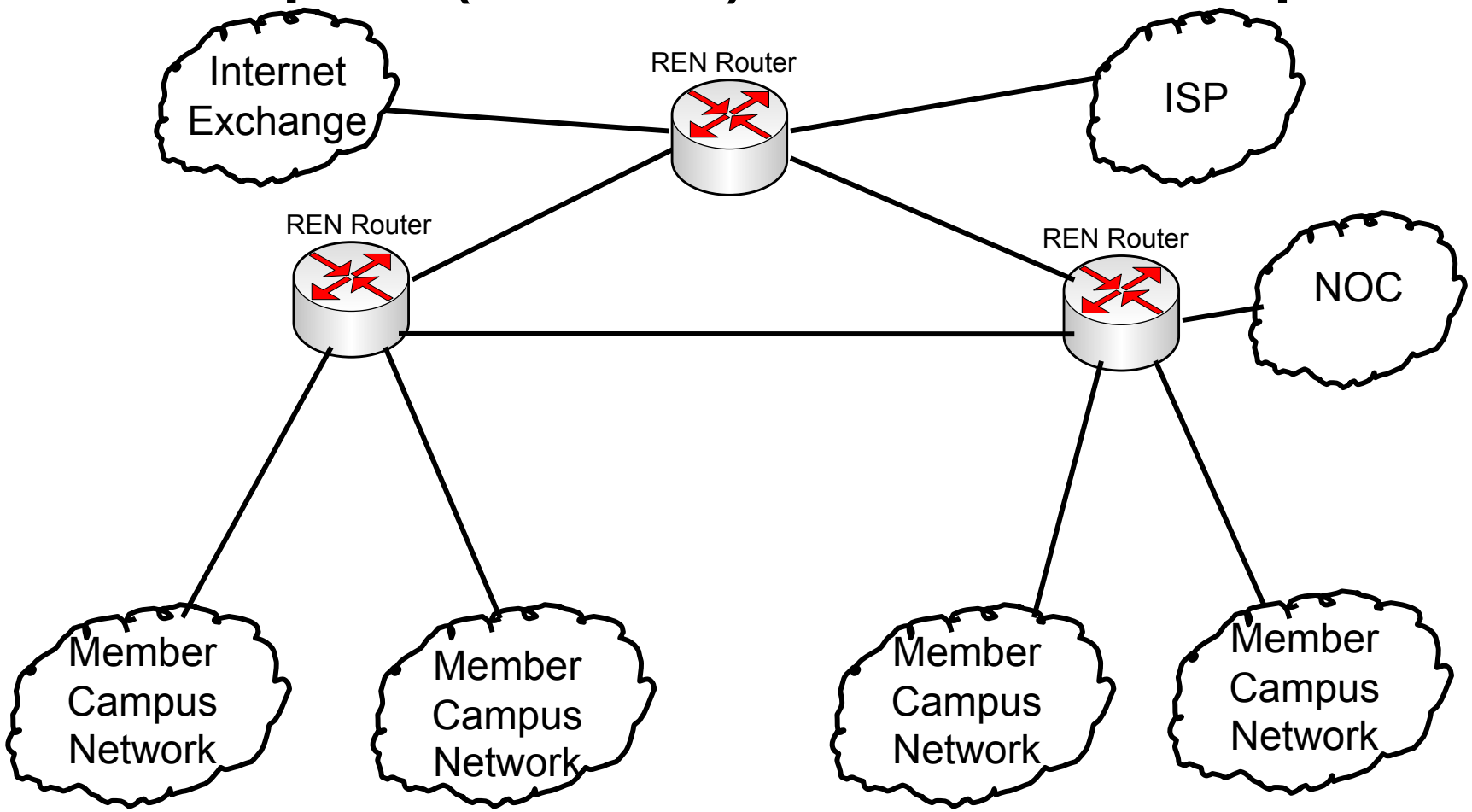
General Notes on IP Addressing

- IP version 4 addresses are 32 bits long
- IP address blocks allocated in powers of 2
  - Blocks of addresses: 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, etc.
- CIDR notation: Address blocks are described with a notation of /number. /32 = 1 address, /31 = 2, /30 = 4, …. /24 = 256

How Much Space for a REN

- Every member connected with a point to point link
  - Every point to point link requires at least a /30 (4 addresses)
- REN will address space for
  - Network management equipment
  - Services such as web, video conferencing
- Build a spreadsheet that details all the above

A Simple (Small) REN Example



Simple (Small) REN Example

Network	Hosts	CIDR block	Size	Qty	Total
Point to point links	2	/30	4	7	28
Server network for network Mgmt	40	/26	64	1	64
Server network for Services	40	/26	64	1	64
Future network for services	40	/26	64	1	64
Future customer links	2	/30	4	4	16
Total					236

You can't get a CIDR block of 236 addresses - rounding up, you get 256 or a /24. **That doesn't include any addresses for customers**

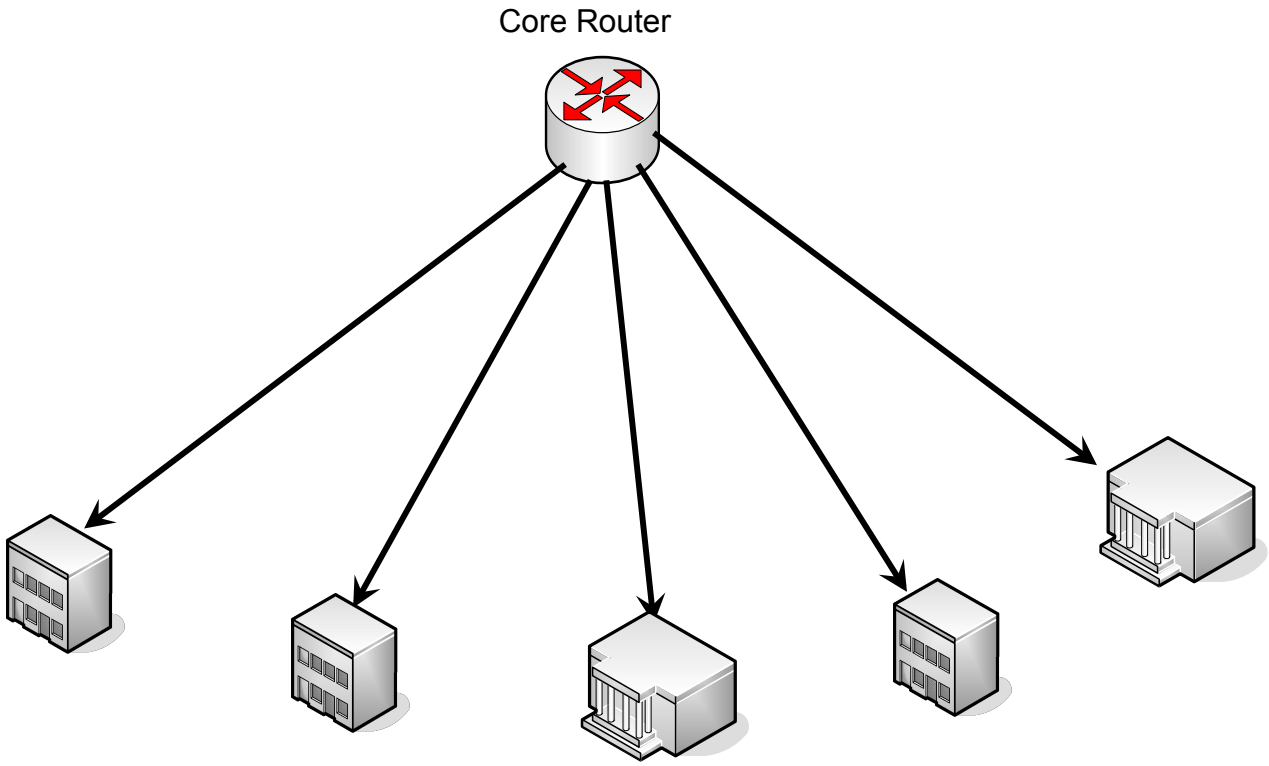
That isn't all for the REN

- If the REN is going to act as an ISP
  - REN needs IP address space to allocate to customers.
  - If customers NAT, don't need as much, but still need space.
  - In application to AfriNIC (www.afrinic.net), you will want to apply for space for your customers.

Campus Network IP Addressing

- Build a spreadsheet
  - One row for every building on your campus
  - Write down how many computers will be in each building
  - Round up to the nearest power of 2
  - Add a row for servers
  - Add a row for wireless

A Simple Campus Example



A Simple Campus Example

Building	Hosts	CIDR Block	Size	Qty	Total
Administration Building	68	/25	128	1	128
Physics Building	220	/24	256	1	256
Chemistry Building	120	/24	256	1	256
Computer Science	200	/24	256	1	256
Literature Building	44	/26	64	1	64
Server Network	20	/27	32	2	64
Additional Buildings Medium	100	/25	128	3	384
Additional Buildings Large	200	/24	256	2	512
Wireless Network	500	/23	512	1	512
Total					2432

Round 2432 up to the next CIDR block gives you 4096 or a /20

Applications to AfriNIC

- AAU has negotiated a 50% discount on fees with AfriNIC
- FRENIA funds are available to pay the other 50% for the first year (first year is free)
- There is no barrier to getting space
- When you apply for V4 address space, also apply for V6 space
- Who has made an appication?

Questions?