

NREN and Campus IP Addressing

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Who Needs Public IP Space?

- **Every campus must have Public IP address space – Where do you get it?**
- NRER needs to get IP address space
- If NRER becomes ISP, it must have address space for its “customers”
- Any University can get their own IP address space.

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 NRER gets space, then addresses provided by NRER 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 things like SIP (standard-based VoIP), which you have to work around
 - NAT translation device needs to know about applications. Stifles innovation.
 - Makes it harder to track down viruses and hackers
 - Don't do it if you don't have to

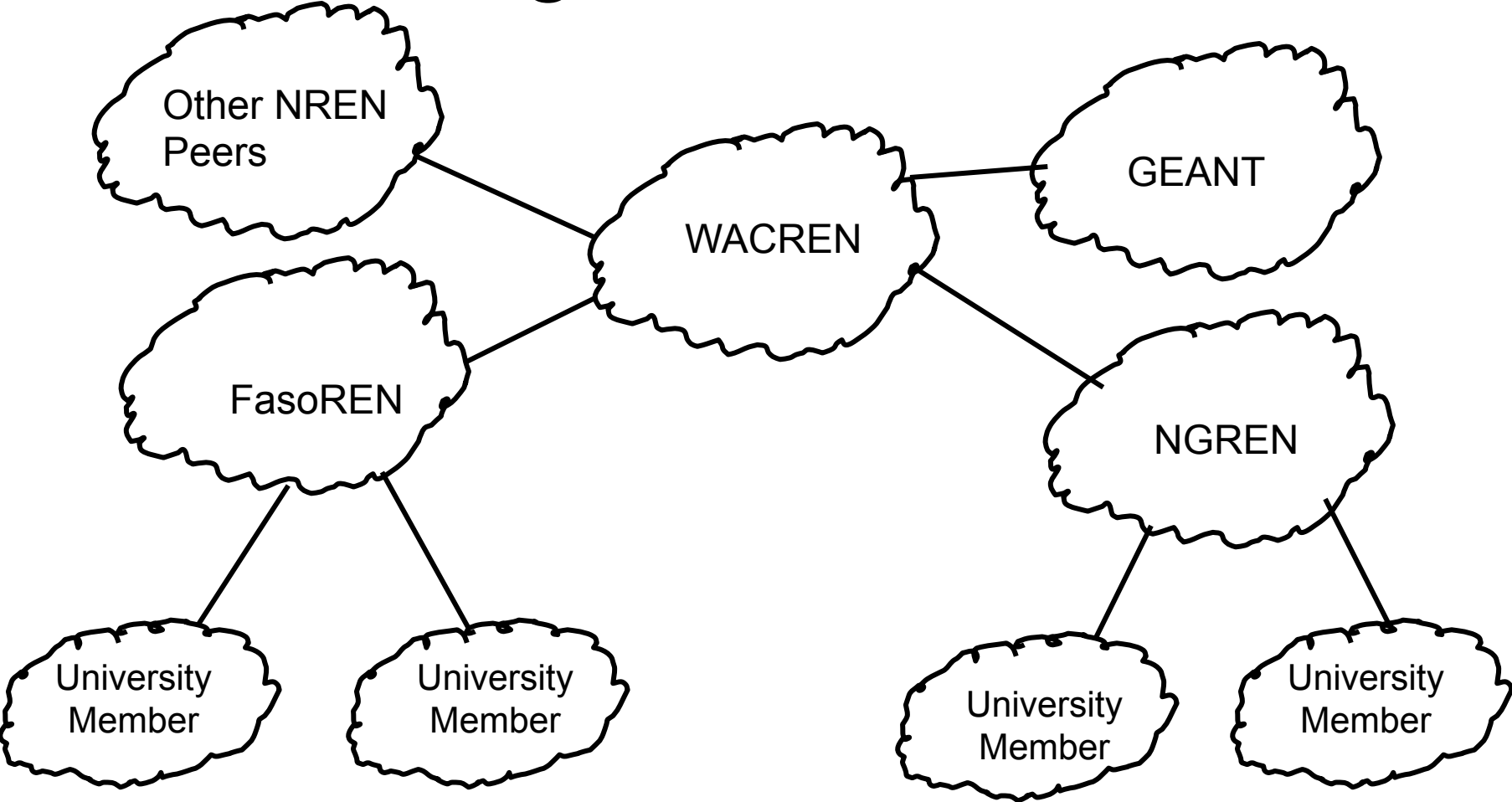
Who Needs Public IP and ASN?

- NREN
 - Must have both ASN and Public IP
- Campus Network
 - All campuses must have Public IP
 - Only need ASN if campus is multi-homed
- How much IP address space?

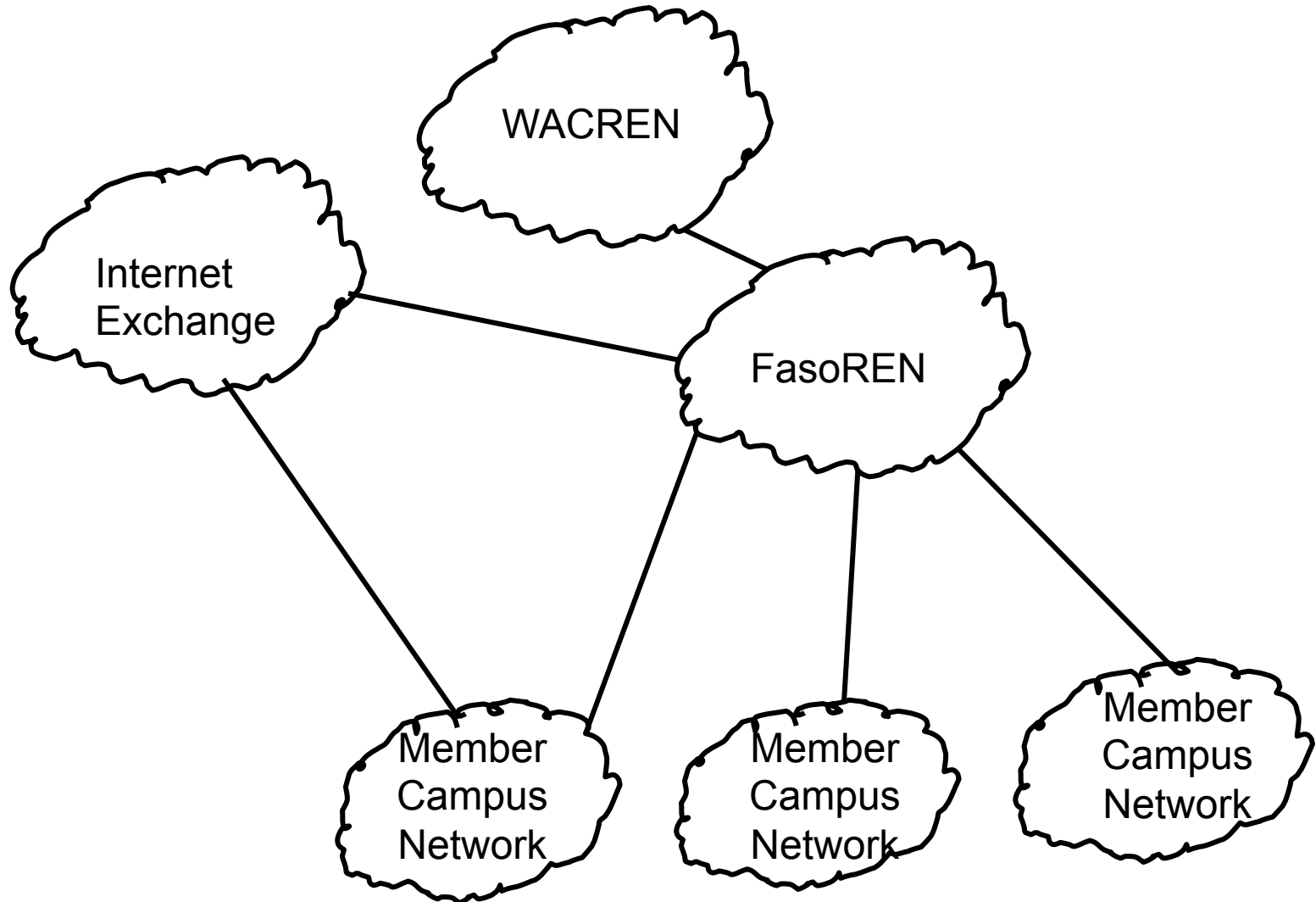
General Notes on IP Addressing

- IP version 4 addresses are 32 bits long
- IP version 6 addresses are 128 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.
- For IPv4: $/32 = 1$ address, $/31 = 2$, $/30 = 4$, $/24 = 256$

Logical Network



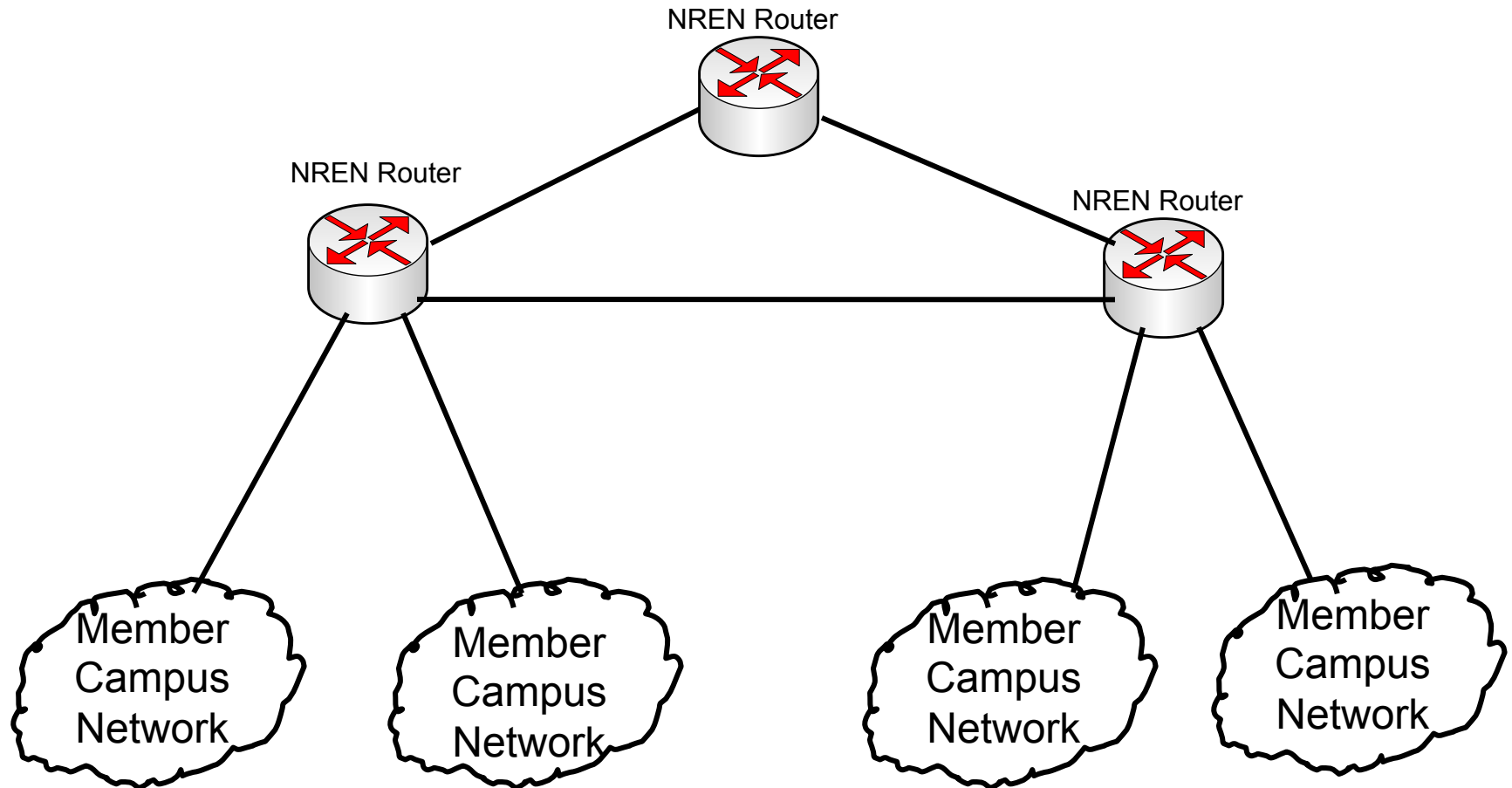
Examining the NREN



NREN IP Addressing

- Every member connected with a point to point link
 - Every point to point link requires at least a /30 v4 (4 addresses) and a /64 v6
- NREN 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

Simple (Small) REN Example

Network	Hosts	CIDR block Size	Qty	Total	
Point to point links	2	/64	-	7	7/64
Server network for network Mgmt	40	/64	-	1	1/64
Server network for Services	40	/64	-	1	1/64
Future network for services	40	/64	-	1	1/64
Future customer links	2	/64	-	4	4/64
Total					14/64

you get a /48 or /56

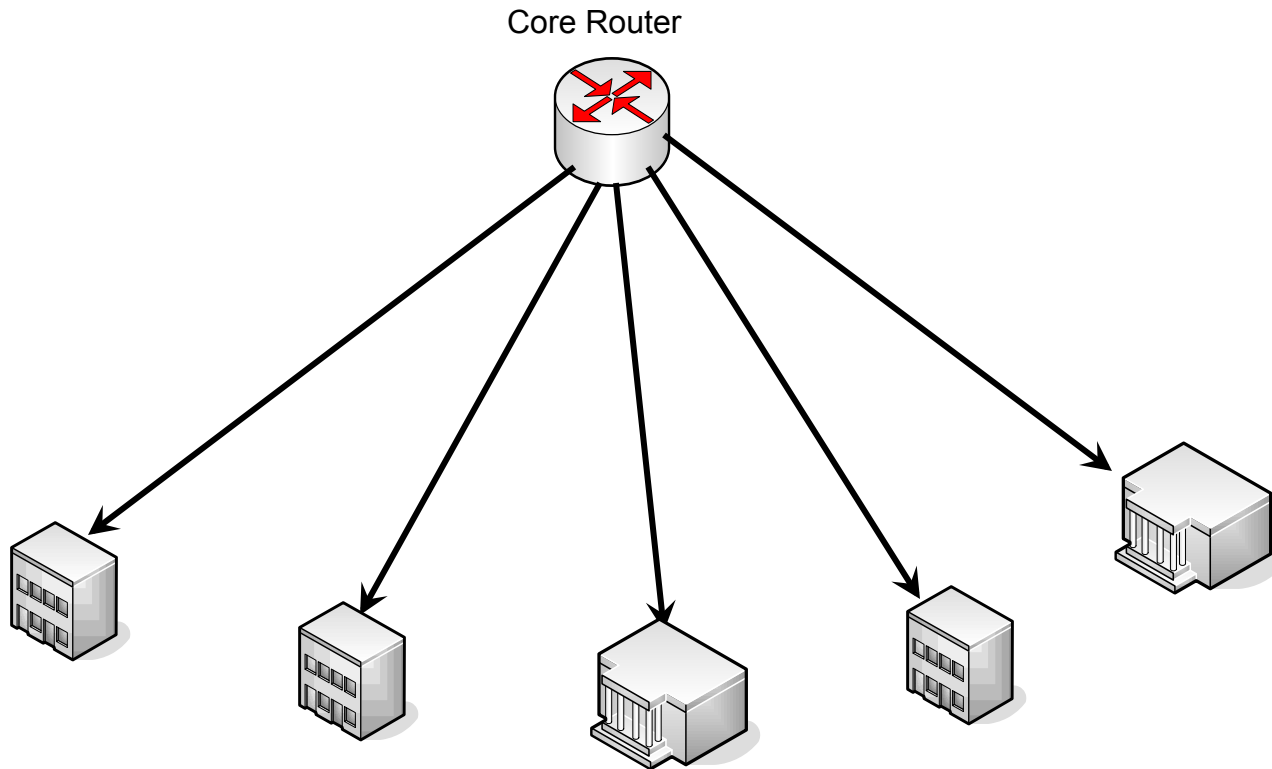
That isn't all for the REN

- 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
- There is no barrier to getting space
- When you apply for V4 address space, also apply for V6 space and ASN

Questions?