

# Why IPv6 (on JANET)?

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# In one slide ...

- Strategic
  - Academic
    - Research projects (and funding)
    - Teaching
  - Operational
    - World class advanced network requires it
    - Continuity of network provision
      - When IPv4 addresses become hard(er) to obtain
      - Access to IPv6 only resources

# Why?

- Expansion once IPv4 addresses run out
  - This is really the main driver
  - IPv6 uses 128 bit addresses rather than 32
    - “More IPv6 addresses than atoms in the universe”
  - But – the two versions of the protocol are not compatible at packet level
    - As well as using different address spaces, the packet header structure has changed
    - Simple switch-on is therefore not possible

# OK, so ...

- There are some other differences between the two versions of IP
  - Outside remit of this slot

# Why Bother?

- Services accessible via IPv6 only will start to appear
- Departments may miss out on research opportunities due to inadequate networking
- Further assignments of IPv4 address space will become hard(er) to obtain

# Registry Warnings

- ARIN, 21-May-2007:

“The available IPv4 resource pool has now been reduced to the point that ARIN is compelled to advise the Internet community that migration to IPv6 is necessary for any applications that require ongoing availability from ARIN of contiguous IP number resources.”

<http://www.arin.net/announcements/2007/20070521.html>

# Registry Warnings

- AP Community, via APNIC, 7-Sep-2007:  
“We recognise that at current rates of allocation, the remaining free pool of IPv4 address space will be consumed within the next 2 to 4 years.  
“... We recognise the critical importance of IPv6 to the future success of the Internet, and will actively promote the adoption of IPv6, and focus our efforts towards comprehensive deployment of IPv6 in the Asia Pacific region.”

<http://www.apnic.net/meetings/program/sigs/policy/presentations/wilson-resolution.pdf>

# Registry Warnings

- RIPE Community, via RIPE NCC, 26-Oct-2007:  
  
“... The remaining pool of unallocated IPv4 address space is likely to be fully allocated within two to four years. IPv6 provides the necessary address space for future growth.  
  
“... We recommend that service providers make their services available over IPv6. We urge those who will need significant new address resources to deploy IPv6.”

<http://www.ripe.net/news/community-statement.html>

# Why Bother?

- Political angle
  - “Get there before the US”
    - Asia adopted a push to deploy IPv6 years ago
      - CERNET2 (China) is IPv6 only
    - EC followed – most recent statement:
      - “Timely implementation of IPv6 is required as the pool of IP addresses provided by the current protocol version 4 is being depleted.  
IPv6 with its huge address space provides a platform for innovation in IP based services and applications.”
  - US DoD mandate for IPv6 by 2008
    - Seen as a final push for vendors to implement IPv6

# Why Bother?

- Political angle

- Whitehall – e-Government advice

[http://www.govtalk.gov.uk/schemasstandards/egif\\_document.asp?docnum=949](http://www.govtalk.gov.uk/schemasstandards/egif_document.asp?docnum=949)

- No easily locatable recommendation for outside government networks

- (<cough>OSI</cough> ☺)

# Why Bother?

- Commercial world
  - IPv6 not deployed on many ISP networks
  - Users in the commercial arena have different demands from those in the academic world
  - The issue of IPv4 address exhaustion is expected to drive market demand, and so commercial ISP deployment

# Can I Get Away With ...

- Interoperability or transition tools
  - Application layer gateways
  - Clever network level stuff
  - More than likely to cause more pain than it saves
- Will IPv6 really get widely deployed?
  - “Nobody uses public IP addresses anymore.”
    - (My favourite “expert” consultant quote, apologies)
  - NAT and private IPv4 address space

# Users and IPv6

- To the vast majority of users, IPv6 simply means bigger addresses
  - `2001:0630:0db8:cafe::00c0:ffee`
  - Ideally not visible to end-users
- Mobile IPv6
  - Similar effect to VPN
  - Development of mobile IP is focussed on IPv6

# Network Admin and IPv6

- Parallel running of both IPv4 and IPv6
  - “Dual-stack”
  - IPv6 and DNS
  - Local configuration systems, network monitoring systems, IPv6 network security
- Mechanisms for IPv4-only users and services IPv6-only services to interconnect

# System Admin and IPv6

- Parallel running of both IPv4 and IPv6
  - Configuring services to operate using both protocols
  - Configuring user workstations for IPv6
  - Host IPv6 security

# Heads of IT and IPv6

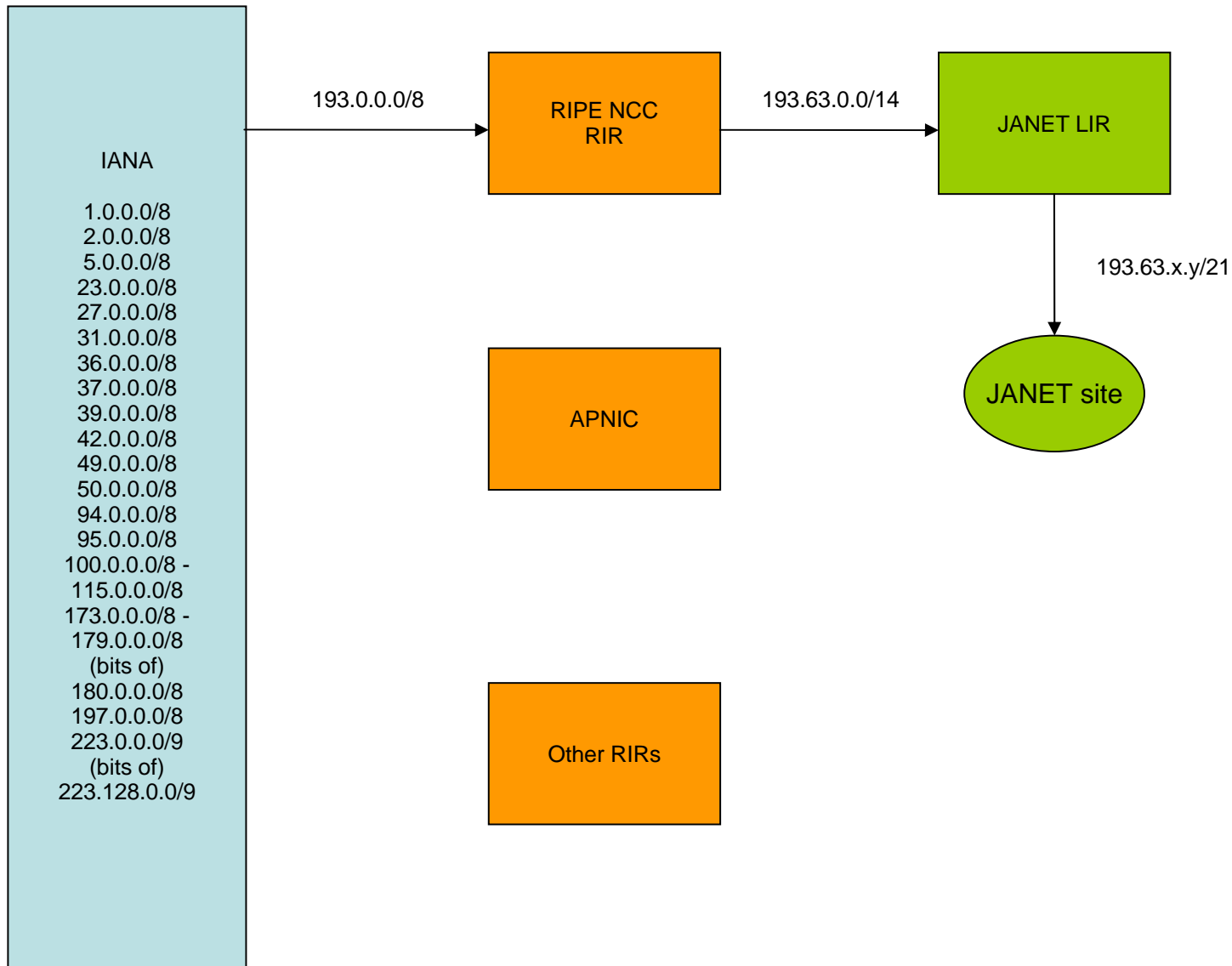
- Formulate a strategy
  - Only buy new equipment that is IPv6 capable
  - Review existing inventory for IPv6 capability
  - Decide on course of action
    - Full deployment (dual-stack)
    - Partial deployment (dual-stack and interoperability)
    - No deployment (rely on interop methods)
  - Remember to consider both network and network services

# bgp.potaroo.net

- Current predictions (3-Jun-2008)
  - Projected IANA Unallocated Address Pool Exhaustion: 20-Jan-2011
    - (26-Mar-2008: 9-Feb-2011, 2007: 10-Jul-2011)
  - Projected RIR Unallocated Address Pool Exhaustion: 2-Dec-2011
    - (26-Mar-2008: 7-May-2011, 2007: 25-May-2012)

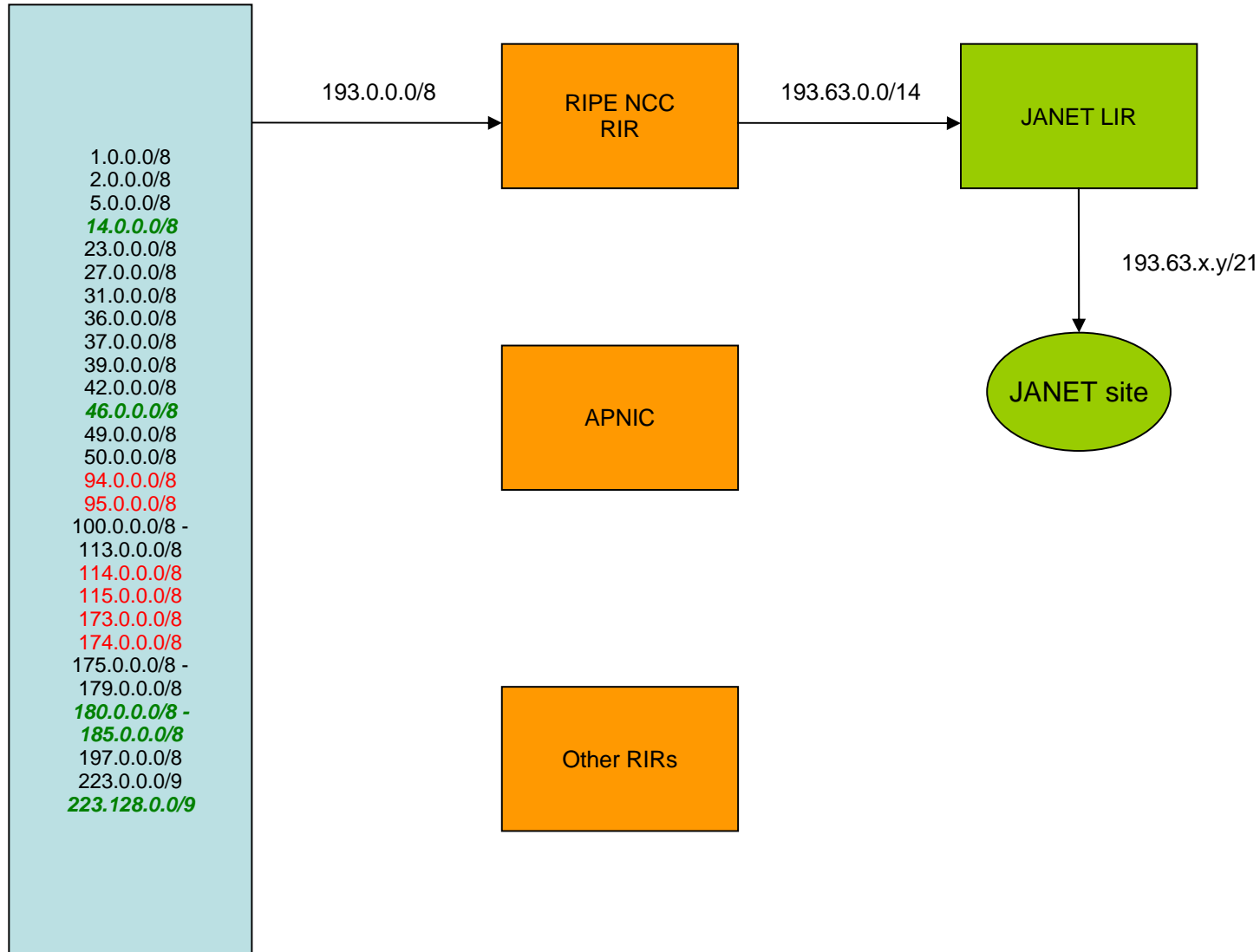
# IANA and RIR (IANA stats from bgp.potaroo.net)

(2007)



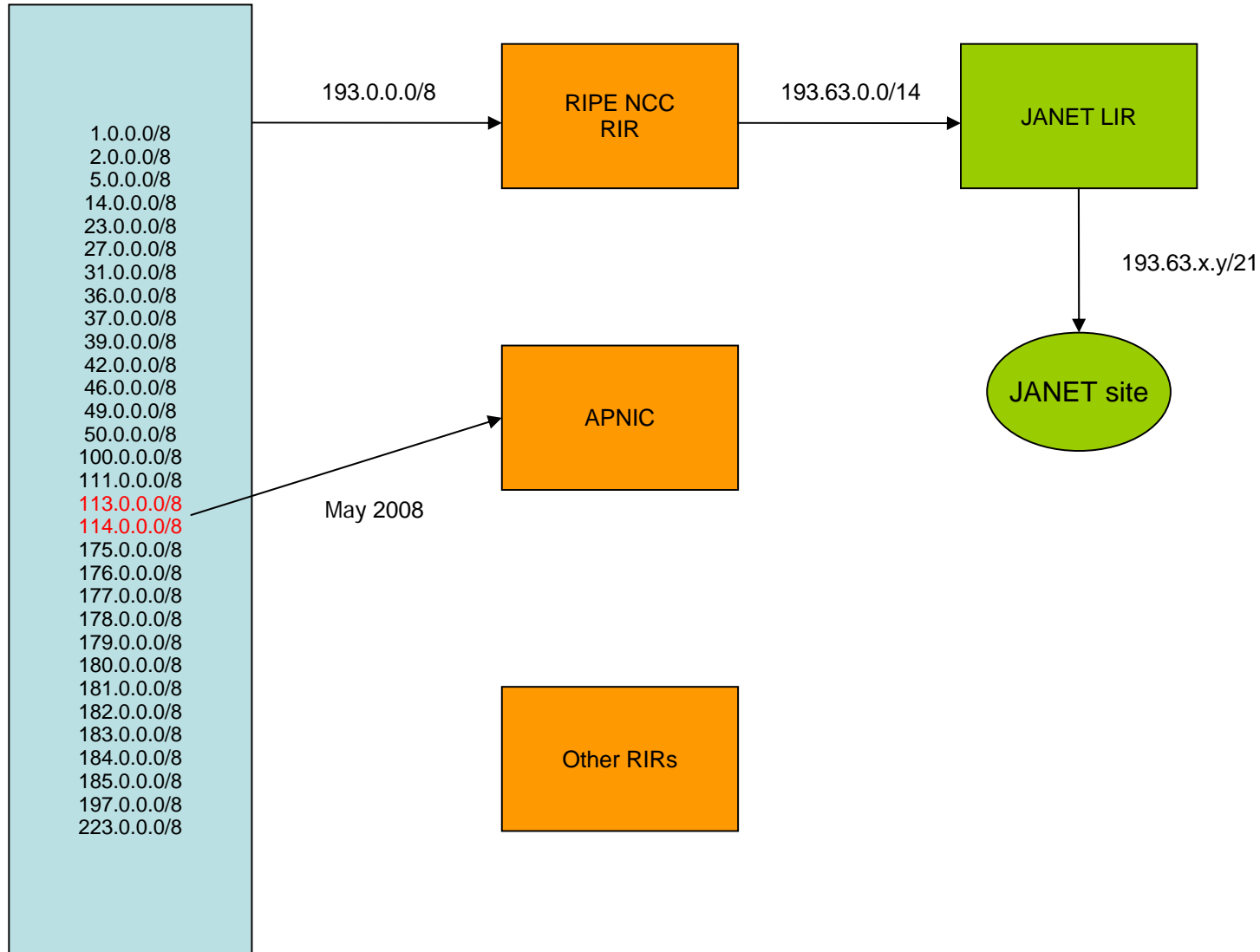
# IANA and RIR (IANA stats from bgp.potaroo.net)

(2008 – as of 26-Mar-2008)



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(2008 – as of 3-Jun-2008)

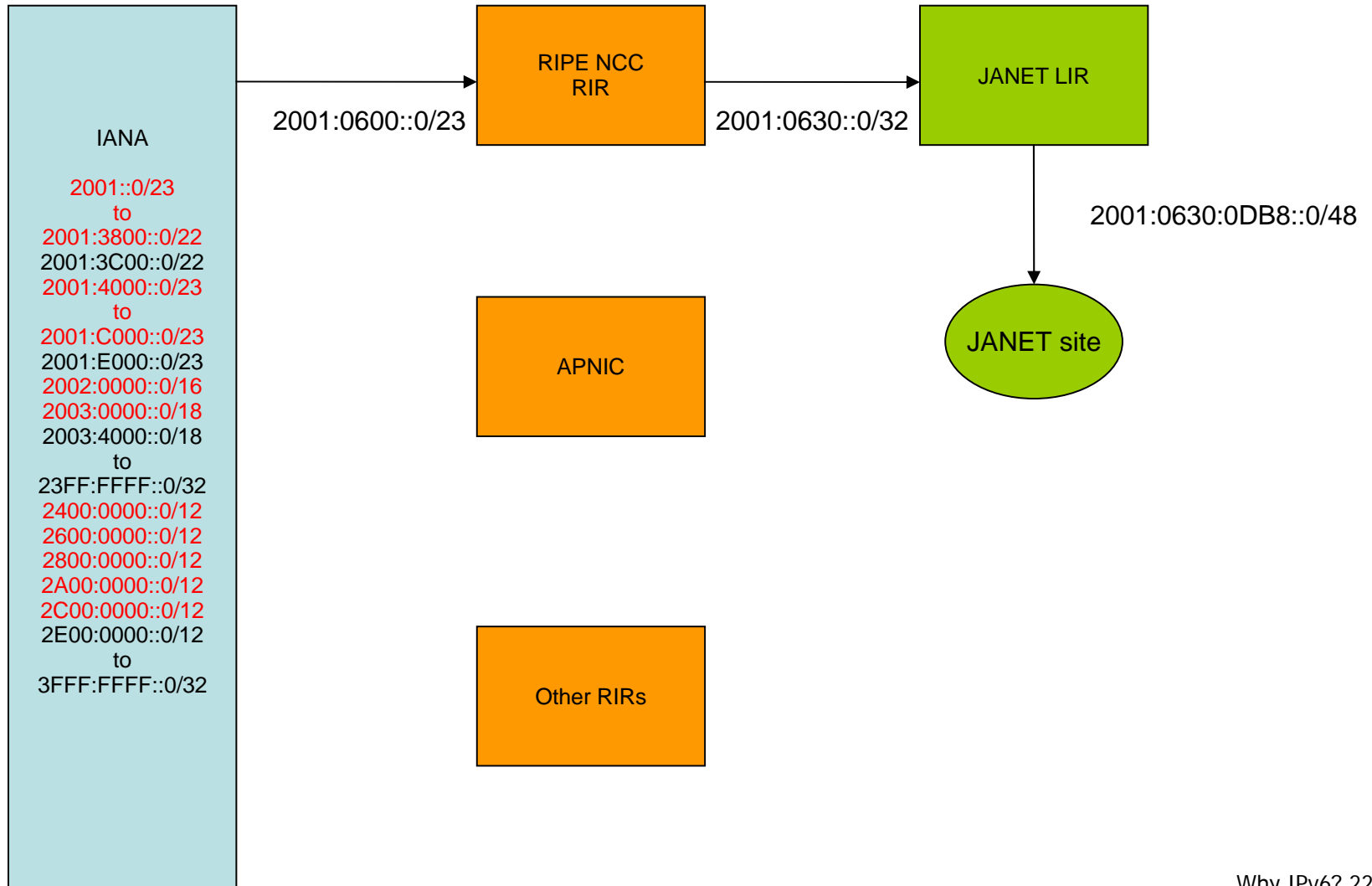


# Unused but out of reach

- 240.0.0.0/4 - "Class E"
  - Reserved for future use
    - Technology limitations (being overcome)
    - Might be made available for standard unicast use
- Unavailable
  - "Unadvertised" - address space not in routing table
  - Advertised large prefixes (eg /16), but only a fraction used

# IANA and RIR (IANA stats from www.iana.org)

(As of IANA update 22-Dec-2006)



# "Internet Protocol Version 6 Address Space"

(last updated 2008-05-13) - from the IANA web site

IPv6 Prefix Allocation		Reference Note
0000::/8	Reserved by IETF	[RFC4291] [1] [5]
0100::/8	Reserved by IETF	[RFC4291]
0200::/7	Reserved by IETF	[RFC4048] [2]
0400::/6	Reserved by IETF	[RFC4291]
0800::/5	Reserved by IETF	[RFC4291]
1000::/4	Reserved by IETF	[RFC4291]
<b>2000::/3</b>	<b>Global Unicast</b>	<b>[RFC4291] [3]</b>
4000::/3	Reserved by IETF	[RFC4291]
6000::/3	Reserved by IETF	[RFC4291]
8000::/3	Reserved by IETF	[RFC4291]
A000::/3	Reserved by IETF	[RFC4291]
C000::/3	Reserved by IETF	[RFC4291]
E000::/4	Reserved by IETF	[RFC4291]
F000::/5	Reserved by IETF	[RFC4291]
F800::/6	Reserved by IETF	[RFC4291]
FC00::/7	Unique Local Unicast	[RFC4193]
FE00::/9	Reserved by IETF	[RFC4291]
FE80::/10	Link Local Unicast	[RFC4291]

# Further Reading

- <http://www.iana.org/about/presentations>
  - IPv4 reclamation in particular
- <http://www.potaroo.net>
  - More stats than you can shake a stick at

# JANET IPv6 Resources

- IPv6 Management Briefing Document
- JANET IPv6 Technical Guide
- IPv6 Multicast on JANET
- Links to other project documentation

<http://www.ja.net/development/ipv6>