IETF activity in IPv6

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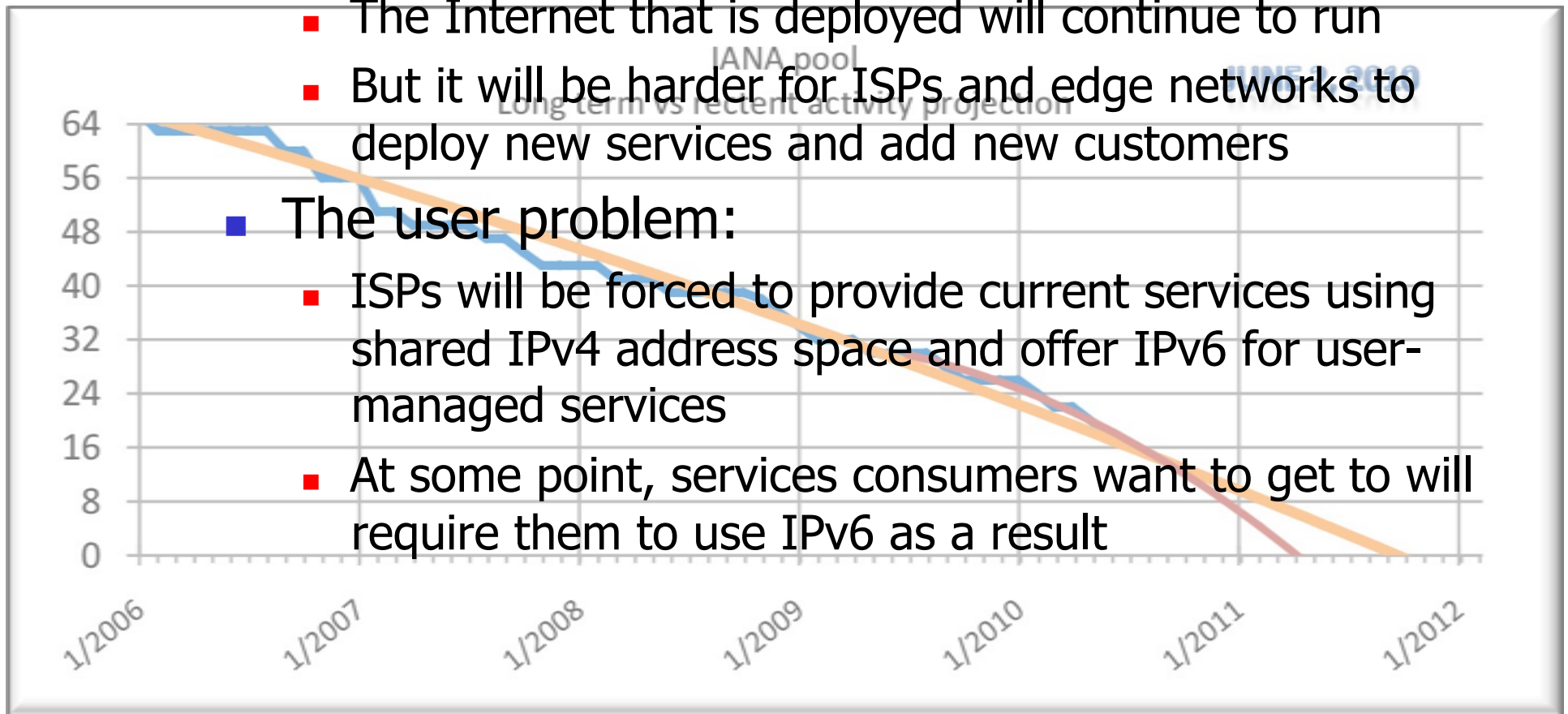
The issue of address depletion

- **The ISP problem:**
  - The Internet that is deployed will continue to run
  - But it will be harder for ISPs and edge networks to deploy new services and add new customers
- **The user problem:**
  - ISPs will be forced to provide current services using shared IPv4 address space and offer IPv6 for user-managed services
  - At some point, services consumers want to get to will require them to use IPv6 as a result

IANA pool
Long term vs rectent activity projection

64	
56	
48	
40	
32	
24	
16	
8	
0	

1/2006 1/2007 1/2008 1/2009 1/2010 1/2011 1/2012

What has the IETF been up to …since 1992?

- Realized we would eventually run out of IPv4 address space
    - Defined private (RFC 1918) address space
    - Adopted Classless Inter-Domain Routing
    - Defined a next generation Internet Protocol
- Practical operations
    - Used IPv4 in its extended form
    - Tested, and thought about how best to use, IPv6

IETF looking at deployment

- **IPv4/IPv6 coexistence**
  - IPv4/IPv6 Dual Stack Deployment
  - IPv4/IPv6 Translation
  - IPv4/IPv6 and IPv6/IPv4 Tunneling
- **Moving along**
  - Securing the network
  - General operational issues

Preferred Approach to Transition:
RFC 4213 Dual-Stack Deployment
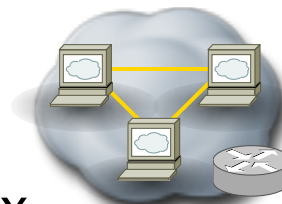
IPv4+IPv6 Hosts

- **Solution:**
  - Hosts today are IPv4+IPv6:
    - Windows Vista, Macintosh, Linux, BSD
  - Make the network IPv4+IPv6.
  - When forced to deploy IPv6-only networks, they will be able to talk with other hosts.
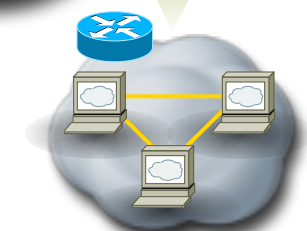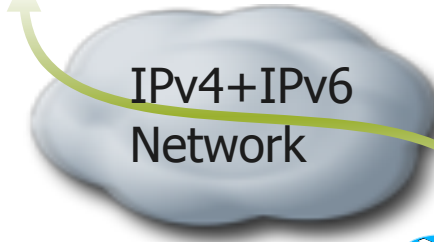
IPv4+IPv6 Network

- **But…**
 - We have run out of time for this to be smooth

IPv6-only
Hosts or Network

Translation: three components

- ## DNS64:
  - ### Translate DNS records
- ## Translator
  - ### Stateless mode
    - Modified SIIT algorithm
    - Uses Service Provider Prefix
  - ### Stateful mode (NAT64) similar to IPv4/IPv4 NAT
    - Permits session initiation IPv6-native -> IPv4 hosts
    - No session initiation IPv4-> IPv6-native

IPv4 or IPv6 Internet

DNS ALG

IPv4 or IPv6 Network
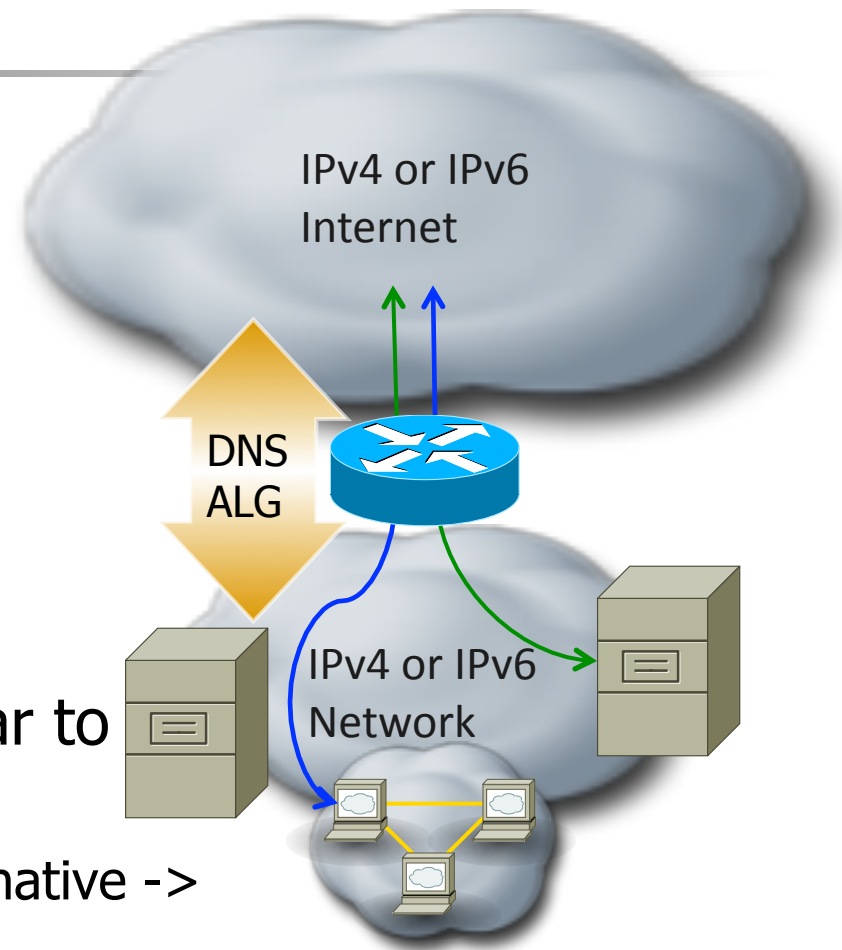
Dynamic IPv6/IPv4 tunneling
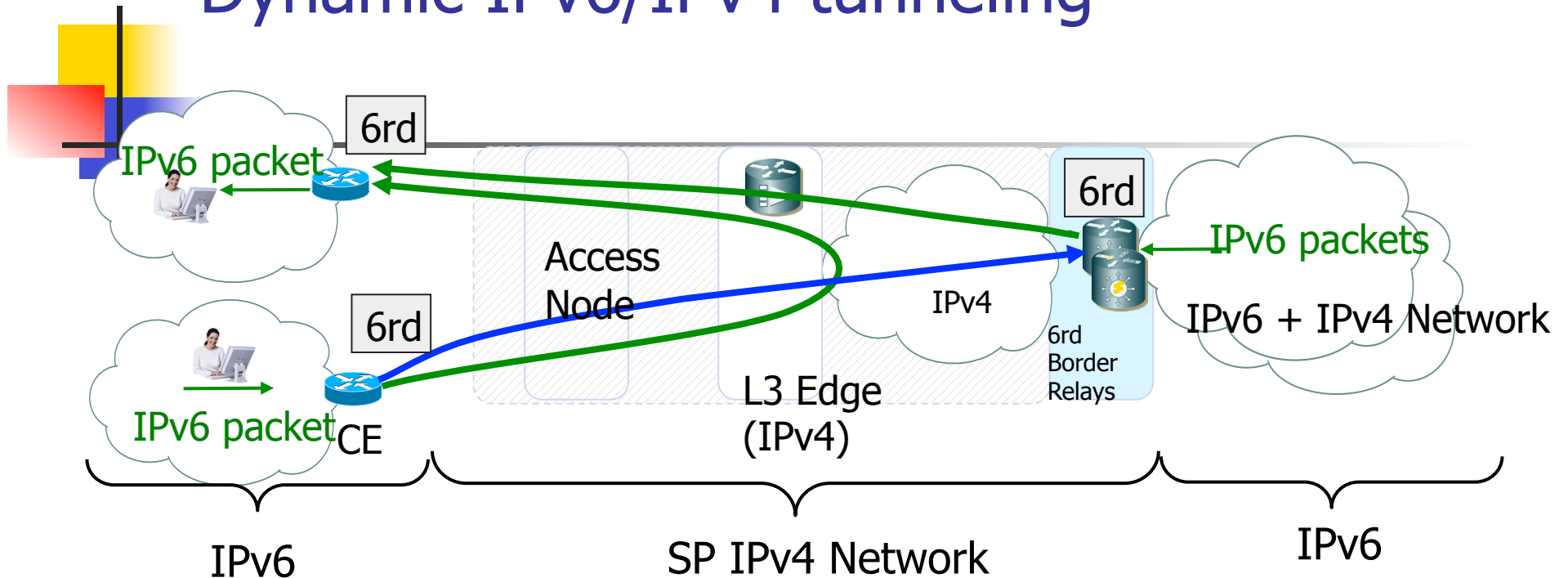
- IPv6 service in the home is essentially identical to native IPv6 service
- IPv6 Packets Follow IPv4 routing
- 6rd Border Relay traversed only when exiting or entering a 6rd Domain
- 6rd Border Relays are fully stateless, no limit on "number of subscribers" supported
- Border Relays may be placed in multiple locations, addressed via anycast.

The biggest problems with coexistence mechanisms

- **It gives the illusion of full service but gives a small subset**
  - Example – the web works well through IPv4/IPv4 translation, but BitTorrent shows us that far more interesting services are possible
- **Issues of management and fault diagnosis**
  - Everything gets harder for the operator
- **Operational and capital costs increase**
  - Since everything is a little harder, it takes smart people to run the network

For further reading…

- http://tools.ietf.org/html/draft-arkko-ipv6-transition-guidelines
  - "Guidelines for Using IPv6 Transition Mechanisms",
  - Jari Arkko, Fred Baker, 24-Feb-10