IPv6 at NPO

Bart Roos
Marco Wessel

NPO Intro

- NPO: Dutch Public Broadcasting
  - NPO ICT: ISP for broadcasters
    - Large network, providing a.o.:
      - uitzendinggemist.nl
      - omroep.nl
      - live-streams of events
      - etc.

Intro

- IPv4
  - In use since 1983
  - 32-bit address space
- IPv6
  - Designed in early 1990s
  - 128-bit address space
  - Individually assigned: more than we could *ever* use, given only the one planet we're on.

Address Space

- 128-bits is *staggeringly vast.*
- Divided into two parts: Network vs. Host, both 64 bits.
- Allows host to generate globally reachable address given only the network prefix
- DHCP no longer needed in its current form

IPv4 Address Space

IPv6 Address Space

(Grossly understated)

Practically Speaking...

- The end of Network Address Translation
- Some built-in obscurity
- More efficient
  - Fixed-length header
  - no checksum
- Improved multicast
- IPSec support required

Advantages for NPO

- Allows UDP use for streaming
  - Less traffic, less processing
  - Video streams don't care about a lost packet or two
- In theory, IPSec might be useful with DRM

Implementing IPv6

- First: IPv6 address space
- Second: IPv6 in the Network
- Third: IPv6 services
- Later: IPv6 office

IPv6 address space

- Request space from LIR (SURF, KPN, ...)
  - Provider dependent addresses
- Become LIR, request space from RIPE
  - Provider independent addresses
  - Allows sub-allocating to end-sites

IPv6 address space

- RIPE requirements for requesting as LIR:
  - Old: must have plan for 200 allocations within two years
    - NPO not likely to satisfy
  - New: must have plan for *an* allocation within two years
    - Easy!

Subnetting

- As a RIPE LIR, you will be allocated a /32.
  - 65536 /48s to assign to end-sites
    - One /48 allows 65536 /64 subnets for hosts
    - End-site:
      - NPO, NOS, VPRO, BNN, etc.

External Connectivity

- The IPv6 world uses BGP, just like IPv4
- Mostly the same, except:
  - IPv6 BGP routing protocols must send *two* next-hop addresses:
  - Global (2000::/3)
  - Link-local (fe80::/64 for ICMPv6 redirects)

External Connectivity

- Where to go?
  - Internet Exchanges have IPv6 in production (AMS-IX, NL-IX, etc.)
  - As do some (not all) large transit networks (Level3, Global Crossing, etc.)
  - And most (all?) NRENs (SURFnet, Belnet, etc.)

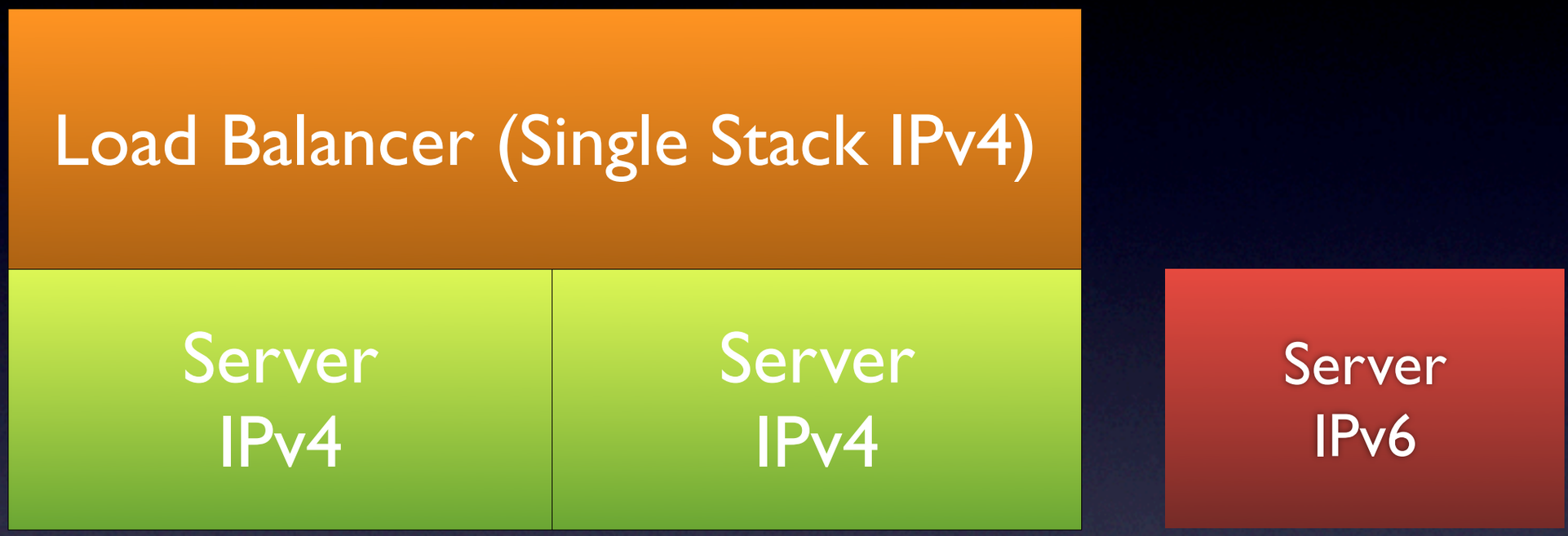
Possible Caveats

- IPv6 does away with ARP
- Instead: ND (neighbour detection)
- Uses Multicast rather than broadcasts
- Problem exists with some IGMP-snooping switches
- Symptom: MAC-addresses aren't learned
- Only solution: disable IGMP snooping

Clustered IPv6 Services

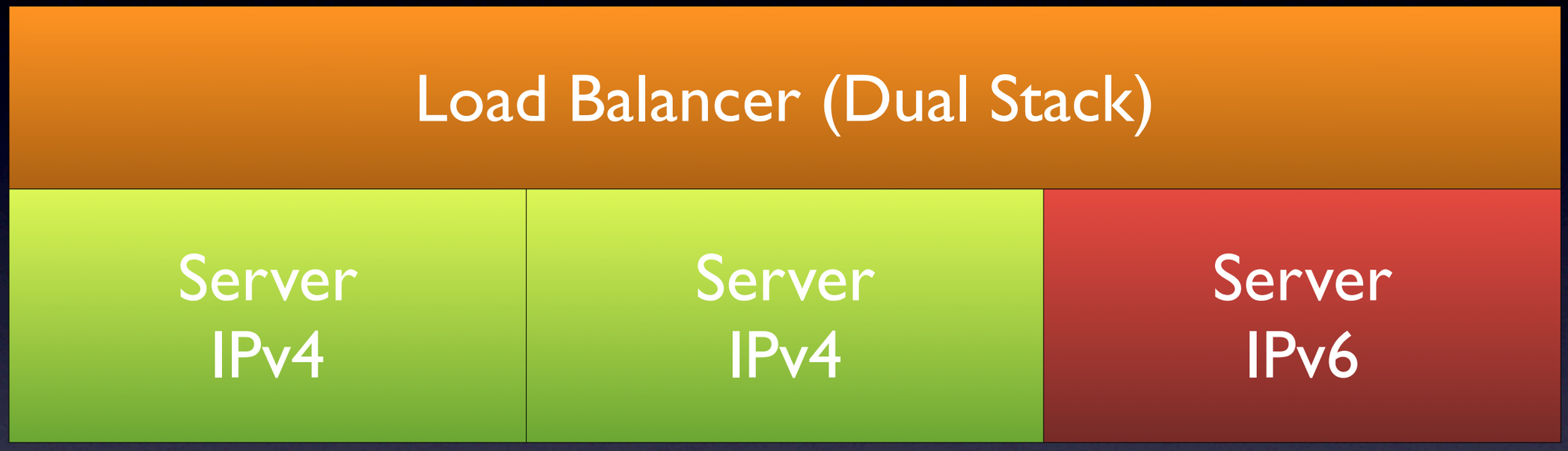
- Transitioning to IPv6, three possibilities:
  - Single-stack cluster, separate single-stack IPv6 node(s)
  - Dual-stack cluster, single-stack nodes
  - Dual-stack cluster, dual-stack nodes

Single Stack Nodes



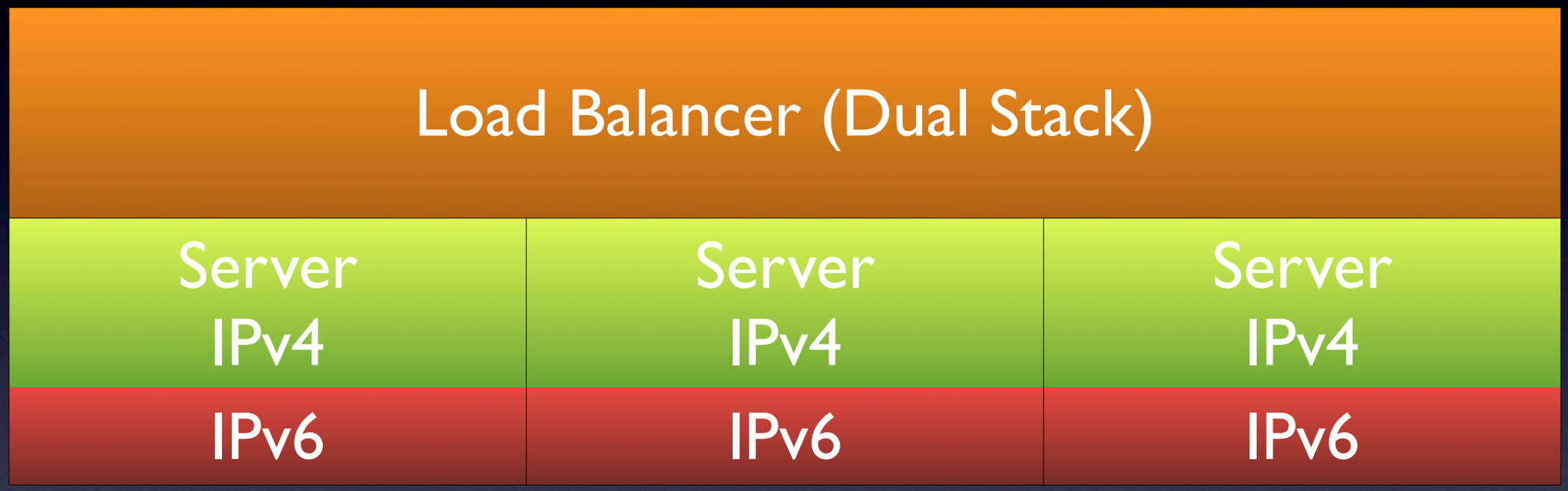
- IPv6 testing environment
- No chance of disruption
- Good initial configuration

Single Stack Nodes



- Still mostly separate, so should not cause interference
- Intermediate configuration
- But: different configurations on servers

Dual Stack Nodes



- Production configuration, after testing
- All servers created equal

Load balancing

- NPO uses Linux IP Virtual Server
- Problem: does not support IPv6 (yet).
  - Use something else, or
  - Financially support IPv6 for IPVS development
- Is that really a problem?
  - Not much traffic yet, so load balancing initially not required

Services

- Name servers
  - BIND, PowerDNS: good support
- Web servers
  - Apache, Lighttpd: likewise
  - IIS: Not so much.

Streaming services

- Windows Media Services
  - Full support for IPv6 since version 9
- Darwin Streaming Server
  - Does not support IPv6 yet (old patch available)
- Shoutcast
  - Also does not support IPv6
  - Can be replaced by Icecast, which does.

Office network

- Some support needed to offer services
  - Testing, development
- Requires some more research
  - Auto configuration (DHCPv6?)
  - Host and software support
  - Firewalls

Wrap-up

- Implementing IPv6 is very possible
- Several challenges do exist
- Worthwhile for NPO?
  - Most users currently are nerds, but
  - More and more routers now support automatic 6-to-4 tunneling (2002::/16)
- Make it worthwhile for clients
  - Provide incentive to switch

Thanks

Questions?