# IPv6 Transition Strategies – A Review

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31 May 2012

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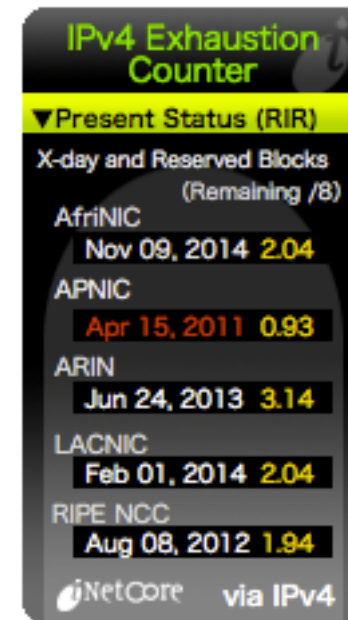
# Agenda

- Where are we?
- Strategies:
    1. Do nothing
    2. Prolong IPv4
    3. Deploy IPv6
- Recommendations

# Is IPv4 really running out?

□ Yes!

- ■ IANA IPv4 free pool ran out on 3rd February 2011
- ■ RIRs' IPv4 free pool will run out soon after
  - □ "soon" depends on RIR soft-landing policies
  - □ www.potaroo.net/tools/ipv4/
- ■ APNIC entered final /8 phase on 14 April 2011



**IPv4 Exhaustion Counter**

▼Present Status (RIR)

X-day and Reserved Blocks (Remaining /8)

| | | |
|---|---|---|
| AfriNIC | Nov 09, 2014 | 2.04 |
| APNIC | Apr 15, 2011 | 0.93 |
| ARIN | Jun 24, 2013 | 3.14 |
| LACNIC | Feb 01, 2014 | 2.04 |
| RIPE NCC | Aug 08, 2012 | 1.94 |

iNetCore   via IPv4

# Strategies available for Network Operators

1. ## Do nothing
   - Business not growing, don't care what happens
   - Wait to see what competitors do
2. ## Extend life of IPv4
   - Force customers to NAT
   - Buy IPv4 addresses on the marketplace
3. ## Deploy IPv6
   - Infrastructure uses IPv4 and IPv6
   - Customers get IPv6 with IPv4 options delivered native, NAT64, 6rd or DS-Lite

# Strategy One:
# Do Nothing

- **Advantages:**
  - Easiest and most cost effective short term strategy
- **Disadvantages:**
  - Limited to IPv4 address availability (RIRs or marketplace)
  - No access to IPv6
  - Negative public perception of SP as a laggard
  - Strategy fails when IPv4 address space is no longer available

# Strategy Two:
# Extend life of IPv4 Network

- Two ways of extending IPv4 network life
  - Next step along from "Strategy One: Do nothing"
- Introduce LSN (Large Scale NAT)
  - Customers and SP infrastructure moved to Private Address space
  - Spend $$ on Large translation devices
- Acquire IPv4 address space from another organisation
  - Spend $$ on transferring address space

# Strategy Two:
# Extend life of IPv4 Network – Issues

- Advantages:
  - Allows continued IPv4 subscriber growth
- Disadvantages:
  - Operator needs large NAT device(s) in network
  - Technical/Operational/Legal drawbacks of NAT
  - No access to IPv6
  - Unknown costs and reputation of purchased IPv4 addresses
  - Concerns over integrity of Routing system
  - Financial pressure on Operators to dispose of IPv4 addresses

# Strategy Three: IPv4/IPv6 coexistence & transition

- Three strategies for IPv6 transition:
  - Dual Stack Network
    - The original strategy
    - Depends on sufficient IPv4 being available (but will most likely use NAT)
  - 6rd (Rapid Deploy)
    - IPv6 tunnelling technique for SP customer deployment
  - Large Scale NAT (LSN)
    - SP deploys large NAT boxes to do address and/or protocol translation
    - LSN without IPv6 is not a transition strategy

# Strategy Three: Dual-Stack Network

- Applicability:
  - Where operator has sufficient IPv4 as well as IPv6
- Advantages:
  - Most cost effective long term model
  - Once services are on IPv6, IPv4 can simply be discontinued
- Disadvantages:
  - IPv4 growth limited to available IPv4 address space
  - Running dual-stack network requires extra staff training
  - IPv6 on existing IPv4 infrastructure might cost extra for hardware upgrades
  - IPv6-only end-points cannot access IPv4

# Strategy Three: 6rd

- ❑ Applicability:
  - ■ Where the ISP infrastructure to customer is not IPv6 capable
- ❑ Advantages:
  - ■ A quick way of providing IPv6 to the customer without deploying IPv6 across the infrastructure
  - ■ Subscribers can readily get access to IPv6
- ❑ Disadvantages:
  - ■ 6rd is not a long-term solution for transitioning to IPv6
  - ■ CPE must be upgraded to support 6rd ($$)
  - ■ The ISP has to deploy 6rd termination devices ($$)
  - ■ NAT may still need to be used for IPv4 ($$)

# Strategy Three: Large Scale NAT

- Large Scale NAT (LSN)
  - Dual-Stack Lite
    - Customer gets Native IPv6, Private IPv4
    - Network Operator runs IPv6-only infrastructure
    - Private IPv4 to IPv6 to Public IPv4
  - NAT64
    - Customer gets Native IPv6, no IPv4
    - Network Operator runs Dual-Stack infrastructure
    - Translation between IPv6 and IPv4

# Strategy Three
# Dual-Stack Lite

- ❑ Applicability:
  - ▪ Service Provider deploys IPv6-only infrastructure
- ❑ Advantages:
  - ▪ The SP is using IPv6 across their entire infrastructure, avoiding IPv4 dependencies
  - ▪ Consumers can transition from IPv4 to IPv6 without being aware of any differences in the protocols
  - ▪ End to End native IPv6 network
- ❑ Disadvantages:
  - ▪ SP requires NAT device in core
  - ▪ Subscriber router and devices need to be IPv6 capable

# Strategy Three: NAT64

- Applicability:
  - Service Provider deploys IPv6-only infrastructure
- Advantages:
  - The SP is using IPv6 across their entire infrastructure, avoiding IPv4 dependencies
  - Allows IPv6-only consumers access to IPv4 based content without using IPv4 address resources
  - End to End native IPv6 network
- Disadvantages:
  - SP requires NAT device in core
  - SP's DNS infrastructure needs to be modified to support NAT64
  - Subscriber router and devices need to be fully IPv6 capable (no legacy support)

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# Recommendations

- Review current IPv4 address usage:
  - Is it sufficient for immediate needs, or is NAT required?
  - If not sufficient, review these IPv6 transition techniques for suitability, versus LSN and no IPv6 deployment
- Develop a business continuity plan:
  - IPv4 + LSN is a band-aid, not a long term solution
  - If business is growing, IPv6 matters, and more so as the use of IPv4 diminishes

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# Recommendations

- Start training technical staff immediately:
    - New technology skills are not acquired overnight
    - APIA has supported APRICOT in providing Workshops
        - APRICOT 2013 in Singapore, 20th to 24th February 2013
    - APNIC Learning & Development provides IPv6 Workshops and deployment consultation/advice
        - APNIC 35 in Phnom Penh, 21st to 25th August 2012

# Thank You!