Engineering Networks for IPv6

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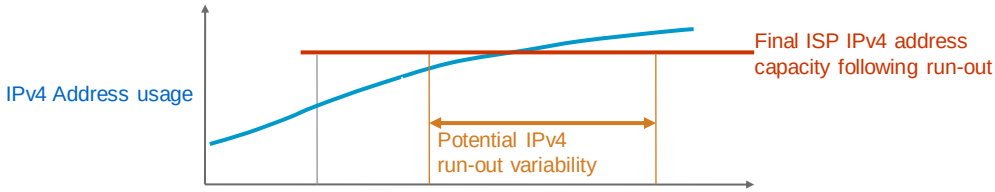
TELSTRA OPERATIONS

No one single fix - the entire eco-system is impacted – content, devices, networks, systems, protocols, CPE.

ISP IPv4 run-out timing variability

- Timing for each Service Provider is highly sensitive to key parameters e.g.
  - Service growth
  - Broadband saturation rate (as a percentage of households)
  - Market Share
  - Concurrency (how many users connected at the same time during the peak)
  - Customer behaviour changes (e.g. "always-on" mobile handset applications)
  - Any new products that consume a significant amount of IPv4 addresses



The ISP IPv4 run-out date is highly sensitive to key parameters which must be carefully monitored and addresses carefully managed

Transitioning to IPv6 requires a commitment to implement change

TELSTRA GUIDING PRINCIPLES FOR IPv4 TO /IPv6 TRANSITION

- IPv6 was designed with transition in mind. Service Providers have a number of approaches and techniques to manage their customer base and their internal business operations
- Telstra has a high level cross business unit strategy, and now we are in a multi-year transition implementation
- Some guiding principles Telstra is aiming to acheive include:
  - Enable customers to migrate to IPv6 capability at their own pace
  - No forced change to consumer CPE
  - Minimise impact on consumer applications
- Avoid transition solutions which require large scale changes to existing infrastructure
- Link dual-stack introduction to lifecycle replacement opportunities wherever possible (particularly for home gateways / modems)
- Migrate as much high volume traffic as possible to IPv6 to minimise the amount of traffic that might need to go through an IPv4 shared address solution in future

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IPv6 DEPLOYMENT – ENGINEERING CONSIDERATIONS

- Native IPv6 in a dual-stack IPv4/IPv6 architecture is Telstra's preferred solution.
- Need a standardised model for delivering dual-stack IPv4/IPv6 broadband services.
  - TR-187 was ratified in May 2010 by the Broadband Forum (IPv6 for PPP Broadband Access). Addresses key issues:
    - Delivering a single PPP dual-stack IPv4/IPv6 session
    - Prefix Delegation to the Residential Gateway
    - Residential Gateway Requirements (which assists CPE vendors)
    - BNG / BRAS Requirements
  - WT-177 in the Broadband Forum is developing a similar standard for delivering IPv6 over Ethernet Access (yet to be ratified).
- Capability, scaling and performance of dual-stack network equipment
  - Ensure that IPv6 capability at least matches that available in IPv4 today (e.g. security, alarming, etc.)
  - Determine the impact that activating IPv6 will have on scaling and performance

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IPv6 DEPLOYMENT - CHALLENGES

- Three different situations for introducing IPv6 capability
  - Retrofitting existing infrastructure / products
  - Lifecycle refresh. Introduce IPv6 capability when infrastructure / applications are due to be upgraded or replaced
  - New infrastructure / products. Specify IPv6 capability from the start
- Need to move to IPv6 capability being 'Business As Usual'
- Key Challenges are:
  - Additional cost yet no additional revenue (effectively a cost of maintaining business)
  - Must encourage vendors/partners to ensure they have IPv6 capability in their roadmaps
  - Lack of IPv6 capable consumer CPE (e.g. fixed broadband CPE, mobile handsets)
  - Ensuring all required elements are IPv6 capable (e.g. Load Balancers, Firewalls, etc.)
  - Impact of IPv6 activation on scaling and performance of legacy equipment
  - IT Systems, including service assurance tools. Infrastructure / products must be supportable.
  - Applications / content (many have not yet become IPv6 capable)
  - Training (e.g. for the field workforce and Front of House)
  - Additional testing for all new products (i.e. must test with both IPv4 and IPv6)
  - Security must be maintained
  - Legislated interception requirements (must be supported in IPv6 as well as IPv4)
  - There is no failover between IPv6 and IPv4, therefore IPv6 implementation must be robust

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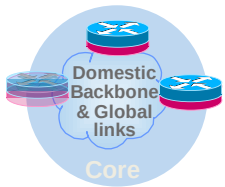
IPv6 DEPLOYMENT



Dual-Stack

Working our way outwards to ensure end-to-end compatibility

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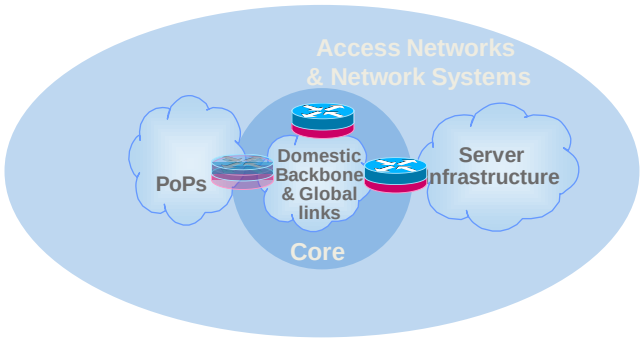
IPv6 DEPLOYMENT



Dual-Stack

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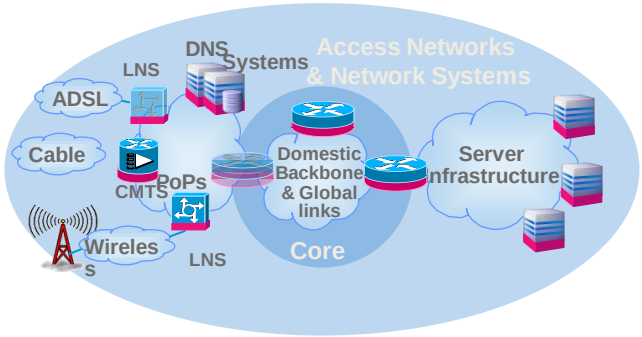

Dual-Stack

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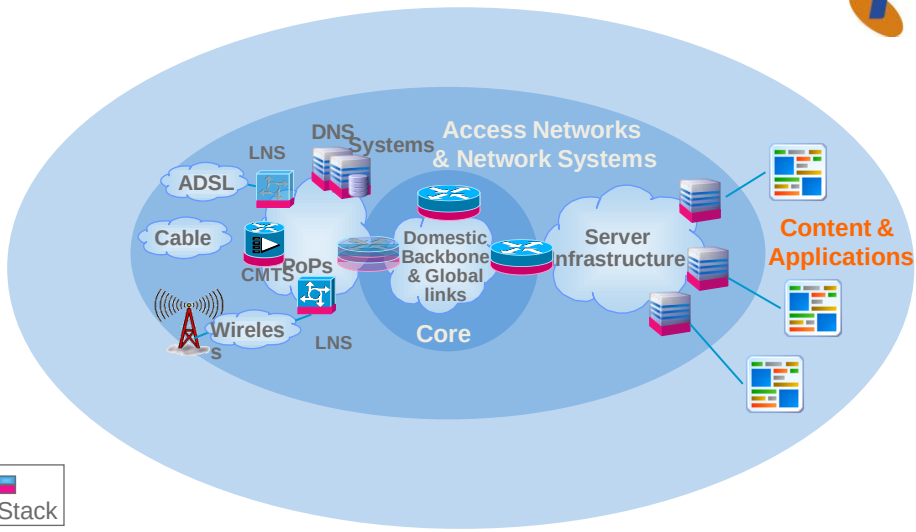

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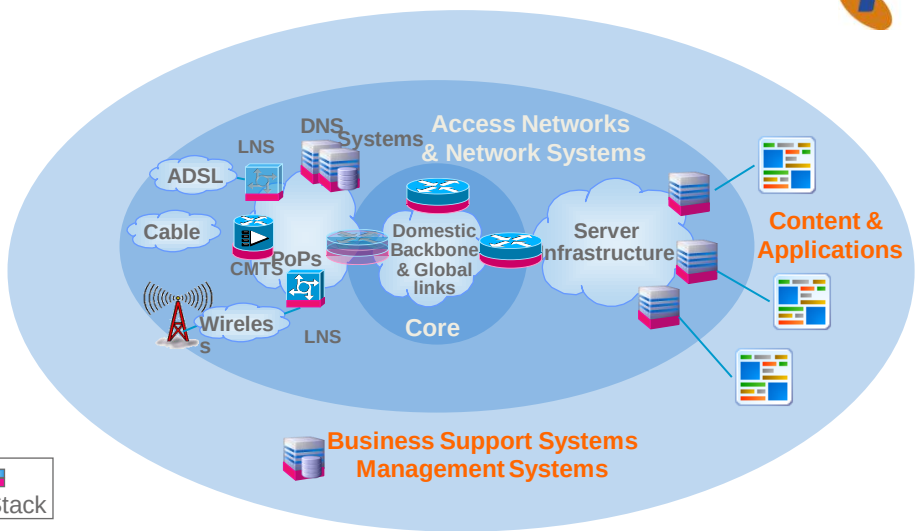

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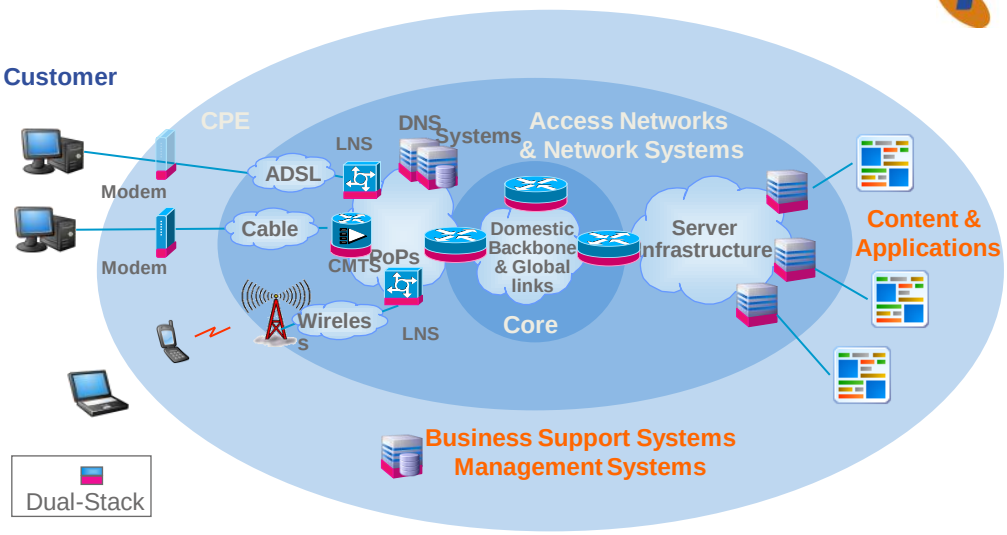
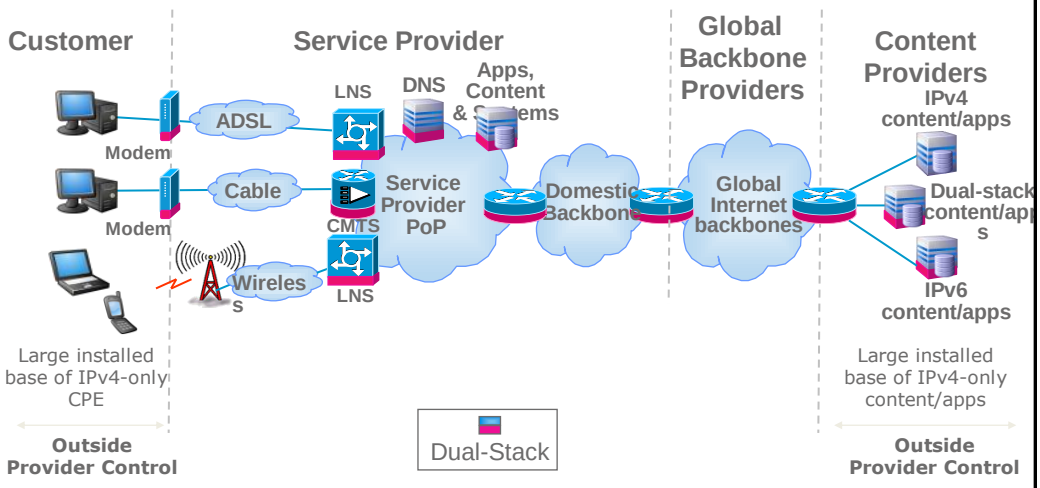


Working our way outwards to ensure end-to-end compatibility

IPv4 AND IPv4 CO-EXISTENCE WITH DUAL-STACK



Dual-Stack enables a smooth transition

IN CONCLUSION

- Telstra is implementing a multi-year programme of change for transitioning to IPv6
  - Network, Applications, Systems, Processes on existing infrastructure and capability aligned as much as possible with lifecycle upgrades
  - New product and technology introductions are being brought in with IPv6 capability
  - IPv6 is being incorporated as BAU
  - Keeping abreast of evolving techniques for managing transition
- Minimising Impact to customers
  - Implementation strategies to minimise customer impacts
  - Address consumption being driven by Smartphone and always on. Industry is developing ways to manage
  - Includes tight management of IPv4, dual stacking, and port address translation
  - Developing solutions for high volume traffic first. We are seeing global content companies moving to IPv6
- Requires consistent effort by all in the ecosystem for smooth transition