Infrastructure for Australia’s Digital Economy:

Politics confront Technology

The story of Australia’s National Broadband Network

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Australia’s National Broadband Network

- **April 2009**: Announced by Federal Government
- 93% fibre to the premises (FTTP)
- Investment of AU $43 billion
- The "single biggest infrastructure decision in Australia's history”
- **September 2013**: New Government resets key parameters
- FTTP largely replaced by fibre to the node (FTTN)
Original Technology Footprints

- Optic Fibre Footprint: 93%
- Fixed Wireless Footprint: 4%
- Satellite Footprint: 3%

Source: NBNCo
NBN Structure

- Exchange
- FTTP Customers
- Satellite Customers
- Wireless Customers

Diagram:
- Retail Service Provider
- Point of Interconnect
- Aggregator
- Competitive Backhaul
- NBN Backhaul
- Exchange
- NBN Access Network
- NBN Monopoly Wholesale Network (L2)
- Competitive Wholesale Network (L2/3)

Networks:
- NBN Monopoly Wholesale Network (L2)
- Competitive Wholesale Network (L2/3)
- NBN Access Network
- NBN Backhaul
- Competitive Backhaul
- Retail Service Provider
- Aggregator
Wireline Technologies

Telstra Ducts (~ AU$ 11 billion)

Passive Optical Network (PON)

Fibre to the Premises (FTTP)

Fibre to the Building (FTTB)

Copper

Fibre

Fibre

Copper

Exchange

Splitter

ADSL

Existing

Coaxial Cable

RF Amplifier

Hybrid Fibre Coax (HFC)
Pricing Principles

• **Uniform Pricing**
  – Uniform wholesale pricing across Australia irrespective of the delivery technology and location
  – Price depends only on product-specific bitrate

• **Avoidance of Cherry Picking**
  – Protections against cherry picking for low cost / high revenue regions
  – Business plan dependent on NBNCo monopoly
Seven Years of Flux

- Federal Election - Change Government
- Proposal for public-private-partnership to establish an NBN fails
- Government-appointed Panel recommends FTTP-based network
- Government announces establishment of NBNCo
- FTTP rollout commences
- Federal Election
  - NBN a major issue in election
- Finalization of agreement to use Telstra ducts and pits
- NBNCo announces downward revision of rollout rates
- Coalition champions replacing FTTP by FTTN
- Federal Election - Change of Government

Multi-Technology Mix (MTM)
Issues in the Political Debate

• Overall project cost
  – Cost-benefit analysis

• Choice of technology

• Speed of rollout

• Monopoly versus facilities-based competition
Cost

• AU $43 billion over 8 years (~ AU $5.5 billion per year)
  ~ AU$ 300 per person per year

• Some commentary:
  – a “shockingly misconceived, wasteful exercise in public policy”
  – a “dangerous delusion”, cost/benefit analysis required
  – a “brilliant initiative that will transform Australia”

• Annual spend on roads: AU $16 billion
Cost

How much debt will the NBN involve?

How long's a piece of fibre-optic cable?

Source: www.nicholsoncartoons.com.au
Choice of Technology

• Many ill-informed opinions in the press, e.g.:
  – Replace FTTP by “mobile technologies and existing fibre”

• Strong political statements, e.g.:
  – a “dangerous delusion”
  – a “white elephant on a massive scale”

• Dearth of informed technical debate
Technologies

Download speeds... the big rollout...

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Technologies

Pay attention—
it gets a bit
technical
after this...

Source: Cathy Wilcox. Reproduced with Permission
Speed of Construction

- Delays caused by factors such as:
  - Difficulties in mobilizing a large workforce
  - Delays in finalizing agreements with Telstra
  - Asbestos in Telstra pits

- Much political debate about these delays and reports of “cost blowouts”

- Labor has since admitted it underestimated the difficulties in ramping up the project
The Debate around User Demand

![Diagram showing the growth of download rates from 1990 to 2020, comparing different technologies such as ADSL, Dial-up Modems, VDSL (FTTN), GPON, xGPON, and G.fast. The chart illustrates a 60% per annum growth rate and the capabilities of each technology in terms of download rates from kilobits per second (kb/s) up to gigabits per second (Gb/s).]
Seven Years of Flux

2007
Federal Election - Change Government
Proposal for public-private-partnership to establish an NBN fails

2008
Government-appointed Panel recommends FTTP-based network
Government announces establishment of NBNCo

2009
FTTP rollout commences

2010
Federal Election

2011
- NBN a major issue in election
Finalization of agreement to use Telstra ducts and pits

2012
NBNCo announces downward revision of rollout rates
Coalition champions replacing FTTP by FTTN

2013
Federal Election - Change of Government

2014
Strategic Review  Cost/Benefit Review  Public Policy Review
Multi-Technology Mix (MTM)  Due this month

THE UNIVERSITY OF MELBOURNE
2013 Election and Beyond

Strategic review (December 2013):

Multi-Technology Mix:
- FTTP: 20-26%
- FTTN/dp/B: to 44-50%
- HFC: ~ 30%

"Fast, Affordable, Sooner"

> 98% of footprint to achieve > 25 Mbps by end of 2020

<table>
<thead>
<tr>
<th>Original Plan</th>
<th>Revised Plan</th>
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<tbody>
<tr>
<td>Announced by the Labor government in 2009</td>
<td>Proposed by the current Coalition government in 2013</td>
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<table>
<thead>
<tr>
<th>Coverage</th>
<th>Total Cost</th>
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<tbody>
<tr>
<td>Fiber to the premises (FTTP) 93%</td>
<td>22% Fiber to the premises</td>
</tr>
<tr>
<td>Fixed wireless 4%</td>
<td>71% Fiber to the node (FTTN)</td>
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<tr>
<td>Satellite 3%</td>
<td>4% Fixed wireless</td>
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<tr>
<td>Finished: 2021</td>
<td>2019</td>
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AU $45.6 BILLION | AU $29.5 BILLION
Multi-Technology Mix

Splitter

Passive Optical Network (PON)

Fibre to the Distribution Point (FTTdp)

Hybrid Fibre Coax (HFC)

Fibre to the Building (FTTB)

Fibre to the Premises (FTTP)

Fibre to the Node (FTTN)

Copper

~ 50 m

~ 400 m

VDSL2 (Vectoring)

Faster, Sooner, Cheaper
Multi-Technology Mix

Bridge to the 21st Century...

And we're going to finish it off with a multi-technology mix!

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If a user needs more bandwidth

– Fibre installed on user-pays basis
– Cost depends on distance to node etc.
Worldwide FTTP Developments

- FTTP rollouts in more than 100 countries
- Most of Scandinavia, the Netherlands, and many of the Arab oil states have FTTP penetration levels of more than 50%
- In developed economies FTTP is predicted, over the next 5 years, grow to around 30% - 50% of the population (Budde)
- Google: Offering 1 Gb/s to cities such as Kansas City and Austin
- AT&T: Tentative plans for 1-Gb/s to ~ 100 cities in 21 metro areas
- By the end of 2014 China aims to have 100 million households connected to fibre
Final Words

• Telecommunications is essential infrastructure
  - c.f. roads, rail, water, electricity, sewer systems

• Engineers need to become more involved in political debate
  - Counteract technical confusion and misinformation

• FTTP will eventually come to Australia
  - But by a circuitous route