



**NEW ZEALAND INSTITUTE FOR THE STUDY  
OF COMPETITION AND REGULATION INC.**

# **THE TYRANNY OF DISTANCE PREVAILS**

**December 8 2010**

**Mark Obren and Bronwyn Howell**

<http://www.iscr.org.nz>; [bronwyn.howell@vuw.ac.nz](mailto:bronwyn.howell@vuw.ac.nz)

**CORPORATE MEMBERS**

*Contact Energy*

*Fonterra Co-Operative Dairy Group Limited*

*MainPower Trust*

*Meridian Energy*

*Powerco*

*Telecom Corporation of New Zealand Ltd*

*Victoria University of Wellington*

*Westpac Institutional Bank*

# THE TYRANNIES OF SCALE AND DISTANCE

## Australia, New Zealand

- small (relatively), distant, isolated economies
- internal capital constraints – reliance upon foreign investment

## Australia

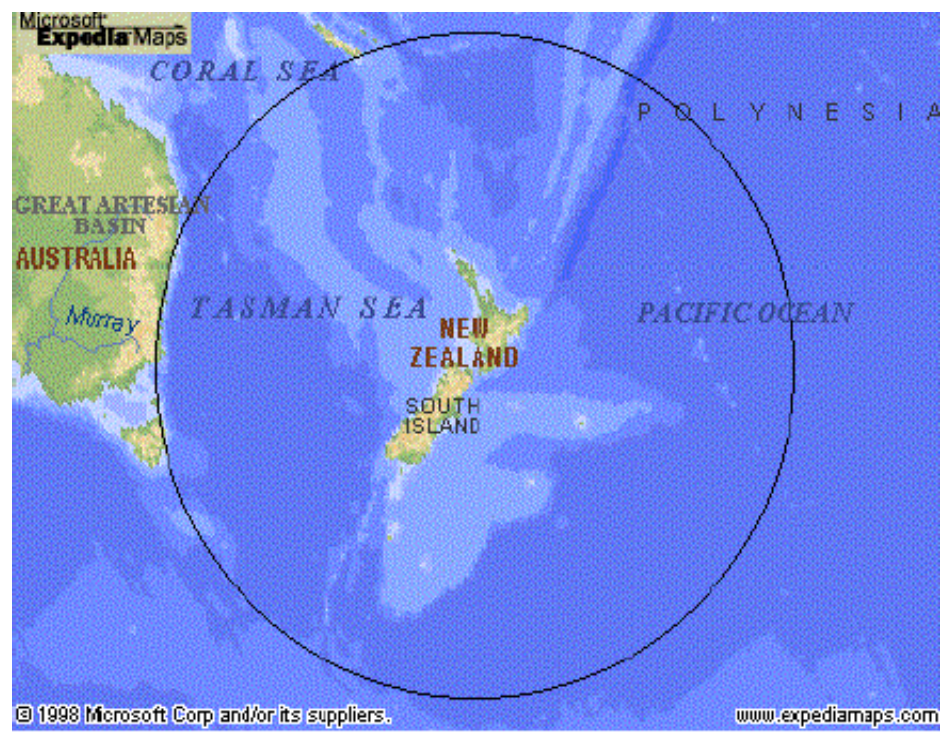
- population 22.5 million – focused on eastern seaboard
- one city of international scale (Sydney, 4.5 million)
- distance Sydney-Singapore 6300km

## New Zealand

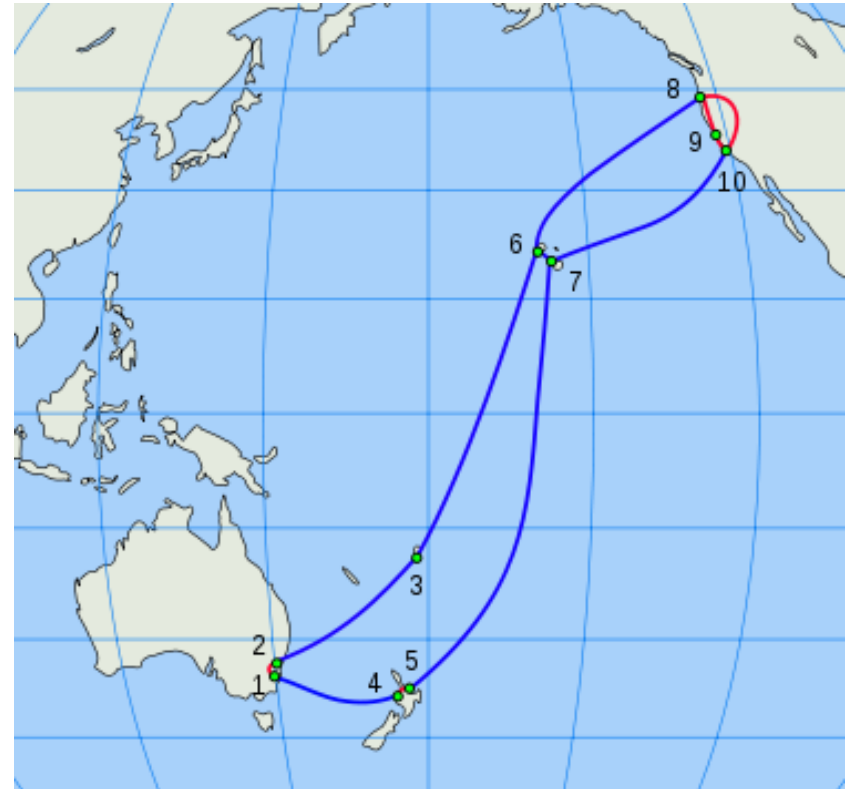
- population 4.5 million (Auckland 1.4 million)
- distance Auckland-Singapore 8400km (Sydney 2151km)
- 3-firm concentration ratio > 85% for most significant industries (even those without high fixed, sunk costs)



# WHERE 2000km WILL TAKE YOU



# LIMITS TO CONNECTIVITY



# POLICY CONTEXT

## Historical:

distance costs

(transporting physical goods, lack of timeliness)

costs mitigated by technological innovation (Blainey, 1966)

freezer ship => mitigates timeliness limitations (for some products)

## Recent:

the internet heralds the ‘Death of Distance’ (Cairncross, 1997)

instantaneous, low-cost information transport

“New Zealand is at the centre of the world” enabling NZ to “overthrow the tyrannies of distance” and “mitigate the disadvantages of our small population and low population density” (Ernst & Young, 1999)

“the expansion and development of broadband is a vital component of NZ’s economic growth, productivity improvements and the government’s wider strategy to increase NZ’s global competitiveness” (Joyce, 2010)



# POLICY CONTEXT II

Economic transformation expected from FTTH investment

1. increased productivity
2. relative to other countries (competitive advantage)

A feasible expectation?

Distance has not changed

And time(liness) still matters

absolute: – how long must Nzers wait to get their data; what is the effect of faster local access bandwidth on wait times (productivity)

relative: - can NZers ‘leap ahead’ (competitive advantage) or does distance still mean we lag the pack for some applications



# TECHNOLOGY CONTEXT

## Enhanced Communications Infrastructure

- Current policy focused on Fibre-optic cable
- Local Access Networks mixture of technologies
- little emphasis on actual client experience (e.g. contention rates); rather on headline speeds
- what most impacts the user?

## HTTP protocol

- Primary basis for running interactive applications through web browsers
- Web sockets recent alternative





# TECHNOLOGY CONTEXT II

Cloud-based computing: beyond client-server

- Superior economics
- Low barriers to entry
- Economy of scale require large markets; location not maximise NZ latency
- Hollowing out threat to New Zealand ICT

Technological change

- Changing nature of content to be carried
- Changing nature of devices accessing information





# WEB 2.0

Web 2.0 popularised in 2004 by Tim O'Reilly, Web 2.0 Conference

Web as a platform

Shifts level of compatibility shift to browser (and phone apps)

- Affects demand for bandwidth as delivered from servers to remote users
- Drives importance of HTTP in delivering future productivity-enhancing ICT

Appears to be competence-destroying discontinuity for ICT in 2004; change incumbents in industry and rate of change in industry

- Shaping future of ICT, e.g. Google I/O conference 2010



# POPULAR DESKTOP APPLICATIONS





twitter™

LinkedIn®

facebook



zynga®



hulu™

tumblr.

You  
Tube

zoho®  
Work. Online

flickr

Google maps



yelp.\*

NETFLIX

PANDORA

Google™



NEW ZEALAND INSTITUTE FOR THE STUDY  
OF COMPETITION AND REGULATION INC.

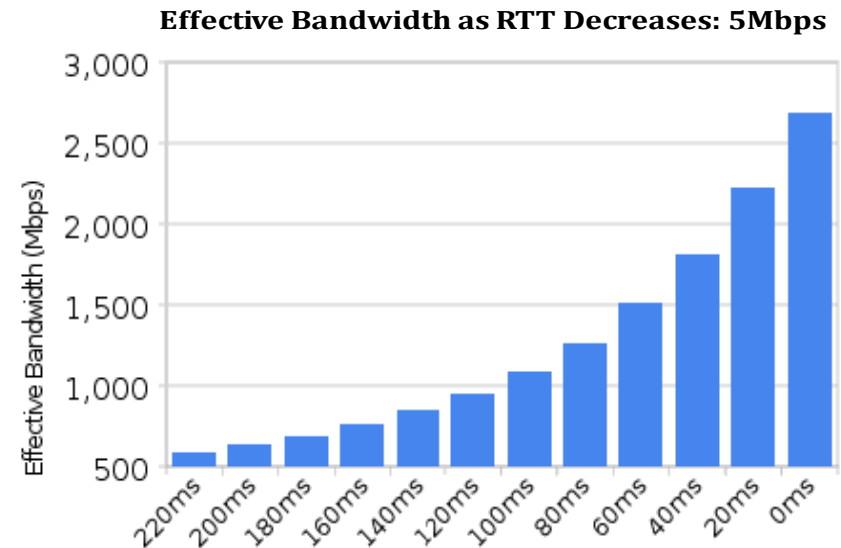
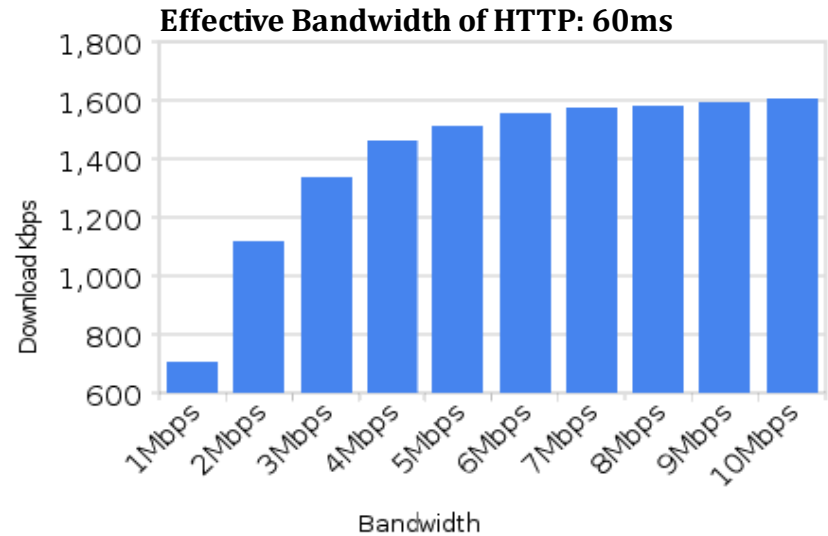
# BELSHE (2010)

Google research into effect of latency on effective bandwidth

Tested bundle of 25 popular websites

Varied latency and bandwidth to estimate effective bandwidth for given latency and speed

Findings – important to positioning of server farms to deliver service



# EXTRAPOLATIONS FOR NZ

Belshe tested for US conditions,

- 0-220ms latency
- 1-10Mbps headline bandwidths

Tested range of websites to determine RTTs in New Zealand context

- 60-600ms latency

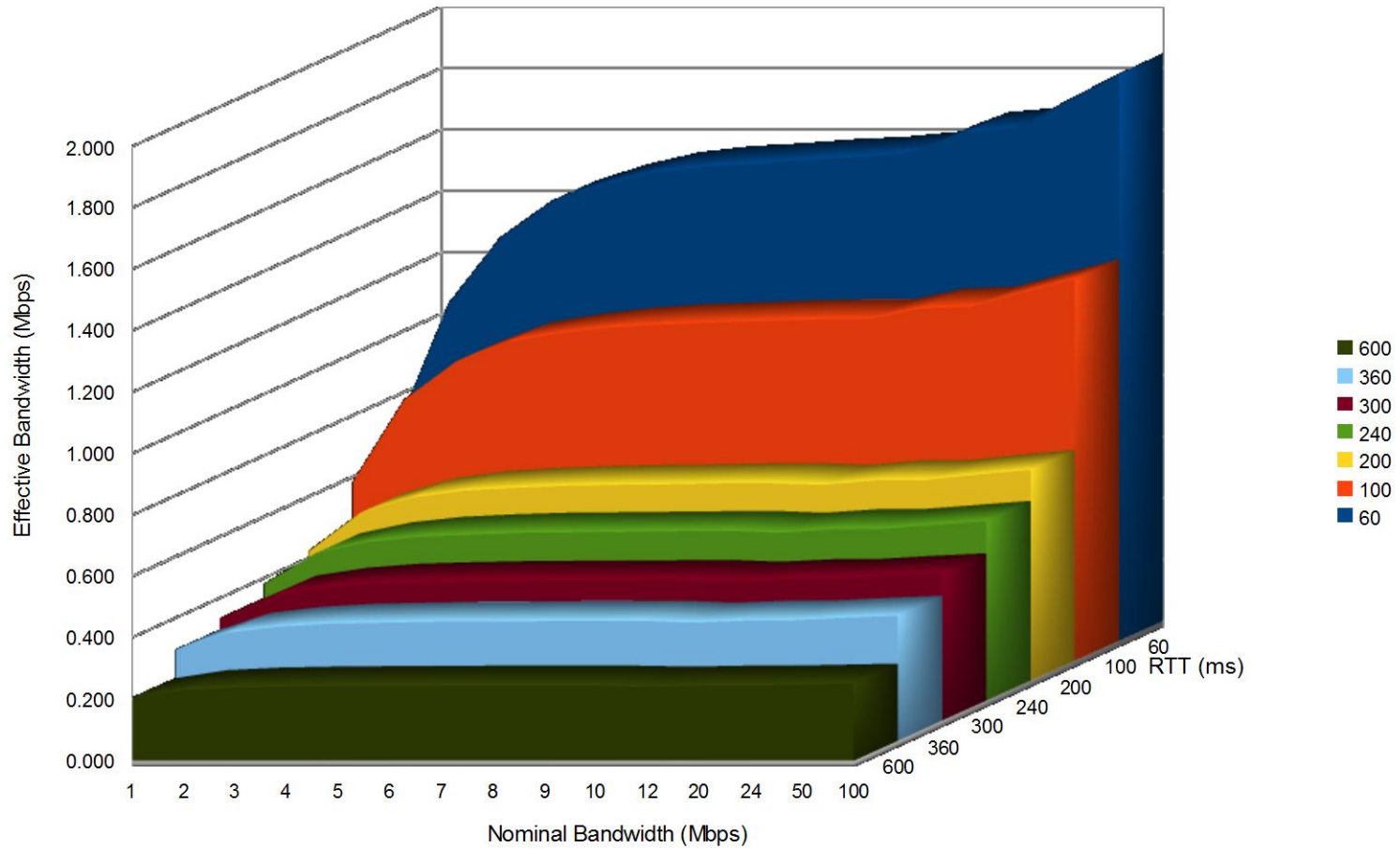
Extrapolated Belshe to account for RTT experienced in NZ and Headline Bandwidths of local interest

- 1-100Mbps

Calculated effective bandwidth combination of both factors using headline bandwidth relevant to local context



# NZ RESULTS



# FINDINGS

## Percentage increase in effective bandwidth of 100Mbps Fibre Optic over indicative alternative network capacities

Network Type	Bandwidth of Network Type (Mbps)	Theoretical speed improvement 100Mbps fibre if 100% scaleable	Location of Internet Platform						
			New Zealand	Australia	Singapore, USA (West Coast)	USA (East Coast)	East Asia	Europe	South Africa
			60ms	100ms	200ms	240ms	300ms	360ms	600ms
3.5G Wireless	20	400%	12%	8%	5%	5%	4%	4%	3%
ADSL2+	24	317%	11%	8%	5%	5%	4%	4%	3%
ADSL	8	1150%	19%	13%	7%	6%	5%	5%	3%
Rural	5	1900%	24%	17%	9%	8%	7%	6%	4%
Basic Broadband	1	9900%	168%	113%	63%	54%	44%	37%	23%





# POLICY IMPLICATIONS

## Decreasing returns to investment in fast local access for HTTP-enabled applications

double decreasing returns effect the further the data must travel  
low marginal benefit over 4Mbps, even for short data trips

## Productivity gains from FTTH investment in NZ

1. Absolute - almost all from local data traffic movements (NZ, and to a lesser extent, east coast of Australia)
2. Relative – for equivalent transactions, users located nearer the host will always have a ‘timing’ edge
  - timing of message arrival (for queued transactions)
  - time savings (productivity gains) arising from faster local access networks will be greater



# POLICY IMPLICATIONS II

New Zealand's economic benefits from the internet are highly application- and location-dependent, not ubiquitous and economy-wide

must be taken into account when identifying benefits and costs from ICT-enhancing and enabling policies

FTTH will have negligible effect on NZ's international competitiveness, given current application base

must be justified from local and regional benefits alone



# ALTERNATIVE METHODS TO IMPROVE PERFORMANCE

Caching optimised for performance rather than cost reduction

Improve contention rates to reduce bottleneck effects

Tiered traffic to optimise performance for latency affected traffic

Wait for improved technologies

- Lower-latency connections
- Lower dependency upon latency

More direct, low-latency connections to relevant markets

