

Tariffs and Trading in a National Research Education and Innovation Network in New Zealand

QUESTnet 2004

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Overview

- The New Zealand Research, Education and Innovation Network
 - NGINZ, the Network, National and International Connectivity
- Tariff Study and Business Case
 - Process and the "TERENA Data"
- What if ... institutional bandwidth trading
 - NOMAD and the Vickery Auction mechanism
 - An application to bandwidth trading?
- Roundup/References

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Background – the ANRE

- NGINZ (Next generation Internet) incorporated in 2003
 - See next slide and <http://www.ngi-nz.co.nz/>
- RFO to network providers were sent in Q1 and Q2 2003
 - REIN - Research Education Innovation Network
 - Selected providers and network management company
 - A nearllyent approach, Gigabit Ethernet technology GigaPOPs
- The government stepped in ... now we have an Advanced Network of Research and Education and Innovation
 - Larger in scope, partially funded by government for 4 years
 - See James Neil's APAN presentation and reference 1, "Discussion Document" for more information. *The Advanced Network should start some operations by the end of 2004.*

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Current Members NGINZ

- **Full Members**
 - University of Auckland
 - Auckland University of Technology
 - University of Waikato
 - Massey University
 - Victoria University
 - University of Canterbury
 - Lincoln University
 - University of Otago
 - National Library
 - Natural History NZ
 - Internet NZ
 - AgResearch
 - HortResearch
 - Landcare Research
 - Crop & Food Research Ltd
 - The Open Polytechnic of New Zealand
- **Associate Members**
 - CityLink

Involvement going forward:

- Championing needs
- Building overseas relationships

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Demand Case, Target Markets and Usage

Target Markets	Primary Usage
Research	Grid Computing Data Transfer Access Grids National Research Communities International Research Communities
Education	Remote Teaching Tools - Video Conf Modelling & Simulation Content Distribution
Business Support	Private Networking Disaster Recovery, Storage etc
Innovation	Bioinformatics Creative Industry ICT

See reference 2,
Demand case for ...

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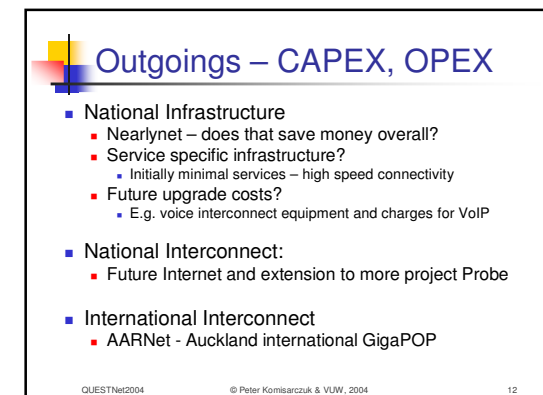
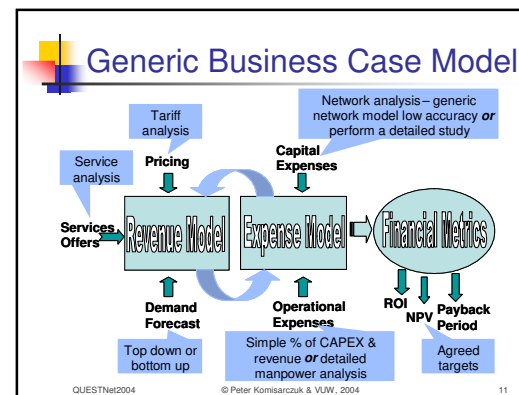
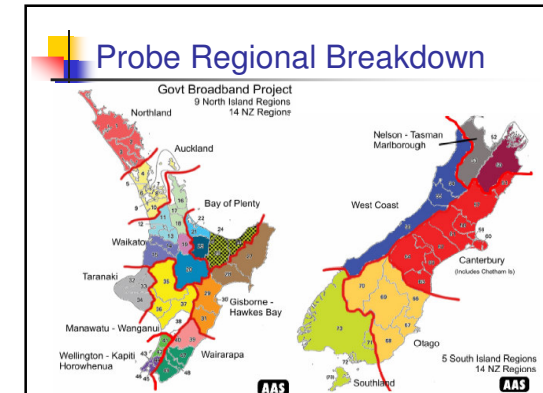
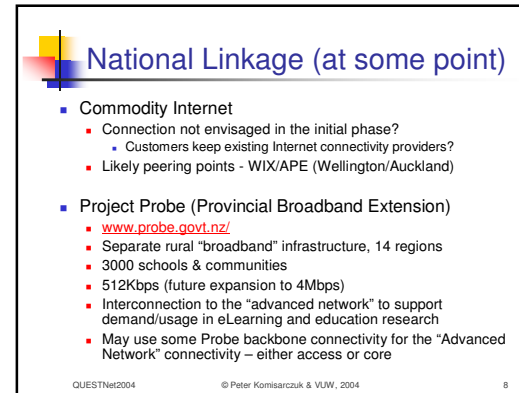
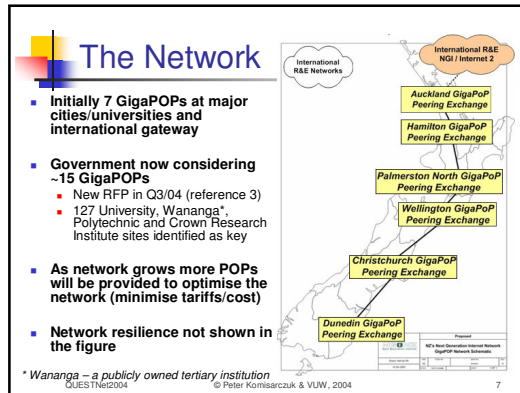
Nearllynet and the Idle Network

- The proposed network was based on the Nearllynet approach (reference 7)
 - Permanent vs. Nearllynet
 - Proposed network architecture currently under review
- Draft architecture discussion (reference 6) identifies:
 - Initially Ethernet based infrastructure
 - Network utilisation in the order of 5-10% - the definition of an "idle network"

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Sources of Income

- Users expected to meet ongoing operational costs (reference 3)
 - What are the applications that drive the demand? Reference 2, "Demand Case ..."
- Who pays for the network? Now and in the future?
 - The Users + Government grants – 4 year current commitment
 - Users pay for services. What is the Service base?
 - A survey of RENs shows that they provide some or all of:
 - Operational Services
 - Information Services
 - Security Services
 - User Support Services
 - Third party services, e.g. commercial grid platforms

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REN = Research and Education Network

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Tariffs

- Required to cover OPEX
- Also likely requirement to cover future network expansion/demand growth
- Tariff Options (TERENA study):
 - Flat Fee only – most popular – 45%
 - Usage/Volume based only – 0%
 - Issue that this may inhibit network usage
 - Mixed Flat Fee and Usage/Volume – 35%
 - Usage/Volume for International links, VoIP
 - Alternative criteria – 20%
 - e.g. based on annual turnover, or number of students (FTE), research income, etc.
- Flat fees are most likely to attract customers/projects

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Problems? Demand?

- Although we have a demand case (reference 2), projects such as:
 - Biotechnology, Physics, Environmental sciences, ICT,
- The required Gigabit enabled infrastructure is not in place for many of these projects
 - Needs funding to upgrade projects to GbE speeds
 - Possibility for Grid computing resources to be sold – 1000+ processor grid from Weta Digital/TelecomNZ
- But why get ANRE connectivity at 1Gbps when requirements are uncertain?
 - Can we mitigate our risk by trading our share of the ANRE bandwidth?
 - Can we create flexibility in ANRE bandwidth assignment?

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What if ... institutional bandwidth trading?

- With uncertainty of usage we may have less propensity for potential customers to buy service
- Increase propensity to buy service?
 - Provide a mechanism for institutions to trade ANRE bandwidth
 - Customers who want more than 10% of a Fast or Gigabit Ethernet on an ad hoc basis get another institutions spare capacity
 - Allows organisations to avoid early upgrade to Gigabit or multiple Gigabit connections, or provide for short term projects
 - Allows organisations to recover some of the incurred costs in the event of lower network demand from their own groups
 - We could envisage an automated contract mechanism to enable purchase of spare bandwidth
 - **Not tested if this will increase the institutions propensity to take part in the ANRE**

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Marketplace Based Model

- Use "NOMAD" - Negotiated - Object - Migration - Access and - Delivery
 - Supports application/software mobility and resource management
 - Not a direct match for bandwidth trading?
- NOMAD Components:
 - A Marketplace
 - Contracts, based around an RDG (Resource Description Graph)
 - 2nd price Vickery Auction based mechanism, resource allocation
 - A Banker
 - Depots – which provide the application/mobility services
 - The network customers and their share of GigaPOPs and the core network services [inc. International Gateway]
 - The Clients – those who want to trade for ad hoc bandwidth

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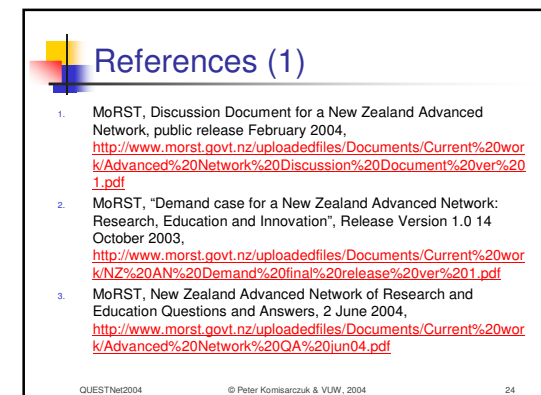
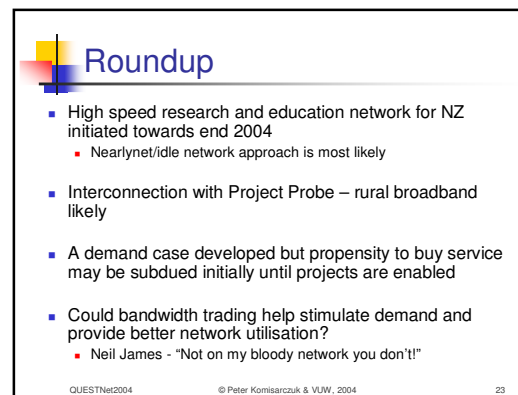
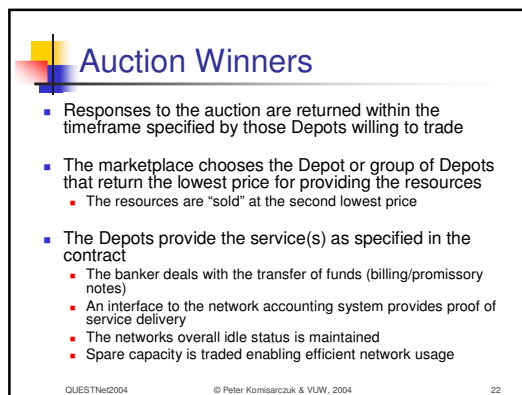
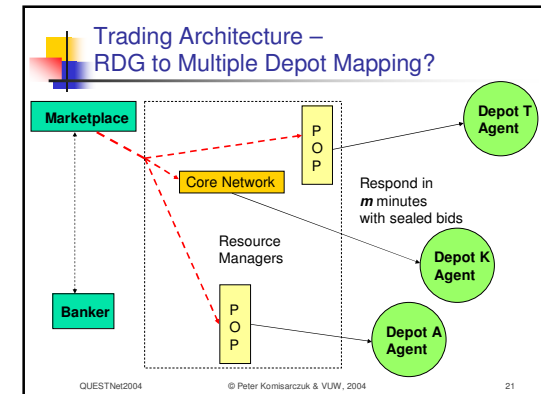
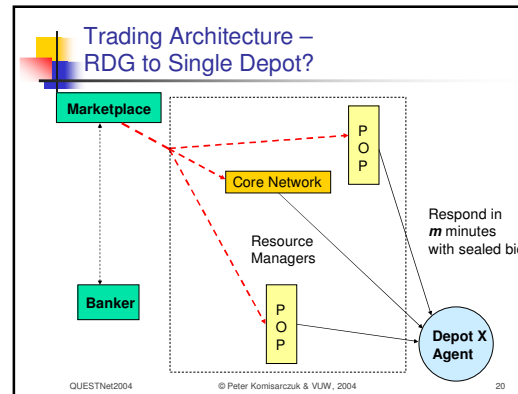
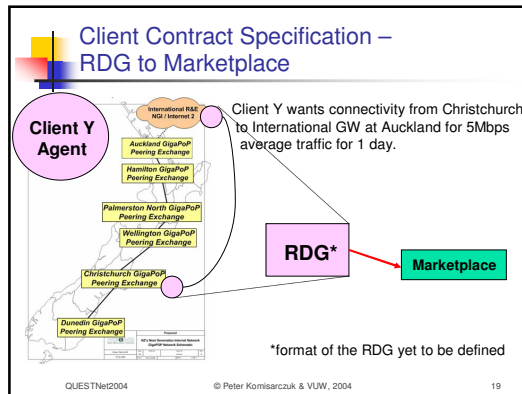
Mapping NOMAD concepts to ANRE

- Depots = GigaPOPs, gateways and core transport
 - Stakeholders =>
 - Universities etc. share their local GigaPOP resources
 - Universities etc. share their share of the core network and national/international gateways
- National marketplace and banker
 - Goods are exchanged for promissory notes or even NZ\$
- Stakeholders describe required contract and resources through RDG (Resource Description Graph) to the Marketplace
 - Marketplace shares RDG with appropriate depots
 - Depots respond to marketplace with offers
 - Marketplace provides best fit and cost to customer

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