Welcome to
"Maximising your IP address potential"

APNIC 21

Perth, Australia

February 27, 2006

Finding out about each other..

- Tell us about yourself..
  - Name, organisation?
  - What kind of work do you do?
  - Why did you attend this tutorial?
  - What do you hope to get out of the session today?
- About the APNIC secretariat
  - 46 staff from 21 nationalities
  - 20 languages

Cantonese, Mandarin, Filipino (Tagalog), Korean, Japanese, Lao, Thai, Persian (Farsi), Telugu, Punjabi, Hindi, Tamil, Sinhalese, Fijian, Bahasa Indonesian, Malay, Hokkien, French, Swedish, English

About APNIC

- ## Regional Internet Registry (RIR)
  - For the Asia Pacific region
  - Core activity is to allocate & assign Internet number resources (IPv4, IPv6 & ASNs)
  - Manages reverse DNS domains

- ## Organisational structure
  - Membership based, non-profit
  - Self-regulatory body governed by members and broader Internet community
    - Bottom up policy and decision making processes

Today's schedule

9 am - 10.30 am	Internet development: technical infrastructure, education, policy & APNIC
11 am - 12.30 pm	Creating policies that work for you
2 pm - 3.30 pm	Efficient address space management tools
4 pm - 5.30 pm	Managing your "old" address space

Maximise address space potential by...

- Gaining understanding of APNIC in a global Internet context
- Learning how to formulate and participate in policy making
- Understanding how to manage your resources more effectively
- Explaining issues to us so we can learn from you!

What questions do you have?

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Internet development

Technical infrastructure, education, policy
and APNIC

Presenters

- Nurani Nimpuno
  - Outreach Co-ordinator
- Anne Lord
  - Communications Director
- Geoff Huston
  - Internet Research Scientist

Defining Internet development

- What do we mean by 'Internet development' in this context?
  - Development of the technical infrastructure
  - Education and learning programmes
  - Policy evolution and support
- UN Declaration of principles (WSIS 2003)
  - "Governments, as well as private sector, civil society and the United Nations and other international organizations have an important role and responsibility in the development of the Information Society and, as appropriate, in decision-making processes."
- As an international organisation, APNIC has an important role to play

Overview

- Technical infrastructure

- Education and support
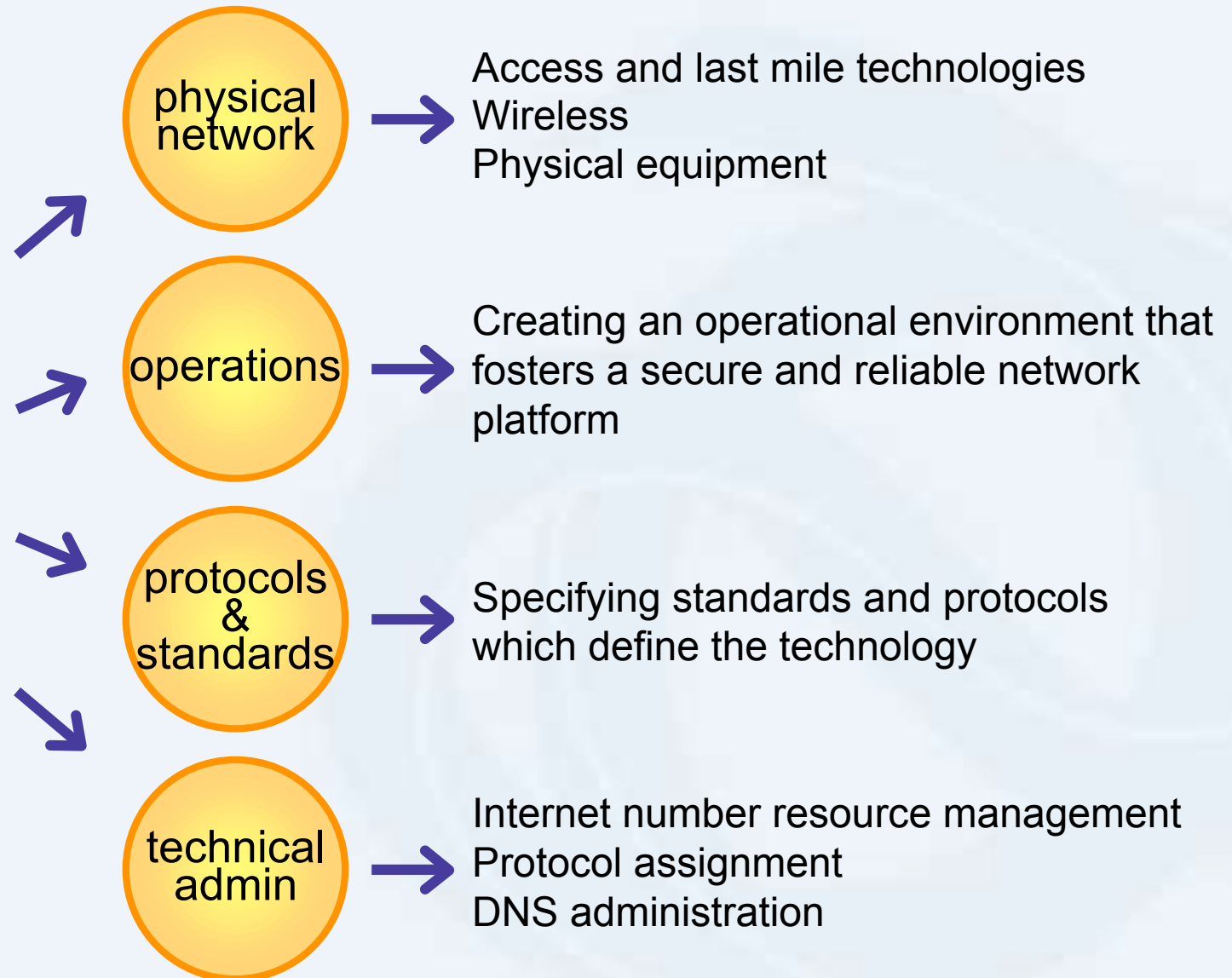
- Policy

- The future of the Internet

Internet Development

Technical Infrastructure

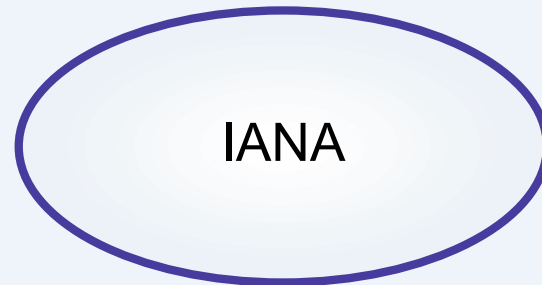# Technical infrastructure development

Technical infrastructure development

physical network → Access and last mile technologies
Wireless
Physical equipment

operations → Creating an operational environment that fosters a secure and reliable network platform

protocols & standards → Specifying standards and protocols which define the technology

technical admin → Internet number resource management
Protocol assignment
DNS administration

Technical infrastructure - global organisations

- Operations
  - Security - FIRST
    - Brings together CERTS from gov't, commercial, & educational org's across globe
    - Cooperation & coordination, info sharing, rapid responses
    - http://www.first.org

- Protocols & Standards
  - IETF purpose is to support a set of open standards that allow interoperability
    - Open processes, technical competence
    - Volunteer code, *"rough consensus & running code"*
    - Protocol ownership
    - http://www.ietf.org

Technical infrastructure - global organisations

Technical administration

IANA

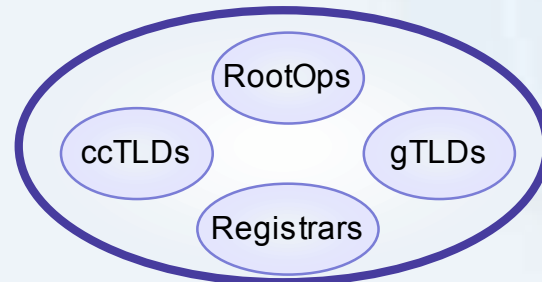→ IP address delegation (to RIRs)

→ Protocol number assignment

→ ccTLD & gTLD delegation

Number resources

RIRs

Afri-NIC

NRO

RIPE NCC

APNIC

ARIN

LAC-NIC
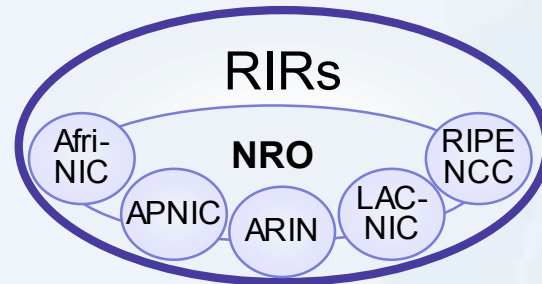
→ Internet Resource allocation

DNS operations

RootOps

ccTLDs

gTLDs

Registrars

→ DNS Name management

Technical Internet infrastructure - regional groups

APTLD	Collaboration of TLD operators in region	http://www.aptld.org
APNG	Fostering the advancement of network infrastructure	http://www.apng.org
APAN	Asia Pacific Advanced Network	http://www.apan.net
APIA	Asia Pacific Internet Association (Supports APRICOT)	http://www.apia.org
AP*	Collaborative effort between AP orgs	http://www.apstar.org

Technical Internet infrastructure - APNIC activities

- Collaboration
  - ICANN root server system advisory committee
  - CAIDA workshops and research
    - Participate in workshops
    - Provide statistics & measurement points

- DNS infrastructure
  - Improving resiliency
    - Secondary DNS services for ranges delegated by APNIC and some ccTLD's
  - Improving quality
    - "Cleaning up the reverse DNS" requested by community
    - Operational report at DNS SIG at APNIC21
      - http://www.apnic.net/services/rev-del/lame-del/lame-del-response.html

Rootservers supported by APNIC

More information at http://www.apnic.net/services/rootserver/

Technical Internet infrastructure - APNIC activities

- Certification Authority (CA)
  - Issuing X.509 certs to access "MyAPNIC"
    - Secure resource management
      - (Also online voting, training & billing records etc)
      - Optimised for faster response
  - Routing certificates trial
    - Issuing X.509 certs with IP & AS extensions
    - Implementing rfc3779
- "Debogon" project (currently in trial)
  - Problem with new APNIC allocations & assignments being blocked by "bogon" filters
  - Test prefixes from new IANA blocks for one month prior to making allocations from it and produce report

RFC
3779

APNIC activities - IETF support

- ## Staff as WG chairs
  - CRISP (cross registry information service protocol)
    - Co-chair: George Michaelson
    - Common framework with registries, structured data (XML)
      - Long term "whois" replacement
      - http://www.ietf.org/html.charters/crisp-charter.html

  - GROW (Global routing operations)
    - Chair: Geoff Huston
    - Examines operational problems of IPv4 and IPv6
      - http://www.ietf.org/html.charters/grow-charter.html

  - Shim6 (Site multihoming by IPv6 Intermediation)
    - Co-chair: Geoff Huston
    - Specifications for IPv6-based site multihoming
      - http://www.ietf.org/html.charters/shim6-charter.html

APNIC activities - IETF support

- PKIX
  - X.509 Extensions for IP Addresses and AS numbers
  - APNIC deployment of resource certificates (rfc3779)
    - http://www.ietf.org/html.charters/pkix-charter.html
- DNSop (DNS operations)
  - Guidelines for DNS operations
    - http://www.ietf.org/html.charters/dnsop-charter.html
- V6ops (IPv6 operations)
  - Guidelines for the operation of shared v4/v6 Internet
  - Operation guidelines on how to deploy IPv6 into existing IPv4-only networks
    - http://www.ietf.org/html.charters/v6ops-charter.html
- IDR (Inter-Domain Routing)
  - Standardize and promote BGP-4 to support IPv4 & IPv6
  - Improving scalability of BGP
    - http://www.ietf.org/html.charters/idr-charter.html

APNIC activities - funding

- Pan-Asia grants
  - Funding partner to ICT R&D grants programme
    - Practical technical research solutions to problems in developing world
    - http://www.idrc.ca/panasia/
    - Staff support on project committee
  - Projects
    - Vclass: SIP-based mobile classroom
    - IPv6 Tunnel Broker: a key for using next generation Internet in developing countries

- Other regional funding support
  - Infrastructure: APstar, APng, APIA, AP*
  - Operations: SANOG, PACNOG, NZNOG..

Internet infrastructure - what about you?

- Use available sources of information
  - RFCs
  - Drafts & BCPs
  - APNIC research & technical articles (Geoff)
- Follow agreed Best Current Practices
  - Spam fighting
  - Security
  - DNS
  - Routing aggregation etc
- Stay abreast of developments

Questions?

Internet Development

Education and Support

Education & support - global

- **ISOC**
  - Facilitates training programmes
    - ccTLD workshops
    - Participation in regional workshops
  - On-line workshop resource centre (with NSRC)
    - http://ws.edu.isoc.org/
- **NSRC**
  - Provides technical and engineering assistance to international networking initiatives building access to the public Internet
    - Active in Africa, South America, Asia
- **ITU**
  - Mostly telecom workshops, training in IPv6

Education & support - regional

NOGs

(Network Operator Groups
- Fashioned after NANOG)

- Technology transfer & education
- Workshops, training, conferences

Also…

- ISOC chapters
- IPv6 forums
- And much more..

SANOG

CNNOG

JANOG

Ph-ISP

SGNOG

NICE

PacNOG

APOPS

AUSNOG

NZNOG
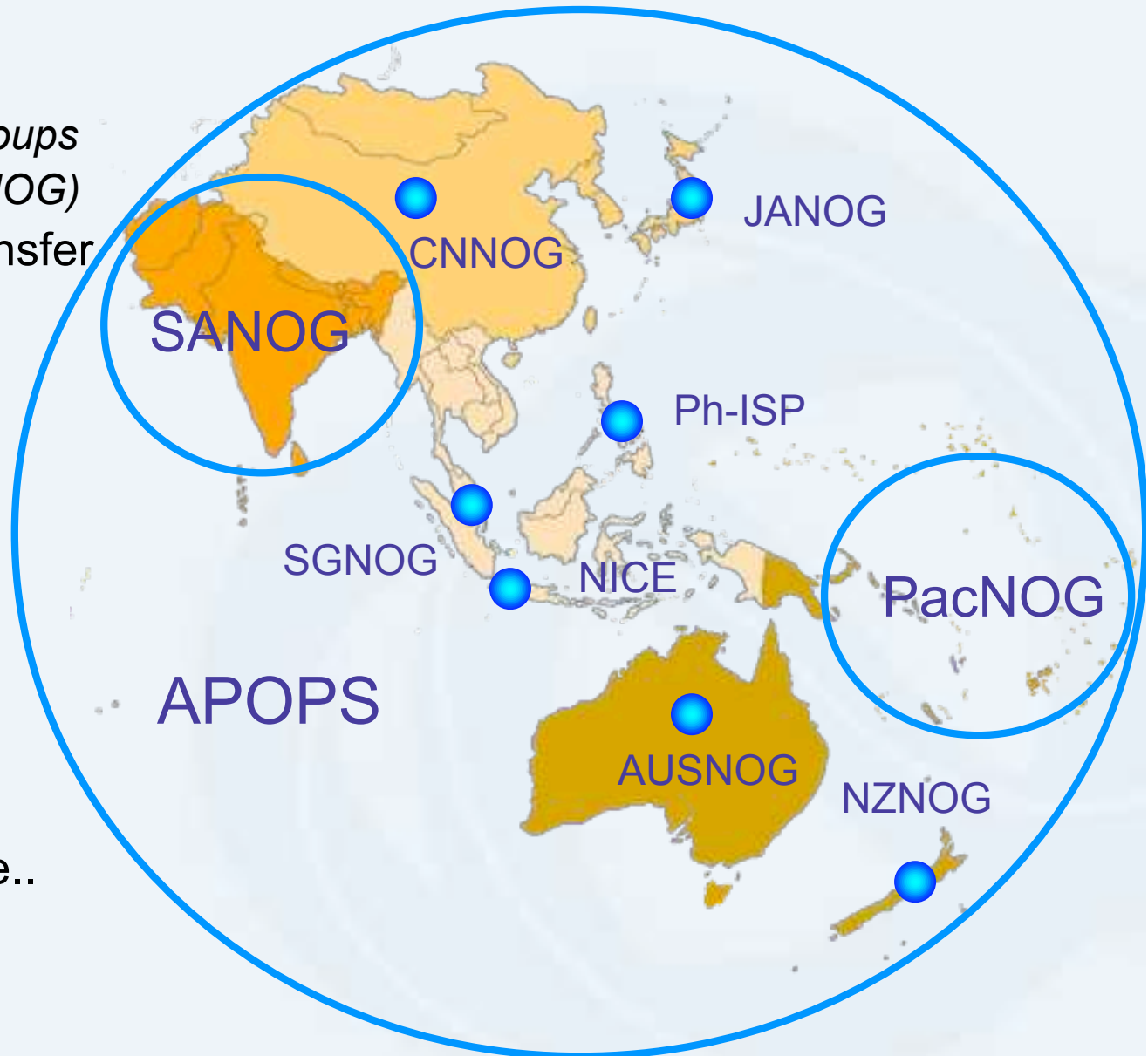
Education & support - APNIC

- **Collaboration with global & regional organisations**
  - Supporting NOGs & educational forums
    - APRICOT, NOGs, PITA, ISOC-AU, RIR meetings
    - IPv6 forums, NIR Open Policy meetings..
  - Collaboration with training partners
    - AIT, Cisco routing workshops, APTLD
    - ISOC and NSRC workshops
  - MoU's: mutual support & collaboration
    - ISP Associations of South Asia
    - Root server operators (F, K, I)
    - ISOC-AU and others..

Education & support - APNIC training

- Training needs established
  - Through member surveys (1999, 2001, 2004)
  - Feedback from HM's, training, outreach, billing
  - "EOI" forms to request training
    - http://www.apnic.net/training/more-info/eoi/eoi-spon-form.html
- Training schedule & locations
    - http://www.apnic.net/training/schedule/
- Sponsorship
  - Ensures cost-recovery
  - Training courses subsidised for APNIC members

Education & support - APNIC training

- Evolutionary approach

Originally…   *Development over time…*   *Today*

No training courses	1st one-day "resource management training"	Additional modules, customised tutorials	Technical courses, tutorials developed	Modular core course Technical workshops & tutorials
Pre-1999	1999	2002	2004	2006

Training in 2005

34 sessions
24 locations

UlaanBaatar
Sep

Guangzhou
Sep + Nov

Hong Kong
Oct +

Dhaka
Feb *

Kyoto
Feb

Karachii
Apr

Taipei
Nov

Delhi
Jan

Thimphu
Jul +*

Bangkok
Jun*

Makati
Mar

Kuala Lumpur
Aug * + Nov *

Vientiene + Hanoi
Jun + Sep +

Singapore
Dec *

Port Moresby
Mar

Jakarta
Jul

Sydney
May

Hamilton
Feb
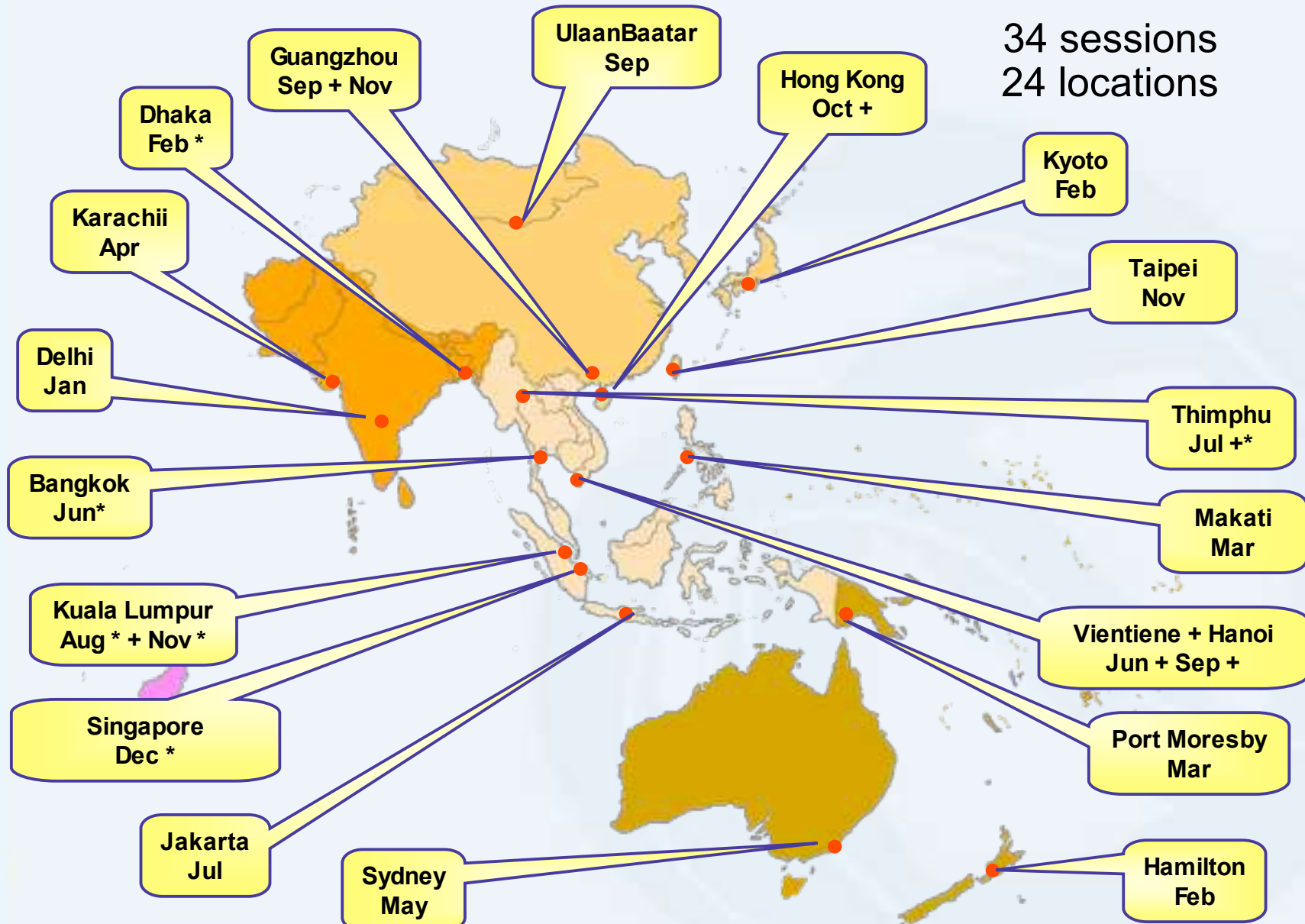
(*) with DNS workshop (+) with Routing Essentials workshop

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APNIC training courses

- **Core courses**
  - Internet Resource Management
    - IRM I, IRM II
    - IRM Essentials

- **Technical workshops**
  - DNS
  - Advanced DNS
  - Routing essentials

- **Tutorials**
  - Security
  - IRR
  - Spam

- **Courses under development 2006**
  - IPv6 services workshop

APNIC training and eLearning

- Taking it further…
    - Hired an eLearning officer
        - Sall'ee Ryman
    - Bringing APNIC training to your desktop
        - On demand training, self paced learning
- eLearners
    - Adult learners
        - Clear instruction and outline of objectives
    - English as a second language (ESL)
        - Visual clues, more time, reading vs listening
- Pilot available 2nd quarter 2006
    - 3 modules ready 3rd quarter

APNIC support services

- Getting answers to your queries
  - Problems with your request? Database update failed? Not sure of the policies?

Member Services Helpdesk

–*One point of contact for all member enquiries!*
helpdesk@apnic.net

Helpdesk hours
9:00 am – 7:00 pm (AU EST, UTC + 10 hrs)

Helpdesk   ph: +61 7 3858 3188   fax: 61 7 3858 3199

- VOIP service trial
  - Save on international call rates to helpdesk!
    - helpdesk@voip.apnic.net

Helpdesk "chat" service

icons.apnic.net

- Online Community of Networking Specialists
  - Articles, presentations, discussions, news

Education & support
- what about you?

- Get involved with your regional / local NOG!
  - Share your knowledge and experience
  - Learn from others
- Participate on ICONs
  - Share material, discuss in the forums, exchange ideas and knowledge

- *Knowledgeable peers benefit you and the rest of the Internet community!*

Questions?

Internet Development

Policy

History of the Internet...

- Initially, research project (70-80s)
  - Open, cooperative, public domain
  - Highly collaborative environment
  - "Rough consensus and running code"
- Then, product of liberalisation (90s)
  - Also, catalyst for deregulation
  - Highly competitive environment
  - Still free to join and use
- Now, public utility and critical infrastructure (2000s)
  - Re-regulation (governance) is a recent afterthought

Internet governance

- May include any aspect of the Internet which requires regulation, coordination or oversight
  - Cybercrime, security, spam, phishing, hacking
  - Content regulation
  - Commerce, trade and taxation
  - Intellectual property
  - Telecommunications regulation, competition policy
  - Development and facilitation, capacity building
  - Equity of access
  - Technical standards and coordination
- None of these are entirely new areas

IGov & WSIS - global discussions

- World Summit on the Information Society (WSIS)
  - Intergovernmental summit hosted by UN
    - Phase I: Geneva 2003, Phase II: Tunis 2005
- WSIS scope covers all aspects of ICTs
  - Content, crime, digital divide, ecommerce, capacity building, financing, linguistic diversity, IGov
- WSIS I outcomes: "Declaration" and "Plan of Action"
  - Guidance to UN and Governments

http://www.wsis.org

Internet Governance

- WSIS II outcomes - 'Tunis Agenda'
  - "Recognises existing arrangements for Internet Governance have worked effectively..", "..enhanced co-operation model.."
  - "..guarantee national interest and rights of countries.."
  - Recommended forming Internet Governance Forum (IGF)

- IGF
  - More work ahead!
  - Governments to limit involvement
  - What will the IGF do?
    - Remit is as advisory body
    - 1st meeting October 24-26th, Athens, Greece

http://www.intgovforum.org

IGov & WSIS - regional concerns

- ## UNDP-APDIP regional survey
  - 1200+ respondents from 30+ economies
  - Reports from its regional dialogue (ORDIG) for CN, IN, ID, PK and TH
    - Concerns about cybercrime, spam
    - Internet infrastructure, access, local language and content
    - Current allocation system for IP resources (China)

- ## AP concerns voiced during WSIS
  - Outcomes of the system of Internet governance not fair
  - Dissatisfaction over US gov oversight of ICANN
  - Concerns about access to resources

RIRs, APNIC, & WSIS

- **RIRs position**
  - Promote need for continued stability
    - Promote a position of "do no harm"
  - Dispel misconceptions and misunderstanding
  - Be mindful of cross-impacts when proposing changes to infrastructure administrative functions

- **APNIC participation in WSIS**
  - Internet "pavilion" as part of Summit 'ICT for all' exhibition
    - NRO, ISOC, IETF, ICANN and CENTR
    - Promoting bottom-up structure
    - Engaging in discussions with stakeholders

Policy in the APNIC region

- Policy goals
  - Lessons learnt from past

  Conservation   Aggregation   Registration
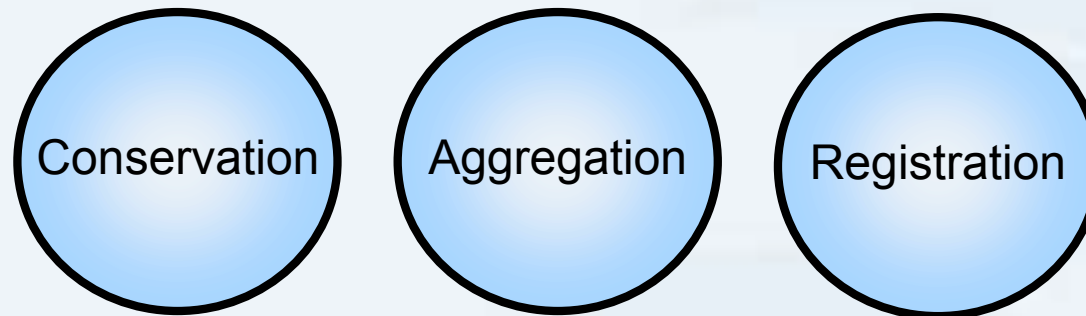
- Who creates policy?
  - *You* as part of the Internet community
  - Policy development open to all
    - Open processes, public discussion, consensus decisions, full archives and documentation
  - Policy changes driven by changes in industry

How to participate?

Participation

Mailing List
- Policy announ-cements
- SIG discussions
- Discuss in your commun-ity

Contact APNIC

Remote Participation
- Video- & audio streaming
- Jabber chat
- Live transcripts
- Archives & minutes

Meeting
- Network & discuss w / peers
- SIGs & BoFs

Internet policy - what about you?

- Have an awareness of current discussions
  - Operational
    - NOGs, IETF, RIR meetings etc
  - Policy
    - Internet resource management

- Participate in APNIC meetings
  - Get involved in discussions
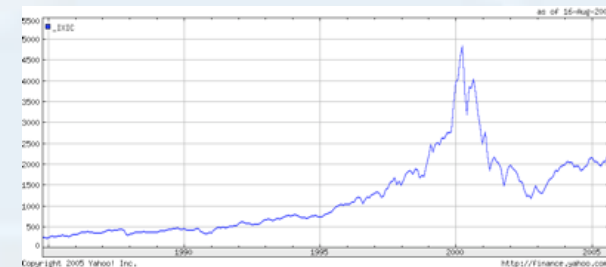   - Create policies that work for you

Questions?

The future of the Internet

Looking forward

There are many ways of predicting the future....

The tough bit is getting it right!

"One day man will travel faster than a horse can run"

Rene Descarte

This approach

- Informal look at some aspects of the ISP industry today that might help us in looking forward across the next few years

Boom and bust.. is nothing new

- 1637 Tulip mania

  – Takes hold in Holland and the price of tulip bulbs escalates to fantastic levels

  – The subsequent recovery from the crash took decades to overcome and restore Dutch fortunes

- 1719 Banque Royale

  – John Law introduces the French king to the magical mysteries of bank credit and paper money. The word "millionaire" entered our vocabulary

  – By 1720 French economy collapsed utterly and France was brought to the brink of revolution
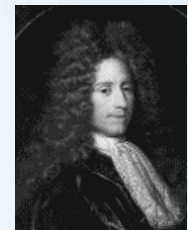
It's a post-dot-boom-and-bust world

- The Internet boom has been pretty mild by comparison with past booms in gold, oil, rail, shipping, ice and, of course, tulips
    - The peak of the Internet boom saw stock indices peak at just 3 times their longer-term value
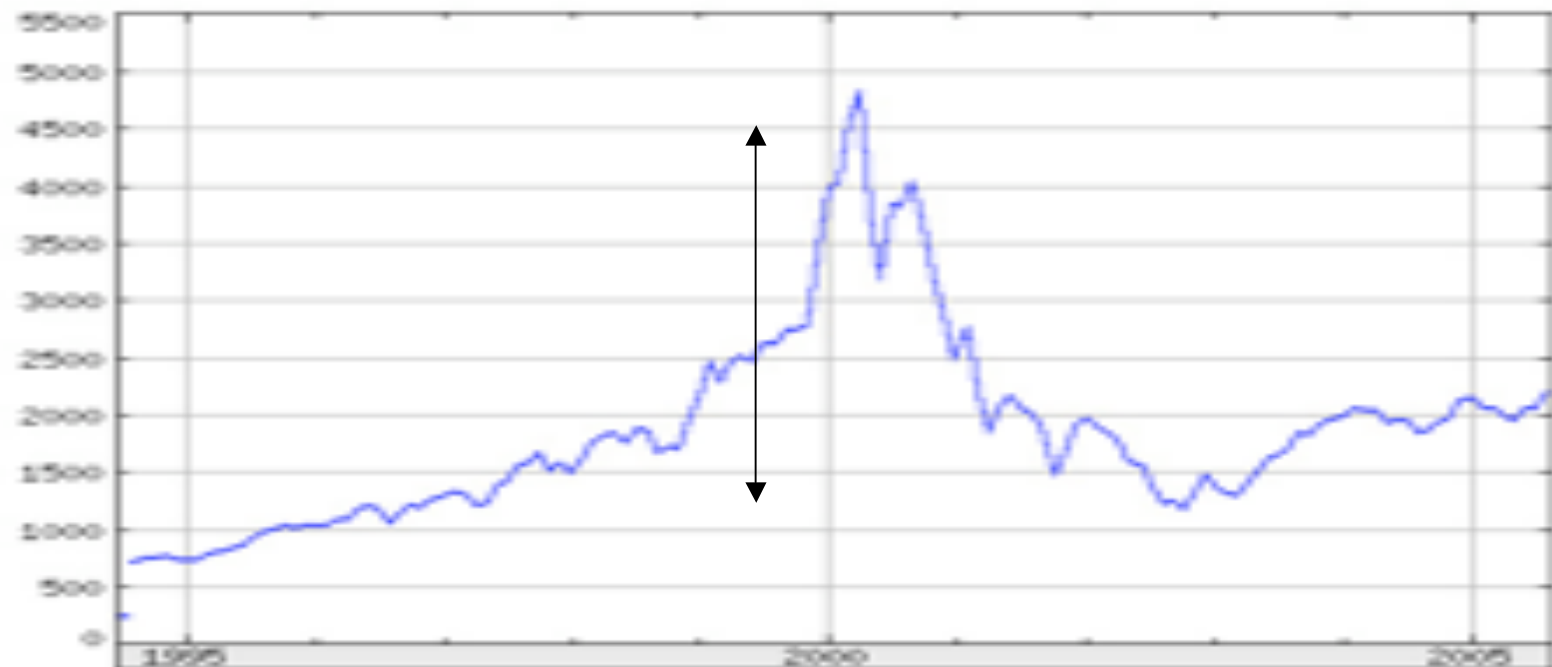
It's a post-dot-boom-and-bust world

- But the lessons from the boom cycle are no different…

Intensity

Cynicism

Mania   Disillusion

Panic

Elation

Depression

Enthusiasm

Innovation   Reality

Overreaction

Time

2005
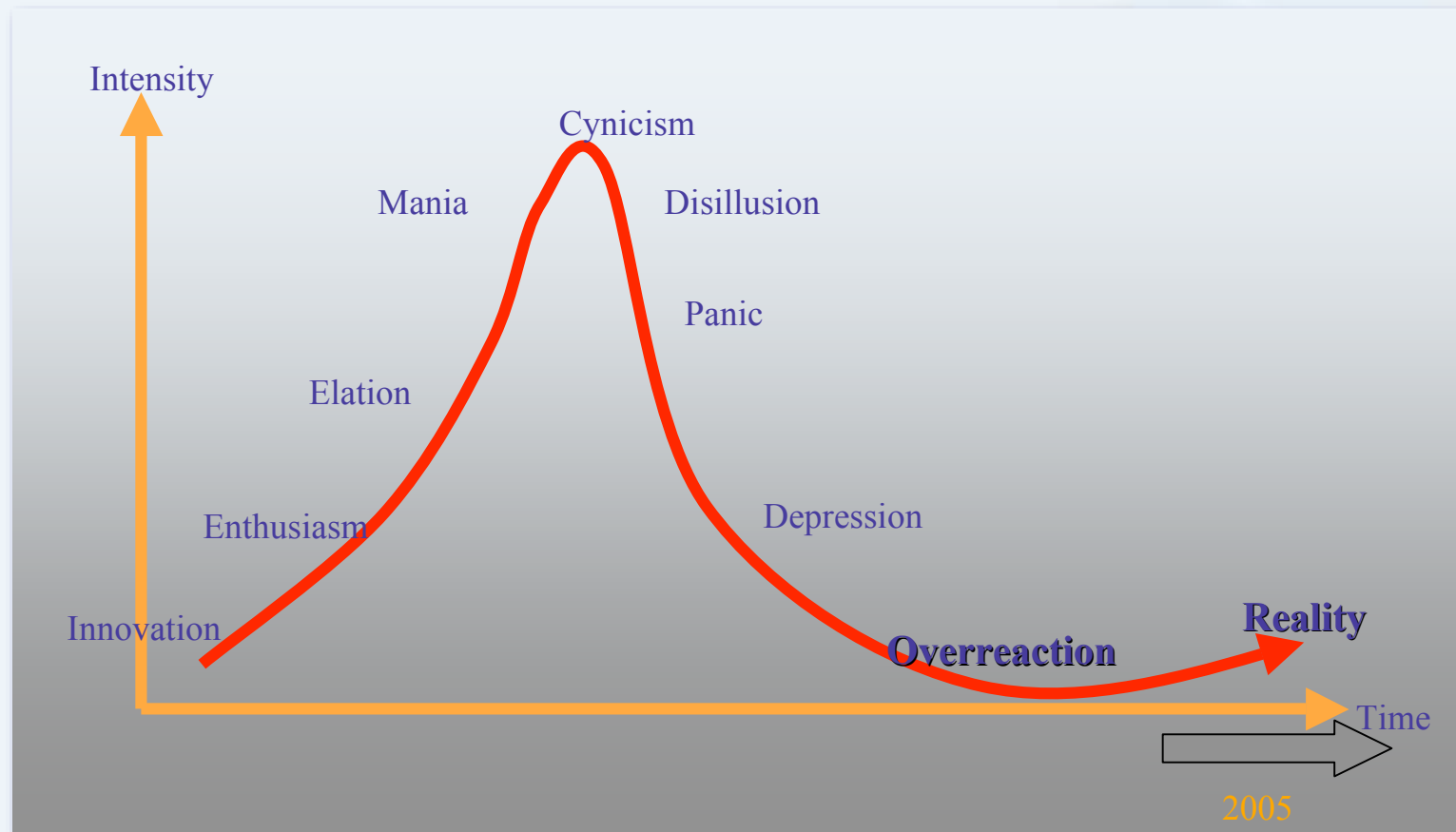
Today..

- ISPs no longer operate a rapid expansion-based business model
  - Internet service business models tending to use a common theme of service consolidation
- Industry attention at the ISP level is now concentrating on *product marketing aspects* of the Internet service model
  - Dependability and integrity
  - Utility and flexibility
  - Value-add service models
  - Quality and performance
- Applications and services that meet business case criteria

From optimism to conservatism

- We've learned that optimism alone is no substitute for knowledge & capability in the industry

- A conservative period of consolidation rather than explosive growth

  - Investment programs need to show assured & competitively attractive financial returns across the life cycle of the program

  - Reduced investment risk implies reduced levels of innovation & experimentation in service models

  - Attempts to combine communications with additional services to create value-added service bundles

  - Accompanied by greater emphasis on service robustness and reliability

Security questions

- It's a very hostile world out there among the packets..

- We have learnt that we need to understand more about what stakeholders want from the Internet in terms of security

Security questions

- The list of outstanding issues include
  - How can users identify each other?
  - How can users identify network-based services & validate the integrity of such services before entrusting them with data?
  - How can the network protect itself from abuse & attack?
  - How can users protect themselves do likewise?
  - What are a user's obligations & responsibilities?
  - How can abusers be identified? And whose role is it?
  - What is the role of the ISP?
    - Neutral common carrier? Trusted intermediary? Enforcement point?

Security focus

- We've learned that we cannot operate global networks based on random trust models
  - A highly visible security focus for the next few years
    - Increased end-user awareness of vulnerabilities & weaknesses & a desire for more secure & trustable services
    - Increased public sector agency awareness of the vulnerabilities of the Internet communications environment & its consequences
    - A response based on increased technology effort in dismantling aspects of the Internet's distributed trust model & attempting to replace it with negotiated conditional trust
  - There is now a considerable industry based on insecurity
  - But little actual work based on robust security

Multiple networks

- We've learned that 'IP' is not the panacea of communications protocols
  - "Convergence" remains a deluded fantasy
- Recognise TCP/IP's strengths & weaknesses
  - TCP/IP allows adaptable traffic sessions to operate extremely efficiently over wired networks
  - TCP/IP is probably not the optimal approach to support
    - Mobile wireless traffic, resource management requirements
  - TCP/IP is not strong in supporting
    - Real time traffic under localized congestion events
    - Various forms of traffic engineering applications
    - (Unless you are willing and able to overprovision everywhere!)

Multiple networks

- "Everything over IP"
  - Still not a viable carrier strategy
  - Continued use of multiple networks to provide specialised service environments for various communications application sectors is likely for some time yet

Bandwidth abundance lessons

- DWD Multiplexing has lifted per-strand optical capacity over a thousand-fold
  - From 2.5Gbps to 6.4Tbps (640 wavelengths, each of 10Gbps per lambda) per optical strand
- Major long haul comms routes worldwide are more than amply provisioned with IP bandwidth
  - The shift from demand-pull to massive supply-overhang has destroyed business stability of the long haul communications supply market
- We've learned that when you eliminate one choke point in a system you expose others - doh!
- Network 'choke' points are shifting to access domain, not the long haul elements
  - Continued pressure for high speed last mile services

Broadband last mile

- What form of broadband access?
  - Wireless probably not a logical contender for ubiquitous last mile, but it has its areas of application - if you are sufficiently desperate!
  - Hybrid Fibre Coax systems are capital intensive & often rely on a strong pay-TV market to provide some capital leverage – no longer relevant for many markets!
  - Fibre is great but also capital intensive – good for CBD and dense MTA deployments but less capital efficient for low density deployments – too expensive!
  - DSL is a reasonable compromise for lower density deployment environments over existing copper plant
    - BitTorrent and similar P-2-P is pushing demand for higher speed symmetrical DSL services

Technology – IPv4

- We're learning that we might be stuck with making IPv4 work for longer than we thought we could or should

- IPv4 remains the overwhelmingly dominant protocol choice for the service industry

- Its now a NAT world - but NAT has its problems
  - Peer-to-peer networks, service fragility, VOIP, complexity and cost

- Even with NATS we are running through the IPv4 address pool
  - IP service networks will need to commence some considered investment in IPv6 sooner rather than later
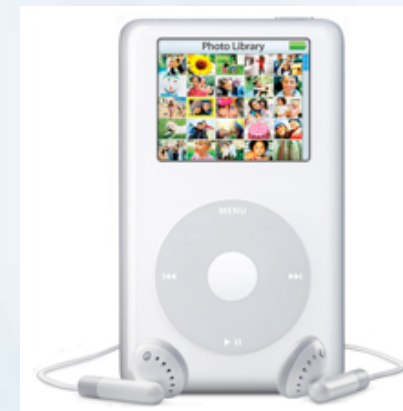
Technology – IPv6

- "IP with larger addresses"
  - Address space requirements are no longer being easily met by IPv4
- This is an issue for high volume deployments including
  - GPRS mobile, pocket IP devices, consumer devices
- IPv6 appears to offer reasonable technology solutions
  - Preserving IP integrity, reducing middleware dependencies & allowing full end-to-end IP functionality for a device-rich world
- BUT no-one wants to pay for widespread IPv6 deployment yet!

IPv6 - From iPOD to iPOT

- IPv4 cannot sustain a device-dense world

- If we are seriously looking towards a world of billions of chattering devices then we need to look at an evolved communications service industry that understands the full implications of the words "commodity" and "utility"

○部分をクリックすると
拡大写真をご覧いただけます。

Voice over IP

- We're learning that voice has more dimensions than just emulating simple carriage of a voice signal
- The technology is getting better…
  - Load-sensitive codecs that adjust their signal rate to the current delay / loss characteristics
  - Abundant trunk bandwidth circumvents need for detailed QoS in network core
  - Solutions available to map between the phone address domain & the Internet address domain (ENUM)
  - Intertwining hand-held devices into phone + PDA
- But its more than Skype
  - There are many practical technology, regulatory and business issues remain on the VOIP path….

Services and Middleware

- Can you completely separate various service platforms from the network?
  - Middleware technologies continue to spread with the addition of a more generic approach to include aspects of
    - Interception technologies
    - Active security-based response systems
    - Open pluggable edge service technologies
  - Directory technologies & mapping of disparate protocol and services domains into the IP world
- But its not the only push
  - The alternative is packaging the entire service delivery model into XML – which also has its own unstoppable momentum

Today's carrier squeeze play

The Traditional Model
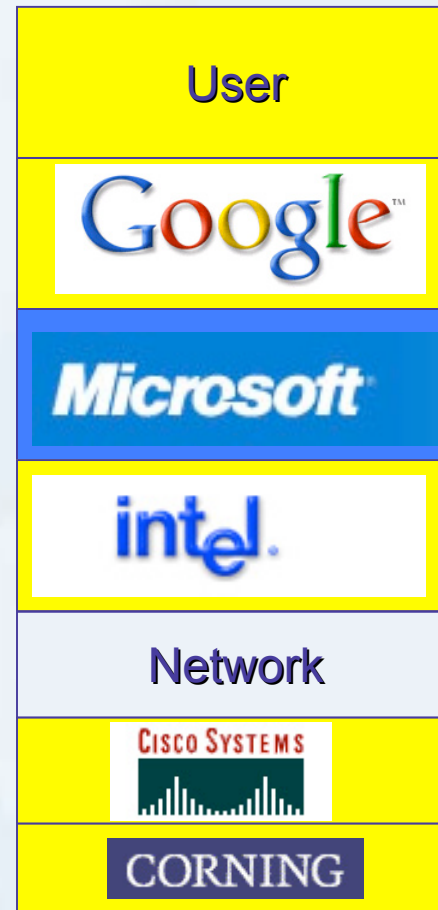
The Emerging Model

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The ISP and the carrier

- The carrier ISP business is being pushed into the role of
  - Commodity IP transit provider
  - Consumer market IP access
  - SME IP access

- The enterprise ISP market is being pushed into the role of
  - SME service integrator

Optimism vs reality

- Convergence to IP as a multi-media broadcast medium are not well grounded

- Triple Play Time is over – BitTorrent wins

Optimism vs reality

- The Internet's major point of leverage was ultimately cheaper services, not better quality

- QoS in the core has lost

- The Internet is a lousy time switch

- High quality real time data needs high quality real time switching

Optimism vs reality

- VoIP is a regulatory mess

- And its going to get a lot messier yet!

- Carrier platform convergence with the mantra of 'everything in ATM IP" is still a myth

- Get over it!

Optimism vs reality

- IP is the not the foundation of high value add networks

- From value to volume - IP Transit is heading into a volume-based low-value commodity activity

Optimism vs reality

- Stop looking for another "killer app" – now 'everything over http' appears to have won the users' play space!

- Think XML, RSS, Wikis, Blogs, Torrents, Podcasts,…

Some guiding principles for the IP utility industry

- Stick to the basics - keep the network offering simple, stable, fast and cheap
- Avoid feature-stuffing the network – leave that to the edge
- Avoid integrated middleware
  - Use modular plug-ins rather than basing the network design on middleware
  - Use modular service architectures

What have we learned?

- The Internet is not infinitely elastic & some things just cannot fly no matter how much thrust is put under it

- Vertical service providers are fading away- building communications infrastructure is one thing, using it to best effect is another - both aspects require care and attention from dedicated players

- That the Internet may not be the best entertainment medium today – but it's a remarkable exchange medium. And the emerging entertainment models appear to be a peer-to-peer edge-to-edge overlay

- That this is an immature technology-intensive activity with much that we still have to learn

So what can we expect?

- My personal list of expectations for the next few years
  - No repeat of boom and bust
  - Networks are a commodity utility business with commodity returns (the shift from value to volume) – this is plumbing
  - More surprises from Google et al in terms of compelling user service models
  - The regulatory pendulum is swinging back - renewed levels of regulatory interest to ensure that public objectives are being achieved
  - More restructuring - industry sector members with longer term objectives phrased more modestly than may have been the case in the past five years

Meet the new economy.

Same as the old economy.

Questions?

Summary

- APNIC is part of a global context
  - In addition to its core responsibilities, it is involved with many aspects of Internet infrastructure development in the region

- Increased awareness of industry developments
  - Who benefits?
    - You gain competitive edge
    - Industry-wide knowledge improves health of the Internet

- Meet the new economy

  … Same as the old

Today's schedule - next session

9 am - 10.30 am — Technical infrastructure, education, policy and APNIC

11 am - 12.30 pm — Creating policies that work for you

2 pm - 3.30 pm — Efficient address space management tools

4 pm - 5.30 pm — Managing your "old" address space