Looking Forward

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APNIC 20

There are many ways of predicting the future….
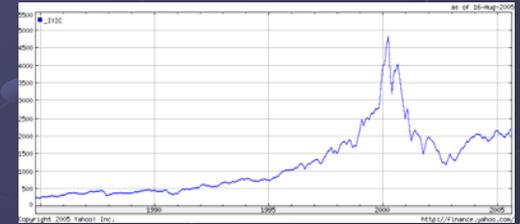
The tough bit is getting it right!

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

Rene Descarte

This approach

is an 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. At this point the word "millionaire" entered our vocabulary. But by 1720 the Parisian crowd were less than impressed with Law's sharp dealings as the French economy collapsed utterly and France was brought to the brink of revolution.
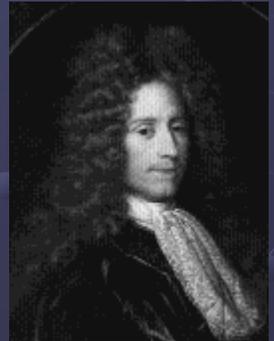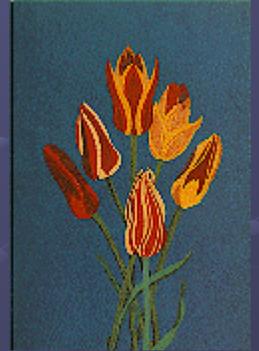
It's a post-dot-boom-and-bust world

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

Enthusiasm   Depression

Innovation   Reality

Overreaction

Time

2005
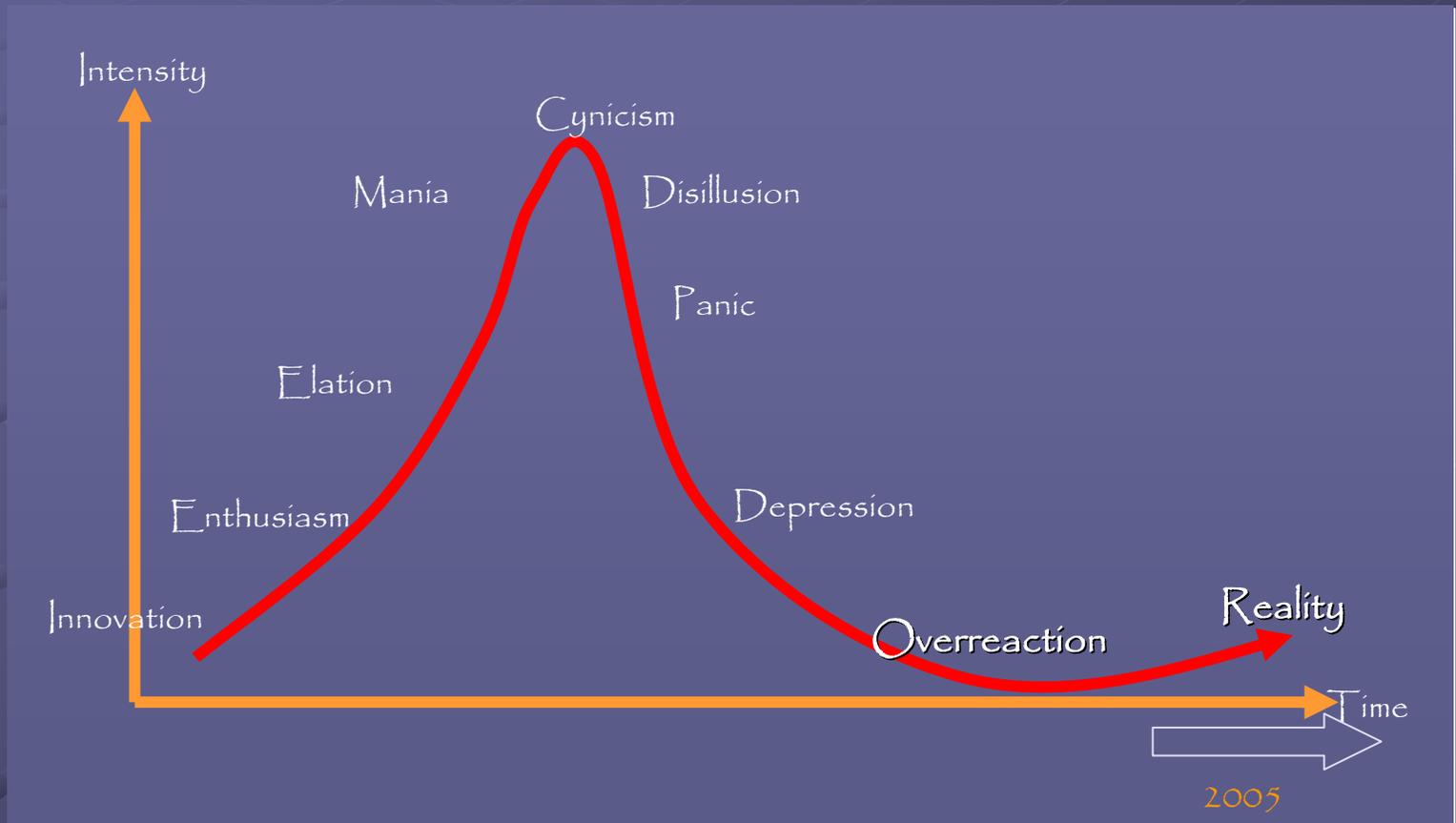
Today

- ISPs no longer operate a rapid expansion-based business model
  - Internet service business models are tending to use a common theme of <u>service consolidation</u>
- 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 and capability within the industry

- A conservative period of consolidation rather than explosive growth
  - Investment programs need to show assured and competitively attractive financial returns across the life cycle of the program
  - Reduced investment risk implies reduced levels of innovation and 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've learned that we need to understand more about what stakeholders want from the Internet in terms of security

- The list of outstanding issues include:
  - How can users identify each other?
  - How can users identify network-based services and validate the integrity of such services before entrusting them with data?
  - How can the network protect itself from abuse and attack?
  - How can users protect themselves from abuse and attack?
  - What are a user's obligations and 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 and weaknesses and a desire for more secure and trustable services
    - Increased public sector agency awareness of the vulnerabilities of the Internet communications environment and its consequences
    - A response based on increased technology effort in dismantling aspects of the Internet's distributed trust model and 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 and that "convergence" remains a deluded fantasy

- Recognise TCP/IP's strengths and 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!)

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

Bandwidth Abundance Lessons

- Dense Wave Division Multiplexing is 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

- The major long haul communications routes worldwide are more than amply provisioned with IP bandwidth
  - The shift from demand-pull to massive supply-overhang has destroyed the 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!

- The network 'choke' points are shifting to the access domain, not the long haul elements
  - Continued pressure for high speed last mile services

Broadband Last Mile

- ## What form of Broadband Access?

  - Wireless is 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 and often rely on a strong pay-TV market to provide some capital leverage – no longer relevant for many markets!

  - Fibre is great – but its 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 IPv4address 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 that preserve IP integrity, reduce middleware dependencies and allow full end-to-end IP functionality for a device-rich world

BUT - Noone wants to pay for widespread IPv6 deployment just 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"

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 the need for detailed QoS in the network core
  - Solutions available to map between the telephone address domain and 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 and 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
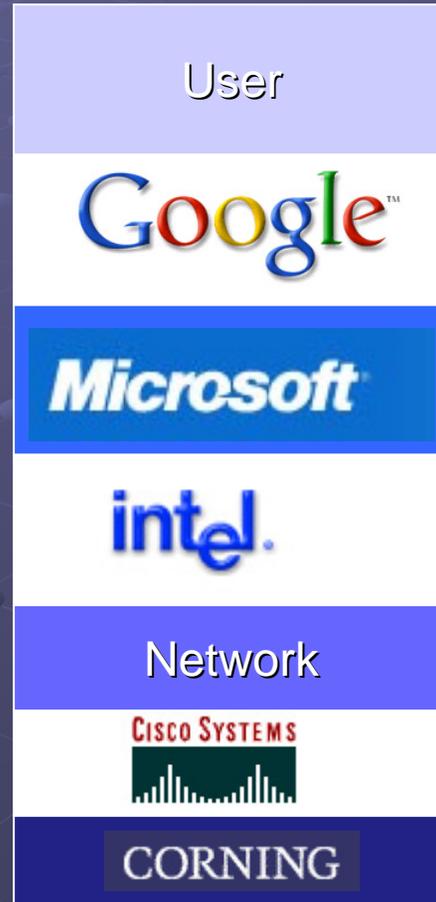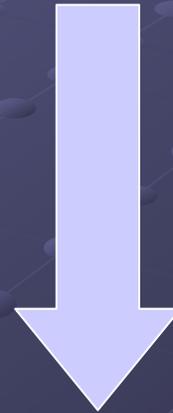
The ISP and The Carrier

- 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

Value Added Service Networks are causing value address service network providers to overstress their business model

Leave overlays to the edge

Optimism vs Reality

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

QoS in the core has lost

Optimism vs Reality

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!

Optimism vs Reality

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?

- That the Internet is not infinitely elastic and 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.