

VSNL INTERNATIONAL™



Business[®]Rich

IPv6 transition Early mover advantage Did it pay off?



24th APNIC Open Policy Meeting / SANOG 10

29 August - 7 September 2007 New Delhi - INDIA



Yves Poppe
Business Development,
Services

Director
IP

Sept 5th 2007



Agenda

- IPv6: Some perceived drivers
- IPv6 early mover advantage?

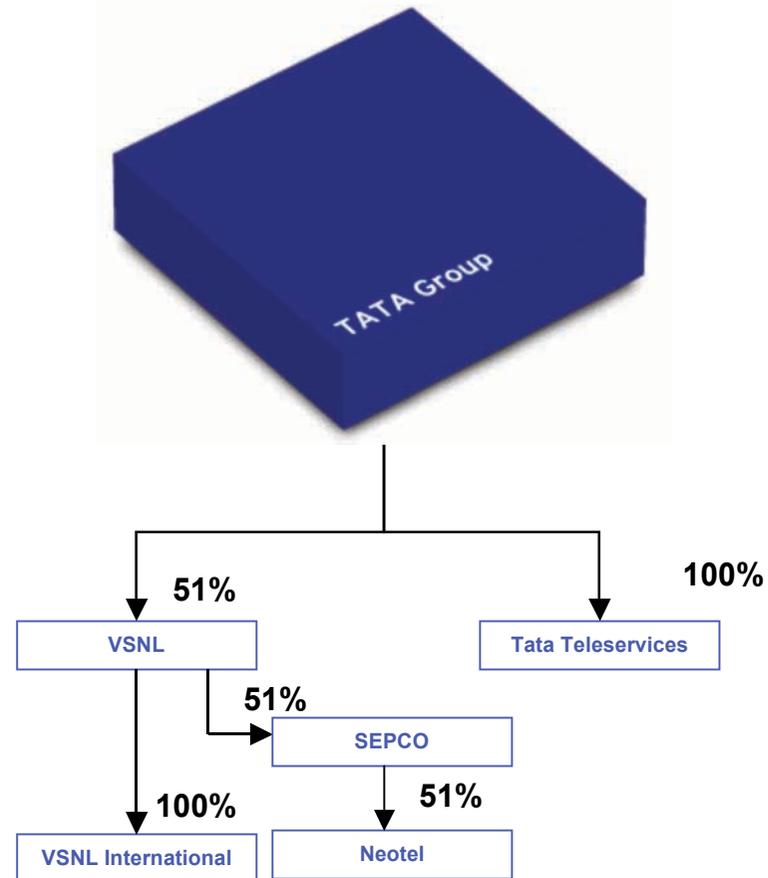
”Ideas and behavior and messages and products sometimes behave just like outbreaks of infectious disease.”

Malcolm Gladwell, author of « The tipping point ».

VSNL International | Member of the Tata Group

Tata Group

- 125-year old largest private sector group
- \$29 billion in revenues
- Acquired VSNL in February 2002
 - VSNL acquired Tyco in Nov 2004
 - VSNL acquired Teleglobe in Feb 2006
- Tata Consultancy Services (TCS)





VSNL International Lines of Business

■ Wholesale Voice

- 21bn minutes of voice traffic p.a
- VoIP and TDM transport

■ Mobile

- 400 wireless operators
- GSM to CDMA conversion
- First link with North America

■ Data

- Tier 1 global backbone
- Peering Relationship with all other major carriers
- Low Latency, Shortest-path global transit routing

■ Enterprise Services

- IPL, IP, MPLS, Ethernet, VPN
- Managed services: VPN, VoIP VPN
- Enterprise Network
- Management Services
- Managed Hosting

■ Global transport services

- International capacity from DS3 to 10 gigabit wavelengths
- Major investor in undersea cable capacity



« ..With the internet and the proliferation of semiconductors, you'll end up with trillions of things connected – not just individuals but cars, roads, homes, appliances, health-care data, and pacemakers. »

**Samuel J. Palmisano, Chairman IBM,
interviewed by Business Week**

April 3th 2006 North-American issue, pp 52-53

“The internet is rapidly becoming a key ingredient in our economic infrastructure – akin to electricity and roads – as well as our social structures »

**OECD Forum Conference
Paris, May 22-23th 2006**



“Picture Apple's slick iPhone shrunk down to the size of a credit card. Then imagine it can connect not only to your contacts on the latest social network but also to billions of pea-sized wireless sensors attached to buildings, streets, retail products, and your co-workers' and business partners' clothes—all sending data over the Net to you.
“

Business Week , « The end of work as we know it »

August 20-27th 2007 double issue



Next x billion dollar level revenue sources

- Next x billion \$ prerequisite: **Wired and wireless Broadband IP converged access and transport networks, multi-functional end-devices, always on, always p2p reachable, nomadic and mobile use, endowed with superior end to end security.**
- Ubiquitous communication for home networks, social networking, location based services, sensor and tracking applications imply self organizing networks meaning plug and play, mobile ad-hoc networks (MANET), networks in motion (NEMO's) and even MANEMO's



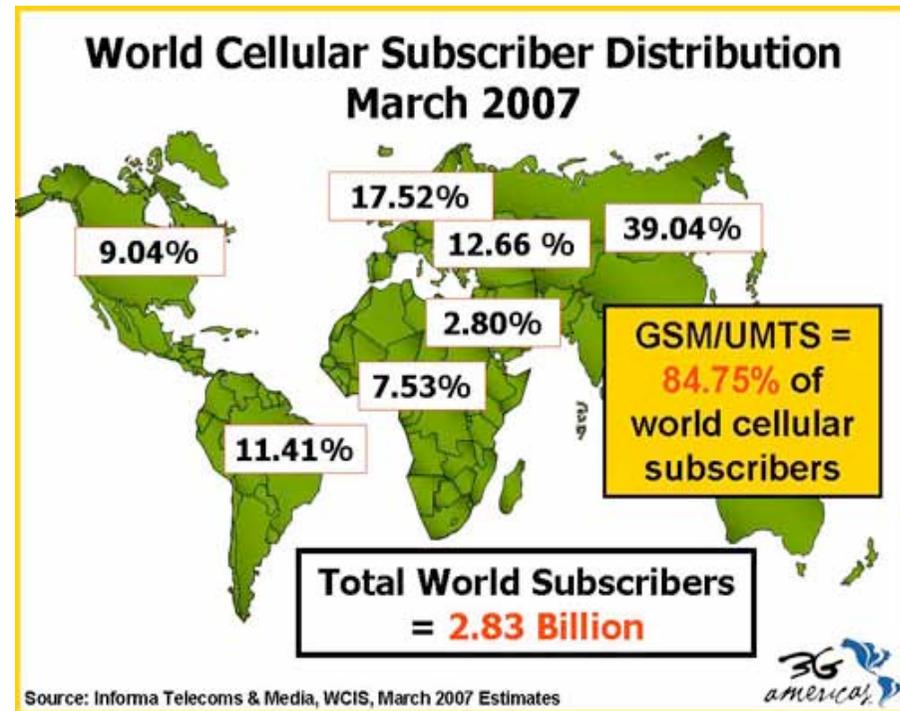
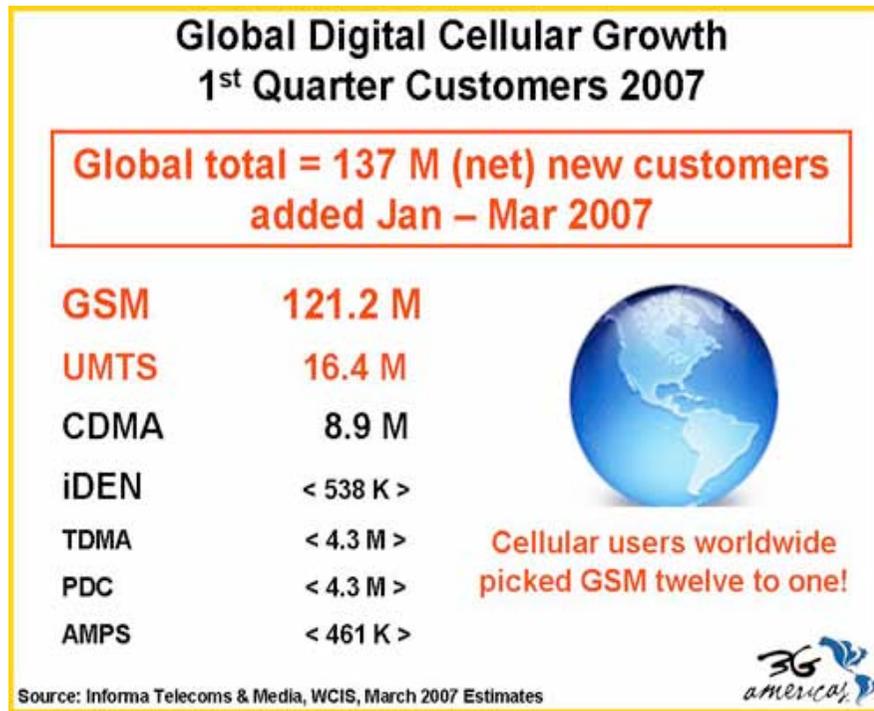
Blurring distribution models

- The old order: discrete and distinct
 - Telecom: voice, data
 - Broadcasters : radio, TV
 - Music industry
 - Movie industry
 - Print and publishing
 - Advertising
 - Gaming, gambling
 - Home entertainment
 - Production control, goods tracking
 - Services: banking, travel, auctions, stores

The e-world is rather disruptive for most existing carrier and service industry business models

Everything which can be dematerialized will ultimately be dematerialized

The incredible growth of Mobile



As reported by 3G Americas www.3gamericas.org

2.8 billion devices reached end Q1, three billion today september 5th?

Mobile devices and next internet growth phase

The future growth of the Internet lies in the hands of mobile phone users, not computers, ...

...while the Internet population has exploded from 50 million to 1.1 billion since 1997, it still only reaches a sixth of the world's population.

the jump to the next (sixth) version of the Internet Protocol IPv6 is desperately needed if we are to reach the world's 4 billion people, who are now untouched by the Net."



Vint Cerf in Bangalore, February 20 th 2007, as reported by Pronetworks and The Hindu

In the wake of GSM Barcelona 2007

- « ..in the all important area of services GSM is still awaiting the major breakthrough of new applications beyond voice and SMS » (Mark Newman in WF07)
- « A key aspect of HSUPA, and one that poses a serious dilemma for many operator business models, is its support for Mobile VOIP » (Julian Bright WF07)
- true broadband could trigger an explosion in mobile use of social networking and other popular fixed internet services
- Nokia estimates about 650 million e-mail boxes globally, only 5% accessed by mobile phone.
- Music station, a flat rate service backed by 23 operators to counter iPhone threat!

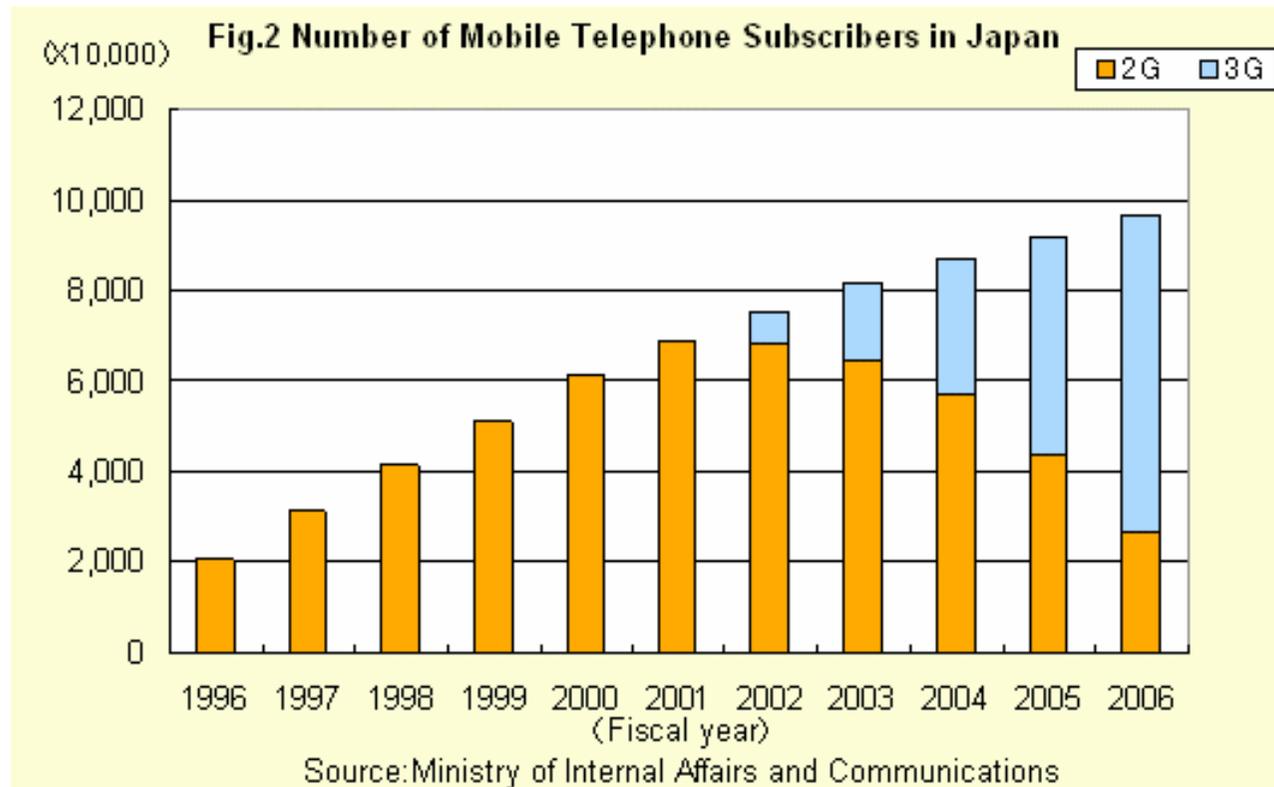


3G as Mobile Broadband access



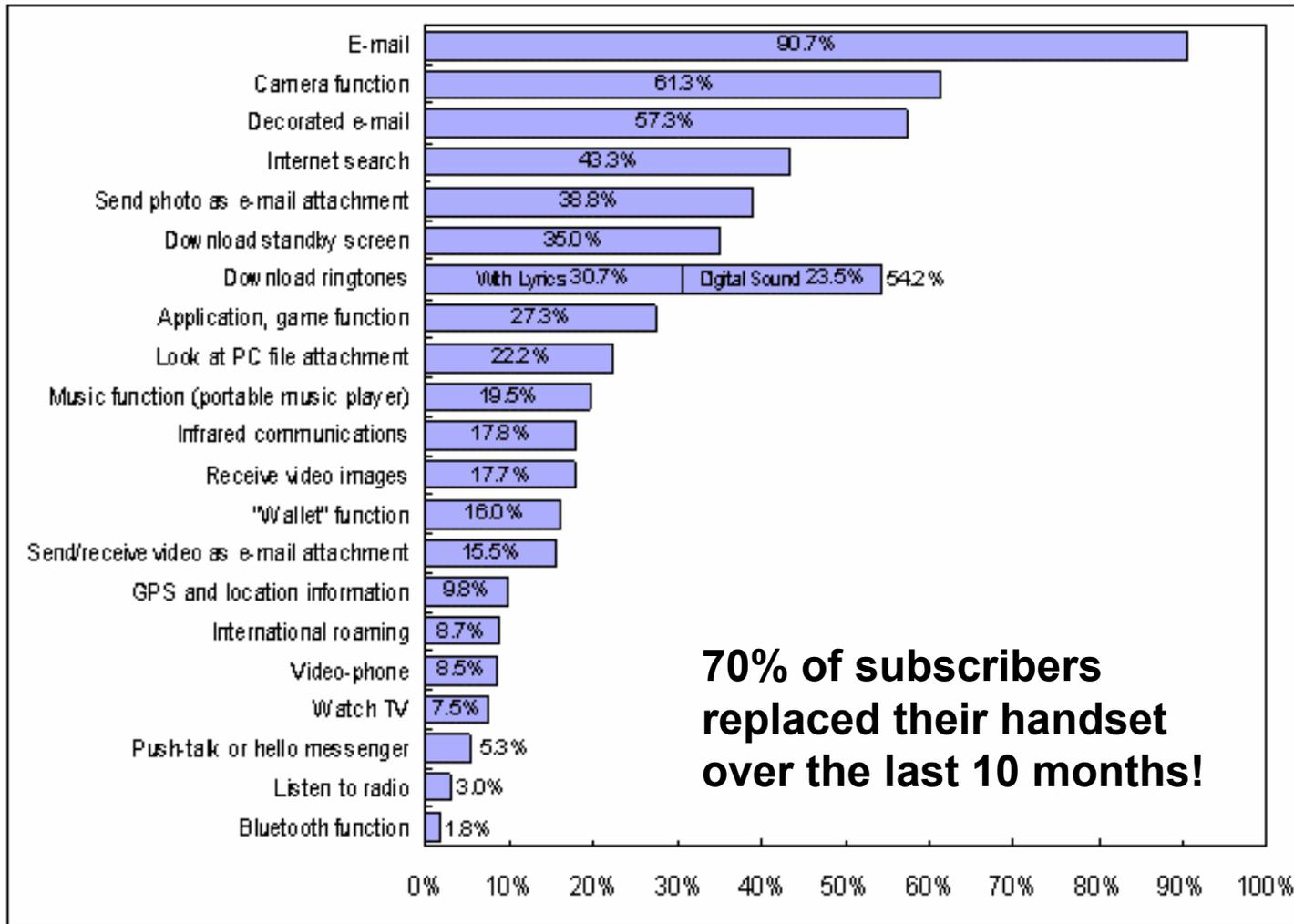
- 3G and CDMA2000 subscribers around the 300 million mark
- With the saturation in mobile voice, the MNO challenge is an upward move in the value chain and avoid becoming a bit pipe. Hence interest in « rich media » mobile games, mobile IPTV, seamless wireless mobility, location based services information, on-line monitoring, payments etc.
- 170 UMTS networks, 100 HSDPA networks (up from one in dec 2005), first HSUPA network (Feb 2007)
- IMS (Internet Multimedia subsystem) to bill these new services
- Toward IP address based billing?

Data and Mobile: The Japanese example



Graph by CIAJ (Communication & Information Association of Japan)

What do Japanese use their handsets for?



IP Telephony



- Disruptive effect catalyzed by the Skype phenomenon :
150 million downloads, 8 billion plus minutes, 1.5 million users on-line and sold for US\$ 2 billion plus, all within two years of setting up the company end august 2003.
- In North-America: 400+ providers; Japan's Yahoo BB is the biggest VoIP provider
- 45+ million subscribers forecasted for end 2006 (double end 2005)
- What role for Google, Microsoft, E-Bay, Apple iPhone?





Windows Vista as IPv6 deployment catalyst

“all of Microsoft's products have been adjusted to work not only in a hybrid IPV6/IPV4 environment, but for those who have a real extreme need to operate a completely native IPV6 infrastructure, which also reduces another class of threats”.

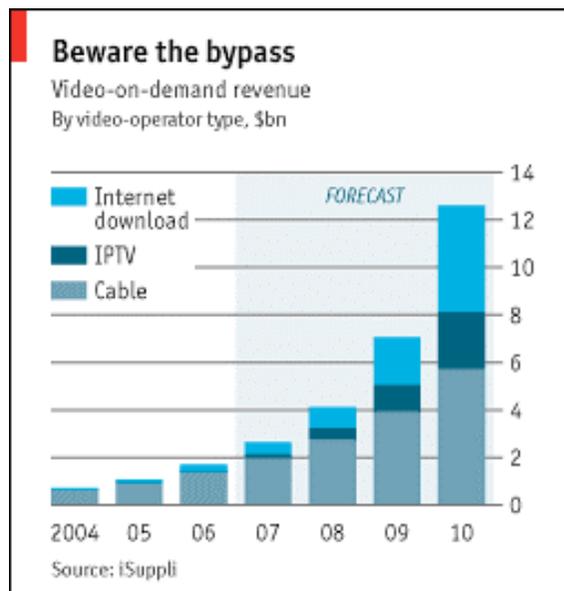
Craig Mundie and Bill Gates keynote at RSA Conference, San Francisco February 6 th 2007

“We are betting our business strategy on IPv6 and IPsec,”

Sean Siler, Microsoft Corp.'s program manager for IPv6 deployment.
at the AFCEA IPv6 Tech Forum, Washington, Feb 20 th 2007, quoted in GCN

IPTV as IPv6 deployment catalyst

The february 10-16 North American issue of The Economist, pp65-66, notes in an article on the future of television:

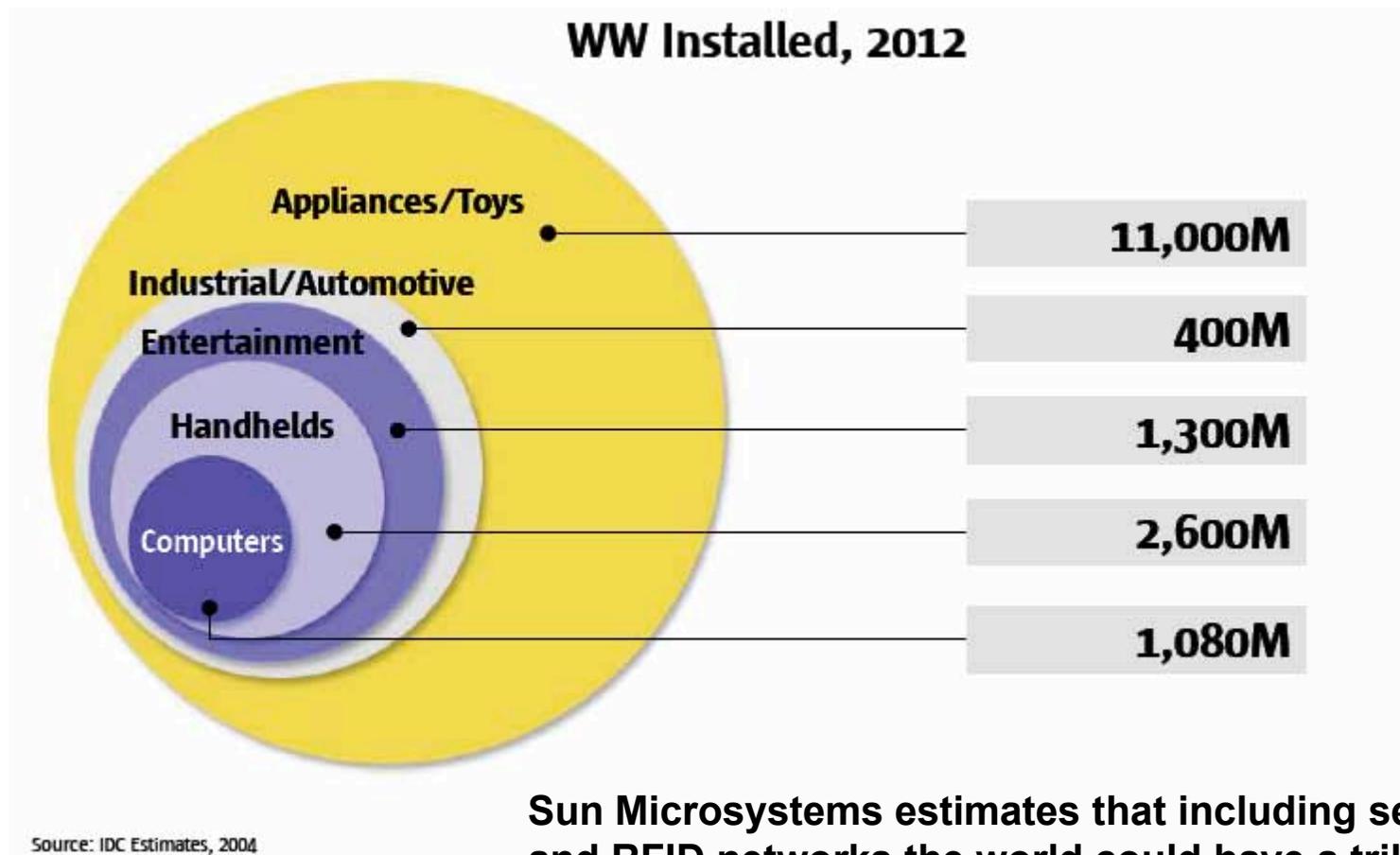


“Combined with other information, such as the computer’s IP address and hence its location, advertisers will be able to target their spots much more accurately—all “Desperate Housewives” fans in a particular neighbourhood, for example—and thus ought to pay a premium”.

This vision implies unambiguous addressing ,ergo IPv6!!

standards battle heats up: Qualcomm Mediaflo versus DVB-H

17 billion Networkable Devices!

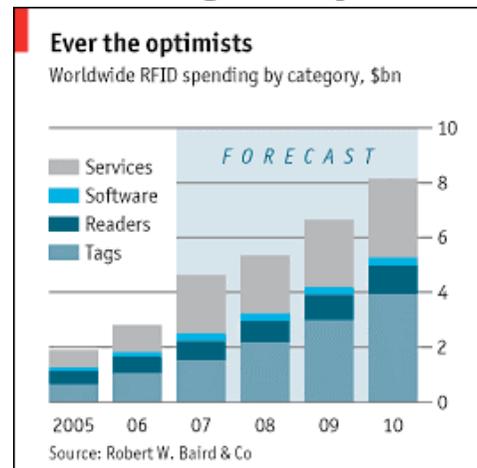
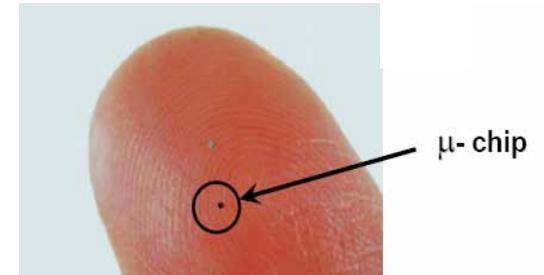


Sun Microsystems estimates that including sensor and RFID networks the world could have a trillion communicating devices in a decade!

RFID's



- **January 2005: The bandwagon started rolling**
 - Wal-Mart Stores and DoD mandatory RFID support programs started.
- **Generalized RFID implies terabytes of traffic daily.**
- **RFID for authentication and for traceability: drugs, passports, banknotes, secure papers, concert entry ticket, casino chips, luggage tags**
- **Take-off slower than originally forecast but accelerating**



Source: Robert W. Baird in the Economist june 7th 2007 issue

Prevalence of fast digital access

- DSL and Cable

- 300+ million by end 2007
- It took mobile phones 5.5 years to go from 10 to 100 million subscribers worldwide; Broadband achieved this in 3.5 years.



- Wi-Fi and Wi-Max

- 213 million wi-fi chipsets shipped in 2006 (in Stat)
- 100,000+ public hotspots worldwide
- 300K Wi-Max chipsets in 2006 (in Stat): will be disruptive



- FTTx

- From 20 million (mid 2006) to 62 million in 2010 (Ovum)
- FTTC versus "real" FTTH debate



- 3G and HSDPA/HSUP





National Policies: Economics

- National policies:
 - China's CNGI
 - Korea's u-IT839
 - Malaysia's MyICMS
 - Japan's U-Japan
 - Singapore's Next Gen NII an IN2015
 - India's 10 point Agenda
 - USA's DoC (Department of Commerce) guidelines
- Common objectives:
 - Provide ubiquitous, affordable high speed communication over converging networks
 - Provide for substantial growth of IT share of GDP and job creation
 - Position the country for competitiveness in a Global Economy.

National Policies: Defense

- In the context of its requirements for Network Centric Warfare, the US DoD decided to mandate IPv6 support.
- Early response to terrorism and natural disasters
- Unpredictable environments need fast connecting self-organizing networks: Mobile adhoc networks (MANET), networks in motion (NEMO) and MANEMOs.
- Only achievable and scaleable in an IPv6 environment.





What does IPv6 bring to the table?

- Solves address shortage
- Restores p2p communication
- Mobility
 - Much easier roaming
 - Better spectrum utilization
 - Better battery life!
- Security
 - IPsec mandatory
- Multicast
- Better QoS (flow labels)
- Auto configuration
 - Mobile Ad-Hoc networking
 - Mobile networks
 - Sensor networks
 - Plug and Play networks
- Permanent addresses
 - Identity (CLID)
 - Traceability (RFID)
 - Addressability!
 - IP address based billing



Agenda

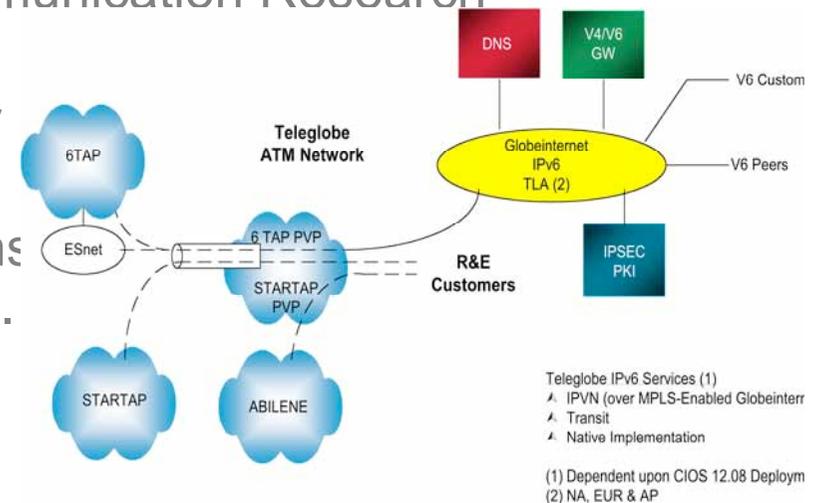
- IPv6: Some perceived drivers
- IPv6 early mover advantage?

« These days all competitive advantages are fleeting. So the smartest companies are learning to create new ones – again and again and again »

Robert D. Hof , Business Week, August 21st 2006

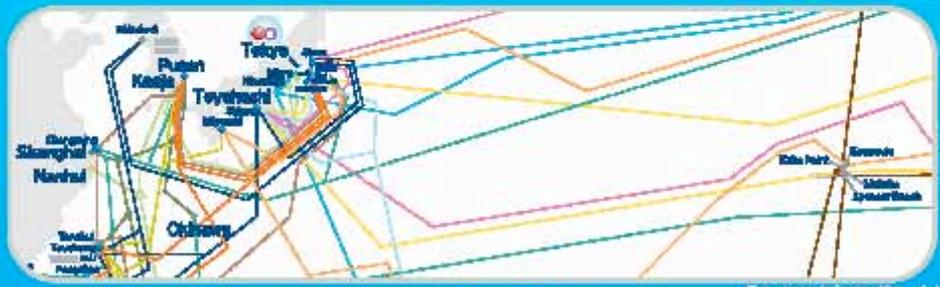
VSNL International and IPv6 : one of the pioneers

- Teleglobe provides the first NGI intercontinental connection in 1995 for the Brussels G7 summit.
- A member of the Canarie Policy Board, Teleglobe promotes the experimentation of IPv6 and the 6bone/6TAP initiative
- Teleglobe hosts the first IPv6 node for Surfnet connection to the Chicago 6TAP located at STARTAP.
- Teleglobe facilitates the world's first intercontinental native IPv6 connection in 1998 between CRC(Communication Research Centre) in Ottawa and Berkom in Berlin.
- Teleglobe becomes a founding member of the IPv6 forum in 1999.
- Teleglobe presents its original IPv6 plans at the Telluride March 2000 IPv6 Forum.
- 2003: Teleglobe starts an IPv6 pilot
- January 2004: service introduction

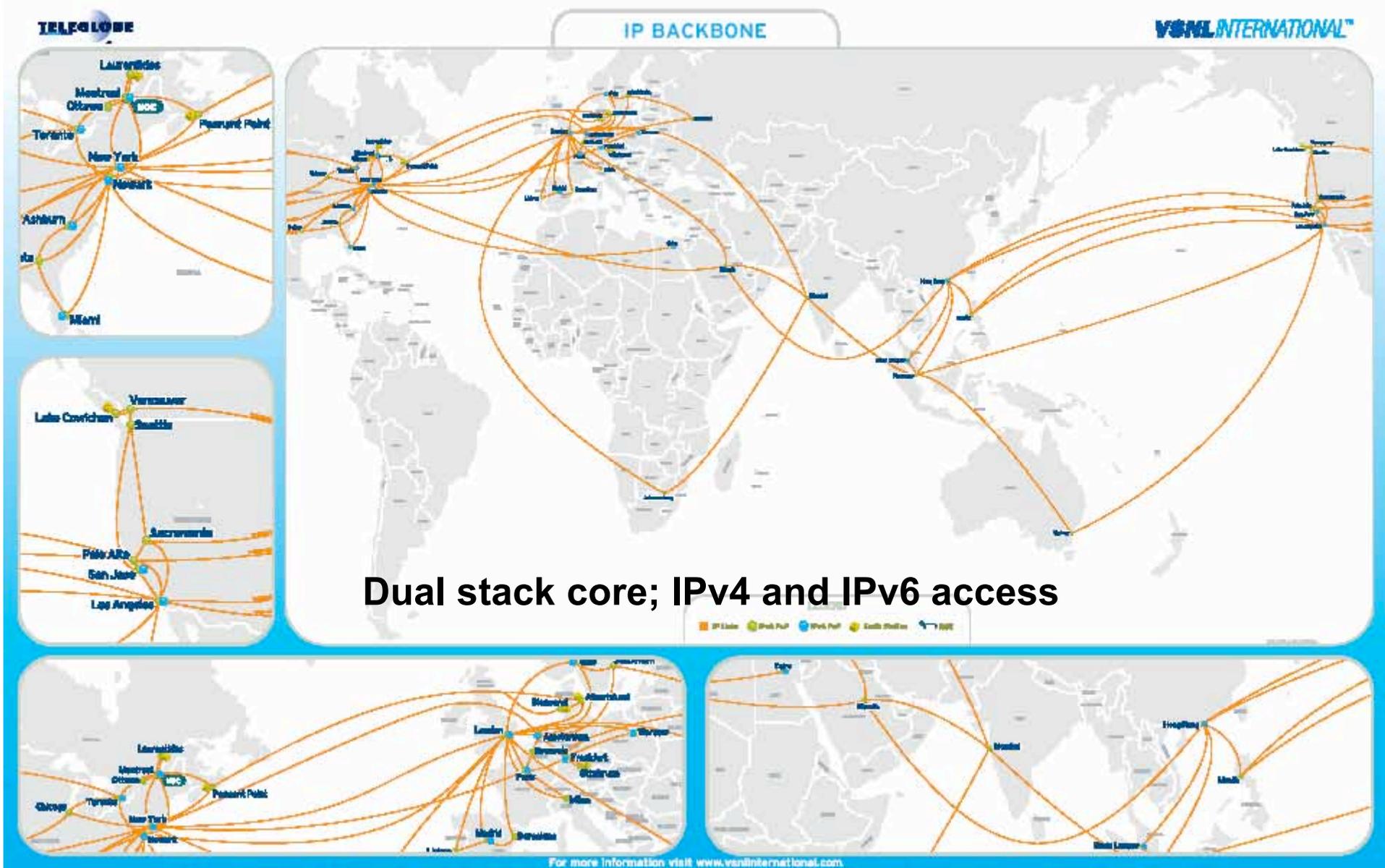




| L1/L2/L3 | | | | L4/L5/L6 | | | |
|----------|------------|----------|---------|----------|------|---------------------|----------------------|
| TEL | SPRINT/BBN | SOX-NE-4 | COMPTON | BT-01 | ERIC | Public Station | Multiple Leasing |
| TEL | SOX-NE-4 | SOX-NE-4 | COMPTON | BT-01 | ERIC | Residential Station | Multiple-IPM Leasing |
| TEL | SOX-NE-4 | SOX-NE-4 | COMPTON | BT-01 | ERIC | IPM | IPM Global Ports |
| TEL | SOX-NE-4 | SOX-NE-4 | COMPTON | BT-01 | ERIC | IPM | IPM Global Ports |
| TEL | SOX-NE-4 | SOX-NE-4 | COMPTON | BT-01 | ERIC | IPM | IPM Global Ports |
| TEL | SOX-NE-4 | SOX-NE-4 | COMPTON | BT-01 | ERIC | IPM | IPM Global Ports |



For more information visit www.vsnlinternational.com



Circling the Globe



- **Explosive growth**
 - Multiple OC48/192 MPLS backbone
 - Courtesy of User Generated Content :Youtube, Myspace etc
- **IP Network at glance**
 - 600+Gbps of Backbone Capacity
 - Carries more then 300 Petabits globally per month;
 - 3 Network operation Centers (NOC) two in North America and one in Asia.
- **upgrade bonus: IPv6 in core**
 - New engine cards justified by (IPv4) traffic growth



- **AS 6453 as tier 1 carrier's carrier network**

- IPv6 traffic still minimal
- IPv6 traffic growth depends on adoption in tier 2 networks
- This in turn depends on IPv6 support on the application level.
- Windows Vista the first catalyst?
- The anticipated exhaustion of IPv4 addresses?



Did our early emphasis on IPv6 pay off?

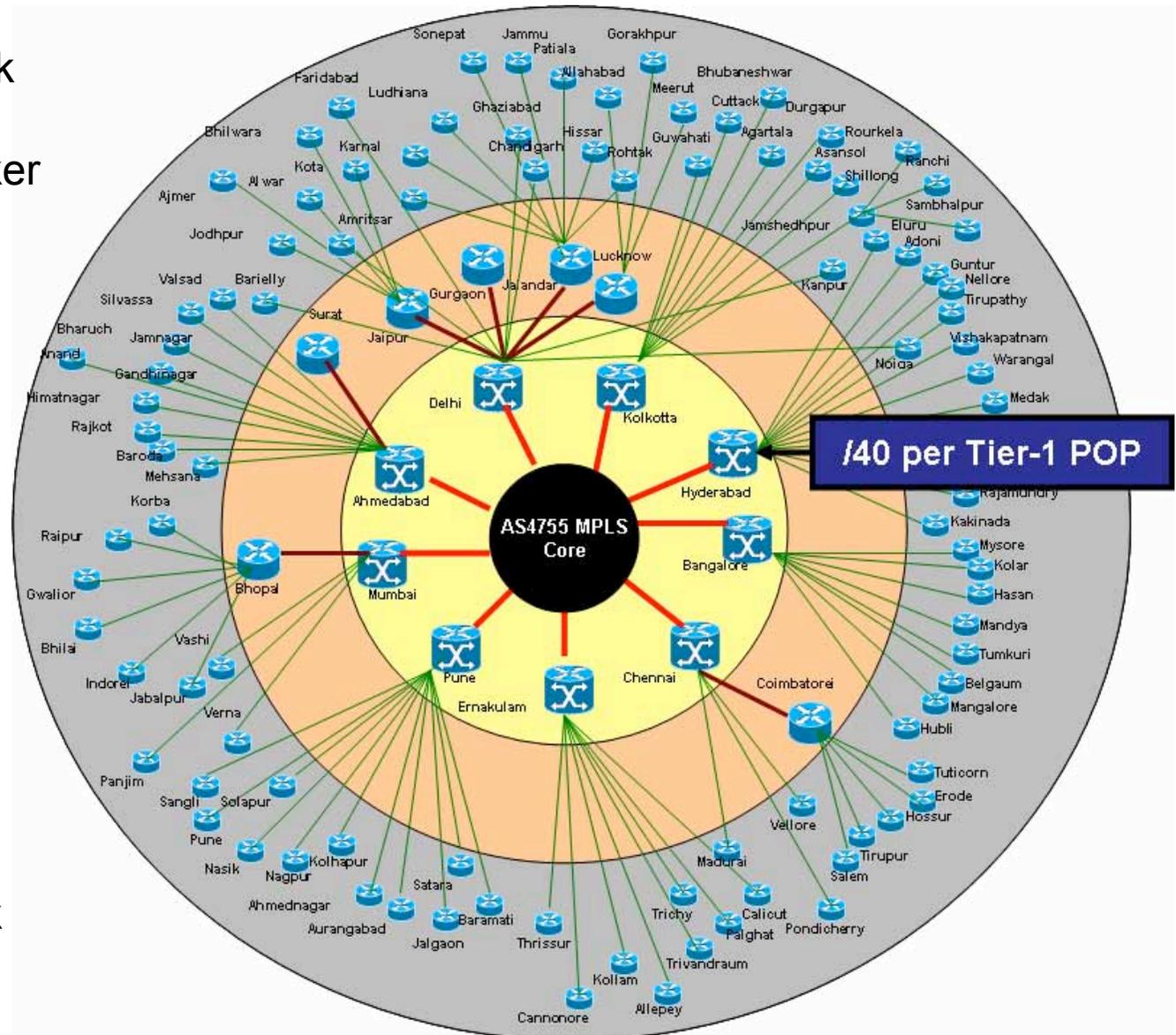
- Gave high visibility and early mover advantage among tier 1 carriers
- Differentiator in the marketplace
 - If carrier A offers IPv4 only and carrier B offers both IPv4 and IPv6, other criteria being similar, who would a tier 2 ISP carrier base go for?
- 30+ of our major customers connect in both IPv4 and IPv6
- Of around 60 major RFQ's for IP transit answered in 2006, about 50 included questions on IPv6 support, roughly half gave points to IPv6 support in their response evaluation and 10 had IPv6 support as mandatory or exclusion factor if not compliant.
- Next step: stimulate growth of the IPv6 component of the overall IP traffic.

IPv6 support on India's AS4755: it started!

Native IPv6, dual stack
IPv4 and IPv6, static
tunnel and tunnel broker
IPv6 access in

- Ahmedabad
- Bangalore
- Chennai
- Delhi
- Hyderabad
- Kolkatta
- Mumbai
- Pune

Available as we speak





India on the Road to IPv6

To hear and learn much more,
Join us at the upcoming Indian IPv6 Summit

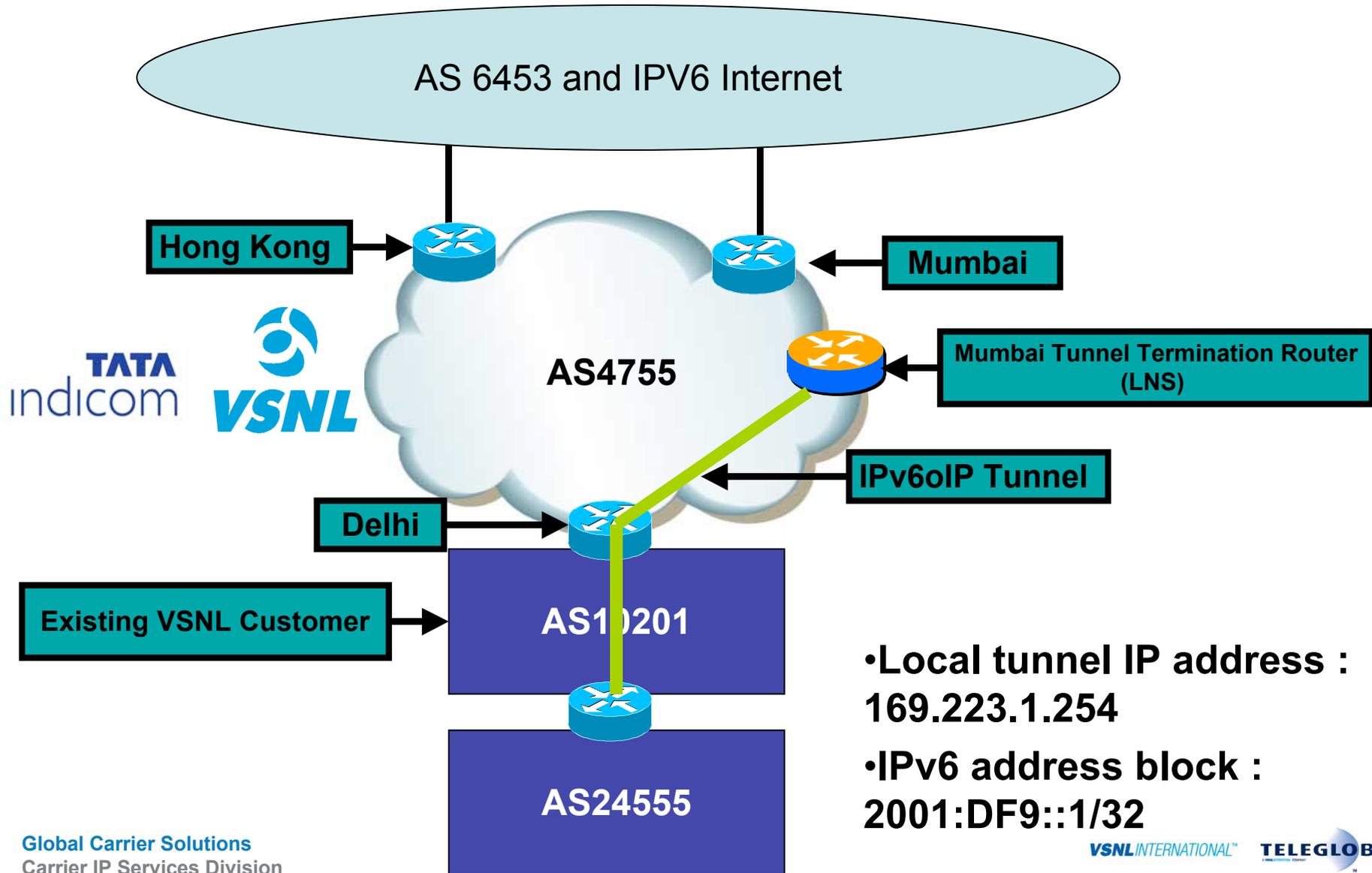
December 12-13th,
Taj Regency,
Bangalore



organized by the IPv6 Forum India

Check <http://ipv6forum.in/> for details

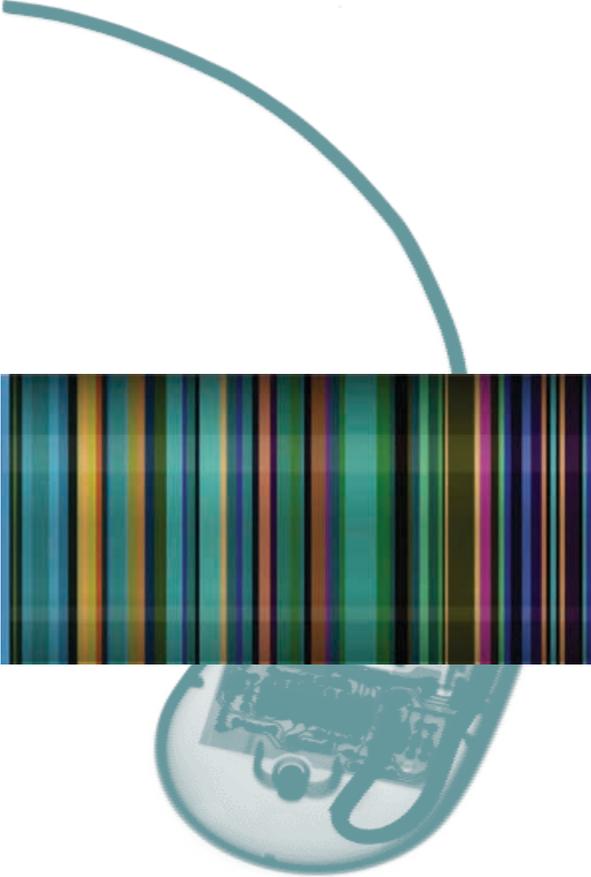
IPv6 connectivity at SANOG 10 in New Delhi





Some concluding thoughts

- Day to day human activity affected by and dependent on telecomms as never before:
 - Digital lifestyle: study, work, play, shop and make friends in cyberspace
 - Telecom lifestyle: everything at your fingertips anywhere, anytime
 - Business processes from design to production to promotion to selling is increasingly telecom dependent. Cyberspace is not virtual any more; it often affects bottom line if not survival.
- On the horizon:
 - Human networks: we will be networks in motion moving around carrying some terabytes of information, communicating with the rest of the world at gigabit speeds.
 - Ambient networks, sentient networks, pervasive networks
..... No place to hide anywhere anymore



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« Whatever advantage you have, someone will take it away from you »

C.K. Prahalad, professor of Corporate Strategy

Thank You for your attention

Global Carrier Solutions

Carrier IP Services Division

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