



Report and Recommendations of the ISACC IPv6 Task Group

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Task Group Work

- Started June 2009
- > 40 individuals from organisations such as: Microsoft, Tata Communications, Viagenie, Industry Canada, Alcatel-Lucent, Bell Canada, Canarie, Cisco, Cogeco, CRC, CRTC, gogo6, ISSEA, ITAC, Polynate, PWGSC, RIM, Rogers, Sandelman, Tata Consulting, Telus, TBS, Vidéotron, Xittel
- 15 meetings
- Preliminary report to ISACC Plenary, Nov. 5th 2009

Task Group Membership



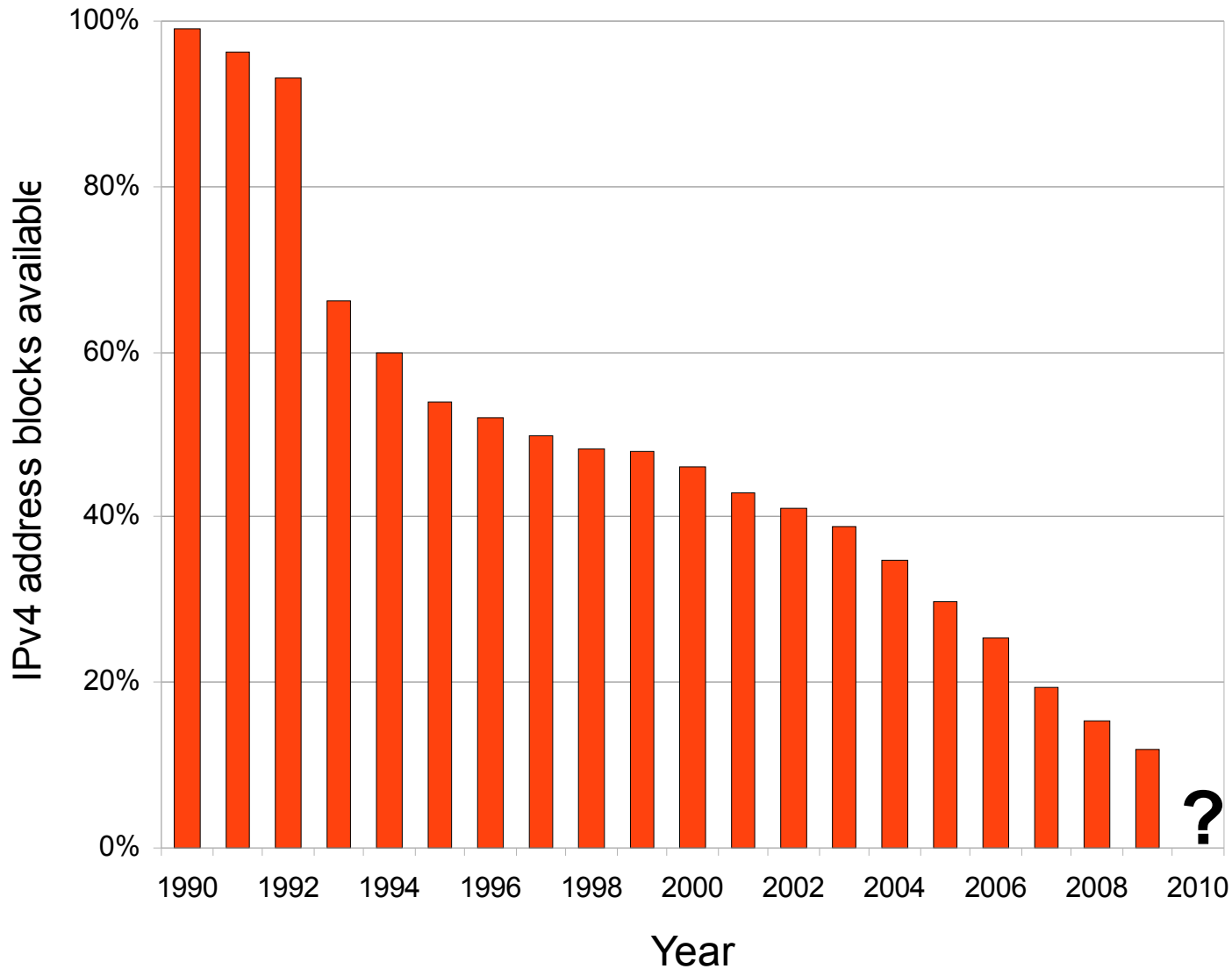
Name	Affiliation and/or IITG Role	Name	Affiliation and/or IITG Role	Name	Affiliation and/or IITG Role
Jim MacFie	Microsoft Canada, and ISACC Chair	Cory Wishak	CRTC	George Babut	Rogers
Yves Poppe	Tata Communications, and Task Group Chair	Mikael Lind	gogo6	Jean-Yves Bernard	Rogers
Marc Blanchet	Viagenie, and Task Group Vice-Chair	David Gibson	Industry Canada	George Hart	Rogers
Ed Juskevicius	TrekAhead, and Secretary for IITG	Tara Hennessy	Industry Canada	Gerry Thompson	Rogers
Marcelo Ferme	Industry Canada, and ISACC Secretariat	Colman Ho	Industry Canada	Michael Richardson	Sandelman Software Works
Faud A. Khan	Alcatel-Lucent ALU Ventures – Bell Labs	Jacqueline Jones	Industry Canada	Mukesh Gupta	Tata Consultancy Services
Douglas Kwong	Bell Canada	John Hopkinson	Chairman of CAC-JTC1/TCIT	Percy Lee	TELUS
Erone Quek	Bell Canada	Bill Munson	ITAC	Ken Nguyen	Treasury Board of Canada Secretariat
Brian Smith	Bell Canada	Eric Beauchesne	Microsoft Canada	Jean-François Tremblay	Vidéotron
Eric Bernier	CANARIE	John Weigelt	Microsoft Canada	Francois Menard	Xittel Communications
Thomas Tam	CANARIE	Anurag Jain	Polynate	Richard Thomas	RJT Solutions Group
Brian Hanson	Cisco Systems	Mario Boisvert	Public Works and Government Services Canada	John Visser	Private Consultant
Stephen Orr	Cisco Systems	Jonathan Sau	Research in Motion	Joe Zearth	Private Consultant
Chris MacFarlane	Cogeco Cable	Vino Vinodrai	Research in Motion VinodraiAssociates		
Lewis Robart	Communications Research Centre Canada				
Eric Tsang	Communications Research Centre Canada				

IPv4



- Current version of Internet Protocol
- Universal transport of packets (Internet, Enterprise)
- Every computer requires an IPv4 address.
- IPv4 uses 32-bit addressing.

The Problem: IPv4 Address Exhaustion



- Remaining: 8%
- Average consumption rate=5%/year
- Complete exhaustion 2012

The Solution: IPv6

- Solution to IPv4 address exhaustion.
- New protocol, improved version
- 128-bit addresses > 10 billion billion billion times more than IPv4
- Brings additional features: mobility, security, autoconfiguration, ...
- Different and incompatible
- Devices and applications are IPv4, IPv6 or dual-stack(IPv4 and IPv6)

	IPv4-only	IPv6-only	Dual-stack (IPv4 and IPv6)
IPv4-only	Compatible	<i>Not Compatible</i>	Compatible
IPv6-only	<i>Not Compatible</i>	Compatible	Compatible
Dual-stack (IPv4 and IPv6)	Compatible	Compatible	Compatible

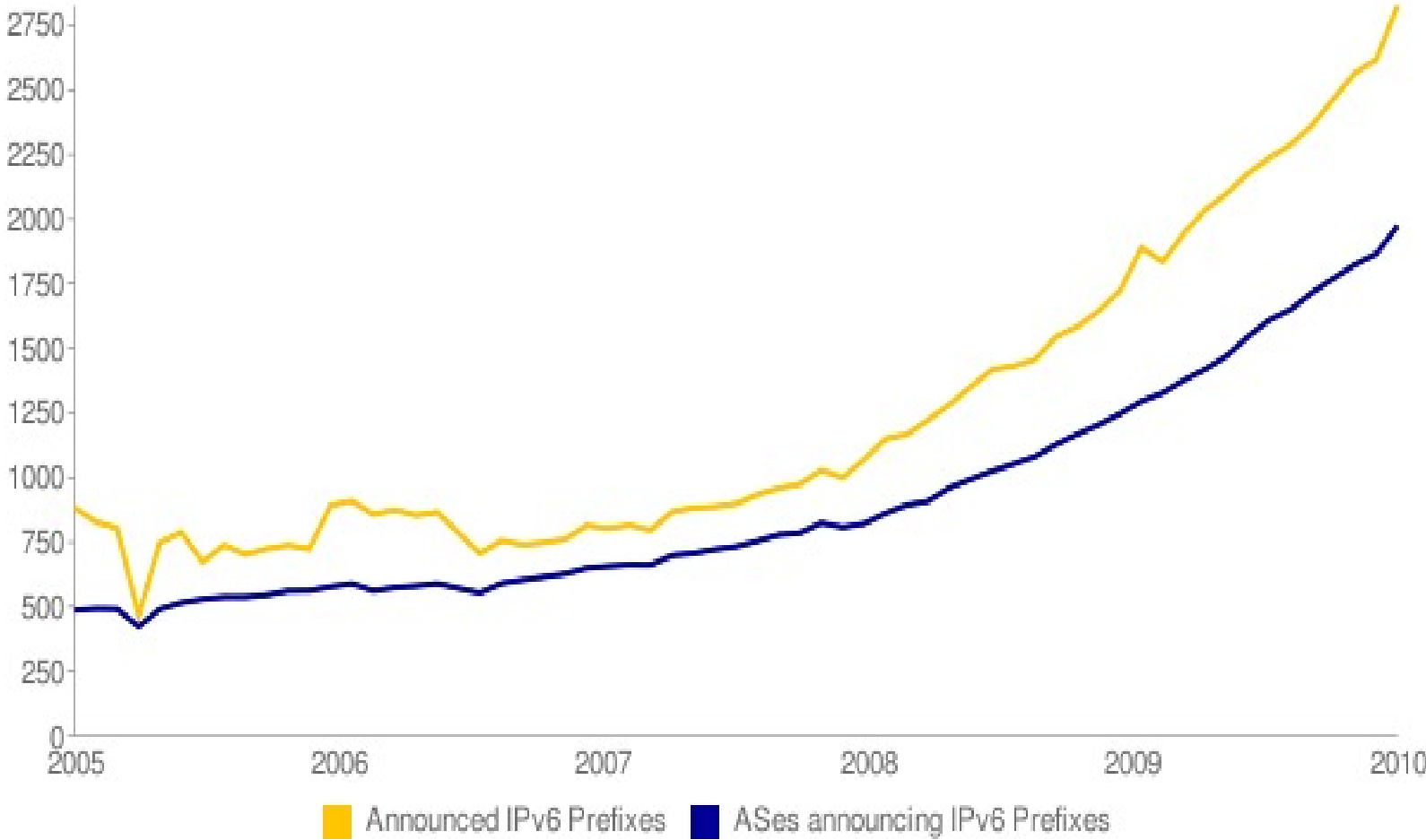
Migration

- When IPv4 addresses are exhausted (2012), new devices, services, applications and end-users on Internet will be using IPv6-only.
- To talk to this new Internet, upgrade of the legacy IPv4 devices, applications, services to dual-stack, is essential.
- IPv6-capable systems are generally available on the market place from most vendors. Often, already installed in your computer: « just » need to be turned on.

Slow Start

- IPv6 invented in 1996. First deployments 1999.
- Up to recently, almost no incentive, no good ROI, no business case to deploy IPv6. Why?
 - Between any 2 IPv6 user, everything in between needs to be upgraded. Important cost, ROI difficult.
 - If application can be deployed over IPv4 (even though less efficiently), then why bother IPv6?
- Consequence:
 - minimal deployment.
 - → Expertise too concentrated in too few people and organizations.

Ramping Up



IPv6 (ISP) prefixes announced on the IPv6 Internet

Deployment Status

- Canada, early mover and innovator in 2000's. Lead has not been sustained.
- Since 2000, Canada's largest trading partners mandated IPv6 deployments, subsidized domestic innovation and procurement of IPv6 products.
- End-result: Canada is lagging.

Canada's Trading Partners

	Canadian Trade with Partners, January 2008 to December 2009	Share of Total Exports	Share of Total Imports	Share of IPv6 '/48s' Allocated To Date	Share of IPv6 '/48s' Allocated Per Capita
1	United States	76.53%	51.82%	10.76%	4.32
2	European Union <i>excluding</i> the UK	4.86%	9.67%	18.40%	4.01
3	China	2.57%	10.30%	0.05%	0.01
4	Japan	2.30%	3.46%	5.97%	5.72
5	UK	2.96%	2.76%	0.90%	1.76
6	South Korea	0.87%	1.49%	3.71%	9.08
~15	India	0.54%	0.53%	0.02%	0.03
~20	Australia	0.47%	0.41%	5.92%	31.70
	Total	91.1%	80.4%	45.7%	
	Canada	<i>n/a</i>	<i>n/a</i>	0.06%	0.21

Sources of Data: Statistics Canada and the Regional Internet Registries (RIRs)

Report Date: 23-Feb-2010

<http://www.ic.gc.ca/eic/site/tdo-dcd.nsf/eng/Home>

<http://bgp.potaroo.net/iso3166/v6cc.html>

Note: One IPv6 /48 prefix is assigned per enterprise.

Time for Action

Recall: IPv4 addresses are exhausted
in 2 years.

Time for Action

-
- Migration Plan: early planning reduces cost.
- Migration plan includes:
 - Specifying IPv6 requirements in procurements
 - Training IT staff
 - Porting web sites and other customer-facing applications to be accessible over IPv6
 - ...

Gouvernement du Québec

- (Only?) example of (large) IPv6 procurement for a government in Canada?
- Migration plan started by requiring IPv6 in network service procurement.
 - RFP for QC Government private network, April 2008.
 - Reason: during the span of the contract (5 years), IPv6 will be required. Therefore, mandated.
 - « *Le niveau de service du service IPv6 doit être identique ou supérieur au service IPv4. Le niveau de sécurité du service IPv6 doit être identique ou supérieur au service IPv4.* » »

Time for Action

- John Curran, CEO, ARIN:
 - *"Corporations and government agencies must IPv6-enable their public-facing Web sites in the next 24 months or risk upsetting a growing number of visitors with lower-grade connectivity. ... The drop-dead deadline for external Web sites to support IPv6 is January 1, 2012."*
- Canadian content from governments (all levels) and content providers such as CBC/Radio-Canada
 - Shall plan to offer content on IPv6.
- Same for enterprises and businesses to reach IPv6-only end-users

Time for Action

- Expertise and awareness
 - Minimal deployment-> limited dissemination of knowledge. Need to multiply.
- IPv6 Market
 - Market now requires IPv6-capable products.
 - Every product that has a networking stack shall be IPv6-capable.
 - Canadian business must be aware of these requirements in time to deliver IPv6-capable products.
 - Delay will hinder the Canadian ICT industry

Time for Action

- Certification and Interoperability
 - Canadian products containing a networking stack are being ported to IPv6. But no facility exists in Canada to do testing and certification of IPv6 functionality.

Time for Action

- Universal Transport
 - IP becoming the universal transport of media, content, telephony.
 - Therefore IP is at the edge of regulation
 - Therefore, as with IPv4, regulation should take into account IPv6 in hearings and work

Recommendations

- N.B. « 6.X » in next slides refers to the section number in the report.

R6.1: Governments

- As owners of large IT infrastructures, protect investment by careful planning.
- Reach IPv6 end-users, services and applications
 - *Canadian governments of all levels (e.g. federal, provincial, territorial, regional, municipal) shall plan for IPv6 migration and specify IPv6 support in their IT procurements immediately.*

R6.2: Internet Service Providers

- ISP deliver Internet service to Canadian enterprises and citizens. Delay in offering IPv6 results in disadvantage for Canadian industry and end-users reaching IPv6 services and applications.
 - *Internet service providers (ISP) shall accelerate the deployment and the commercial availability of IPv6 service for business and consumer networks.*

R6.3: Content and Applications Service Providers



- Reach IPv6 end-users
- Not reaching means fragmented Internet.
 - *Internet content and application service providers make their content and applications reachable using IPv6.*

R6.4: Industry

- IPv6 is an important market, with growth.
- Required in procurement, worldwide.
- Need to provide IPv6-capable products.
 - *Industry in all sectors shall intensify the support of IPv6 on all products that include a networking protocol stack.*

N.B. Many industrial products now include a networking protocol stack.

R6.5: Center of Excellence

- Need to multiply the concentrated IPv6 expertise in Canada.
- Need to disseminate best practices, facilitate collaboration and establishment of interoperability and conformance testing labs for Canadian industry to use in order to compete.
 - *Industry and governments establish a Canadian Center of Excellence to increase IPv6 awareness in Canada, and to train, educate, and advise on best practices.*

R6.6: Government Support Programs



- Programs such as SRED, NRC IRAP, Action Canada Remote community access, shall support IPv6.
 - *Governments at all levels shall review current programs to ensure eligibility of IPv6 initiatives and evaluate the creation of specific programs to enable Canadian industry to take full advantage of global IPv6 markets.*

R6.7: CRTC

- IP is universal transport for media, content. IPv4 is at edge of regulation, so is IPv6.
 - *The CRTC shall ensure that relevant telecommunications and broadcasting decisions and policies support IPv6 deployment.*

Conclusion

- IITG work by 40+ individuals with large stakeholders representation.
- Consensus:
 - IPv6 is inevitable and happening now
 - Not migrating is not an option
 - All of Canada's largest trading partners are actively transitioning to IPv6.
 - Canada is lagging.
- Any delay in moving will hinder the Canadian economy.