

Internet and IPv6 Road map for India

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Information Systems & Management

The world is in transition from the industrial age to information age.

Information Technology is changing the relationships between the companies and their customers and suppliers. The rapid advancing knowledge base, the globalised economics, the competitive & open markets, the revolution taking place in computer and communication technologies are changing the global scenario.

Why the change is happening

- The two critical dimensions for any business is cost of production and response time to reach customer.
 - The world has become interdependent and interconnected.
 - The knowledge as resource.
- The Internet and networking is the most critical dimensions changing the business environment.

World-wide Internet Users Penetration

<u>Country</u> (in million)	<u>Users</u>	<u>Population</u> (in million)	
India	20	1000	2% (As on June '02)
USA	165.75	280.58	59.1% (As on Apr '02)
Japan	51.34	126.97	40.43% (As on Apr '02)
China	37.55	1271.70	2.92% (As on May '02)
UK	34	59.65	56.88% (As on May '02)
Germany	30.2	83.03	36.37% (As on Feb '02)
Canada	16.84	31.9	52.79% (As on Mar '02)
France	16.97	59.55	28.39% (As on May '02)
Australia	10.63	19.55	54.38% (As on Feb '02)
Russia	18	146.03	12.42% (As on Dec '02)
Indonesia	4.4	227.88	1.93% (As on Jan '02)

Some Statistics about rural and urban Connectivity in India

- India resides in villages where digital divide is pertinent
- Information and communication technologies(ICT) provide effective tools and technique for variety of applications in rural scenarios such as

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- Voice Communication (mainly by DOT and few private players)
- Telemedicine
- Education and training
- E-governance like Land record management
Citizen Govt. Interface, Market Information
- Entertainment
- Agricultural Development
- Teleconferencing
- Video streaming

Contd...

Villages & Connectivity

- 6.2 lakh Villages in the country
- DIT under its National Telecom / Internet Database Project has made the Geographical Information System (GIS) with LAT/LONG for these 6.2 lakh villages and Telecom / Internet Data (from different Service providers) is being overlaid on it.
- BSNL has provided rural telephony to more than 4 lakh villages using technologies like copper line,WLL,MARR ,V-SAT etc..
- In these cases speed is between 10 Kbps to 40 Kbps which is no way near broadband communication required for the applications mentioned earlier

Issues with existing telecom Infrastructure

- Mainly catered to the voice communication
- Do not address the broadband requirement for Data/video Transmission including telemedicine e.g Sending ECG Signal
- Last mile communication infrastructure need to be strengthened particularly in the villages for Broadband application

Broadband paradigm

- Broadband is key to provide required content / applications in rural areas
- Allows for extremely high speeds and supports data, voice and video information.(At least 200 Kbps)
- Broadband communications consist of the technologies and equipment required to deliver packet-based digital voice, video and data services to end users

- Broadband offers end-users high-speed, always-on access to the Internet
- Broadband access technologies are being deployed to address the bandwidth bottleneck for the "last mile", the connection of homes and small businesses to this infrastructure
- Broadband access technologies is still very much in the early stages of deployment and need to to be expedited to remove digital divide

Broadband Access Technologies

There are many competing broadband access technologies being brought to address last mile connectivity, Such as

- Cable modem
- Digital subscriber line (DSL)
- Optical Fiber
- Wireless PAN & LAN

(Blue tooth and 802.11(a),(b) & (g) versions)

Some Statistics for the ICT Sector

Indian Scene:

- Telephony density: 6.7%

Total telephone connections: 67 Million

Of this Mobile connections: 20 Million

Fixed Line connections: 47 Million

Accelerated growth target: 10% by 2005

20% by 2010

First 50% of Mobile installed in last 7 years and remaining in last 7 months.

- TV Homes: 90 Million
- Of this potential Internet users: 50 Million
- Internet subscribers: 3.7 Million(16.5 Million users)
Growth predicted: 35 Million by 2007
- Fibre Routs Kms. Laid: 500,000 Kms. (412,485 Kms. by BSNL)
Every village within 25 Kms. Of fibre.
- International capacity installed on submarine cable landing at Mumbai, Chennai and Kochi: 200 Gbps
10.6 Gbps (used up)
Satellite capacity with 56 licensees: 1.4 Gbps

- Internet Congestion/charges

8% subscribers unable to connect after four attempts

47% subscribers are dissatisfied

In 1998 usage charges: Rs. 35/hr

Now reduced to: Rs. 5/hr

Telephone dial up charges : Rs. 1.2 for 3 minutes

- PC Penetration

PC sells in 2003: 2.3 Million

PC penetration (Mid 2003) : 0.8% (80:20 in commercial to domestic usage)

Growth forecast: 1.09% by 2005 (NASSCOM)

2% by 2006 (MAIT)

IT and ITES (NASSCOM Strategic Review 2003)

c) Total number of manpower employed in IT and ITES : 650,000

Out of this in IT services export: 205,000

Domestic IT services: 25,000

ITES export: 160,000

Users: 260,000

b) Total number of SEI CMM Quality V Certified institutions : 48

In India: 48

Of this Bangalore alone: 75%

Growth Potential

- **During Th plan , Internet demand is poised to explode significantly on account of following trends and developments :-**
 - **E-Learning applications and education services in the country ramping up from 1,00,000 - 6,00,000 schools , 250 universities and around 3000 institutions of higher learning in the areas of engineering , medicine, law and social sciences.**
 - **Nationwide Telemedicine referral system interlinking Public Health Centers (PHCs) with districts hospitals and state governments and national level super specialty hospitals both in government and private sector.**

Growth Potential

- **E-Commerce related activities including EDI services for export promotion and financial services such as Net Banking.**
- **E-Governance services facilitating citizen-centric govt. services (G2C) being made available through citizen portals with broad band access capabilities.**
- **Growth of Internet Telephony.**

Estimated Domestic Internet Bandwidth Profile

– operational by 2007

Dial – Up	311.00 Gbps	
Corporate Leased Circuits	45.00 Gbps	
E-Learning	82.50 Gbps	
E-Governance	6.60 Gbps	
Banks & Fls	4.00 Gbps	
Telemedicine	4.76 Gbps	
E-Entertainment	1100.00 Gbps	

(Broad Bandwidth)	1553.86 Gbps	1.5 Tbps

International (20% of Domestic)		310 Gbps

Suggestions for increasing growth of Internet in India

1. Tariff

- a. Adopt a flat tariff structure for calls made to access Internet, in consonance with the internationally popular practice, suggesting a shift away from per minute pricing regime to the pricing based on flat rate billing.
- b. Further reduce Internet service charges to be paid to the ISPs.

1. **Access Mechanisms**

- a. Open up Internet telephony, without any restriction, to and beyond ISPs, to PSTNs also.
- b. Encourage cost-effective wireless access by de -licensing 2.4 GHz (ISM) based for w-LANs applications outdoors.
- c. Facilitate usage of alternate access technologies like Cable TV (set top box) with in-built Internet access on any available medium e.g. PSTN, Wireless, Satellite on return path without any additional cost penalty. This will help reduce load on PSTN dial up. Thus relevant standards are to be mandated for STBs.
- d. Encourage use of other available access mechanisms remote usage through WLL, CorDECT and Broadband.
- e. Encourage, through a policy formulation, innovative technical solutions like voice on Internet over wired as well as wireless networks to enable cheaper access on PSTN lines

1. **Fiscal Measures**

- a. Encourage setting up Cyber Cafes in rural and remote areas by offering infrastructure at subsidized cost through tax exemption, softer loans etc.
- b. Encourage donation of used PCs for Internet access by Corporates, Government and Institutes of higher learnings to schools, community centers, cyber cages in remote areas etc. providing for fast depreciation.
- c. Encourage use of on-line services by introducing measures to reduce transaction cost through tax exemption.

1. Content/Services

- a. Encourage hosting of Websites & Portals in regional languages for offering citizen services, by providing special concessions on infrastructure such as Servers/Farms etc.
- b. Encourage private enterprise to offer such services as e-Education, e-Health, e-Governance, e-Entertainment, e-Agriculture using the telecom infrastructure provided by the Public Sector.

2. Infrastructure

- a. With the setting up of NIXI (National Internet Exchange) mandate all ISPs to route their traffic through it.
- b. Promote a liberalized framework domain name in the country by involving enterprise for marketing and registering the domains and using efficient technical infrastructure.
- c. Mandate Central and State-Government with defined (2-3%) spending on IT infrastructure and on-line services.

IPv6 is an upgrade to the data networking protocols

The Internet Engineering Task Force (IETF) developed the specifications during 1990.

The primary motivation is to expand the available address space of the Internet

Enabling billions of new devices such as PDS, Cellphones, appliances.

New users in countries like China and India etc.

New always on technologies such as XDSL, Fibre to the home cable etc.

Requirements for the new protocol

- Support billions of hosts
- Reduce size of routing tables
- Simplify protocol, process packets faster
- Provide better security (authentication & privacy)
- Better QoS (particularly for real-time data)
- Aid multicasting, anycasting
- Make it possible for a host to roam without changing its address
- Possibility of auto-configuration

The existing IPv4 protocol has 32 bit address space that provides approx. 4 billion hosts.

IPv6 has 128 address space that can address around 340 undecillions.

Main advantages of IPv6 are:-

Expand addressing capabilities;

Server-less auto-configuration (“plug-n-play”) and
econfiguration;

More efficient and robust mobility mechanisms;

Built-in, strong IP-layer encryption and
authentication;

Streamlined header format and flow identification, and;

Improved support for options/extensions

Global Scenario

Globally major efforts are going on in Japan, Korea, Taiwan, China, Europe, USA, etc. to deploy the IPv6 across their networks and services.

European commission is perusing the R & D activities in the IPv6 area, as well, focussing on projects, networks, trials and applications developed and demonstrated under the Information Society Technologies (IST) Programme.

How others have done it ?

- Europe: IST projects, IPv6 Forum, IPv6 taskforce, EU policy decision
- Japan: Political decision to deploy IPv6 nationwide, Multiple testbeds, applications and research projects
- Korea, China: Catching up with Japan
- U.S: Waiting in the wings, but not enthusiastic, however vendors are ready to deliver the boxes

European Projects

Development Projects:

- **6INIT: Introduction of IPv6 services in Europe (00-01)**
- **6WINIT: IPv6 Wireless Initiative (01-02)**
- **GCAP: Global Communication Architecture and Protocols (00-02)**
- **WINE: Wireless Internet Networks (00-01)**
- **LONG: Laboratories over Next Generation Networks (00-02)**
- **NGNLAB: NGN Laboratory (01-03)**
- **EURO6IX: Native IPv6 Exchange Backbone (02-04)**
- **6NET: IPv6 academic Network (02-04)**
- **Awareness and promotional projects**
 - 6LINK: IPv6 cluster project (new: start from Mar. 02)**
 - NGNI: NGN initiative (01-02)**

Transition tools from IPv4 to IPv6

Tunneling: IPv6 packets are tunnelled through an IPv4 network

Dualstack : Hosts and routers run both an IPv4 and IPv6 protocol stack.

Translation: Translates IPv4 packets to IPv6 packets and vice versa.

Translator technology

A translator device converting IPv4 to IPv6 and vice versa is installed, and communications between IPv4 and IPv6 nodes are enabled via this translator, so to speak, it serves as an interpreter” between IPv4 and IPv6.

Dual-stack technology

By adapting PCs and network equipment to be both IPv4 and IPv6-ready, IPv6 is used if the other end is IPv6-ready, and IPv4 is used if the other end is IPv4-ready. It is like a bilingual person who can speak two languages of IPv4 and IPv6.

Tunnel technology

To communicate by using IPv6, sender/receiver PCs and communications equipment such as relaying routers have to be all IPv6-ready. If non-IPv6-ready products are on the way, the IPv6 packet is encapsulated into an IPv4 capsule to pass non-IPv6-ready equipment as an IPv4 packet.

Proposed Indian Roadmap for IPv6

o facilitate the efforts of stakeholders regarding the adoption and the deployment of IPv6, for instance through awareness-raising campaigns

ndertaking detailed study for transition from IPv4 to IPv6 environments based on the experience gained through the networks within the country.

Involve Internet Service Providers to get connected to IPv6 based network and initiate the services within one year.

To facilitate, among other things by enabling IPv6, an integrated part of research & educational networks

Making all major ISPs and major universities / research laboratories in India IPv6 aware: Implement a show case for awareness creation among all stakeholders: users, ISPs, industries, research institutes policy makers and politicians.

R&D test bed for identifying the issues that need to be addressed for a smooth transition.

Undertake research and development activities for products, processes and systems for IPv6 environment.

Success of such products, processes and system depends on the spread of commercialization, therefore, industry to be involved ab-initio.- To consider initiatives aimed at the integration of IPv6 infrastructures, including the interoperability aspects of IPv6 services and applications,

To participate actively in the establishment of a nation wide, vendor independent, training and education programme on IPv6.

Making at least 2 large ISPs (both in public and private sectors) ERNET and BSNL, VSNL, Satyam etc. to provide select commercial IPv6 services.

National Taskforce for implementation of Ipv6 roadmap in India

1. Secretary, DIT – Chairman
2. Addl. Secretary, DIT – Vice- chairman
3. Dr. A.K. Chakravorty, Adv., DIT
4. Dr. Dheeraj Sanghi, IIT Kanpur
5. Gopi Garge, IISc, Bangalore & IPv6
Forum, INDIA
6. Rep. from DRDO

7. Rep. from ISPAI
8. Director, IDRBT, Hyderabad
9. Rep. TRAI
10. Rep. COAI
11. Rep. Public/Private Networks (BSNL/Sify)
12. Rep. NIXI
13. Sh. R.K. Arora, GC, CC&BT Group – Member Secretary
14. Dr. Govind, director, DIT - Convenor

National Centre for IPv6 technology Evaluation & Testing

- **Scope:** The Centre will perform:
Evaluation/testing, Addressing engineering issues involving research and development,
Publish the resultant reports/papers etc.
- **Deliverables:** Research and development reports, Publications in appropriate journals, publication of evaluation / test reports to the user community / collaborating organisation, assistance in IPv6 capable product design

IPv6 awareness project for ISPs, Universities & Research Laboratories

Scope: Workshops, Seminars and Tutorials for spreading IPv6 –

Awareness in the country as well as assisting them in making smooth transition towards IPv6

Likely partners: BITS- Pilani, ERNET, BSNL/VSNL, WIPRO

IPv6 based QoS – aware Grid Computing Project

This shall be a long-term research project aiming at evolving new architectures and solutions for scalable QoS- aware Grid Computing for IPv6-capable systems. The project shall also benefit from the involvement of BITS in the PlanetLab project.

Likely partners: C-DAC, Pune, BITS – Pilani, IISc. – Bangalore, University of California at San Diego, University of Bern, ComLab at Oxford University

Location: BITS - Pilani

Setting Up of a Testbed project connecting various Research & Education

Institution: ERNET

Scope: To study the interoperability issues
between various nodes, QoS and application
on IPv6

Partners: IIT, NITs etc.

Design & Development of IPv6 Application Tools

Scope: Design & Development of IPv6 Tools
for various applications

Agency: CMC Limited

IPv6 Test Set Up in public and private networks such as BSNL, MTNL, Sify, HCL Infinet etc.

Scope: Experimental services such as ADSL, dual stack etc.

Agency: IPv6 Forum India members

IPv6 setup in a corporate and Govt. enterprise

Scope: To deploy IPv6 products in Govt., corporate networks and verify issues like inter-operability, VoIP applications etc.

International Cooperation

Scope:

Indo-EU joint proposal on IPv6

Indo – Japan, Indo- Korea, Indo –
Taiwan joint proposal on IPv6