Ministry of Communications & IT
Department of Telecommunications

IPv6 Deployment in India - Policies and Plans

Tokyo (Japan)

03.02.2011

Department of Telecommunications (DoT)

- The **Department of Telecommunications** is part of the Ministry of Communications and Information Technology ,

Main Functions

- Policy Formulation for the growth of telecommunication services in India
- Grant of licenses for various telecom services
- Spectrum Management ,Regulation and monitoring Wireless usage

Status and Growth of Indian Telecom Network

Unprecedented Growth

- Indian Telecom sector has witnessed over 5 times growth in last five years
- 2nd largest telecom network in the world with more than 764 Million customers
- 100 million Internet users and180 million data users on mobile
- Mobile Number Portability (MNP) has been introduced in the country recently

Deployment of IPv6 in India

Need for IPv6

Only 18.5 million IPv4 addresses for a population of 1.2 billion in India.

- But the requirement for IP addresses will keep increasing with new services, new networks, new applications.
- Telecommunications will be largest consumer of IP addresses in coming years (Broadband, 3G, NGN, 4G, LTE etc.)
- IPv4 is a **diminishing resource** and is very costly compared to IPv6 right now and will be more costlier with passage of time

IPv6 is the only solution !

Initiatives by Government

Various issues on IPv6 were deliberated at different levels in DoT, Department of Information Technology (DIT), Telecom Regulatory Authority of India (TRAI) and other Stakeholders during previous years based on which Telecom Commission in 2009 took certain decisions for IPv6 related activities in India

Government of India's Decision

- All Government Departments to purchase IPv6 enabled equipments in future
- To conduct Training Programmes for imparting knowledge in IPv6 domain.
- Preparation of Migration Strategy and Migration Plan for the country.
- Telecommuinication Engineering Centre(TEC) to take up with Equipment Manufacturers, Service Providers and other stake holders to deploy IPv6 Compliant Equipment

IPv6 Related Activities undertaken by Telecom Engineering Centre (TEC) under Department of Telecommunications (DoT)

Workshops Conducted by TEC

Sr No.	Date	Venue	Theme
1	21st July 2009	New Delhi	Migration from IPv4 to IPv6 in India
2	15th Sept 2009	Bangalore	IPv6 Transition and Greenfield Applications in India
3	22nd October 2009	Chennai	IPv6 as a New Platform for Innovation
4	27th Nov 2009	Mumbai	IPv6: New opportunities for the Country
5	22nd Jan 2010	Kolkata	IPv6 Migration Timeframe by Consensus or Mandate
These workshops were well attended by more than 1000 participants involving all telecom service providers, manufacturers, industry associations, industries, govt. departments, educational institutions (IITs, IISc etc.)			

Other Events

- **Training Programme with APNIC, Australia (25-26th Nov 2009, Mumbai)**
- **International Summit with IPv6 Forum (15-16th Dec 2009, New Delhi)**
- **Appointment of Nodal Officers in Central & State Govt. Departments for IPv6 Deployment**

Workshops Participation Statistics

CATEGORY	Workshop-1 (New Delhi)	Workshop-2 (Bangalore)	Workshop-3 (Chennai)	Workshop-4 (Mumbai)	Workshop-5 (Kolkata)
Government Organizations	74	72	70	30	45
Industries	53	45	49	51	37
Telecom Service Providers/ISPs	19	21	25	20	22
Educational Institutes	1	3	3	10	8
Others	103	99	93	39	18
TOTAL	**250**	**240**	**240**	**150**	**130**

Some important extracts from Workshops

- Suitable policy framework by Govt. for smooth Transition.
- Specific deadlines for Transition
- Creation of IPv6 Task Force and working Groups
- More Training and awareness activities
- Guidance to SME service providers and organizations on implementing IPv6
- Govt. departments should take IP-based services from only IPv6 ready ISPs after a certain period of time
- Promoting Pilot projects in "Greenfield Applications"

Actionable Points of "National IPv6 Deployment Roadmap"

"**National IPv6 Deployment Roadmap**" was released by the Government of India **in July 2010**. based on various IPv6 activities and discussions

1. All major Service providers (having at least 10,000 internet customers or STM-1 bandwidth) will target to handle IPv6 traffic and offer IPv6 services by **December-2011**

2. **All central and State government ministries and departments, including its PSUs, shall start using IPv6 services by March-2012**

3. **Formation of the IPv6 Task Force** with one Oversight Committee, one Steering Committee and 10 working groups

MOUs/ Agreements/ Collaborations

Sr No.	Date	Venue	Event	Description
1	1st October 2009	New Delhi	MOU with the IPv6 Forum	To jointly participate in various IPv6 activities in India in association with the India Chapter of the IPv6 Forum
2	1st October 2010	New Delhi	MOU with the IPv6 Promotion Council, Japan	To collaborate on various projects and issues concerning the deployment of IPv6 in India (e.g. **Smart Building Pilot Project**)
3.	-	-	IIT Kanpur	Joint collaboration between TEC, IIT Kanpur and BSNL for working on a pilot project on "Intelligent Transport Systems using IPv6"

MOU with the IPv6 Promotion Council, Japan

Under this MOU following activities are envisaged:

- Promote IPv6 for telecommunication services
- Smoothen the IPv6 transition process
- Assist vendors, operators and other stakeholders in the transition
- Test Bed creation for IPv6 testing
- IPv6 applications in wireless sensors
- IPv6 in important sectors like Health, Transportation, Environment, Public Safety
- Cooperation in IPv6 trails and IPv6 pilot projects

Few Required IPv6 based Pilot projects in India

- Logistics and Supply Chain (e.g. Railways, Shipping, Postal etc.)
- Intelligent Transport System (e.g. Road & Surface Transport)
- Intelligent Warfare (Ministry of Defence)
- Healthcare System (Ministry of Health)
- Tele-education (Ministry of Human Resource Development)
- Smartgrids (Ministry of Power)
- Smart Buildings (All Ministries)
- Sensor based Intelligent Systems (Weather Monitoring, Agriculture etc)

1. **Different Ministries, Government Departments and Organizations along with Private Sector will Work on these and similar Pilot Projects.**

2. **Many ministries/Departments don't have enough computerization so they can jump start directly with IPv6 without going in for legacy IPv4 network**

Proposed IPv6 Deployment Plan for Service Providers & Govt. Departments

Timeframe of Activities by Service Providers

Sr. No.	Activity	Proposed Target Date
1.	Circulation of letters, guidelines, checklist , important points from roadmap etc. to all concerned within the organization	15.9.2010
2.	Form a dedicated "IPv6 Transition Team" within the organization	31.10.2010
3.	Audit of Equipment Reports by other Agency	30.11.2010
4.	Based on the Equipment Audit Reports, prepare an Equipment replacement plan to phase out non-compliant hardware and software.	31.12.2010
5.	Based on the replacement plan, prepare a procurement plan	31.01.2011
6.	Identify persons for IPv6 training and send them on training (Parallel Activity)	A continuous process

Timeframe of Activities by Service Providers

Sr. No.	Activity	Proposed Target Date
7.	Initiate the process of procurement of hardware and software as per the plans	31.03.2011
8.	Set up a pilot test network for testing and training	31.05.2011
9.	Equipment Procurement and deployment in the network	30.09.2011
10.	Testing of hardware and software and migration of applications	15.12.2011
11.	**Launch of IPv6 Services**	**31.12.2011**

Timeframe of Activities by Govt. Departments

Sr. No.	Activity	Target Date
1.	Appointment of State Nodal Officer	31.8.2010
2.	Circulation of letters, guidelines, checklist etc. to all ministries / organizations / educational institutions / PSUs etc. and orders on appointment of departmental nodal officers to all Departments	15.9.2010
3.	Appointment of Next level Departmental Nodal Officers	30.9.2010
4.	Form a "State Transition Team" consisting of concerned officers & experts from stakeholders like service provider, vendors, software developers etc.) for giving technical advice and look into issues concerned with transition to IPv6	31.10.2010
5.	Call a meeting of all ministries, organizations, educational institutions, PSUs etc. and discuss the following issues – a)Instructions issued by DoT b)Checklists issued by TEC c)Annexure 'A' & 'B' of Roadmap d)Preparation of equipment reports	30.11.2010

Timeframe of Activities by Govt. Departments

Sr. No.	Activity	Target Date
6.	Reports preparations based on activities in Sr. No. 5	31.12.2010
7.	Audit of Equipment Reports by other Agency	15.01.2011
8.	Based on the Equipment Audit Reports, prepare an Equipment replacement plan to phase out non-compliant hardware and software. Assistance may be taken from "State Transition Team"	15.02.2011
9.	Based on the replacement plan, prepare a procurement plan for different ministries / departments	15.03.2011
10.	Identify persons for IPv6 training and send them on training (Parallel Activity)	A continuous process

Timeframe of Activities by Govt. Departments

Sr. No.	Activity	Proposed Target Date
11.	Float tenders for procurement of hardware and software as per the plans	15.04.2011
12.	IPv6 Address Allocation Policy	30.06.2011
13.	Set up a pilot test network either centrally or in each department for testing and training	31.07.2011
14.	Equipment Procurement and deployment in the network	31.10.2011
15.	Testing of hardware and software and migration of applications	28.02.2012
16.	**Launch of IPv6 Services**	**31.03.2012**

Meetings for IPv6 Implementation and Important Issues

Many different meetings conducted with service providers, Central and State Government Departments and other stakeholders and following issues emerged –

- **Consultancy** required by almost all Government departments for IPv6 Implementation
- Vendors of mobile handsets have to be pursued for manufacture of **IPv6 compliant handsets**
- Vendors and application developers also to be pursued for developing and **supporting IPv6 applications**
- Proper **IPv6 address Planning** for India
- Urgent need for National Internet Registry (NIR) in India
- To put up a **detailed FAQ** on IPv6 transition on the website (Under development)
- To give out a **comprehensive list of IPv6 hardware and software** compliance of networking equipments to be used as a ready reference (Already released)

India IPv6 Task Force

(Structure & Functions of Working Groups)

India IPv6 Task Force

1. **Formation of IPv6 Task Force was approved by Government in July 2010. The IPv6 Task Force has the following committees & working Groups**
   - Oversight Committee
   - Steering Committee
   - 10 working groups

2. **Membership of the task Force has now been finalized by the Government**

Oversight Committee

Secretary(T), Chairman

- **Member(T), Vice Chairman**
- **Advisor(T) DoT**
- **Sr.DDG, TEC**
- **Senior Officers of DoT/DIT/TEC**
- **DDG(NT), Convener**

Industry Associations / Heads of Service Providers / Key Govt. Departments / Educational Institutions / Industry Forums / eminent persons

Steering Committee (To Head the Working Groups in Task Force)

Advisor(T)/Member(T)
Chairman

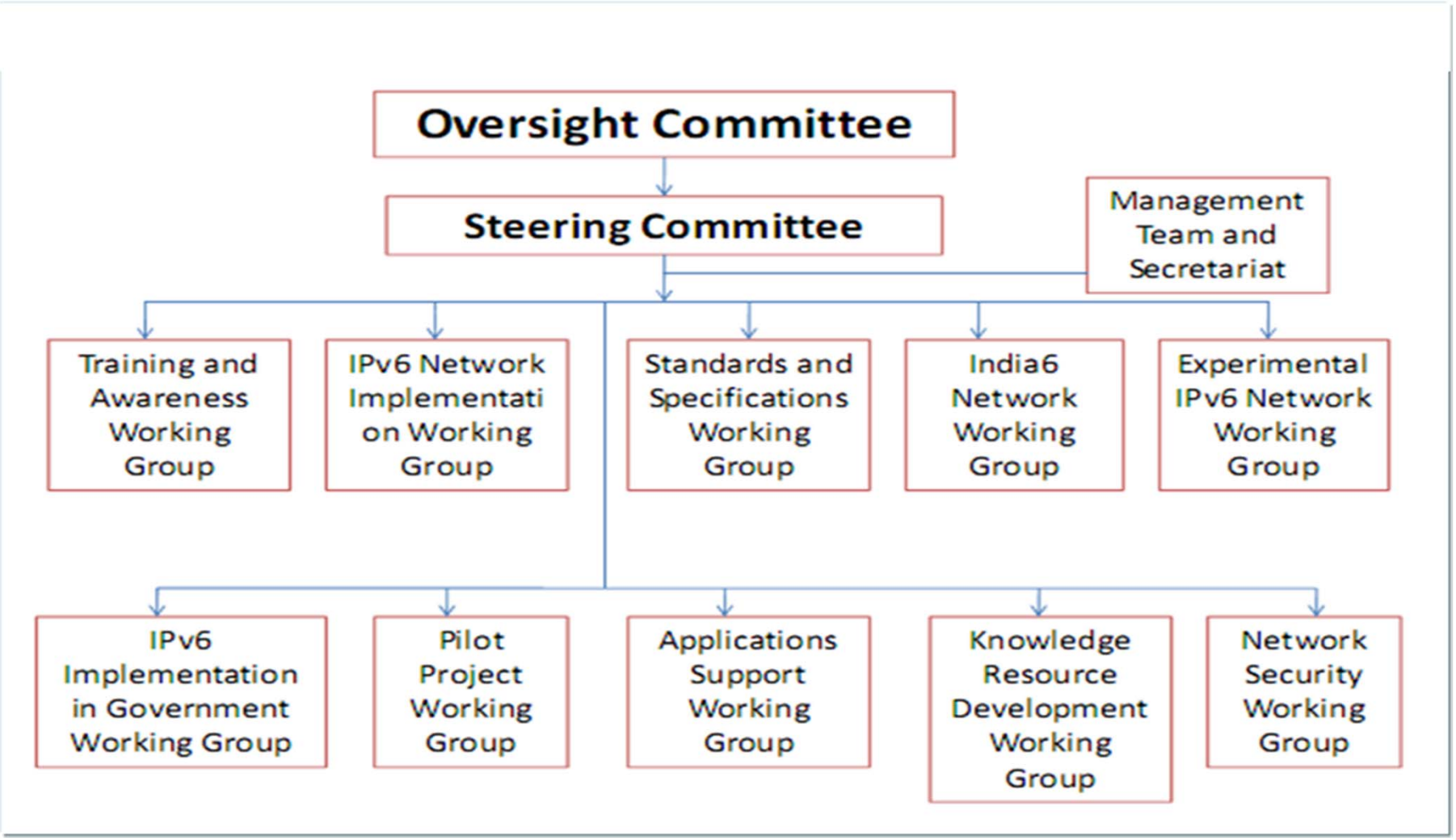
Sr.DDG, TEC
Vice Chairman

Senior Officers of DoT/ DIT/TEC

DDG(NT), Convener

Industry Associations / Heads of Service Providers / Key Govt. Departments / Key Educational Institutions / Industry Forums / eminent persons

Structure of "India IPv6 Task Force"



Lead & Co-Lead Organizations for Working Groups

Sr.No.	Name of the Working Group	Lead Service Provider / Organization	Co-Lead Organizations	No. of Members
1.	Training and Awareness WG	BSNL	CMAI, CISCO, TATA	21
2.	IPv6 Network Implementation WG	TEC	CISCO, BSNL, SIFY, NIC	66
3.	Standards and Specifications WG	TEC	CDOT, IPv6 Forum	20
4..	India6 Network WG	Tata Communications	COAI, AUSPI, DoT, CISCO	22
5.	Experimental IPv6 Network WG	SIFY	TEC, Juniper	11
6.	Pilot Project WG	DIT	Tech Mahindra, ERNET	13
7.	Applications support WG	Tech Mahindra	UTStarcom, CDOT, IAMAI	16
8.	Knowledge Resource Development WG	ISPAI	BSNL, IAMAI, NIXI	18
9.	IPv6 Implementation in the Government WG	DoT	TEC, M/o Railways, NASSCOM, CCAOI	130
10.	Network Security WG	DoT	M/o Defence, MHA, IISc Bangalore	6

Note: Each working Group will be headed by a Lead Organization

Functions of Different Working Groups

WG-1 (Training and Awareness for ~ 250,000 persons)

•Hands-on trainings in association with APNIC, IISc and other organizations
•IPv6 Certification programs for qualified engineers
•Trainings for nodal officers from government
•Conducting Workshops, seminars and conferences

WG-2 (IPv6 Network Implementation)

•Studying the different network scenarios and make action plans for individual service providers / organizations.

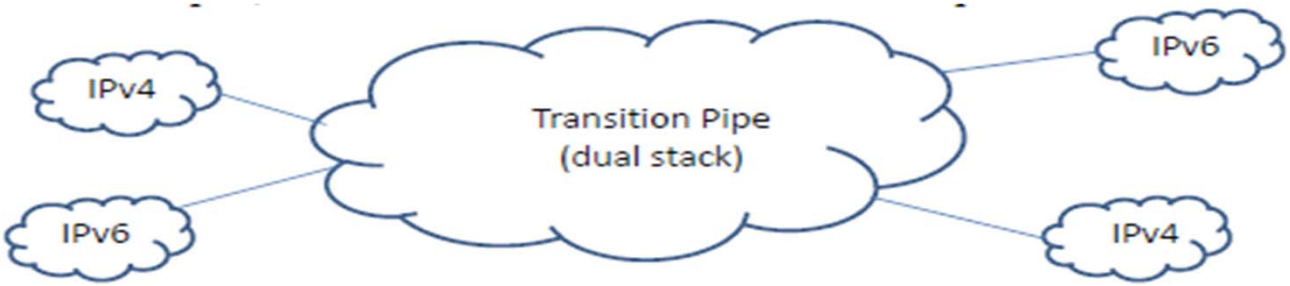
WG-3 (IPv6 Standards and Specifications)

•Coordinate with TEC for development of common IPv6 specifications for the country, which will be followed by all stakeholders.

Functions of Different Working Groups contd..

WG-4 (India6 Network)

•To study, plan and prepare a project report for building a nationwide IPv6 Carrier Network called “Transition Pipe”, which will be entrusted to one of the operators



WG-5 (Experimental IPv6 Network)

•Study, plan and prepare to build this network, which can then be used for experimentation by different vendors and organizations both from the public and the private sector.

Functions of Different Working Groups contd..

WG-6 (Pilot Projects on "Greenfield Applications")

•Prepare Plans, project reports, funding models and coordinate with different government and service providers to take up the deployment of such pilot projects to demonstrate the IPv6 capabilities

WG-7 (Application Support)

•Facilitate the transition of existing content and applications and development of new content and applications on IPv6.

WG-8 (Knowledge Resource Development)

- To ensure active participation of the educational institutes
- Involved in the change of curriculum to include study of IPv6 as a subject.

Functions of Different Working Groups contd..

WG-9 (IPv6 Implementation in Government)

- Pursue with different government departments for implementation of IPv6.
- Guidance on solving problems related to implementation of IPv6
- Members will be drawn from nodal officers in various government departments for active participation

WG-10 (Network Security)

- Research on Security related issues in IPv6
- Development of security protocols specific to India for use in Indian Networks

Workgroups: Activities Completed So Far
&
Next Steps…..

WG1: Training & Awareness

Responsibilities

- Hands on training in association with APNIC, IISc and other organizations
- IPv6 Certification Program for qualified engineers
- Network Engineers Training
- Training for Nodal Officers from Government
- Conducting Conferences, Seminars and workshops

Scope

- There are about 100 different central government departments / ministries
- Each department/ministry has about at least 100 different units including PSUs and their wings etc
- There are 34 states/UTs and each one has about 100 different state government ministries, departments and PSUs
- By conservative estimates, even if 5 persons are required at each place the demand is a staggering 67,000 persons (Approx.) to be trained on IPv6

Readiness of BSNL

- BSNL has 18 regional training centers spread geographically throughout India
- BSNL has already trained 60 trainers of 18 training centers .
- BSNL is setting up 2 IPv6 test lab
  - Connectivity for all training RTTCs and above test labs for Remote Testing and Monitoring.

WG3: Standards & Specifications

TELECOMMUNICATION ENGINEERING CENTRE
दूरसंचार अभियांत्रिक केन्द्र
MINISTRY OF COMMUNICATIONS AND INFORMATION TECHNOLOGY
संचार एवं सूचना प्रोधोगिकी मंत्रालय
DEPARTMENT OF TELECOMMUNICATIONS
दूरसंचार विभाग
GOVERNMENT OF INDIA
भारत सरकार
सत्यमेव जयते
ISO 9001:2008

IPv6 Standards for India

- TEC is developing the Standards Document for IPv6 Testing, which will be released by March 2011
- TEC also proposes to set up IPv6 Test bed for testing these standards
- Other organizations can also set up the Test Beds and apply for accreditation to TEC/IPv6 Ready Logo for testing these standards

WG4: India6 Network

TATA COMMUNICATIONS

TAKING YOU FARTHER ™

India6 Network Phase wise approach

The activities of the India6 Network Working Group will be carried out in 5 phases

Awareness & Survey

Needs Awareness survey and roadmap

India6 Network Requirement

Building of the India6 Network requirement summary

Network Build

Building of the India6 Network

Traffic and Application Migration

IPv6 Traffic Application testing and migration to the India6 Network

Support

Ongoing support and optimization

- India6 Network approach has been defined
- The requirements and applications will drive the network build rather than other way around
- Govt. and Academia must take the lead in creating the innovation culture in India

WG5: Experimental IPv6 Network

sify

Objectives

- Create an IPV6 ready Experimental network for
  - Service providers to Plan / Test their V6 migration
  - Government Agencies to Plan / Test their V6 migration
  - Enterprise Customers to Plan / Test their V6 migration
  - Equipment / Application suppliers to test their product readiness under customer scenarios
- Work on creating a logo lab in India

Network Design Guidelines

Network to support simulation of various user/client and application/server environments like in

- Enterprise Network scenarios
- Consumer network scenarios
- Equipment suppliers testing scenarios
- Application Providers testing scenarios

WG6: Pilot Projects on “Greenfield Applications”

Need for Pilot projects

IPv6 Adoption Challenges

- Large Investments in Current IPv4 Infrastructure -
- Uncertainty of Market Demand
- Lack of IPv6 Skills
- Lack of IPv6 ready products and solutions
- Lack of Government incentives

IPv6 Pilot Project - Goals

- Technology demonstration – Build confidence in IPv6 as a technology
- Innovation – Entrepreneurship, New ideas and solutions
- Showcase application of IPv6 in e-governance/citizen services in cities/districts/states – *Create market demand*
- Showcase that IPv6 applications can impact/enhance the lives of our citizens – *Create market demand*
- Showcase solutions – which result in RoI

A few IPv6 pilot projects planned

- Initiate IPv6 pilot projects across at least across one state from eastern, northern, western and southern part of India.
- Proposed states: Bihar, Uttarakhand, Gujarat, Maharashtra, Karnataka, Jharkhand, Andhra Pradesh, Tamilnadu
- A pilot project would be executed across at least two states

A few IPv6 pilot projects planned

Sector	Pilot project
IT Infrastructure	IPv6 enablement of State Data Center Infrastructure (Including switches, network component, monitoring, SSDG, security, access control, Edge, Cloud, Green DC)
IT Infrastructure	IPv6 based Backbone Testbed
Citizen Services	IPv6 Enabled Citizen Services over Secure Data Center
Citizen services	Delivery of Citizen Services over IPv6 enabled SDG (issuance of Income Certificate, Child School performance monitoring System)
Agriculture	IPv6 enablement of Wireless Sensors for Agriculture use (Example in a greenhouse to monitor temperature and moisture and turn on relevant devices to control these parameters)
Healthcare	IPv6 based Healthcare/tele-medicine Electronic Health records linked to Aadhaar and stored centrally Providing health based benefits to beneficiaries using IPv6 enabled devices and authentication based on Aadhaar
Education	IPv6 based e-learning system
Electoral process	Internet based voting using Aadhaar

Milestones

- Finalize Pilot projects – 1 Month
  - Scope
  - Location
  - Size
- Get funding approvals – 3 Months
  - Resources
  - Logistics
- Execution of projects – 12 – 18months

Deliverables

- Demonstration of IPv6 enabled infrastructure, Applications and services
- Creation of IPv6 resource pool
- Scalable solutions which can be adopted across the nation

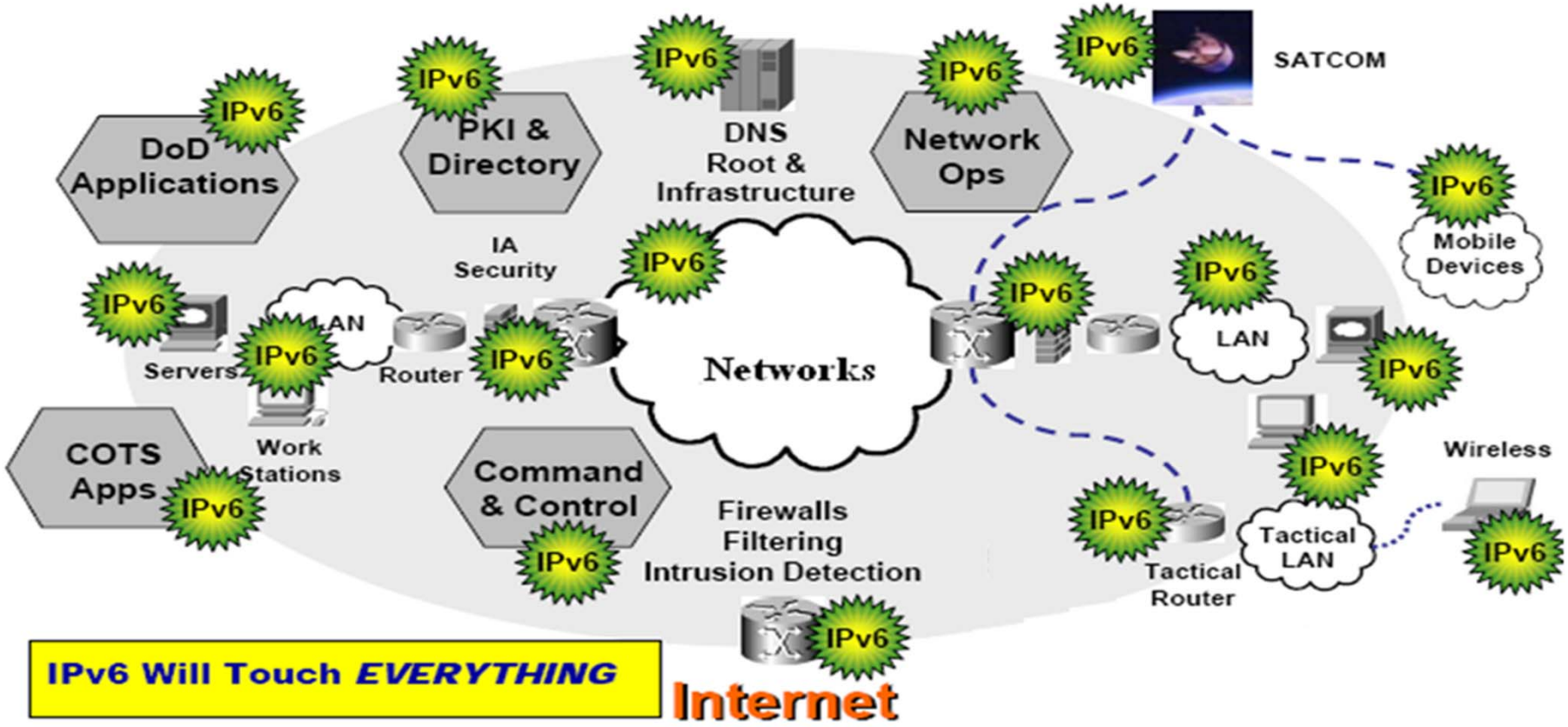
Role model District/Village/State around IPv6 solutions

WG7: Application Support

CREATE THE NEXT WAVE

Tech Mahindra
IT Services and Telecom Solutions

Areas Impacted by IPv6



IPv6 across applications

- State wide Wide area Network (SWAN)
- State Wide Data Center (SDC)
- Common services Center (CSC)
- E-Governance services
- Citizen services

E-governance/Citizen services Applications

- UID services
- Ration card services
- Passport services
- Income tax services
- Electoral services
- Police services
- Education services
- Healthcare services
- Energy monitoring
- And so forth ….

IPv6 Consulting – Key Deliverables

IPv6 Transition Strategy and Planning

- IPv6 Transition Impact Analysis
- IPv6 Business Case Development
- IPv6 Transition Strategy and plan Development
- IPv6 Transition Project Management

IPv6 Network Infrastructure Transitioning

- IPv6 Architecture Development
- Network Transition planning and Project Management
- IPv6 OSS/BSS and Network Management Solutions

IPv6 Application Transition

- Application – IPv6 Impact Analysis
- Application – IPv6 migration
- Application – Verification and inter-operability

IPv6 Security Solutions

- IPv6 Security Planning
- IPv6 Security Architecture Development
- IPv6 Security Guidelines - Best practices
- Risk Analysis and Mitigation Techniques

IPv6 Solution Showcase

Location in India	Applications to be showcased	Details
Pune	IPv6 Applications - OSS, BSS, L2C, T2R, Security	Showcase IPv6 Applications in the mentioned specific areas
Noida	VAS – Applications IMS Lab – Cloud computing, Virtualization	Showcase IPv6 VAS applications and Enterprise scenarios
Bangalore	IPv6 Applications Lab for Service Providers Core , Broadband network, Mobile	Showcase and test IPv6 Applications specific to service providers.
Hyderabad	Industry vertical lab for IPv6 Applications	Catering to Industry vertical labs related to Energy, Healthcare and others
Mumbai	Industry vertical lab for internet and mobile applications	Showcase large internet application such as email, content delivery etc, critical internet infrastructure and interoperability

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