2001:E30:1801:1::ABCD

IPv6
The future of networking……for the welfare of mankind

ERNET India

Indian Research and Education Network

Wednesday, October 09, 2013

What IPv6 offers?

The massive proliferation of devices, need for newer and more demanding applications on a global level and the increasing role of networks in our lives are some of the pressing issues the IPv6 protocol seeks to cater to.

IPv6 protocol offers:

✓ New header format designed to keep header overhead to a minimum. The streamlined IPv6 header is more efficiently processed at intermediate routers.

✓ Large address space - IPv6 has 128-bit (16-byte) No need for NAT.

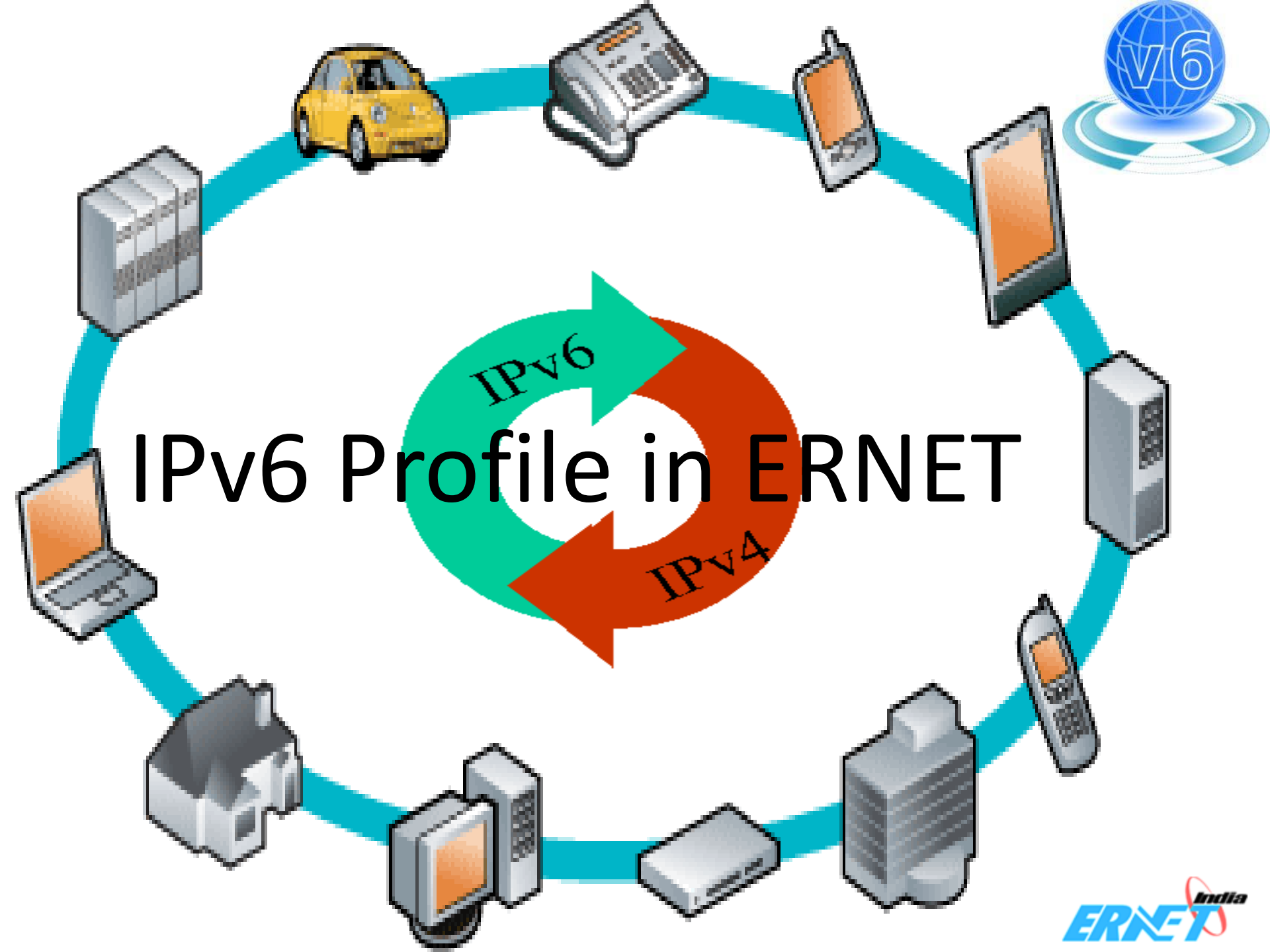
✓ Stateless and stateful address configuration both in the absence or presence of a DHCP server. Hosts on a link automatically configure themselves with link-local addresses and communicate without manual configuration.

✓ Built-in security: IPSec is actually a part of the IPv6 protocol. IPv6 provides header extensions that ease the implementation of encryption, authentication, and Virtual Private Networks (VPNs) - utilized along the entire route, from source to destination.

✓ Better support for prioritized delivery thanks to the Flow Label field in the IPv6 header

✓ Extensibility- IPv6 can easily be extended for new features by adding extension headers after the IPv6 header.

IPv6 thus holds out the promise of achieving end-to-end security, mobile communications, quality of service (QoS), and simplified system management.



IPv6 Profile in ERNET

ERNET's IPv6 Profile

1st network in India to offer dual stack IPv4 & IPv6 about 6 years ago.

IPv6 enabled applications like Domain Name Server (DNS), Mail Server, Webserver, Web-casting, Video Conferencing, e-learning etc. have been implemented on the dual stack network.

Most user have IPv6 upto CPE level

All POPs are IPv6 enabled

Number of applications are running e.g ISABEL multimedia applications, conferencing, Iperf etc.

Experiments across labs in India, Europe & Asia Pacific have been undertaken on IPv6 (6LowPAN, 6Choice, Telemedicine-DVTS)

Number of workshops, training events organised to promote and train users in the use of IPv6 on a regular basis.

ERNET works closely with the industry and institutions to undertake research and development in the area of IT products and applications on IPv4 as well as IPv6.

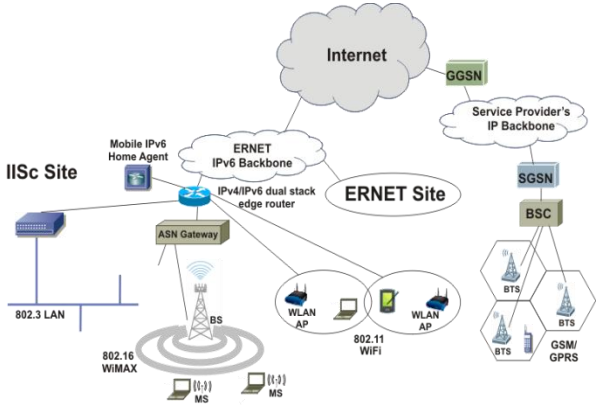
2 Gbps of dedicated connectivity for experimentation running live IPv6 traffic to Asia Pacific region and the west.

ERNET India

IPv6 Projects

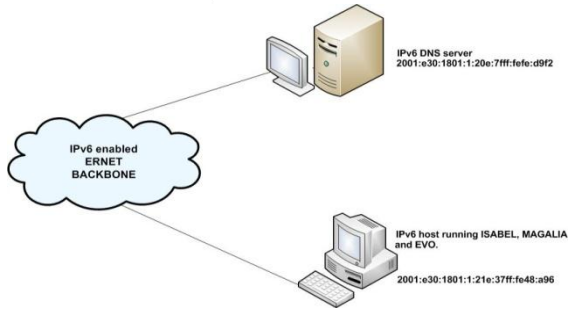
Mobile IPv6

- To build and deploy Mobile IPv6 Test bed to support network layer (Layer 3) mobility
- Mobile IP is part of both IPv4 and IPv6 standards.
- Support for seamless mobility between heterogeneous access networks – WLAN, WiMAX and Cellular network



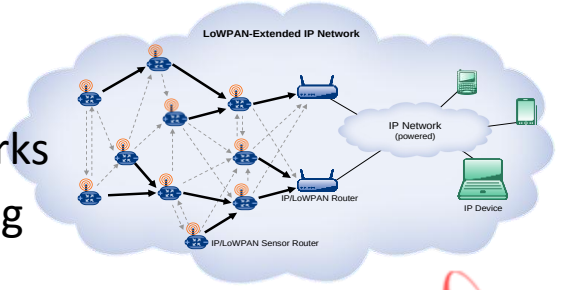
6CHOICE

- ERNET GEANT GARUDA (EGEE) European Grid
- To promote IPv6 adoption
- Consortium of eight members from Europe and India
- ISABEL - a distributed presentation tool - Tested
- Workshops, training events organized to train users on IPv6



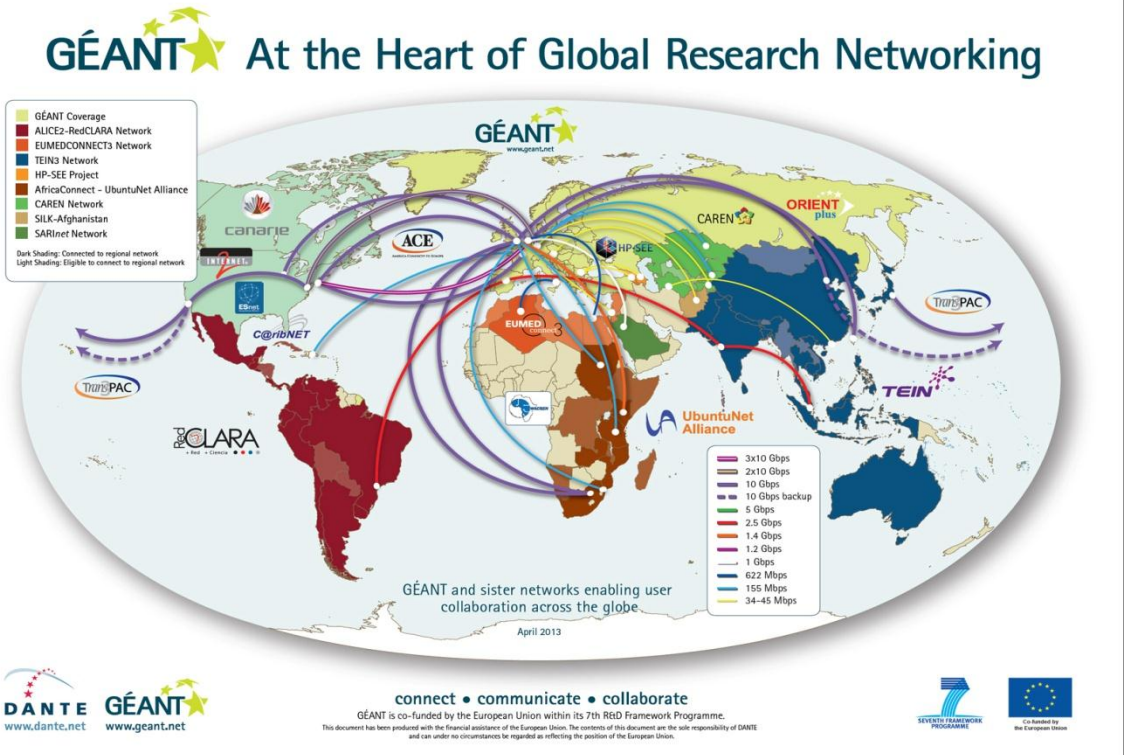
6LowPAN

- Adaptation of IPv6 onto low powered Wireless Sensor Networks
- Design and develop a framework for monitoring and managing
- Monitoring parameters adhering to open standards – SNMP
- Real-life Application demonstration (e.g., agriculture, healthcare)



Connectivity with European Research Network – GEANT / TEIN3 / TEIN4

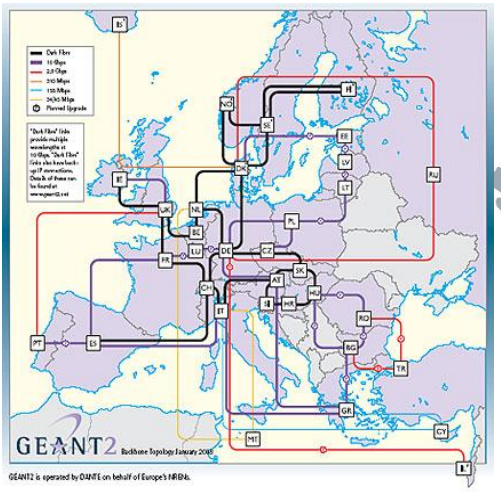
- To provide direct connection between the region to support current & potential co-operative research between regions
- Share each others resources
- Regular IPv6 traffic between ERNET & other NREN's

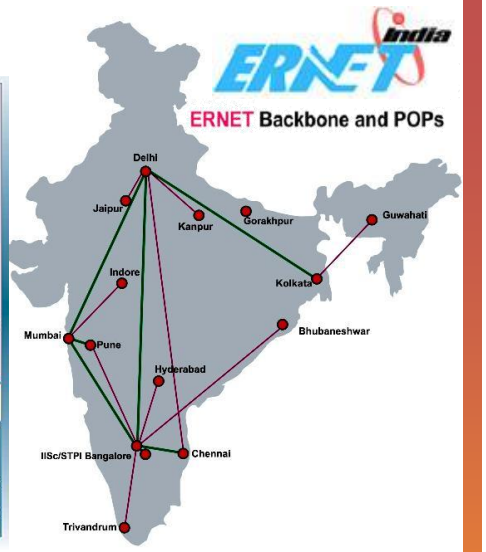


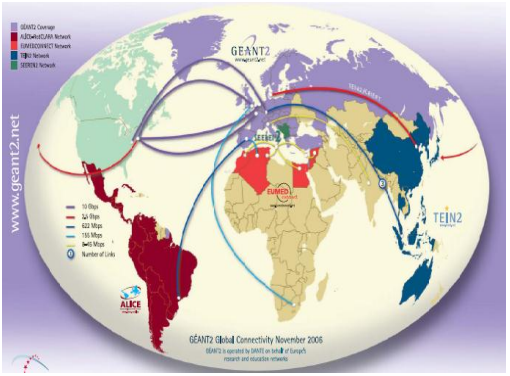
6CHOICE.eu

IPv6 Cooperation

The Right Choice For the Future Internet







6Choice Facts

Instrument: CSA-CA FP6

Start date: 01/03/2008

Duration: 24 months

http://www.6choice.eu

6Choice Goals

Boost close co-operation of Universities, R&D centres and initiatives connected to ERNET & GEANT regional networks after their interconnection.

Promote the common exploitation of existing & new IPv6 services, tools & contents.

Coordinate workshops, training courses and concertation meetings to promote IPv6 usage & benefits.

Support GARUDA (Indian Grid project) & EGEE GRID network in Europe.

6Choice Participants

UCL, Renater, Telefónica Investigación y Desarrollo, ERNET India, HP, Sify, TELSCOM, Indian Institute of Science

6Choice Cooperation

6DEPLOY
FEDERICA
GLOBAL
EURO-INDIAGRID

6CHOICE.eu

The Right Choice

IPv6 Cooperation

For the Future Internet

Home Environment

http://6choice.ipv6.telscom.ch/TelscomHomeEnvironment

Shows home appliances & sensors control over standard IPv6 enabled web browsers.

Main goal is to show attractive applications fields expected to be improved by IPv6.

All users experiencing it are expected to save energy and leave appliances switched off !

ISABEL Conferencing

isabel://lab.ipv6.telscom.ch/conference

http://isabel.dit.upm.es

Enables realization and participation in distributed events with remote speakers, attendants and/or auditoriums.

Main goal is enable EU & Indian organization to participate in planned events and organize new ones.

Techcnial University of Madrid (UPM) cooperated with free testing licenses and events coordination.

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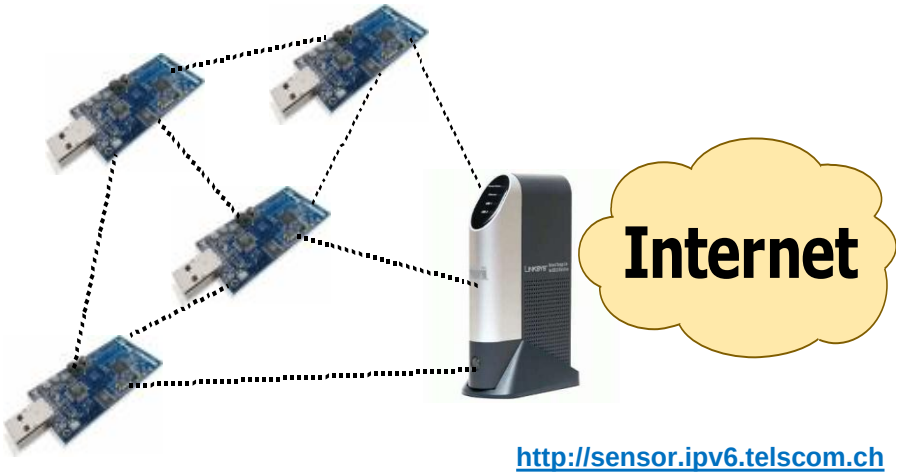
IPv6 Cooperation

The Right Choice For the Future Internet

Sensor Networks



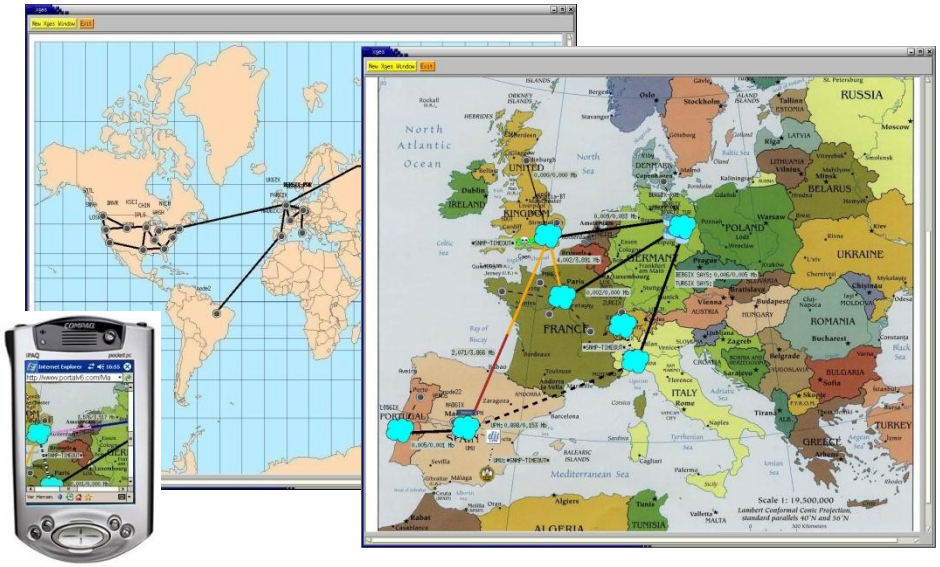
http://sensor.ipv6.telscom.ch

A sensor network is provided for remote demos & experiments, including humidity, light & temperature sensors. 802.15.4 (Zigbee) & IPv6 gateway are used.

The main goal is to collected from the sensors can be accessed remotely. Status panel is located under address 2001:1620:2028:1000::3000.

Indian researchers may remoteley access and demonstrate the scenario.

Real-Time Monitoring



MAGALIA tool enables graphic & real-time monitoring of network traffic and services activity.

The main goal is to set up MAGALIA EU and Indian sites sharing real-time specific information so that all them are then able to build global & regional conetxtual maps.

As an open source tool, new maps & monitoring features can be easily added as needed by the community.

The Opportunities

Future for the next generations; Comfort for the present

- Societal challenges

Health monitoring for aging people

Improving the living standards

- Environment challenges

Global warming

Judicious usage of natural resources

- Better quality, productivity and new business models

Improvements and consistency in quality and productivity

Insights into real-world in real-time leading to new businesses

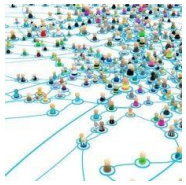
- Safety and security

Dissemination of vital information in real time

Safety and security of people with privacy

The Solution

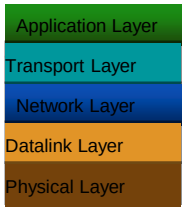
IPv6 brings the technology closer to the people



Internet of Things

Internet enabled objects that interacts with the environment

Provides insights into the real-world in real-time



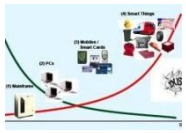
Underlying technologies

WPANs (e.g. IEEE 802.15.4), IPv6, RFIDs, sensors, smart-handhelds and real-time web

A new paradigm in communication

Thing-to-person and vice versa

Thing-to-thing



The application scope

70 billion machines, only 1% are connected

Enables the next trillion connections

The Applications

Healthcare

Patient care in hospitals and at home

Tele-assistance for aging and rural citizens

Connected Home

Home safety, security, automation and control

Smart appliances and home entertainment systems

Telematics

Improvement of safety of transporting systems

Fleet management and traffic flow optimization

Safety and Security

Periodic monitoring of the architecture status

Emergency warning information,

The Applications ...

Smart Grid

Enables smooth and efficient delivery of electricity

Quality, losses monitoring, Green energy integration and energy management

Saves energy, reduces cost and increases reliability

Industrial Monitoring

To increase productivity, efficiency, and safety

Machine Surveillance, asset tracking and storage monitoring

Agriculture Monitoring

Accurate temporal and spatial monitoring

Reduced water, energy, and pesticide usage; Better productivity

Smart Cities

Sustainable urban development; Eco-friendly infrastructure

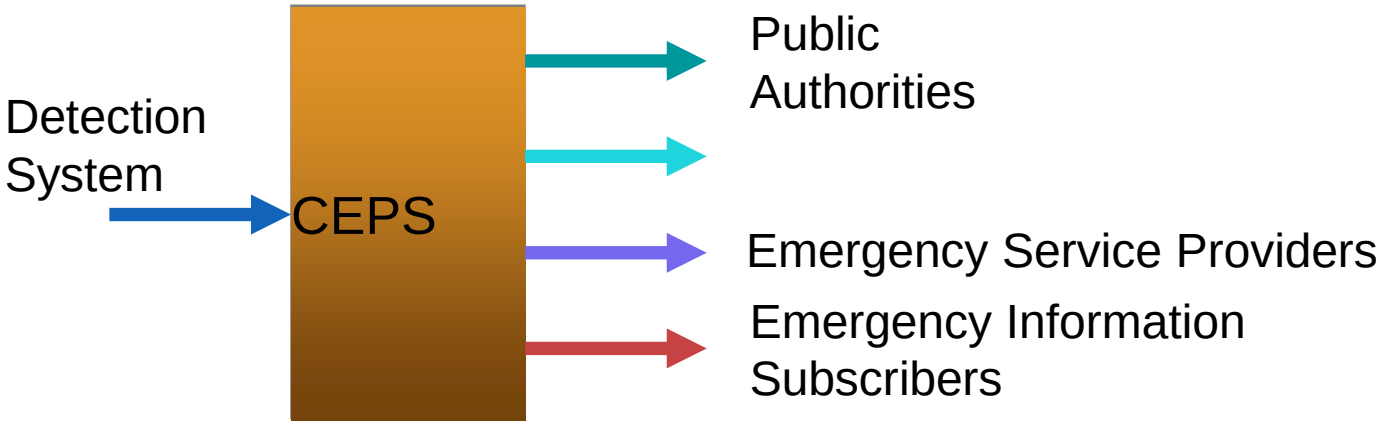
Water, land, skills and energy resources optimization

Pilot Projects in the Pipeline

City Surveillance

- Setting up network of IPv6 Cameras with lumens spike detection
- Provide Video Conferencing facility on handheld
- Provide sensors for high noise detection
- Speed Detectors

Emergency Processing System Disaster Warning System



Intranet and Smart Classrooms at 17 NIELIT Centres across the country

- Setting up of Video Conferencing & Virtual classroom facility
- Setting up of IPv6 enabled dual stack network connectivity
- Driving e-content
- 1st Phase covering 8 Centers in NE and Delhi successfully implemented and inaugurated by the Hon. MoS, MCIT.

HQ as Central Site

Guwahati Center

Internet

IPv6 enabled WAN

Remote Site 1

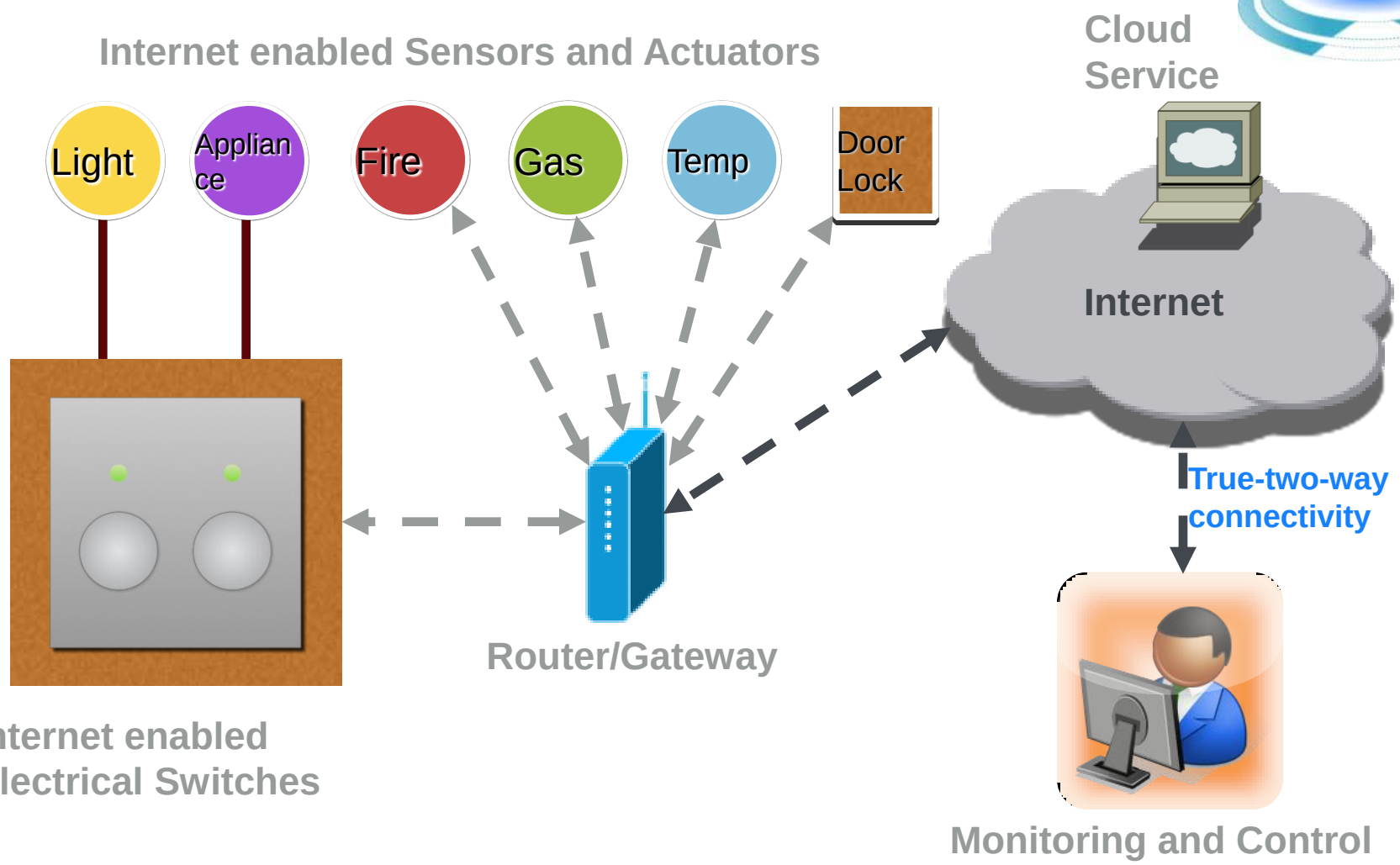
Roaming / Guest User

Remote Site...n

Remote Site 3

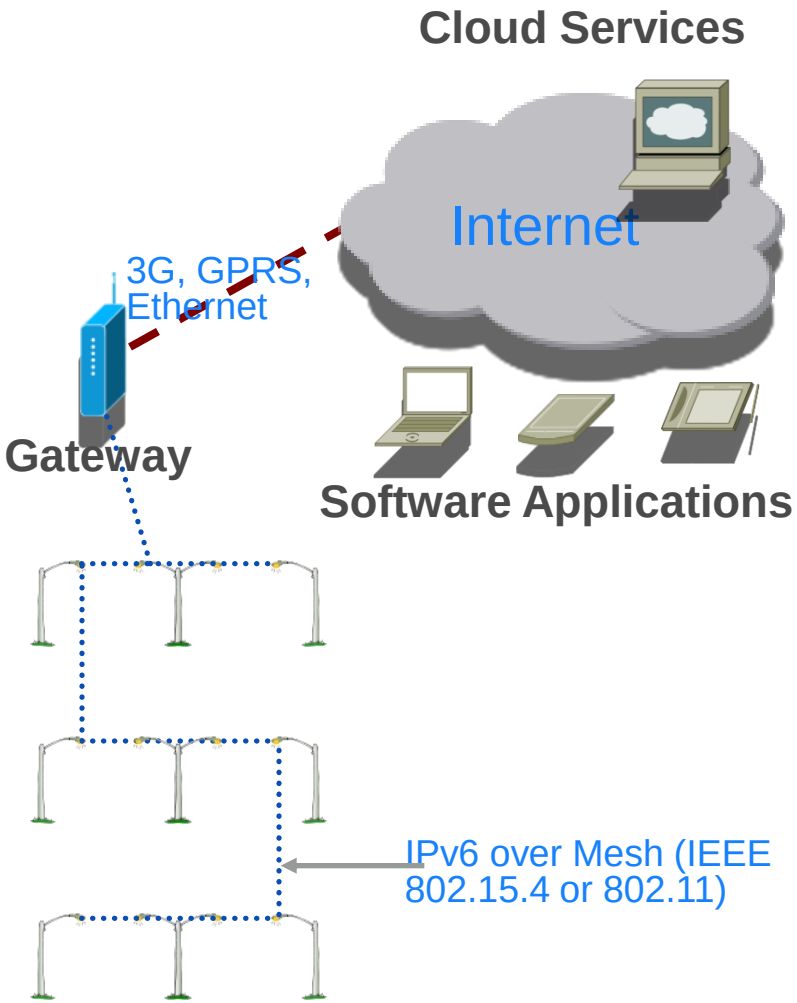
Remote Site 2

IPv6 based Smart building



Only IPv6 can provide the future poof solution!

Smart Lighting System

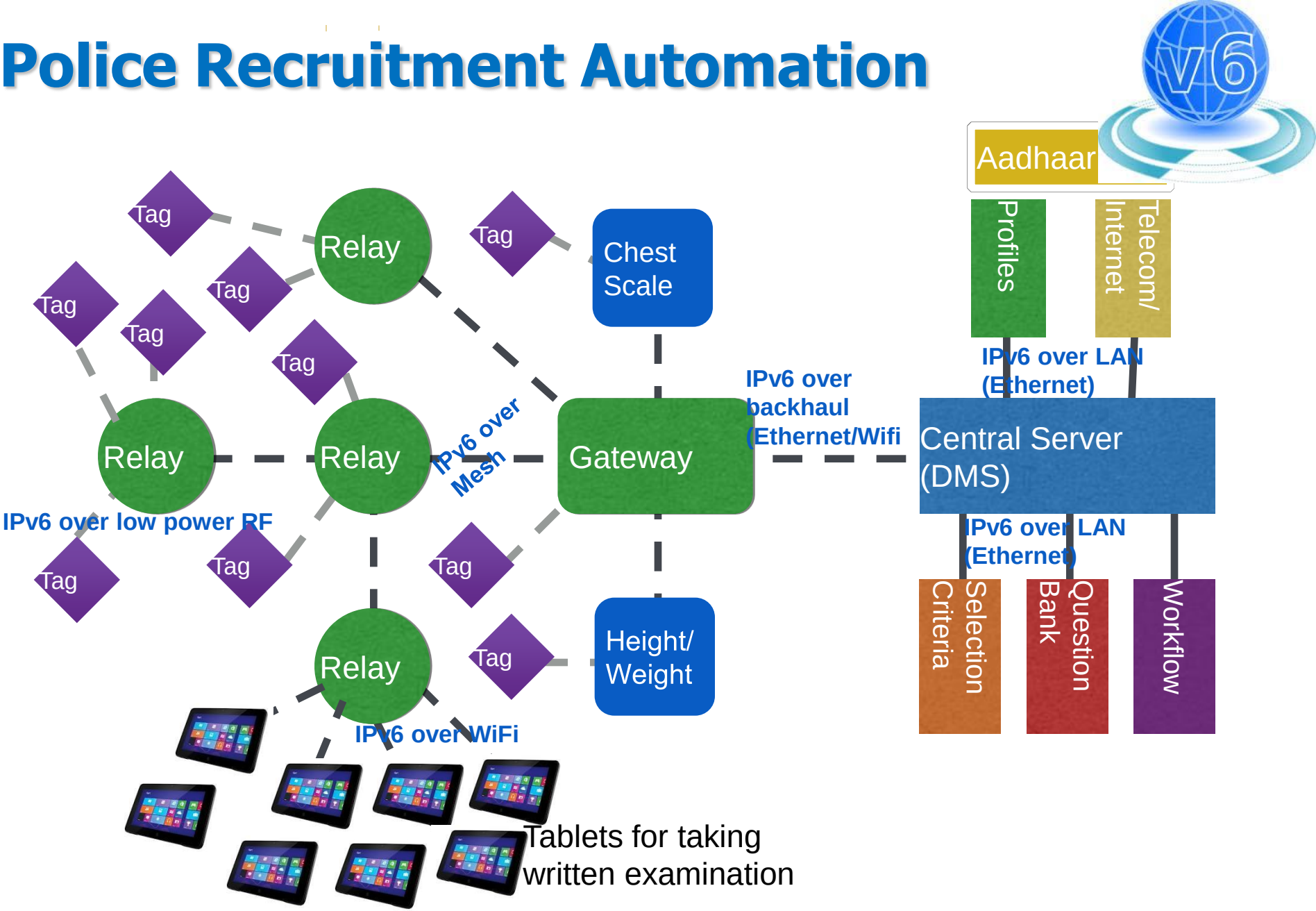


Smart Lighting Solution transforms street / Campus/ building lights into intelligent, energy-efficient, remotely managed lights

Saves energy over 30%

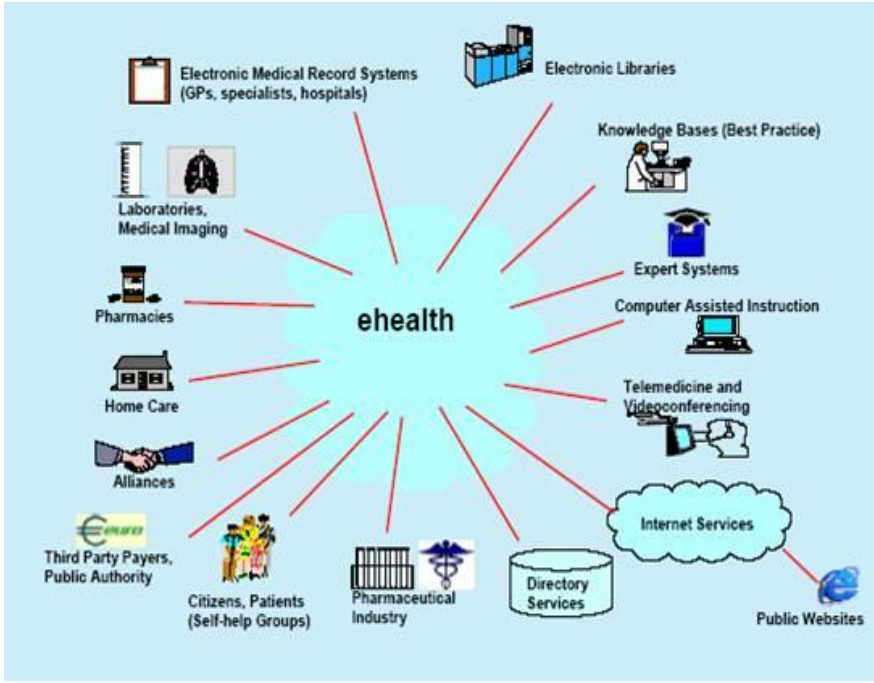
Smart Lighting serves as a foundation for building a Smart City

Police Recruitment Automation



Tele-consultation

- Complete IPv6 based infrastructure for providing basic diagnostic and consultation facility to patients in the remote / rural areas
  - Stethoscope
  - Ultrasound
  - X-Ray
  - External Examination
  - Eye care
  - Patient Record management
  - Prescription



Migration of eGov Applications

- Study of eGov Application
- Creation of a Central Infrastructure for Hosting and Testing eGov applications on IPv6
- Extensive testing with respective State Governments
- Transfer Application to the SDC once the SDC is IPv6 ready
- Upgrade existing application for dual stack production environment

Central Facility for training & testing IPv6 Products and applications

- An IPv6 environment to play
- Central facility for demonstrating and compatibility testing of IPv6 applications and equipments
- Motivate and support users on the use of IPv6
- Infrastructure consists of
  - Virtual Router Network replicating disbursed ISP network
  - Video Conferencing on IPv6 both in Point-to-Point and Point-to-Multipoint
  - Hands-on IPv6 configuration and practice on DNS, mail server, proxy, web-server using virtual machines
- Providing IPv4 to IPv6 remote login in IPv6 infrastructure
- Designed to provide hands-on training through Internet

Do you have an IPv6 connectivity or setup ?

- All websites hosted at ERNET are IPv6 enabled
- Test your connectivity and browser by logging in on www.ernet.in
- Test your mail services for IPv6 by sending a mail from your IPv6 ready mail server to test@six.ipv6.ernet.in
- Public DNS is available – dns6.ipv6.ernet.in
- Test out your SIP (VOIP) devices for IPv6
- Quiz Test & improve your knowledge
- Experience IPv6 connectivity on wi-fi @ ERNET Offices

ERNET India
Education & Research Network

Your IP is: 2001:e30:1801:1::51 via IPv6

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Welcome to ERNET

ERNET India is the National Research and Education Network dedicated to support the needs of the research and education community within the country. It was established in 1998 as an autonomous scientific society under the Department of Electronics & Information Technology (DeitY), Government of India. It operates ERNET network – a pan-Indian terrestrial and satellite network with 15 points of presence at premier research and academic institutions.

more...

News

ERNET starts pilot of eduroam services in India

ERNET to setup IPv6 Lab

ERNET empannelled as IPv6 Consultant by DoT

IPv6 Consultancy and Turnkey Migration Services

- Only government organisation in India with staff having Hands-on experience in IPv6 migration and management for the past half a decade both on Networks and applications

- Empanelled by DoT to provide IPv6 migration Consultancy and Turnkey implementation

IPv6 Transition Lifecycle

- Discovery Workshop
- IPv6 Readiness Assessment
  Gap Analysis
  IPv6 Awareness

- IPv6 Transition Methodology
- High Level Design
- Bill of Materials
- Commercial & Technical Impact

- Low Level Design
- Addressing Plan
- IPv6 Enablement Plan

- IPv6 Design Validation
- IPv6 Migration Plan Validation
- Business Process Validation

- Hardware/ Software upgrade
- IPv6 Services validation
- Migrate and enable IPv6 services
- Knowledge transfer

- Network optimization services
- High availability services
- Testing & Validation

Implementation Approach

- Activate / Procure IPv6 ready equipment during natural technology replacement and capacity enhancement
- Adopt dual stack approach as far as possible
- Educate users on IPv6 and create actual user demand
- Focus on external service provision instead of internal infrastructure adoption
- Implement by services, phases, and data centres

Benefits

Connecting government services and users to the Next-generation Internet

Opportunities for future types of government applications and services

Successful example and experience gained for reference

Transparent to government users and the public

Challenges – IPv6 Deployments

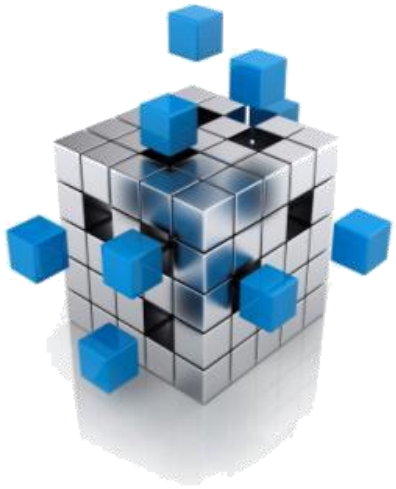
Technical Challenges

- IPv6 is **not "backward compatible"** with IPv4 that requires Dual-stack or tunneling kind of mechanisms
- IPv4 and IPv6 are distinct and different communications protocols
- IPv4 and IPv6 are expected to **co-exist** for few years
- **How to connect IPv4-only** entities – be it web sites, devices, applications etc.

Business Challenges

- Business Continuity
- Need for an holistic approach
- Costs
- Awareness among stakeholders
- Procurement
- Training needs
- Testing Environment requirements
- Application dependencies
- Service-oriented Migration approach

Migration Considerations



- **Security policies need to be revised**
  Security issues with IPv4 & IPv6
- **Application compatibility needs to be verified**
  Not all existing applications are IPv6 compliant; Upgrades may be required
- **IPv6 compatibility in equipment often comes with performance risks**
  Unlike IPv4 several IPv6 implementations not yet optimized
- **Management on IPv6**
  Current management and troubleshooting tools and methods may not work. Need to be upgraded.
- **SPAM tools need to be reinvented**
  Heavy reliance on DNS
- **Testing v6 Services for Compatibility**
  Comprehensive testing of IPv6 scenario.

IPv6 Capacity building and Skill Development Services

- Extensive courses designed and developed In-house
- Customised to suit novice to expert
- Intensive hands-on training as part of the course (>50%)
- Backed by ERNET's half a decade of experience
- Online portal being developed for examination and certification
- Infrastructure available across the country over Internet

Training Modules

Name	Description	Duration	Fees
Intro-6	Overview of IPv6	2 days	5000
Module -1	IPv6 - Fundamentals	4 days	10000
Module- 2	IPv6 - System Administrator	7 days	15000
Module -3	IPv6 - Networking Essentials	4 days	10000
Module -4	IPv6 - Advance Networking	5 days	15000
Module -5	IPv6 - Transition and Security	6 days	18000

ERNET India

Deploying the next generation network for the future of mankind

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