IPv6 Research & Promotion Activities

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Outline

- **Challenge in IPv6 development**
- IPv6 Promotion: Government Influence
- IPv6 Promotion: Industry Influence
- IPv6 Technology Research

Internet Development in China

By the end of 2011:

- Internet users : 513Million, penetration rate: 38.3%
- Broadband Internet users: 392 Million
- Mobile Internet users: 356 Million
- IPv4 address: 330Million (0.64per-capita)
- Private IPv4 Addresses used widely

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IP Address Demand

Mobile Internet:
1billion

Total net demands on IP address:
11.5billion (in 5 years)
Given that the efficiency of address allocation is 33%,
34.5billion addresses are needed

Fixed Internet:
5 to 6 hundred million

The Internet of Things:
10billion

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Challenges in IPv6 Development

- IP address demand is the main motivation for adopting IPv6
- Very limit immediate business or application demand
- The impact of IPv4 exhaustion to different player is different, hard to create a coherent driving force
- Lack effective coordination development incentive system between ISP and ICP
- The benefit of IPv6 has to be realized in the long term
- Require huge investment and no short term gain can be expected

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Government effort in IPv6 promotion

- National strategy for the next generation Internet in the 12th Five-Year-Plan
- Government support technology research programs:
  - High-performance Broadband Information Network‘ (3TNet)
  - Architecture of Next Generation Internet
  - ‘973’ Programs & ‘863’ Programs
  - Mobile IPv6 Security
  - IPv6 Scenarios in Mobile Internet
  - Network architecture based on IPv6
  - Solution on mobile network migration from ipv4 to ipv6
- Government driven project
  - CNGI
  - Sensing China

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Next Five-year Plan of CNGI Project

- Promote IPv6 commercial deployment in the 12th Five-Year-Plan
- **Targets**
  - Internet penetration rate: rises from 34% to 45%
  - Internet users accessing by IPv6 broadband: above 25 million
- **Plan**
  - **2011-2013, initial stage**
    - Backbone, CERNET and networks newly set up fully support IPv6
    - Metropolitan area networks(in developed regions) are gradually migrated to support IPv6
    - DNS systems are mainly upgraded to support IPv6
    - Websites(including Top100 commercial websites, government's websites) are gradually upgraded to support IPv6
  - **2014-2015, advance stage**
    - Further upgrade MAN(in developed and developing regions) to support IPv6
    - Further upgrade websites(including commercial websites and government's websites) to support IPv6

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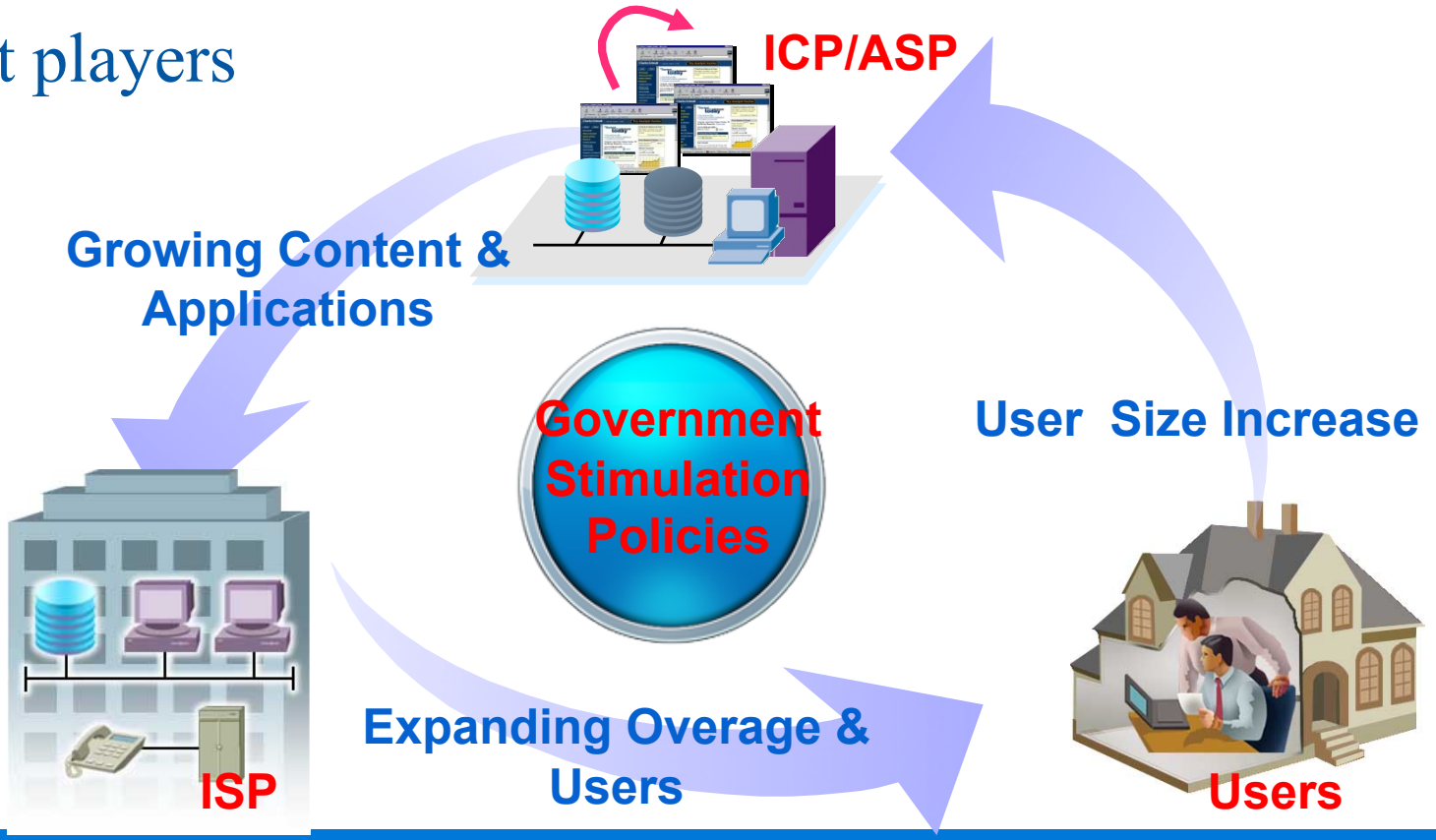
Our Advisory Report

Overview of our advisory report to the National Informatization experts advisory committee:

- IPv6 transition will be a prolonged process if it were driven purely by business demand
- The longer the transition process, the more costs and difficulty will be incurred
- Chinese ISP may have more challenge in IP address resources than other countries because of the rapid increase of Internet users
- A referenced transition time table is necessary for effective coordination between different player in the industry chain
- Government's specific IPv6 promotion policies & programs are proven to be effective in IPv6 promotion

Government Stimulation Policies Recommendation

- Establish transition time table
- Lead by migrating government networks and services to IPv6
- Financial stimulus programs to early adopter
- Establish a mechanism for effective coordination between different players



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ISP's Perspectives in IPv6 deployment

- Government guidance is necessary for making business decision, especially in IPv6 adoption
- National transition time table is preferable for effective coordination
- IPv6 pilot projects and test beds are effective in nurturing IPv6 expertise and confidence

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ISP's Perspectives in IPv6 deployment

- **Top 5 Priorities** of consideration in choosing a transition mechanism:
  - User Experience
  - Smooth
  - Cost
  - Workload
  - Operability
- Prefer to choose dual stack model as transition technology
  - –NAT444 vs. DS-Lite
  - Will maintain IPv6 and IPv4 services to the market, prefer minimizing IPv4/IPv6 Translation & pushing to the edge

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Our Observation

- Government guidance & transition time table is necessary
- IPv4&IPv6 may co-exist for a long time
- The main driven force of adopting IPv6 is user experience and new application demand
- User experience will be impacted significantly when NAT user increase
- IPv6 deployment Opportunities in China:
  - Urbanization
  - Increase of Internet penetration rate
  - Increase of Mobile Internet user & application
  - Sensing China Project

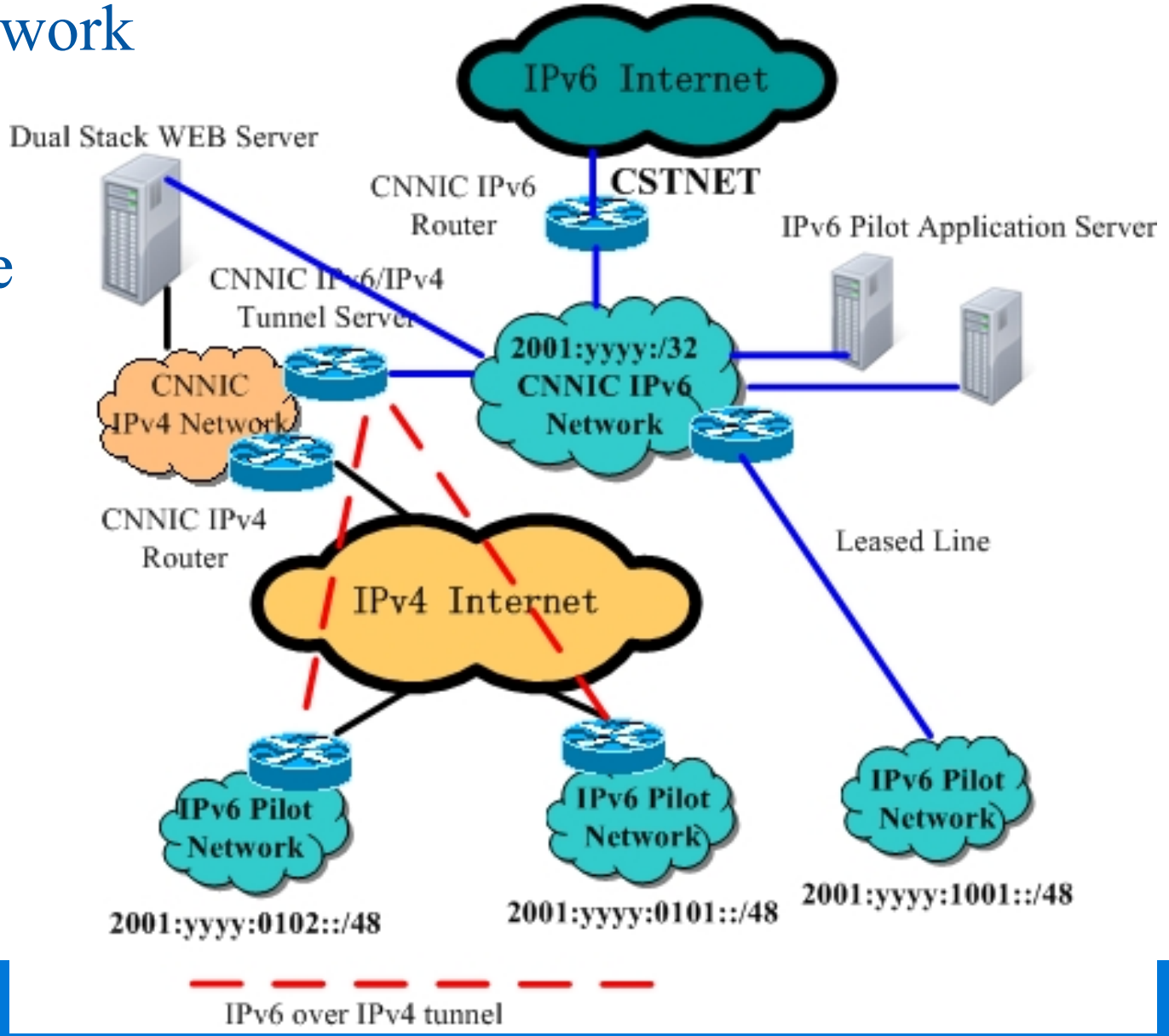
CNNIC Promotion Activities – OPEN LAB (DNSLAB)

- Objectives:
  - –Promote collaboration between research & industry
  - –Accelerate research achievement commercialization
  - –Promote key Internet technology research & application
- Fund enterprise research project
  - ➢IPv6 transition
  - ➢Trustworthy Network
  - ➢ DNS technology
- Establish joint lab with enterprise

D:Data-analysis
N:Naming-addressing-routing
S:Security -stability-resilience

CNNIC Promotion Activities – IPv6 Application Pilot Center

- IPv6 Pilot Network Services
  - –Tunnel
  - –Leased Line



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CNNIC Promotion Activities – IPv6 Application Pilot Center

- IPv6 Application Pilot Services
  - –Testing & Staging
  - –Application development & migration guide
  - –Sample code
  - –Sample migration scenario
  - –Development & testing tools

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CNNIC Promotion Activities – IPv6 Application Pilot Center

- Training
  - –IP address exhaustion & solutions
  - –IPv6 introduction
  - –IPv6 address planning
  - –IPv6 migration planning
- Consulting
  - –IPv6 capability & migration assessment
  - –Building IPv6 pilot network

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The IP Address Management Challenge

COMPUTERWORLD Survey:

- About 2/3 organizations use basic tools like spreadsheets for IP address management, despite the increasing demands and costs
- Cost to manage each IP address:
  - –Find and provision an available address
  - –Record it in the management system
  - –Update DNS and other related tasks
- The annual cost to manage each IP address is directly correlated with organization size:
  - –Enterprise average: $9.19 annually
  - –SMB average: $7.12 annually
  - –Mean: $8.10 annually
- **Conclusion**: Costs per IP address grow for all devices as the size of IP address increase

The IP Address Management Challenge

- **Yankee group report summary:**
  - –Consumerization, mobility, cloud computing, device evolution and the transition to IPv6 are **driving up the number of endpoints**
  - –IPv6 networks twice the no. of subnets, 10 times the no. of IP addresses, twice the no. of DNS queries and DHCP transactions
  - –Virtual machines (VMs) is **driving up the reconfiguration tasks**:
    - ➢DHCP transaction, DNS queries, reconfiguration of the network devices
  - –the largest cause of downtime is due to human errors made when configuring network devices.
- **Conclusion:**
  - –Automating repetitive tasks can eliminate those errors and make the required changes faster

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IPv6 Address Management Challenge

- Fast expanding use of IP-enabled devices and applications, including RFID tags, mobile devices and virtual devices
- Significantly more addresses & subnets, more DNS queries & DHCP transactions, more reconfiguration tasks
- IPv6 addresses are longer and more complex to handle
- IP address management tasks be more complex with the transition from IPv4 to IPv6
  - –Concurrent Management of IPv6 and public & private IPv4, NAT pool, etc.

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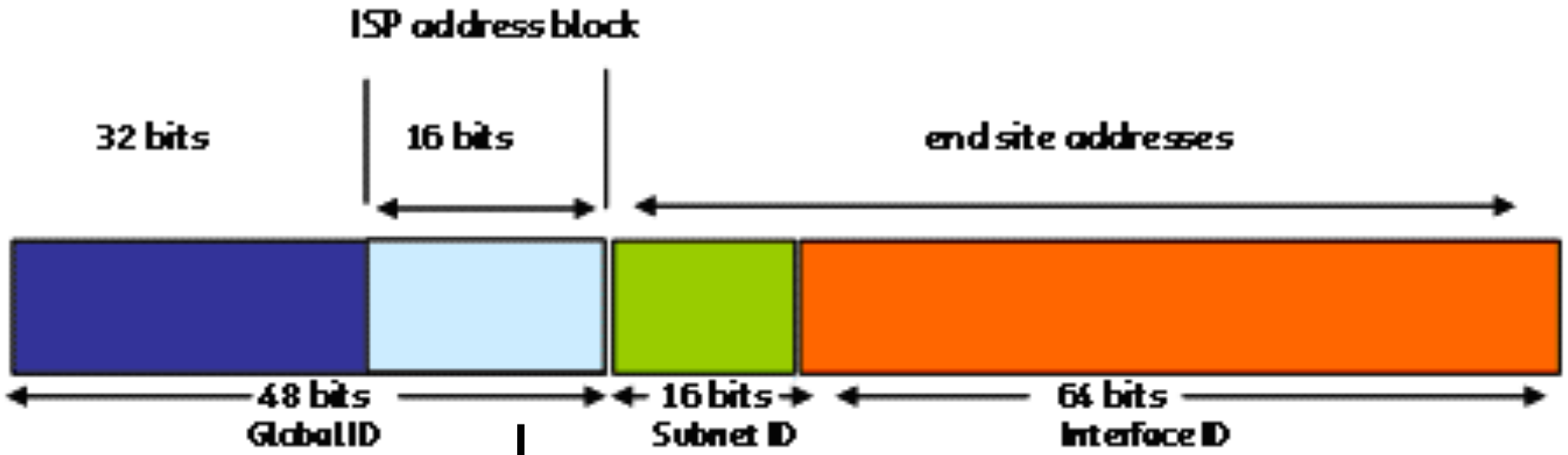
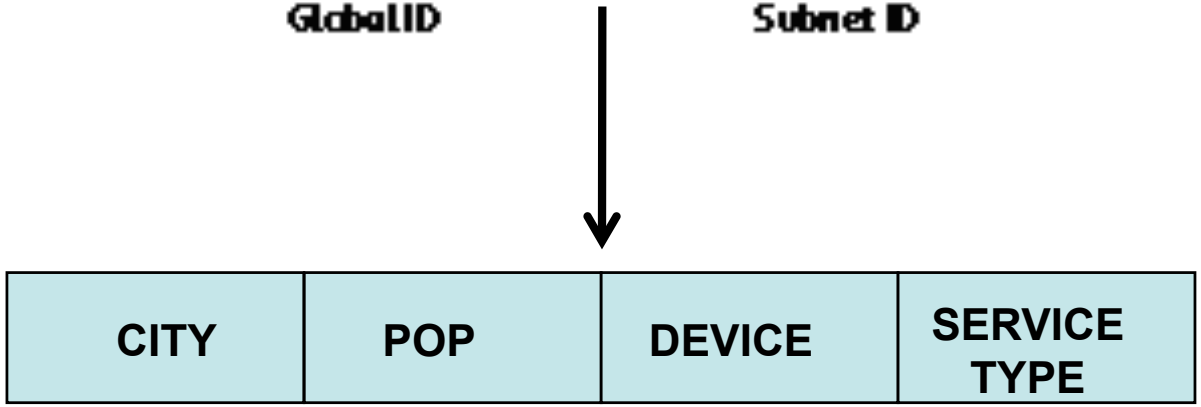
IPv6 Address Management Solution

- Effective address planning & allocation
  - –Carrying multi-dimensional attributes information with IPv6 addresses
- IP address management automation tools
  - –Automating repetitive IP address management tasks
- Nice-to-have in IPv4, Need-to-have in IPv6

Effective IP@ Identification





For Example:

Network Info

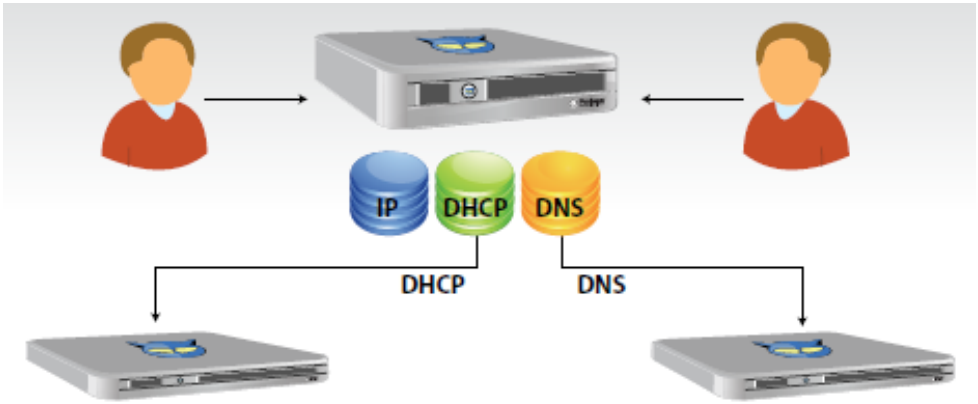
- –Topology
- –Location
- –Service Type
- –Customer Type
- –VLAN number
- –IPv4 address

User Info

- –MAC address
- –Phone No.
- –IMEI code

IP Address Management Automation

- Centralized management of IP addresses, namespace and DHCP services
- Address utilization & capacity forecasting
- Renumbering & reconfiguration assistance
- Track & reclaim IP address and subnet
- WHOIS registration and Reverse DNS Delegation between LIR/NIR/RIRs



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What NIR can Do?

- Raise awareness
- Provide tools through RMS
- Hosting IP management services

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Thank you!

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