Problem Statement for Operational IPv6/IPv4 Co-existence
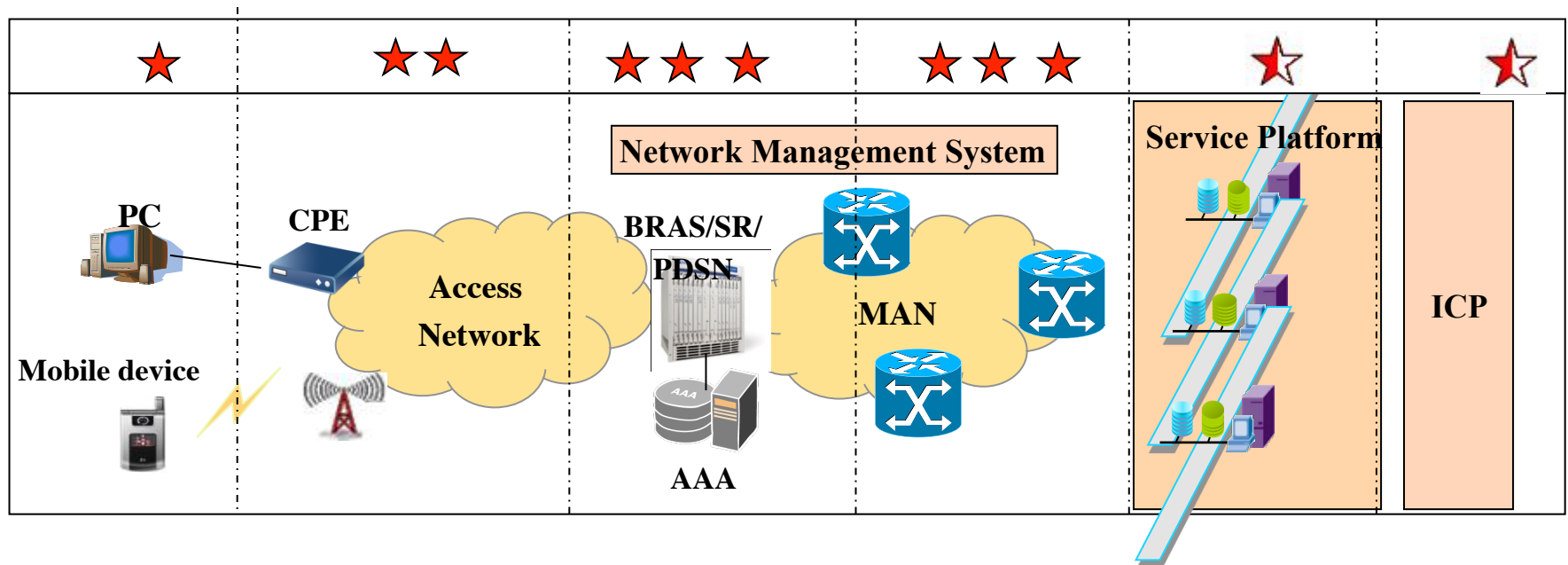
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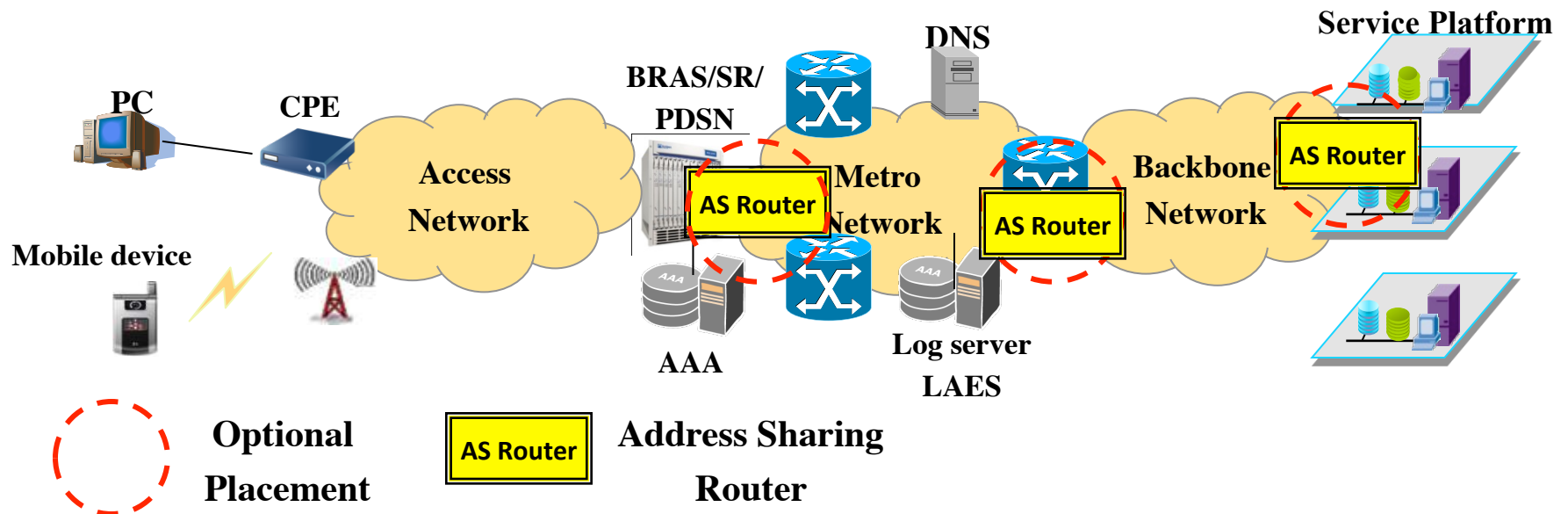**3/31/2011**

Current Situation

- ISP: facing the biggest pressure of IPv4 address shortage

- ICP: lacking of enough motivation to migrate to IPv6

- Manufacture: wondering what to do next…

Network Architecture

performance requirement

● **AS Router would be suitable for centralized placement**

Communication Scenarios

- IPv6 is a final way to solve address shortage; however, there is not much IPv6 content.

- IPv4/IPv6 will co-exist for long period.

- Two major scenarios: IPv4←→IPv4 for most current applications and IPv6←→IPv4 for P2P applications and future IPv6-only ones.

DS-Lite	A+P	Stateless NAT64 / dIVI	Stateful NAT64	NAT444 +IPv6
IPv4←→IPv4 IPv6←→IPv6	IPv4←→IPv4 IPv6←→IPv6	IPv4←→IPv4 IPv6←→IPv4 IPv6←→IPv6	IPv6→IPv4 IPv6←→IPv6	IPv4←→IPv4 IPv6←→IPv6

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End-to-End transparency and Scalability

● It should be scalable, easy for new applications to deploy in operational network.

● CGN would bring much complexity to the core of Internet, which includes transport-layer port mapping and ALG.

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● CGN would also bring a lot of cost for ISPs.

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DS-Lite	A+P	Stateless NAT64/dIVI	Stateful NAT64	NAT64 +IPv6
CGN problem	Better Core stateless	Better Core stateless	CGN problem	CGN problem

Addressing and Routing

- Existing ISPs who adopt PPPoE/PPPoA need to allocate PD-prefix and WAN-interface address, and CPE would re-allocate IPv6 addresses to end systems.

- Address allocation system would setup the corresponding
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  re-allocate IPv6 addresses to end systems.

  - Address allocation system would setup the corresponding

DS-Lite	A+P	Stateless NAT64/dIVI	Stateful NAT64	NAT444+IPv6
Address of the tunnel end to be passed	Changes to address allocation related to the address format, address of the Changes to address allocation related to the	Some changes to address allocation related to the address format	No specific requirement	Private IPv4 addressing

Address usage and consumption

- IPv4/IPv6 transition solutions would need address
  - IPv4/IPv6 transition solutions would need address sharing, including dynamic and static ones.

  - Nowadays, most applications consume many concurrent sessions,

  - With address multiplexing, IPv4 address shortage problem could already be largely released.

DS-Lite	A+P	Stateless Stateless	Stateful Stateful	NAT444 NAT444
Dynamic sharing	Static sharing	Static sharing	Dynamic sharing	Dynamic sharing

User management and logging requirement

ISPs and ICPs have the requirements of lawful interception and surveillance.

- Session-based logging would bring a great burden to

- ISPs and ICPs have the requirements of lawful interception and surveillance.

- Session-based logging would bring a great burden to existing software-based logging system.

DS-Lite	A+P	Stateless NAT64/dIVI	Stateful NAT64	NAT444 +IPv6
Session-based	No binding table	No binding table	Session-based	Dual-stack-based
Add IPv6 feature	Add IPv6 feature	Add IPv6 feature	Add IPv6 feature	Add dual stack feature
Logging:	**Logging:**	**Logging:**	**Logging:**	**Logging:**
Session-based	No binding table	No binding table	Session-based	Session-based

CPE issue

● Most IPv6 transition solutions would need to take additional modifications to CPE, apart from native IPv6 support.

And cost is extremely huge due to the large number of ● ISPs sometimes could not fully control customer's CPEs. customers.

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● ISPs sometimes could not fully control customer's CPEs.

DS-Lite	A+P	Stateless NAT64/dIVI	Stateful NAT64	NAT444+IPv6
Tunneling+IPv6	NAT+ Tunneling +IPv6	dIVI: NAT+ translation+IPv6	IPv6-feature	IPv6+NAT44

Summary

● Existing solutions for IPv4 address sharing is operationally complex

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● We need more scalable address sharing mechanism to reduce the state, cost and

- We need more scalable address sharing complexity of core network

● There are alternatives that make life a lot easier for operators

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Summary

development

- **Better scalability**
  -

  direction Stateless ones without address constraint should be our
  direction

  maintain per-subscriber state entries in core network,
  Keep state as few as possible in core network, only
  maintain per-subscriber state entries in core network,
  and state should be stable.
  - **Flexible addressing**
  -

  system Little modification to existing addressing and routing

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  - Define flexible addressing plan for different purpose

Thank you