

IPv6 Migration Challenges for Large Service Providers

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Agenda

- Airtel Overview
- Drivers of IPV6
- Migration challenges
- Design Considerations
- Deployment plan

Airtel Overview

- India's largest Integrated and the first private telecom service provider with foot print in 23 circles
- Fixed line services in 94 cities
- Vsat network
- National long distance network across country
- International connectivity through i2i and SE-ME-WE4
- Integrated solutions for enterprise customers

Infrastructure and services

- **ISP network**

- POPs across country
- Peering with major Tier 1
- National peering with NIXI and local ISPs

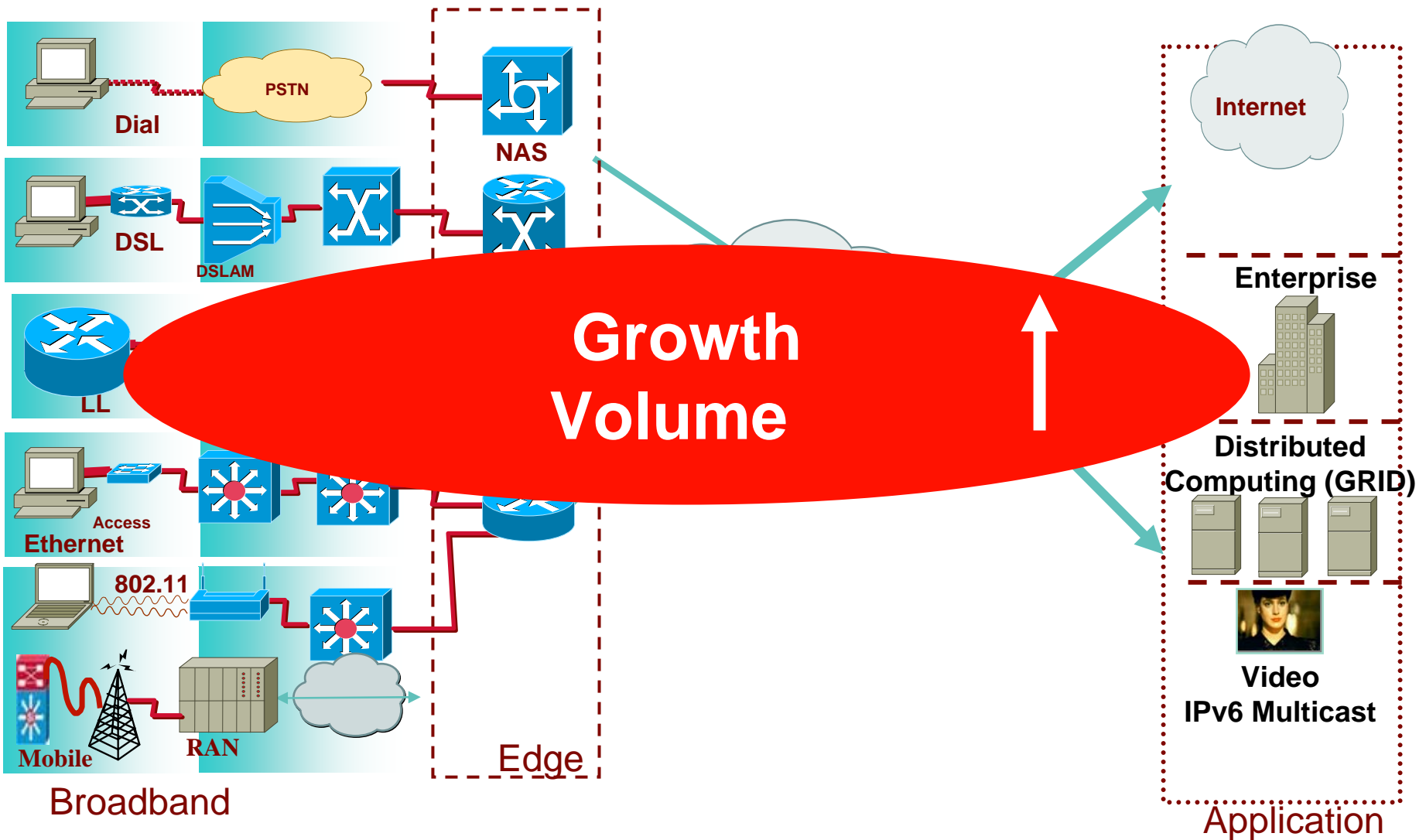
- **MPLS**

- POPs across country
- L2 and L3 VPNs
- NNI with various carriers
- Multicast
- QOS

Infrastructure & services

- ATM/FR network
- Wholesale BW for other carriers
- VSAT network
 - Internet services through VSAT
 - L3 VPNs
 - MPLS and VSAT are integrated
- Metro Ethernet in all major metros
- Wimax in all major cities
- GPRS
- EDGE

Broadband growth



Need of more IP s per broadband link

Convergence of n IP networks in Multi Play calls for huge scale (nxIP) address space. Plug & play home networking



In Summary

- IPv4 address pool exhaustion (Future)
- Increased Broadband user
 - (xDSL/Metro Ethernet / Wireless / GPRS / Dialup/Vsat)
- IPTV Service
- Class 5 VoIP
- Other Applications

Migration Challenges

The background features a solid red color with a faint, large number '10' in the center. Overlaid on this are several sets of overlapping circles in a lighter red shade, arranged in a pattern that suggests interconnectedness or a network.

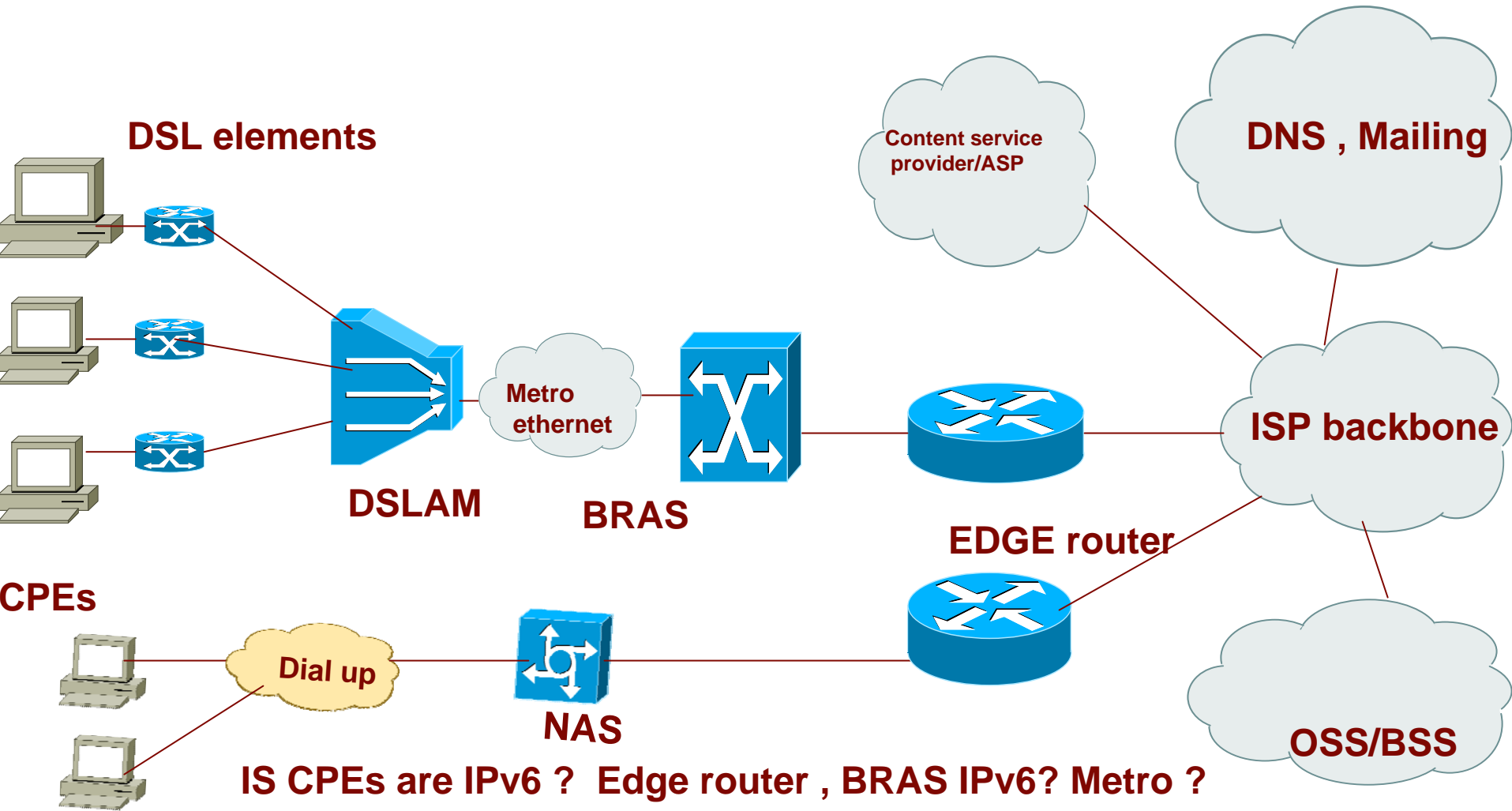
Network Assessment

- A key and mandatory step to evaluate the impact of IPv6 integration
- Split in mainly two phases
 - Infrastructure – networking devices
 - Hosts, Servers and applications
- Must be as complete as possible to allow upgrade costs evaluation and planning
 - Hardware type, memory size, interfaces, CPU load,...
 - Software version, features enabled, license type,...
 - IPv6-capable definition, knowledge of the environment and applications, design goals

Core/Access Assessment

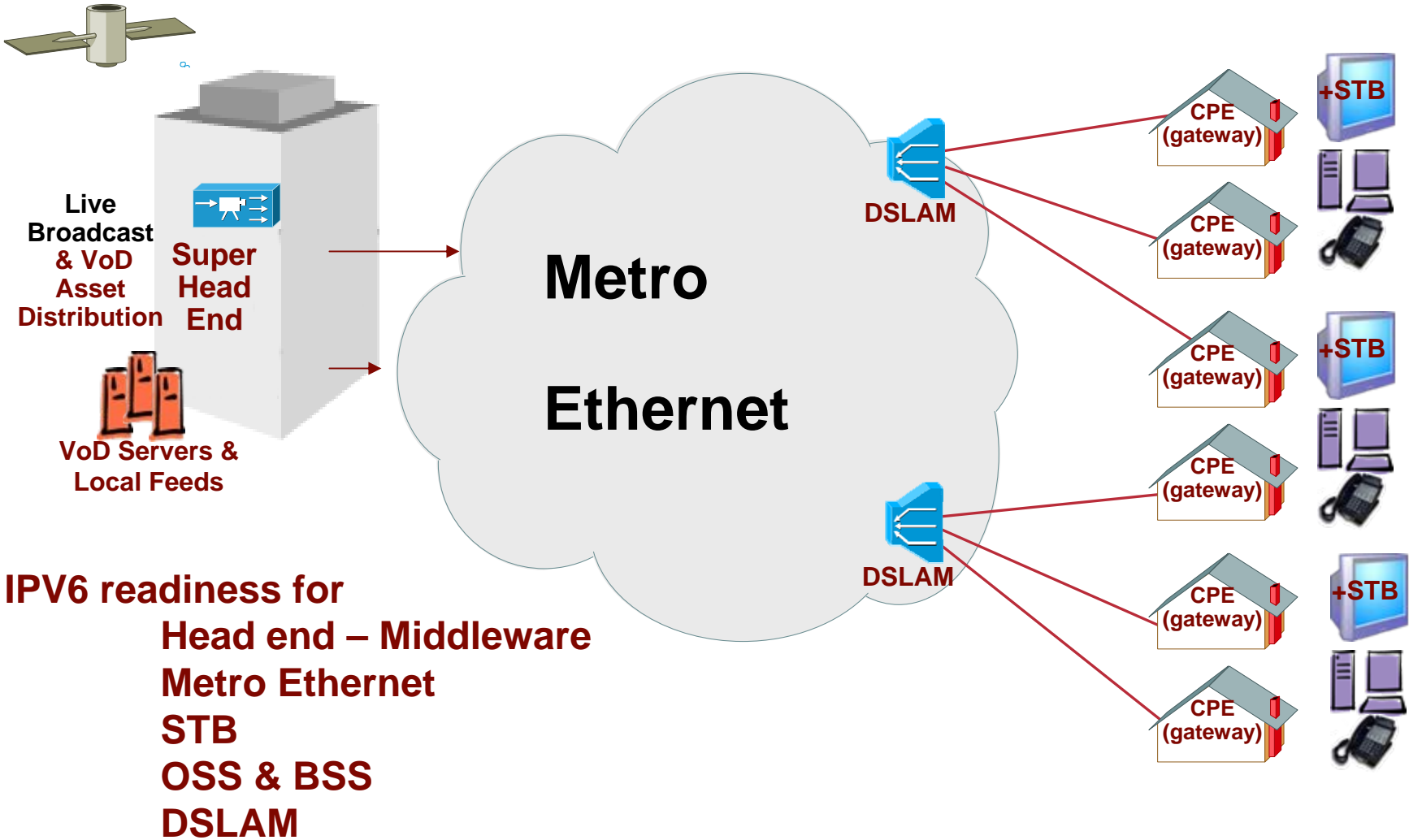
	Environment	Scenario	Does Network Support ?
Core	Core is IPv6 aware – Native IP	Dual Stack	Does existing HW/SW support
	Core is IPv6 unaware – MPLS	6PE/6VPE	PE ?
Access	Few customers, no native IPv6 service from the PoP or Data link is not (yet) native IPv6 capable,	Tunnels	CEs support ?
	Native IPv4-IPv6 services between aggregation and end-users	Dual Stack	CE and PE HW/SW support
	Dedicated circuits – IPv4 – IPv6	Dual Stack	CE and PE HW/SW ?

Access network

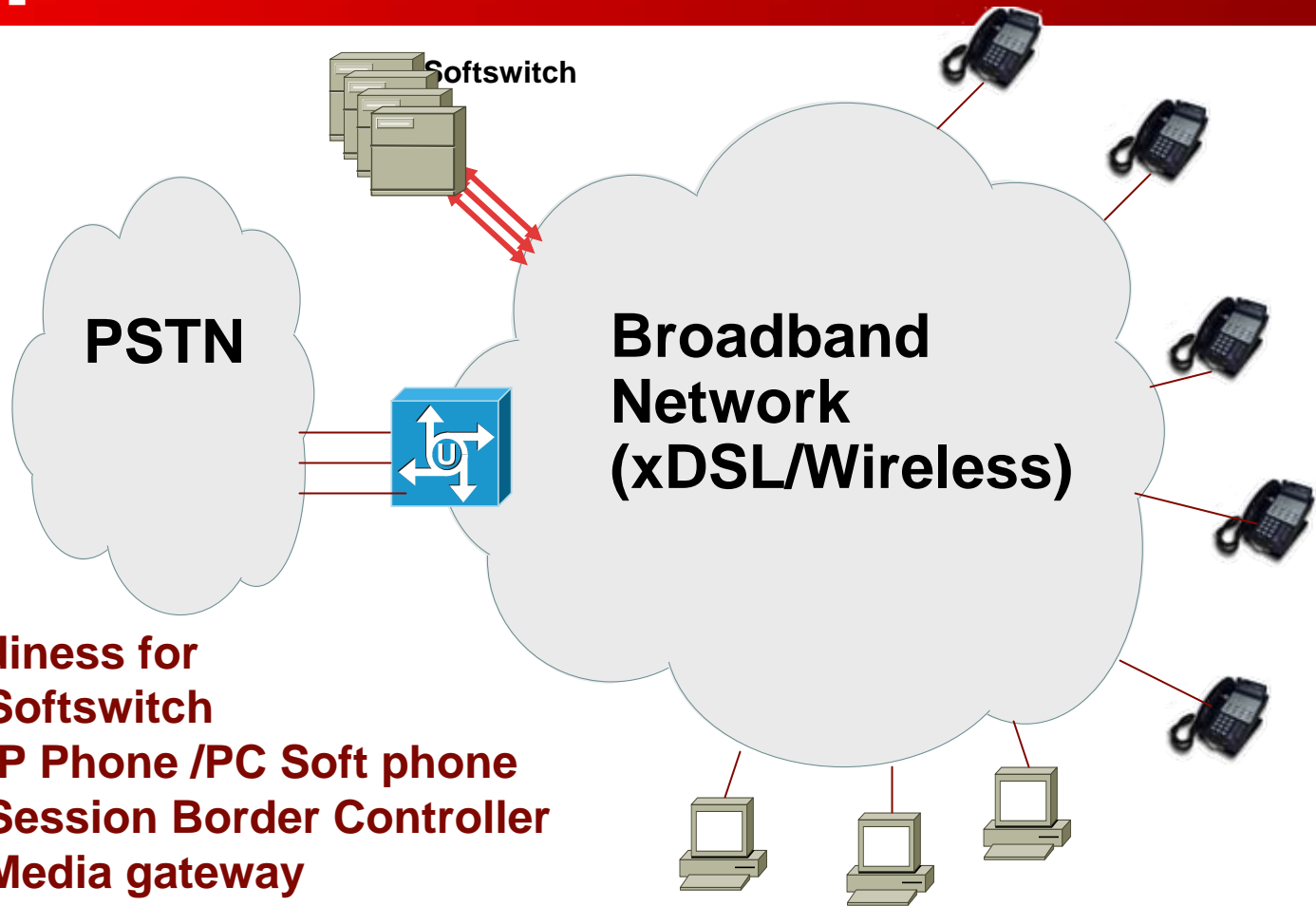


IS CPEs are IPv6 ? Edge router , BRAS IPv6? Metro ?

IPTV



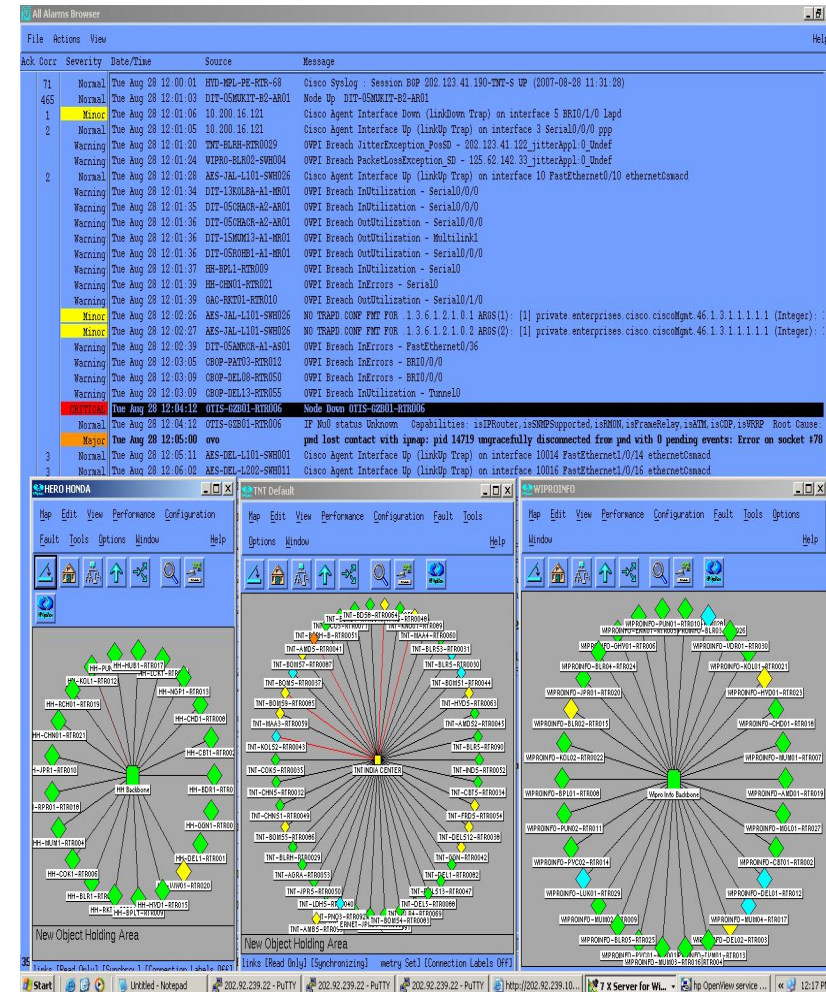
VoIP



IPV6 readiness for
Softswitch
IP Phone /PC Soft phone
Session Border Controller
Media gateway
OSS – DHCP, NMS, DNS
BSS

Network monitoring and management

- Network Management evolution needs to be to done before IPv6 deployment strategy
- Areas to consider
 - NMS & Applications for IPv6
 - HP OV NNM
 - Performance monitoring tool
 - Service desk
 - Network Protocol (SNMP, TFTP, Syslog, Telnet, SSH,...over IPv6
 - DNS/DHCP server, Netflow Collector, Ciscoworks
- In a dual-stack network, both IPv4 and IPv6 environments must be managed with the best optimization to decrease the cost of operations



Network Security

Threat protection

- Does the network Support IPV6 based Standard, reflexive, extended access control list ?

Secure Connectivity

- Support IPSEC
- Protocol Authentication for OSPFv3
- IPv6 IPsec Tunnel Router-to-Router
- IPv4/IPv6 Encryption hardware adapter
- Mobile IP authentication

IPv6 Firewall

- Are there firewall which support IPV4 and IPV6 ?
- Security appliances

OSS /BSS Challenges

- AAA server for dial up and broadband on IPv6
- Mediation/ Billing server
- DNS servers which understand IPV4 A records and IPV6 AAAA records
- Legal interception
- Customer portal
- FCAP

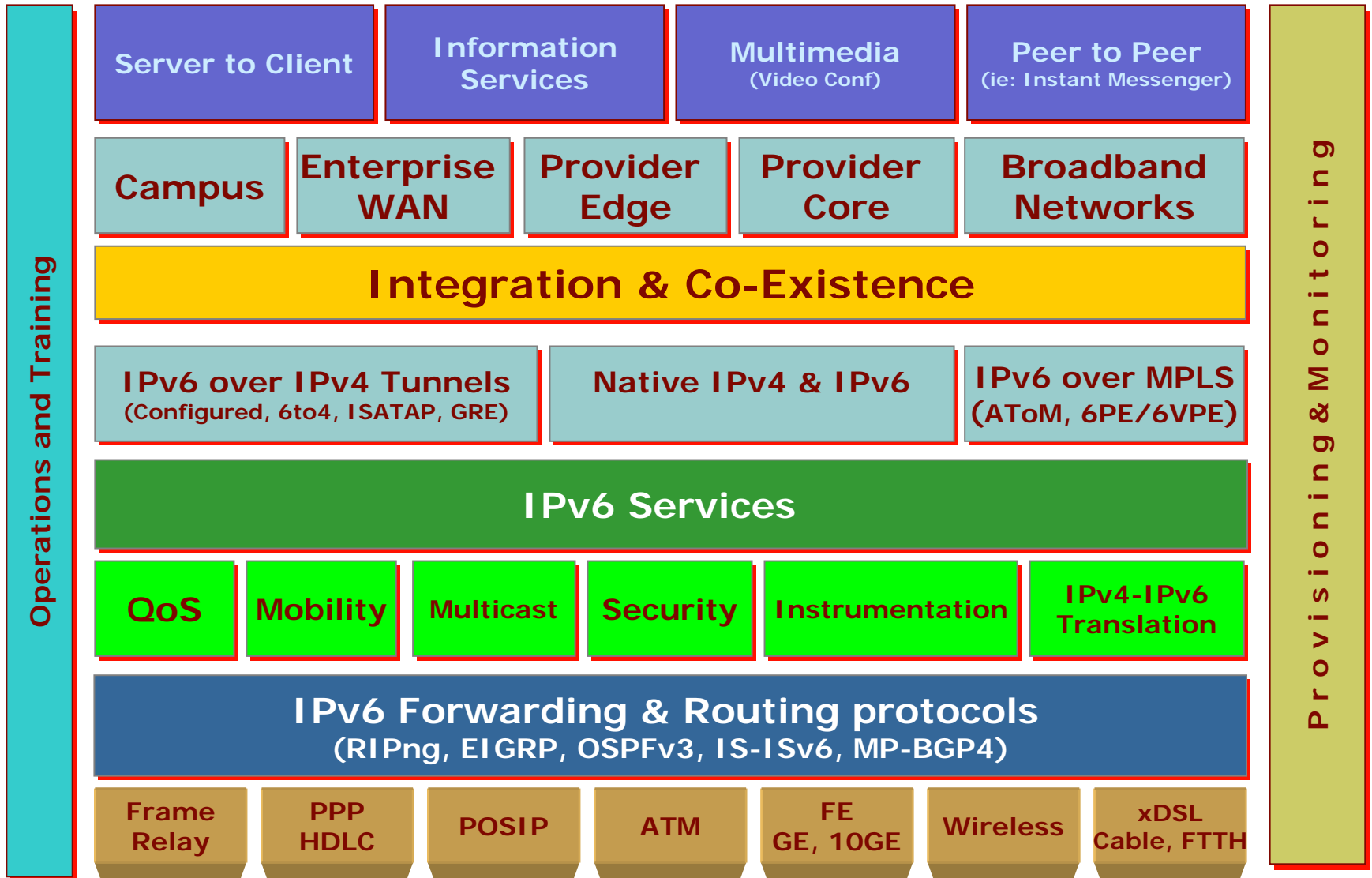
Other challenges

- End customer readiness
- Investment
- Operational issues
- Training



Design Considerations

The Scope of IPv6 Deployment



3 Key phases

- Providing IPv6 services at access level /Edge
 - Providing IPv6 at core level with out major upgrade of the core and minimum impact on IPv4
- Running IPv6 within core infrastructure
- Interconnecting with other IPv6 service providers

Design Objectives

- IPv6 services to End Users, End to End IPv6 traffic forwarding as applications are located at the edge.
- Service wise approach
- Minimum/no impact on services
- Minimum Operational issues
- Low risk deployment
- Low cost
- Easy trouble shooting

Deployment strategy

Deployment method	Benefits	Limitations
IPv6 over IPv4 Tunnels	Easy to deploy on the existing IPv4 Low cost and low risk	Complex management and diagnostics .
IPv6 over Dedicated Data Links	End-to-end IPv6 with no impact on the IPv4 traffic Low cost	Lack of IPv6-specific hardware Support for IPv6 network management for the current deployed hardware
IPv6 over MPLS	Less investment high scalability	the our ork . Readily available
IPv6 Using Dual-Stack Backbones	Easy to implement for small campus networks with a mixture of IPv4 and IPv6 applications.	Complex dual management of routing protocols. Major upgrade for large networks.

IPv6 over MPLS Backbones

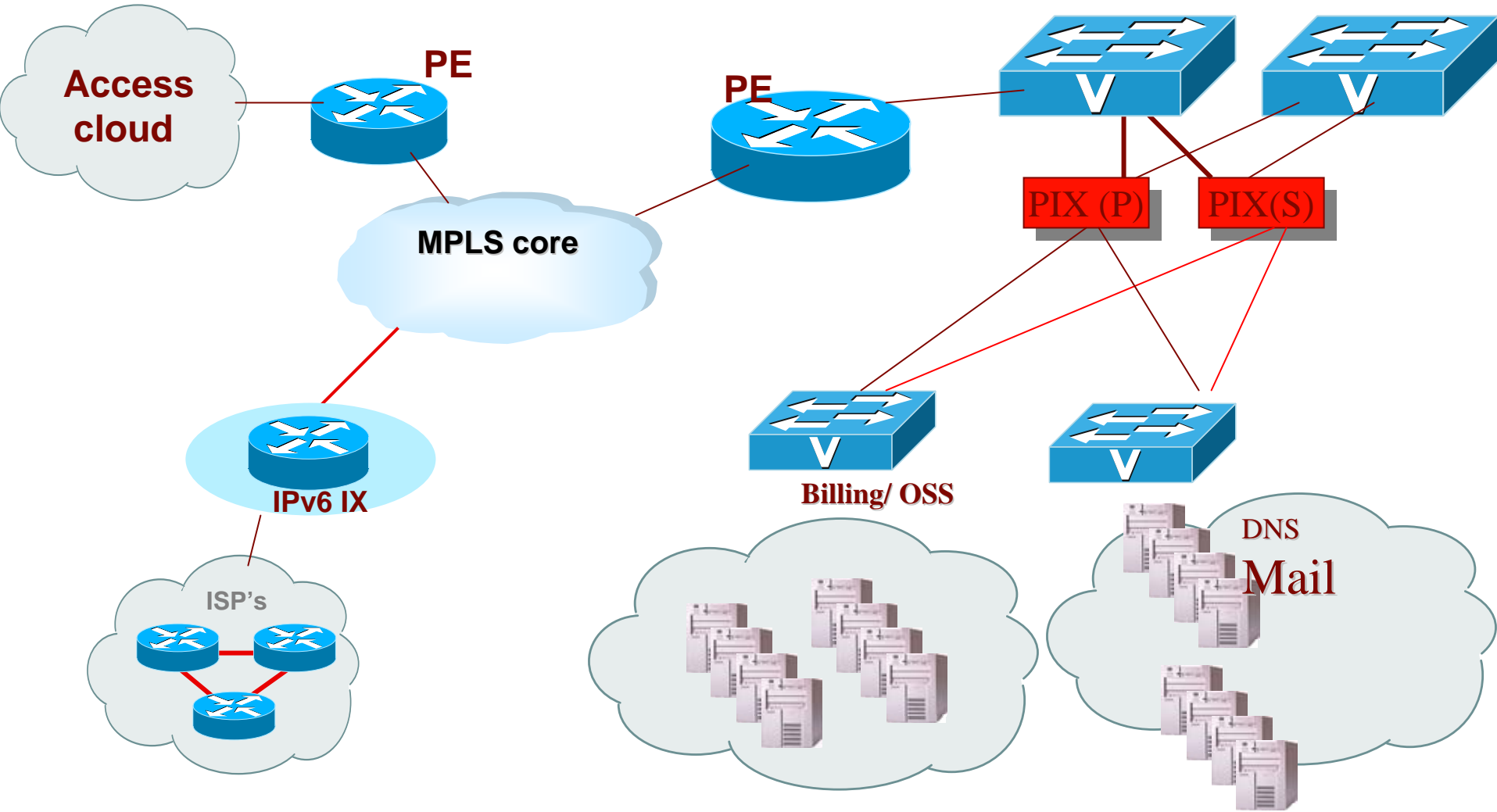
Network design Considerations

- Addressing design
- Access design
- POP design
- Core Design
- Edge design
- RR design

Access design

- Termination of access on PE
 - Leased lines
 - Dialup
 - Metro network
 - Broadband network
 - Wimax
- PE's are connected to core
- Integration with IPV6

POP Design



Core Design

- Routing Protocol design
 - Running IS-IS
 - Edge peering use their respective loopback address for V4 and will use the same for V6
 - New PE will add new entries in the core table
- MPLS design
 - Run LDP
 - LSPs between loopback addresses
 - 6PE and 6VPEs will share the same LSPs
 - No configuration changes required in MPLS network

Edge Design

- Edge design
 - PEs dual stack
 - Core facing interfaces no change
 - Changes only in PEs only
 - Management configurations for IPv6
 - Security configurations for IPv6
 - 6PE (IPV6) PE-PE routing design similar to IPv4 PE –PE routing design
 - 6VPE (IPV6 VPN) PE-PE routing design similar to VPNV4 PE-PE routing design
- RR design
 - RR will be used to scale IPv6 and VPNv6
 - RR are not part of LSP
 - Dedicated RR boxes with full redundancy

The background is a solid red color with several faint, overlapping circular patterns in a lighter shade of red. These patterns consist of multiple concentric circles and some overlapping circles, creating a subtle, decorative texture.

Deployment plan

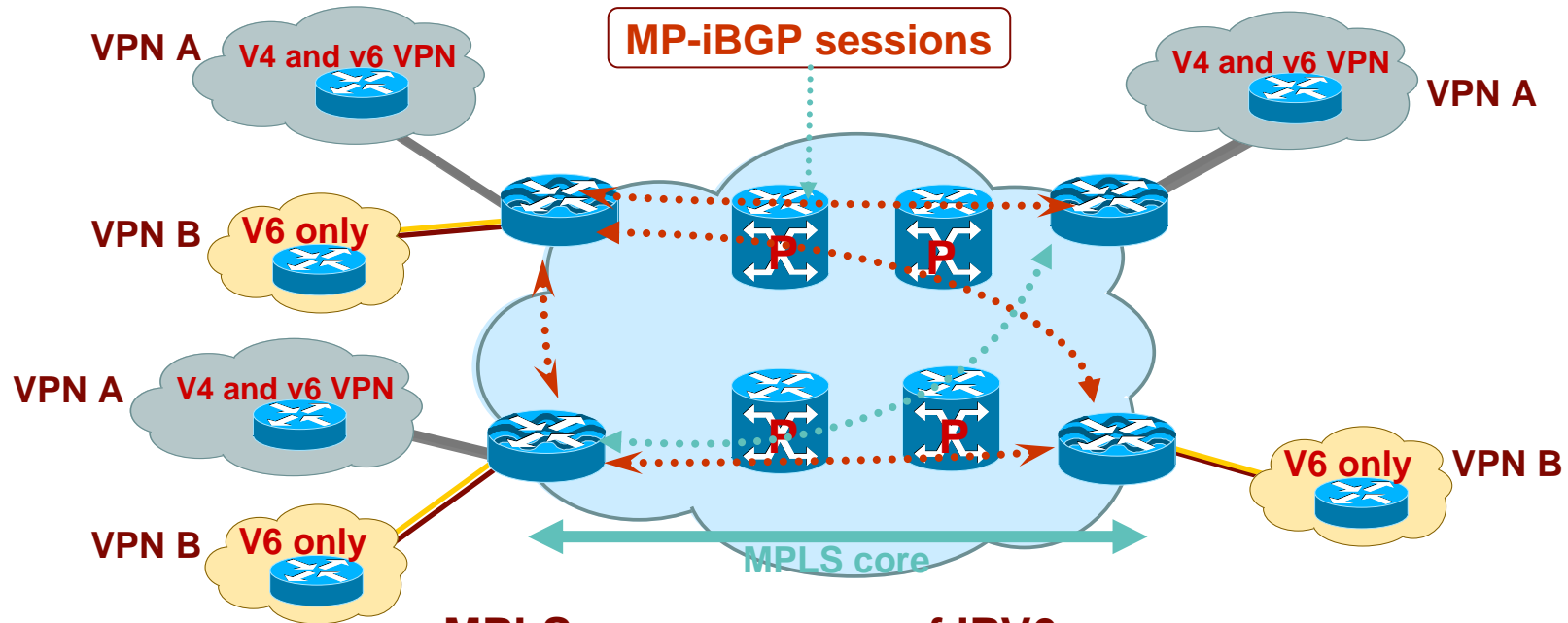
Deployment plan

- Identify service
- Mapping respective routers in the network
- Identify the customer locations
- Plan for Dual stack routers or separate router for less operational issues
- Setting up DNS to support existing IPV4 A records and IPV6 AAAA records
- OSS/BSS IPV6 readiness
- Interconnect access routers over the IPV4

IPv6 over MPLS Infrastructure

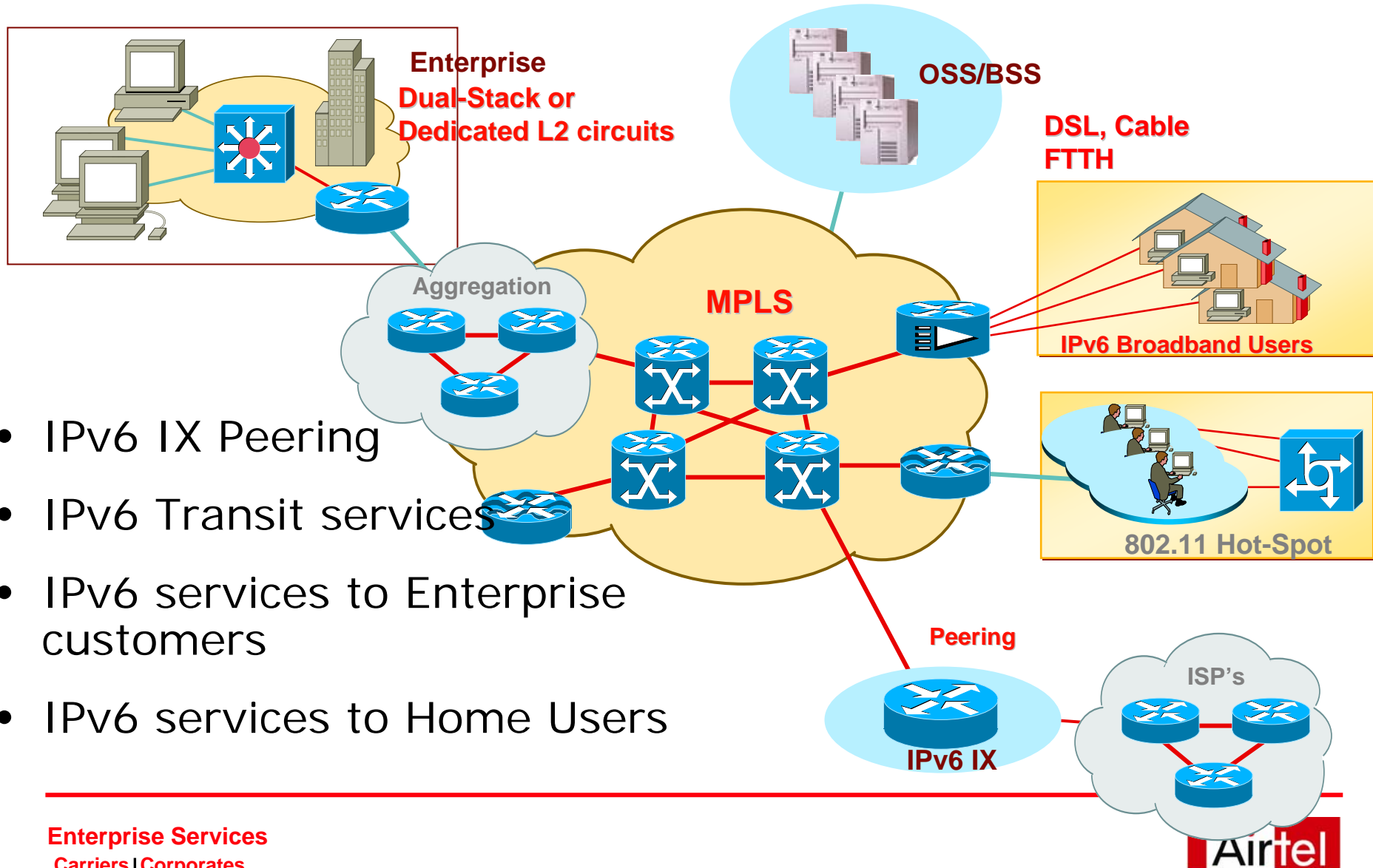
- MPLS in their IPv4 backbone for various services
 - MPLS/VPN, MPLS/QoS, MPLS/TE
- Several IPv6 over MPLS scenarios
 - IPv6 Tunnels configured on CE (no impact on MPLS)
 - IPv6 over Circuit_over_MPLS (L2 VPN- no impact on IPv6)
 - IPv6 Provider Edge Router (6PE) over MPLS (no impact on MPLS core)
- Upgrading software to IPv6 Provider Edge Router (6PE)
 - Low cost and risk as only the required Edge routers are upgraded or installed

IPv6 over MPLS Infrastructure



MPLS core unaware of IPV6
PE to be upgraded to dual stack
IPV6 reachability among 6PEs MP-IBGP
IPV6 packets transported from 6PE to 6PE
No change of other architecture of MPLS core
NO icmp support as core does not support IPV6

Phase II



Summary

- Time to start work on IPV6 deployment
- Migration Challenges
 - 360 Degree Analysis
- Investments Planning & Approval
- Phased Approach for Migration



Thank you