Cisco Expo Tunis

Le Nouvel Ethernet Operateur (aka Carrier Ethernet)

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The Need for Carrier Ethernet

Service-optimized Packet Access Networks

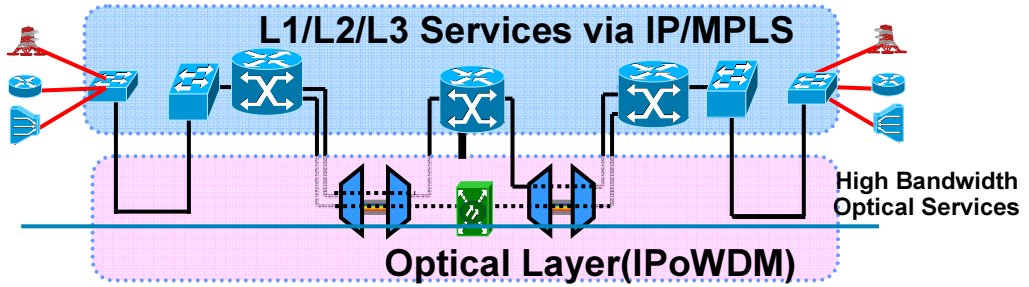
Retail	*Mobile*	*Consumer*
Wholesale	*Fixed*	*Business*

NGN Service Optimized Architecture
Scalable / Flexible / Resilient / Optimized

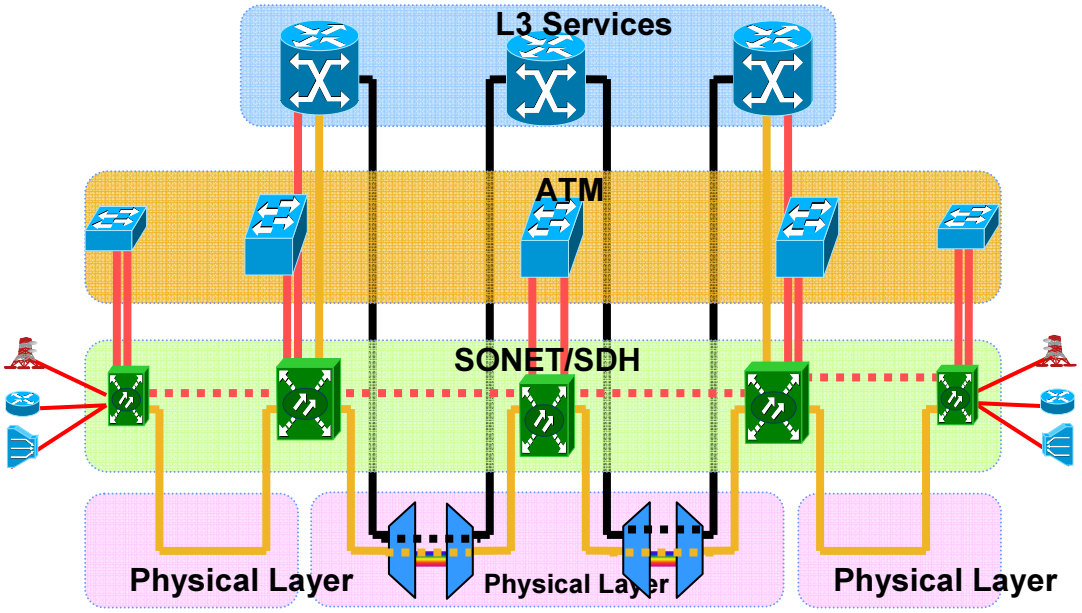
Optimize cost through of operational and transport efficiency	*Multi-service capable, expandable*	*Implement Services & Functions at the appropriate layer*

SP Network Evolution

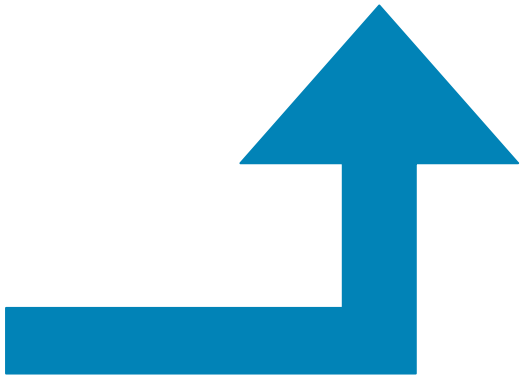
- Historic Growth
- Not built for packet initially
- Diff. Departments
- High OPEX due to layering



Tomorrow

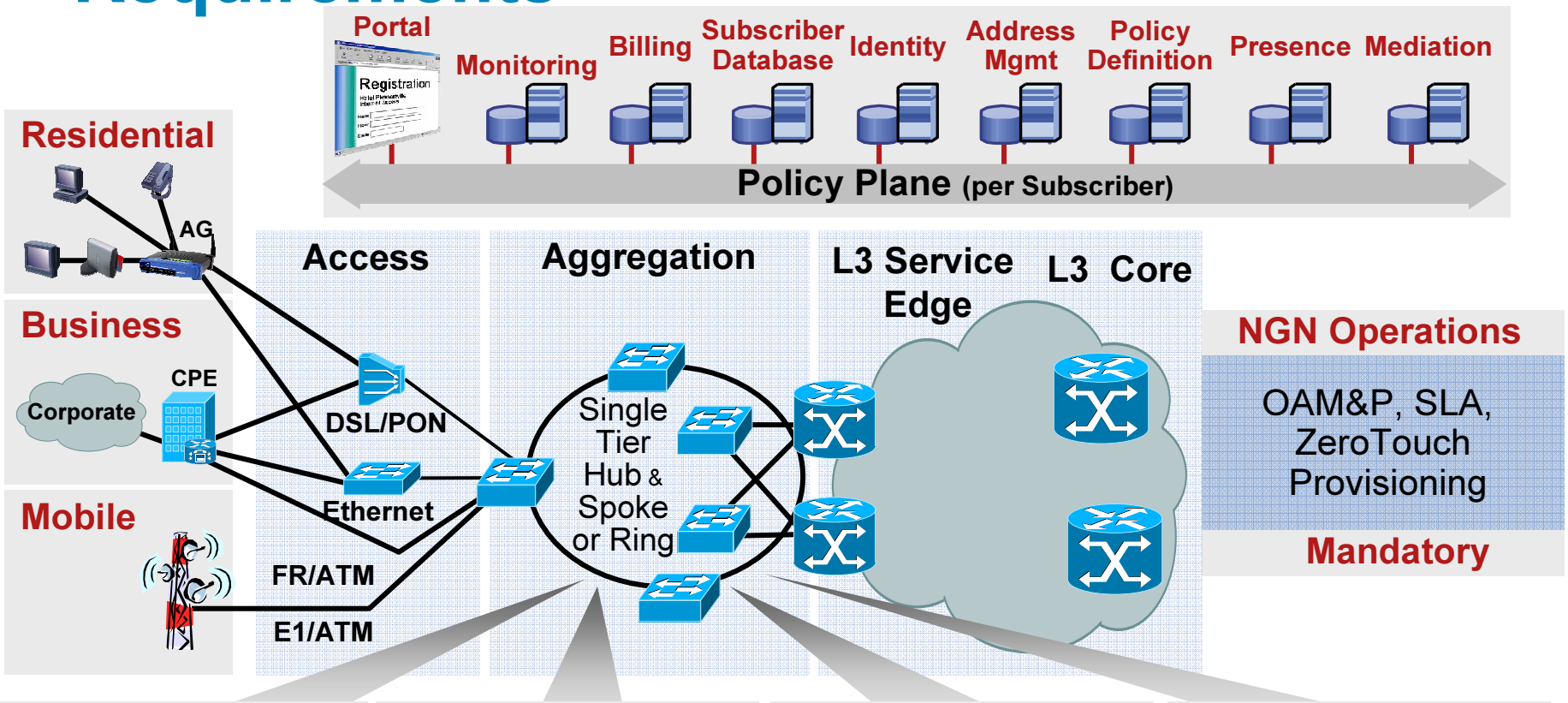


Yesterday



- Evolution not revolution
- Minimal Layering
- similar control plane in aggregation and core

Next-Generation Network Requirements



Ethernet	Legacy Services	NGN Application	Others
Point to Point Point to MP Multipoint	ATM Frame Relay TDM	Efficient IP Multicast Efficient VoD Delivery Call Admission Control	Standards Based Cost Effective QoS, TE & Recovery Fast Provisioning
Mandatory	Optional	Mandatory	Mandatory

Theme of Application Management Emerges
Transport Services vs. Managed Application Services

Transport Service

- Service = CIR/PIR pipe with applications hosted by third parties
- SLA defined by transport parameters
- Residential HSI = 5Mbps down, 1Mbps up, no guarantee for streaming quality
- Business VPN = CIR & PIR, jitter, delay, loss guarantees, no app. guarantees

Network QoS Requirements

- Shape & drop packets over CIR, leverage TCP back-off
- QoS can change dynamically per sub (turbo button, bandwidth on demand)
- Transport SLA must be enforced per subscriber

e.g. HSI & Business VPNS

Managed Application Service

- Application hosted by provider
- SLA is defined by Quality of Experience (QoE) expectation
- Video = 1 artifact per 2 hour movie
- Voice = no sound quality impairments, blocked calls rare

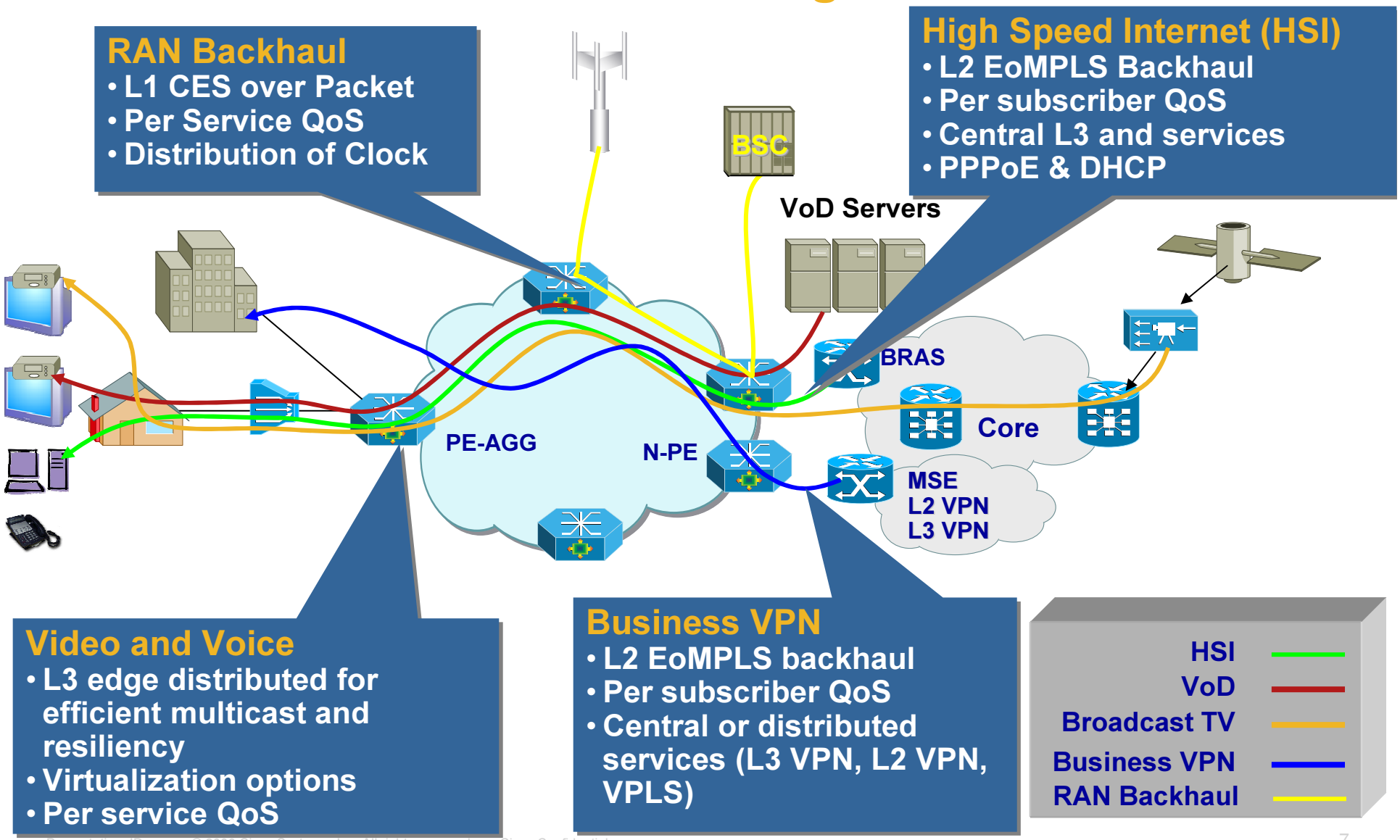
Network QoS Requirements

- QoE mapped to network QoS requirements
- QoS same for all subs of a particular app
- No need to enforce transport SLA per subscriber, per-service SLA instead

e.g. Residential VoIP & Video

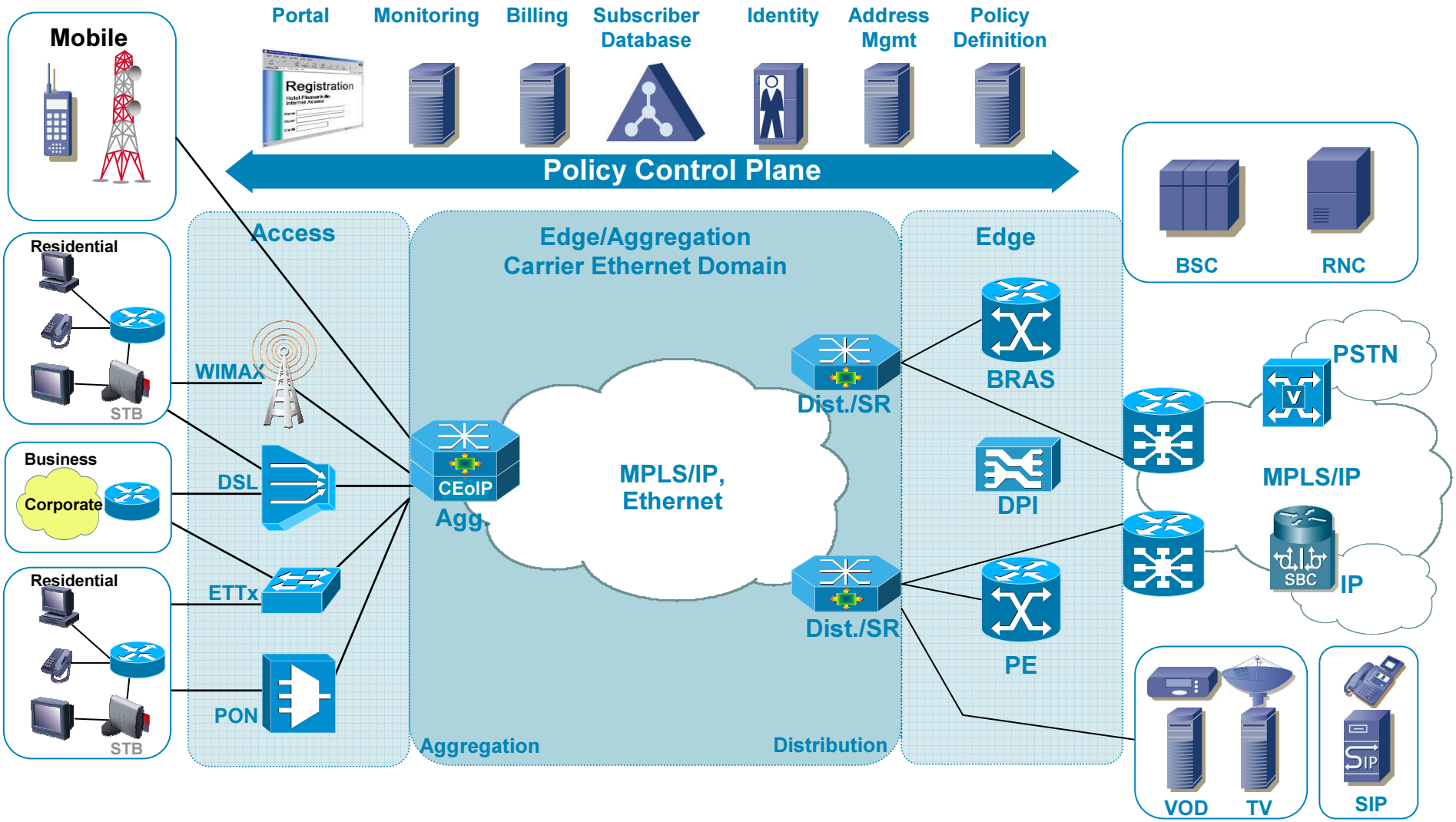
From Design Principles to Implementation

Carrier Ethernet IP NGN Design



Next Generation Carrier Ethernet

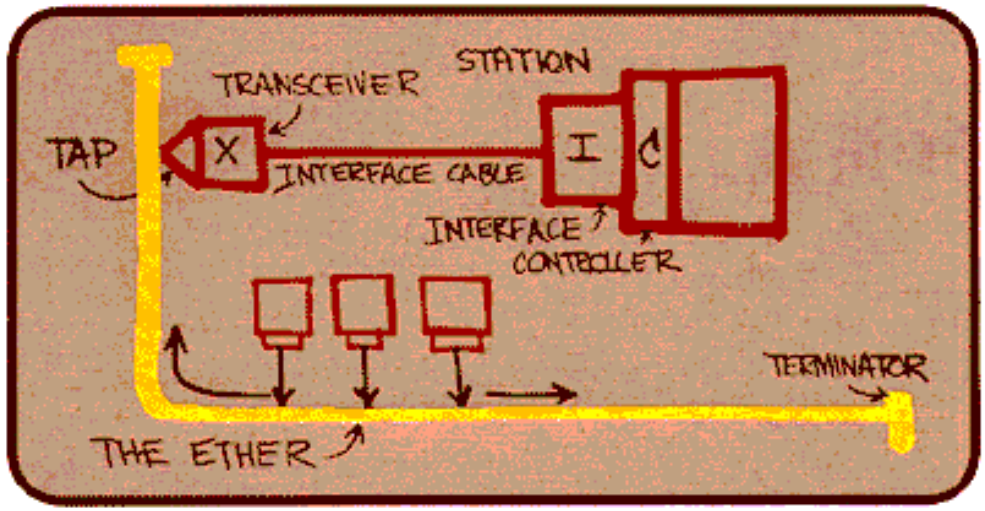
Cisco Multi-Service Architecture Overview



Ethernet: a Carrier Technology

Generalizing SP Ethernet Access

Evolving the Original Idea of the Ethernet Service Bus

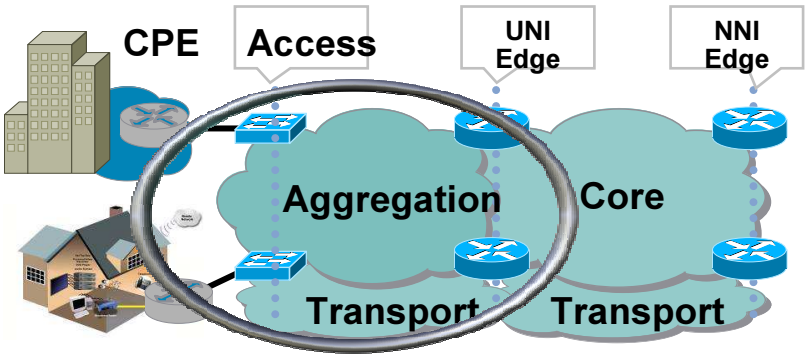


Metcalfe's Original Concept of Ethernet (1976)

- Ethernet began as Shared Media Tap points for workstations & bridges
- leverage the multipoint nature of Ethernet in SP access. There is a *lot* of value here…
  - Ethernet as a "predator" in the L2 world
  - Optimizing Transport Cost versus Operational Costs (GE, 802.3AD, 10 GE.. 100GE in IEEE PAR)
  - Ethernet also being targeted for Synchronization transport !

Cisco Alignments with major standardization efforts wrt Ethernet

- Ethernet technologies maturing for Carrier Aggregation Networks
- IEEE and IETF provide Ethernet and MPLS aggregation options
- DSL Forum defines architecture models for EtherDSL aggregation
- MEF defines Ethernet services and UNI options
- Cisco Systems has an active role in these standards bodies



Focus on the User-Perspective: Ethernet Services, UNI, Traffic Engineering, E-LMI, ...

SP-Ethernet: Provider Bridges (802.1ad); EFM (802.3ah); Connectivity Management – OAM: 802.1ag; 802.1ah Backbone Bridges, 802.1ak Multiple Registration Protocol, 802.1aj Media Converters, etc.

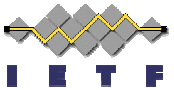
L2VPN, PWE3 WG – Building the Network Core: VPWS, VPLS

SG15/Q12, SG13/Q3; Architecture of Ethernet Layer Networks, Services etc. – from a Transport perspective. E2E OAM.

Ethernet to Frame-Relay/ATM Service Interworking

TR-101 alignment : BRAS-requirements, Ethernet Aggregation / TR-59 evolution, subscriber session handling, ...

Takeways on standard



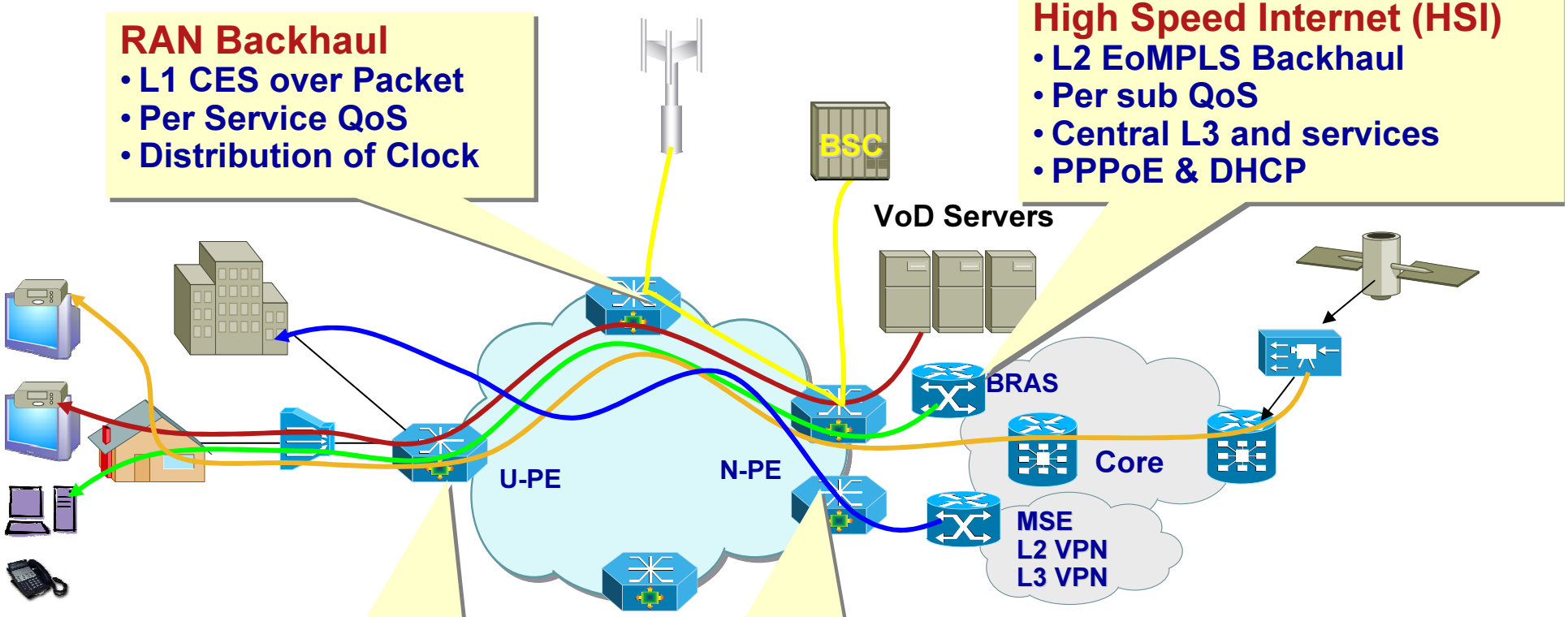
- Ethernet is quickly getting ready to become a ubiquitous technology
  - Evolving from Enterprise to include SP requirements:
    - Service Mapping, Scalability, Reliability, Maintainability, Security
  - End-to-End Focus: Access, Aggregation and Core
- Converging Standards in multiple forums and organizations rapidly evolve Ethernet to meet SP requirements
  - MEF, MFA, IEEE, IETF, ITU, DSF-F
  - Alignment is key
  - Keep Ethernet Ethernet (and don't make it ATM)

Carrier-Ethernet infrastructure: supported services

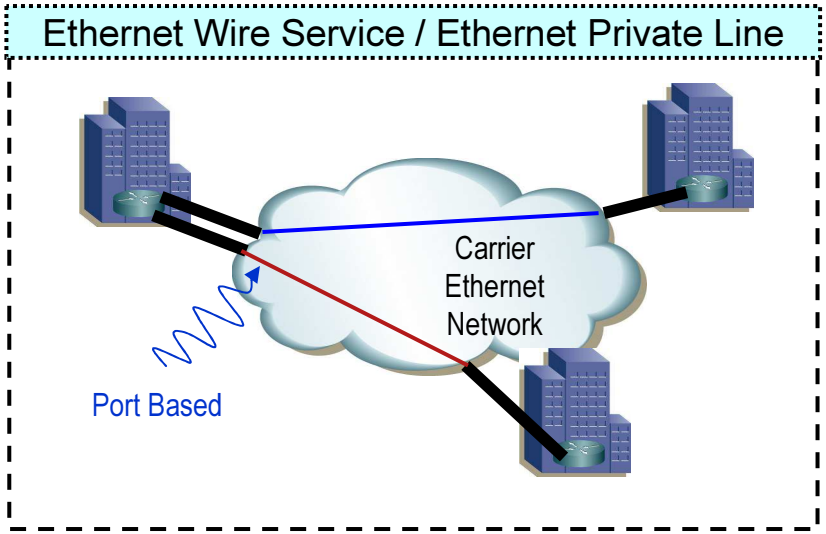
Carrier Ethernet Networks
Services

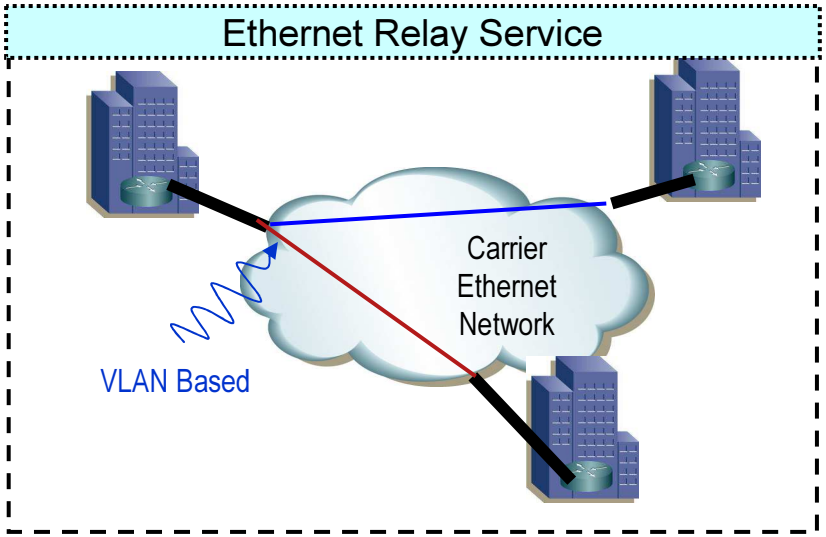
Market	Services	Access	SLA Type	SLA Example
Residential	Internet Access	Ethernet, DSL	Transport	Dynamic access bandwidth, session/idle timeout, advertisements, post paid/prepaid (time and volume)
	VoIP Telephony	Ethernet, DSL	Application	The number of VoIP appliances, SIP URLs/PST Phone numbers, active calls, VoIP call quality
	VoD	Ethernet, DSL	Application	The number of STBs, stream quality, content flavours, charging models
	TV	Ethernet, DSL	Application	The number of STBs, type of TV packages, SD vs HD content and delivery quality
Business	L3 VPN	Ethernet, DSL	Transport	Access bandwidth, differentiated services support, L3 VPN topology, managed services
	E-Line	Ethernet, DSL	Transport	Access bandwidth, differentiated services support, transparency
	E-LAN	Ethernet, DSL	Transport	Access bandwidth, differentiated services support, multipoint transport, transparency
Wholesale	L3 (P2P, MP)	DSL	Transport	Aggregated bandwidth on ISP level, differentiated services support, with subscriber management at ISP
	L2 (P2P, MP)	DSL	Transport	Aggregated bandwidth on ISP level, differentiated services support, transparent Ethernet transport P2P and MP (multicast optimized)

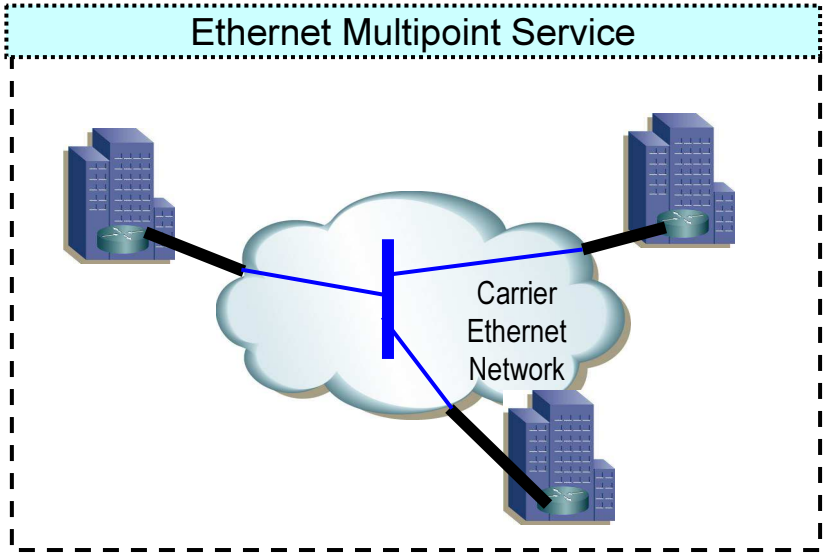
One Carrier Ethernet Design to match any services

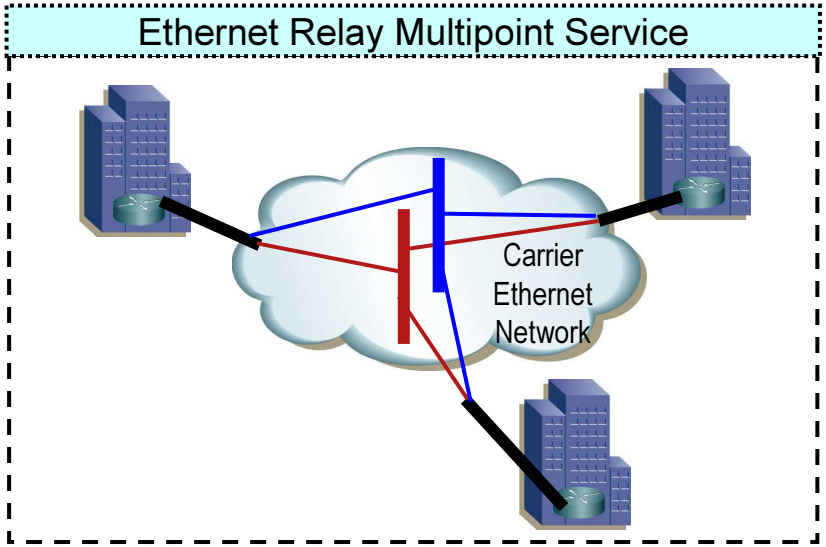


Business VPN Services: SP View



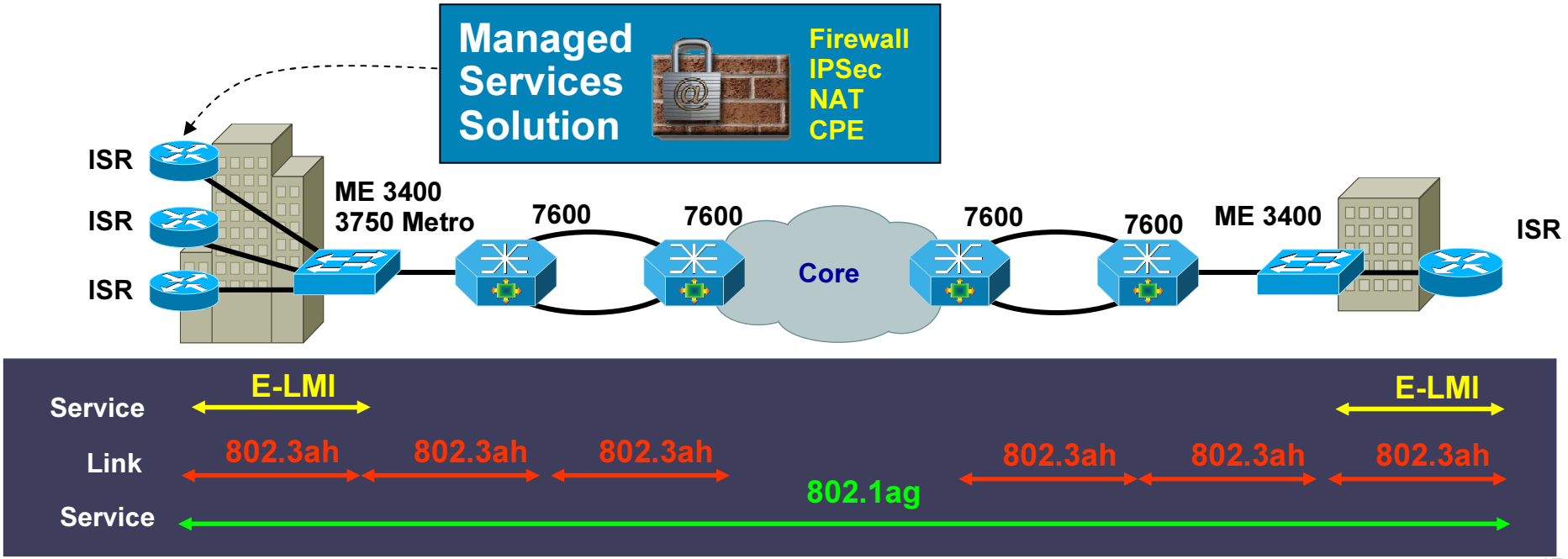






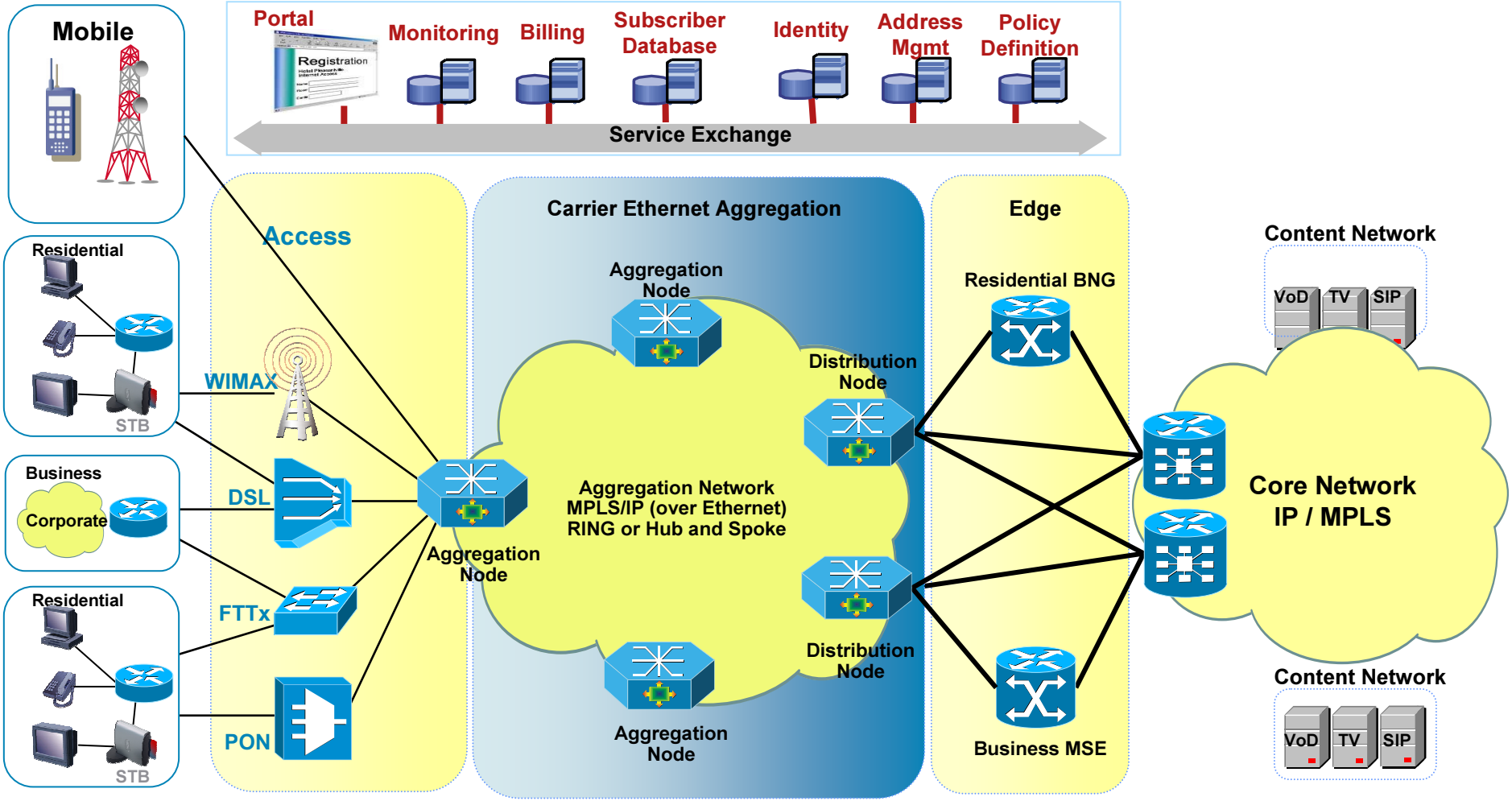
Business VPN Services: Customer View

- Business Ethernet
  - End-to-end Ethernet solution, including ISR
  - 802.1ag, 802.3ah for Ethernet SLAs
  - Auto-provision w/E-LMI for time to service
  - OAM supports ATM/FR to Carrier Ethernet migration

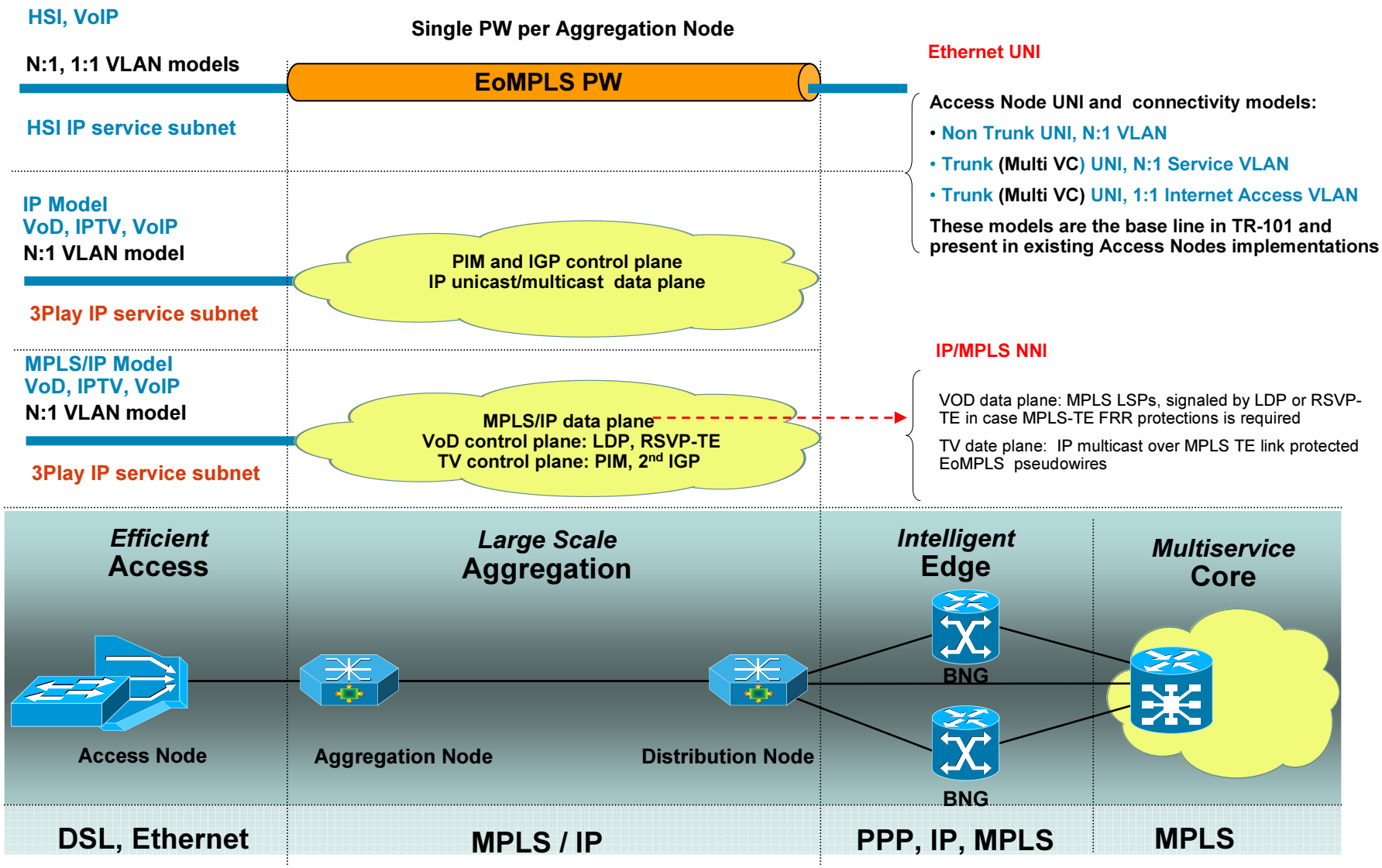


A reference architecture

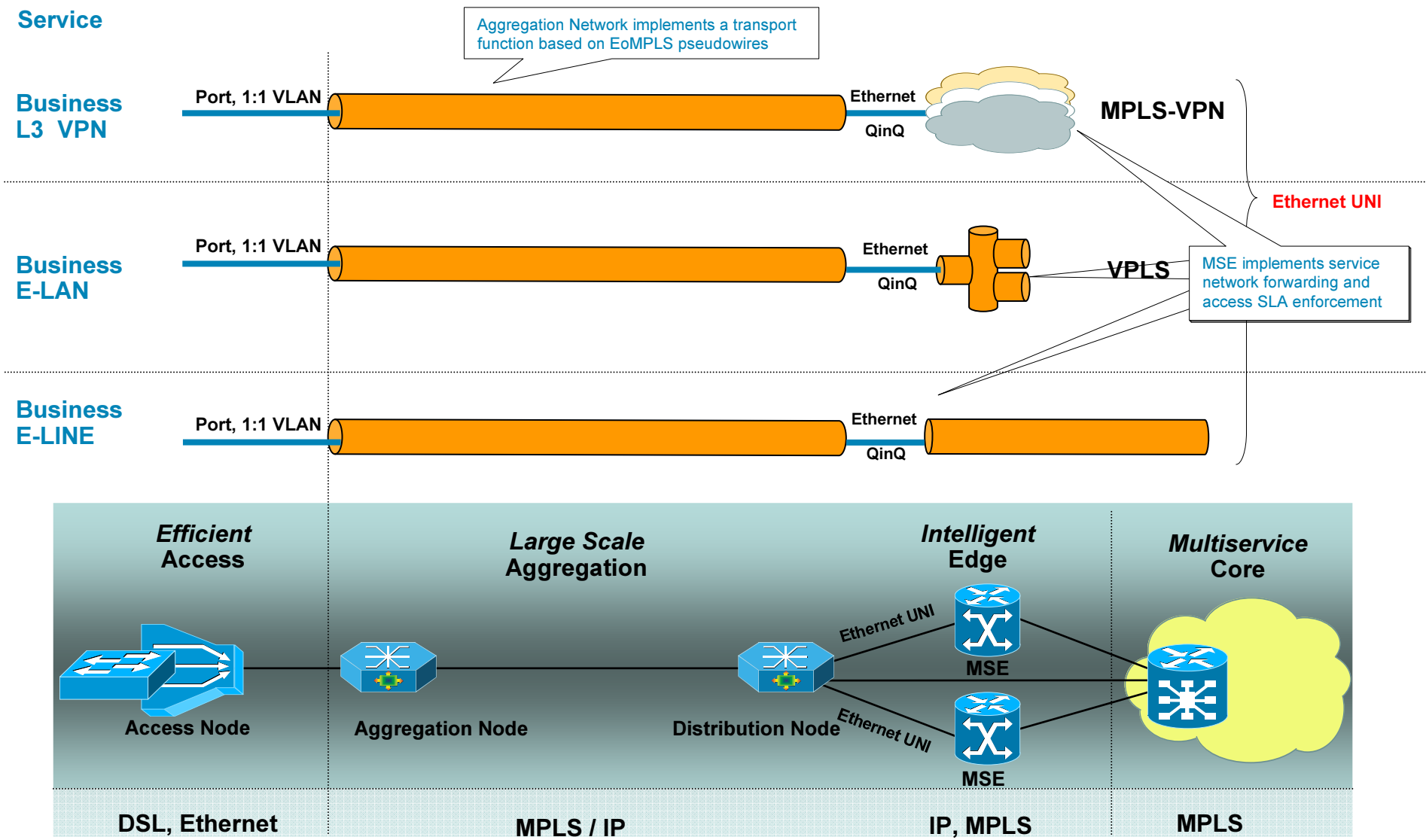
Carrier Ethernet Aggregation System



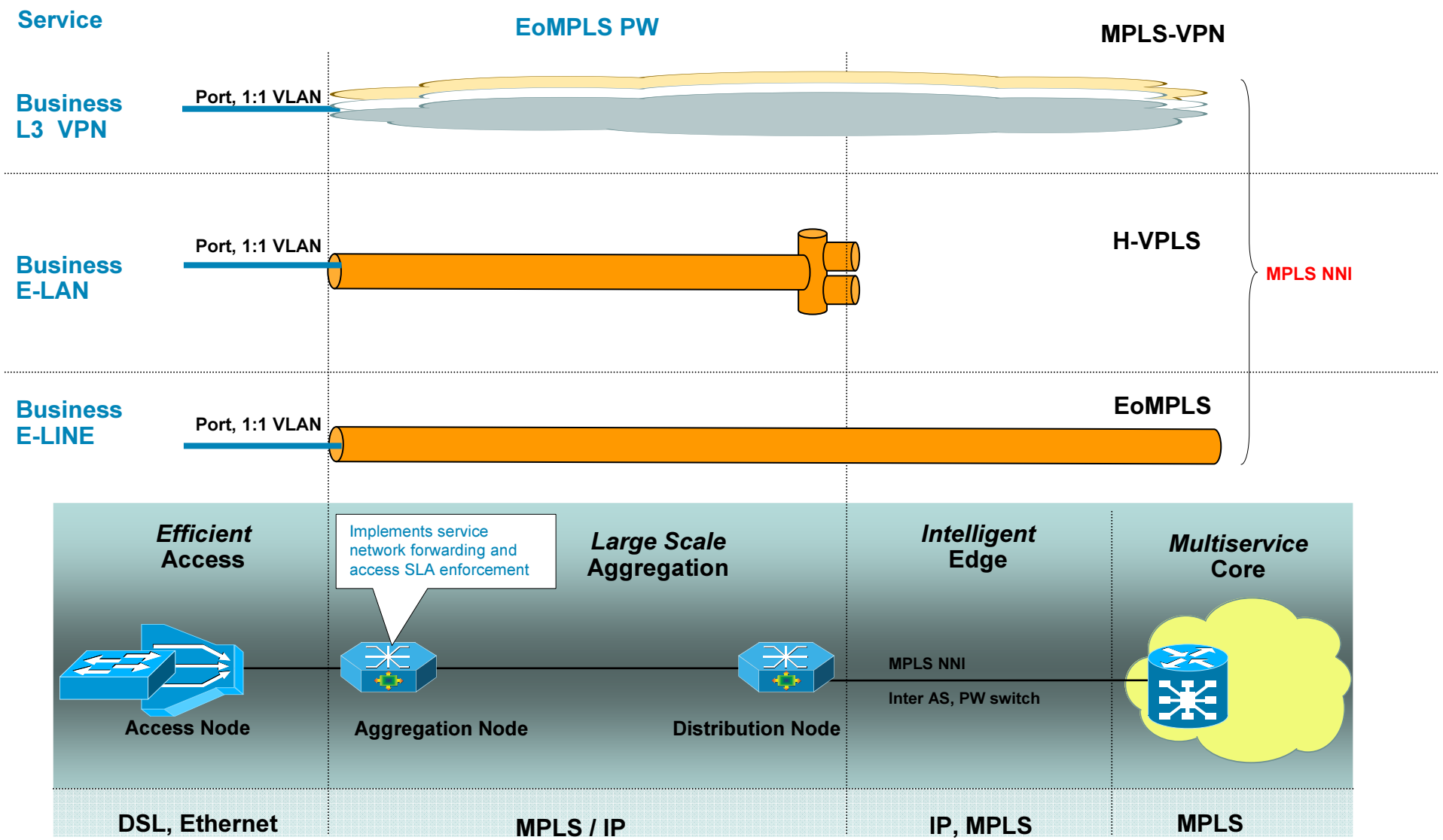
Retail Services Architecture



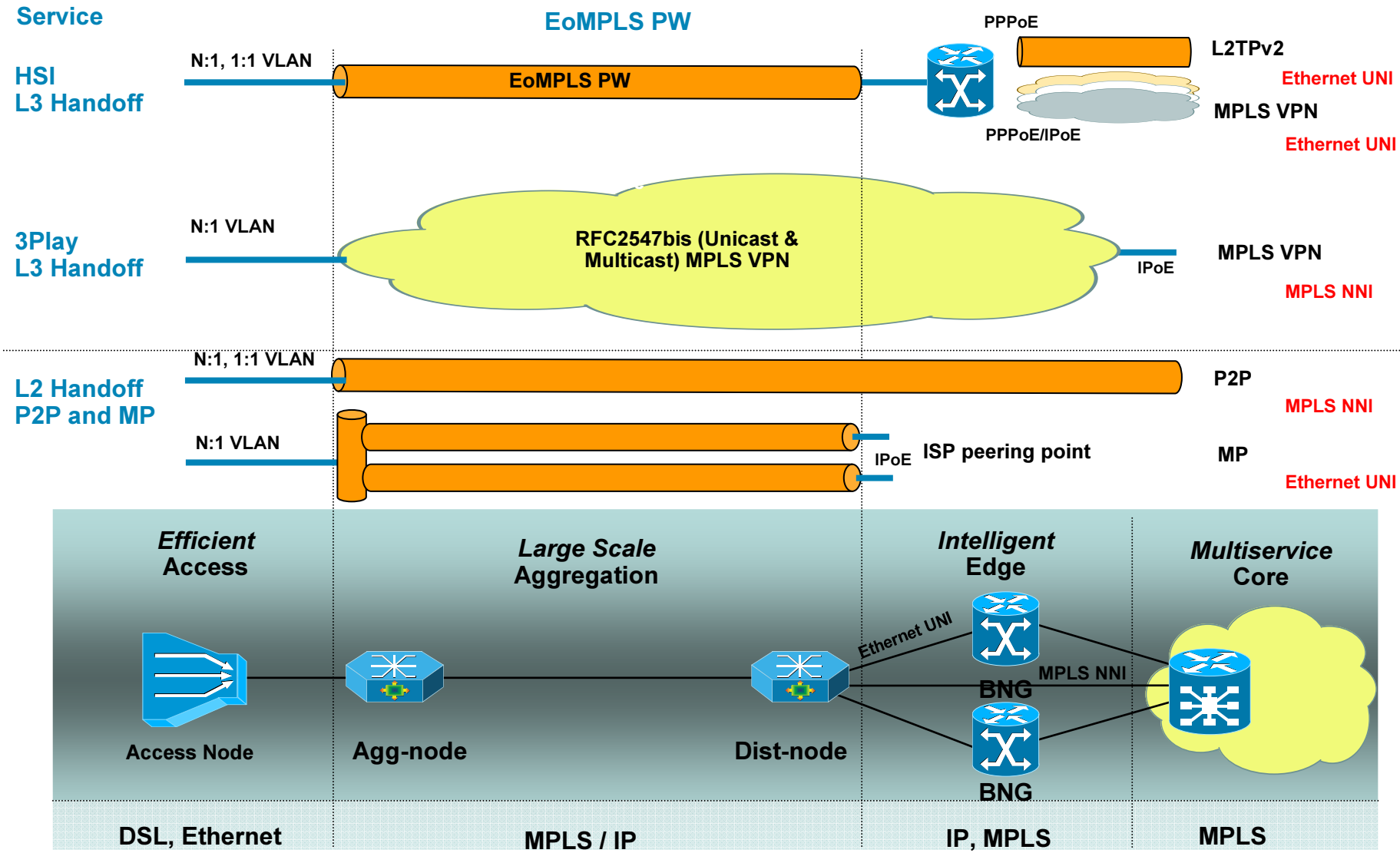
Business Services Architecture



Business Services Architecture

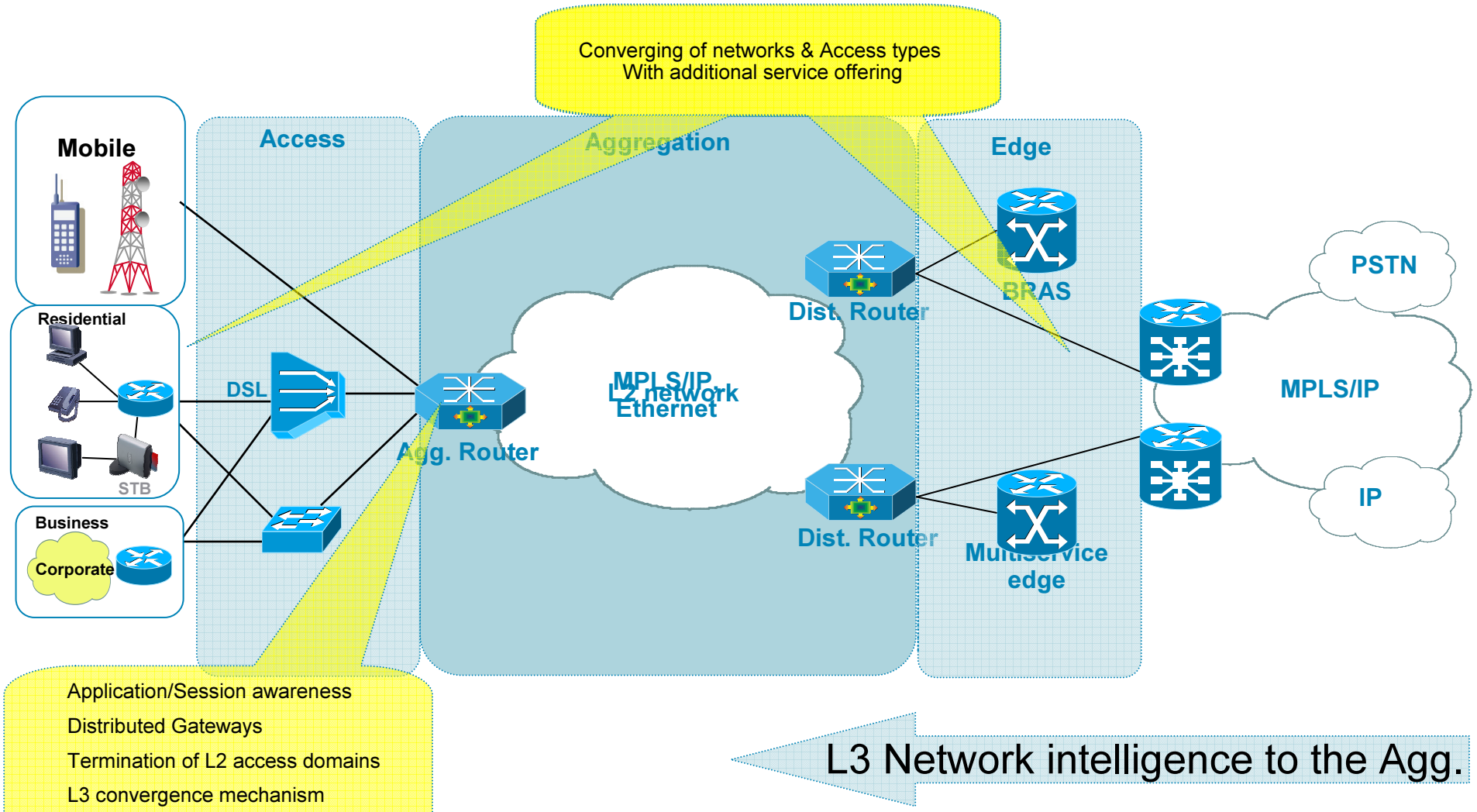


Wholesale Services Architecture



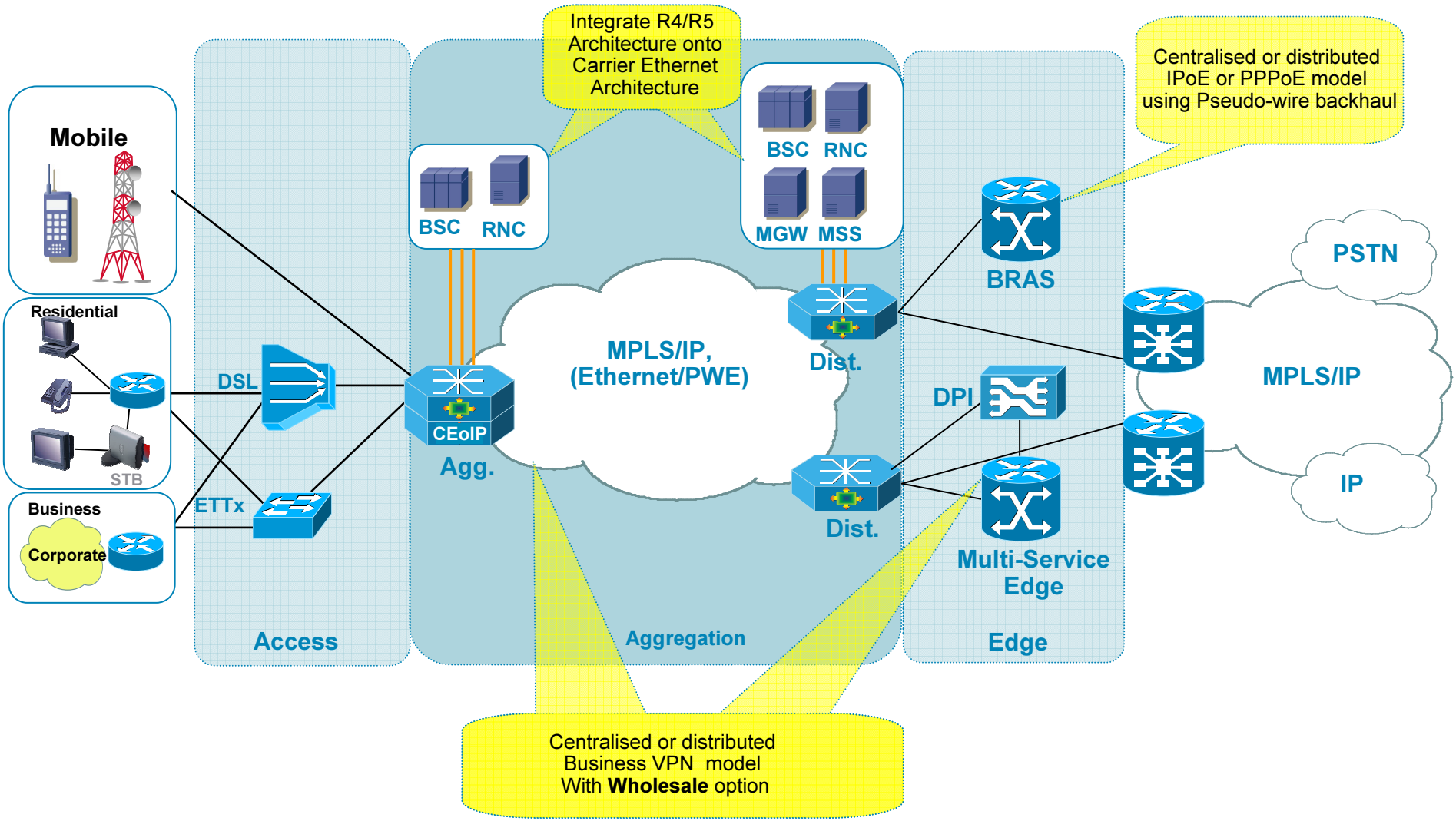
Potential Next Generation Network Evolution

with Cisco Multi-Service Architecture



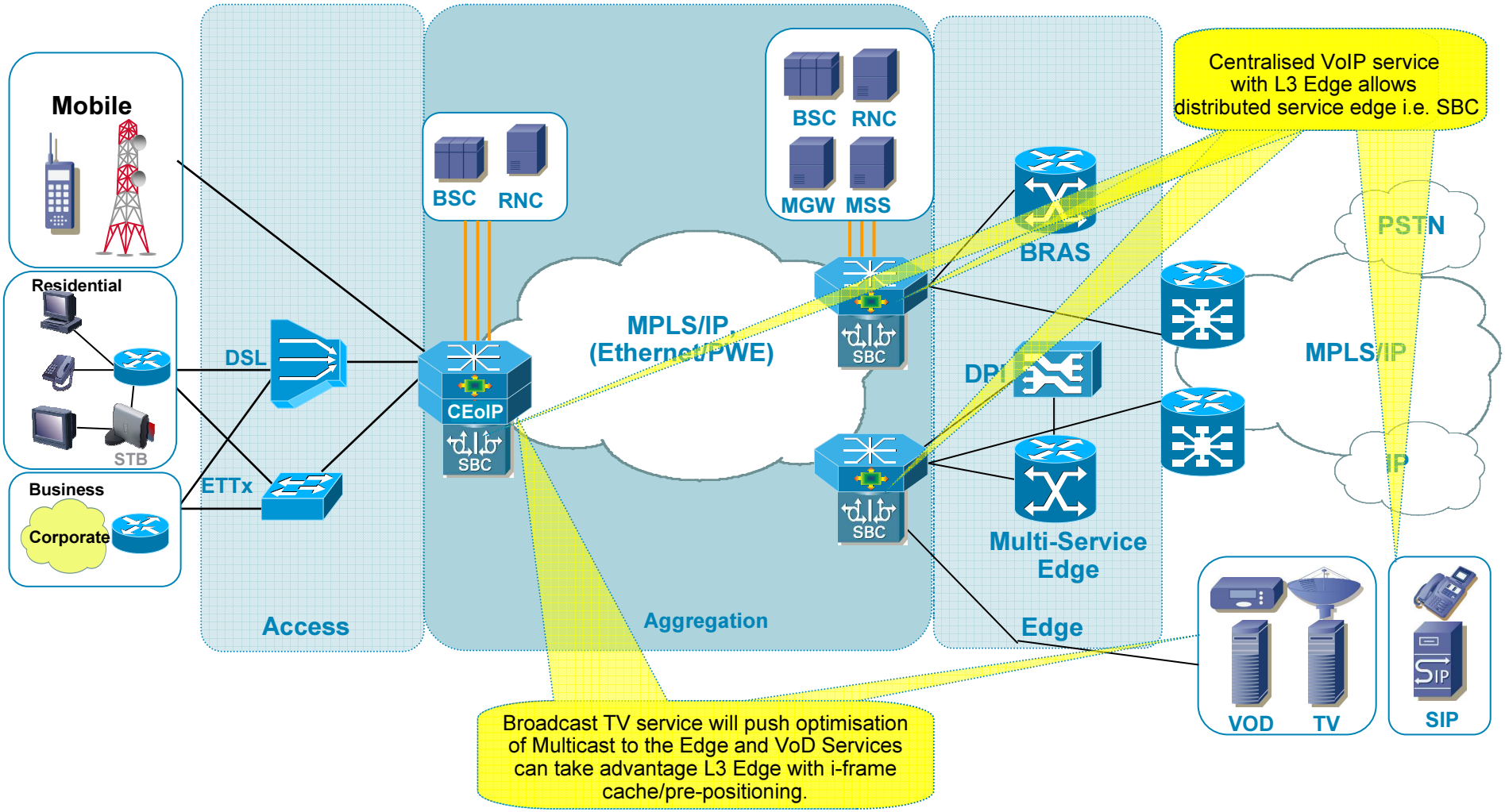
Potential Next Generation Network Evolution

R4/R5 Architecture, Internet Access (IA), Business Services



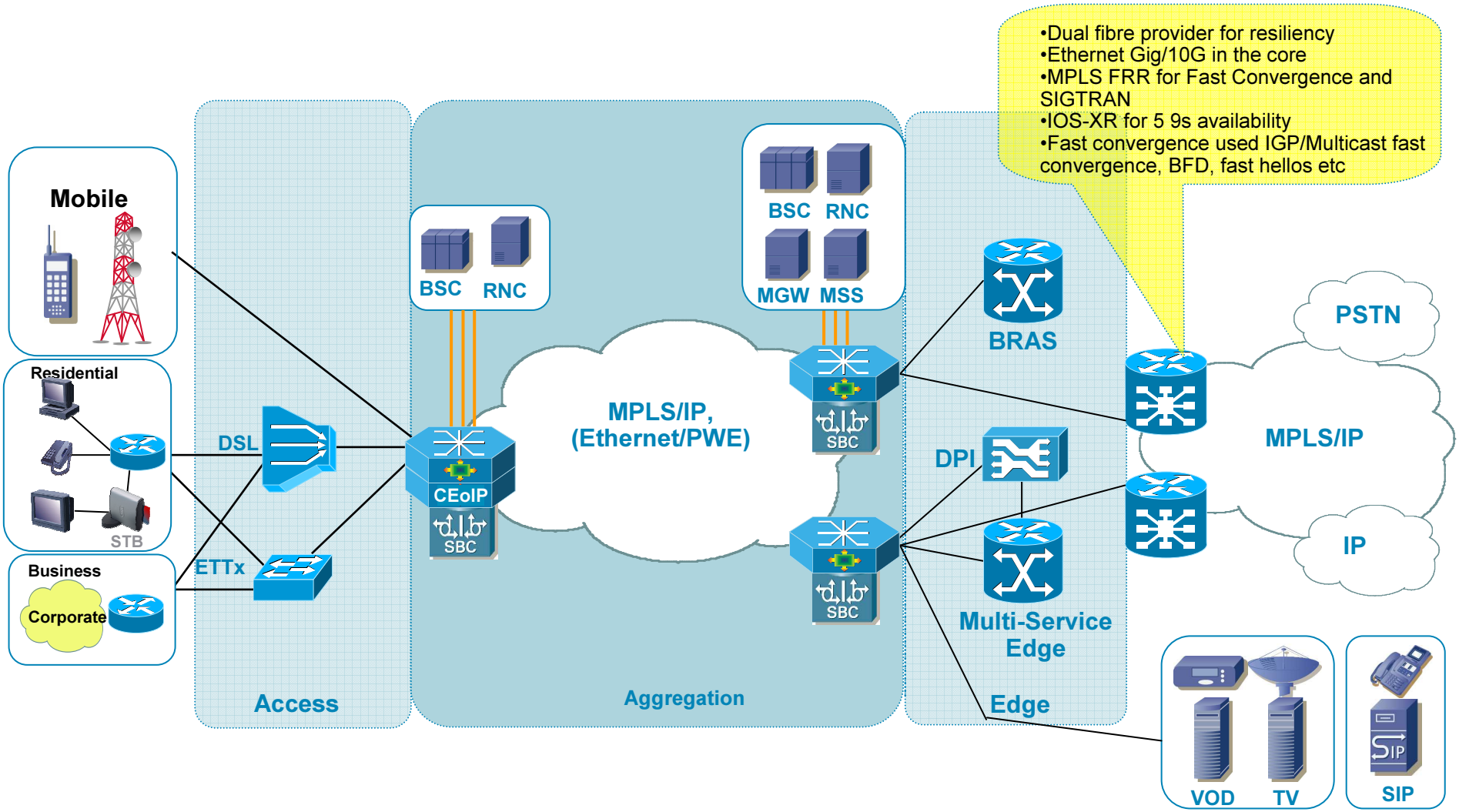
Potential Next Generation Network Evolution

L3 edge for VoIP service and optimised IPTV offering



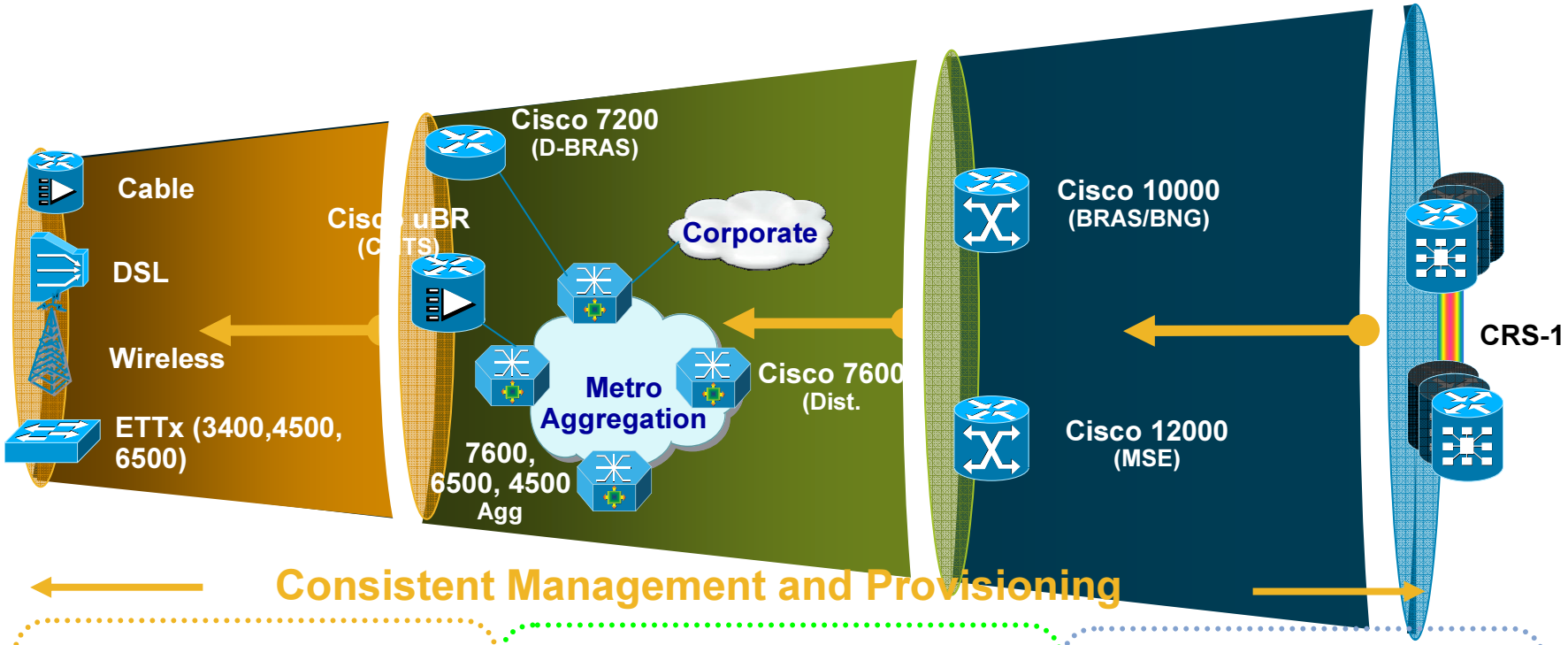
Potential Next Generation Network Evolution

Core Evolution



Carrier-Ethernet Solution: Cisco Component

Which Equipment ?



Access

- Media and Access Technology Agnostic
- Ethernet over Anything
- Consistent Service Level Agreements
- Rapid Deployment Velocity

Aggregation

Convergence :

- Business & Consumer
- Wireline & Mobile

- Personalized Service Distribution
- Policy Enforcement

Service Edge

Centralized Services

- Business VPNs
- Policy Management

- Flexible Business Models

Cisco Carrier Ethernet Architecture
Summary

- Market Leading Network and Service Flexibility
- Common NGN Carrier Ethernet Network and Systems Solution for All Services
  - Retail & Wholesale
  - Business & Residential Customers
  - 3-Play and Flexible Service Tiering
  - Advanced Set of Tools For Service Customization and SLA Assurance
- CAPEX and OPEX Optimized
  - Multiple Transport Options to Suit Specific Geo, Market and Infrastructure Needs
  - Advanced Operational Network Instrumentation and Systems Tools for Fast Service Velocity and OPEX Optimization
- Well Proven Solution with Numerous References
  - Business Services, Residential 3-Play