



Cisco Expo
2008

Carrier Ethernet

Part I. – Network Design



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Cisco Central & Eastern Europe

Agenda

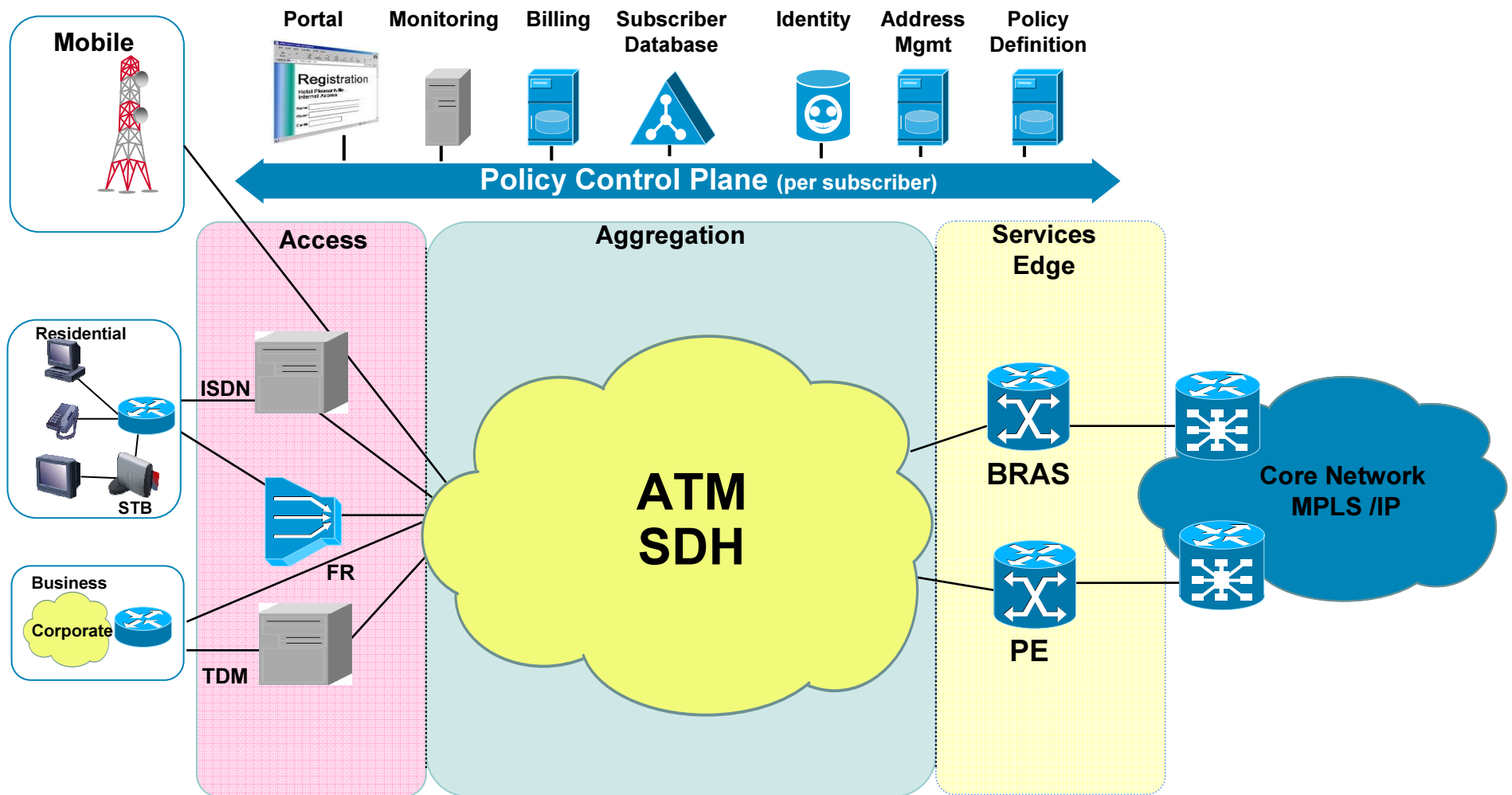
Carrier Ethernet Design

- what is Carrier Ethernet?
- history, presence, future
- service edge

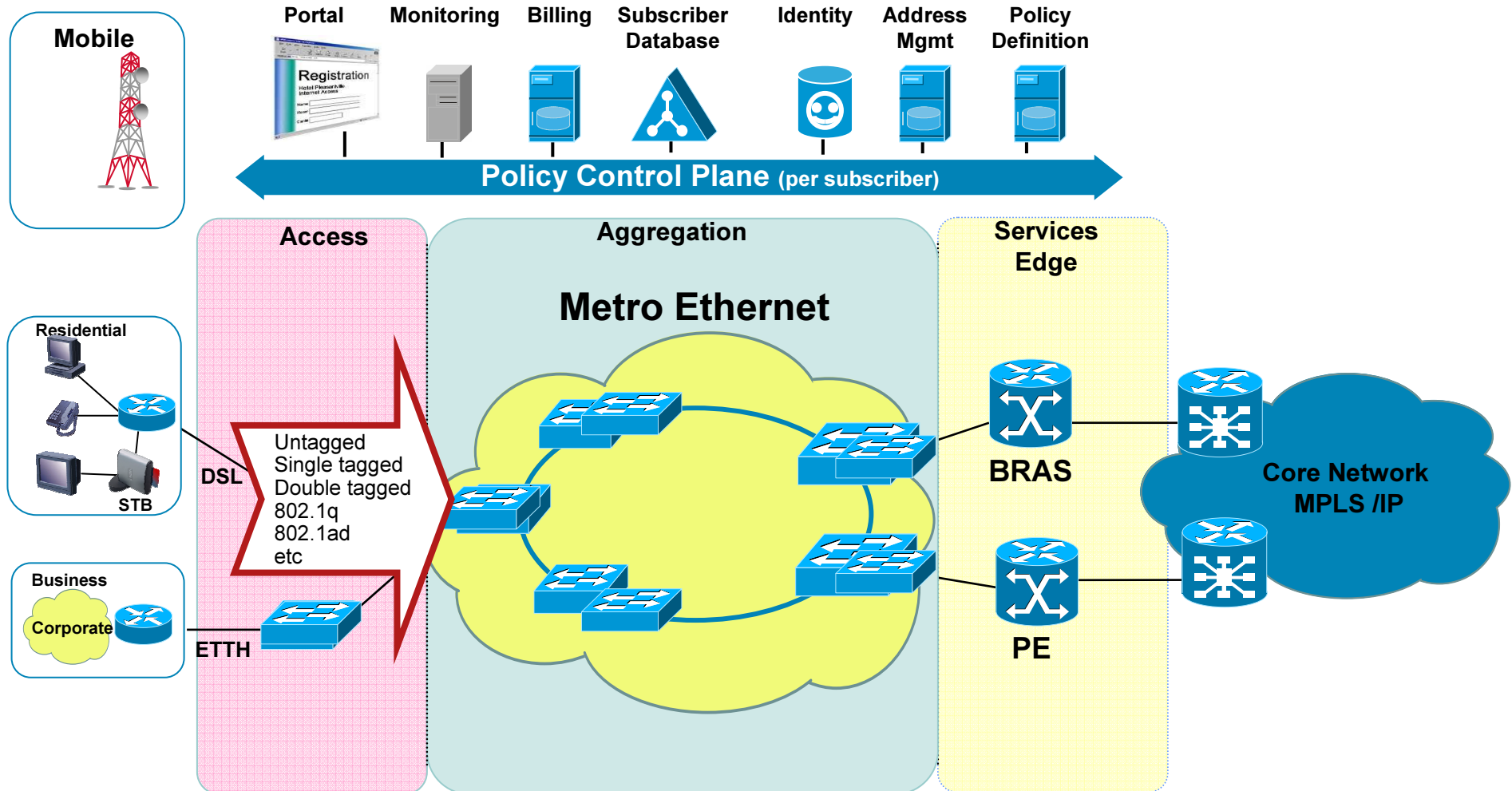
Carrier Ethernet hardware – Cisco 7600

- what is so different on ES cards?
- existing and future hardware

Where is it going from: **Aggregation 2000**



Where is it going from: **Aggregation 2005**

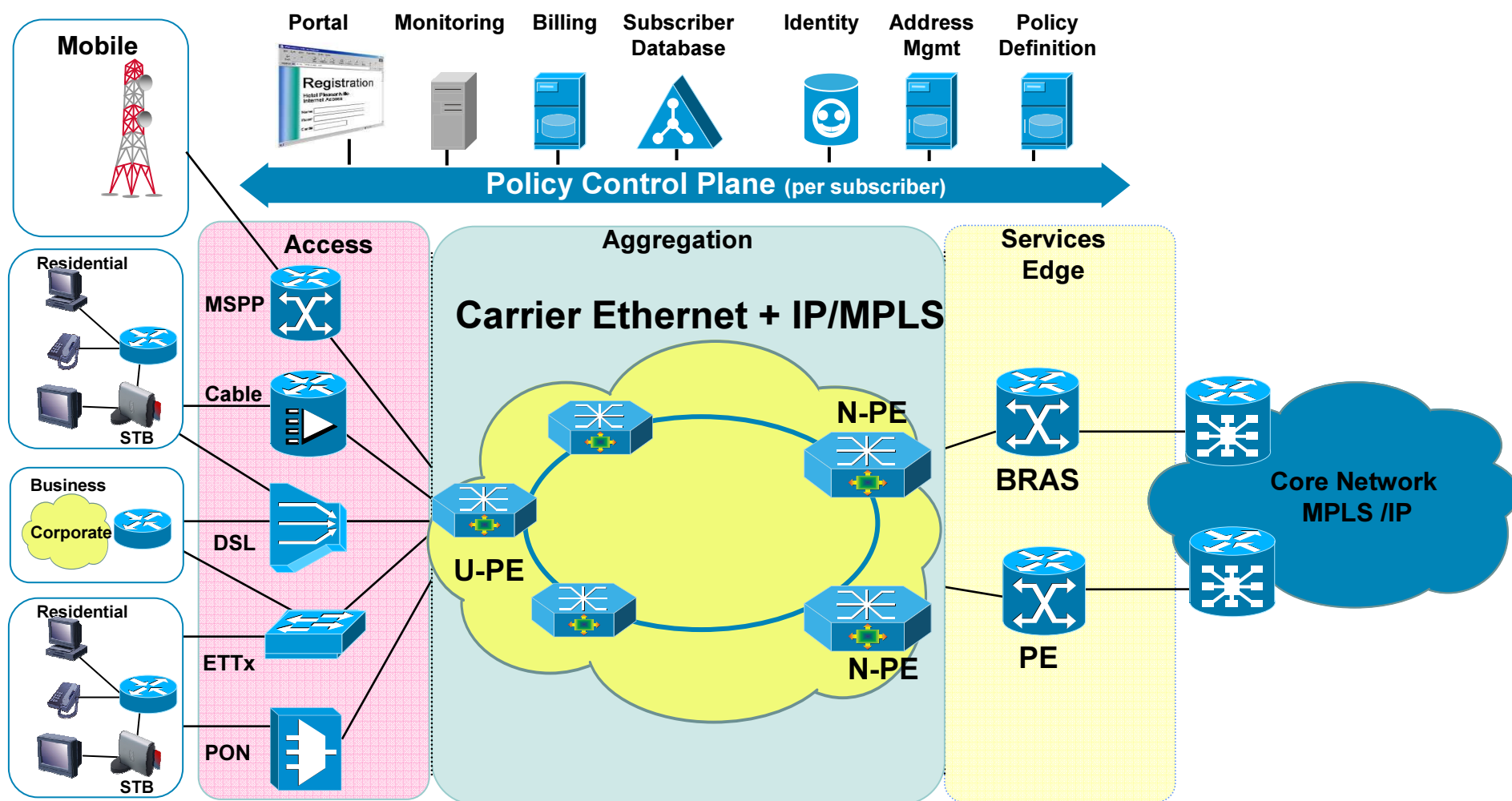


What is Carrier Ethernet?

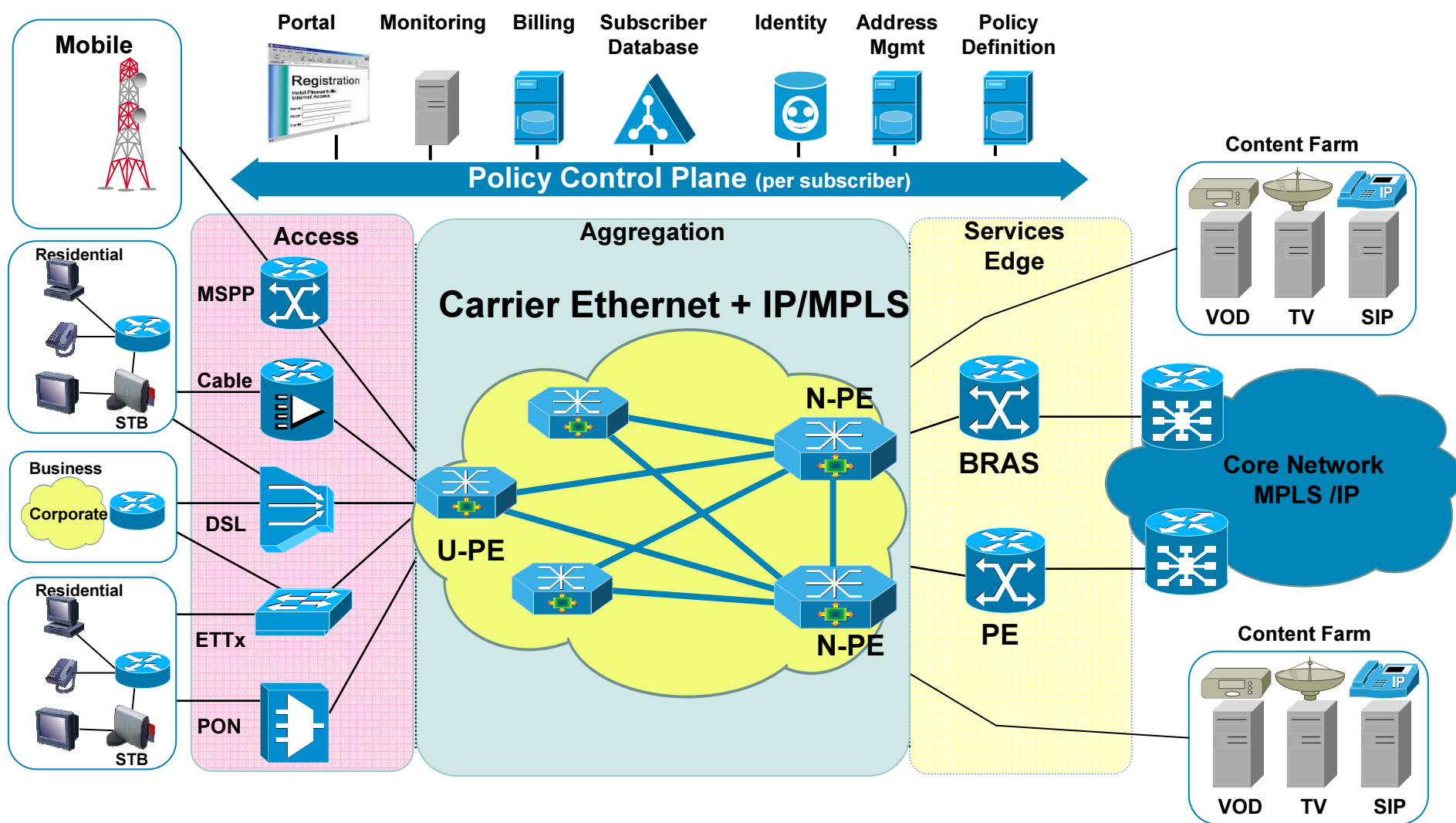
Making LAN Ethernet suitable for replacing ATM/SDH

- Scalability
 - Going beyond 4K VLAN's and keep the flexibility
- Reliability
 - Going beyond Spanning Tree (50ms/FRR, fault detection, 1+1)
- Dynamic signaling
 - DLDP-set pseudowires (PVC vs. SVC)
- Service Management
 - OAM to Provision, Monitor, Diagnose and Resolve Issues
- Standardized Services
 - Standard EVC, E-Line, E-LAN (MEF)
 - de-facto standard Residential Quad-Play (incl. IPTV, Mobile)
 - de-facto standard Business IP VPN (inc. H-QoS)

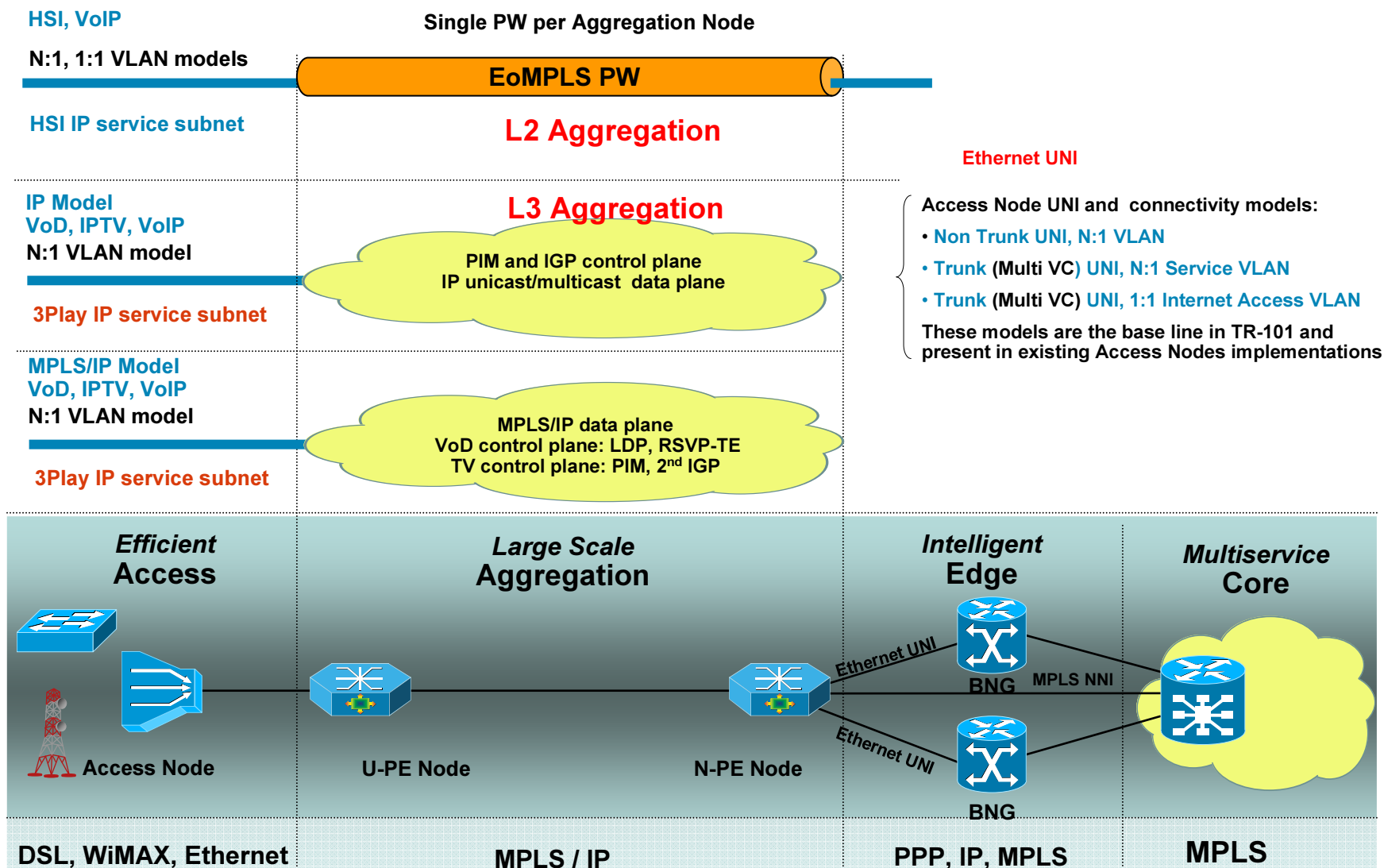
Carrier Ethernet – Centralized Design



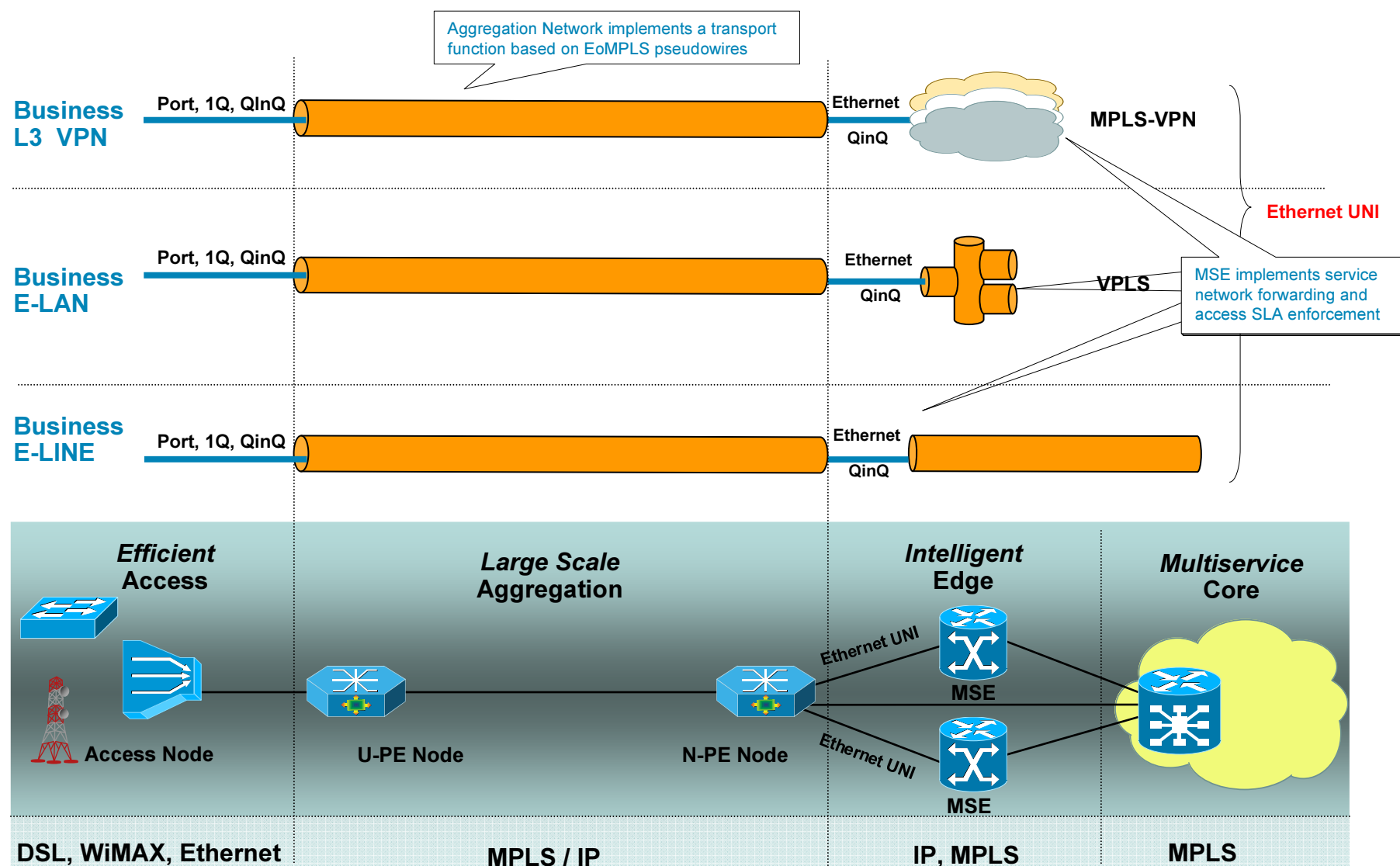
Carrier Ethernet – Centralized Design



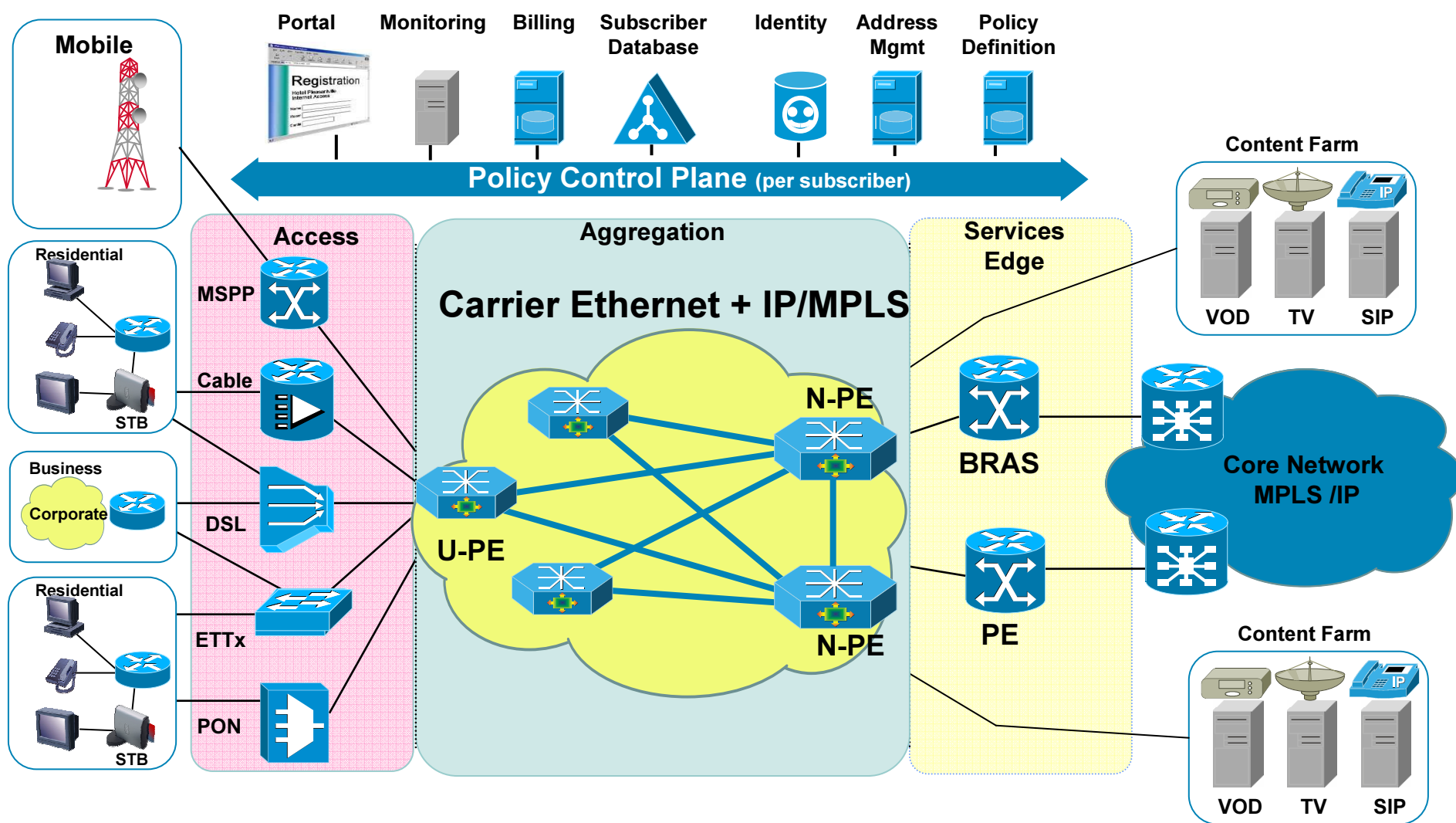
Residential Services Architecture



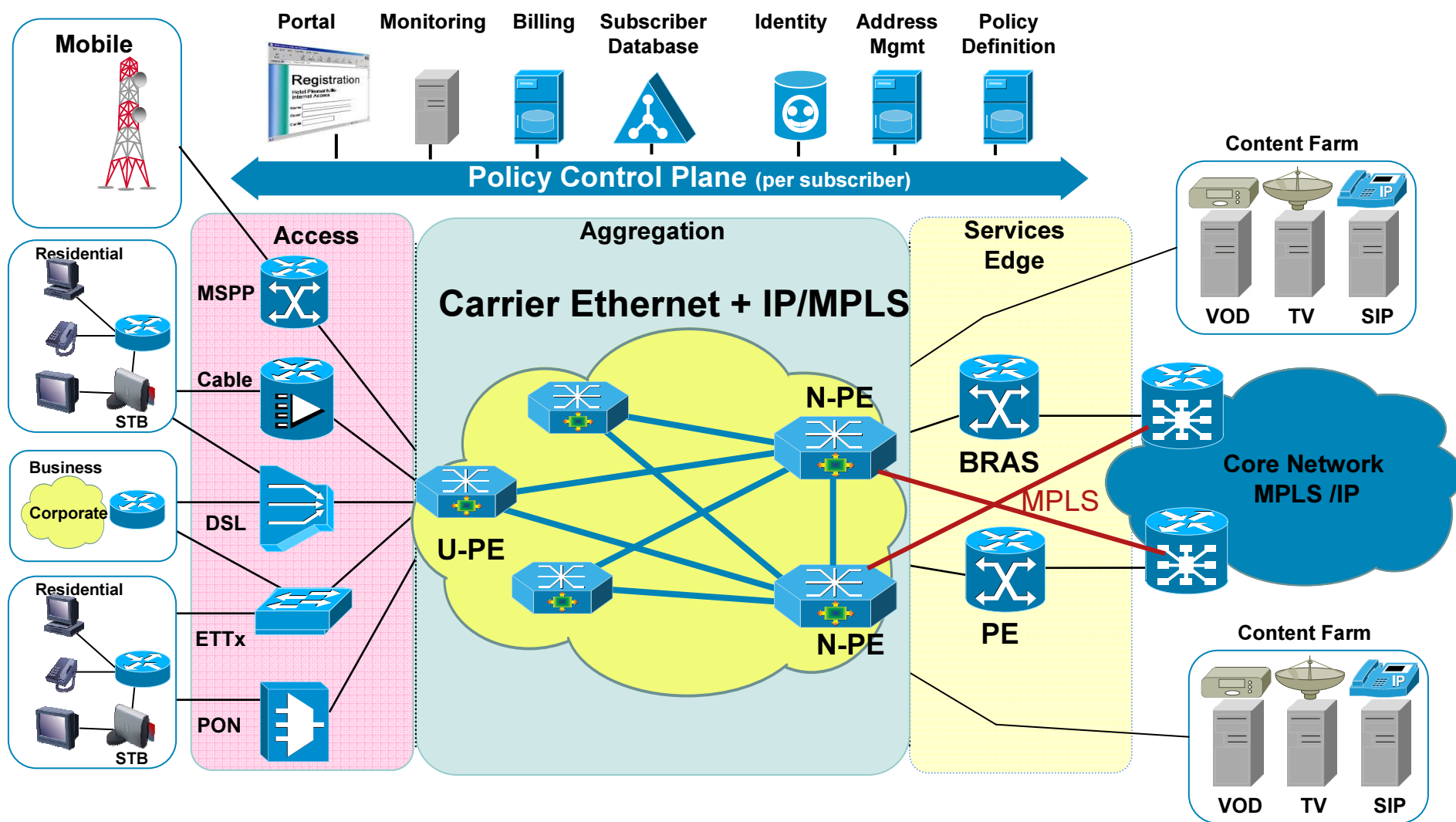
Business Services Architecture



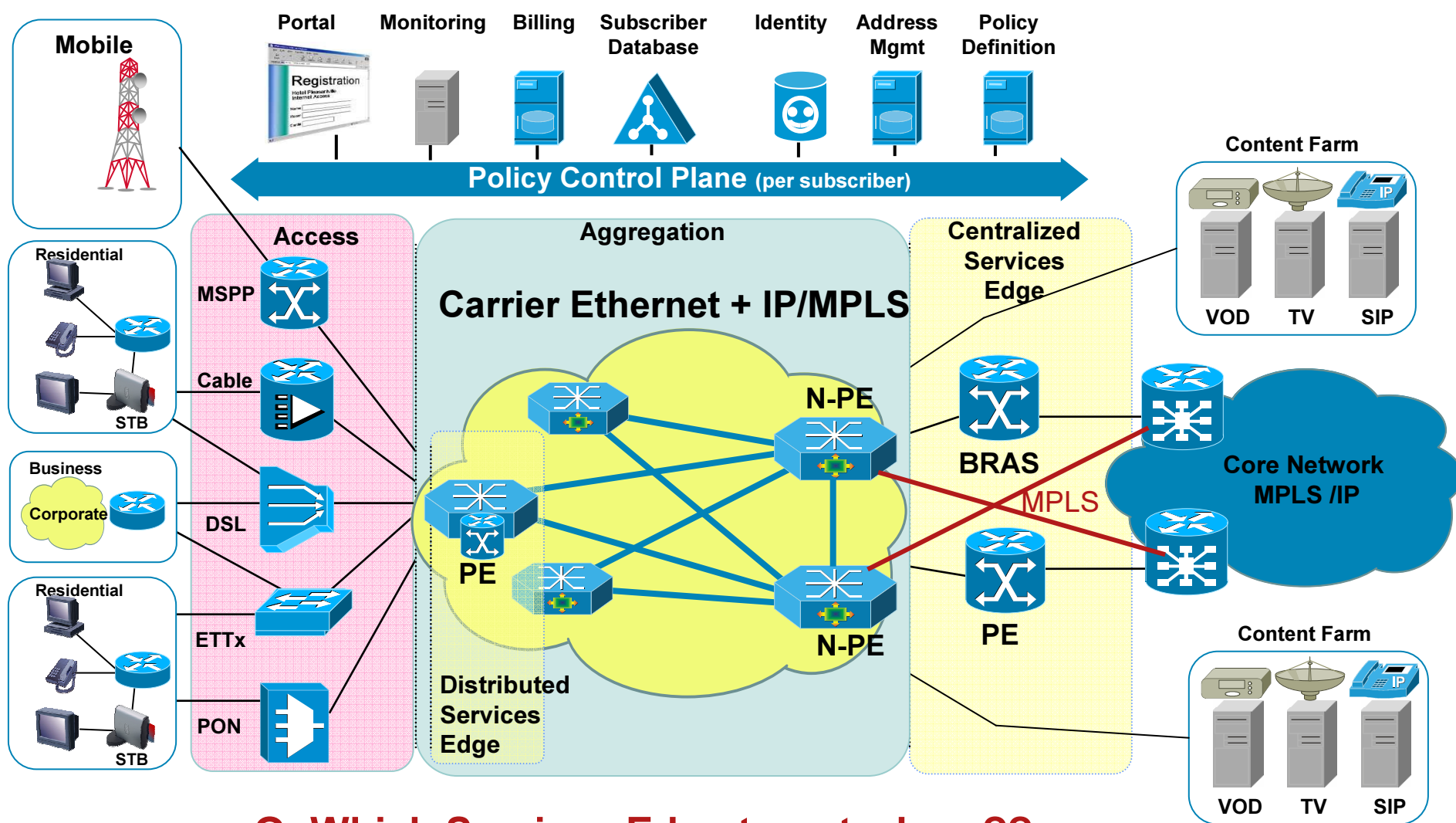
Carrier Ethernet – Centralized Design



Carrier Ethernet – MPLS NNI

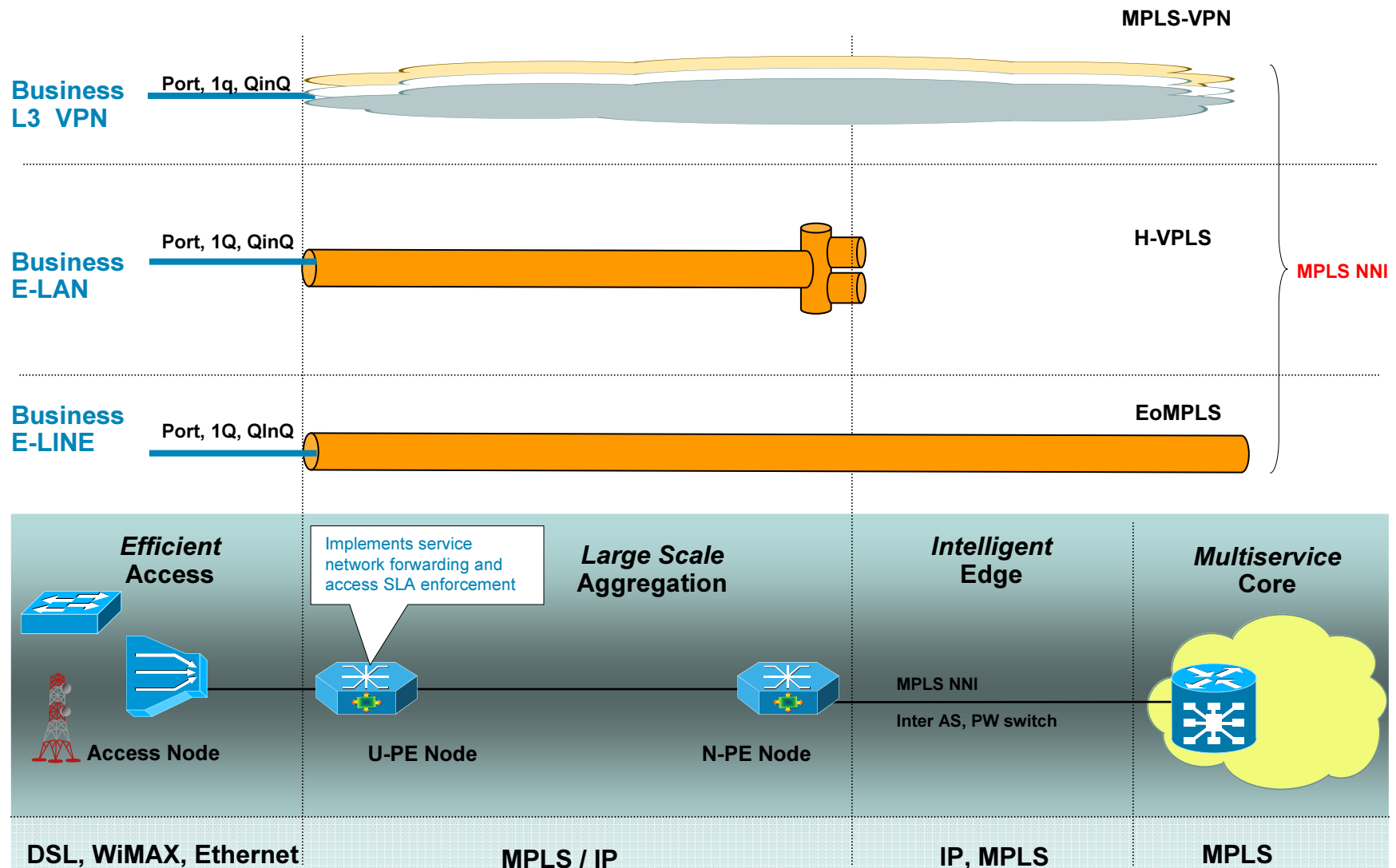


Carrier Ethernet – New Service Edges



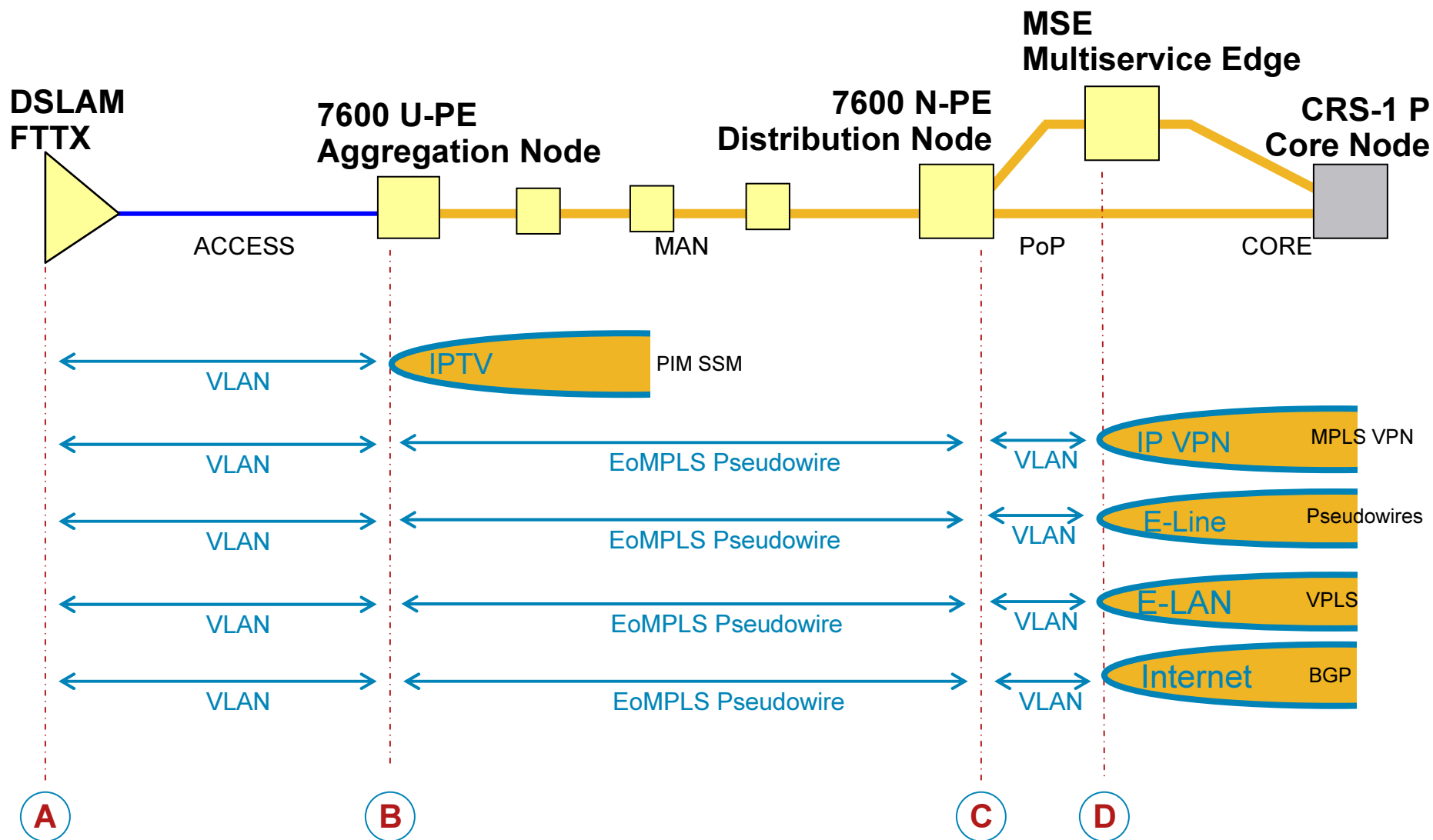
Q: Which Services Edge to put where??

Aggregation Network Service Edge Business Ethernet Services Architecture



Flexible Service Edge

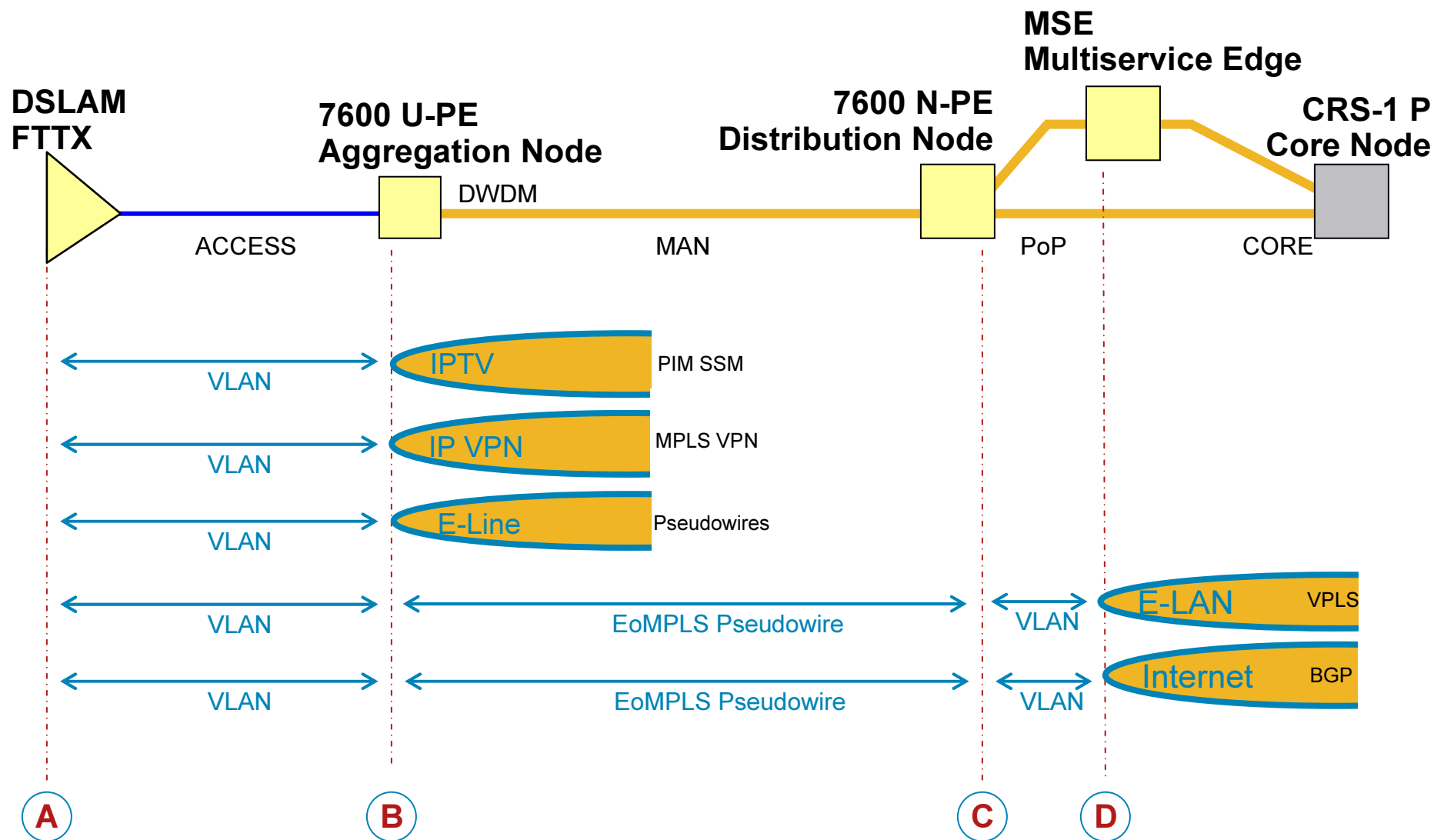
according to penetration, complexity, growth...



PROVISIONING POINTS

Flexible Service Edge

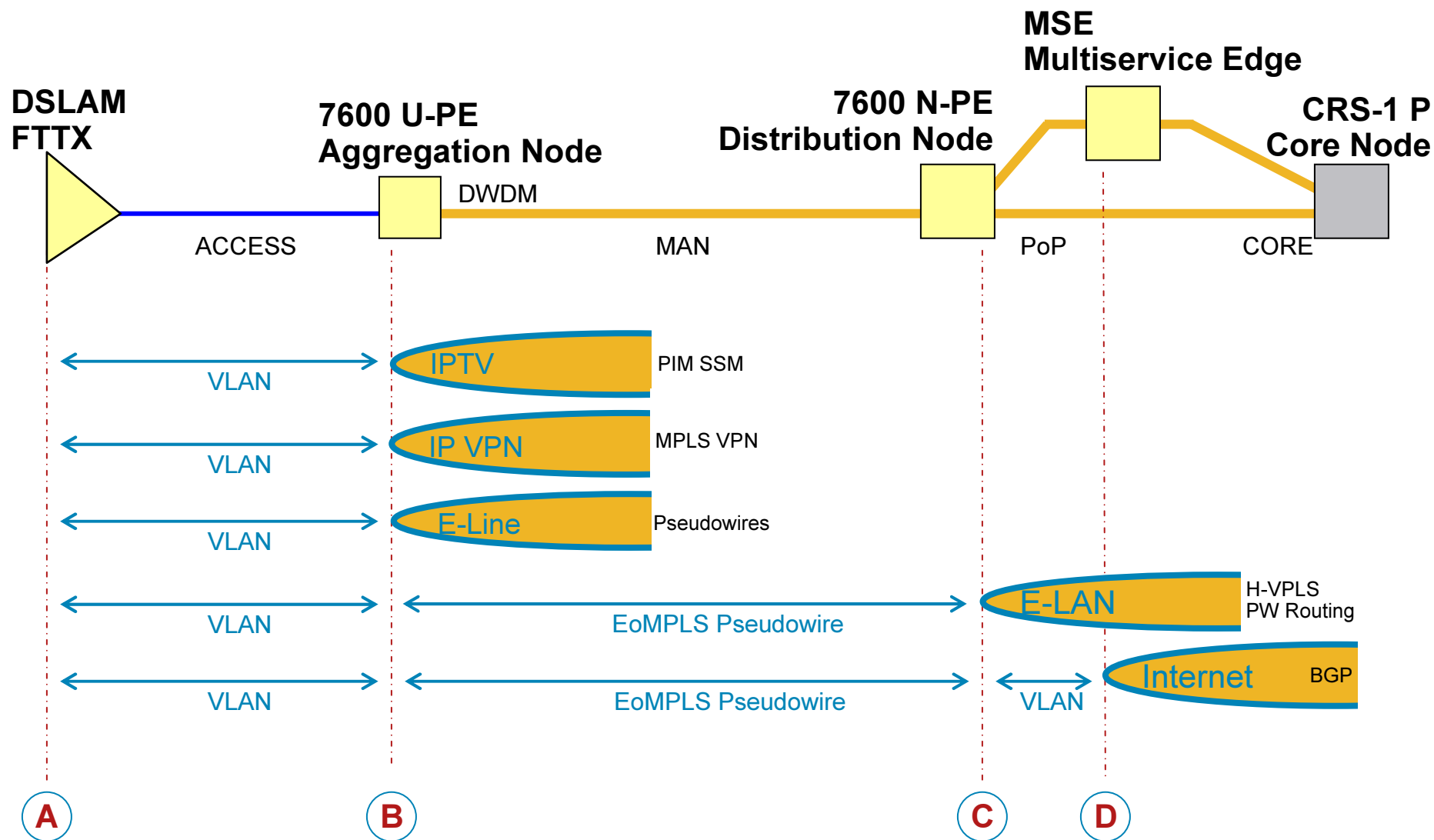
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PROVISIONING POINTS

Flexible Service Edge

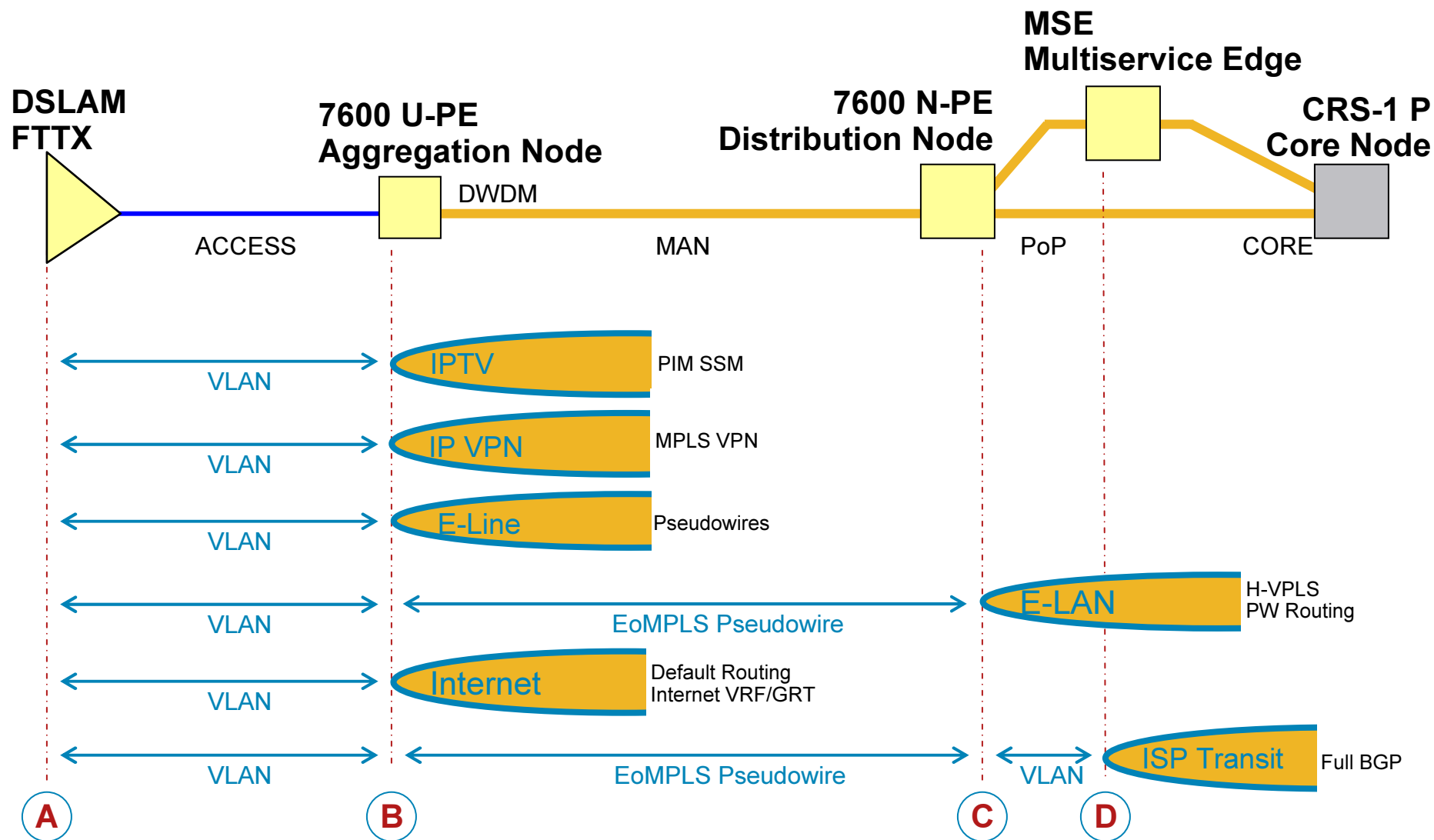
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PROVISIONING POINTS

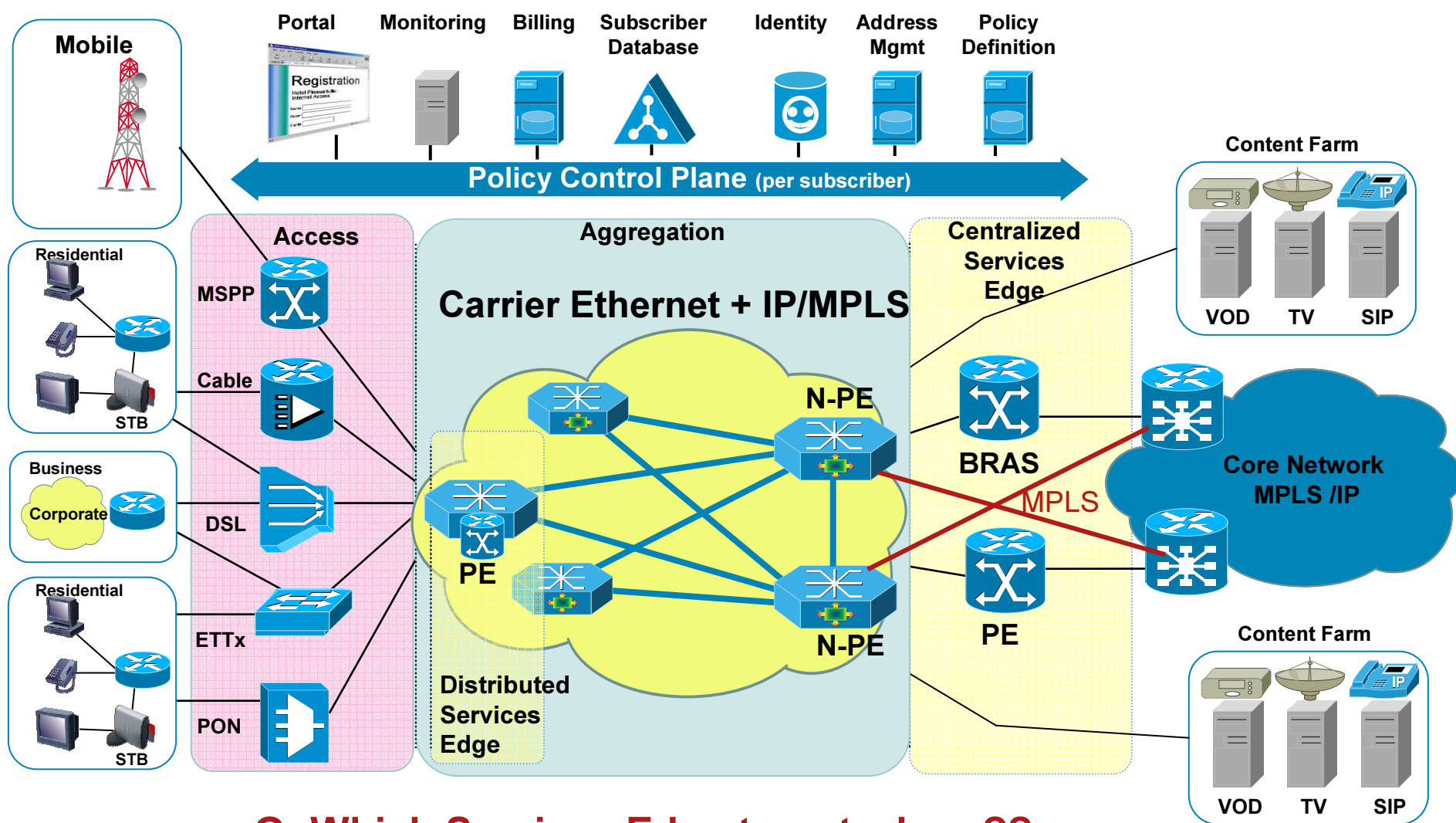
Flexible Service Edge

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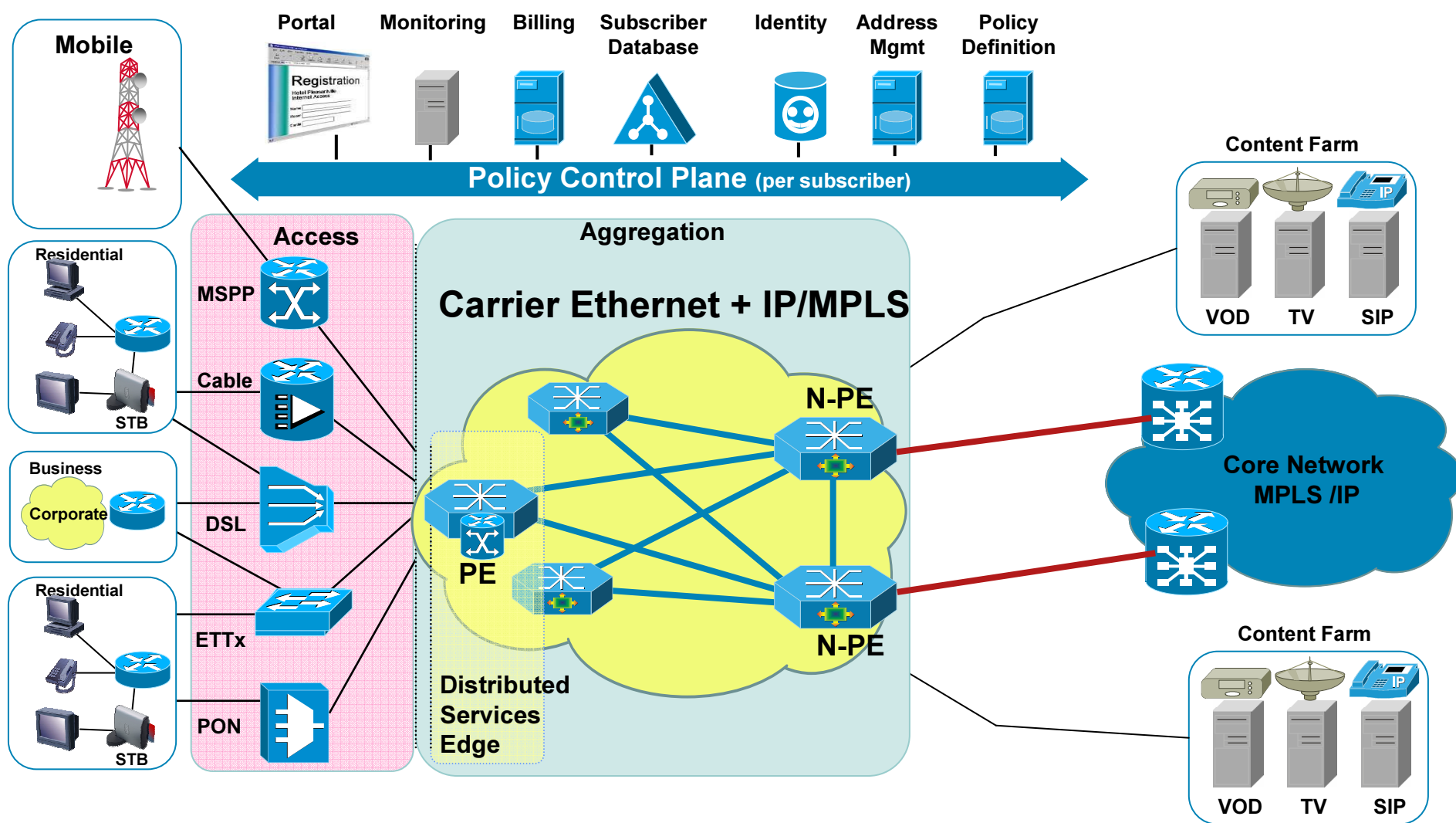


PROVISIONING POINTS

Carrier Ethernet – New Service Edges

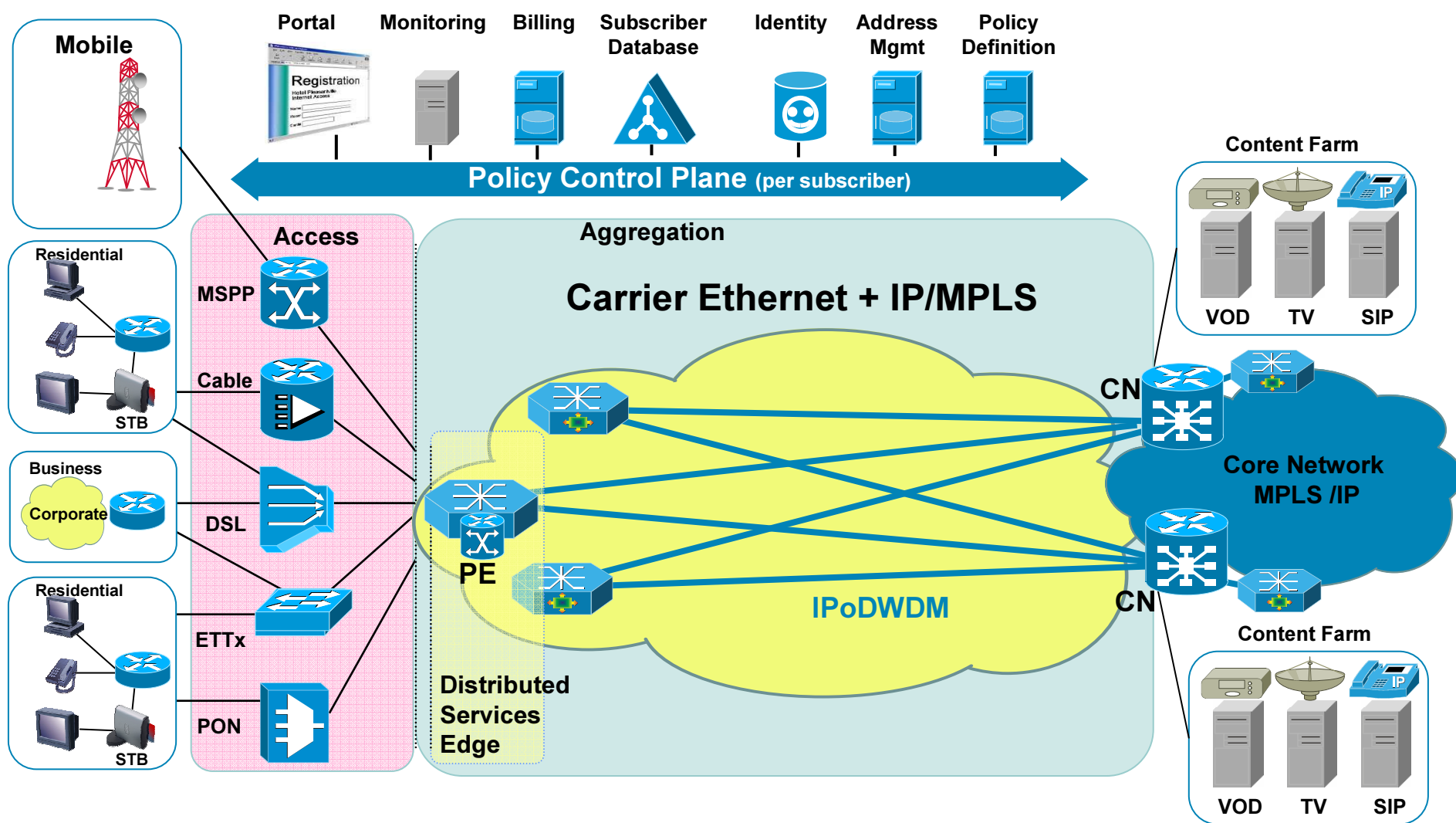


Carrier Ethernet – Distributed Design

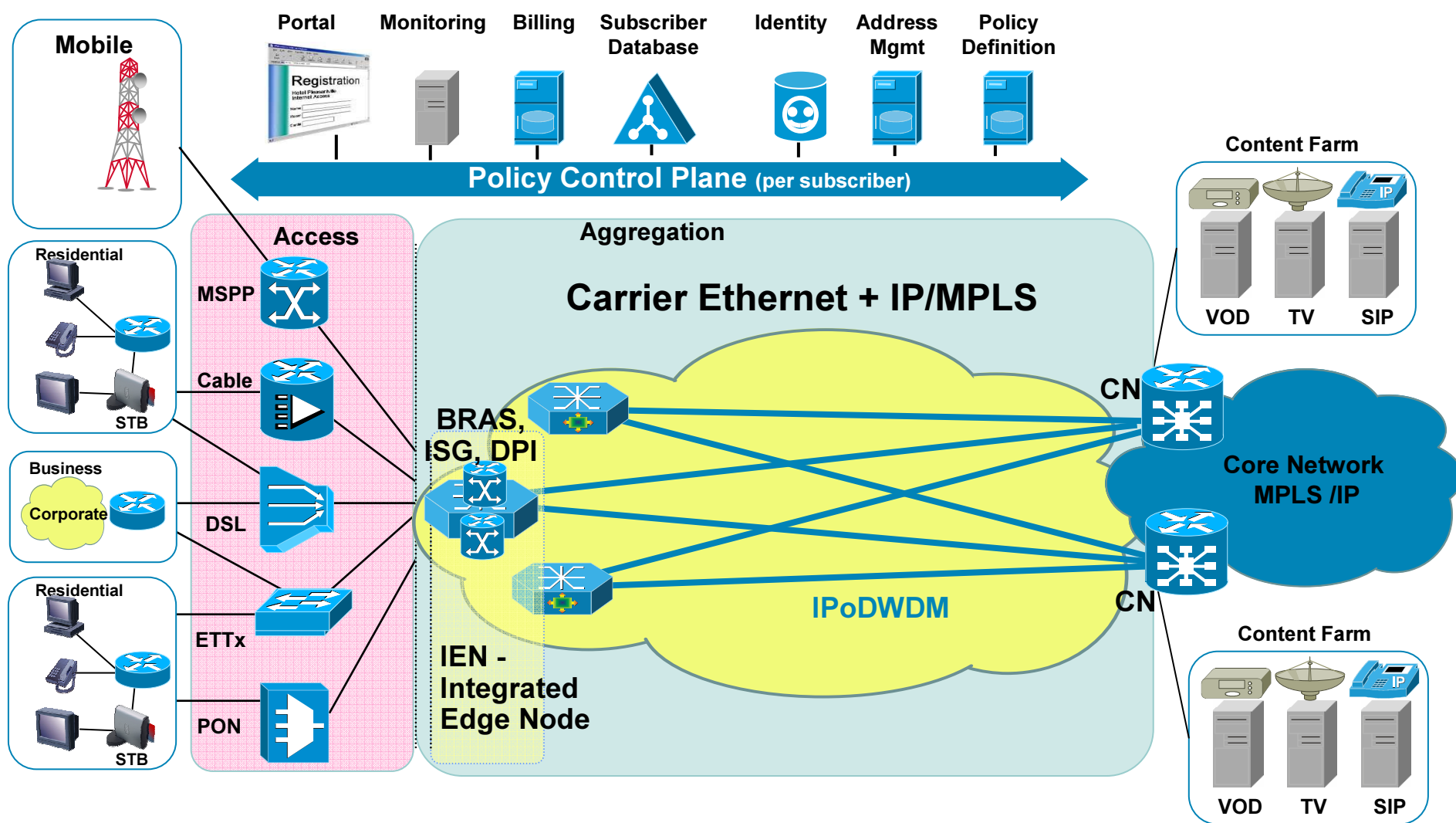


The old Centralized Edge does not have to be in every PoP!

Carrier Ethernet – Integrated Design



Programmable Carrier Ethernet vision



Agenda

Carrier Ethernet Design

- what is Carrier Ethernet?
- history, presence, future
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Carrier Ethernet hardware – Cisco 7600

- what is so different at ES cards?
- existing and future hardware

Cisco Carrier Ethernet Portfolio



Cisco 7600 – Carrier Ethernet Aggregation



ESR 10000 – Centralized BRAS
ASR 1000 – Distributed BRAS



Cisco XR12000 – Multiservice Edge



ONS 15000 – Ethernet DWDM MSTP



Cisco CRS-1 – IP NGN Core



Carrier Ethernet Access

- Catalyst ME3400, ME45/4900 – IEEE L2
- Catalyst ME3750, ME6500 – MPLS
- Catalyst 4500 – E-FTTH

Cisco 7600 Series

Flagship Carrier Ethernet Platform



- Cisco 7600 alone \$1.15B FY08!
- Nearly 25K systems per year
- ES40: major hardware upgrade in Q1 2009
- 1.6% marketshare gain in H1
- expected lifetime 15+ years (2016+)

~70,000 Cisco 7600 Units Deployed Networks Today



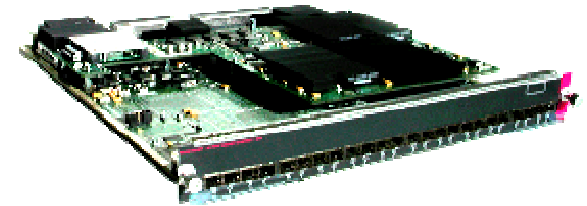
7600: High-Density Ethernet Modules

Catalyst 6500 compatible

- complete Campus and LAN features set

Carrier Ethernet Features

- Up to 4K VLAN's
- IP, IP Multicast, MPLS VPN
- IPv6, IPv6 Multicast, 6PE, 6VPE
- Up to 4K MPLS pseudowires
- Up to 1K MPLS VPN's
- E-OAM
- Per-Port QoS



X6724/48-SFP
24 or 48-port GE



X6724/48-TX
24 or 48port 10/100/1000



X6704-10GE
4-port 10GE XENPAK



X6708-10GE
8-port 10GE X2

7600: Ethernet Service Modules

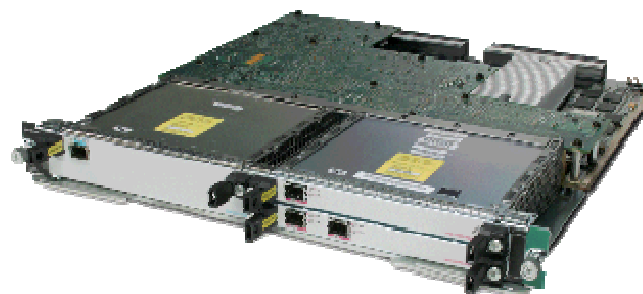
Carrier Ethernet Features

- Up to 32k EVCs per system (16k per card)
- Up to 32K Pseudowires (16k per card)
- Multipoint VPLS & H-VPLS
- E-OAM and MPLS OAM interworking
- Flexible VLAN translation
- Hierarchical QOS and per-VLAN shaping (16K, resp. 32K queues)

Pricing difference?

- X6724 LAN card = \$15,000 GPL
- ES20-GE card = \$40,000 GPL
- 3-Play only pricing scheme (L2 MPLS + L3 IPTV)
- ES20-ADVIP-LIC = additional \$40,000 GPL

Business VPN pricing scheme (VRFs, MVPN, IPv6)



SIP-400 – 4x SPA



ES20 – 2-port 10GE



ES20 – 20-port GE

Cisco Carrier Ethernet Evolution

ES20+ and ES40 linecards (Q1 CY09)

Carrier Ethernet Convergence with Scale:

L2 & L3 Ethernet services to 40 Gbps
(business and residential coexistence)

Support for full suite of L2+L3 features:

H-QoS: 128k queues with 5-level hierarchy capable hardware

MPLS: EoMPLS, H-VPLS, 2547 VPN

Native Ethernet: 802.1ad, 802.1ah (MAC-in-MAC), VLAN translation

E-OAM: 802.1ag (CCM in hardware), 802.3ah, E-LMI, IP SLA

Vidmon – Inline Video Stream Monitoring

Product details

2-port 10GE & 20-port GE

4-port 10GE & 40-port GE

Combo Cards

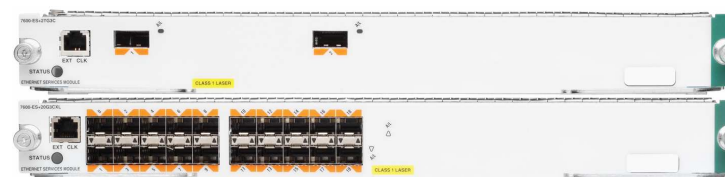
Intelligent Subscriber Services

802.1ah

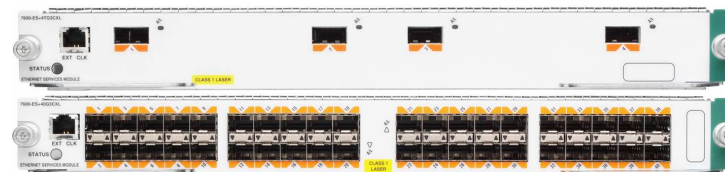
ISG

Video

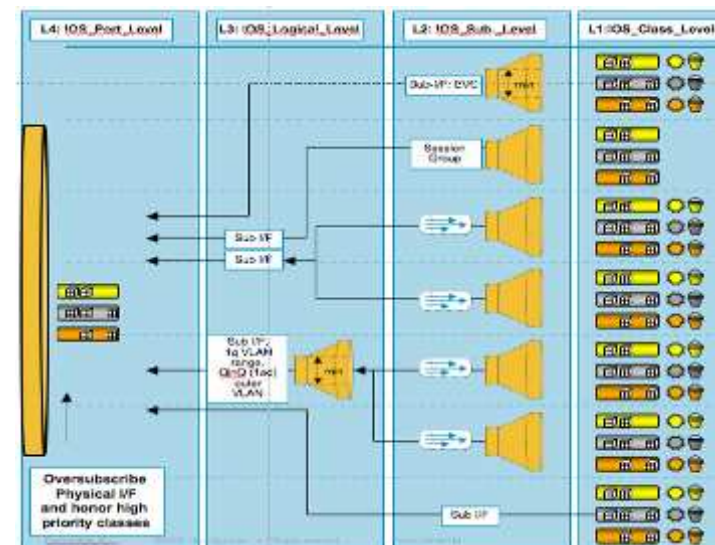
H-QoS



ES20+

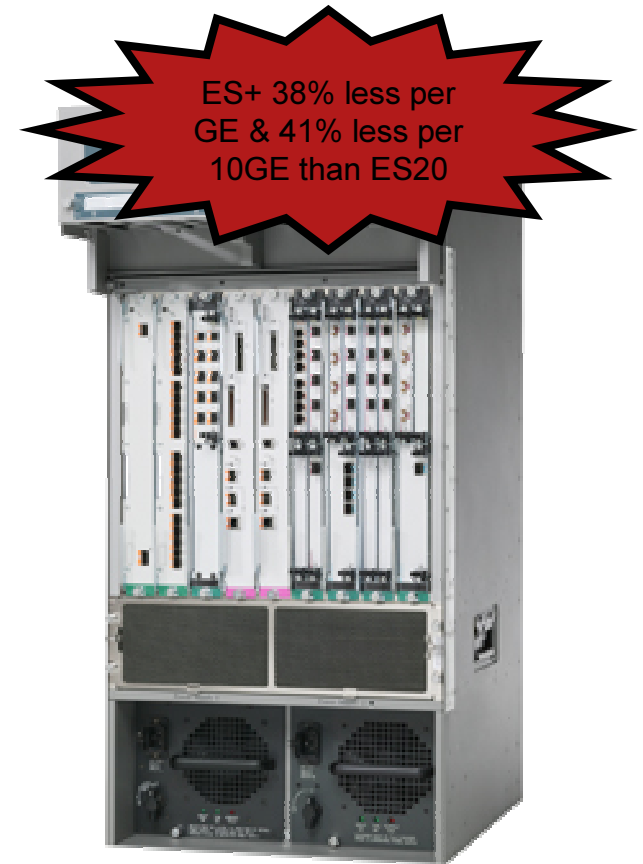


ES40



Preliminary Power Consumption – ES40 is Green! 160GB

	7609-S 6000w max		7609-S 6000w max	
Slot 1	ES40-GE	420w	ES20-GE	340w
Slot 2	ES40-GE	420w	ES20-GE	340w
Slot 3			ES20-GE	340w
Slot 4			ES20-GE	340w
Slot 5	RSP720-3C	340w	RSP720-3C	340w
Slot 6	RSP720-3C	340w	RSP720-3C	340w
Slot 7	ES40-10G	400w	ES20-10G	340w
Slot 8			ES20-10G	340w
Slot 9				
	Dual Fan tray	480w	Dual Fan tray	480w
	Total power required	2,400w		3,200w

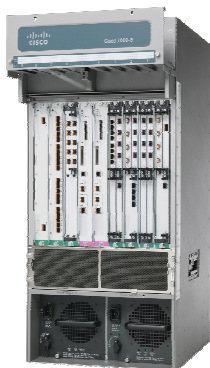


Cisco 7609-S

ES40 is ~800w Greener
With Double Performance

New specialized Carrier Ethernet platforms are coming!

Existing:



Cisco 7600

- hardware: ES20, SIP-400, ES20+, ES40
- software: IOS 12.2SR

Q1 CY09:



Catalyst ME4500

- hardware: all modules w/ Metro Sup
- software: IOS 12.2XO



Cisco ASR 9000

- hardware: all modules
- software: IOS XR 3.7

Conclusion

1. Carrier Ethernet Technology

- Bringing Ethernet at ATM level from operational point of view
- Uses MPLS, uses both L2 (Ethernet) and L3 (IP) elements

2. Network Architectures

- central edge vs. distributed edge designs
- **Flexible Service Edge** – reducing the complexity and cost

3. Carrier Ethernet Hardware

- **Cisco 7600** is the flagship platform
- **ES** linecards

