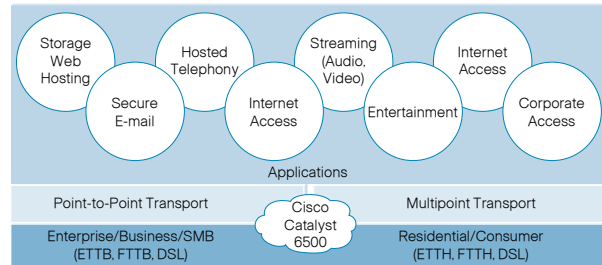


Carrier Ethernet Requirements

Service providers offering Carrier Ethernet target two market segments, *corporate* and *residential* customers (Figure 1).

Figure 1. Carrier Ethernet Market Segments and Applications



The evolving services and network convergence of service providers require a network infrastructure able to fulfill the following requirements:

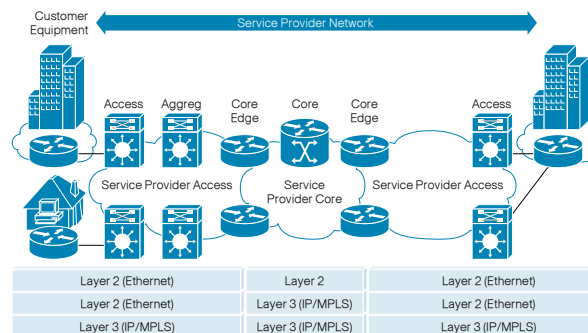
- **Scalability**—Offer high switching performance and bandwidth availability to support bandwidth-intensive applications and enable new services without operational impact.
- **Flexibility**—Offer flexibility of port densities, and various connector types with long-reach optics. Offer the ability to integrate “Triple-Play” and TLS services based on Layer 2, IP, and MPLS technologies.
- **Feature Richness**—Offer differentiators to enable metropolitan services, such as MPLS, IPv6, and Multicast.
- **Security**—Protect service provider resources and guarantee subscribers’ traffic isolation and authentication.
- **High Availability**—Maximize service uptime and reduce MTTR and MTBF, through hardware redundancy, software rapid failover and subsystem In Service Software Upgrade (ISSU) with software modularity.
- **QoS**—Enable voice, video, and data on the same platform, with jitter, latency, and packet loss guarantees.
- **Manageability**—Ease service provisioning, improve operational efficiency, and reduce OpEx costs.

Carrier Ethernet Architectures

Carrier Ethernet service providers can choose the following three different architectures for offering Triple-Play and TLS services to residential and corporate customers (Figure 2):

- End-to-end Layer 2
- Layer 2 in the metropolitan area and IP/MPLS in the core or backbone
- End-to-end Layer 3

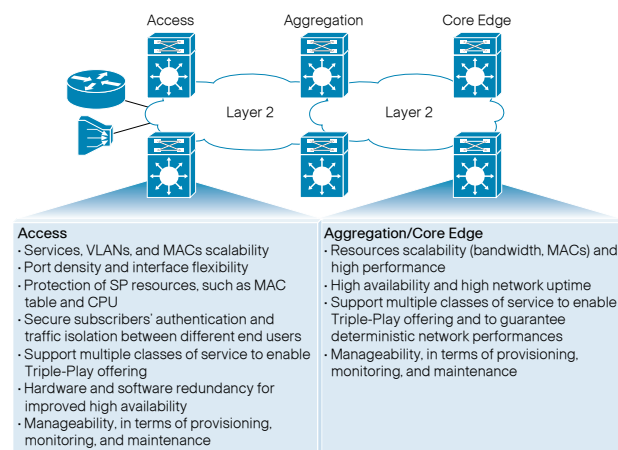
Figure 2. Carrier Ethernet Architecture Options



The focus of this At-a-Glance is the end-to-end Layer 2 architecture.

A Layer 2 Carrier Ethernet network can be segmented into an access and an aggregation or core edge layer with the following requirements for enabling services (Figure 3):

Figure 3. Carrier Ethernet Access and Aggregation and Core Edge Requirements



Cisco Catalyst 6500 Series: The Foundation

The Cisco® Catalyst® 6500 and Cisco ME 6524 Series switches form the foundation of Layer 2 Carrier Ethernet architectures by providing leading Layer 2 switching and high performance. The Cisco Catalyst 6500 Series is the premier Cisco switching platform for the access, aggregation, and core edge of the service provider network with the following key advantages.

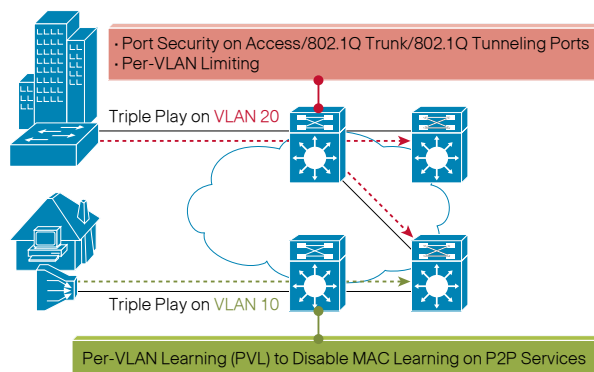
Scalability and Flexibility

- **720-Gbps integrated switch fabric capacity** with Cisco Catalyst 6500 Series Supervisor Engine 720
- **Ability to scale** from 15- to 400-Mpps switching performance with distributed forwarding
- **High-density Gigabit and 10-Gigabit Ethernet** support
- **End-to-end architecture and features consistency** with Cisco ME 6524, Cisco Catalyst 6500 Supervisor Engine 32, and Supervisor Engine 720
- **High-performance CPU** for Layer 2 protocols convergence and stability
- **Optimized switching capabilities** with centralized and distributed MAC learning in hardware
- **Optimized performance with jumbo frame support**, deep packet buffers to handle bursty traffic, and low latency to minimize response times of real-time applications
- **Innovative mechanism to scale the number of service instances and MACs** in a Layer 2 network
- **Support for a broad range of connectivity options** by offering 10/100, 100BASE-X SFP, 10/100/1000, Gigabit Ethernet SFP, and 10-Gigabit Ethernet line cards
- **Enhanced service richness in the same platform** by supporting Layer 2 service enablers such as access and 802.1Q trunk ports, hardware-enabled 802.1Q tunnels, VLAN translation, and Layer 2 Protocol Tunneling
- **Full IEEE compliancy and third-party interoperability** through IEEE 802.3ad, 802.1w, and 802.1s
- **Support for next-generation Layer 2 networks** through pre-standard IEEE 802.1ad implementation

Security

- Memory protection, fault containment, and improved scalability through dedicated TCAMs for ACLs, security, and QoS deployments
- Protection of the service provider's network against DoS attacks, enabling Control Plane Policing and hardware rate limiters
- Flexible mechanisms to safeguard service provider's MAC table and optimize MAC learning (Figure 4):

Figure 4. Security Mechanisms to Protect Service Provider MAC Table



- Protection of service provider's CPU through port-, VLAN-, and MAC-based ACLs enabled in hardware
- Protection from unauthorized end users through 802.1x, DHCP Snooping, and Dynamic ARP Inspection
- Subscribers' protection and traffic isolation through Private VLANs and Private Hosts

High Availability

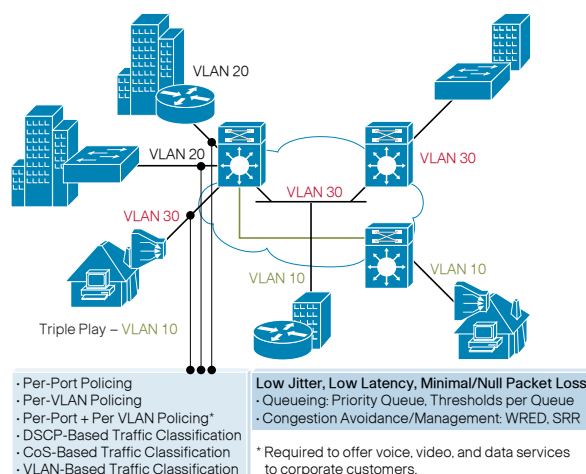
- Hardware redundancy for fans, power supplies, fabrics, and clocks for nonstop operation
- Complete separation of control and data planes for enhanced resiliency
- Optimized Layer 2 fast convergence by enabling IEEE 802.1w (RSTP) and IEEE 802.1s (MSTP)

- Improved Layer 2 fast convergence over hub-and-spoke topologies by enabling Flexlink to obviate the need for Spanning Tree
- Leadership in high availability and service uptime; stateful switchover (SSO) to help ensure minimal traffic loss and subsecond recovery in Layer 2 networks upon primary supervisor failure
- Cisco IOS® Software modularity to deliver fault containment, memory protection, process restartability, and In Service Software Upgrade (ISSU) for patch fixes

QoS and Multicast

- Advanced quality-of-service mechanism to enable Triple Play and TLS services on the same infrastructure (Figure 5):

Figure 5. Flexible QoS Mechanism to Enable Voice, Video, and Data



- Triple-Play services support by enabling Cisco innovative technologies, such as hardware-enabled PIM-SM and PIM-SSM and IGMP Snooping, and hardware-based Layer 2 Multicast

Manageability

- Increased end-to-end service operational efficiency through management and monitoring features such as E-OAM protocols
- Flexible and comprehensive network monitoring capabilities through SNMP MIBs for interface management, traffic monitoring, switching protocol management, and features management

Table 1 gives Carrier Ethernet Layer features of the Cisco Catalyst 6500.

Table 1. Key Carrier Ethernet Layer 2 Features on Cisco Catalyst 6500

	Access	Aggregation/ Core Edge
10 GE	X	X
Per VLAN Learning	X	X
802.1x	X	
DHCP Snooping	X	
Private VLAN	X	
Private Hosts	X	
HW-enabled Control Plane Policing	X	
Hardware Rate Limiters	X	
SSO	X	X
Software Modularity	X	X
Per Port/Per VLAN/Per Port + Per VLAN Policing	X	
HW-enabled PIM Snooping and IGMP Snooping	X	X
E-OAM, IEEE 802.1ag	X	X
E-OAM, IEEE 802.3ah	X	