



# **Carrier Ethernet Access Technologies for the Fastest Return on Investment**

Ubiquitous Ethernet Services over Any Access Network

# Ethernet Access Service Market

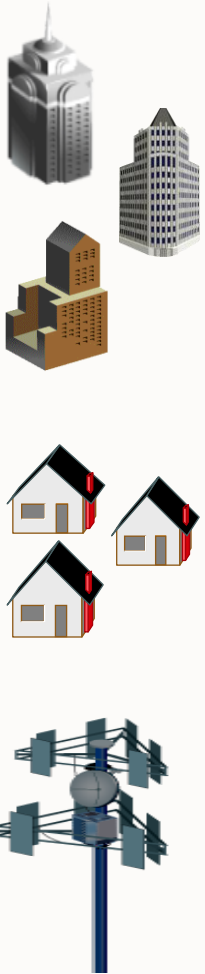
## Some things to consider...

- **Ethernet becoming preferred technology inter-provider handoff**
  - Retail / Partner Service Provider wants a Layer 2 handoff from their wholesale access provider
    - Even if Retail Service Provider is delivering an IP service to its customers
- **Ethernet is delivered over many types of layer 1 technologies**
  - SONET/SDH, T1s/T3s, Wavelengths, copper pairs, DOCSIS and fiber
  - Need to unify Ethernet services over these different access networks
- **Diverse usage of Ethernet in Access Networks**
  - Access to Internet (IP Services)
  - Layer 2 site-to-site connectivity (hub and spoke still popular)
  - Backhaul of residential broadband services and cell sites to MTSOs

Need to address a broad spectrum of services over a diverse set of access networks

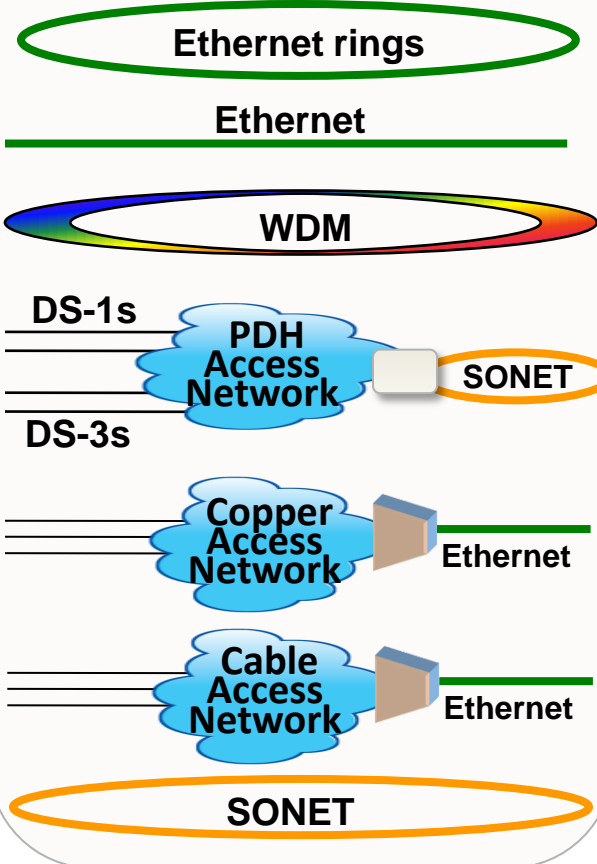
# Ethernet Access Challenges

Customer Premises



Ethernet RUNI / UNI

Access Networks



Ethernet ENNI / UNI

Partner Service Provider

- ISP Internet Access
- TSP Voice
- VSP VoD and IPTV
- MPLS Inter-Metro Transport
- Mobile Telephony Switching Office
- Retail Service Provider

How does one deliver Ethernet with a complex mix of access networks?

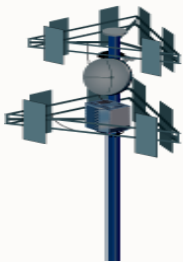
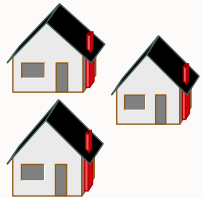
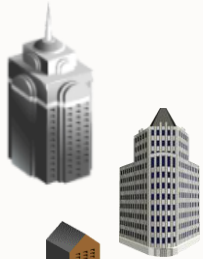


# Ethernet Access Service RUNI / UNI

## Requirements at the Customer Premises



Customer  
Premises



Ethernet RUNI / UNI

- **Deliver UNI on behalf of Partner Provider**
  - MEF Remote UNI (RUNI)
- **Ensure SLA Conformance**
  - High Availability through protected RUNI / UNI
    - Equipment Protection and Link Aggregation
  - Preserve VLAN ID & 802.1p / DSCP (L2 / IP CoS)
  - Bandwidth Policing / Shaping
  - Fault Management (Loopbacks / Linktraces)
  - Performance Monitoring (Latency, Loss, IFDV)
  - FM and PM for you and your Partner Provider
- **Connection-oriented Ethernet**
  - Simpler to traffic engineer than Switched Ethernet
  - Closely aligns with existing transport operations

# Access Service Ethernet ENNI / UNI Requirements at Service Edge

Ethernet ENNI / UNI

Partner Service Provider

ISP Internet Access

TSP Voice

VSP VoD and IPTV

MPLS Inter-Metro Transport

Mobile Telephony Switching Office

Retail Service Provider

- **Flexible VLAN ID and CoS ID Marking/Mapping**
  - Don't know if partner is delivering Layer 2 or IP service
  - You don't know your partner's equipment limitations
  - Ethernet 802.1p  $\leftrightarrow$  IP DSCP / TOS
  - C-Tag and S-Tag push/pop/swap
- **Ensure SLA Conformance (similar to RUNI / UNI)**
  - High Availability through protected ENNI / UNI
    - Equipment Protection and Link Aggregation
  - Preserve VLAN ID & 802.1p / DSCP (L2 / IP CoS)
  - Bandwidth Policing / Shaping
  - Fault Management (Loopbacks / Linktraces)
  - Performance Monitoring (Latency, Loss, IFDV)
  - FM and PM for you and your Partner Provider
- **Connection-oriented Ethernet**
  - Presents access network as a simple transport network
  - Simplifies SLA conformance

# Introducing the EoX Gateway

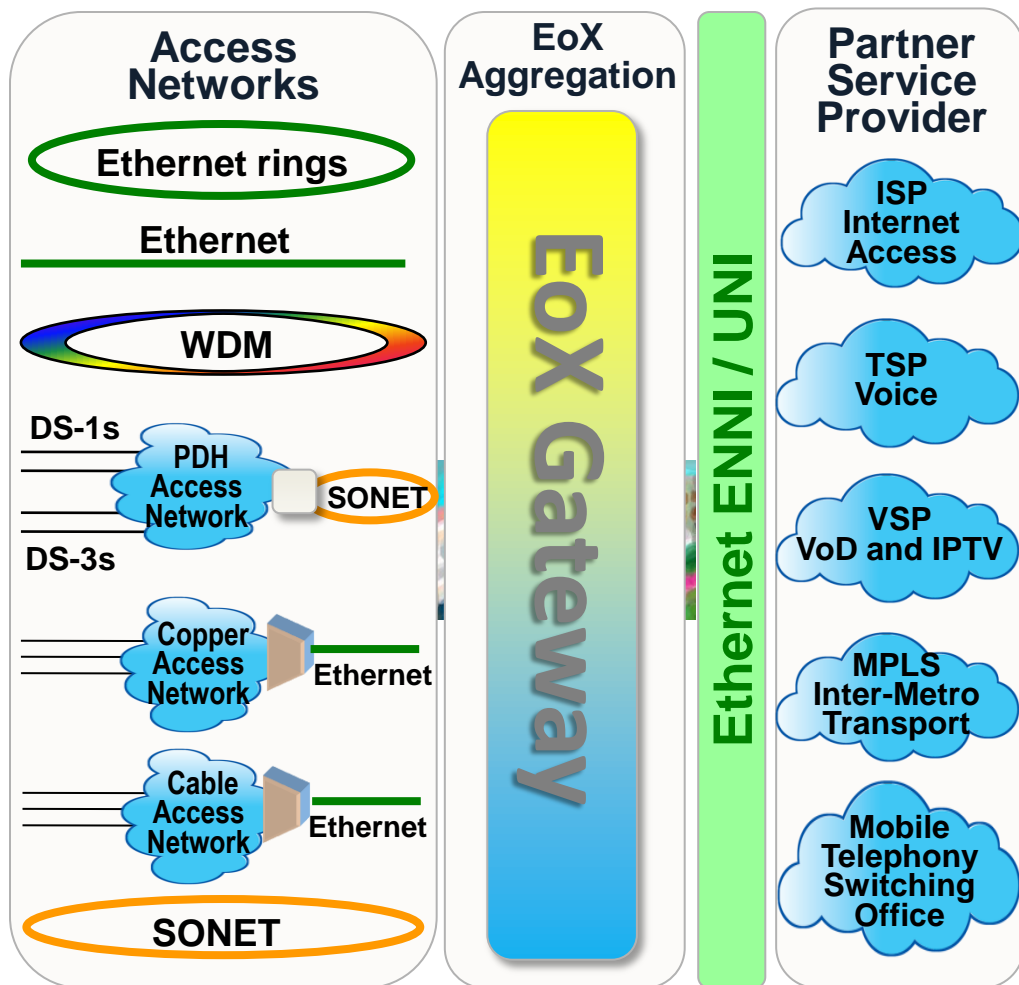
## ■ EoX Aggregation

- Connection-oriented Ethernet
- Protected Ethernet ENNI / UNI
- Adds/removes Layer 1 encapsulation technologies
  - GFP, X.86, G.709 (OTN)
- L2 handoff to partner provider

## ■ Unified Service Description

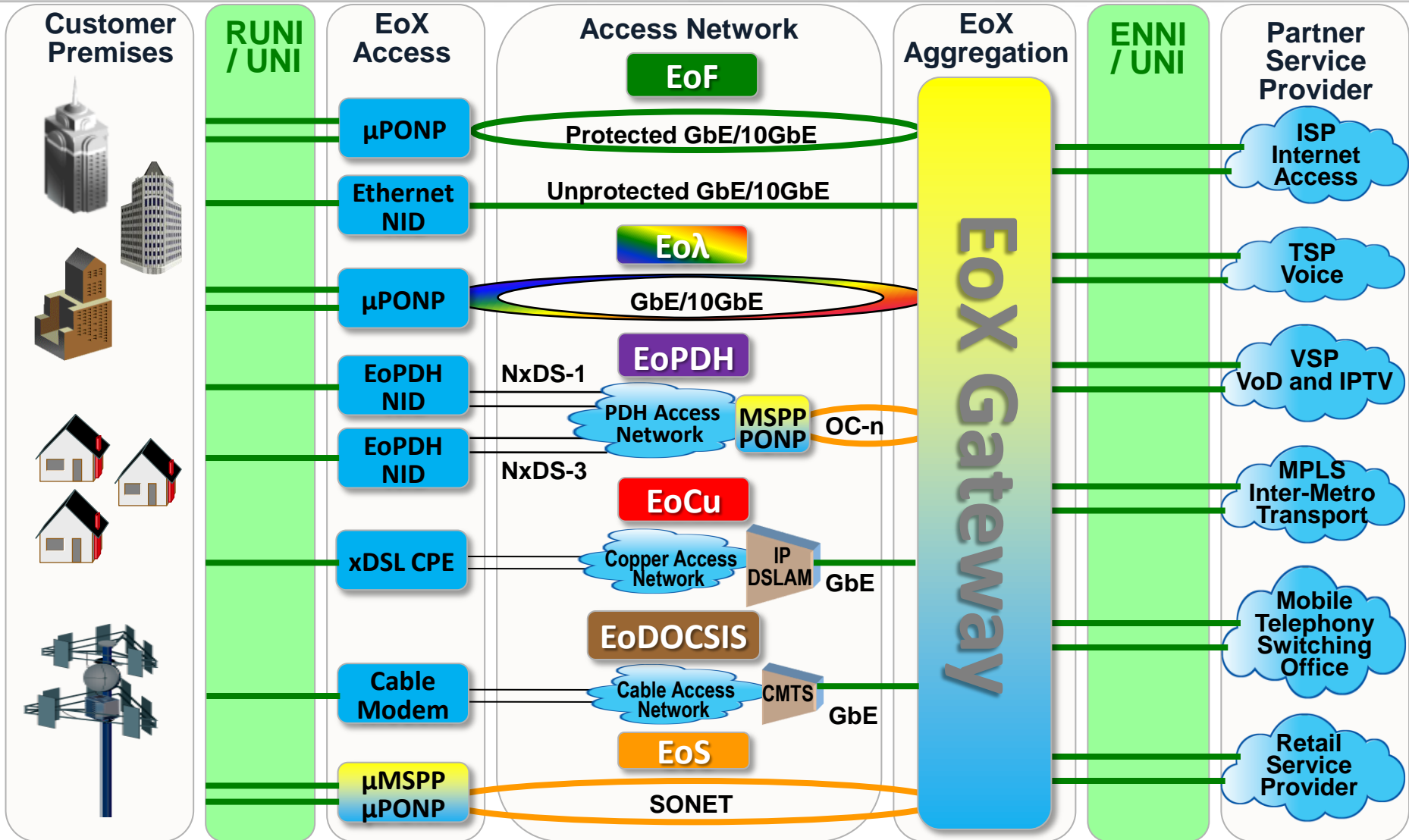
- EPL, EVPL, Ethernet access to IP services over any access network

## ■ Reduce time to revenue



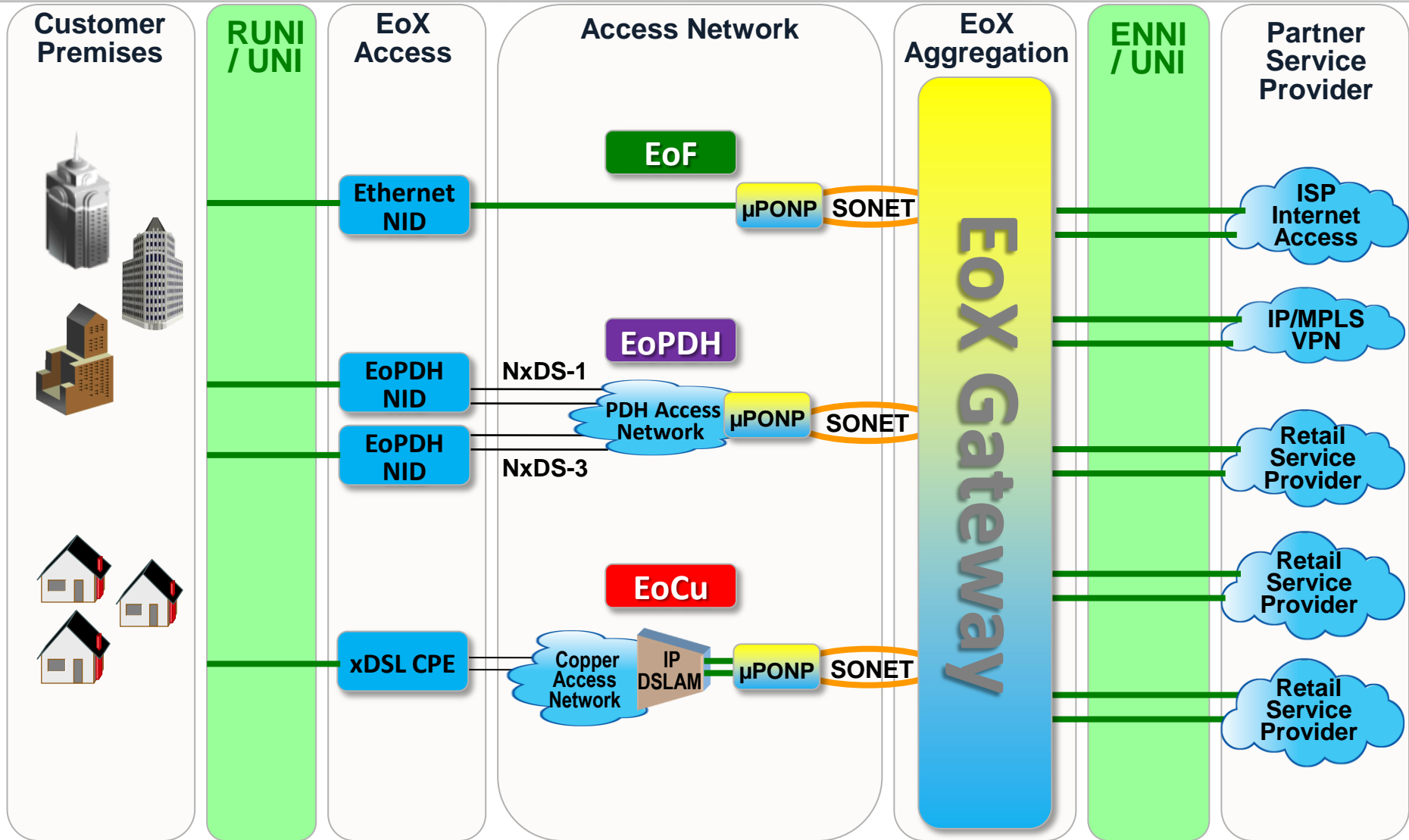
EoX Gateway Simplifies Service Delivery over Any Access Network

# Putting it all together




Ubiquitous Ethernet Services over Any Access Network

# Service Provider Delivering Retail / Wholesale Ethernet / IP Services



Convergence of all services from legacy networks to Ethernet





FUJITSU