DPoE™, DPoG™, and other PON Activities

Joint SIEPON/BBF Meeting

Louisville, CO

Curtis Knittle

June 26, 2014

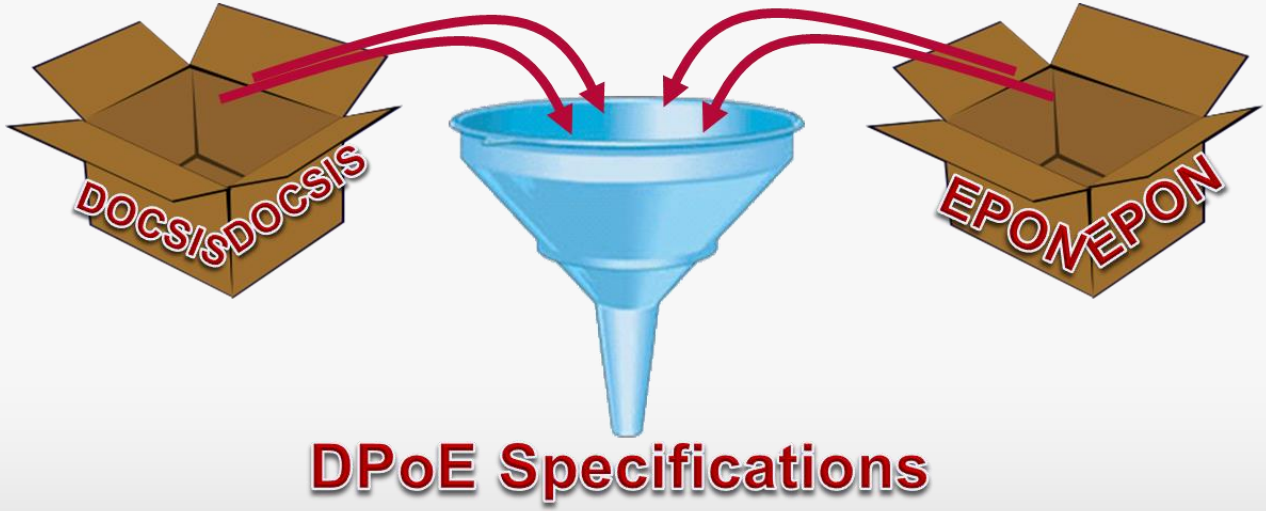
Access Networks for Business Services

- Motivation for PON access networks

	DOCSIS	PON	P2P Fiber
Latency	Poor	Good	Great
Jitter	Poor	Good	Great
Upstream bandwidth	Poor	Great	Great
Downstream bandwidth	Good	Great	Great
Symmetric	Poor	Great	Great
Cost	$	$$$	$$$$$$
SLA Enforcement	Poor	Great	Great

DOCSIS Provisioning of EPON (DPoE™)

- Brings the mature systems and business processes of the DOCSIS OSS to EPON access networks
- Enables full vendor/equipment interoperability – similar to CMTS and Cable Modems
- Leverages existing technical and customer care knowledge base, systems, and processes
- Developed by MSOs, CableLabs, and vendors

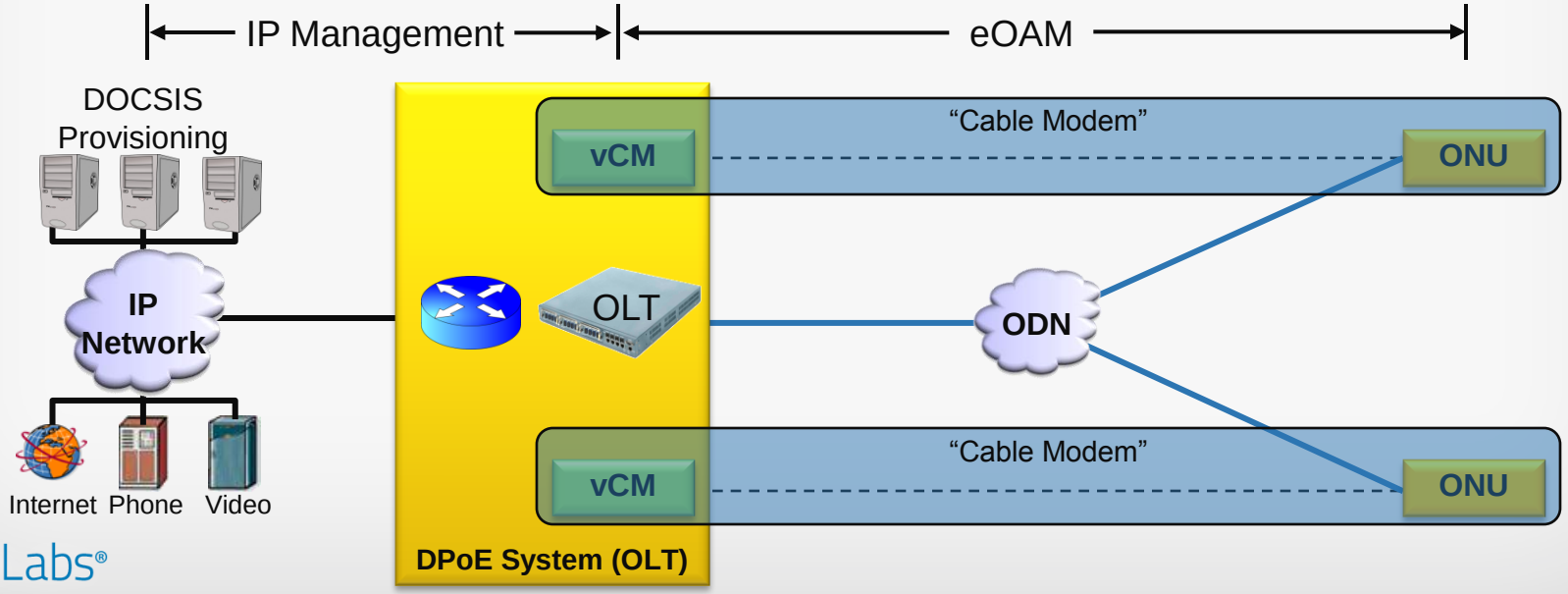


DPoE Specifications

- Version 1.0
  - Internet Protocol v4 (IPv4) – Ethernet Private Line – IP High Speed Data (IP(HSD)) – interoperable extended OAM – configuration file provisioning
- Version 2.0
  - Internet Protocol v6 (IPv6) – Ethernet (Virtual) Private Line – Ethernet (Virtual) Private LAN – Ethernet (Virtual) Private Tree – IP Multicast – MPLS/BPG/LDP – IEEE 1588v2 Time Synchronization – IP Detail Record (IPDR) – Service OAM – Metro Ethernet QoS parameters
- Extensions to v2.0 are being discussed with more focus on residential

DPoE Architecture

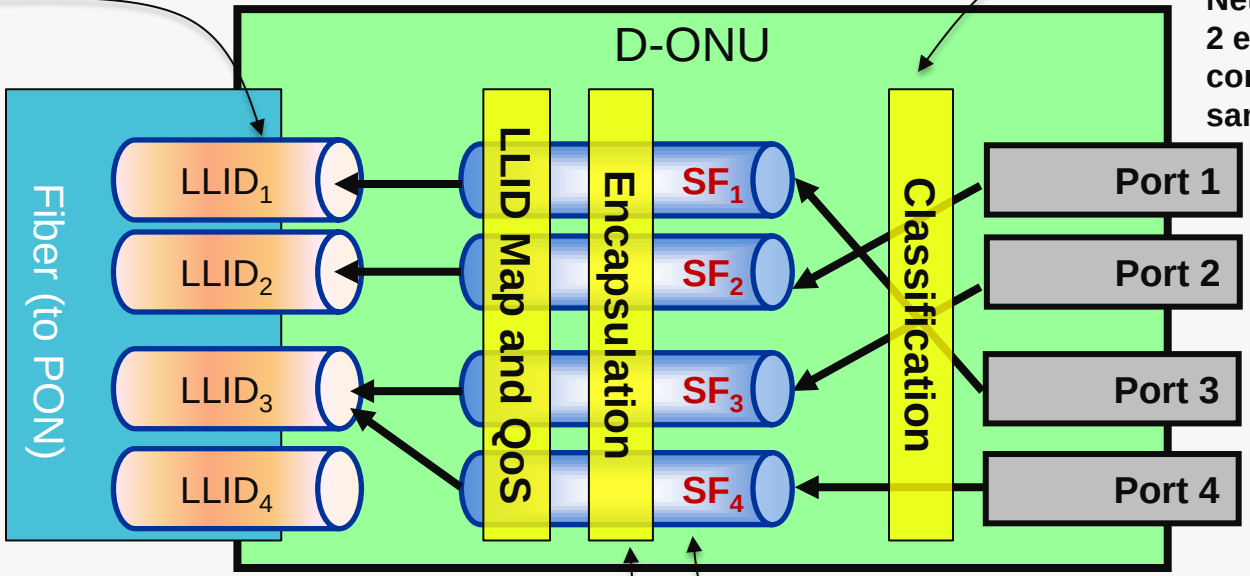
- Each registered ONU has a corresponding virtual cable modem (vCM) which acts as an IP proxy for the ONU
- vCM then configures/manages the ONU using extended OAM (eOAM)



Mapping DOCSIS Concepts to EPON

LLIDs are similar to SIDs and are scheduled by the DPoE System for upstream transmission

Additional classification fields are defined for DPoE Networks due to layer 2 emphasis, but the concept remains the same



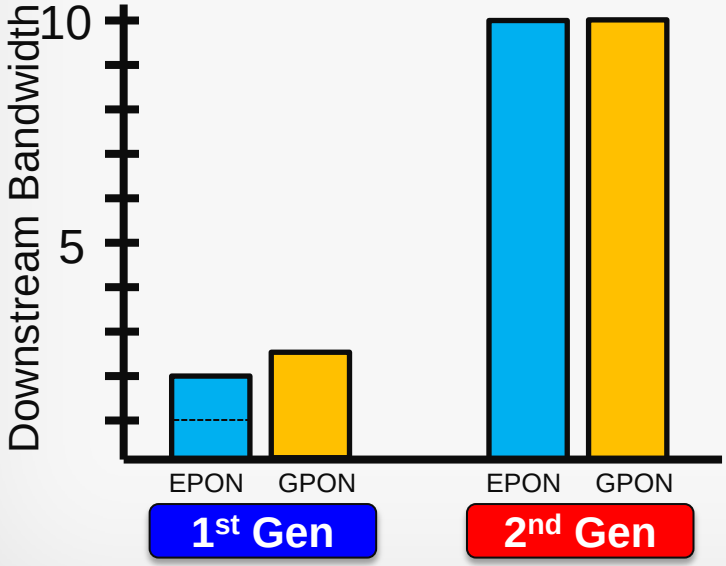
Ethernet interfaces are the same as in DOCSIS, including the concept of Cable Modem Interface Mask (CMIM)

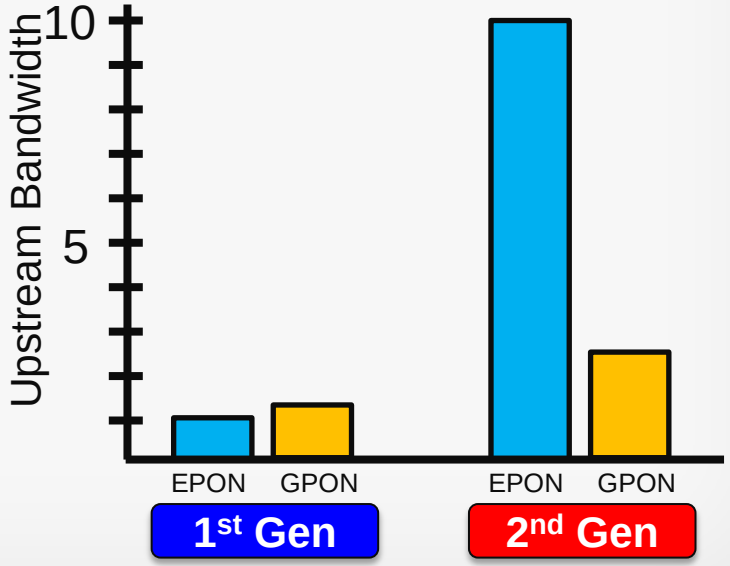
L2VPN spec used to define 802.1ad, 802.1ah tags and TPID translations

Service flows (a well-known DOCSIS concept) "carry" frames and are configured with a QoS

2G-EPON

- 2 Gbps downstream was already “standardized” in Chinese specifications
- An Engineering Change (EC) to DPoE specs will specify the method in detail

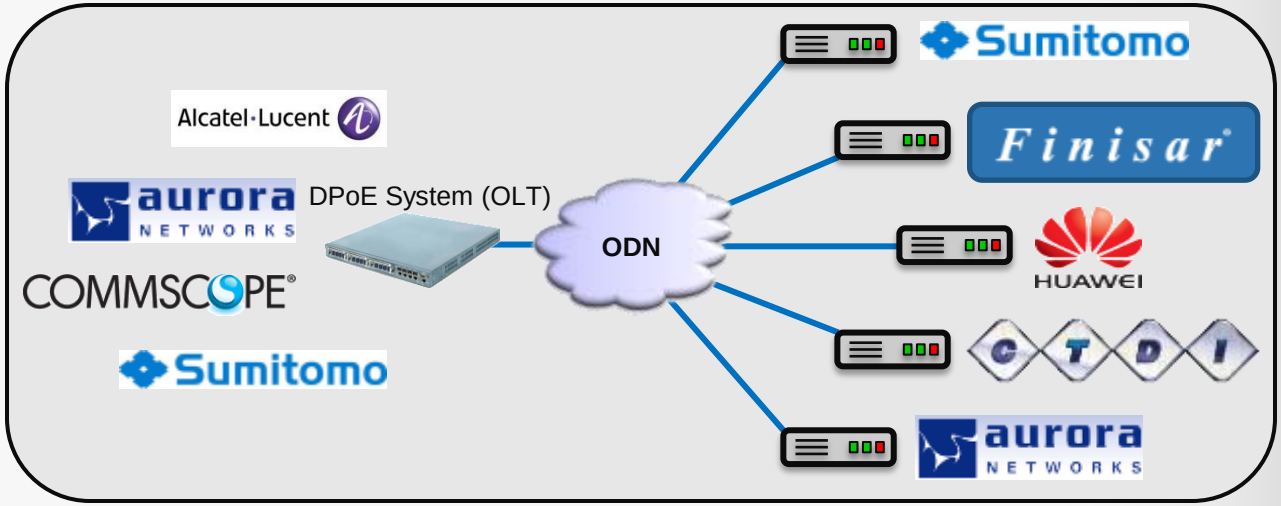




DPoE Certification Testing

DPoE Specification Validation Continues

- DPoEv1.0 certification testing began in July 2012
- Five (5) ONUs, four (4) DPoE Systems successfully certified (so far)
- DPoEv2.0 Interop events to begin June, 2014
- DPoEv2.0 certification testing to begin Q42014



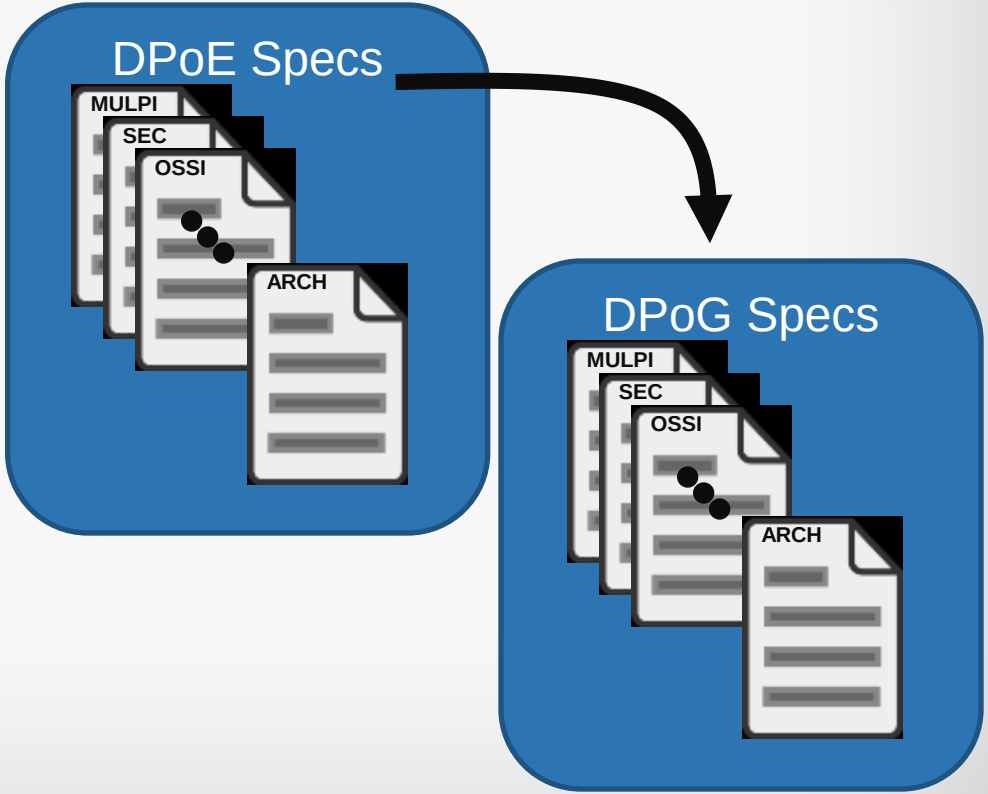
DPoE – Next Steps

- V2.0 Interop events in 2014
  - Interop #1 :: June, 2014
    - Improving chip diversity
    - 10G interop testing
    - Includes new IP(HSD) requirements
  - Interop #2 :: August, 2014 (??)
- V2.0 qualification testing
  - ~Q4 2014 or Q1 2015

DOCSIS Provisioning of GPON (DPoG)

Specifications for IP High Speed Data using GPON technology

- Comcast-lead effort converted DPoE specifications to support GPON
- Directly mirrors the DPoE requirements, except where underlying technologies differ, such as Logical Links versus GEM Ports
- DPoGv1.0 specifications support only IP High Speed Data (IP(HSD)) services for residential or business deployments



DPoG Architecture

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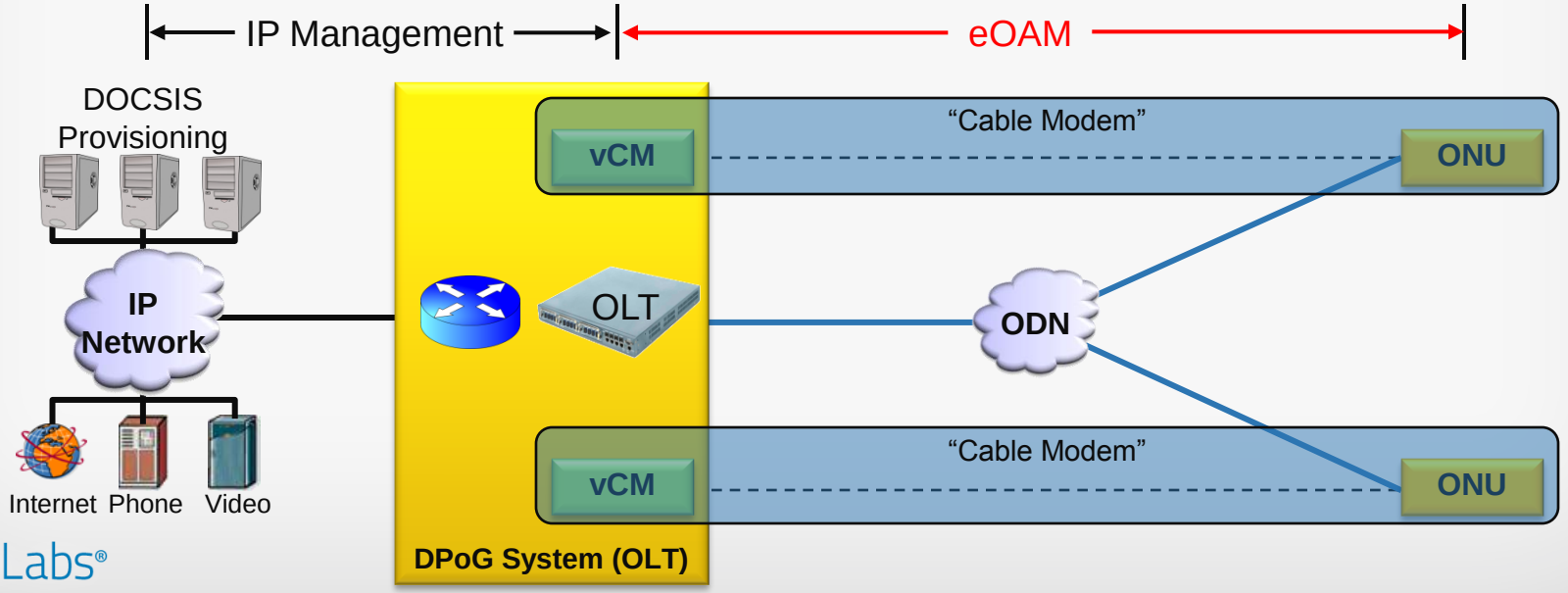

Mapping DOCSIS Concepts to GPON

TCONTs and GEM ports replace LLID and SID

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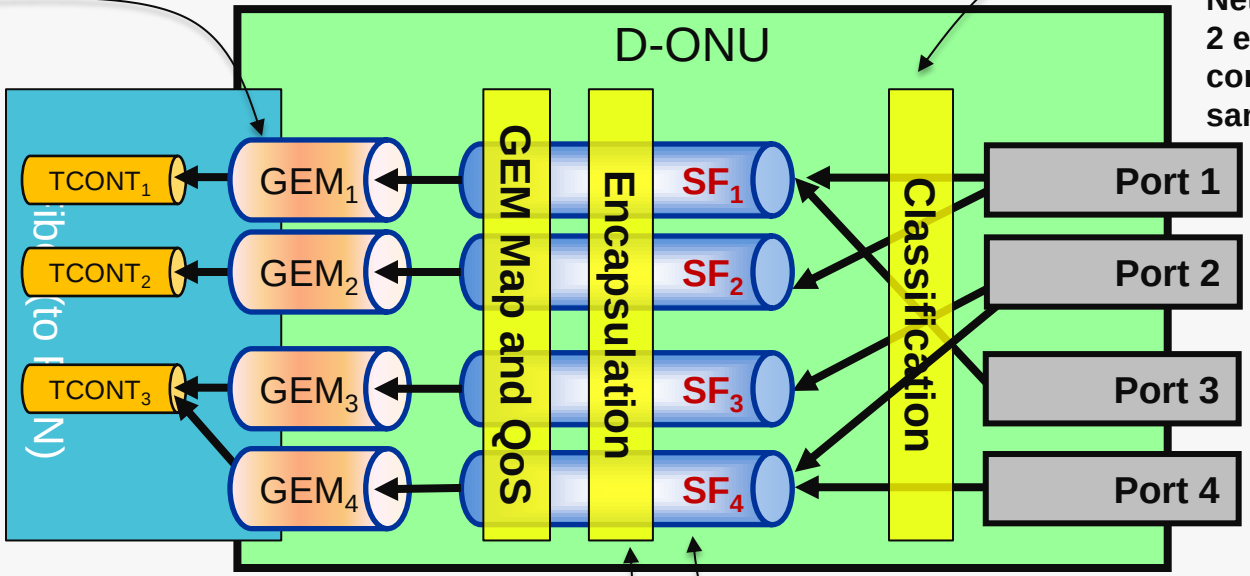

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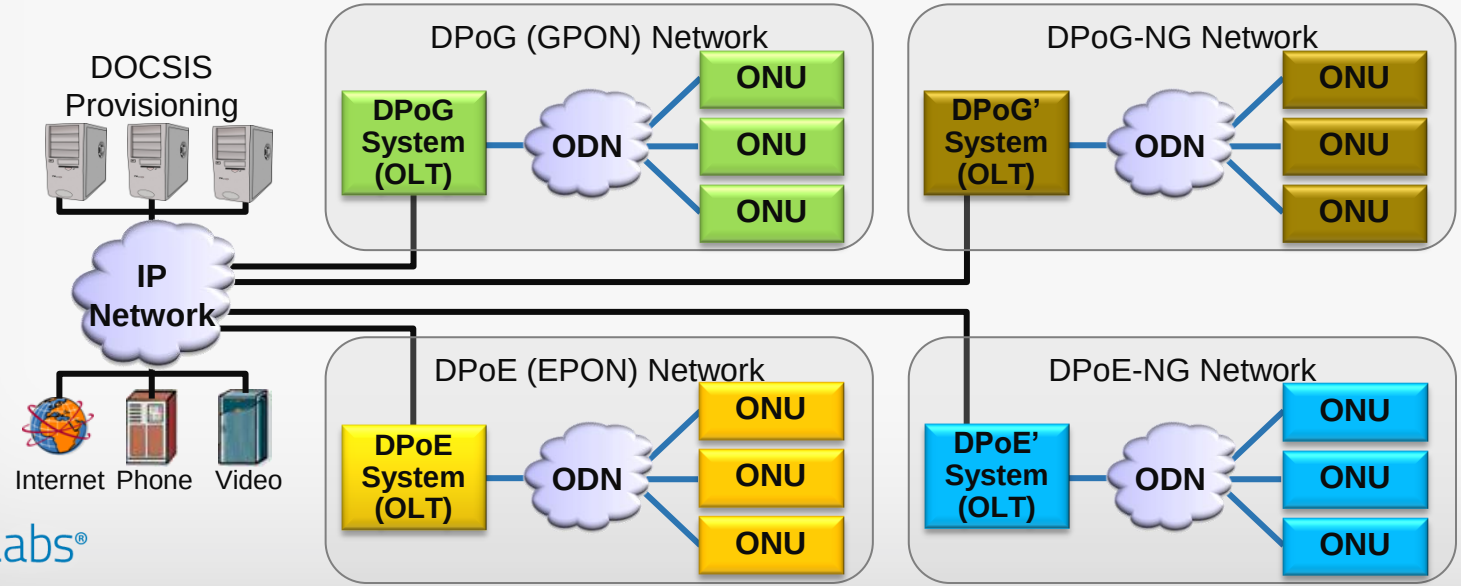
Common Architectures/Interfaces

Expanding Network Tool Chest

- DPoE/DPoG solutions look identical for a reason
  - For either flavor of PON to get deployed, they need to have the same northbound and southbound interfaces and functionality as back office requires
- DOCSIS provisioning today, NFV/SDN tomorrow



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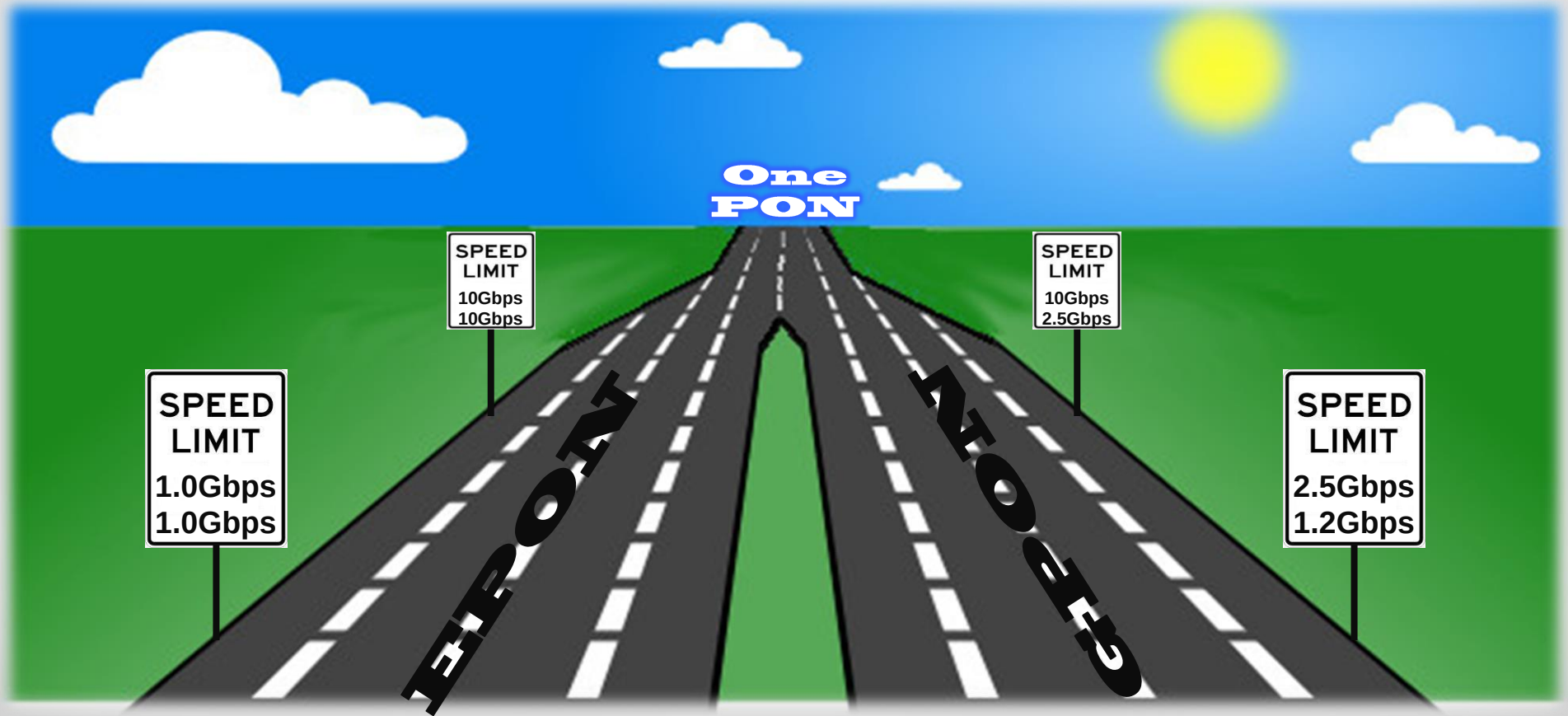
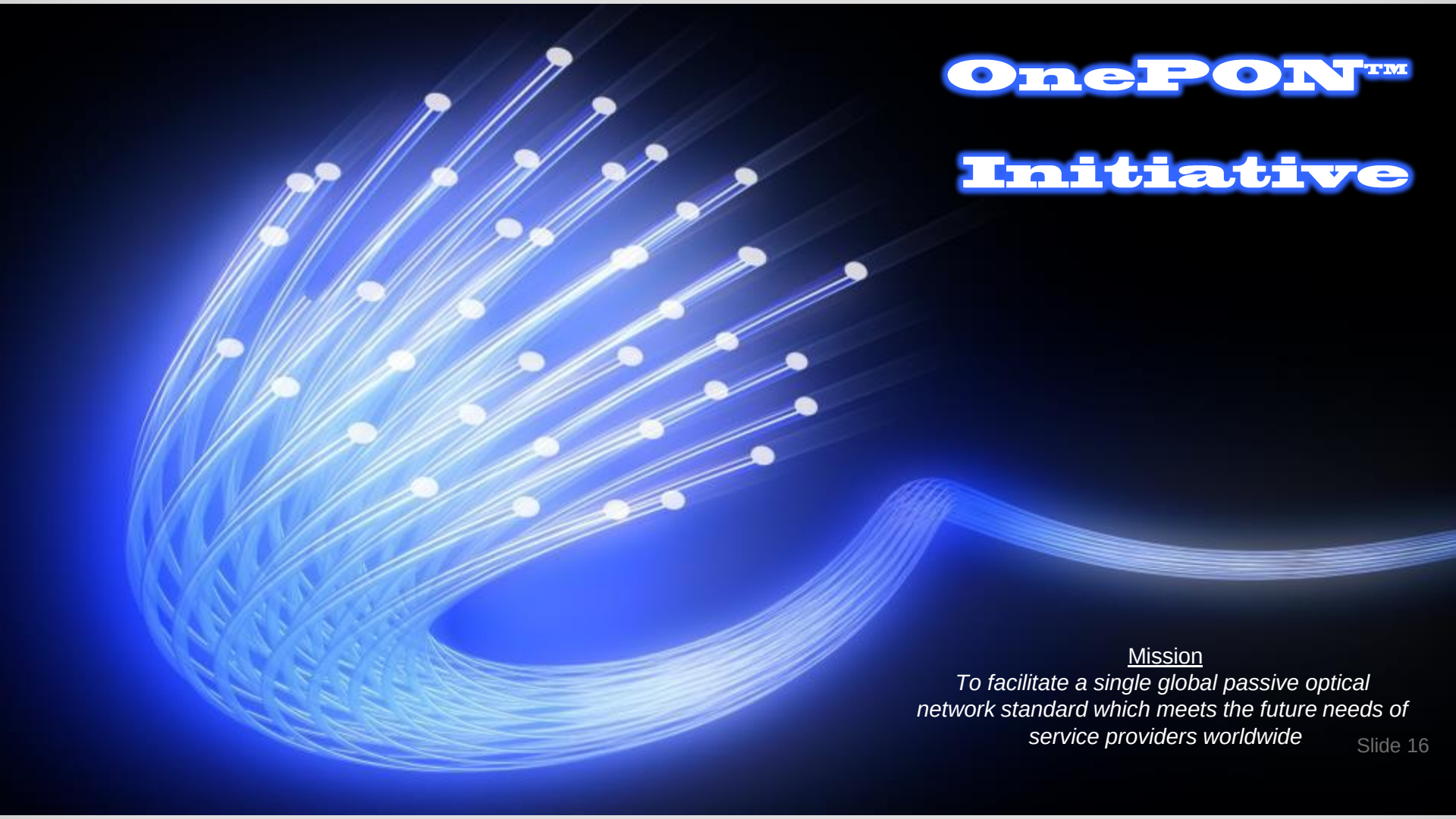
Two Parallel PON Activities

What We Really Need…

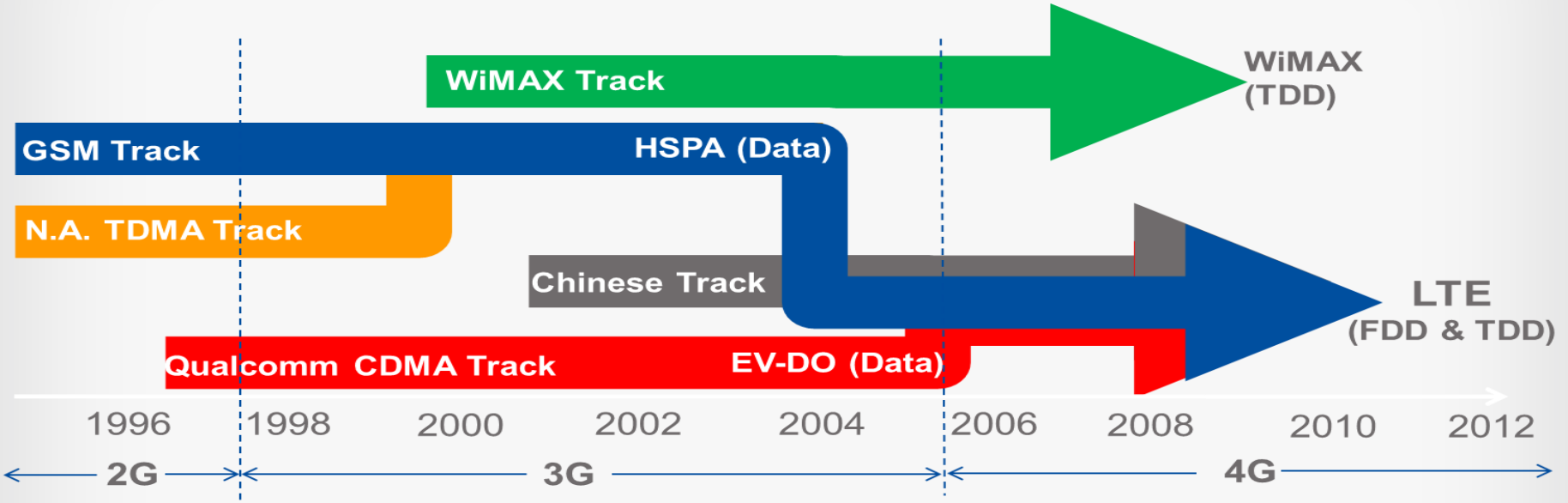




Mission

To facilitate a single global passive optical network standard which meets the future needs of service providers worldwide

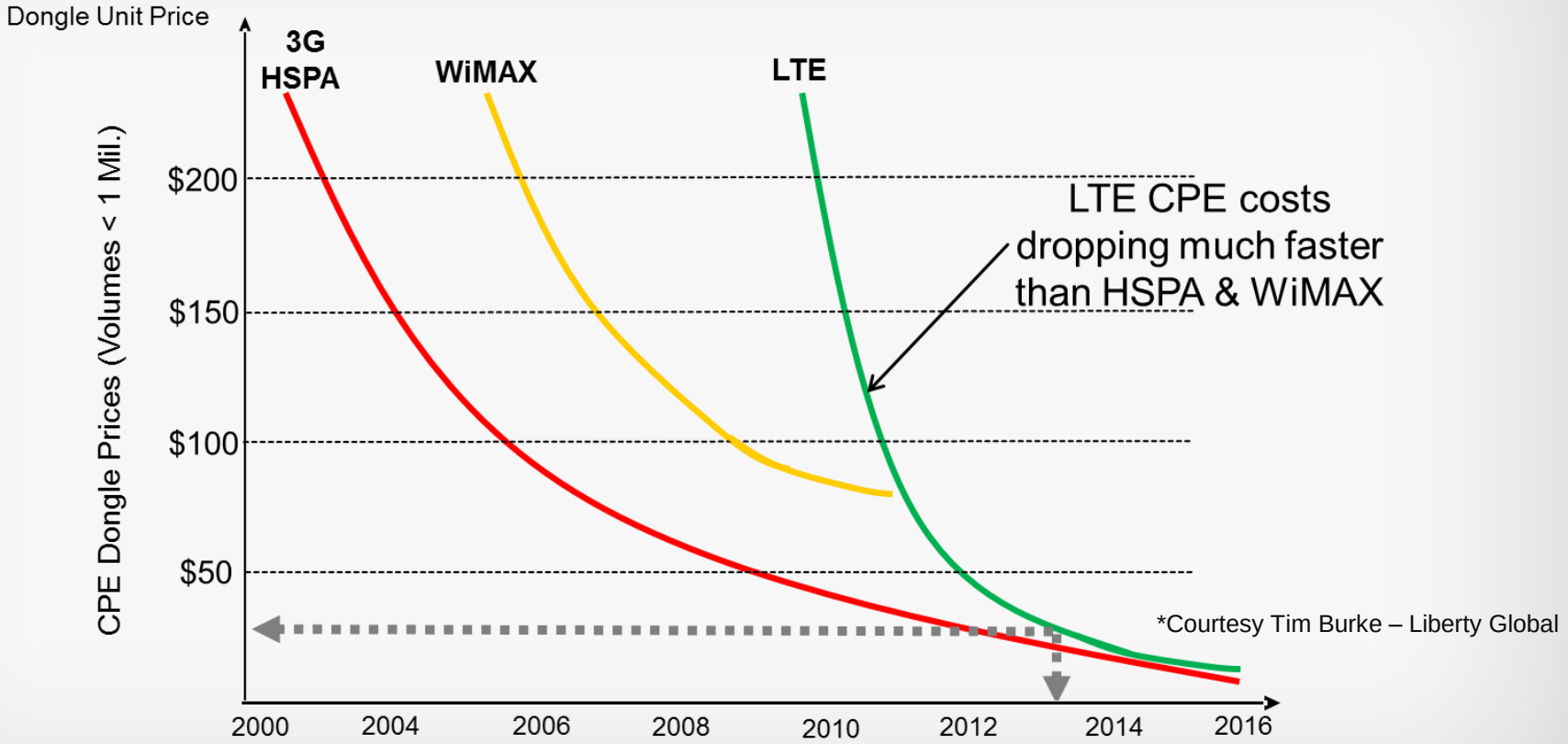
One Wireless



*Courtesy Tim Burke – Liberty Global

- For the first time in ~20 years (since analog) mobile standards have converged into a single worldwide standard (LTE)
- Resulting in a large device ecosystem with excellent economics and selection

One Wireless Pricing and Timing



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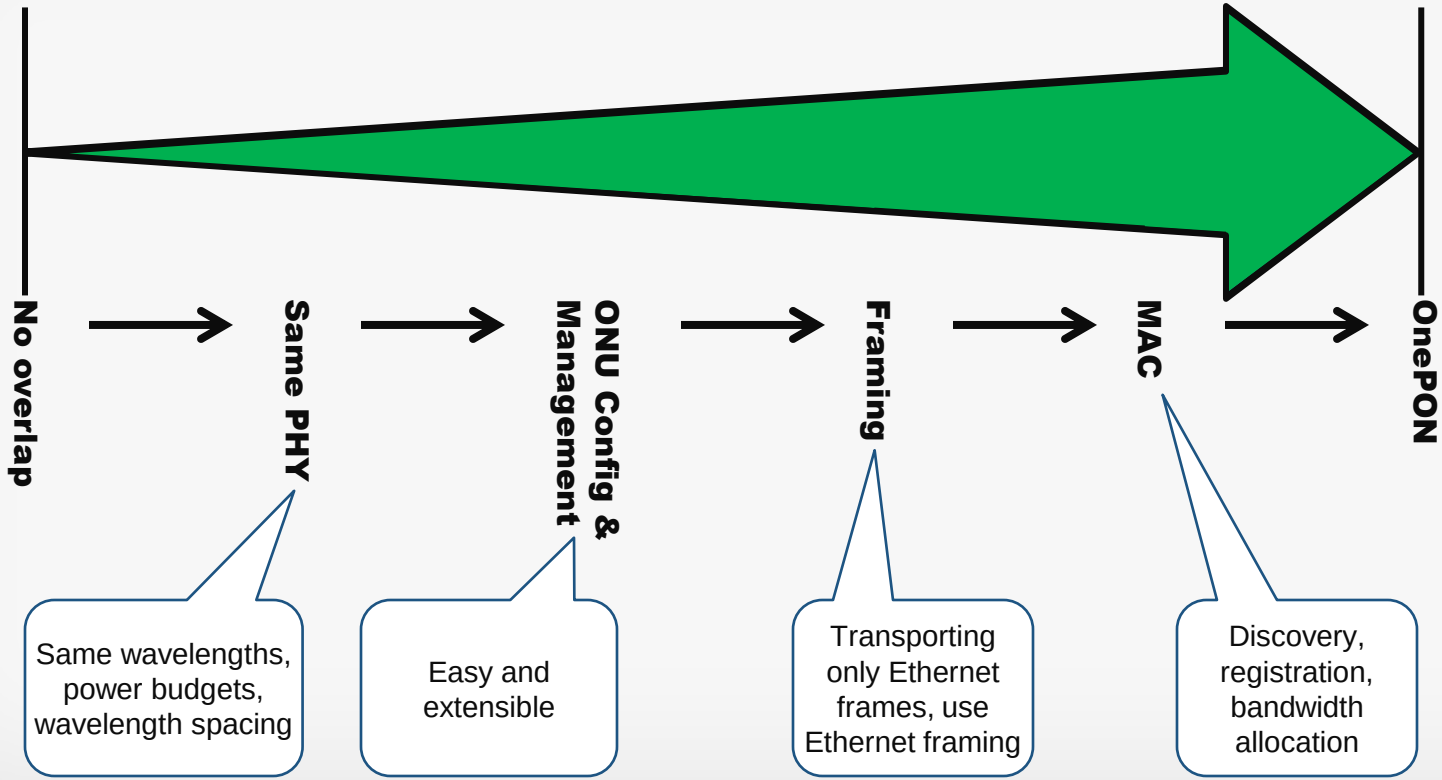
OnePON Progression



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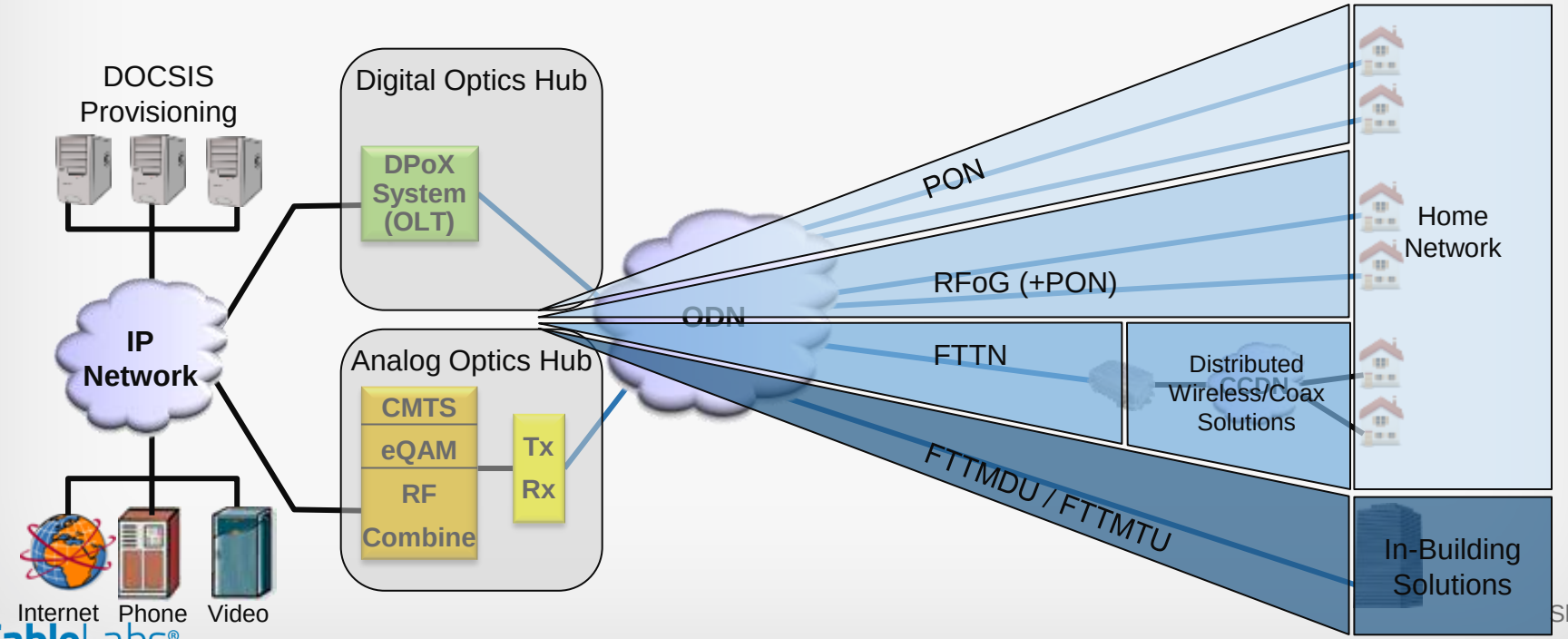
Fiber Deep Strategy Map

- MSO strategies for pushing fiber deeper will vary depending on FTTH and IP video timelines, and of course, investment timeline



What's Next?

Opportunities for Engagement

- DPoE Specs
  - ATP development and validation
  - DPoEv2.0 interoperability testing
  - DPoEv2.0 qualification testing
- DPoG Specs
  - DOCSIS PON IPR pool
  - Specification development
  - Interoperability testing
- Fiber Deep
  - Provisioning and management
  - SDN and virtualization applications
  - Fiber installation, connectors, prefab
  - Optical modulation improvements
  - Network topologies
- OnePON™ Initiative
  - Service provider / vendor meetings
  - Establish key tenets
  - Engage operators, SDOs

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