UNLEASH THE POWER OF LIMITLESS CONNECTIVITY
Converged Networks and Mobility

On The Road to 10G - Converged Access Platform for HFC & Ultra Long (+60km) NGPON2

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Principal Strategic Access Architect
COX Communications
Acknowledgements

ADVA: Clark Scott, Lutz Rapp, Sorin Tibuleac
COX: Sung Kim, Igor Tavrovsky, Ted Boone, Brian Yarbrough
Agenda

Converged Access Platform ROCML & Drivers
Data Projections
ROCML Overview
COX PON Architecture
Future 25G PON With ROCML
DOCSIS 4.0 & FTTH Network
What is the ROCML

ROCML – Raman Optical Comm. Module
Single platform for HFC, PON & 5G
Passive OSP, active components in CO
Raman, SOA and EDFA amplification
Fiber protection
Dispersion management

Drivers

Extended range +60km 10G PON2
- Scalable to 25G PON & beyond
25Gbps DWDM optical link for ESD 1.8GHz
Primary & backup fiber links
High system OSNR platform
Coherent Capability 100G-400G
20 Year Data Projections

**Downstream**

YoY traffic CAGR 25-30%
Max speed: Half node/link capacity

**HFC D4.0 (ESD 1.8 GHz)**
- Up to 12 Gbps DS/6 Gbps UP
- 350 HP/node
- 200 subs/node

**PON**
- 10Gbps symmetrical
- 64 HP/link
- 40 subs/link
Raman Optical Communications Module (ROCML)

COX's Next Generation Converged Access Platform

Loss Budgets: PON 50dB, Ethernet 35dB

5 to 70km

Primary

Secondary

OLT 10G- PON, 1

MUX

C Band

D Band

WDM

Dispersion Management

Ethernet DS

C Band EDFA

NGPON2 DS

DS

20 DS CHs

25G 100/400G

20 US CHs

NGPON2 UP

Raman Pump

2 x 1 Splitter

25G

RMD

100/400G

1:64 PON (Future 25G PON)

1: 64 PON

10G PON

25G

RMDM

C/L Band

D WDM

OTDR

Primary

Secondary

OTDR

Coherent
### Ethernet & PON Transport

#### 8 NGPON2 PtP Wavelengths
- **L band DS**
- **C Band UP**

#### 20 Bi-Di Ethernet Wavelengths
- **C band DS/UP**

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**NGPON2 L Band DS**

**NGPON2 C Band UP**

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Raman Amplification in ROCML

ADVA 70km Simulations

C band UP Gain
- NGPON2 21dB
- Ethernet 18dB

DS Gain
- NGPON2 L Band 5 dB
- Ethernet C Band 7.5dB
Current and Proposed 10G PON Architecture

Current COX 10G PON

ROCML 10G PON

Same Fiber Distribution Network
Future 25G PON With ROCML

25GS-PON

- 25G OLT
  - 25G Tx
  - 25G Rx
- ODN
  - 29 dB loss
- 25G symmetric ONU
  - 25G Tx
  - 25G Rx

- 29dB Loss budget
- 20km
- 0-band single wavelength
- NRZ transmission
- Low cost DML lasers in ONUs
- No dispersion compensation
- No optical amplification

25G PON over ROCML

- 25G OLT
  - 25G Tx
  - 25G Rx
- ODN
  - ROCML
  - RMDM
  - 50 dB loss
- 25G symmetric ONU
  - 25G Tx
  - 25G Rx

- 50dB Loss budget
- +60km
- L/C Band multiwavelength, 8 X 25G
- NRZ transmission
- Low cost DML lasers in ONUs
- Dispersion compensation
- Optical amplification

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DOCSIS 4.0 ESD (1.8GHz)

- Backbone
- Metro
- Regional Data Center
- Virtual Controller
- ROCML, RPAs, OTDR
- HUB
- Fiber (5-70km)
- Coax (1-2km)
- 1.8 RMD 35k
- 1.8 Amp. 600k
- 1.8 Taps 3M
- SUBSCRIBER

Access
25G DWDM Network

UHS DOCSIS 4.0 Upgrades
Nodes, Amps and Taps
CIN, OCMLs, RPAs, vCMTS
D4.0 CPE

DATA CENTER

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FTTH – ROCML PON Network

Backbone

Metro

DATA CENTER

Fiber (5-70km)

Distribution Fiber
(1-5km)

Access
C/L Band 10G/25G DWDM

HUB

FTTH Upgrades
Fiber to homes
CIN, ROCMLs, RPAs, OLTs
ONU

Less Hardware
No field actives, Increased
Reliability, Reduced OpEx

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Summary

ROCML Provides Access platform for 20 Years

Single DOCIS, PON, 5G & enterprise platform
Protected fibers
25G DWDM ethernet links for RMD
Long range +60km 10G PON, scalable to 25G PON
Coherent 400G capability

ROCML enables transition to all PON network
Thank You!

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