Verizon NG-PON2: What, Why, and Pushing the Envelope

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Distinguished Member Technical Staff
Verizon NG-PON2: What, Why, and Pushing the Envelope

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Greg Sherrill, DMTS
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Outline

1. Verizon’s Intelligent Edge Network (iEN)
2. Overview of NG-PON2
3. Why NG-PON2 for the iEN?
4. Where the technology is going
   - N2 OLT optics
   - Bonded channels
   - SFP+ ONT
Verizon’s Intelligent Edge Network (iEN)
NG-PON2 in the iEN

1. New Electronics in CO
2. New Combiner in CO
3. No Change in OSP

NG-PON2 PON System

WM

NGPON 2 (10G/10G*)

Office Park

GPON+RF

Cell Site

NGPON (10G/10G*)

Splitter

Today

GPON
RF video

64-128 way split

* These rates are based on PON line rate. Available bandwidth for customer traffic is lower because of protocol overheads.
NG-PON2 Advantages

9.95 Gbps line rate upstream and downstream, per channel (~8.5 Gbps service rate)

Split up to 1x128 with “N2” OLT optics

Uses same power-split optical network as GPON

Narrower channel bandwidth reduces timing error

Can be overlaid on existing GPON PON

Supports multiple independent wavelengths – independent channels – on the same PON
NG-PON2 in the iEN – Multiple Wavelengths

1. New Electronics in CO
2. New Combiner in CO
3. New NG ONT

Future: Channel Bonding, e.g., Use of two or more wavelength pairs at a time

Customers could get a wavelength or a portion

No Change in OSP

GPON + RF

* These rates are based on PON line rate. Available bandwidth for customer traffic is lower because of protocol overheads.
Advantages of NG-PON2 Multiple Wavelengths

- One Fiber
- Pay as You Grow
- Non-service-affecting Maintenance

- Service Separation
- Channel Bonding
- Non-service-affecting Activation
- Load Balancing
- Power Management
- Rogue Mitigation
Advancing: N2 OLT Optics

N2 optics and integrated WM1 + 1x4 splitter increase downstream power to OSP by 3 dB
- 2 dB output power increase, 1 dB loss decrease in 4x4
- Upstream sensitivity increases are the biggest hurdle; vendors making progress
Demonstration is a major milestone on the path towards providing higher bandwidth speeds and lower latency to customers over Verizon’s Intelligent Edge Network using AXOS.

To reach 34 Gbps, Verizon and Calix extended intelligence and improved wire speed to the ONT by bonding all four available wavelength channels using software, achieving service data rates in excess of individual wavelength channel capacity.
Advancing: Pluggable PON ONU Module

NG-PON2 ONU in a small pluggable form factor

- Optics, SoC, CPU, memory, packaged in SFP+

The most elegant implementation of PON-based transport

Encouraging vendors to accelerate development

<table>
<thead>
<tr>
<th>Basic Requirements</th>
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<tr>
<td>• Compatibility with the backhaul transceiver cage of the host unit</td>
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<td>• I-Temp rating</td>
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<td>• Precision time protocol support</td>
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<tr>
<th>Challenges</th>
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<tr>
<td>• Power draw</td>
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<td>• Heat dissipation</td>
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<td>• Mechanical dimensions</td>
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## Pluggable PON ONU Module Management

<table>
<thead>
<tr>
<th>Host Interface</th>
<th>Fiber interface</th>
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<tr>
<td>• Basic MSA-based control and diagnostic monitoring</td>
<td>• Activation</td>
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<tr>
<td>functions</td>
<td>• Software upgrades</td>
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<tr>
<td>• Forced ONU reboot</td>
<td>• Configuration</td>
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<td></td>
<td>• Provisioning</td>
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<td>• Maintenance</td>
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<td>• Alarm indication</td>
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<td>• Performance monitoring</td>
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<td>• Testing</td>
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broadband forum
June 2-4, 2020
Den Haag, The Netherlands

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