Provide Appropriate Support for OTN

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Ethernet over OTN Transport Service Model

Packet Services
- Only the packets are transported
- Full rate or sub-rate service
- Statistical multiplexing opportunity
- Supports a variety of topologies – packets may be delivered to different egress points depending on the destination address
- Increase or reduce capacity in-service with VCAT/LCAS
- Gracefully degrade (reduce capacity) on partial link failure

Circuit Service
- Every bit, byte, or codeword is transported
- Full-rate, transparent service
- No packet grooming in the transport
- Supports most proprietary extensions to Ethernet frame format
- The circuit service requires coordination between IEEE and ITU-T due to the need to carry every bit, byte, or code block

Both packet and circuit oriented services across the OTN are required. The circuit service requires close coordination between IEEE and ITU-T.
Need of Transparent Circuit OTN Transport

40 Gigabit Ethernet
- 40G transport networks have been on the market for six years
- 40G (ODU3) transport equipment is shipping today in growing volumes
- By 2010 there will be large installed ODU3 WDM infrastructure in most provider networks
- Transparent backhauling of 40 GbE clients will be required with existing ODU3 rates

100 Gigabit Ethernet
- No existing 100G transport network
- ITU-T SG15 decided in March 2007 to extend G.709 to the next higher rate (ODU4) to carry 100 GbE on a single wavelength
- ITU-T SG15 is monitoring the HSSG/TF activities and will define an ODU4 rate that is sufficiently large for transparent backhauling of 100 GbE
- 100 GbE may also be carried over current OTN networks using virtual concatenation (VCAT):
  - ODU3-3v, 3 bonded wavelengths of 40Gbit/s
  - ODU2-11v, 11 bonded wavelengths of 10Gbit/s

Both 40 GbE and 100 GbE need transparent circuit OTN transport
40 Gb Ethernet Circuit Transport over OTN

<table>
<thead>
<tr>
<th>OTN Edge NE</th>
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<tr>
<td>ODU3 (40.150159 Gbit/s ±20ppm)</td>
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<td>- Simplest evolution from 10G is a 40G MAC with 64B/66B giving 41.25Gbit/s, but this is larger than the OPU3 payload area</td>
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<td>- Could choose slightly lower MAC rate to fit</td>
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<td>- Could choose a 40G MAC rate with a more efficient line code than 64B/66B</td>
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<td>- Could develop a reversible transcoding that would compress 64B/66B from LAN to a format that fits the OPU3 payload area</td>
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<td>- Which bits, bytes, or blocks required to be carried for transparent service is TBD</td>
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<td>- Same PMD not required at ingress and egress</td>
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Close cooperation needed between IEEE and ITU-T to find a solution that meets the requirements of both groups
100 Gb Ethernet Circuit Transport over OTN

ITU-T working to specify serial transport over one wavelength

ODU4 (>=103.125 Gbit/s)

ODU3 (40.150159 Gbit/s ±20ppm)

ODU2 (9.995276 Gbit/s ±20ppm)

Same PMD not required at ingress and egress.
Which bits, bytes, or blocks required to be carried for transparent service is TBD
Provide appropriate support for OTN

Objective defined to ensure that a mechanism exists that enables transparent transmission of 40GE or 100GE over an OTN network

- For 100GE, OTN transport is currently under definition within ITU so it is expected that transparency will be a key objective in this definition

- For 40GE, the installed base of ODU3 products has a payload that is smaller than the expected 40GE line rate
  - more efficient coding or reduction of the MAC rate will be necessary
  - transcoding has been identified as a possible method to ensure transparency.
  - requires IEEE 802.3 to forbid use of undefined 64B/66B code words
  - transcoding would be defined within ITU