Provide Appropriate Support for OTN

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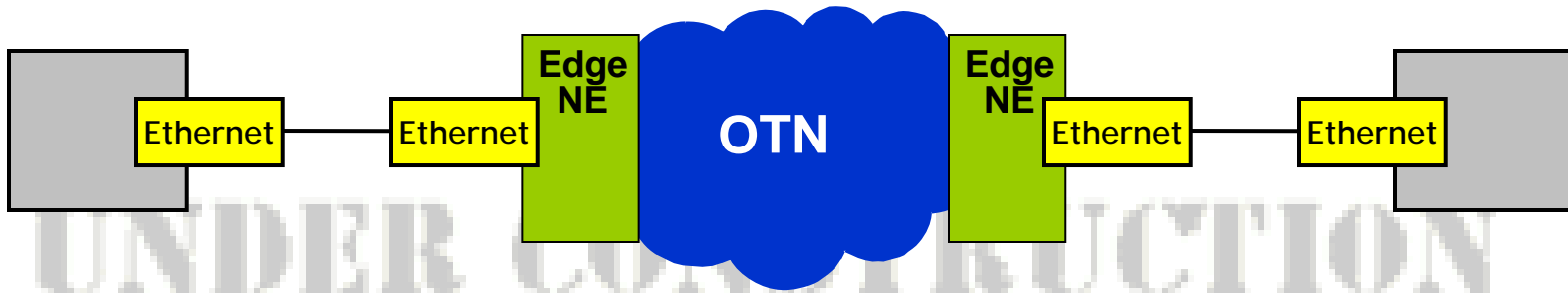
Martin Carroll, Verizon

Thomas Fischer, Nokia Siemens Networks

Ralf-Peter Braun, Deutsche Telekom

George Young, AT&T

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

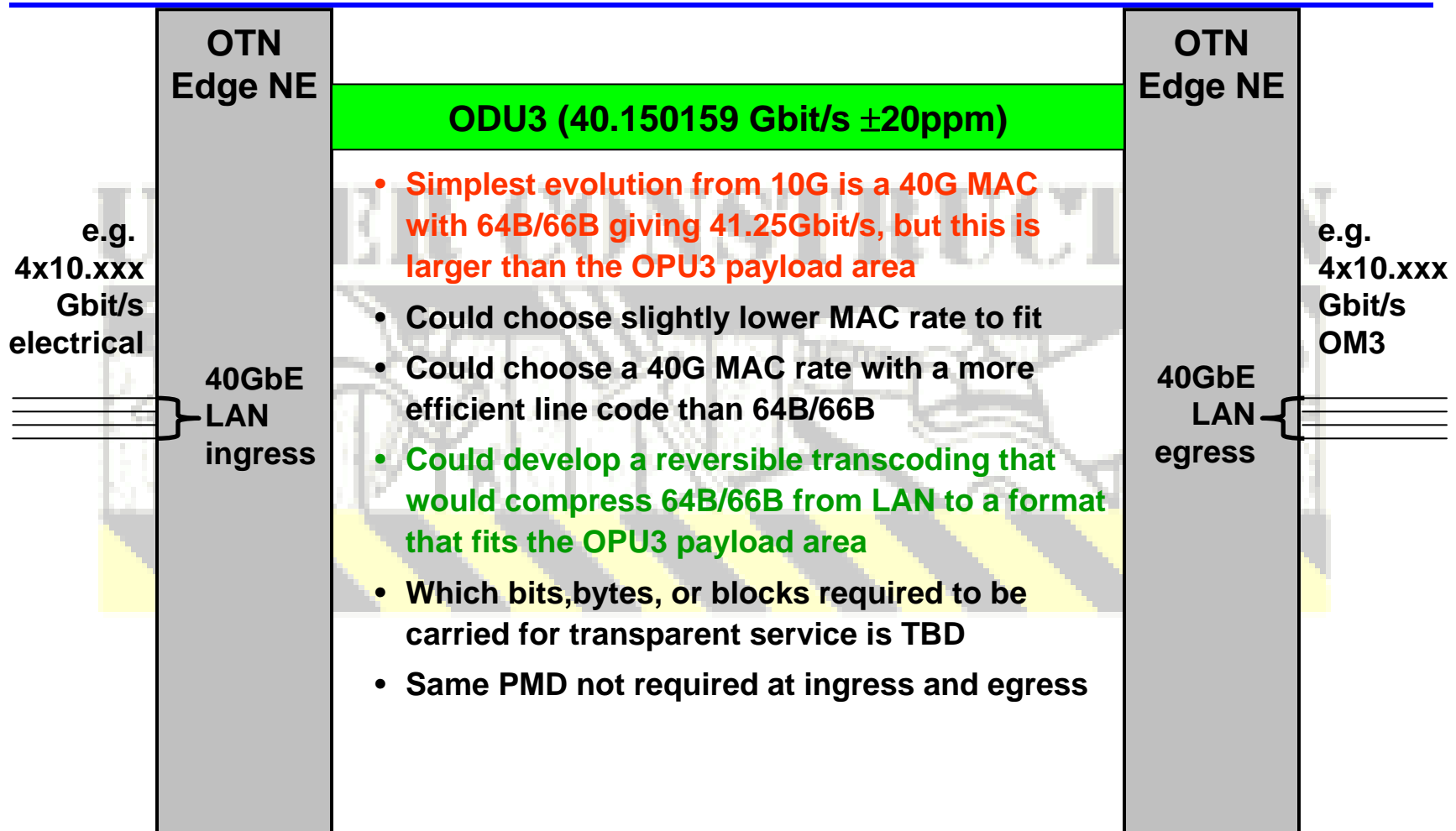# Need of Transparent Circuit OTN Transport

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
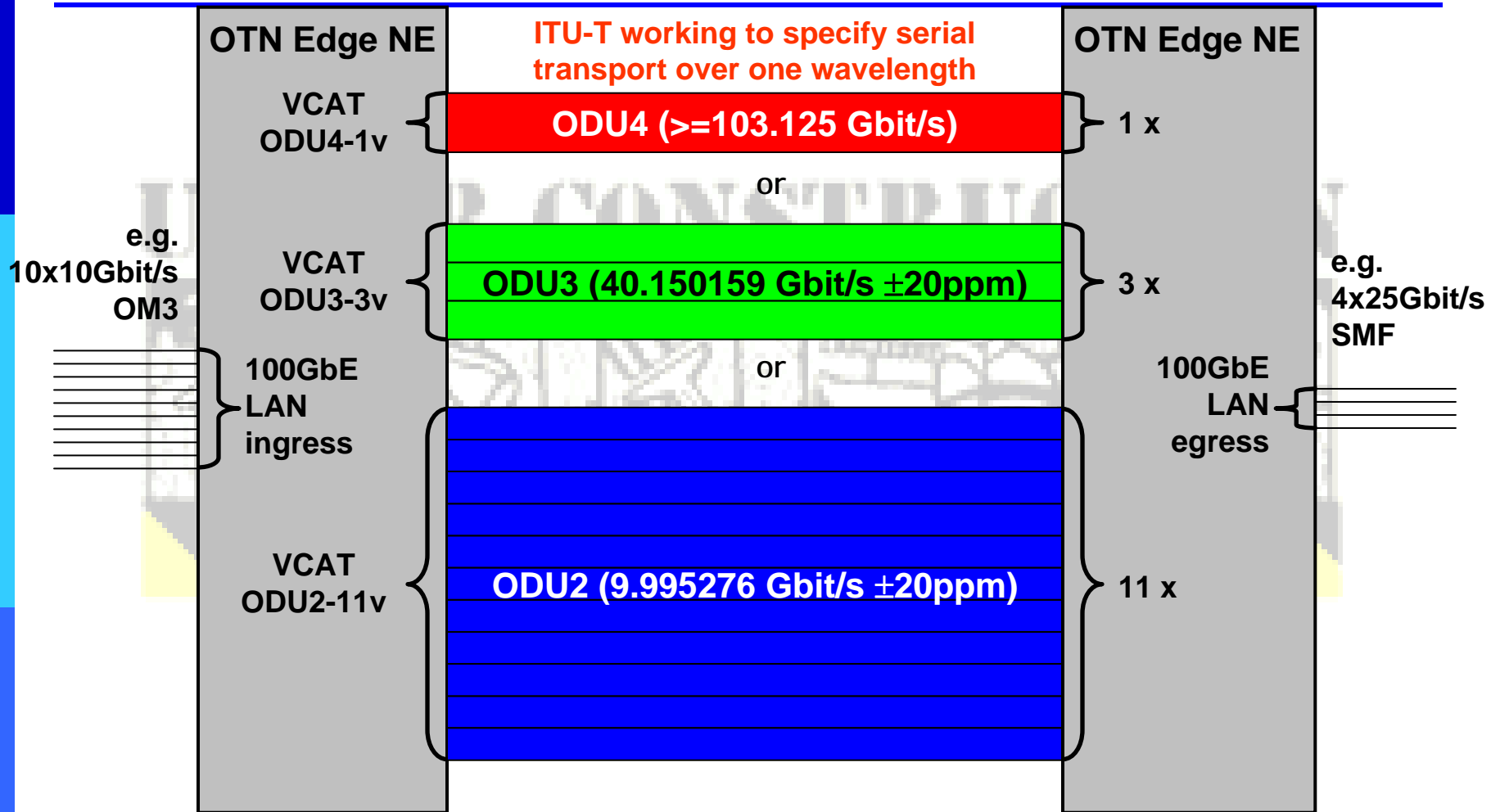 - ODU2-11v, 11 bonded wavelengths of 10Gbit/s

Both 40 GbE and 100 GbE need transparent circuit OTN transport

40 Gb Ethernet Circuit Transport over OTN

OTN Edge NE

OTN Edge NE

ODU3 (40.150159 Gbit/s ±20ppm)

e.g. 4x10.xxx Gbit/s electrical

e.g. 4x10.xxx Gbit/s OM3

40GbE LAN ingress

40GbE LAN egress

- Simplest evolution from 10G is a 40G MAC with 64B/66B giving 41.25Gbit/s, but this is larger than the OPU3 payload area

- Could choose slightly lower MAC rate to fit

- Could choose a 40G MAC rate with a more efficient line code than 64B/66B

- Could develop a reversible transcoding that would compress 64B/66B from LAN to a format that fits the OPU3 payload area

- Which bits,bytes, or blocks required to be carried for transparent service is TBD

- Same PMD not required at ingress and egress

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

OTN Edge NE

ITU-T working to specify serial transport over one wavelength

OTN Edge NE

VCAT
ODU4-1v

ODU4 (>=103.125 Gbit/s) — 1 x

or

e.g.
10x10Gbit/s
OM3

VCAT
ODU3-3v

ODU3 (40.150159 Gbit/s ±20ppm) — 3 x

e.g.
4x25Gbit/s
SMF

100GbE
LAN
ingress

or

100GbE
LAN
egress

VCAT
ODU2-11v

ODU2 (9.995276 Gbit/s ±20ppm) — 11 x

**Same PMD not required at ingress and egress.
Which bits, bytes, or blocks required to be carried for transparent service is TBD**
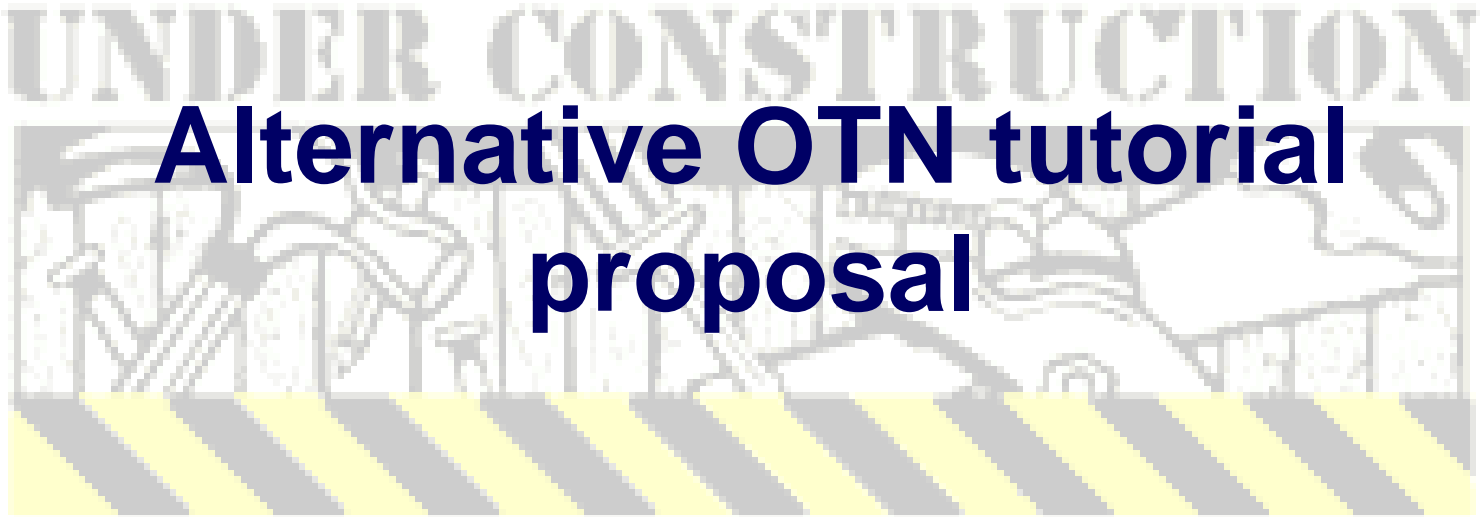
Alternative OTN tutorial proposal

Mark Nowell, Cisco

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