IEEE 802.3 Ethernet Working Group
Liaison Communication

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Liaison To ITU-T Study Group 15 from IEEE 802.3

From: David Law – Chair, IEEE 802.3 Ethernet Working Group

Approval: Agreed to at IEEE 802.3 Plenary meeting, Denver, July 17, 2008

Dear Mr. Maeda and Members of ITU-T Study Group 15,

The IEEE P802.3ba 40Gb/s and 100Gb/s Ethernet Task Force has adopted an objective to "Provide appropriate support for OTN". In May, 2008 a baseline proposal was adopted to satisfy this objective (see slides 58-69 of BaselineSummary_0508).

The focus of this study has been to explore how to support full-rate "transparent" transport of 40 GbE and 100 GbE over OTN. Packet or Frame based transport of Ethernet is also an important family of services, but does not appear to be affected by the standardization of new MAC data rates for Ethernet.

The adopted baseline proposal covers two aspects: the ability to map (fit) 40 and 100 GbE into OTN containers, and the mechanism that should be used to signal faults from the OTN layer to the Ethernet layer.

For 100 GbE, we understand that ITU-T will specify a new ODU4 container whose capacity will be chosen considering 100 GbE as one of its clients. We therefore do not foresee that there will be any issue with whether 100 GbE fits into ODU4.

For 40 GbE, we understand that the payload capacity of the ODU3 container is ~40.150519322 Gb/s ±20ppm. The MAC data rate for 40 GbE will be 40.0 Gb/s ±100ppm, but this is increased with the inclusion of control, lane marking, and line coding information to 41.25 Gb/s ±100ppm, slightly more than the space available.

There are proposals that have been made to both of our standards groups that show that it is possible to take advantage of the coding of control information and the line code to map the 40 GbE signal into the available space (transcoding). Key to making this work is a stable specification of the PCS codeword space, in particular, the four values to be used for lane markers and the set of 66B control block types.

While the set of 66B control block types has proven to be extremely stable (in seven years of history since 802.3ae, there has never been a proposal to introduce a new control block type), as a safeguard, the IEEE 802.3 working group intends to include in the IEEE 802.3ba amendment:

[1] This document solely represents the views of the IEEE 802.3 working group and does not necessarily represent a position of either the IEEE or the IEEE Standards Association.

- A requirement that unspecified control block types shall not be transmitted and shall be considered an error if received, so that the mapping of higher speed Ethernet over OTN does not need to take into account other than the specified control block types.
- As a safeguard against unintentionally breaking the OTN mapping with future evolution of the IEEE 802.3 standard, we plan to include a warning note to the table of 66B control block types indicating that the OTN mapping specified by ITU-T depends on this set of control block types and that this table should not be changed without coordination with ITU-T Study Group 15.

Please confirm that this matches your expectation as to how the transparent mapping of 40 GbE into ODU3 will be performed, and whether this approach provides satisfactory safeguard. Please also inform us which ITU-T standard will include this mapping so that we can make a proper reference (e.g., a future revision of Recommendation G.709). Further, we suggest that aspects of your standard that depend on the IEEE 802.3 standard in general or the 802.3ba amendment in particular make appropriate reference to our standards.

The other aspect we have studied with respect to the transparent mapping of 100 GbE and 40 GbE over OTN is link fault signaling, in particular, how a failure in the OTN network should be signaled to the Ethernet layer network. In looking at similar applications in other technologies, the normal practice for signaling a server layer failure to a client layer network would be insertion of an alarm indication signal (AIS). For Ethernet, the forward defect indication signal with similar semantics is a Local Fault Indication (LF). For 100 GbE and 40 GbE this will be signaled using a sequence ordered set. In a point-to-point Ethernet link, this is used to indicate that an (unspecified) fault has been detected and alarmed at the near end. While the Ethernet standard itself will not specify any network configuration where the PCS is carried over multiple hops, in the case of Ethernet carried over OTN, if a failure in the OTN network transmits an Ethernet LF downstream from the fault, this will inform the receiving equipment that the fault has occurred upstream (or in the simple case of a point-to-point Ethernet link, the fault has occurred at the far end), and there is no need for the receiving equipment to raise its own alarm. We recommend this behavior for the appropriate equipment Recommendation describing the behavior of Ethernet carried over OTN.

Sincerely,

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FOR EXECUTIVE COMMITTEE REVIEW