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LIAISON STATEMENT

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Title: Enhancements to the OTN

LIAISON STATEMENT

For information to: **IETF ccamp Working Group**

Approval: **Agreed to at SG 15 meeting (Geneva, 28 September-9 October 2009)**

Deadline: **-**

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Since the initial OTN Recommendations were approved in 1999 the OTN has undergone significant evolution. The current ODU multiplexing structure allows non-homogeneous payloads to be carried by a (higher order) ODU. This implies that the links and subnetworks presented to the (lower order) ODU have the ability to convey payloads with multiple (different bitrate) clients. The currently approved version of G.709 (Interfaces for the Optical Transport Network (OTN)) supports the multiplexing of non-homogeneous lower order ODUs into a single higher order ODU. At this meeting support for arbitrary bitrates via the ODUflex has been added to G.709. Note that the ODUflex is mapped into an integer number of Tributary Slots of another (higher order) ODU for transport (using GMP). OTN equipment has evolved and electronic ODU fabrics that can accommodate a range of bit rates are now available. The current model in G.872 (Architecture of optical transport networks) describes each ODUk as an independent layer network, i.e. the bit rate is an implicit characteristic of the layer network. This approach results in a model requiring multilayer interaction to model a network that has inherent support of multiple bit rate clients. Recognizing that this approach may introduce unnecessary complexity Q12/15 has initiated work to update G.872 to describe the ODU as a single layer network where the bit rate of the ODU signal is defined by a parameter. This representation shows a single topology containing ODU links and subnetworks (i.e. resources) that is shared by all ODU signals. Note that all of the ODUs have a common characteristic information (i.e. overhead structure as defined in G.872). In some ways this is similar to a CO-PS layer network in that bandwidth is a connection parameter. However, as with any CO-CS layer network, the resource reservation and allocation is made at the time a connection is established. The suite of ASON Recommendations will also be updated to reflect these enhancements to the OTN.

This approach requires that number of the characteristics of the OTN must be taken into account when performing path computation and when establishing a connection.

- The capacity (effective bit rate) offered by TS on an OTUk link is dependent on the value of k. This may result in the allocation of a different number of TSs for a given ODU over different OTUk links. For example an ODU2e will occupy 9 (1.25G) timeslots on an OTU3 link but only 8 on an OTU4 link.
- The 2003 version of G.709 only supported a (nominally) 2.5Gb/s Tributary Slot (TS). Amendment 3 approved earlier this year introduced a (nominally) 1.25Gb/s TS. Existing ODU crossconnect equipment may only support 2.5G TS granularity whilst new equipment will support 1.25G TS granularity. G.709 describes how regions that support the different TS granularity may be interconnected. It is possible that some cross-connects (fabrics) will have a limit on the maximum number of TSs that can be combined to support a "high rate" connection.
- The TSs assigned to carry an ODU are determined (locally) on each link. This information is conveyed by the multiframe Multiplex Structure Identifier (MSI). This information should be provisioned at both the sending and receiving ends of the link. The MSI is then used to verify the configuration.
- The mapping of an ODU, including ODUflex into the HO ODUk/OTUk is determined locally, the allocation of the fixed and variable stuff bytes is dependent on the bit rate and bit rate tolerance of the payload being mapped and the TS capacity of the (local) OTUk link.
- Support for the capability to modify the bandwidth of an ODUflex after the initial connection has been established is not currently provided. The addition of this capability is for further study.

Information about these characteristics must be provided to the control application for path computation and must be provided by the control application when a connection is established. This control application may reside in either the management plane or an ASON control plane (or both). In the case of the ASON control plane this information must be conveyed by the routing and signalling protocols.

Specifically the following information is relevant to ODU connection set up and path computation:

Link characteristic:

The OTU rate (e.g. OTU1, 2, 3, 4) must be provided. The TS granularity and maximum TS capacity of the fabric attached to the end of the link could also be presented as a characteristic of the link. In this case the "lowest common capability" of the fabrics on each end of the link would be presented. For example consider and OTU4 link between a local fabric/link termination that can support 1.25G TS with the ability to assign 80 TSs to a single connection whilst the link termination/fabric at the far end only supports the ability to assign only 32 TSs to a single payload the link would report 1.25G TS and a maximum connection size of 32 TS.

Payload characteristics:

The bit rate and tolerance of the ODU (e.g. ODU1, ODU2, ODUflex) that the connection is being configured to support must be know. This information may be needed at intermediate points along the path.

TS assignment

The TSs chosen to support a connection must be negotiated between the ends of each link and in the case where signalling is used this information must be conveyed for each hop.

We understand that ccamp is currently developing some signalling extensions for OTN. We request that this work also considers the recent changes in the OTN and the new approach being taken on the model for OTN. It is possible that some extensions will be required to the discovery and routing protocols. We would like to work cooperatively with you to develop the extensions that are necessary to allow a control plane to establish ODU connections.