Isocore MPLS-TP interoperability Testing
Report to IETF MPLS Working Group

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INTRODUCTION

Recently, Isocore successfully completed the interoperability of standards-based MPLS-TP and presented the results at MPLS2010 International Conference. This brief report intends to share with the IETF community the tests that were executed and some of the high-level observations that were made during the testing.

The focus of the MPLS-TP testing revolved around the support that implementations had during September-October 2010 time frame and as the TP standards evolve, implementations would continue to stabilize as well. During the test planning stage, an extensive exercise was carried out amongst the participants to understand the current state of implementations, the internet-drafts that each implementation supported, and the prioritization of the tests scenarios that would be meaningful for the packet transport community. Based on the discussions, the following areas were prioritized for the testing, these included:

a. Statically provisioned co-routed LSPs
b. Linear Protection with and without protection state coordination
c. MPLS-TP OAM - including BFD connectivity Check (CC) and LSP Ping using ACH
d. PW Status notification and Interworking with IP/MPLS

MPLS-TP enables MPLS to support packet transport services with a similar degree of predictability, reliability and OAM to that found in existing transport networks.

This report provides an overview of the MPLS-TP interoperability executed using network elements from Cisco, Ericsson, Hitachi, NEC and Ixia. In addition to being a LER for the MPLS-TP, Ixia also provided the client traffic the verification of the MPLS-TP data plane.

MPLS-TP INTEROPERABILITY TESTING AREAS

STATIC BIDIRECTIONAL CO-ROUTED LSP SET UP

During the test, many bidirectional co-routed LSPs were setup between two LERs (Label Edge Routers) from multiple vendors in a one-hop (or back-to-back) configuration or with an LSR (Label Switch Router) along the path of the LSP between the two LERs. MAC addresses were either statically configured for each LSP or dynamic ARP were used to retrieve the remote MAC addresses. During the testing, agreements on the label range to be used for MPLS-TP label assignments were agreed between the participating vendors to overcome the interoperability of different vendors supporting different label ranges. In a real-world deployment, this could become an interop issue if in a multi-vendor network; these things are not agreed prior to deployment or testing phase. Many successful scenarios comprising of at most two

vendor combinations were tested for working and protected paths. All successful setups were configured to carry variety of client traffic (IP, PW based Ethernet services)

LINEAR PROTECTION

During the test many successful co-routed bidirectional LSPs were extended for this test. LSPs that were created were associated with working LSPs in a 1:1 linear protection configuration. Test cases with either Protection Switching Control (PSC) enabled or disabled were tested. Not all implementations supported the PSC messaging, which helps the LSRs/LER to select the working or recovery path, and to transmit different protocol messages. In tests scenarios, where PSC functionality was disabled, BFD continuity check (BFD CC) was used for detection of loss of continuity to trigger the protection failover. Both revertive and non-revertive configurations were tested during the event.

MPLS-TP OAM - INCLUDING BFD CONNECTIVITY CHECK (CC) AND LSP PING

Once the LSPs were set up with matching labels, BFD CC (Continuity Check) was enabled to monitor the continuity of the LSPs. BFD CC provides a rapid detection mechanism for LSP LOC (Loss of Continuity), in particular when lower layer may not be able to detect LOC failure at the LSP layer. BFD slow start was not enabled during the test, however, BFD slow start is interoperable with equipment that doesn't support BFD slow start.

LSP Ping using ACH (Associated Channel Header) was tested on each end of an LSP. Each LER supporting the functionality initiated LSP ping to the peering LER; in either a back-to-back configuration or through an LSP in the path, depending on the setup under test.

In the above tests, BFD CC sessions were running concurrently on both primary and backup LSP. When a BFD CC failure was introduced into the primary path, traffic successfully switched to the backup path. In addition, after the BFD CC failure was repaired, the traffic successfully reverted back from the backup LSP to the primary LSP

SWITCHING OF STATIC AND DYNAMIC PWS, AND MPLS/IP INTEROPERABILITY

This being one of the most important piece in the integrating MPLS-TP into already deployed MPLS infrastructure, special emphasis was made to execute tests using this scenario. Successfully established MPLS-TP LSP was extended to perform MPLS-TP and IP/MPLS interoperability using PW switching between static and dynamic PWs and verifying the status of end-to-end Ethernet services. The testing involved setting up of static PWs between T-PE and S-PE. Following this, a dynamic PW was created between the S-PE and T-PE in the IP/MPLS domain, with S-PE performing the stitching operation connecting the dynamic and static PW, forming a multi-segment PWs

crossing from one domain to the other. The end-to-end verification was performed by flapping the attachment circuits, or the transport MPLS-TP LSP.

IETF DOCUMENTS REFERENCED

a. MPLS-TP Data Plane Architecture, RFC 5960
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f. A Framework for MPLS in Transport networks, RFC 5921
g. MPLS-TP Identifiers, draft-ietf-mpls-tp-identifiers
h. MPLS-TP Linear Protection, draft-ietf-mpls-tp-linear-protection
i. Proactive CV-CC and RDI for MPLS-TP, draft-ietf-mpls-tp-cc-cv-rdi
j. MPLS-TP Survivability Framework, draft-ietf-mpls-tp-survive-fwk
k. LSP-Ping and BFD encapsulation over ACH, draft-ietf-mpls-tp-ping-bfd-procedures