Diagnostic tool-test for MPLS transport profile
draft-flh-mpls-tp-oam-diagnostic-test-00

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Abstract

This document describes a Multi-Protocol Label Switching Transport Profile (MPLS-TP) Operations, Administration and Maintenance (OAM) diagnostic tool-TST (test), which is used to perform one-way, or two way on-demand out-of-service measuring throughput or in-service diagnostics tests for verifying throughput.

Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [I].

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1. Introduction

MPLS-TP is technology of packet transport network, which requirement is defined in MPLS-TP requirement [2], and OAM is its most important function. MPLS-TP OAM requirement [3] define diagnostic tools that MAY be used for PW, LSP and Section, such as consists in looping the traffic at an Intermediate Point or End point back to the originating
End Point-loopback. And another example of such diagnostic tool-test (TST) consists in estimating the bandwidth or throughput of transport path e.g., an LSP.

This document defines one diagnostic tool-TST (test) for bandwidth estimating, measuring or verifying. And it describes TST OAM frame format and the procedures for the transmission, receive of such OAM frames.

The TST function SHOULD be performed between End Points of PWs, LSPs and Sections.

2. Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRC</td>
<td>Cyclic Redundancy Check</td>
</tr>
<tr>
<td>G-ACh</td>
<td>Generic Associated Channel</td>
</tr>
<tr>
<td>ACH</td>
<td>Associated Channel Header</td>
</tr>
<tr>
<td>ITU-T</td>
<td>International telecom union-Telecom</td>
</tr>
<tr>
<td>LCK</td>
<td>lock</td>
</tr>
<tr>
<td>LSP</td>
<td>Label Switch Path</td>
</tr>
<tr>
<td>MEP</td>
<td>ME Edge Point</td>
</tr>
<tr>
<td>MIP</td>
<td>ME Intermediated Point</td>
</tr>
<tr>
<td>MPLS-TP</td>
<td>MPLS transport profile</td>
</tr>
<tr>
<td>OAM</td>
<td>Operations Administration and Maintenance</td>
</tr>
<tr>
<td>PDU</td>
<td>Payload Data Unit</td>
</tr>
<tr>
<td>PRBS</td>
<td>pseudo-random code stream</td>
</tr>
<tr>
<td>PW</td>
<td>Pseudo wire</td>
</tr>
<tr>
<td>TLV</td>
<td>Type Length Value</td>
</tr>
<tr>
<td>TST</td>
<td>Test</td>
</tr>
</tbody>
</table>
3. Mechanics of TST

3.1. General Requirements

TST is used to perform one-way or two-way on-demand in-service or out-of-service diagnostics tests. This includes verifying throughput, which is a capacity in terms of line rate; it is the amount of bits observed passing a point during a time interval.

When configured to perform such tests, a MEP inserts packets with MPLS-TP test information with specified throughput, packet size and transmission patterns. For one way test, remote MEP receives the packet and calculates the packet loss. For two way test, the remote MEP loopback the packet to original MEP and calculates the packet loss.

When out-of-service MPLS-TP test function is performed, client data traffic is disrupted in the diagnosed entity by LCK function. The MEP configured for the out-of-service test transmits LCK packets in the immediate client (sub-) layer. And gradually increase TST packet bandwidth until hitting a threshold TST packet traffic loss rate.

When an in-service MPLS-TP test function is performed, data traffic is not disrupted and the packets with MPLS-TP test information are transmitted such that a limited part of the service bandwidth is utilized. This rate and QoS of transmission for TST packets is predetermined for in-service MPLS-TP test function.

The maximum rate at which TST packets can be sent without adversely impacting the data traffic for an in-service is should be calculated carefully.

Observe TST packet that are transmitted, delivered, and or rejected on a PW, LSP or Section. When detect threshold of packet loss rate, calculated the throughput.

In order to support TST, a Test TLV in TST PDU should be defined:

Test TLV - Optional element whose length and contents are configurable at the MEP. The contents can be a test pattern and an optional checksum. Examples of test patterns include pseudo-random bit sequence (PRBS) \((2^{31}-1)\) as specified in sub-clause 5.8 of ITU-T O.150 [4], all ‘0’ pattern, etc.

At the transmitting MEP, provisioning is required for a test signal generator which is associated with the MEP. At a receiving MEP,
provisioning is required for a test signal detector which is associated with the MEP.

A MIP is transparent to the TST packets and therefore does not require any provisioning to support MPLS-TP test functionality.

A MEP inserts TST packets towards its peer MEPs. The receiving MEP detects these TST packets and performs the intended measurements.

3.2. Transmission

A test signal generator connected to a MEP can transmit TST packets as often as the test signal generator configuration. Each TST packet is transmitted with a specific Sequence Number. A different Sequence Number must be used for every TST packet, and no Sequence Number from the same MEP may be repeated within one minute.

When a MEP is configured for an out-of-service test, the MEP also generates LCK packets in the same direction where TST packets are transmitted. And TST packet transmission rate should be increased gradually by step of x Kb/s and recorded TST packet transmitted, delivered or rejected.

When a MEP is configured for an in-service test, the MEP not generates any LCK packet. And TST packet transmission rate should be increased gradually by step of x Kb/s, but it is less than Maximum bit rate. In order to verify the throughput, QoS of test packet should be considered, color, CIR/EIR should be carefully calculated in order not to impact the service.

And service packet that is transmitted MUST be also recorded by traffic condition performance counter.

3.3. Receive

If the receiving MEP is configured for MPLS-TP test function, the test signal detector connected to the MEP detects bit errors or packet loss rate from e.g. the pseudo-random bit sequence of the received TST packets and reports such errors.

Further, when the receiving MEP is configured for an out-of-service test, it also generates LCK packets a in the direction where the TST packets are received. Detected the packet loss rates or bit errors of test packet, and record the rate of test packet transmission or rejected.
When the receiving MEP is configured for an in service test, no any LCK packet is generated. At same time, record all service packet counters of transmitted, delivered, and or rejected.

3.4. Performance Monitoring counter and throughput calculation

To be added.

3.5. State machine

To be added.

4. TST Frame format (PDU)

TST PDUs are encapsulated by using the ACH, according to RFC 5586 [5].

```
  0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|0 0 0 1|Version|   Reserved    |  TST       Channel Type       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Figure 1: TST-ACH

The first four bytes represent the ACH ([RFC 5586]):

0001: Indicate it is ACH

Version: 00x0

Reserved: reversed for further standardization, it is 00xx

TST Channel type: indicate it is test OAM packet allocated by IANA.

Tools TST use TST PDU to verify bandwidth that carries some information of TST TLV.
The fields of the TST PDU format are as follows:

Reserved: 16 bits, reserved for future international standardization, set to 00xx.

Flags: none, set to 0x00.

TLV Offset: set to 0x08

Sequence number: 4 octets

PM counter: record packet transmitted, delivered or rejected.

Test TLV: to be inserted in this field, format sees below.

End TLV: set to 0x00.

TLV describe test pattern that is shown in Figure 3.
The fields of the Test TLV format are as follows:

Type: 1 octet, the value for this TLV type is Test (32)

Length: 2 octets, Identifies size, in octets, of the Value field containing the Test Pattern and the optional CRC-32 field.

Pattern Type: 1 octet, identifies the Test pattern type; values are defined in Table

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x00</td>
<td>Null (all-zeroes) pattern without CRC-32</td>
</tr>
<tr>
<td>0x01</td>
<td>Null (all-zeroes) pattern with CRC-32</td>
</tr>
<tr>
<td>0x02</td>
<td>PRBS 2-31-1 pattern without CRC-32</td>
</tr>
<tr>
<td>0x03</td>
<td>PRBS 2-31-1 pattern with CRC-32</td>
</tr>
<tr>
<td>0x04-0xFF</td>
<td>Reserved for future standardization</td>
</tr>
</tbody>
</table>

Test Pattern: n octets, an n-octet (n . Length) test pattern as identified by the Pattern Type.

CRC-32: 4 octets, an optional field, contains the CRC-32 calculated over all fields (from Type to last octet before CRC-32)

5. Security Considerations

Refer to draft-fang-mpls-tp-security-framework [6]
Mechanisms SHOULD be provided to ensure that unauthorized access is prevented from triggering any TST function.

This will prevent unauthorized access to vital equipment and it will prevent third parties from learning about sensitive information about the transport network.

TST messages MAY be authenticated.

6. IANA Considerations

There is one channel type for TST by IANA actions required by this draft.

7. Acknowledgments

The authors acknowledge the helpful inputs from Xiaobo YI and Italo busi, William Zhang and discussions with Xiaohua MA and Stephan ROULLOT.
8. References

8.1. Normative References


8.2. Informative References


Authors’ Addresses

Feng Huang
Alcatel-Lucent shanghai Bell
Email: feng.f.huang@alcatel-sbell.com.cn

Lieven Levrau
Alcatel-Lucent
Email: lleavrau@alcatel-lucent.fr

Han Li
China Mobile
Email : lihan@chinamobile.com
Ruiquan Jing
China Telecom
Email: jingrq@ctbri.com.cn