

GENI

Global Environment for Network Innovations

Milestone S2.h Draft Measurement Data File Format

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“Programmable Measurements over Texas-based Research Network: LEARN”

TABLE OF CONTENTS

1	DOCUMENT SCOPE	3
1.1	EXECUTIVE SUMMARY.....	3
1.2	RELATED DOCUMENTS	3
1.2.1	GENI Documents	3
1.3	DOCUMENT REVISION HISTORY.....	3
2	INTRODUCTION	4
3	INFINERA TL1 COMMAND FORMAT	4
3.1	INPUT COMMAND FORMAT	4
3.2	COMMAND RESPONSE FORMAT	5
4	INFINERA TL1 COMMAND EXAMPLES	5
4.1	MEASURING RECEIVED POWER.....	6
4.2	MEASURING BIT-ERROR RATE (BER)	7
5	SUMMARY AND CONCLUSIONS	7
6	BIBLIOGRAPHY	8

1 Document Scope

This section describes this document's purpose, its context within the overall GENI project, the set of related documents, and this document's revision history.

1.1 Executive Summary

This technical note presents the results obtained in work package "Milestone S2.h: Draft Measurement Data File Format" of Project Nr. 1733, "Programmable Measurements over Texas-based Research Network: LEARN" [LEARN_1].

This milestone deals with the drafting of the data file format for the transfer of measurement data between the Infinera Digital Transport Node (DTN) [Infinera_1, Infinera_2] and the Integrated Measurement Framework [IMF_1]. It also deals with completing the specifications for the Measurement Handler Software, which will utilize an existing interface (TL1 over SSH) into the Infinera DTN to make optical measurements.

In Section 2, we explain how the measurement data file format is based on the TL1 command format of the Infinera DTN [Infinera_3, Infinera_4]. Further, we discuss the specifications of the Measurement Handler Software. Section 3 describes the TL1 command formats that are supported by the Infinera DTN. In Section 4, we examine two specific TL1 commands that are of particular interest for the GENI measurement framework: an optical power measurement and the bit-error rate (BER) measurement.

1.2 Related Documents

The following documents are related to this document, and provide background information, requirements, etc., that are important for this document.

1.2.1 GENI Documents

Document ID	Document Title and Issue Date
GENI_QR_ERM_Oct09	GENI ERM Quarterly Status Report, Oct 09 [ERM_1]
GEC4_Columbia_ERM	GENI ERM Presentation Made at GEC4, March 09 [ERM_2]

1.3 Document Revision History

The following table provides the revision history for this document, summarizing the date at which it was revised, who revised it, and a brief summary of the changes. This list is maintained in chronological order so the earliest version comes first in the list.

Revision	Date	Revised By	Summary of Changes
1.0	10 Nov 09	M.S. Wang	Initial draft
1.1	15 Nov 09	D. Gurkan	Revised draft

1.2	16 Nov 09	C. P. Lai	Revised draft
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2 Introduction

One goal of this milestone is to draft the data file format for the transfer of measurement data between the Infinera Digital Transport Node (DTN) [Infinera_1, Infinera_2] and the Integrated Measurement Framework (IMF) [IMF_1]. Commands are issued to the Infinera DTN in the Transaction Language 1 (TL1) format, which is a vendor-independent network management protocol. These commands are encoded in plain ASCII text, resulting in easy readability and greater interoperability. In Section 3.1, we examine the TL1 command format for the Infinera DTN. Further, we examine in more detail the “RTRV-PM” command, which is used to retrieve various performance-monitoring data. Then, in Section 3.2, we examine the TL1 response format for the Infinera DTN. All measurement data retrieved by the Infinera will be in this TL1 response format. Essentially, we define the measurement data file format as the TL1 response format of the Infinera DTN.

The other goal of this milestone is to create specifications for the Measurement Handler Software. Essentially, the Measurement Handler Software manages the issuing of various “RTRV-PM” commands to the Infinera DTN to make optical measurements. The software will utilize an existing interface, such as SSH, to interface with the Infinera DTN.

3 Infinera TL1 Command Format

The Infinera DTN receives and responds to commands via the TL1 format [Infinera_3, Infinera_4]. We examine the input command format, as well as the response command format in the sections below.

3.1 Input Command Format

The input command format for the Infinera DTN is as follows:

```
<verb>[-<modifier1>[<modifier2>]]:[TID]:[AID]:<CTAG>:[GENBLK]:
[ParameterBlock]<Terminator>
```

An Infinera DTN command is specified by a <verb> segment and up to two modifier segments. The <TID> segment is a user-defined Target Identifier that identifies the specific network entity within the Infinera DTN being addressed by the command. The <AID> segment addresses a particular entity such as hardware, software, facility, etc within the Infinera DTN. The difference between the <AID> and <TID> segments is that the <TID> is defined by the user to clarify and differentiate between different commands, while the <AID> segment is a predefined parameter. Furthermore, the <CTAG> segment is used to correlate an input command with a corresponding response message. It is also user-defined.

The Measurement Handler Software uses the “RTRV-PM” command to retrieve various performance-monitoring data. Its command format is as follows:

```
RTRV-PM-{OC768|OC192|OC48|OC12|OC3|STM256|STM64|STM16|STM4|STM1|1GBE|10GBE|
```

```
OCH|OCG|OTS|BAND|TRIB|DTPCTP|DCF|OSC|GTP|VCG}: [<TID>]: <AID>: <CTAG>::
[ <montype> ], [ 1-UP ], [ NEND ], [ RCV|TRMT ], [ 15-MIN|1-DAY ], [ <mondatt> ], [ <montm> ] ;
```

The second modifier of the “RTRV-PM” command is used to specify which channel in the Infinera DTN to retrieve measurement information. This command can be used to measure the optical power, BER, Forward Error Correction (FEC) bits, wavelengths, etc, of any given optical channel in the Infinera DTN. Moreover, it can either obtain a real-time measurement, or amass a history of the measurements over a period of time set by the user.

3.2 Command Response Format

The command response format for the Infinera DTN is as follows:

```
<cr><lf><lf>
^^^<SID>^<Date>^<Time><cr><lf>
M^^<CTAG>^<CMPLCDE><cr><lf>
<Text Block><Terminator>
```

Essentially, this is also the measurement data file format that we define for the transfer of measurement data between the Infinera DTN and the IMF. The <cr> field specifies a carriage return, and the <lf> field specifies a line feed. The <CTAG> segment correlates a particular response to an input command. The <CMPLCDE> segment indicates the state of the response. A “COMPLD” state indicates a successful completion of the input command; a “DENY” state indicates a failure of the input command; and a “PRTL” indicates a partially successful completion of the input command.

The <Text Block> segment of the command response contains the detailed measured results of the input command. This segment can differ greatly for different commands. In Section 4, we take a more detailed look at the response of two specific commands: optical power measurement and BER measurement.

4 Infinera TL1 Command Examples

The Infinera DTN supports a large variety of performance monitoring commands. In this section, we take a detailed look at two specific instructions that can be of great use for the GENI measurement framework: optical power measurement and BER measurement.

In Section 3, we described the general TL1 format for all Infinera DTN commands. Not all of the fields in this general format need to be used for all commands. In this example, the following reduced TL1 command format is sufficient:

```
rtrv-pm-och::<AID>:<CTAG>::<MONTYPE>;
```

Note that the second modifier is “och”, which stands for optical channel termination point. Hence, the “RTRV-PM-OCH” command retrieves performance monitoring data from an optical channel. Note

from the Section 3.1 that the “RTRV-PM” command can monitor performance from many different types of channels, some of which are digital and some are optical.

The <AID> field is used to identify clearly which optical channel to measure. For the “OCH” second-modifier, this <AID> field contains five subfields, separated by hyphens:

<AID> sub-fields for “OCH” second-modifier	Valid Values
Chassis	1-10
Service Shelf	A
DLM Slot	3-6
DLM OCG	L1
OCH	1-10

Multiple DTN transport chassis can be clustered to form a DTN digital node. The <Chassis> specifies which chassis to monitor performance. The Digital Line Module (DLM) is a fundamental building block of the Infinera DTN. The DLM transmits and receives ten 10Gbps DWDM signals, referred to as the Optical Carrier Group (OCG). The DLM can be installed in slots 3-6 of a particular chassis; it can be selected by the <DLM Slot> field. Finally, any one of the 10 optical channels within an OCG can be selected by the <OCH> field to measure performance.

Moreover, the <MONTYPE> field of the “RTRV-PM-OCH” instruction is used to specify which performance parameter to monitor. The performance parameters that we examine below are: OPR (optical power received), UNCORRBBER (uncorrected BER), and CORRBBER (corrected BER).

4.1 Measuring Received Power

The command to measure received optical power over a specific optical channel (in a specific DLM of a specific chassis) is defined as:

```
rtrv-pm-och::<TID>:<CTAG>::opr;
```

example:

```
rtrv-pm-och::1-A-4-L1-8:tag_rx_power::opr;
```

(Measures received optical power from chassis 1, DLM slot 4, and optical channel 8)

The response format of this command is defined in Section 3.2 with the following <Text Block> field:

```
"<TID>,OCH:OPR,<Optical Power Value in dB>,,NEND,RCV,,"
```

example:

“1-A-4-L1-8: OCH:OPR: -27.84,,NEND,RCV,,”

(Optical power received from chassis 1, DLM slot 4, and optical channel 8 is -27.84 dB)

4.2 Measuring BER

The Infinera DTN performs the FEC encoding/decoding function for every optical channel. Further, the DTN is used to compute the effective BER on each optical channel. In fact, it can calculate both the FEC-corrected, as well as the uncorrected BER. The command formats of BER measurement over a specific optical channel (in specific DLM of a specific chassis) is defined as:

```
rtrv-pm-och::<TID>:<CTAG>::corrber;
rtrv-pm-och::<TID>:<CTAG>::uncorrber;
```

example:

```
rtrv-pm-och::1-A-4-L1-8:tag_rx_power::corrber;
```

(Measures corrected BER from chassis 1, DLM slot 4, and optical channel 8)

The response format of these two BER commands are precisely as defined in Section 3.2 with the following <Text Block> fields:

```
"<TID>,OCH:CORRBER,< Corrected BER>,,NEND,RCV,,"
"<TID>,OCH:UNCORRBER,<Uncorrected BER>,,NEND,RCV,,"
```

example:

```
“1-A-4-L1-8: OCH:CORRBER: 10e-22,,NEND,RCV,,”
```

(Corrected BER from chassis 1, DLM slot 4, and optical channel 8 is 10e-22)

5 Summary and Conclusions

In this report, we drafted the data file format for the transfer of measurement data between the Infinera DTN and IMF. Essentially, we define the measurement data file format as the TL1 response format of the Infinera DTN. As a result, we described in detail the TL1 input command format and TL1 command response for the Infinera DTN. We further examine two specific TL1 commands that are of particular interest for the GENI measurement framework: optical power measurement and BER measurement.

Moreover, we specify the Measurement Handler Software as responsible for managing the issuing of various “RTRV-PM” commands to the Infinera DTN to make optical measurements. The software will utilize an existing interface, such as SSH, to interface with the Infinera DTN.

6 Bibliography

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