A YANG Data Model for Network Tester Management

draft-ietf-bmwg-network-tester-cfg-02

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Progress


- Open-source gigabit media-independent interface (GMII) device implementation - Verilog (Ultra96 with 6x SFP+ extension board)
- Open-source 10BASE-T device implementation (yosys/iCE40) (work in progress)

- Test reports and comparison with commercial RFC2544 implementation (see links below)
- IETF116 Hackathon report presentation follows ...
YANG model for management of Network Tester

- IETF116 Hackathon
- March 25-26, 2023
- Online
The project

Specification:
* draft-ietf-bmwg-network-tester-cfg-02

Client side:
* Test script – rfc2544-benchmark (Python)

Device side:
* Software - YANG/NETCONF server instrumentation code (C)
* Firmware - (Verilog)
* Hardware – off-the-shelf FPGA module Ultra96 + 6x SFP+ network programmability kit shield (KiCAD, Walk-through)
Design and implementation

NETCONF Server (Model (YANG), Implementation Generator module (C), Analyzer module (C))

TRAFFIC-GENERATOR-SW (C)           TRAFFIC-ANALYZER-SW (C)
|                                     |
Socket API                           Socket API
|                                     |
Kernel                                Kernel
|                                     |
Sync ->{RTCLOCK}(Verilog)            PPS / |
|                                     |
DMA                                    DMA
|                                     |
[AXI] [AXI]                            [AXI]
MAC TRAFFIC-GENERATOR-HW (C,Verilog)  MAC TRAFFIC-ANALYZER-HW (C, Verilog)
|                                     |
\ /                                    |
\ /
GMII_MUX                                GMII_MUX
| [GMII]                                [GMII]
PHY                                     PHY
|                                       |
SFP+ TX                                 SFP+ RX
|                                       |
+->----------------------------------->+-

* - underlined text has links to repositories
Network testers

```
+-----------------+   +-----------------+
|                 |   |                 |
| +-----------------+   | +-----------------+
| |                 |   | |                 |
| | +-----------------+   | | +-----------------+
| | | DUT | >-------------+   | | | DUT | >-------------+
| | | +----+   | +----+   | | | +----+   | +----+
| | | tester0   |     | | | | tester0   |     |
| | |     |     |     | | | |     |     |     |
| | | x     |     | | | | |     |     |     |
| | | +-----+   | +-----+   | | | | +-----+   | +-----+
| | | tester1   |     | | | | | tester1   |     |
+-----------------+   | +-----------------+
```

IETF Hackathon – YANG model and implementation of Network Interconnect Tester
Results

* DUT0 (optical SFP modules + 1 m. fiber) - report, verbose-log

* DUT1 (copper 1000BASE-T modules + 1 m. Ethernet cable) - report, verbose-log

* DUT2 (low cost Ethernet bridge TL-SG105E wo QoS - 100% bandwidth) - report, verbose-log

* DUT3 (low cost Ethernet bridge TL-SG105E w QoS - 50% bandwidth) - report, verbose-log
Validation of results

Validated results for DUT3 (low cost Ethernet bridge TL-SG105E w QoS - 50% bandwidth) against results for same DUT3 tested with commercial tester:

* reference (anritsu-md1230b-log.txt)
* result

Summary:
* 997024 (67%) vs. 1000000 (67.2%)
* 6668 ns vs. 24440.4 nanoseconds (24 ns is the actual maximum delay. None is wrong.)
* Frame loss 32%,25%,15%,3% vs 32%,24%,15%,3%
* 1682 back-to-back frames vs. 1679
* System recovery 0.000491 sec vs. N/A
The End