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Updates for the Back-to-back Frame Benchmark in RFC 2544
draft-ietf-bmwg-b2b-frame-01

Abstract

Fundamental Benchmarking Methodologies for Network Interconnect Devices of interest to the IETF are defined in RFC 2544. This memo updates the procedures of the test to measure the Back-to-back frames Benchmark of RFC 2544, based on further experience.

This memo updates Section 26.4 of RFC 2544.

Addressing Maciek, Vratko, and Tim's Comments:

- Since the original submission deadline:
- Addressed Comments from Vratko – see e-mail to the list
- Addressed Comments from Tim – See Reply on the list

- Keep in mind:
  - This is one of several updates to RFC2544
- Previous updates include:
  - IPv6 address space
  - Reset & Restoration
  - MPLS
  - State of the art Latency

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[VSPERF-b2b] provides the details of the calculation to estimate the actual buffer storage available in the DUT, using results from the Throughput tests for each frame size, and the maximum theoretical frame rate for the DUT links (which constrain the minimum frame spacing). We present some of these details here.

The simplified model used in these calculations for the DUT includes a packet header processing function with limited rate of operation, as shown below:

```
                        |------------ DUT --------|
Generator -> Ingress -> Buffer -> HeaderProc -> Egress -> Receiver
```

So, in the back2back frame testing:

1. The Ingress burst arrives at Max Theoretical Frame Rate, and initially the frames are buffered

2. The packet header processing function (HeaderProc) operates at approximately the "Measured Throughput", removing frames from the buffer

3. Frames that have been processed are clearly not in the buffer, so the Corrected DUT buffer time equation (Section 5.4) estimates and removes the frames that the DUT forwarded on Egress during the burst.

When the VSPERF CI results were examined [VSPERF-b2b], several aspects of the results were considered notable:

1. Back-to-back Frame Benchmark was very consistent for some fixed frame sizes, and somewhat variable for others.

2. The number of Back-to-back Frames with zero loss reported for large frame sizes was unexpectedly long (translating to 30 seconds of buffer time), and no explanation or measurement limit condition was indicated.

3. Calculation of the extent of buffer time in the DUT helped to explain the results observed with all frame sizes (for example, some frame sizes cannot exceed the frame header processing rate of the DUT and therefore no buffering occurs, therefore the results depended on the test equipment and not the DUT).

4. It was found that the actual buffer time in the DUT could be estimated using results from the Throughput tests conducted according to Section 26.1 of [RFC2544]. It is apparent that the DUT's frame processing rate tends to increase the "implied" estimate (measured according to Section 26.4 of [RFC2544]), and a calculation using the Throughput measurement can reveal a "corrected" estimate.

6. Reporting

The back-to-back results SHOULD be reported in the format of a table with a row for each of the tested frame sizes. There SHOULD be columns for the frame size and for the resultant average frame count for each type of data stream tested.

The number of tests Averaged for the Benchmark, N, MUST be reported.

The Minimum, Maximum, and Standard Deviation across all complete tests SHOULD also be reported (they are referred to as "Min,Max,StdDev" in the table below).

Minimum Step Size (during searches), in frames.

If the tester has an actual frame rate of interest (less than the Throughput rate), it is useful to estimate the buffer time at that frame rate:

$$\text{Actual Buffer Time} = \text{Corrected DUT Buffer Time} * \frac{\text{Measured Throughput}}{\text{Actual Frame Rate}}$$

and report this value, properly labeled.

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Implied DUT Buffer Time =

Average num of Back-to-back Frames / Max Theoretical Frame Rate

The formula above is simply expressing the Burst of Frames in units of time.

The next step is to apply a correction factor that accounts for the DUT's frame forwarding operation during the test (assuming a simple model of the DUT composed of a buffer and a forwarding function).

Corrected DUT Buffer Time =

$$= \text{Implied DUT Buffer Time} * \frac{\text{Measured Throughput}}{\text{Max Theoretical Frame Rate}}$$

where:

1. The "Measured Throughput" is the RFC2544 Throughput Benchmark for the frame size tested, and MUST be expressed in Frames per second in this equation.

2. The "Max Theoretical Frame Rate" is a calculated value for the interface speed and link layer technology used, and MUST be expressed in Frames per second in this equation.