Session based high bandwidth throughput testing.

Student: Bram ter Borch
Research Question

Student: Bram ter Borch
# UDP vs TCP

<table>
<thead>
<tr>
<th><strong>UDP</strong></th>
<th><strong>TCP</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>connectionless</td>
<td>connection oriented</td>
</tr>
<tr>
<td>8 byte header</td>
<td>20 byte header</td>
</tr>
<tr>
<td>no ordering</td>
<td>ordering</td>
</tr>
<tr>
<td>lightweight</td>
<td>heavyweight</td>
</tr>
<tr>
<td></td>
<td>reliable</td>
</tr>
<tr>
<td></td>
<td>congestion control</td>
</tr>
</tbody>
</table>

**Student:** Bram ter Borch
What is needed to perform high bandwidth session based throughput tests and how to go beyond pure network infrastructure testing?

The term "high bandwidth" references to at least 40Gb/s.

The term "session based" references to TCP traffic.

Student: Bram ter Borch
Test environment

Vlan100: 10.10.10.0/24

40Gb/s

100Gb/s

40Gb/s

1Gb/s

1Gb/s

1Gb/s

1Gb/s

1Gb/s

100Gb/s

4x10Gb/s

Vlan 66: 10.60.66.0/24

Internet

Student: Bram ter Borch
First important result

DPDK is the way to go

Student: Bram ter Borch
<table>
<thead>
<tr>
<th>NR</th>
<th>Use case</th>
<th>DUT</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>UC1</td>
<td>Bandwidth generation</td>
<td>Client</td>
<td>The goal is to see if the client is capable of filling up the link and to reach the maximum amount of pps.</td>
</tr>
<tr>
<td>UC2</td>
<td>Throughput</td>
<td>Switch/Router</td>
<td>Generate the maximum amount of bidirectional data to make sure the intermediate hardware is able to forward at line rate.</td>
</tr>
<tr>
<td>UC3</td>
<td>Session per second</td>
<td>Client/Server</td>
<td>Get the hardware limitations of the end hosts.</td>
</tr>
<tr>
<td>UC4</td>
<td>Application</td>
<td>Server and intermediate devices</td>
<td>The clients will try to overload the server with requests at application level.</td>
</tr>
</tbody>
</table>
Experiment UC1 bandwidth

Student: Bram ter Borch
Experiment UC1 PPS

Student: Bram ter Borch
Experiment UC3 HTTP link usage

Student: Bram ter Borch
Experiment UC3 sessions

Student: Bram ter Borch
Real world test

---

**Student:** Bram ter Borch
Real world result - bandwidth

NGINX

RAW TCP

HTTP

Student: Bram ter Borch
Conclusion

DPDK is the way to go for high bandwidth session based throughput testing

The use cases are valid

The weakest link in a path can be found

Monitoring is very important

Student: Bram ter Borch
Future work

- DPDK tests have to be run using 100Gb/s interfaces
- IPv6 support has to be added to WARP
- Other layer 7 protocols have to be added to WARP

Student: Bram ter Borch
Questions

Thank you

Student: Bram ter Borch