A Flexible OpenFlow-Controller Benchmark

Michael Jarschel, Frank Lehrieder, Zsolt Magyari, Rastin Pries

www3.informatik.uni-wuerzburg.de
Motivation

- Important for network performance
- Largely uninvestigated
  - Scalability?
  - Robustness?
  - Fairness?

⇒ Requirement for a tool to answer these questions

Focus of performance analysis
Agenda

- OFCBenchmark Features
- OFCBenchmark Components
- Comparison with Cbench
- Illustration of measurement features
- Outlook
### Current OFC Benchmark Feature Set

<table>
<thead>
<tr>
<th>Feature</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load balancing</td>
<td><strong>Scalability:</strong> Avoiding bottlenecks in the measurement system</td>
</tr>
<tr>
<td>Topology representation</td>
<td><strong>Realism:</strong> Gauging the impact of a controller on a real network before deployment or determine the cause of issues after</td>
</tr>
<tr>
<td>Replay of captured traffic</td>
<td></td>
</tr>
<tr>
<td>Individual packet monitoring</td>
<td><strong>Granularity:</strong> Monitor the performance of individual switches over time to identify issues not perceivable through mean values</td>
</tr>
<tr>
<td>Individual switch configuration</td>
<td></td>
</tr>
</tbody>
</table>

*Software is still in development. Input welcome!*
OFCBenchmark Architecture

Statistics:
- Packet send- & reception timestamps
- Number of sent and received packets over a time interval
Testbed Setup

- Setup (both PCs)
  - Fujitsu Siemens Esprimo C5900
  - Intel Pentium IV HT 3.4 GHz
  - 1 GB RAM
  - Ubuntu 10.04 LTS
- Nagle’s algorithm was disabled

- Benchmarked Controllers
  - Nox Classic ("Zaku" release)
  - Floodlight (version 0.82)
  - Maestro (version 0.2)
- Learning switch module of each controller used
- 5 test repetitions
Performance Comparison with Cbench

- OFCBenchmark performance results are comparable to those of Cbench.
- With additional test clients no performance degradation occurs.
Advantages of a fine-grained statistics

- Behavior over time is visible
- Differences between individual switches are visible
Outstanding Packets

- Individual switches are treated differently by the controller
- Different controllers treat switches differently
  → This could have a considerable impact on network performance!

Why does this happen? Scheduling? Buffering strategy?
→ Current work
Summary

- OpenFlow controller performance
  - Crucial for network performance
  - Largely uninvestigated, only basic tools available

- OFCBenchmark
  - Delivers comparable results to Cbench
  - Enables a more detailed view on controller performance
  - Shows importance of such measurements

- Current Work
  - Verification of tests using different hardware & software setups
  - Further development and debugging for early 2013 release
  - Further tests to investigate controller behavior
Questions and Comments?