draft-ietf-bmwg-mlrsearch-06

IETF-119 Brisbane, BMWG Meeting
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MLRsearch Update

• draft-ietf-bmwg-mlrsearch-06 posted on 4\textsuperscript{th} of March 2024

• Changes from -05
  • Fixed few logical inconsistencies left from previous edits.
  • Added chapter Addressed Problems.
  • Improved language.

• BMWG next steps
  • Draft ready for BMWG review.
Topics

• MLRsearch Introduction
• Problems Summary and Approach
• Sample Results and Discussion
• Work Status as of -06
  •
MLRsearch Introduction

• Multiple Loss Ratio search (MLRsearch)
  • defines a new network throughput testing methodology extending RFC2544.

• MLRsearch goals include
  • minimizing overall search duration,
  • supporting multiple loss ratio searches,
  • improving result repeatability and comparability.

• Primary target for MLRsearch
  • evaluation and testing of software-based networking systems' data planes.
### Problems Summary

<table>
<thead>
<tr>
<th>Problem</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Search Duration</td>
<td>• Time efficiency is critical in high cadence development and deployment of software networking systems.</td>
</tr>
<tr>
<td></td>
<td>• The bisection method (binary search) is excessively slow.</td>
</tr>
<tr>
<td>• DUT in SUT</td>
<td>• SUT is multi-tenanted, software DUT is nested within the SUT.</td>
</tr>
<tr>
<td></td>
<td>• DUT is subject to interference from SUT Operating System and other applications running on the SUT.</td>
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<tr>
<td>• Repeatability and Comparability</td>
<td>• Repeatability of measurement cannot be determined from just one discovered throughput value.</td>
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<td></td>
<td>• Binary search results tend to wander away from the noiseless end of SUT performance spectrum, resulting in poor throughput repeatability.</td>
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<tr>
<td>• Throughput with Non-Zero Loss</td>
<td>• Many benchmarking teams settle with small non-zero loss ratio as the goal for their load search of software DUTs.</td>
</tr>
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<td></td>
<td>• Support for non-zero loss goals makes any search algorithm more user friendly.</td>
</tr>
<tr>
<td>• Inconsistent Trial Results</td>
<td>• Any throughput search is subject to encountering inconsistencies between trial results.</td>
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<td></td>
<td>• Any robust throughput search algorithm needs to decide how to continue the search in presence of such inconsistencies.</td>
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## MLRsearch Approach

<table>
<thead>
<tr>
<th>Problem</th>
<th>Approach</th>
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<tbody>
<tr>
<td><strong>Long Search Duration</strong></td>
<td>- Major reduction in execution time achieved with the introduction of preceding targets.</td>
</tr>
<tr>
<td></td>
<td>- Additional time savings achieved with pre-initial trials, halving mode and smart splitting in bisecting mode.</td>
</tr>
</tbody>
</table>

- **DUT in SUT**
  - SUT with performance spectrum instead of a single performance value.
  - Noiseless performance on one end of the spectrum, noiseful performance on the other.
  - DUT in SUT performance measurement problem reduced to estimating the noiseless end of SUT performance spectrum.

- **Repeatability and Comparability**
  - Multiple trials with noise tolerance enhancement to increase result stability.
  - Additional configuration parameters to aid repeatability and comparability.
  - Achieves benefits of Binary Search with Loss Verification, [RFC9004] (section 6.2) and [TST009] (section 12.3.3).

- **Throughput with Non-Zero Loss**
  - MLRsearch search goals include configurable loss ratios.

- **Inconsistent Trial Results**
  - Relevant lower bound to be smaller than any upper bound.
  - Unequal handling of good and bad short trials.
  - Preference to lower load when choosing the winner among candidates.
Sample Results and Discussion: Plot

* CT stands for Conditional Throughput
Sample Results and Discussion: Table

(CT stands for Conditional Throughput)

<table>
<thead>
<tr>
<th>quantity</th>
<th>1x60s, 0%</th>
<th>60x1s, 0%</th>
<th>21x1s, 0%</th>
<th>21x1s, 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>duration avg [s]</td>
<td>315</td>
<td>289</td>
<td>165</td>
<td>147</td>
</tr>
<tr>
<td>duration stdev [s]</td>
<td>101</td>
<td>28</td>
<td>21</td>
<td>22</td>
</tr>
<tr>
<td>0% CT avg [pps]</td>
<td>30,405,394</td>
<td>29,966,406</td>
<td>30,152,424</td>
<td>30,806,424</td>
</tr>
<tr>
<td>0% CT stdev [pps]</td>
<td>367,722</td>
<td>140,646</td>
<td>144,197</td>
<td>98,543</td>
</tr>
<tr>
<td>0.5% CT avg [pps]</td>
<td>33,542,114</td>
<td>33,419,650</td>
<td>33,425,449</td>
<td>33,481,149</td>
</tr>
<tr>
<td>0.5% CT stdev [pps]</td>
<td>138,155</td>
<td>129,493</td>
<td>122,457</td>
<td>132,460</td>
</tr>
</tbody>
</table>

trials, exceed ratio
Sample Results and Discussion: Comments

- Columns show the overall duration and two conditional throughputs for each run.
  - Duration uses right Y axis, throughput share common left Y axis.
- The runs are grouped by different input parameters used:
  - Always two search goals, differing in goal loss ratio (0% or 0.5%).
  - Leftmost group has final trial duration 60s, all other groups have 1s.
  - All groups have 1s as the initial trial duration.
  - Two left groups have goal duration sum 60s, two right groups 21s.
  - Rightmost group has exceed ratio 50%, all others have 0%.
- Towards right, durations get shorter and more consistent, zero loss throughput gets more consistent and higher, 0.5% throughput barely changes.
Sample Results and Discussion: Production

csit.fd.io Dashboard: Release Report Testing

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Sample Results and Discussion: Production

csit.fd.io Dashboard: Trending Testing

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MLRsearch Work Status

• Draft is ready for review
THANK YOU!

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