IMPLEMENTING FASTER ASSOCIATIVE CONTAINERS FOR GIDS IN HPX
Introduction

- HPX - A general purpose C++ runtime system for parallel and distributed applications of any scale and can run on multiple localities.
- GIDs – Global Identification addresses, currently HPX has a container for mapping.
- AGAS - Active Global Address Space, key concept introduced by HPX supporting and enabling the uniform syntax for local and remote operations.
- Associative containers hold data by pairs in a key, value relationship.
Project

- **Topic:** Work with various associative containers and either determine or refine one or several to optimally work with HPX.
- **Goal:** To select the best performing data structure for AGAS used to lookup information about global identifiers (GIDs).
- **Task:** Testing search trees along with benchmarking.
Tasks and Timing

- Identified several data structures. Concentrating on the main operations preformed on databases.

- Criteria:
  - Able to handle large amounts of insertions, searches and deletions.
  - Preferable to be Standard Template Library (STL) compatible.
Benchmarking

Key Features:

- Uniform data sets (1 million – 10 million elements).
- Measured time how long for each of three tasks.
  - Insertions
  - Searches
  - Deletions
## Search Trees

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3</td>
<td>B&lt;sup&gt;x&lt;/sup&gt;</td>
<td>Map</td>
</tr>
<tr>
<td>2-3-4</td>
<td>(Optimal) Binary Search</td>
<td>Unordered Map</td>
</tr>
<tr>
<td>AA</td>
<td>Dancing</td>
<td>123 Top-Down List</td>
</tr>
<tr>
<td>(a,b)</td>
<td>H Tree</td>
<td>S-Tree</td>
</tr>
<tr>
<td>AVL</td>
<td>Interval</td>
<td>Splay</td>
</tr>
<tr>
<td>B+</td>
<td>Order Statistic</td>
<td>T</td>
</tr>
<tr>
<td>B</td>
<td>(Left-leaning) Red Black</td>
<td>Treap</td>
</tr>
<tr>
<td>B*</td>
<td>Scapegoat</td>
<td>UB</td>
</tr>
</tbody>
</table>
Revised Search Trees

- 2-3
- AVL
- B
- Binary Search Tree
- Map
- Unordered Map
Next Steps

- Revisit the list and maybe implement more search trees
- Use the benchmark program to evaluate other programs
- Create new data sets for better evaluation
Thank you!

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Questions?