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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 (1million – 10 million elements).
  - Measured time how long for each of three tasks.
    - Insertions
    - Searches
    - Deletions

Search Trees

2-3	B^x	Map
2-3-4	(Optimal) Binary Search	Unordered Map
AA	Dancing	123 Top-Down List
(a,b)	H Tree	S-Tree
AVL	Interval	Splay
B+	Order Statistic	T
B	(Left-leaning) Red Black	Treap
B*	Scapegoat	UB

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!

- Dr. Hartmut Kaiser
- Stellar Group
- CCT

Questions?