PCRC Activities

Parallel Compiler Runtime Consortium

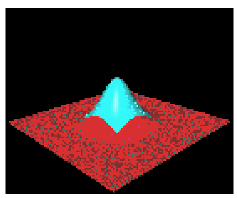
DAGH

☆ **High-level Programming Abstractions**

- Grid Function Abstraction (Distributed application fields)
- Grid Hierarchy Abstraction (DAGH structure specification)
- Grid Geometry Abstraction (Coord, BBox)

☆ **Distributed Dynamic Data-structures**

- Dynamic Data-objects (Adaptive grids, trees, meshes)
- Hierarchical Distributed Dynamic Array (Extendible hashing)
- Hierarchical Index Space (Space-filling curves)



Meta-Chaos

- A framework for providing the ability to use multiple specialized data parallel libraries and/or languages within a single application.
- Meta-Chaos library is used to exchange data between data parallel programs written in High Performance Fortran, the Chaos and Multiblock Parti libraries developed at Maryland.
- Experimental results show that Meta-Chaos is able to move data between libraries efficiently.

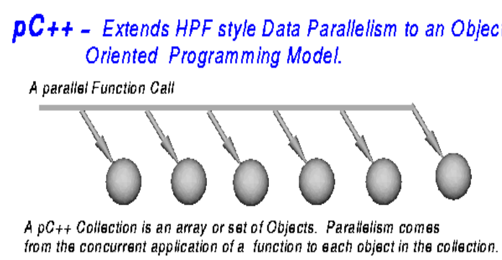
Chaos Project

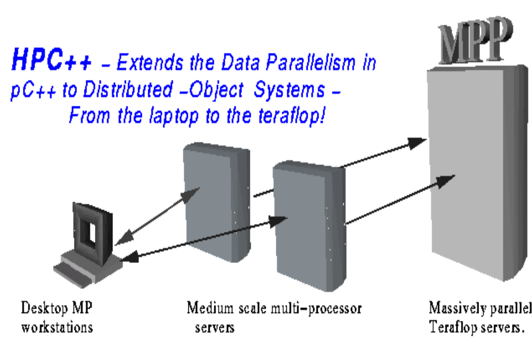
Optimizations for Java JIT Compiler

- Briki --- a research compiler for Java class files.
- A front-end to recover high-level structure from the information from the class file to allow more productive optimizations.
- Focused on a set of machine-dependent optimization issues related to memory hierarchies and array processing.
- 50% improvement in performance is achieved.

UNIVERSITY OF ROCHESTER COMPUTER SCIENCE

High Performance C++





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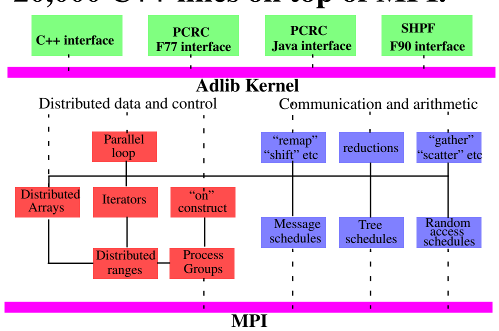
PCRC Activities

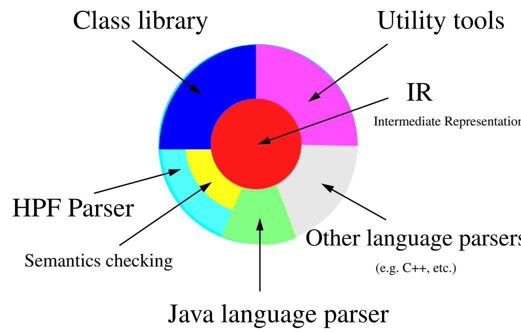
Runtime Proper

- Distributed data management, data movement, and computational routines.
- Distributed array descriptor (DAD), range, and group.
- Fortran, C++, and (Java) interfaces.
- Also support "globalized" SPMD programming paradigm.
- 20,000 C++ lines on top of MPI.



Infrastructure

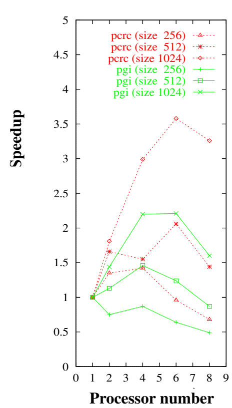
- ☆ HPF 2.0 and Java front-ends.



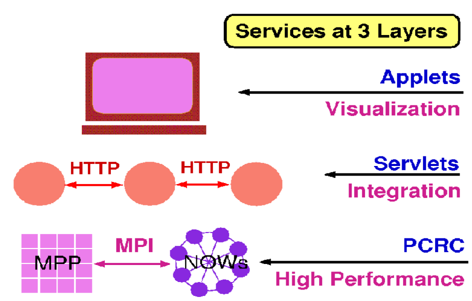
- ☆ Xsageop class library (Indiana)
- ☆ Comprehensive testsuites.
- ☆ Tested on 6 different UNIX platforms
- ☆ 65,000 C/C++ lines, available in public domain.

HPF Compiler

- ⇨ Node program calls the runtime: `pcrc_set_array_align`, `pcrc_write_halo`, and `pcrc_cshift` ...
- ⇨ Effective communication detection: no communication, shift communication, and remap communication.
- ⇨ `INHERIT` implemented without copy-in and copy-out.
- ⇨ High performance: scalable speedup, better than commercial compilers on a *Laplace* solver.
- ⇨ 15,000 C++ lines on top of xsageop.



Bridge to WebTop Computing



- ❑ Base layer of a three layers of services.
- ❑ Java servers coordinated by WebFlow through a web based AVS type of user interface.
- ❑ High performance computation process is monitored and rendered through a Java applet.