

#### **IBM Research**

### Eclipse PTP - Parallel Tools Platform Performance Tools Framework

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### Agenda

- PTP (Eclipse Parallel Tools Platform) Overview
  - PTP Goals
  - PTP Core: Runtime, debugger
  - PTP's PLDT: Analysis tools
  - PTP Community & Current Availability
- Performance Tools Framework
  - Existing tools

- What does Eclipse integration mean?
- Plans for Performance Framework



### **PTP Goals**

http://eclipse.org/ptp

- To produce an open-source industry-strength platform that provides a highly integrated environment specifically designed for parallel application development. The project will provide:
  - a standard, portable parallel IDE that supports a wide range of parallel architectures and runtime systems
  - a scalable parallel debugger

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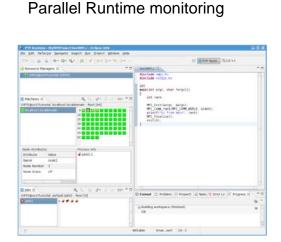
- support for the integration of a wide range of parallel tools

Such as: Performance Tools

an environment that simplifies the end-user interaction with parallel systems

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Parallel Analysis Tools



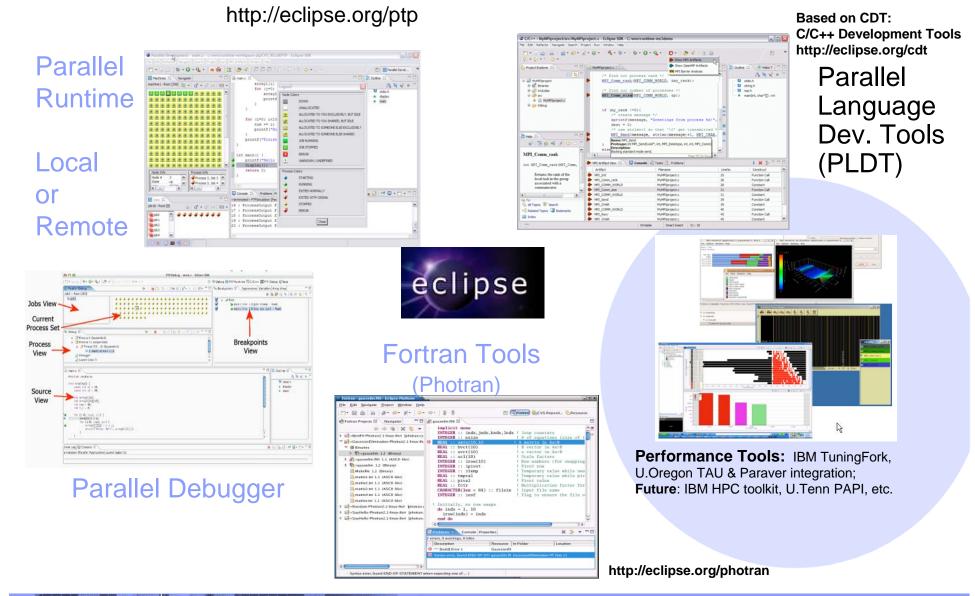
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#### Parallel Debugger

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### **Eclipse PTP: Parallel Tools Platform**



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### **PTP Core Features**

Parallel Runtime Monitoring

Local and Remote

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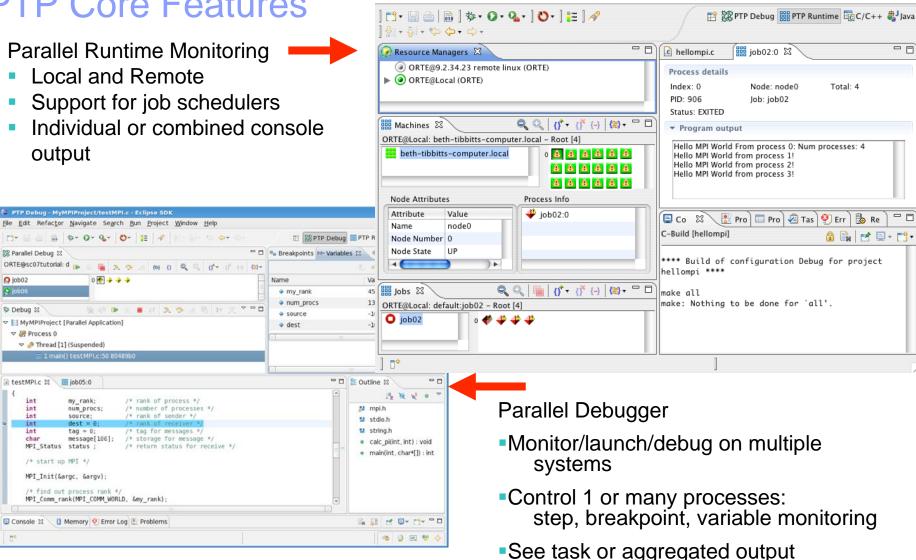
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- Support for job schedulers
- Individual or combined console output



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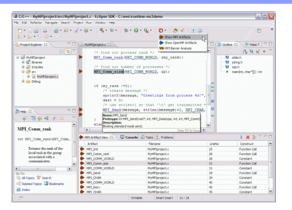
## PTP / Parallel Language Development Tools - Analysis tools

Current PLDT – available at eclipse.org

- Tools to assist developers in developing parallel codes
- Assistance tools: Identify MPI/OpenMP/LAPI "artifacts", help (hover, content assist, etc.), wizard for new MPI project creation
- Static Analysis tools: OpenMP concurrency analysis
   MPI barrier analysis to detect deadlocks

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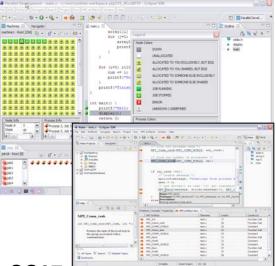
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### **PTP Community & Availability**

- Building the PTP Community
  - PTP Download statistics: over 2000
  - Website & Wiki: http://eclipse.org/ptp
  - Mailing lists: for users and developers
  - Events
    - PTP tutorials @LACSI 06, SC06, ORNL 5/07, OSCON 07, SC07
    - PTP Workshop @ORNL May '07

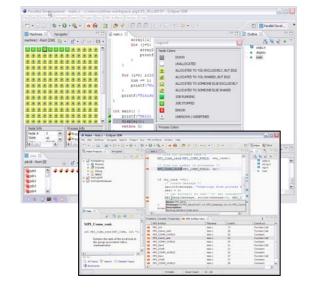
- SC07: PTP Tutorial, BOF, and demo'd at IBM booth
- 2008 tutorial plans: HPCSW, OSCON, SC08, NCSA
- Academic Adoption
  - Calvin College, University of Kentucky, LSU
- Availability: PTP 2.0 "early release" available now at http://eclipse.org/ptp
- Related Communities
  - Scalable Tools Communication Infrastructure (STCI) open-source project



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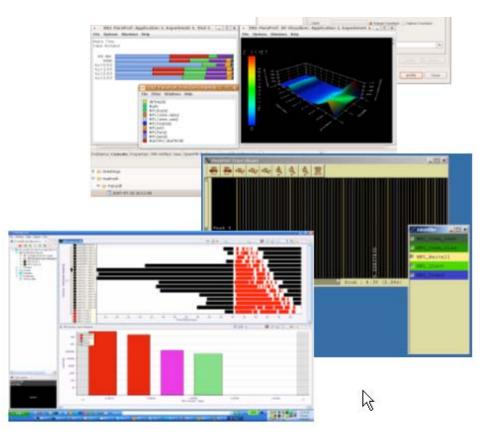
## **PTP contributor Community**

- Committers:
  - LANL, IBM, Monash Univ, U. Oregon
- Contributors:
  - Oak Ridge National Lab: PTP Core & parallel debugger
- Interested/started
  - U.Tenn: getting starting with plugins for PAPI
  - U.Houston: contributing compiler analysis feedback (Fortran)
  - BSC: integrating Performance tools
  - MCSC: Munich Computational Sciences Center / consortium
- Interested/discussing
  - HP: Remote & PLDT
  - Georgia Tech: interested in PLDT
  - RENCI/NCSA: interested in integrating performance tools
  - Univ. Florida: UPC and PGAS tools incl. performance tools
  - ... and growing



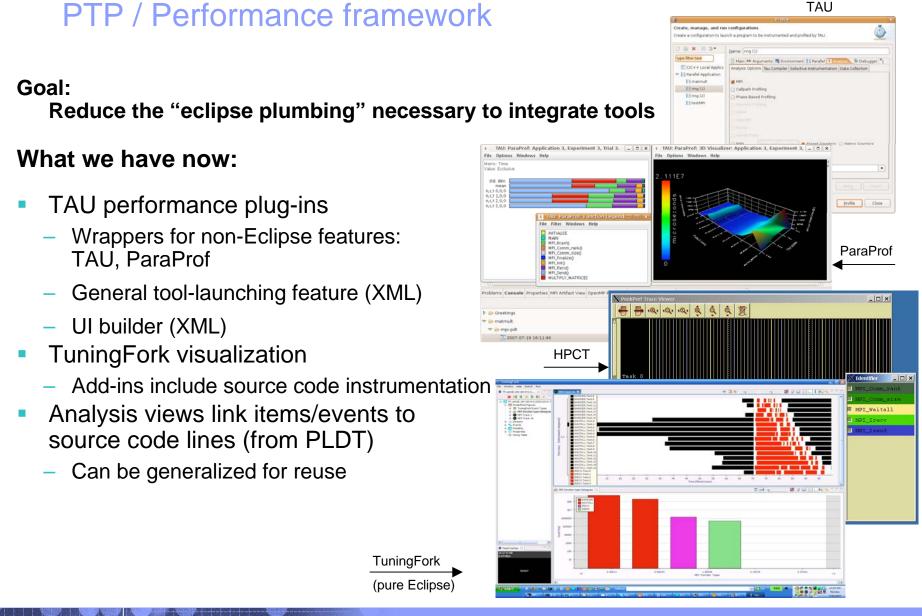
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## **PTP Performance Tools**



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#### Parallel Tools Platform - Performance Framework

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### TAU plug-ins contributed to PTP

- Contributed by U. Oregon
- TAU (Tuning and Analysis Utilities)
- Eclipse plug-ins wrap TAU functions, make them available from Eclipse

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Other plug-ins launch Paraprof from Eclipse too

### http://www.cs.uoregon.edu/research/tau/home.php

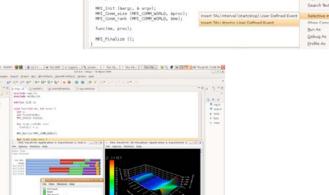
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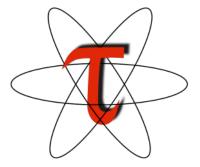


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### TAU Plug-in features to seed the Performance Analysis Framework

- Began as an Eclipse-based interface for the TAU performance analysis system
- Encapsulates existing command-line based performance analysis tools within the Eclipse environment
- Tool definition file allows generation of tool-specific GUI elements without Eclipse plug-in development
- Tool workflows define compilation, execution, data collection, processing and visualization steps of performance analysis
- Compatible with Photran and CDT projects and with PTP parallel application launching

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- Tools and tool workflows are specified in an XML file
- Tools are selected and configured in the launch configuration window
- Output is generated, managed and analyzed as specified in the workflow

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### TuningFork

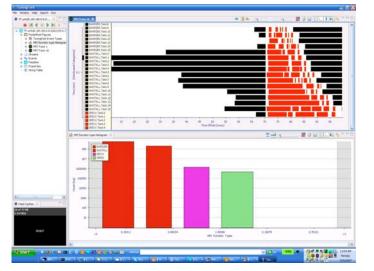


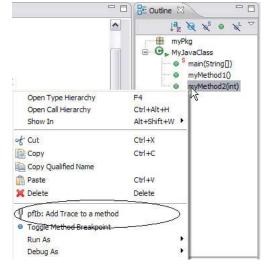
- •Rich graphical Eclipse RCP app developed by IBM Research
- •Originally designed for real-time Java traces
- •MPI traces and other HPC uses developed
- •http://www.alphaworks.ibm.com/tech/tuningfork

### Integration plans:

- Source Code Instrumentation
  - •Automatic and selective instrumentation of Java first, C/C++ later
  - •Visible and invisible (modify source code or not)
  - •Markers & Views for tracking
- •Source code integration

- •Run TuningFork in SDK (vs. RCP)
- •Link visualization entities to src code lines
- •Early client for Performance Framework







### PTP / Performance framework

#### Goal:

Reduce the "eclipse plumbing" necessary to integrate tools

### What we need:

- Help for others interested in integrating tools
  - TAU, ParaProf/ U.Oregon (Wyatt Spear)
  - TuningFork / IBM (Beth Tibbitts)
  - PAPI/ U.Tenn (Dan Terpstra, Shirley Moore)
  - HPC toolkit, Paraver / BSC / IBM
- Reusable parts for building new tools
  - Uls for user interaction
  - Views for source code integration
  - Source code instrumentation tools

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– ...etc.

# Framework Integration points:

- 1. Instrumentation, automatic and selective
- 2. Build, may be transparent to user
- 3. Launch with instrumentation
- 4. Management of profile/trace data
- 5. Analysis/visualization launch

### sometimes these overlap



### What does (Eclipse) integration mean?

### Loose Integration

**Tight Integration** 

**PTP,PLDT** 

Paraprof TAU

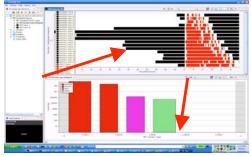
- Launch external tools from Eclipse UI
- Easiest reuse of existing tools

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- Tools run as Eclipse plug-ins
- Easiest interaction / communication with other eclipse tools



Example: TuningFork (and PTP already)

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# PTP Performance FrameworkAvailability Plans for PTP 2.0 (1Q08)

**Basic Performance Framework functionality** 

 Initially will be mostly external launch of existing tools (more "loose" integration)

One sample/reference implementation

Probably TAU - initially may still have more TAU-specific code

The basic functionality will include:

- Workflow launch: launching external tools at different points in the development workflow (compilation, execution, data collection, processing, and visualization)
- UI launch specifications from XML (build Eclipse GUI)
- Launching a binary through CDT or PTP

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 Interaction between Eclipse (e.g. source code) and analysis data collected by external tools



### **Future Work**

- Availability of existing features generically: Eclipse extension points, reusable and callable classes
- Generalization of TAU specific features
  - Selective instrumentation of files, routines and specified source lines
  - PAPI hardware counter specification
  - Profile database and web-portal interoperation
- Logical/iterative performance workflows

- Performance visualization and analysis features integrated directly into Eclipse (e.g. Tuning Fork)
- More flexible instrumentation features (both source-based and not)

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### PTP - Performance Framework Conclusions

- Goal: make it easier to integrate tools with Eclipse/PTP
- Leverage existing work for specific tools

- Questions?
- Comments?
- Suggestions?
- Volunteers? (This is an open-source project!)

