



parallel tools platform

<http://eclipse.org/ptp>

PTP Overview

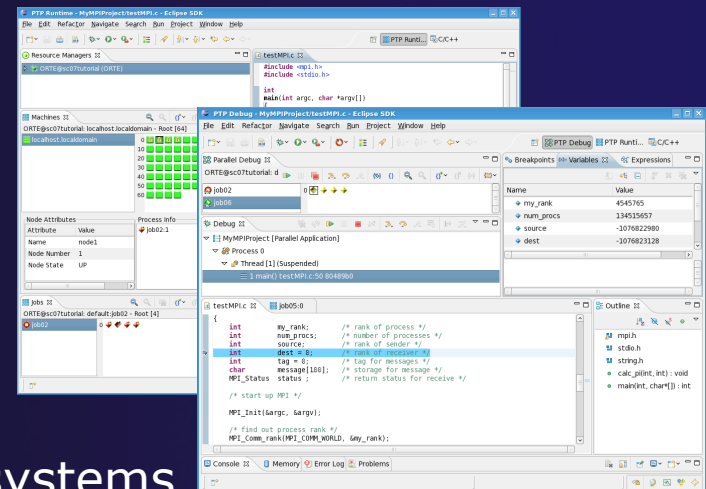
Beth Tibbitts, IBM
tibbitts@us.ibm.com

SC12 PTP BOF
November 13, 2012

Portions of this material are supported by or based upon work supported by the Defense Advanced Research Projects Agency (DARPA) under its Agreement No. HR0011-07-9-0002, the United States Department of Energy under Contract No. DE-FG02-06ER25752 and the SI2-SSI Productive and Accessible Development Workbench for HPC Applications, which is supported by the National Science Foundation under award number OCI 1047956

Parallel Tools Platform (PTP)

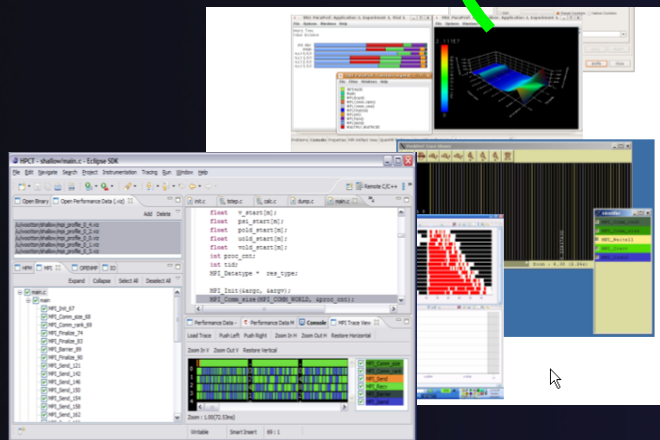
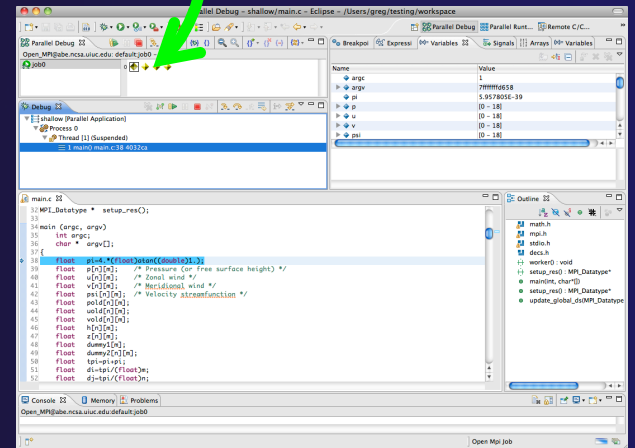
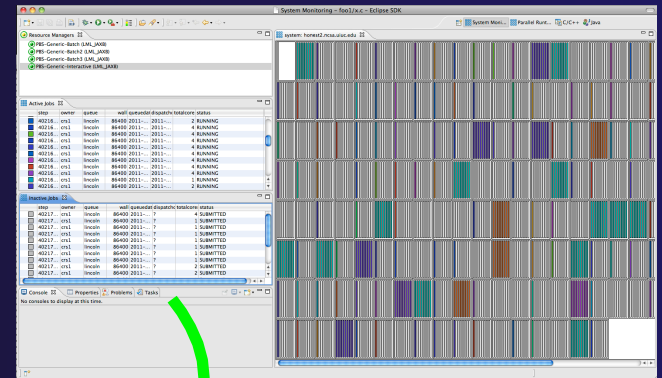
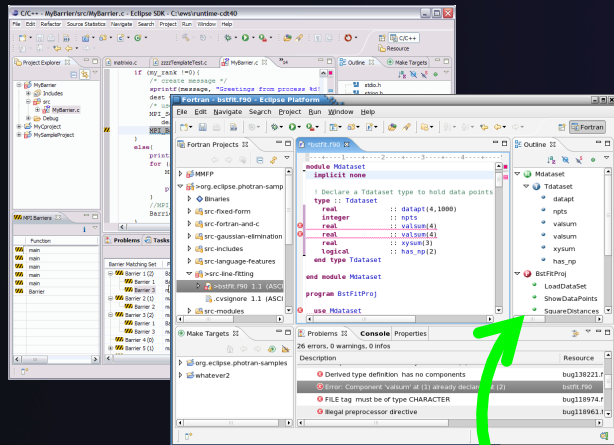
- ★ The Parallel Tools Platform aims to provide a highly integrated environment specifically designed for parallel application development
- ★ Features include:
 - ★ An integrated development environment (IDE) that supports a wide range of parallel architectures and runtime systems
 - ★ A scalable parallel debugger
 - ★ Parallel programming tools (MPI, OpenMP, UPC, OpenSHMEM, OpenACC, etc.)
 - ★ Support for the integration of parallel tools
 - ★ An environment that simplifies the end-user interaction with parallel systems
- ★ <http://www.eclipse.org/ptp>



Eclipse PTP Family of Tools

Coding & Analysis
(C, C++, Fortran)

Launching & Monitoring



Performance Tuning
(TAU, PPW, ...)

Parallel Debugging

Download PTP

- ★ Eclipse is available in a number of different packages for different kinds of development
 - ★ <http://eclipse.org/downloads>
- ★ For PTP, we recommend the all-in-one download:
 - ★ Eclipse for Parallel Application Developers



Eclipse for Parallel Application Developers, 200 MB

Downloaded 88,437 Times

[Details](#)

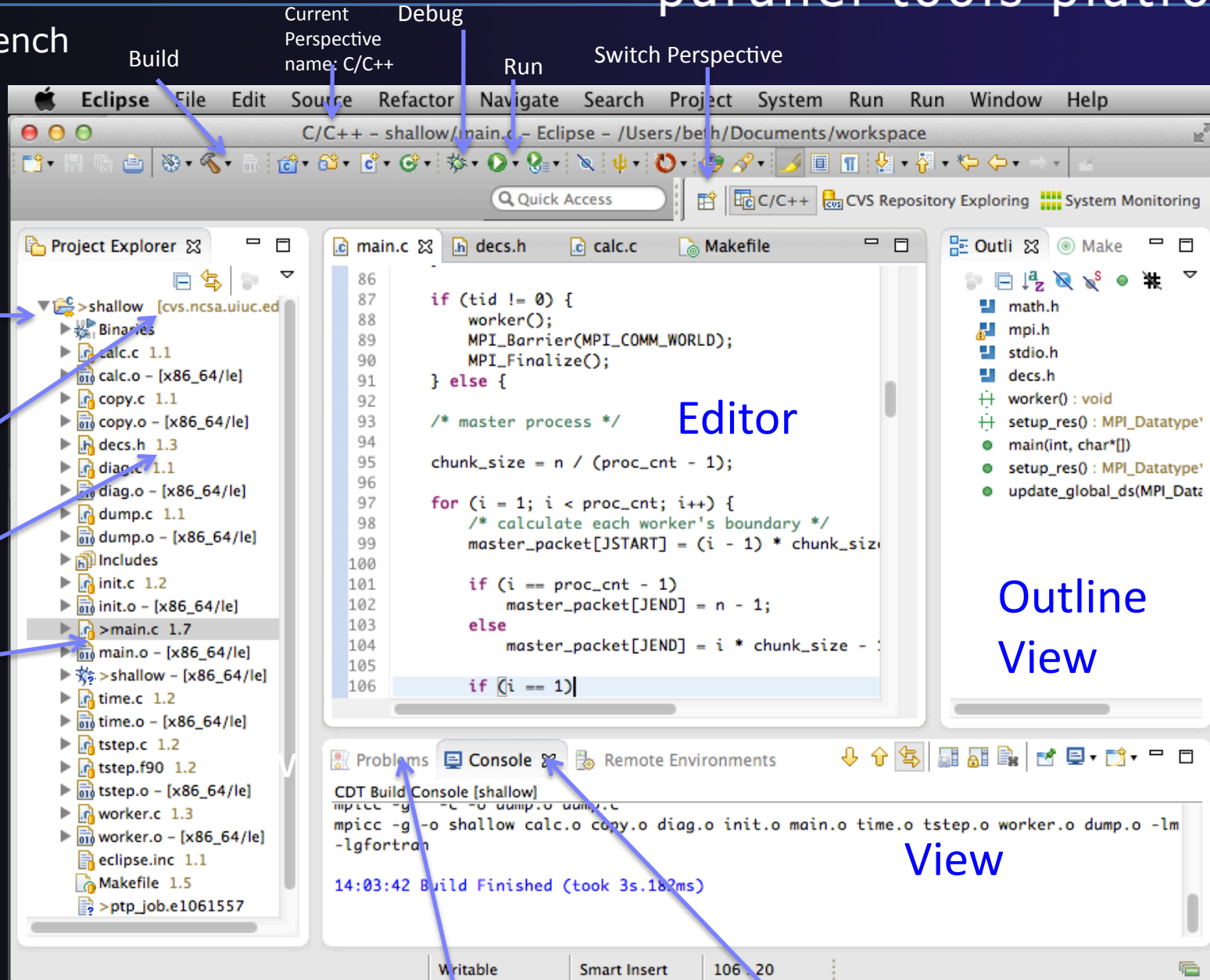
We often call this the “Parallel Package”

- ★ Update the package to current PTP release via instructions at <http://www.eclipse.org/ptp/downloads.php>

Highlight of PTP Features

parallel tools platform

Workbench



Rightmouse for Project Properties

Source Code Repository

Version # in SCR

> Indicates change from SCR

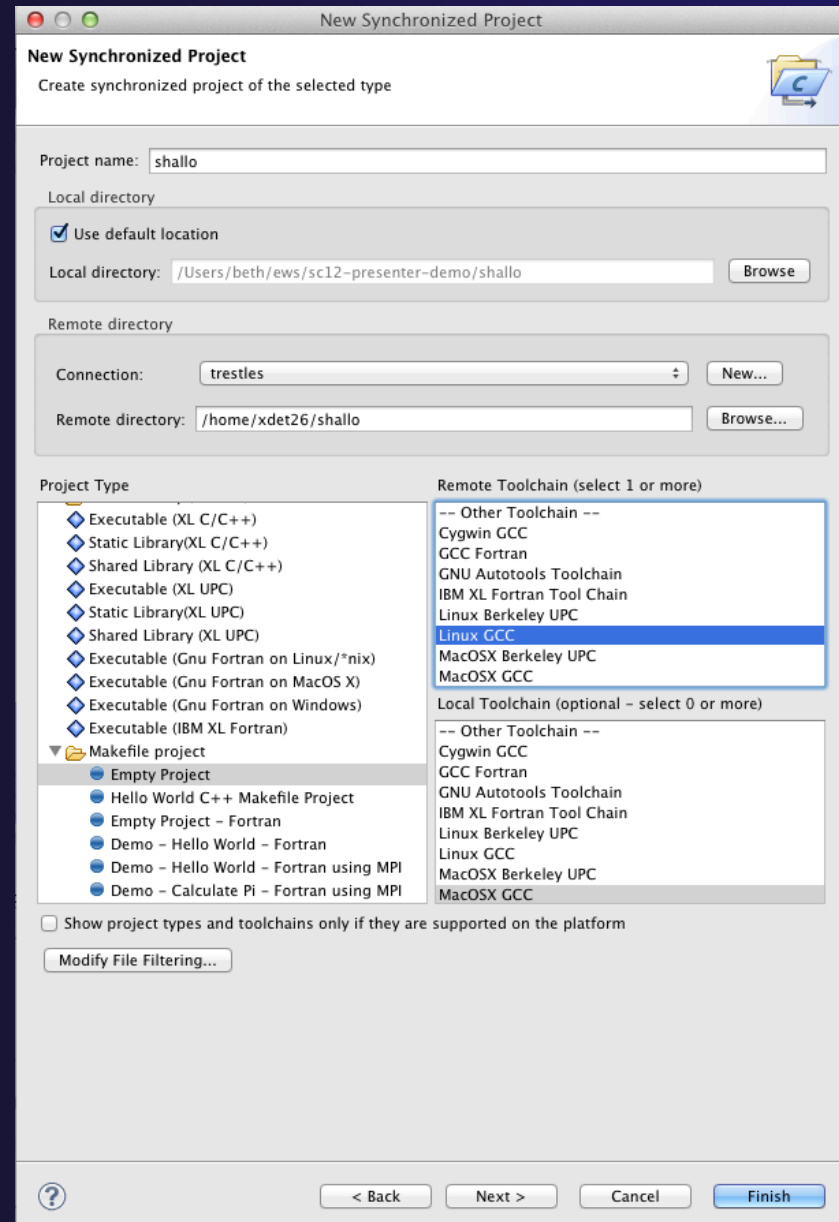
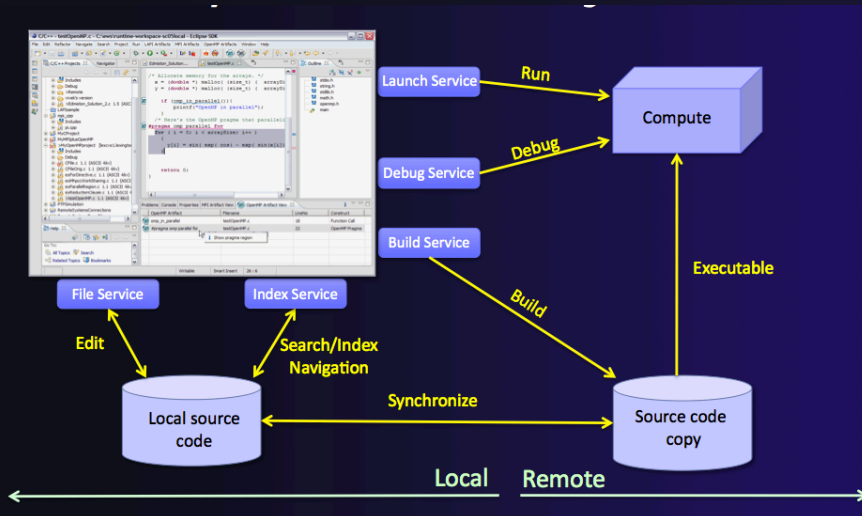
Preferences: Menu: Window>Preferences
Mac: Eclipse>Preferences

Problems view: Build errors etc.

Console view: Build output; Run output

Synchronized Projects

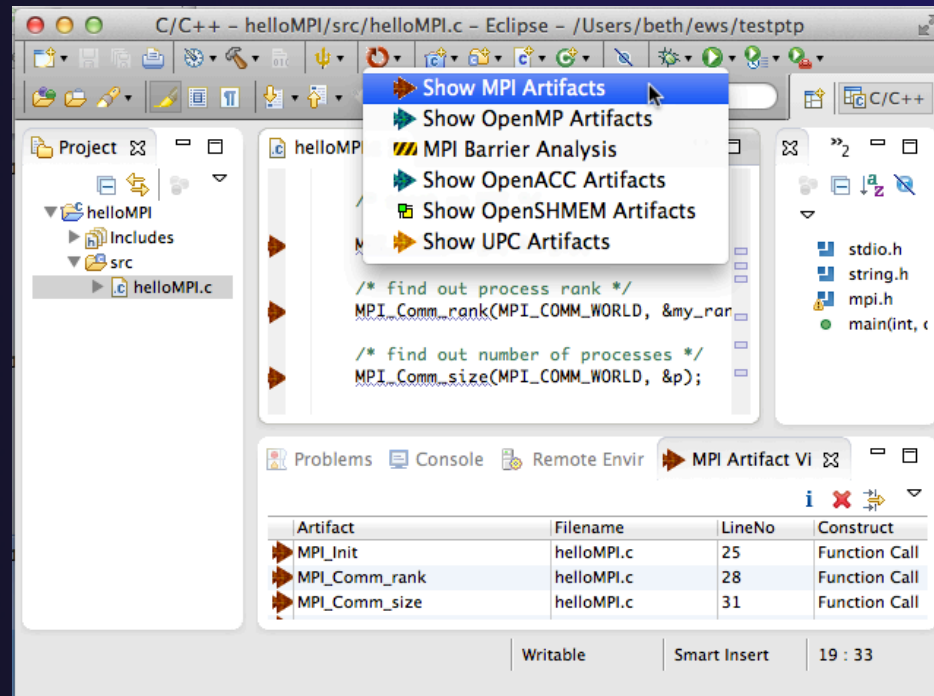
- Source is mirrored on local and remote host
- Responsive editing and interactions on local
- Build and run on remote



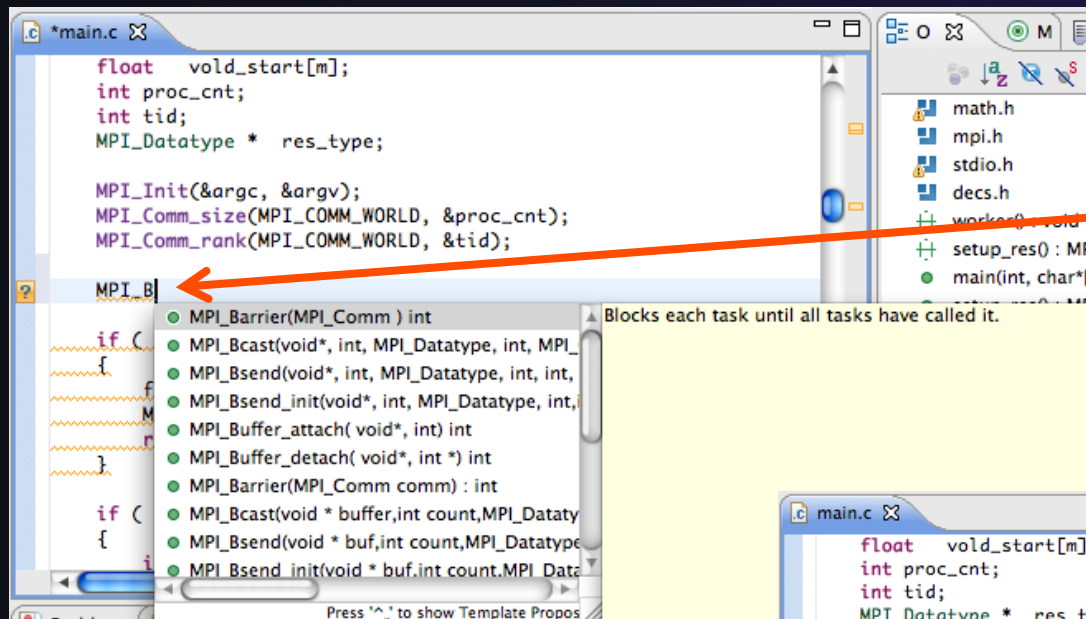
MPI, OpenMP, UPC, Support

Support for a variety of languages/APIs/Libraries for parallel development

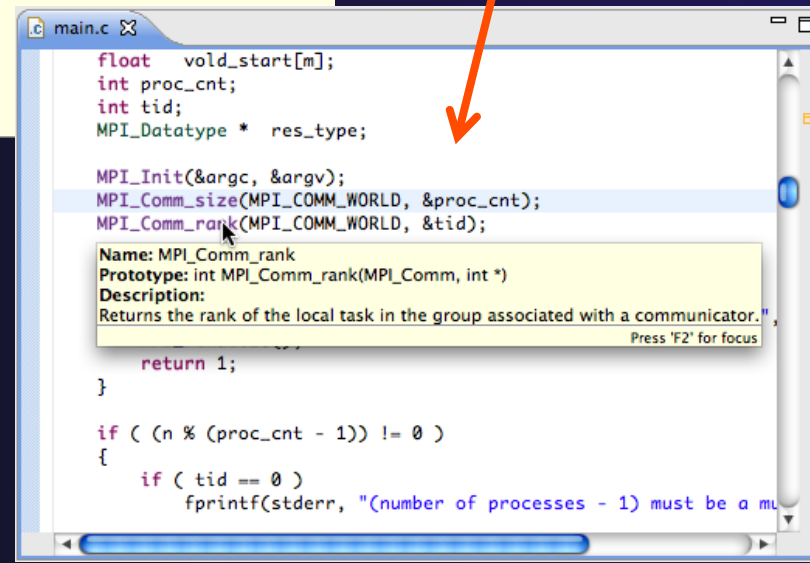
- ★ MPI
- ★ OpenMP
- ★ OpenSHMEM
- ★ OpenACC
- ★ UPC



Editor Features for Parallel Development



- ★ Code completion will show all the possible MPI keyword completions
- ★ Enter the start of a keyword then press <ctrl-space>
- ★ Hover over MPI API
- ★ Displays the function prototype and a description



- ★ MPI Barrier Analysis
- ★ Code templates for common idioms
- ★ Similar tools for OpenMP, UPC, OpenSHMEM, OpenACC

Fortran

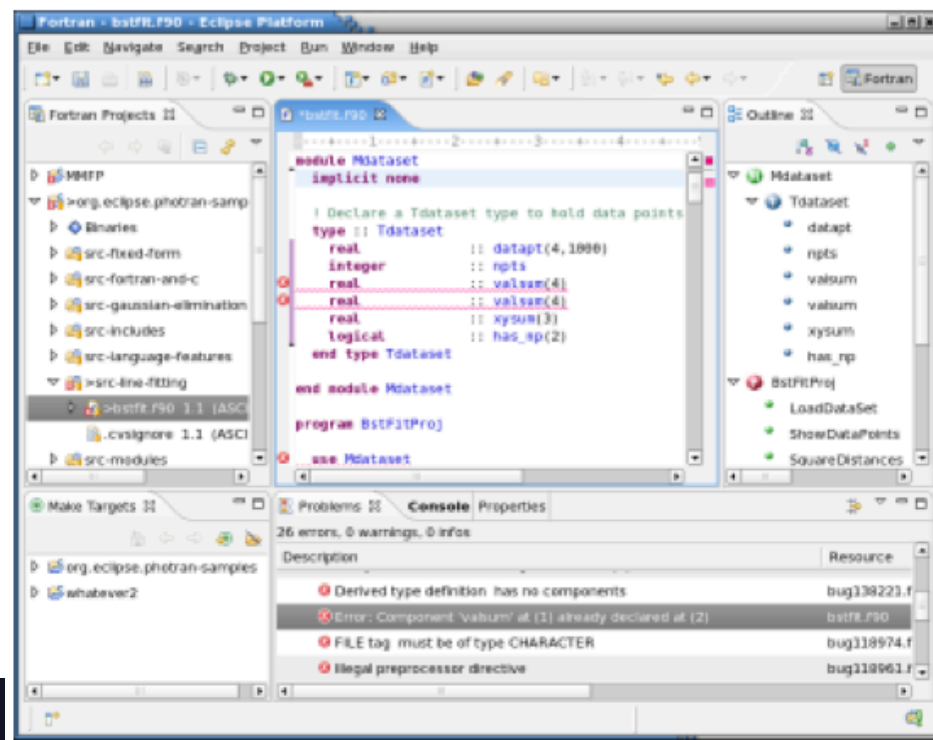
★ Photran: <http://eclipse.org/photran/>

Photran - An Integrated Development Environment and Refactoring Tool for Fortran

Photran is an IDE and refactoring tool for Fortran based on **Eclipse** and the **CDT**. **Photran 8.0** was released with Eclipse 4.2 (Juno) on June 27, 2012.

Photran 8.0 supports Fortran 77-2008. It includes 39 refactorings (including Rename, Extract Procedure, and loop transformations), as well as the following IDE features:

- Syntax-highlighting editor
- Outline view
- Content assist*
- Open declaration*
- Declaration view and hover tips*
- Fortran language-based searching*
- Support for CVS & other VCS's**
- Interactive debugger (*gdb* GUI)
- Makefile-based compilation
- Optional Makefile generation



Refactoring Example: Fortran Loop Transformations

★ Unroll Loop

★ Select a loop, click **Refactor** ▶ **Do Loop** ▶ **Unroll Loop...**

```
do i = 1, 10
  print *, 10*i
end do
```



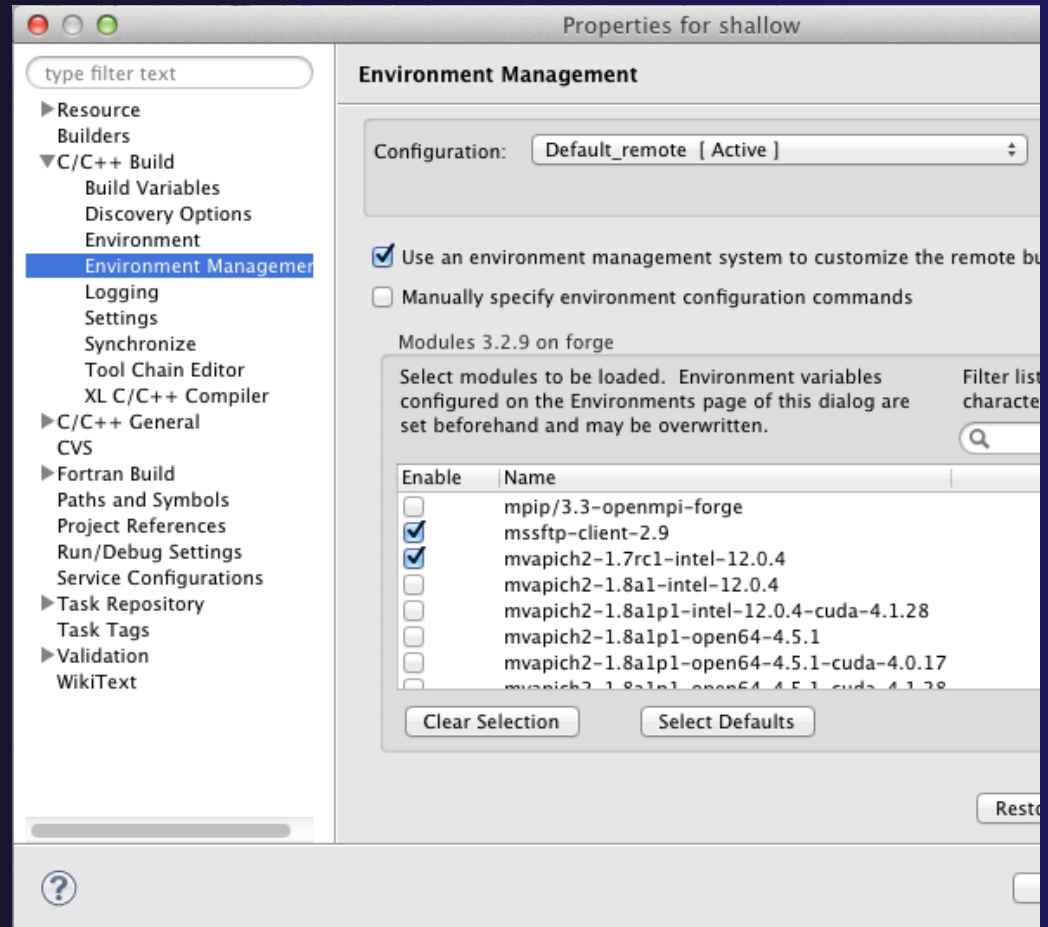
Unroll 4x

```
do i = 1, 10, 4
  print *, 10*i
  print *, 10*(i+1)
  print *, 10*(i+2)
  print *, 10*(i+3)
end do
```

Original Source	Refactored Source
68	78
69 ! Don't apply time filter on first	79 end if
70 if (firststep == 0) then	80
71 do j = jstart+1, jend+1	81 do j = jstart+1, jend+1
72 do i = 1, m	82 LoopUpperBound = m
73 pold(i,j) = p(i,j)+alpha*(pne	83 do i = 1, LoopUpperBound,4
74 uold(i,j) = u(i,j)+alpha*(une	84 p(i,j) = pnew(i,j)
75 vold(i,j) = v(i,j)+alpha*(vne	85 u(i,j) = unew(i,j)
76 end do	86 v(i,j) = vnew(i,j)
77 end do	87 p((i+1),j) = pnew((i+1)
78 end if	88 u((i+1),j) = unew((i+1)
79	89 v((i+1),j) = vnew((i+1)
80 do j = jstart+1, jend+1	90 p((i+2),j) = pnew((i+2)
81 do i = 1, m	91 u((i+2),j) = unew((i+2)
82 p(i,j) = pnew(i,j)	92 v((i+2),j) = vnew((i+2)
83 u(i,j) = unew(i,j)	93 p((i+3),j) = pnew((i+3)
84 v(i,j) = vnew(i,j)	94 u((i+3),j) = unew((i+3)
85 end do	95 v((i+3),j) = vnew((i+3)
86 end do	96 end do
87 end subroutine	97 end do
88	98 end subroutine
	99
	00

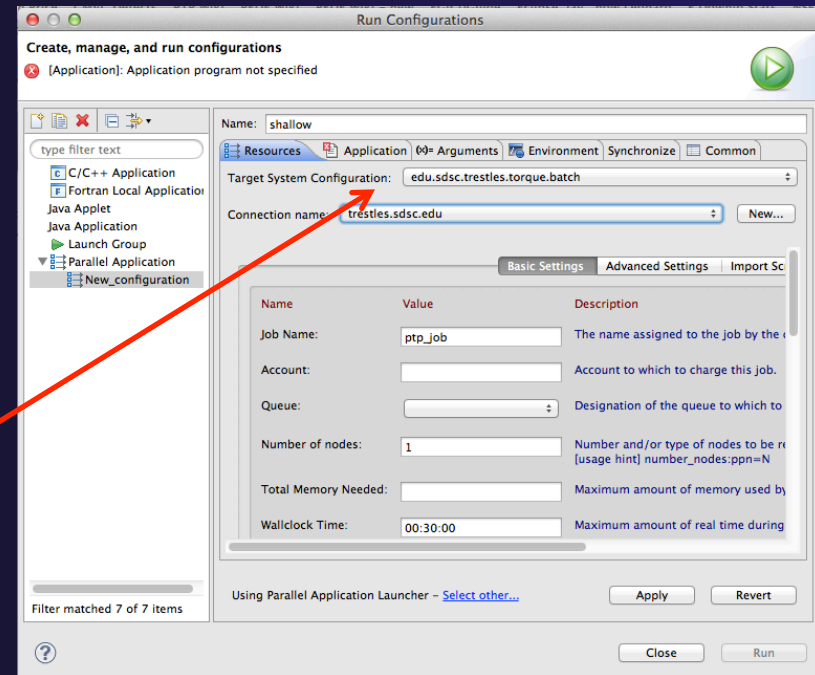
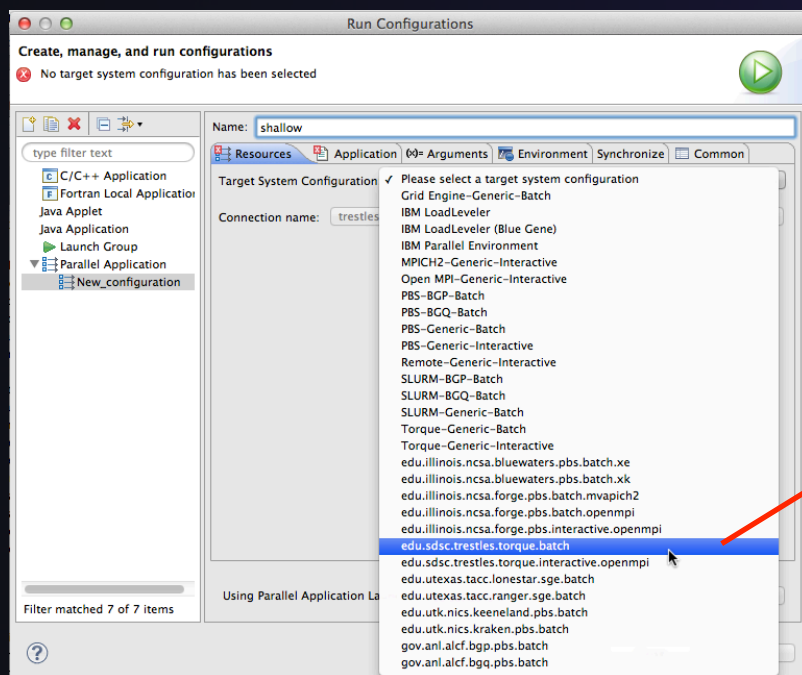
Configuring Build Modules

- ★ If the remote system has Modules installed, a custom set of modules can be configured for building C/C++ projects



Launching

- ✦ Flexible Target System Configurations
- ✦ UI solicits input depending on remote target



Monitoring

★ System view

★ Jobs running on system

★ Active jobs

★ Inactive jobs

★ Messages

★ Console

The screenshot shows the Eclipse IDE's System Monitoring window for a TORQUE Resource Manager system. The window is divided into several panes:

- Monitors:** Shows the connection name 'trestles.sdsc.edu' and system type 'TORQUE Resource Manager'.
- Active Jobs:** A table listing jobs currently running on the system.

step	owner	queue	wall	queued	dispatch	total
10553...	jmondal	normal	64800	2012...	201	201
10553...	jmondal	normal	64800	2012...	201	201
10553...	jmondal	normal	64800	2012...	201	201
10553...	jmondal	normal	64800	2012...	201	201
- Inactive Jobs:** A table listing jobs that are not currently running.

step	owner	queue	wall	queued	dispatch	total
1056...	tibbitts	shared	1800	201...	201...	5
1056...	tibbitts	shared	?	?	?	?
1056...	tibbitts	shared	?	?	?	?
- Messages:** Shows system messages, including a terminated process: '<terminated> shallow [Parallel Application] Runtime process 1'.
- Console:** A text area for viewing the output of the monitored application.
- Resource Grid:** A large grid of colored squares representing the status of individual resources (nodes) in the system. Each square's color indicates the resource's state (e.g., blue for idle, green for active, red for failed).

Scroll to see more

Parallel Debugger

- ★ **Parallel Debug view** shows job and processes being debugged
- ★ **Debug view** shows threads and call stack for individual processes
- ★ **Source view** shows a **current line marker** for all processes

The screenshot displays the Eclipse Parallel Debugger interface. The top toolbar includes icons for running, pausing, and stepping through code. The main window is divided into several panes:

- Parallel Debug View:** Shows a tree view of the debugging session, including the job 'job0' and its processes.
- Debug View:** Shows the current process 'shallow [Parallel Application]' and its threads. The thread 'Thread [1] (Suspended)' is selected, showing its call stack with 'main()' at the current position.
- Source View:** Displays the source code of 'main.c'. A blue line marker is positioned on line 38, indicating the current execution point. The code includes MPI-related declarations and a main function with various floating-point variables.
- Variables View:** Shows the current values of variables: 'argc' (1), 'argv' (7fffffff658), 'pi' (5.957805E-39), and arrays 'p', 'u', 'v', 'psi' (each with values [0 - 18]).
- Outline View:** Shows the project structure, including headers like 'math.h', 'mpi.h', 'stdio.h', and 'decs.h', along with function declarations.
- Console View:** Shows the output of the program, currently displaying 'Open_MPI@abe.ncsa.uiuc.edu:default:job0'.

Tutorial, VM

- ★ Tutorial slides

- ★ <http://wiki.eclipse.org/PTP/tutorials/SC12>

- ★ Virtual Box + Torque vm

- ★ Good sample target platform for PTP

- ★ <https://www.cct.lsu.edu/~dcastl2/ptp/vbox.php>

Commercial Products that include PTP

Commercial Products that include PTP

- ★ IBM Parallel Environment Developer Edition
 - ★ Eclipse, PTP
 - ★ IBM HPC Toolkit
 - ★ Assistance tools for IBM PAMI & LAPI
 - ★ XLC Compiler Transformation Report viewer

- ★ <http://ibm.co/tdM7QD>



Online Information

- ★ Information about PTP
 - ★ PTP online help
 - ★ <http://help.eclipse.org>
 - ★ Main web site for downloads, documentation, etc.
 - ★ <http://eclipse.org/ptp>
 - ★ Wiki for designs, planning, meetings, etc.
 - ★ <http://wiki.eclipse.org/PTP>
- ★ Information about Photran
 - ★ Main web site for downloads, documentation, etc.
 - ★ <http://eclipse.org/photran>

Mailing Lists

- ★ User Mailing Lists
 - ★ PTP
 - ★ <http://dev.eclipse.org/mailman/listinfo/ptp-user>
 - ★ Photran
 - ★ <http://dev.eclipse.org/mailman/listinfo/photran>
 - ★ Major announcements (new releases, etc.) - low volume
 - ★ <http://dev.eclipse.org/mailman/listinfo/ptp-announce>

- ★ Developer Mailing Lists
 - ★ Developer discussions - higher volume
 - ★ <http://dev.eclipse.org/mailman/listinfo/ptp-dev>

Getting Involved

- ★ See <http://eclipse.org/ptp>
- ★ Read the developer documentation on the wiki
 - ★ <http://wiki.eclipse.org/PTP>
- ★ Join the mailing lists
- ★ Attend the monthly developer meetings
 - ★ Conf Call Monthly: Second Tuesday, 1:00 pm ET
 - ★ Details on the PTP wiki
- ★ Attend the monthly user meetings
 - ★ Teleconf Monthly: 4th Wednesday, 1:00 pm ET
 - ★ Details on the PTP wiki
- ★ Annual PTP User-Developer meeting