The Tool-set

An Integrated Tool Environment for PVM

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Sept. 14, 1995

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Overview

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Motivation

- PVM is a de-facto standard for parallel applications
- PVM is also a good platform for tool developments
- Yet only few tools available and usable for programmers
  $\rightsquigarrow$ tools provide only subset of needed functionality
  $\rightsquigarrow$ no support for integrated usage
  $\rightsquigarrow$ tools are even incompatible to each other

Two projects at LRR-TUM address this problem:

- The Tool-set for PVM
  $\rightsquigarrow$ integrated set of tools for programming with PVM
- On-line Monitoring Interface Specification (OMIS)
  $\rightsquigarrow$ basis for easy development of other tools

Components of The Tool-set

- Parallel file system
  $\leadsto$ Various modes for distributed file access, fully monitored
- Checkpoint generator and load balancer
  $\leadsto$ Migration of running PVM tasks, support for multiuser environments, basis for fault tolerance
- Debugging system
  $\leadsto$ Visualization of data structures, distributed breakpoints, message transfer breakpoints, restart from checkpoint
- Performance analysis system
  $\leadsto$ Focusing by attributed measurements, I/O related measures, support for multiuser environments
- Visualization system
  $\leadsto$ Animation of logical behavior, global point of view, hierarchical objects
- Deterministic execution controller
  $\leadsto$ Forces the program to execute communication calls in a unique sequence, allows to find sporadic errors due to races

Information Gathering

All information necessary for the tool environment is provided by a software monitoring system based on OMIS

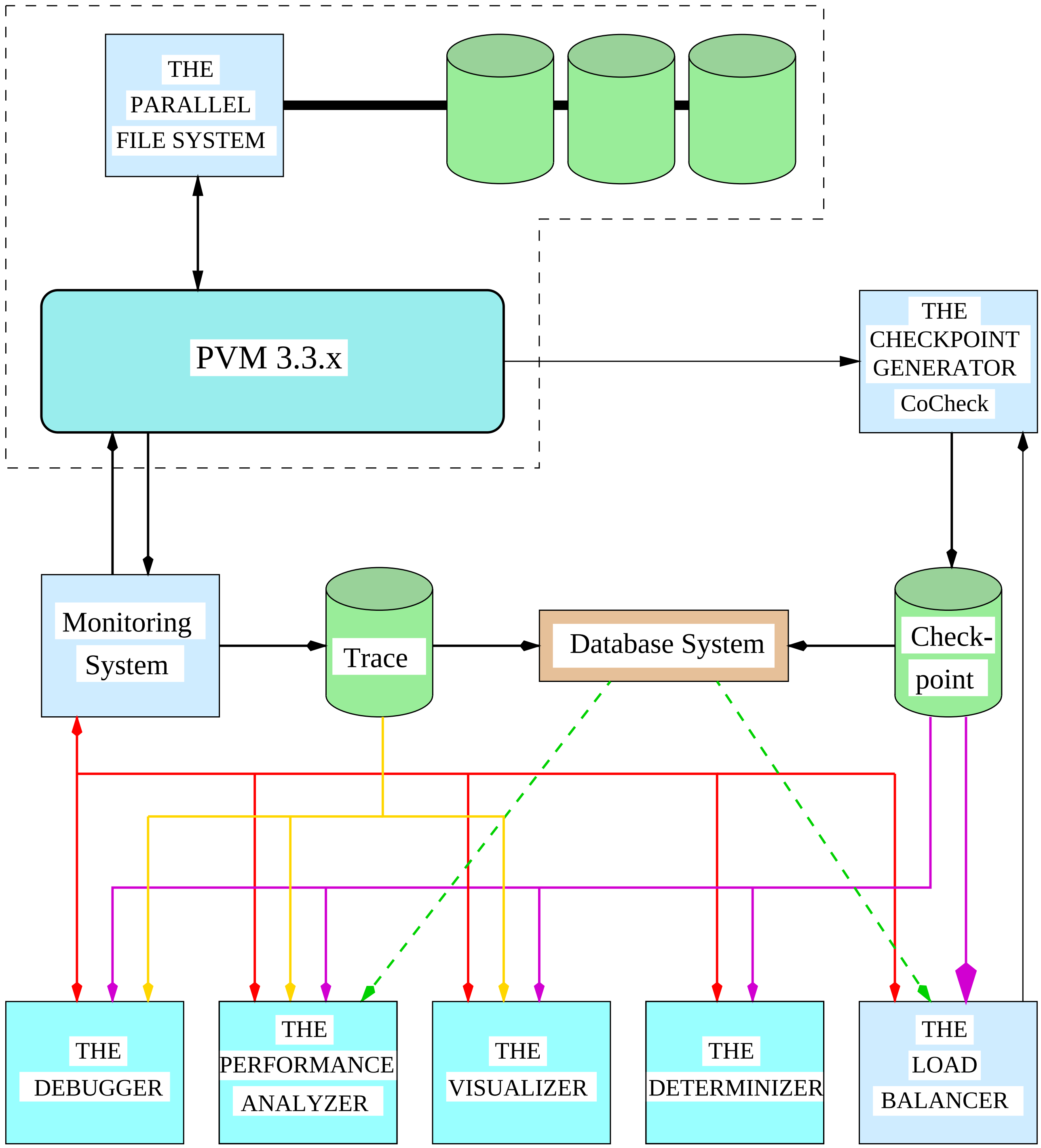
Monitor input

- commands from the tools
- information from the running program:
  - hoster/tasker interface within PVM
  - UNIX ptrace interface
  - UNIX system calls
  - information sources like /proc or /dev/kmem

Monitor output

- online data (state information, events, summarized/preprocessed values)
- trace data (in principle same information as online data)
- control data for the running program

Global Structure of THE TOOL-SET



Ancestors of THE TOOL-SET

LRR-TUM has a long years experience in design and specification of online and trace-driven interactive tools and automatic tools:

- TOPSYS (Tools for parallel systems)

  DETOP, PATOP, VISTOP for iPSC/2, iPSC/860, SunOS

- Implementations within Esprit projects Hamlet and Prepare

  trace driven performance analysis, performance analysis for HPF

- Commercial tools integrated into Parsytec's PARIX

  DETOP and PATOP

- Implementations within funded projects

  Intel, Siemens, ...

Project Status and Availability

What is currently available

- A highly motivated group of researchers
- First version of the parallel file system (PFSlib)
- First version of the checkpointing system (CoCheck)
- First version of the visualizer
- PARIX versions of debugger and performance analyzer

Next steps

- The monitoring system (based on OMIS)
- The debugging system
- The performance analysis system

A first subset with at least one interactive tool should be available in spring 1996