An Approach to Executing Ptolemy Classic Models under Ptolemy II

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Motivation

• Simulation Framework for Photonics CAD Consortium (PCAD*)
• Ptolemy Classic Wavelength Domain Simulator (WDS) from MONET

• Why not stay with Ptolemy Classic?
  – Make use of the Java-based Vergil GUI and related improvements
  – Access MoML for model representation
  – Type checking is supported better in Ptolemy II
• Must support legacy implementations of stars
  – Many existing Ptolemy Classic C++ stars, galaxies, and universes
  – Performance issues for computationally intensive stars
• Client/Server architecture across Windows and UNIX platforms

* www.pcad-team.com
PCAD Team

Internal Structure of Benes Switch
Sample Output

Wavelength Domain Spectrum before Demux – for Iteration 8

- Channel 8 will have poor performance
- Noise

PCAD Framework Approach

- Vergil GUI
  - Ptolemy II
  - Classic Linkage
  - User-Supplied

- PTCL Interpreters
- Ptc1 Server

- Icon Descriptions
- Actor Placeholders
- MoML Designs

- C++ PL Stars
- Augmented Plugs
- C++ PL Source
Components of the Hybrid System

- Augmented pflang code generator
  - Automated class generation for Java placeholder actors
  - Parameters: names, types, and default values
  - Ports: names, directionality, and data types
  - Binds SVG icon description to actor (with default icons)
- PtcDirector class
  - Does not schedule or fire any Java stars directly
  - Creates a script describing topology and parameters of the Universe
  - Opens a control socket from Vergil to a ptcl server instance
  - Creates a single PlotResult instance and advertises its socket port
- PlotResult class
  - Opens a single server socket for PlotResult requests
  - Manages PlotFrame instances for display of simulation results
  - Distributes incoming simulation result data to the correct PlotFrame

Components of the Hybrid System (cont.)

- Ptolemy TCL (ptcl) interpreter
  - Interpreter unchanged from the standard Ptolemy Classic version
  - Display class in kernel is replaced by the Plotter or TPlotter classes
  - Functions of pxgraph replaced by PlotResult client code
- Vergil Configuration (vergilConfiguration.xml)
  - Director Library includes a director derived from PtcDirector
  - Actor Library includes a placeholder actor for each Classic star
- Server Dispatcher
  - Dispatches a separate ptcl server instance for each simulation run
  - Multiple model windows can be opened and run simultaneously
  - C++ instance can crash without affecting other current simulations
**Process Flows**

- **Model Creation**
  - The user creates a model from the placeholder actors
  - The user configures actor parameters and director parameters
  - The model is saved as a MoML universe or galaxy

- **Model Execution in PtcDirector**
  - Prefire:
    - The model script is created in the ptcl language
    - A socket is opened to a new ptcl instance
    - The script is transmitted and interpreted, errors are caught
  - Fire:
    - A script is sent telling ptcl to execute the model N iterations ('run N')
  - Postfire:
    - Simply returns false
  - StopFire:
    - A halt script is sent to ptcl, and haltRequested is set

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**Process Flows (continued)**

- **Plotting**
  - Stars requiring static plots or histograms instantiate a Plotter
  - Stars requiring multi-iteration sequence plots instantiate a TPlotter
  - AddPoint is used to send data points to either class
  - Plotter::terminate formats and sends a plot/histogram as PlotML
  - Tplotter::initialize causes an empty PlotFrame to be sized and drawn
  - Tplotter::terminate causes one point to be added to each dataset

- **Errors**
  - Errors caught during scripting are reported on Vergil
  - Errors caught by ptcl interpreter are returned on the control socket
Caveats

- Not intended to solve the general problem
  - Only tested with SDF domain
  - Some features unimplemented, i.e., multi-portholes
- No tokens pass directly between Java actors and C++ stars
- Type mismatches between Ptolemy II and Classic
- Simulation Control and Error Reporting are not complete

Summary

- Ptolemy Classic simulations can be built and executed in Vergil
- Classic linkage plugs seamlessly into Ptolemy II
- Makefile support for Windows DLL’s and UNIX/Linux shared libs
- The ptcl servers can execute on one or more remote hosts
- Performance essentially the same as Ptolemy Classic execution
- Java actors are generated automatically by ptlang extensions
- Most built-in SDF stars function in the hybrid system, except:
  - Some special port data types are not supported
  - Stars using pxgraph will display on the server machine
Network Design Tools, Inc.

- Spun off from Telcordia Technologies March, 2001
- Located in Monmouth County, New Jersey
- Based on three software tools from Telcordia Applied Research
  - Wavelength Network Designer (WaND)
  - Strategic Analysis Tool (SWAT)
  - Wavelength Domain Simulator (WDS)

Benes Switch with Sources and Sinks