

# The Tycho User Interface System



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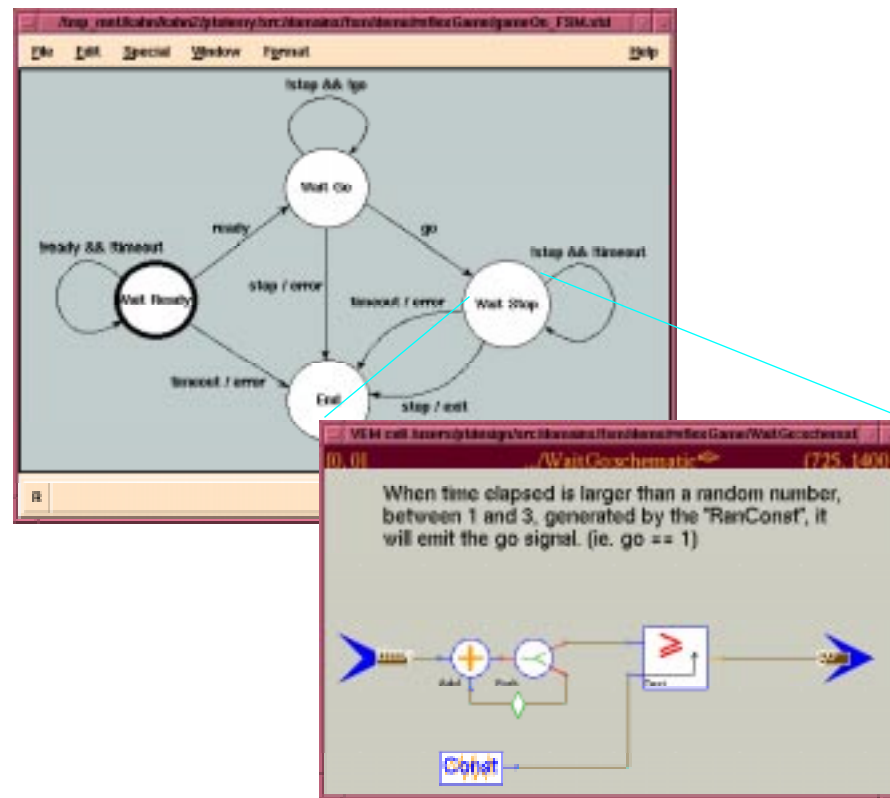
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**UC Berkeley  
Dept. of EECS**

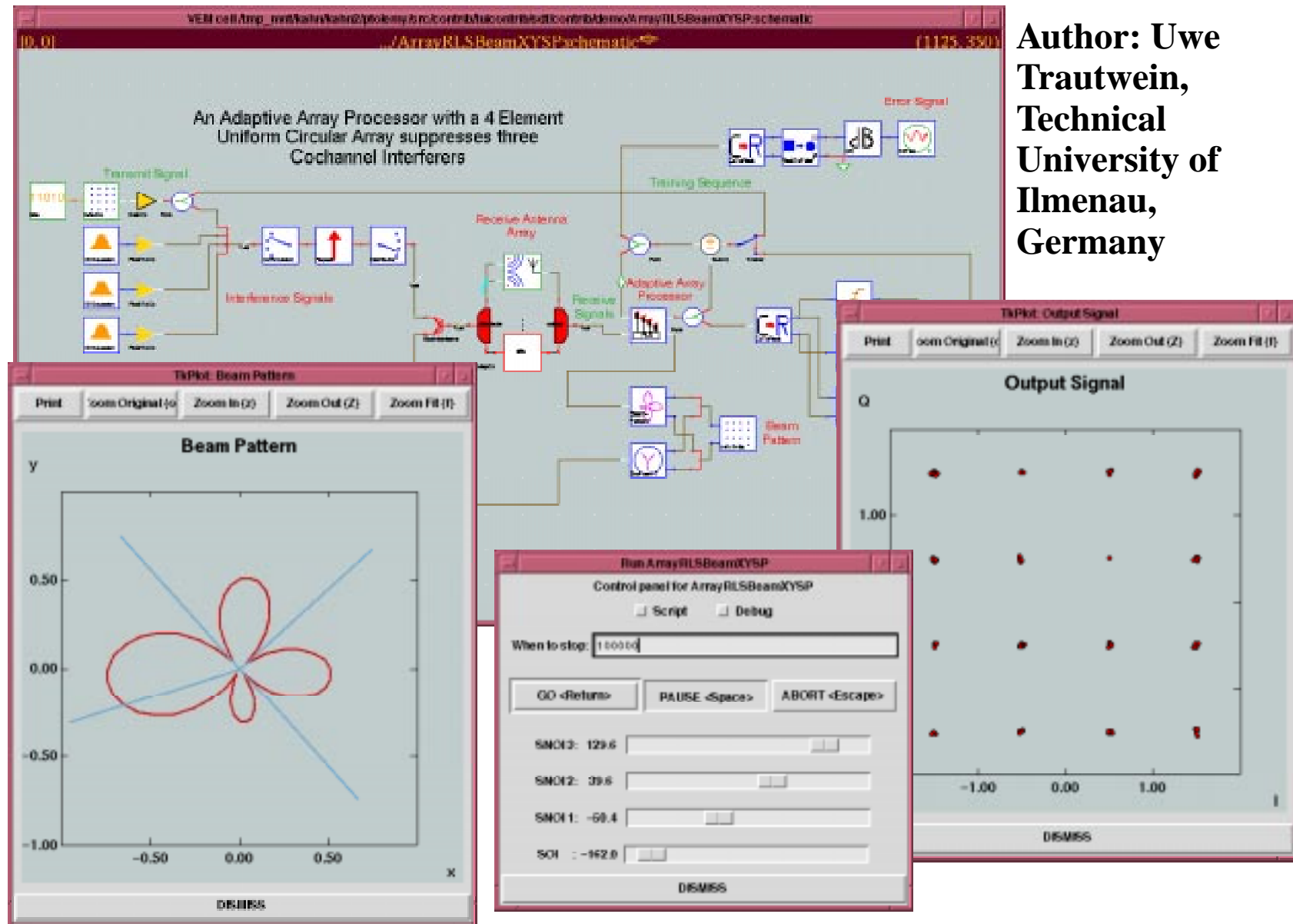
## Ptolemy: heterogeneous modeling

- Design methodology for reactive systems—  
signal processing, telecommunications,  
hardware-software codesign
- Heterogeneity—multiple, domain-specific,  
semantic models:
  - synchronous/reactive  
models
  - multi-rate dataflow
  - discrete-event  
simulation
  - modular hierarchical  
finite state machines



# Ptolemy: interactive, high-level simulation

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Germany





# Tycho



**Goal:** to extend the non-dogmatic nature of the Ptolemy kernel—multiple semantic models—to the user interface. Thus: multiple syntactic models.

**Authors:**

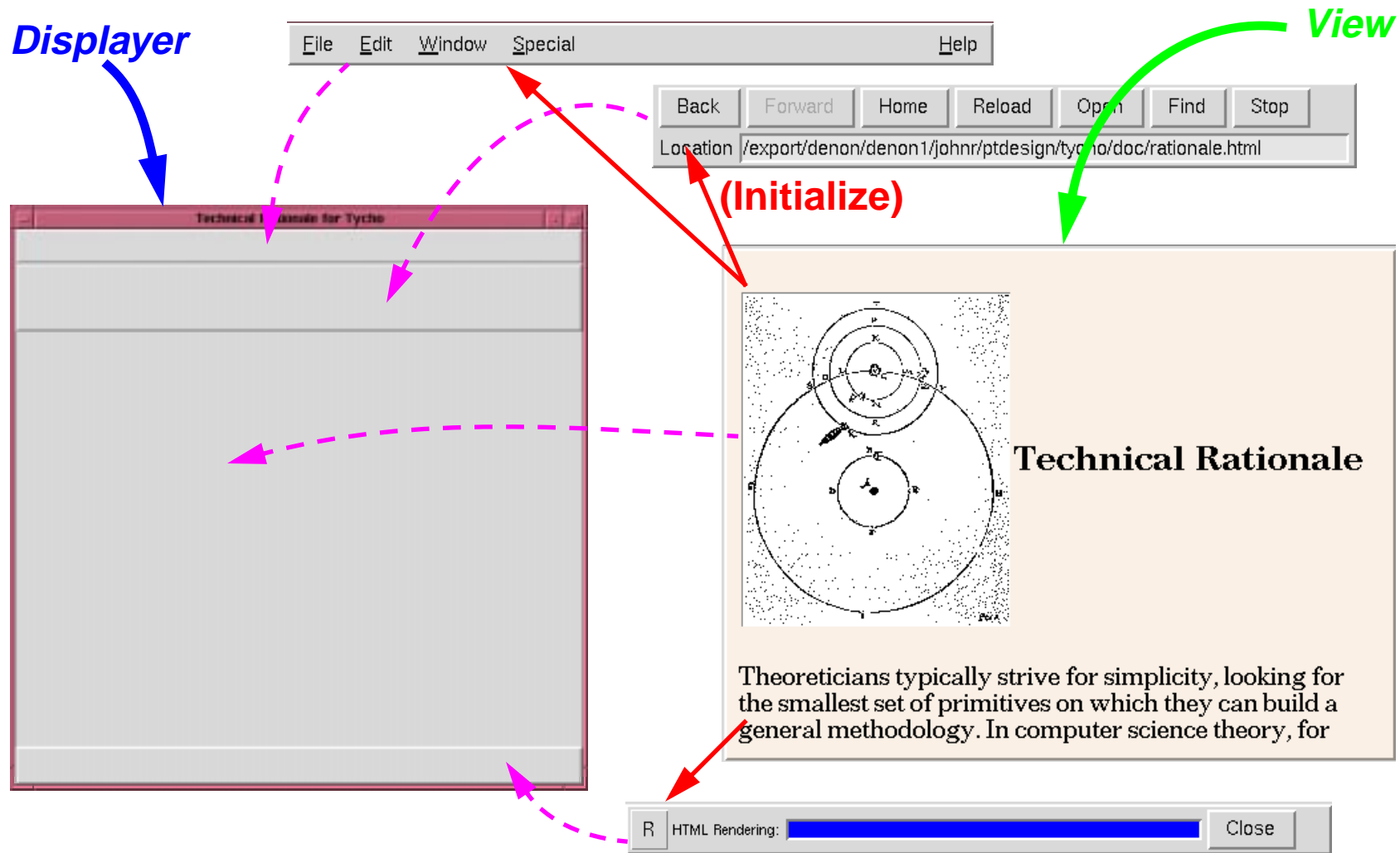
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Wan-teh Chang  
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## Motivation

- **Cross-platform portability**
  - ✓ [incr Tcl]/[incr Tk] — object-oriented scripting
  - ✓ Java — portable, clean, system-level language
  - ✗ C/C++ — ?
- **New Ptolemy GUI**
  - ✓ Domain-specific graphical editors
  - ✓ Design visualization and exploration
  - ✗ Binary internal representations, complex databases
- **Extensible, re-usable user-interface framework**
  - ✓ Sub-classable user-interface widgets
  - ✓ Application framework
  - ✗ Ad-hoc Tcl scripts

## Frameworks: UI layout

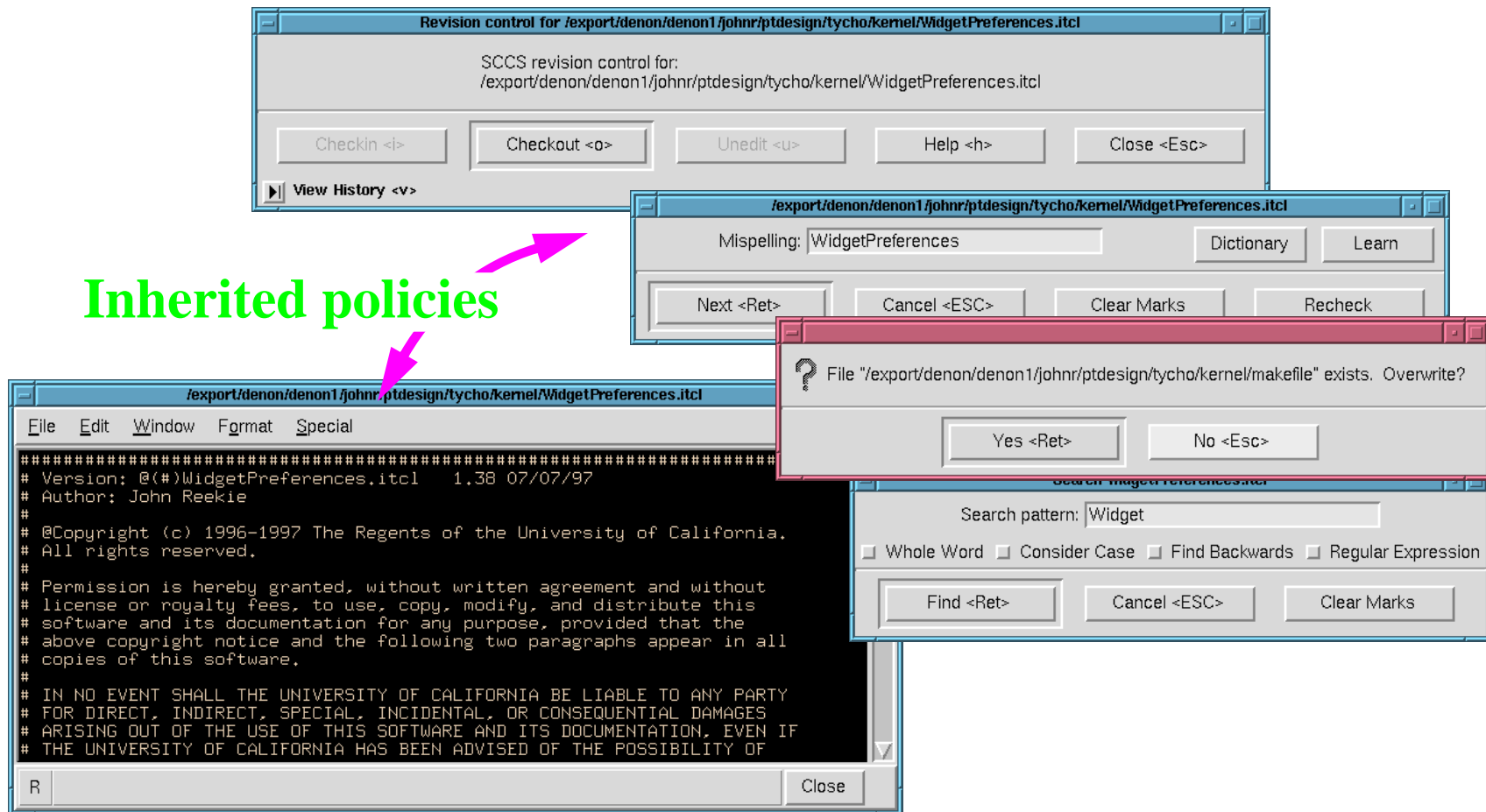
- A *displayer* contains *views*
- Menu bar, tool bar, and status bar come “for free”



# Frameworks: file management

- File load/save policies
- Access management
- Look-and-feel

Inherited policies



# Frameworks: documentation

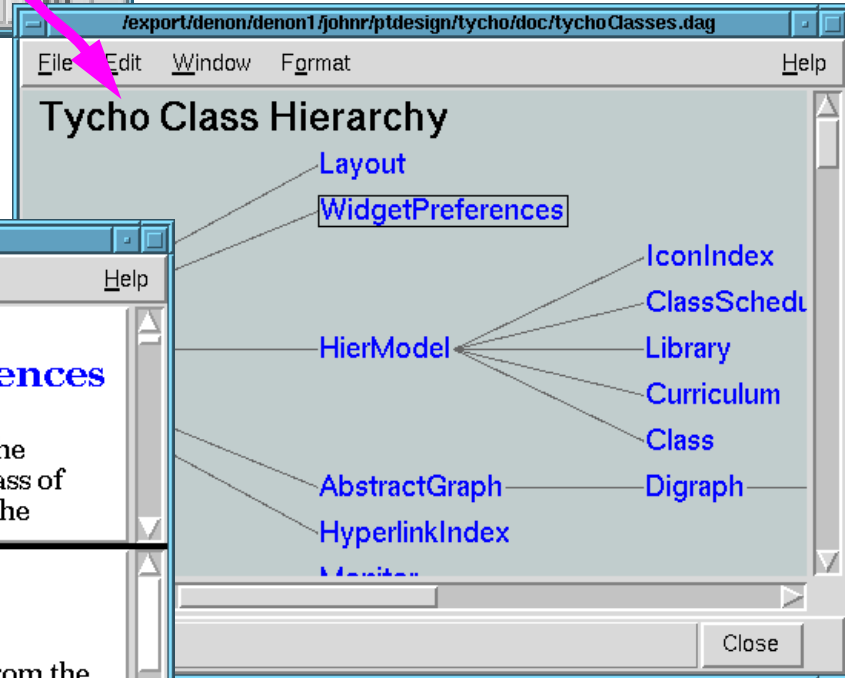
```
#####  
# Version: 0/0/WidgetPreferences.tcl 1.38 07/07/97  
# Author: John Reekie  
#####  
# Copyright (c) 1996-1997 The Regents of the University of California.  
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#####
```

## Multiple languages:

- ✓ [incr Tcl]
- ✓ Java

Generate

Hyperlink



```
class ::tycho::WidgetPreferences
    assign
    different
    excludeoptions
    get
    groupcget
    group
    groups
    initialize
    prefcget
    preferences
end

excludeoptions group widget args
Exclude one or more options of a widget from the subscription mechanism. Once excluded, requests
```

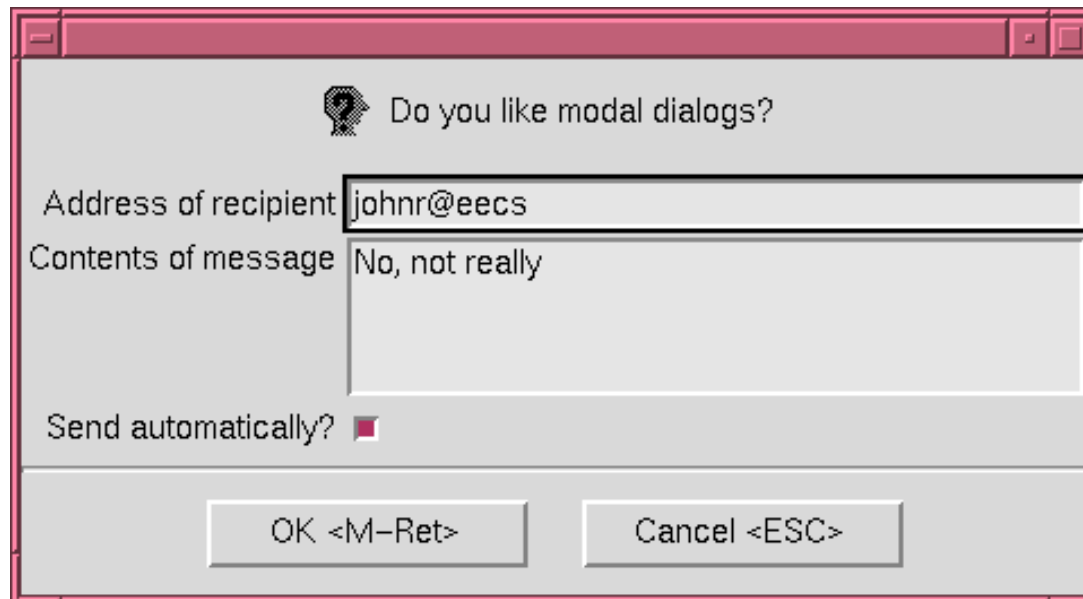


## User interface components

Components are customizable by:

- parameters
- inheritance

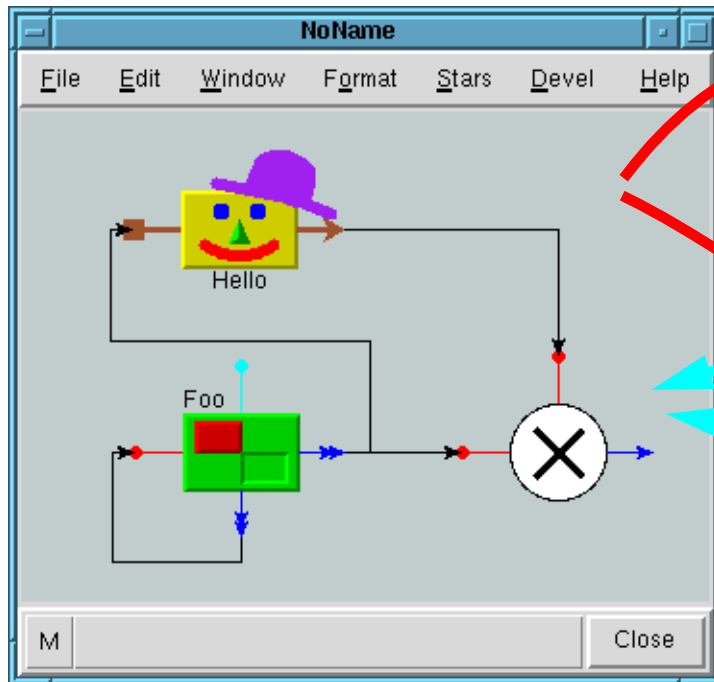
```
::tycho::query "Do you like modal dialogs?" {  
  {line address "Address of recipient" {johnr@eecs}}  
  {lines contents "Contents of message" {No, not really} 4}  
  {check auto "Send automatically?" 1}  
}
```



# Model-view architecture

- Flexible data representations
- Unbounded history mechanism
- “Publish-and-subscribe”

## View/Controllers

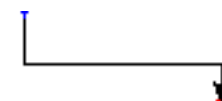


## Layout model

*vertex0* →



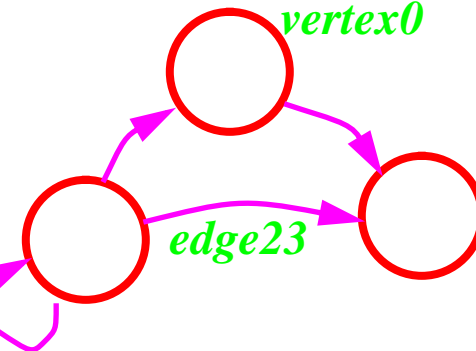
*edge23* →



*Publish*

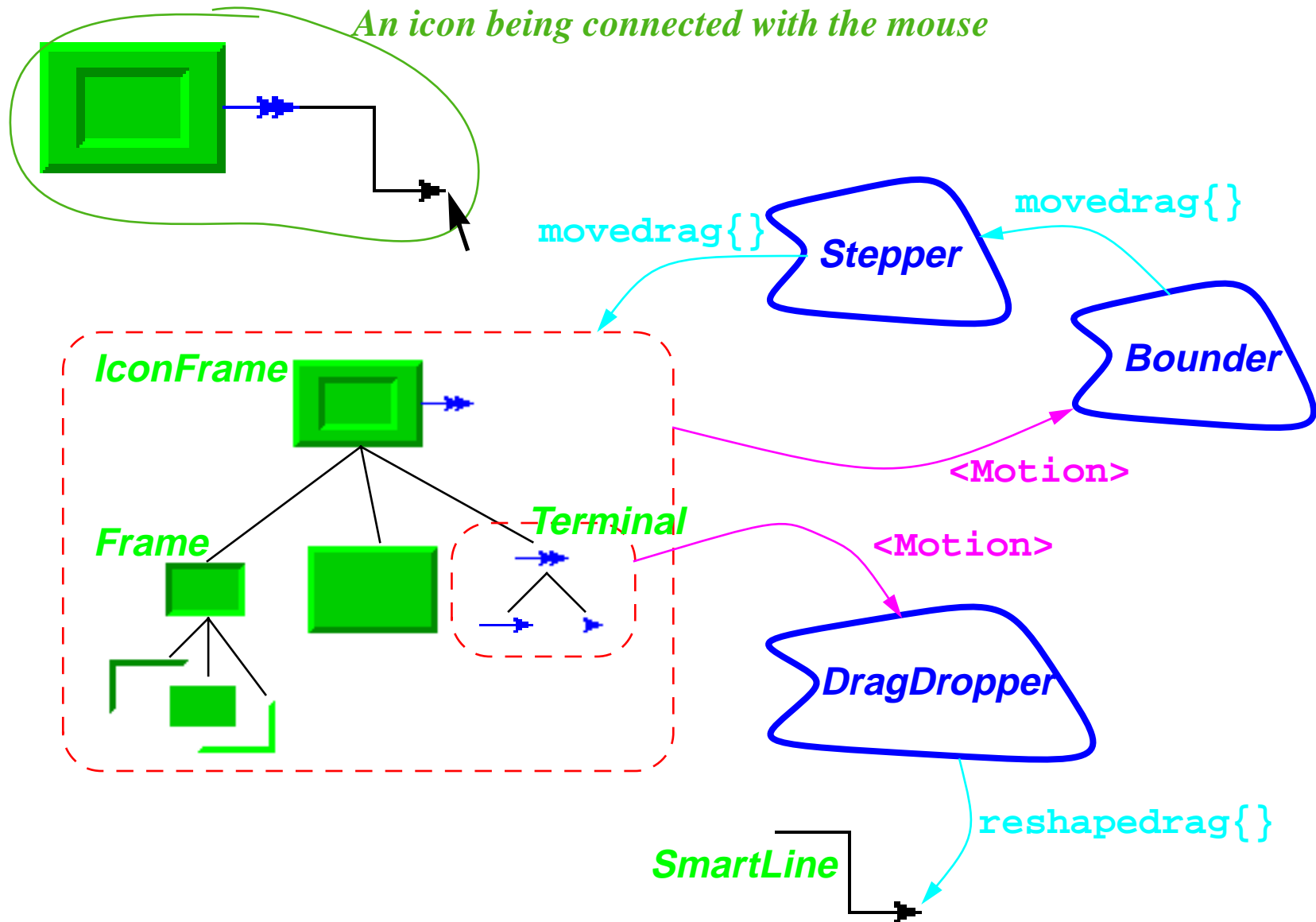
## Semantic model

*vertex0*



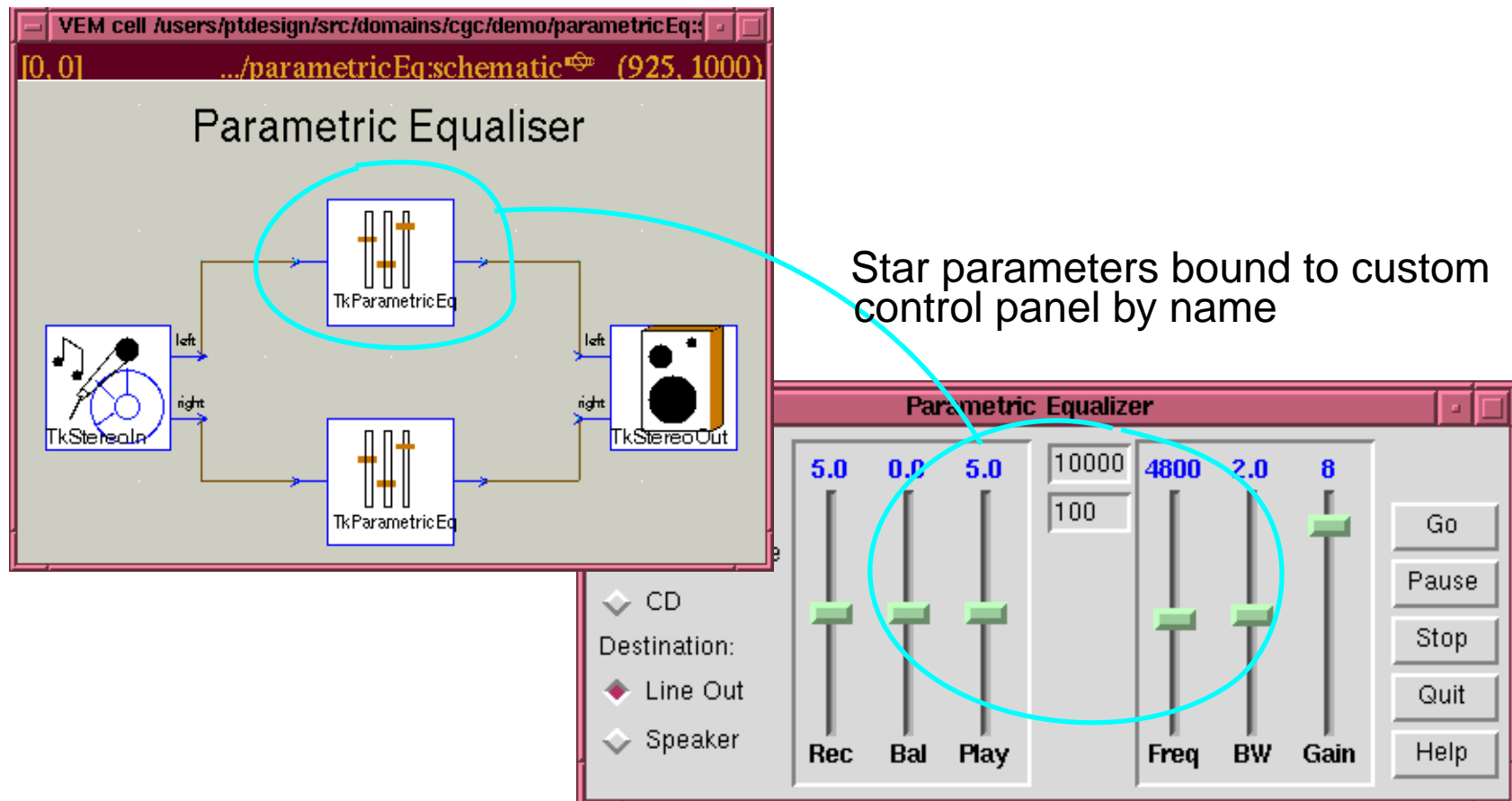
*Notify*

# Hierarchical graphics and interactors



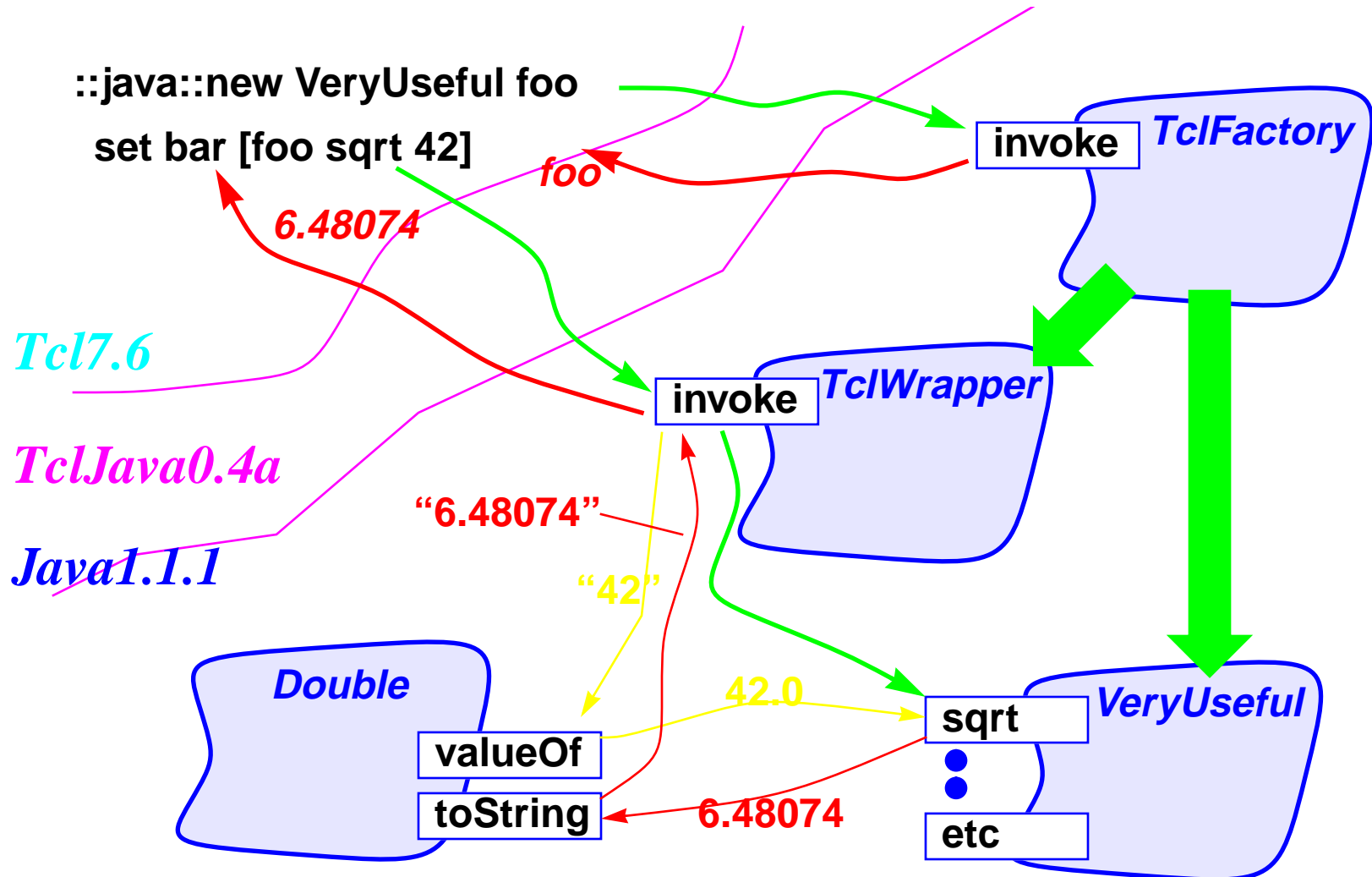
## Custom simulation interfaces

- Ptolemy generates a Tcl-Tk package, which Tycho compiles
- User-interface uses Tycho infrastructure
- Tycho “schedules” real-time executions



## Tcl ↔ Java

- WELD i/f prototype: Tcl U/I, Java network access
- Updating needed: Tcl8.0, Java 1.1.x, object references





## Status

- **Version 0.2 released June 97**
  - ✓ <http://ptolemy.eecs.berkeley.edu/tycho/>
  - ✓ Application framework
  - ✓ Text editors and user interface components
  - ✓ Automatic documentation
  - ☞ Graphical and tree viewers, Tcl profiler
- **Version 0.2.1 scheduled for Fall 97**
  - ☞ Itcl 3.0 (the byte-compiler version!)
  - ☞ New Java interface
  - ✓ “Network-aware”: HTTP, FTP, mailto, WELD
  - ☞ Graphical editing support

## Concluding remarks

- For user interface development, Tk is flexible and powerful.
- [incr Tcl] and [incr Tk] greatly improve program structure and clarity.
- [Incr Tcl]/[incr Tk] is portable: Tycho runs on UNIX and Windows.
- Development at this scale (85 kloc) is hampered by poor performance and lax parsing.
- Our experiments with Tcl + Java are very positive:
  - Java is easy to learn and use, and has extensive libraries.
  - Tcl/Tk simplifies user interface development and scripting.
  - An updated, platform-independent interface is essential.
- Hearty thanks to those who developed infrastructure we have used: Michael McLennan, John Ousterhout, Stephen Uhler, Mark L. Ulferts.