



Kepler

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LTER Network Office





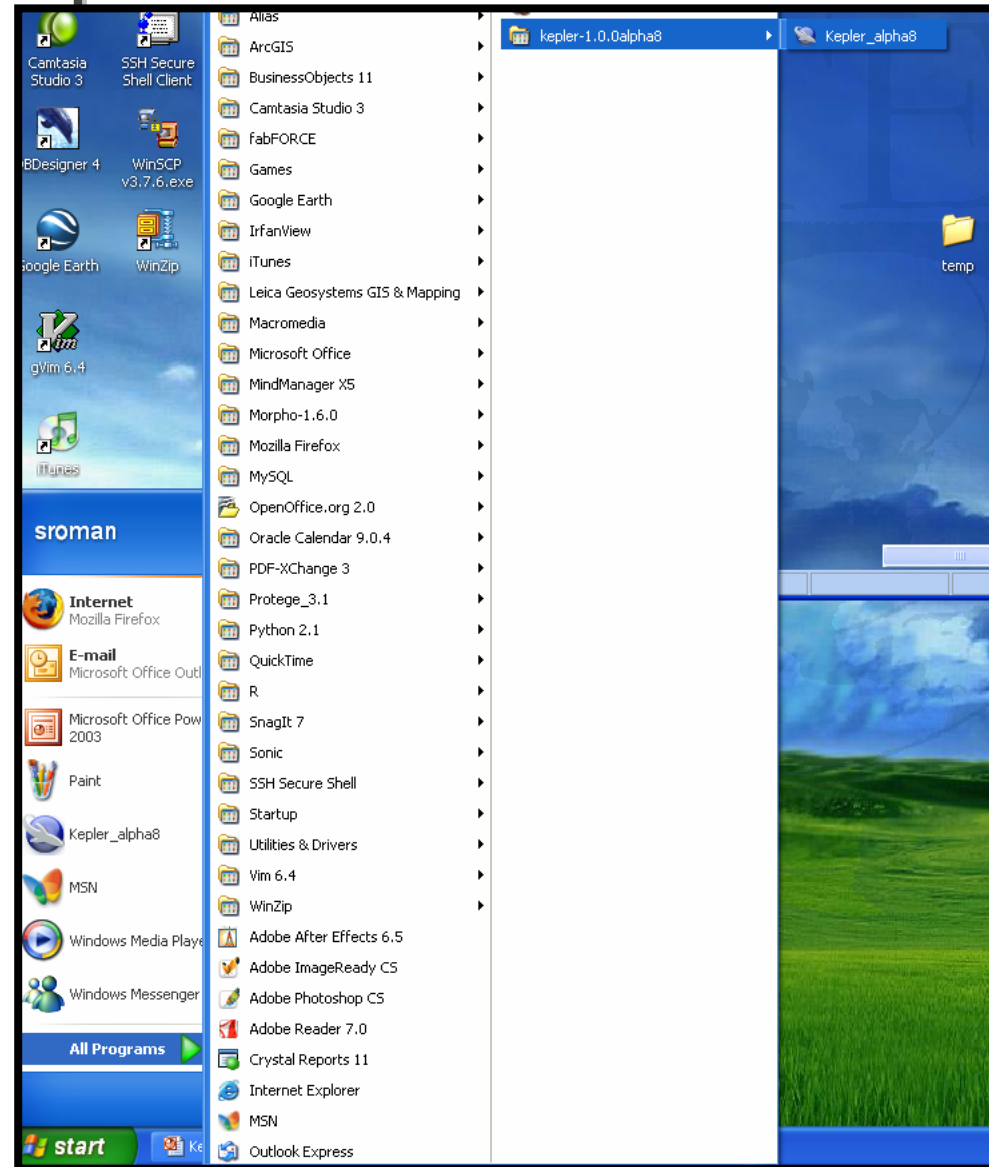
Download Kepler

- Kepler website: www.kepler-project.org
- Click on the Downloads link
- Right-click kepler-1.0.0alpha8-jre.exe
- Save to desktop
- Double click on installer
- Accept all defaults EXCEPT: install to c:\ not to Program Files
- When install is finished, Kepler-alpha8.exe should be in your start menu
 - start it



SEEK Open Kepler

- Start
- My Programs
- Kepler



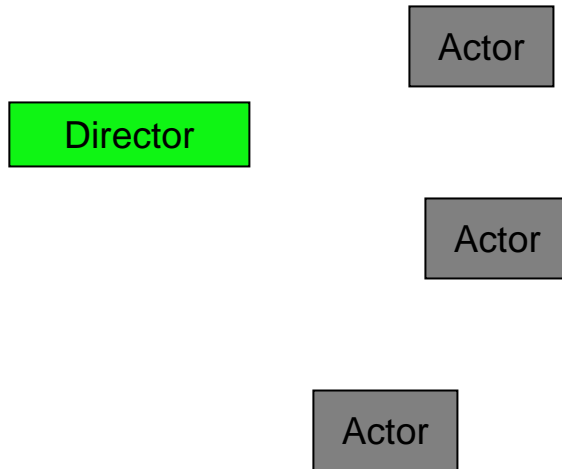


Kepler start up screen





Director/Actor Metaphor



Actors know HOW to act..know their part
Directors know WHEN they should act

Kepler Directors:

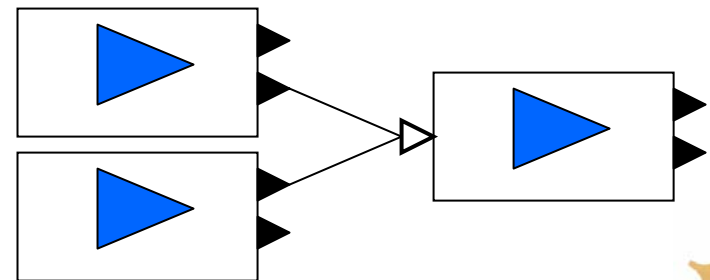
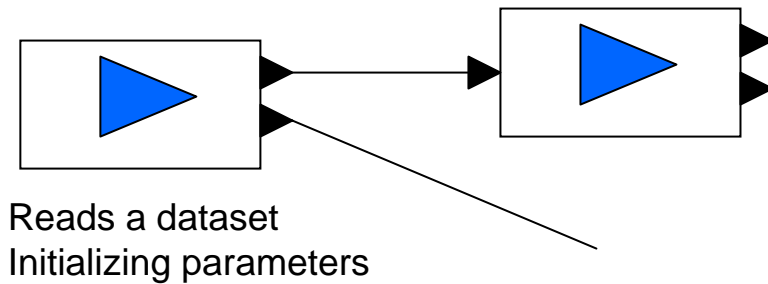
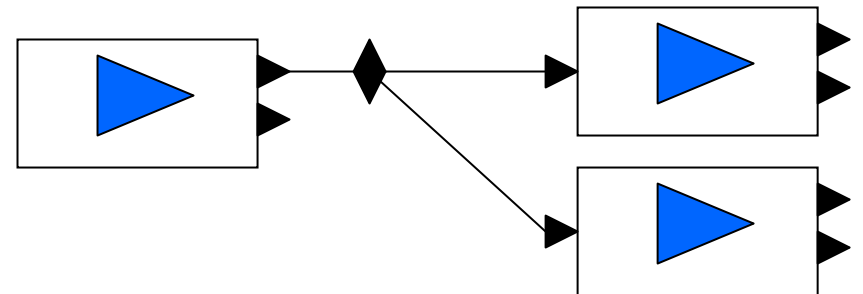
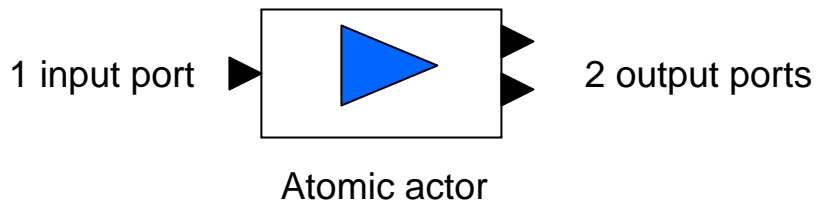
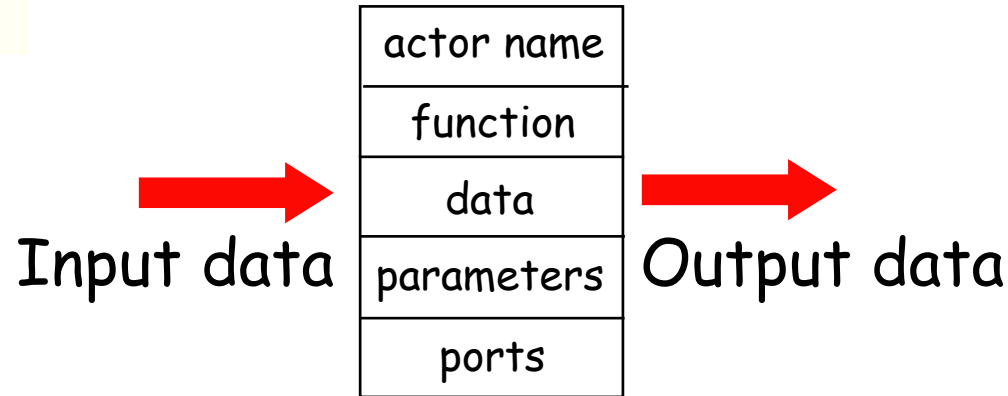
1. Continuous Time
2. Discrete Event
3. Process Network: procedural
4. Synchronized Data Flow: subset of Process Net

- Directors define the model of computation to be used in the workflow
- Every workflow must specify a director



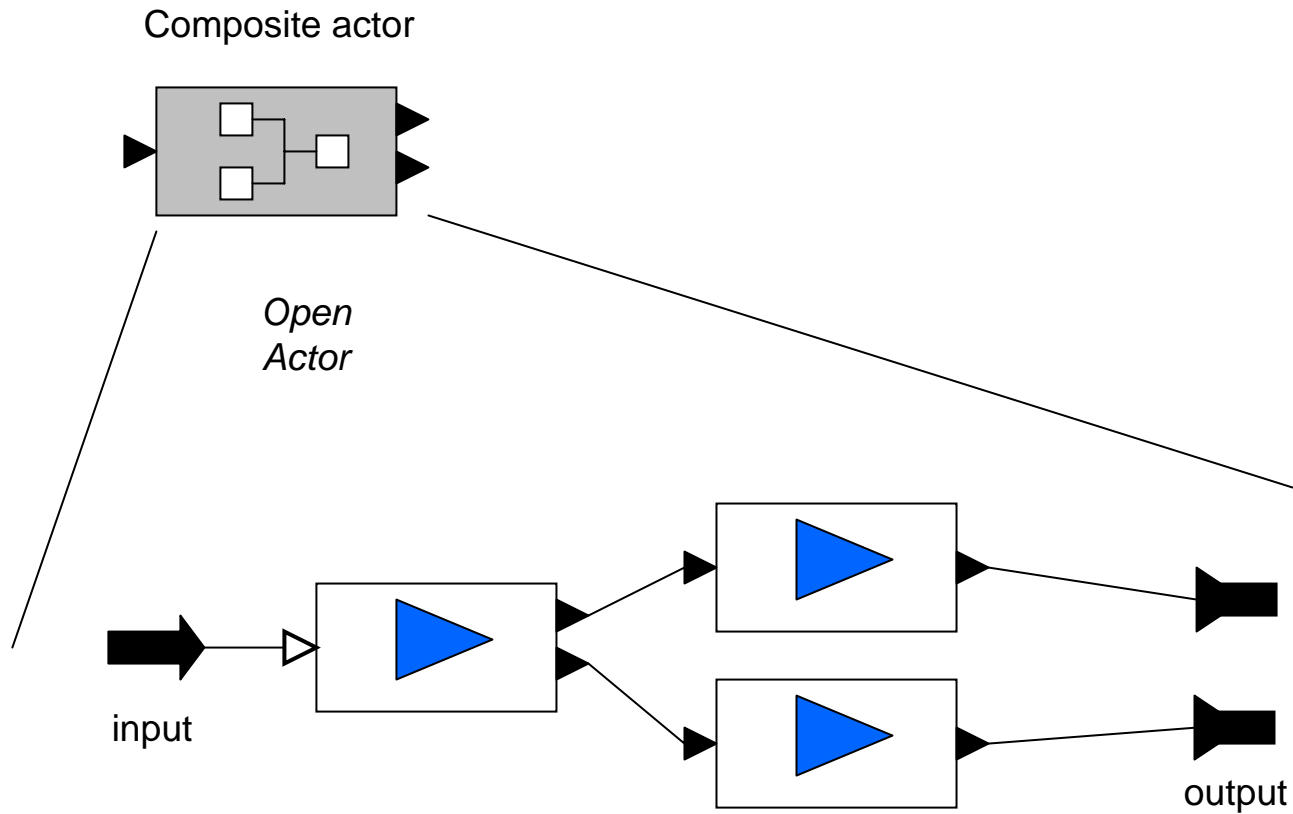


Actors & ports





Composite Actors





New Graph Editor

jar:file:/C:/Programs/kepler-1.0.0alpha8.jar!/ptolemy/configs/kepler/intro.htm

File Help

Open File Ctrl+O
Open URL
New
Save Ctrl+S
SaveAs
Print Ctrl+P
Close Ctrl+W
Exit

Kepler: A System for Scientific Workflows

Graph Editor
FSM Editor
Modal Model
Interface Automaton Editor
Text Editor
Expression Evaluator

Version: 1.0.0alpha8

SDM CENTER

SEEK

Ptolemy

GEON
CYBERINFRASTRUCTURE
FOR THE GEOSCIENCES

ROADNet

EOL

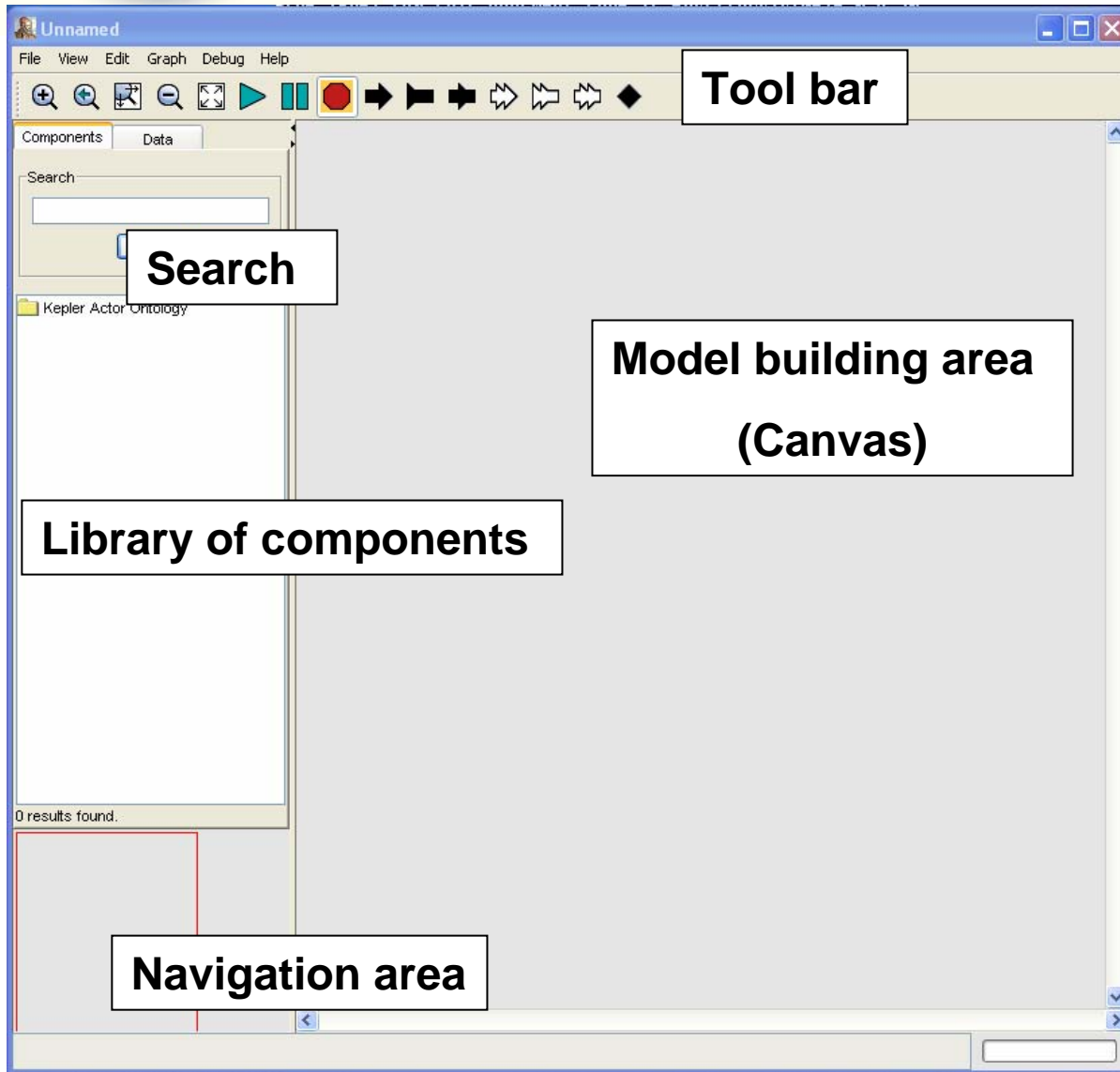
Kepler (<http://kepler-project.org>) is a collaboration between computer and domain scientists with:

The SEEK project <http://seek.ecoinformatics.org>
The SDM Center <http://sdm.lbl.gov/sdmcenter>
The Ptolemy project <http://ptolemy.eecs.berkeley.edu>
The GEON project <http://www.geongrid.org>
The EOL project <http://eol.sdsc.edu>
The ROADNet project <http://roadnet.ucsd.edu>

December 16, 2005



SEEK Graph Editor

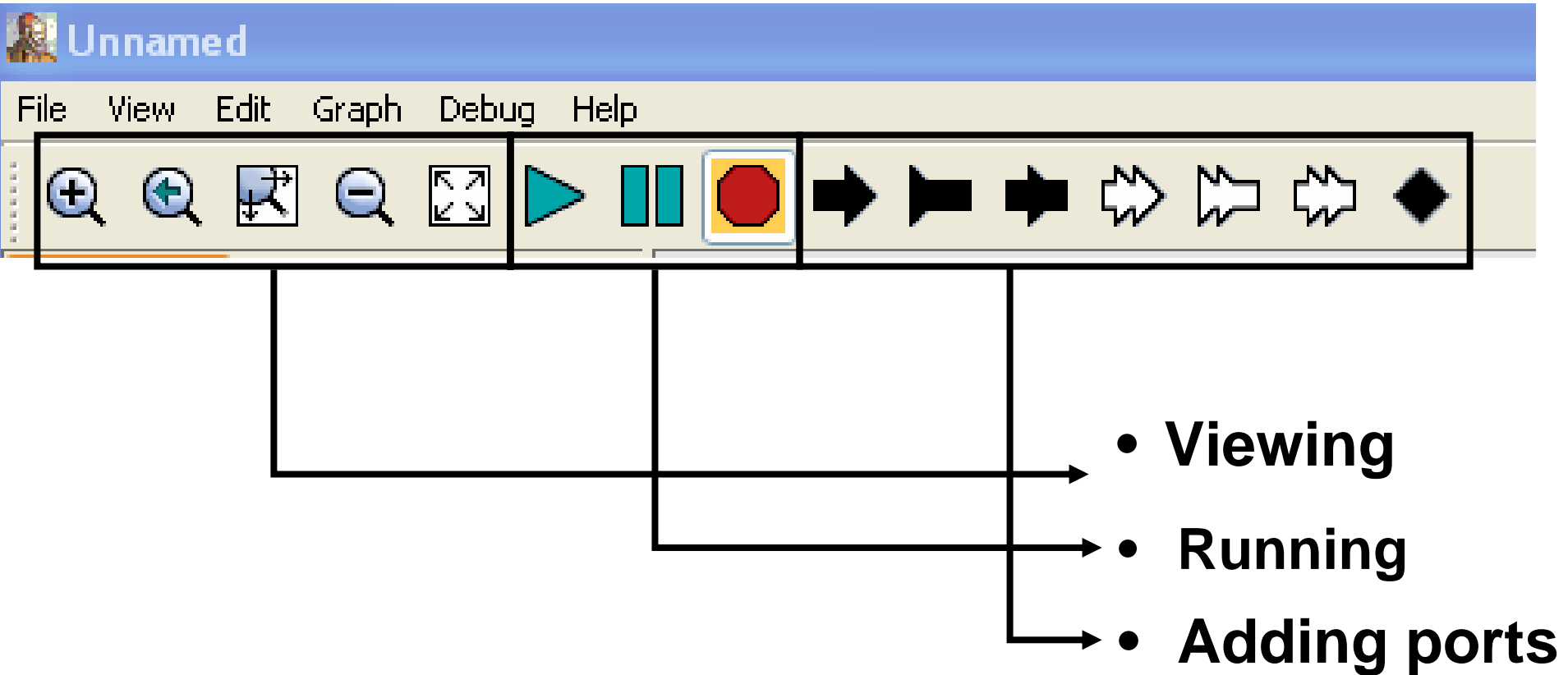


- The graph editor
 - Tool bar
 - Data tab
 - Component tab
 - Canvas
 - Overview pane

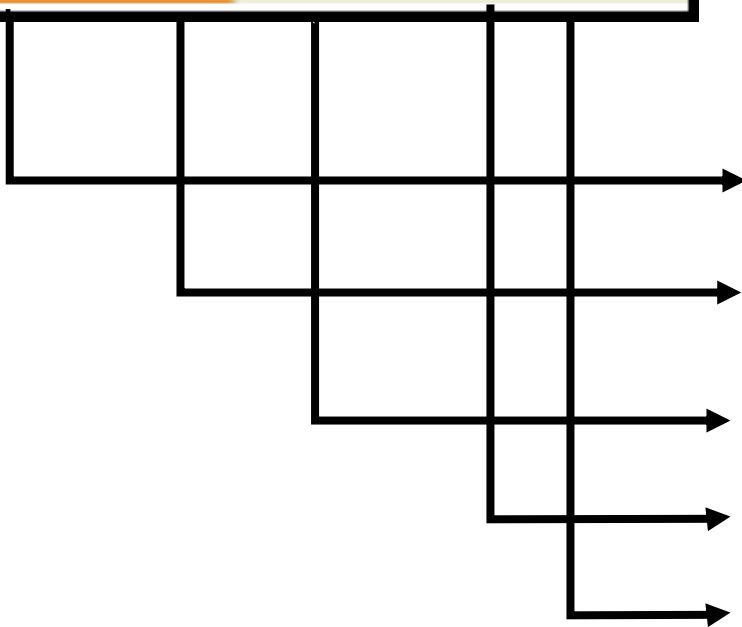




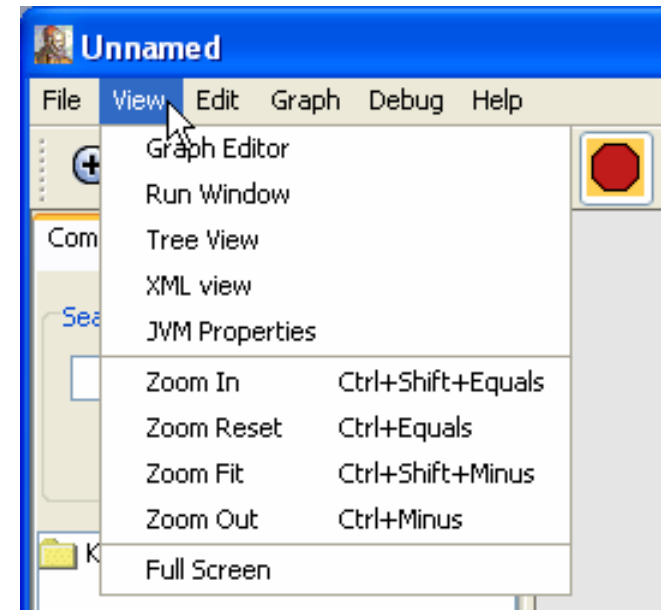
Tool Bar



SEEK Viewing

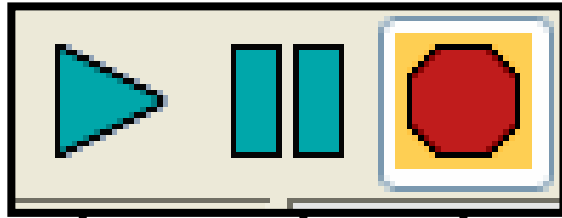


- Zoom In
- Zoom Reset
- Zoom Fit
- Zoom Out
- Full Screen





Running Model

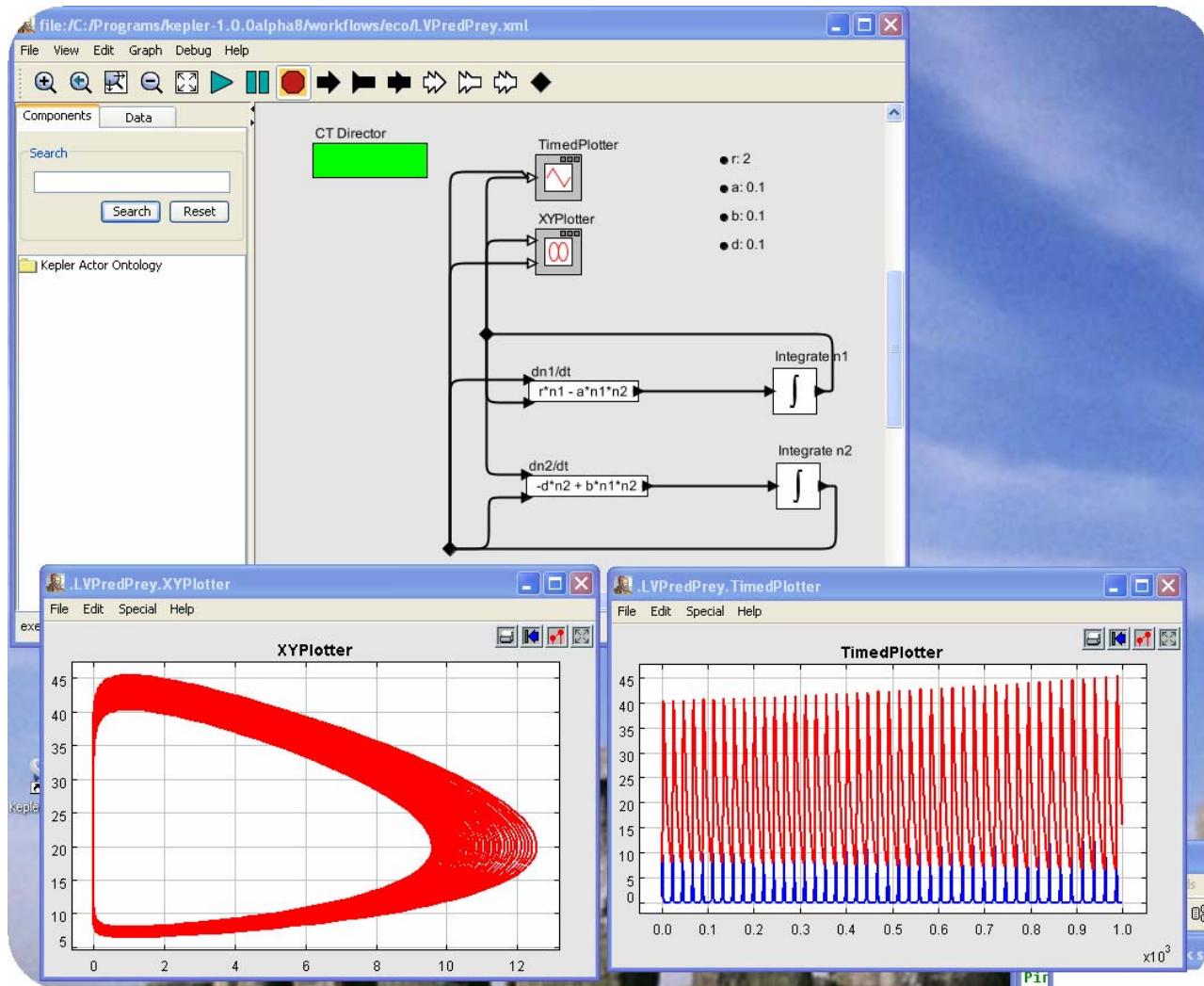


- Run or resume model
- Pause the model
- Stop the model



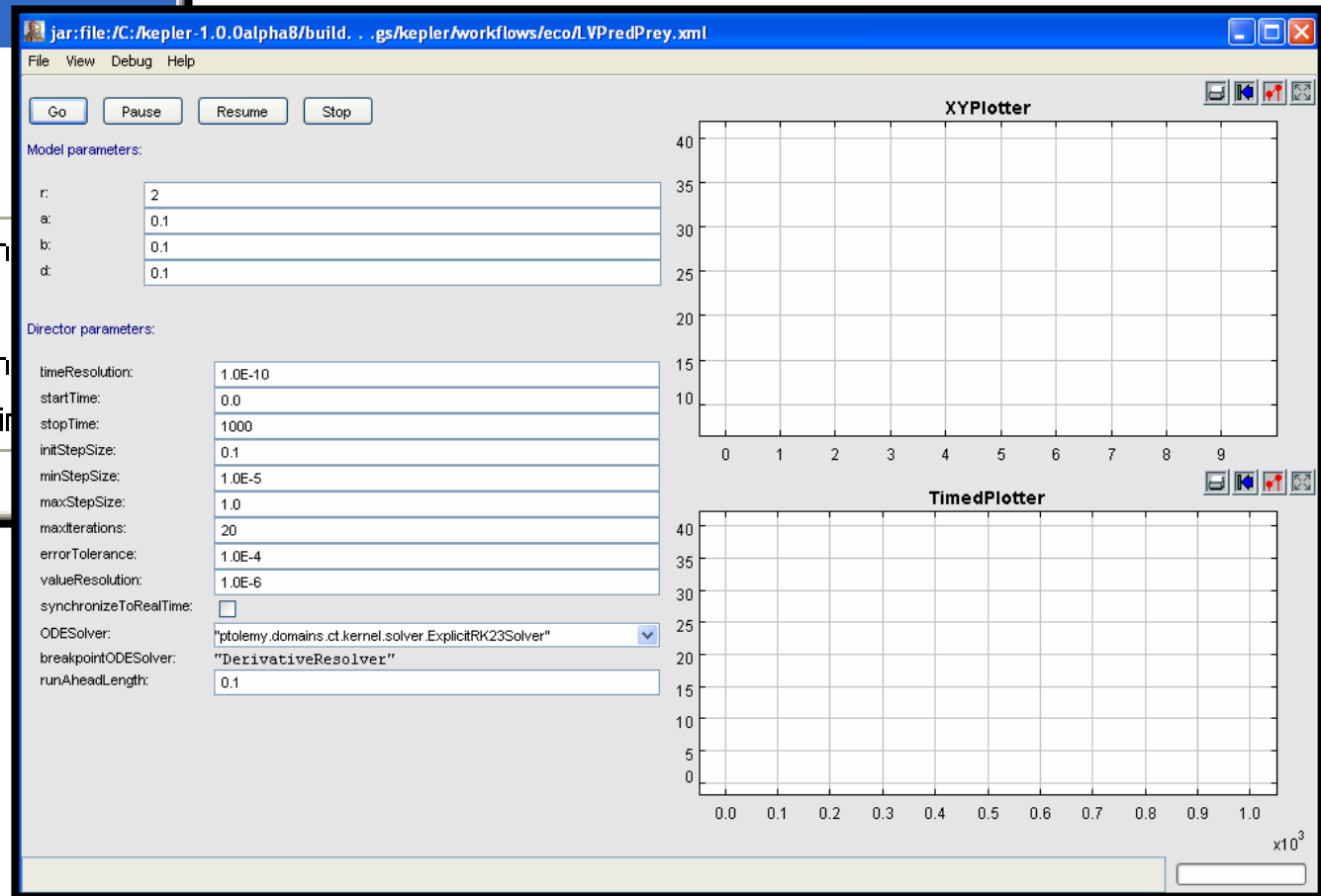
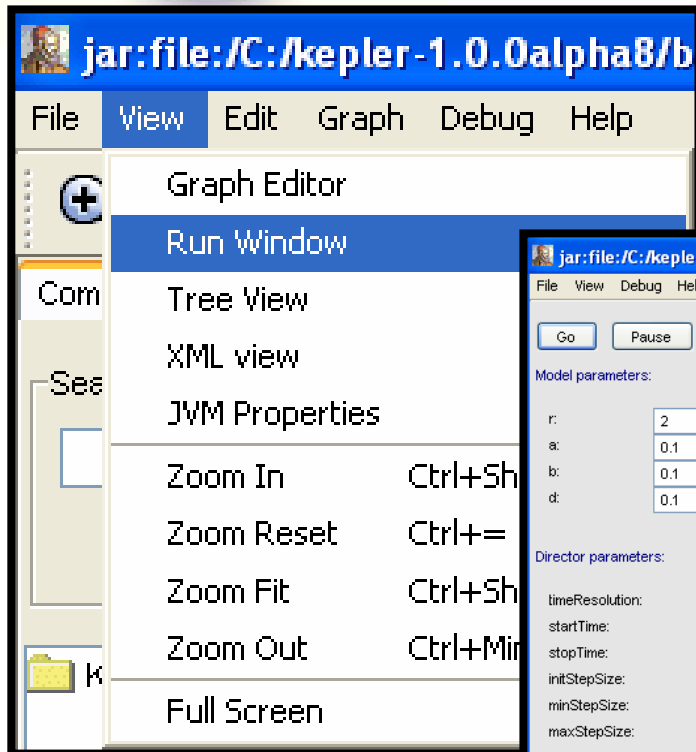


Running Model

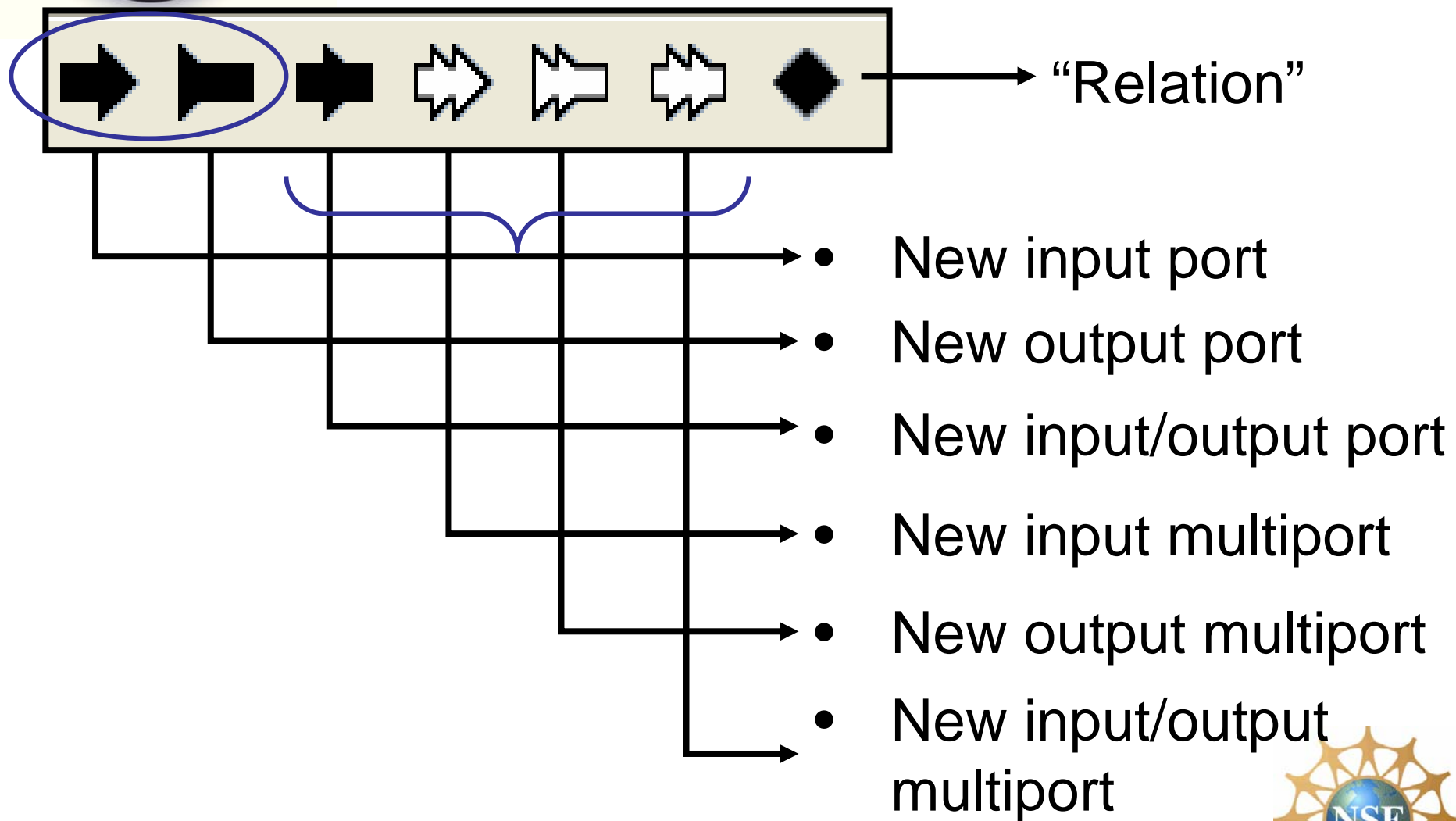




Running Model Run Window



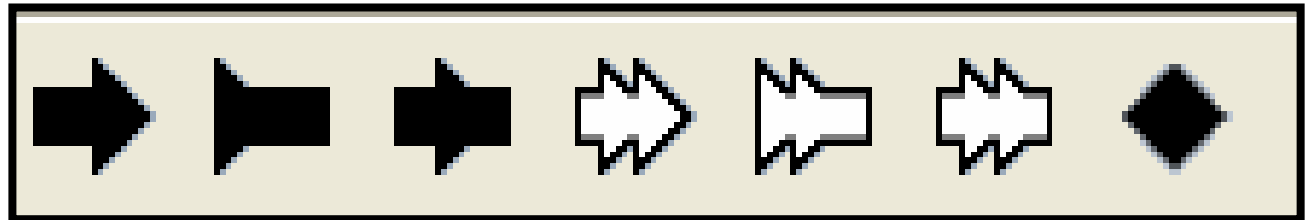
SEEK Adding Ports



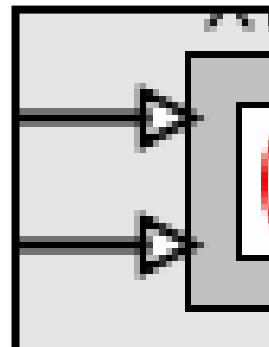


Adding Ports

- There are two ways to add ports
 - One to connect workflows (AKA composite actors)

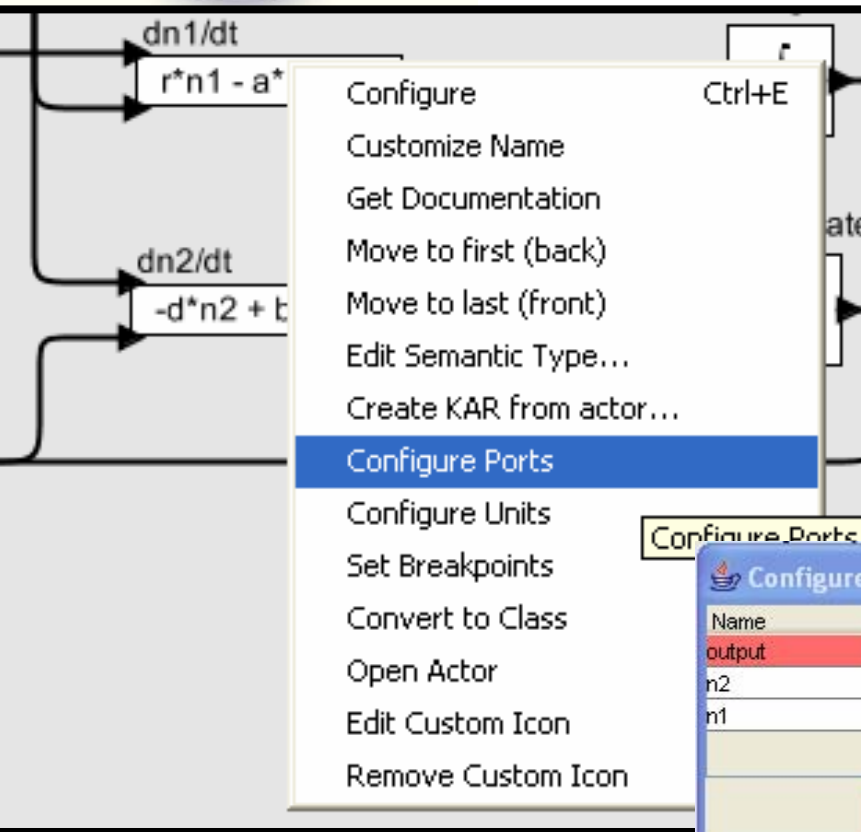


- One to connect actors within workflows





Adding ports to actors



Data Types

String

[text]

Int

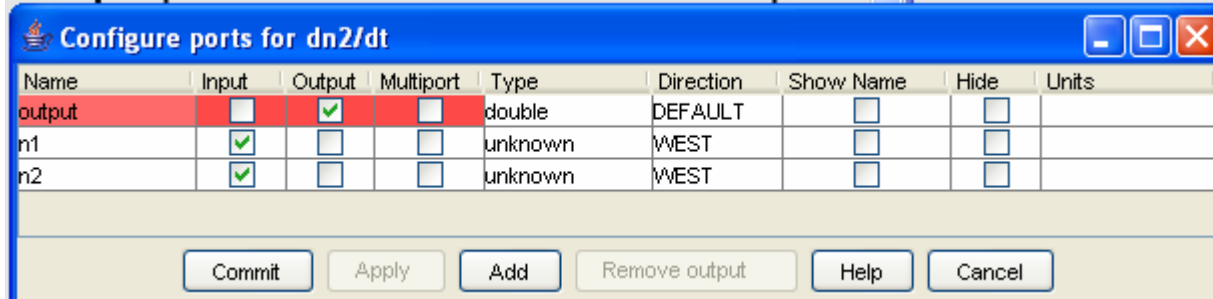
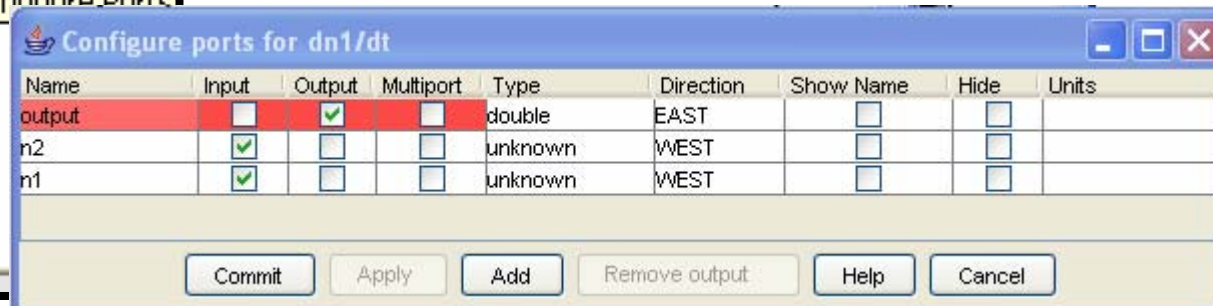
[numeric integer]

Double

[numeric decimal]

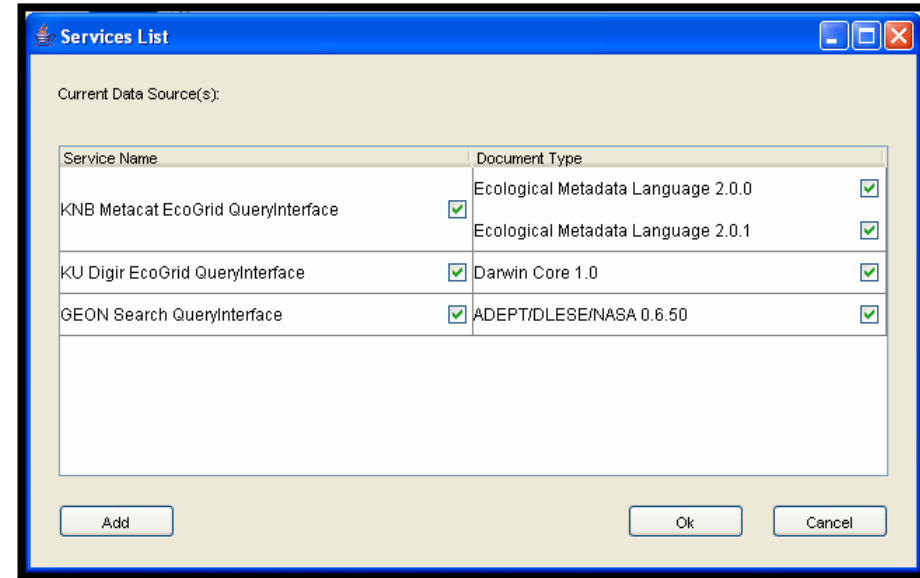
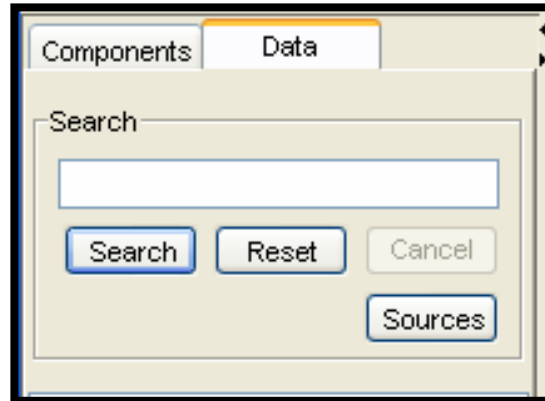
{ } *array*

[n-D matrix]

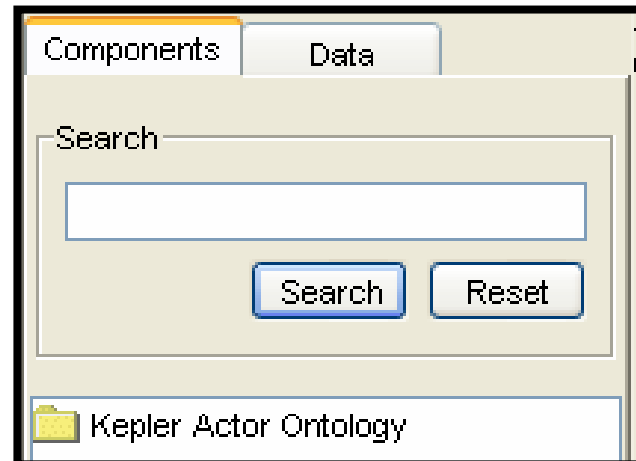


SEEK Searching

- Data

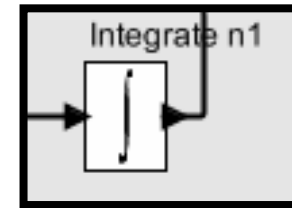


- Actors
- Directors

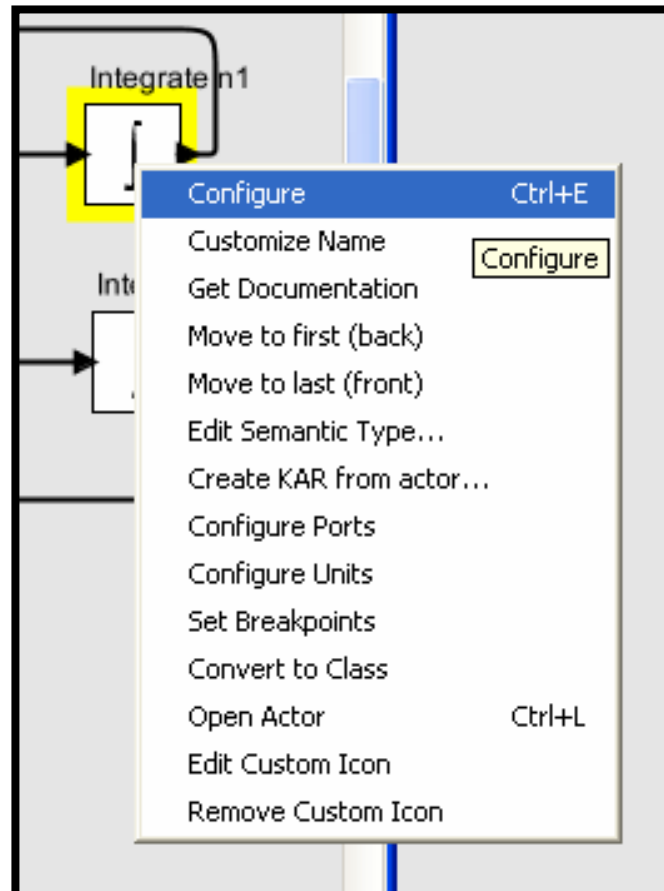




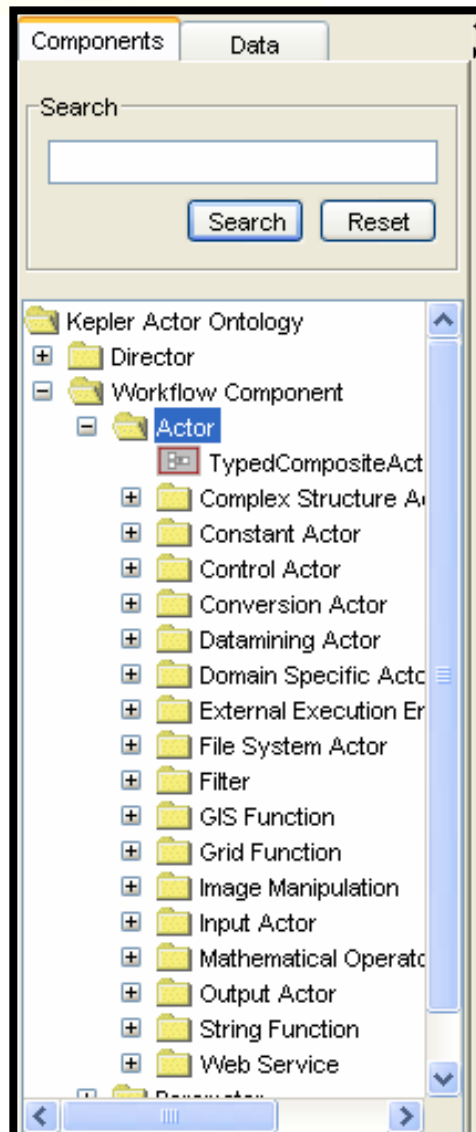
Actors



- Actors are components that execute and communicate with other actors in a model.



SEEK Actor Library

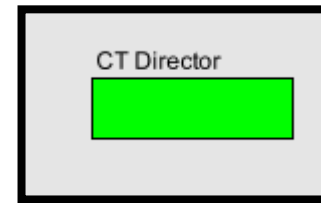


- Variety of Actors grouped based on the type of functions

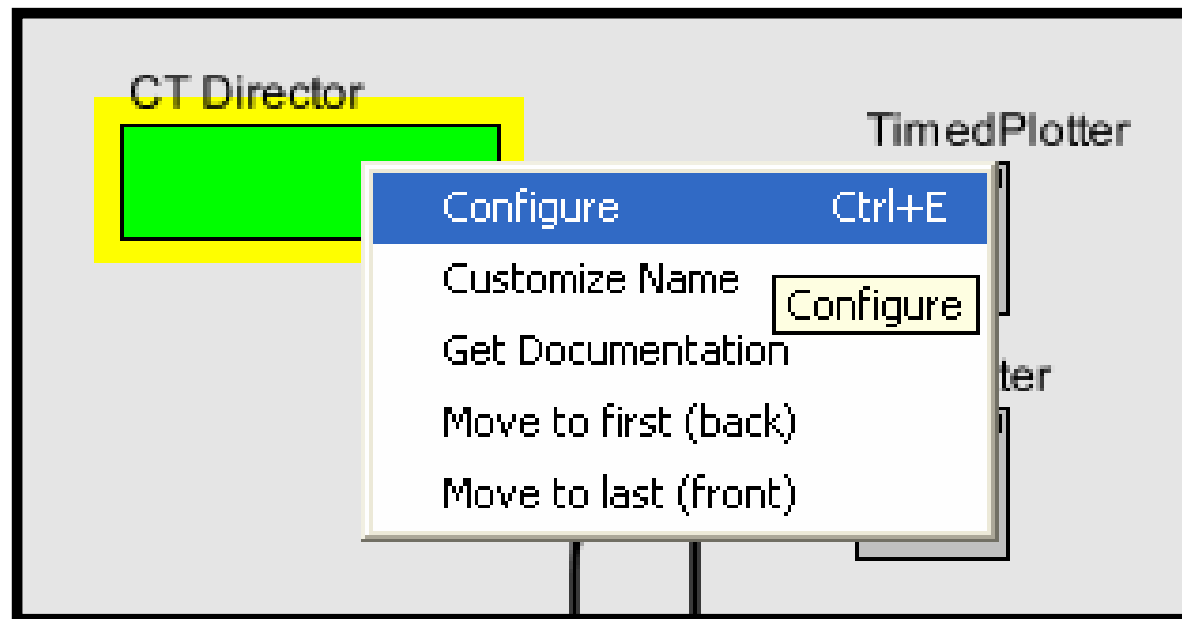




Director




- Governs the execution of a workflow.





SEEK Configuring the Director

Edit parameters for CT Director

 timeResolution: 1.0E-10

startTime: 0.0

stopTime: 1000

initStepSize: 0.1

minStepSize: 1.0E-5


maxStepSize: 1.0

maxIterations: 20

errorTolerance: 1.0E-4

valueResolution: 1.0E-6

synchronizeToRealTime: ☐

ODESolver: "ptolemy.domains.ct.kernel.solver.ExplicitRK23Solver" 

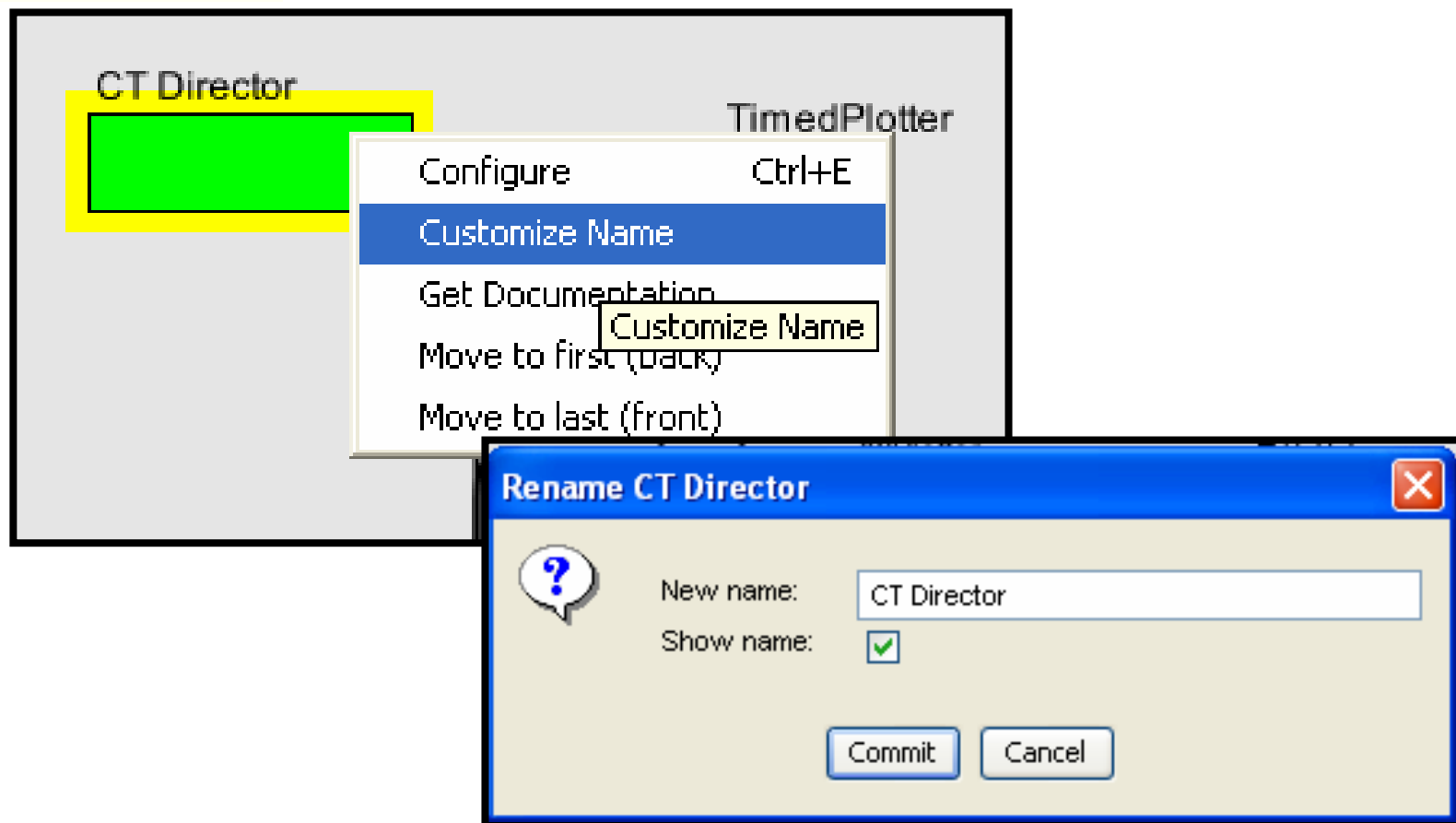
breakpointODESolver: "DerivativeResolver"

runAheadLength: 0.1



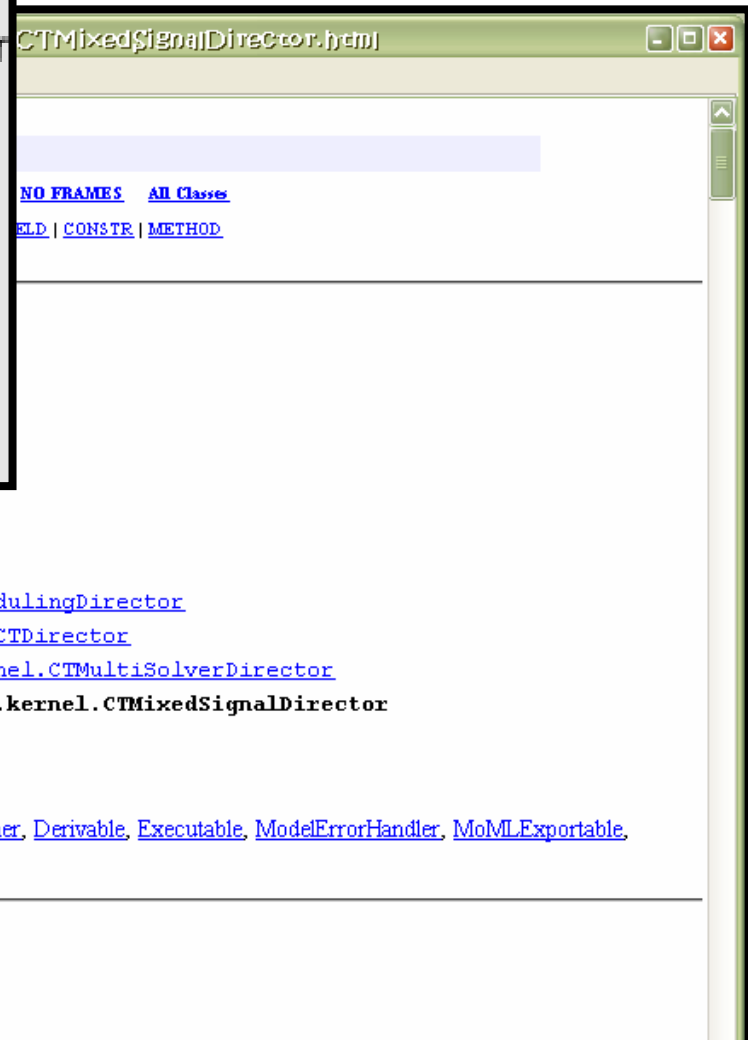
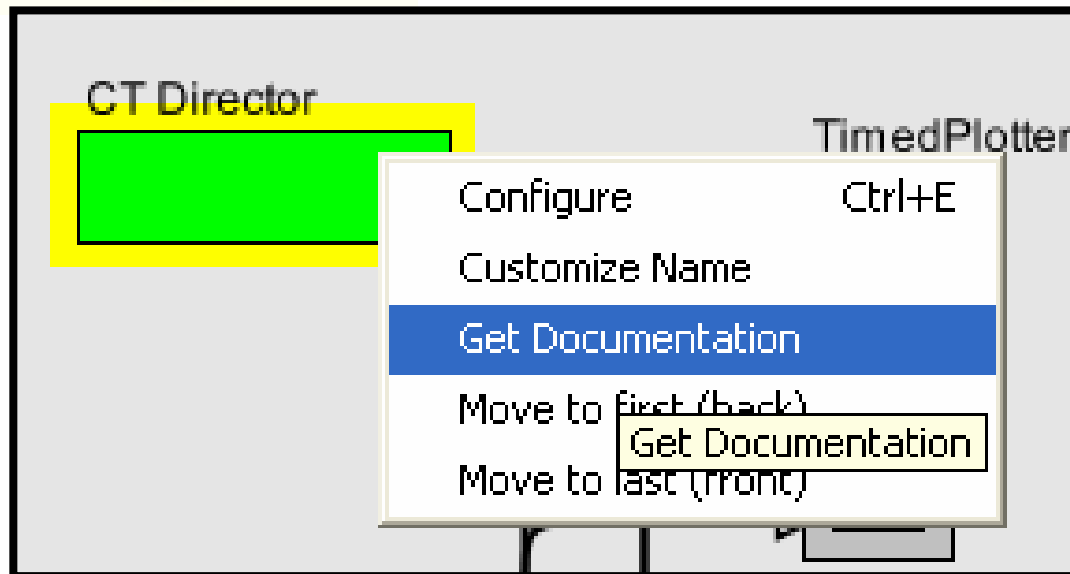


Renaming the Director

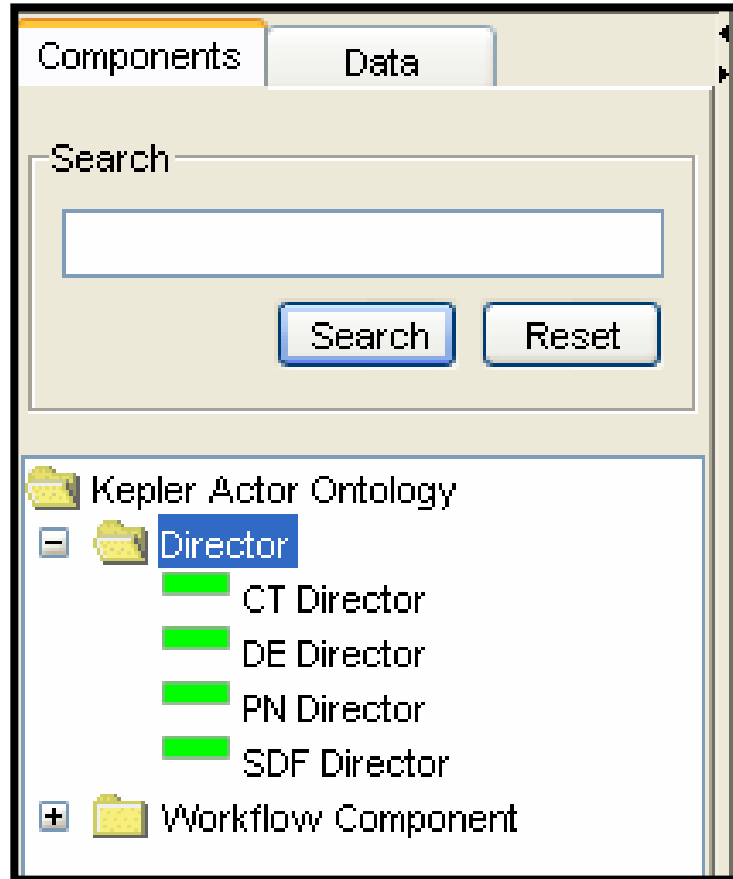




Get documentation



SEEK Director Library



- A variety of directors depending upon the type of model being executed.





Using Kepler

- Executing a ready to run workflow
- Building a model
 - Choosing a director
 - Choosing actors
 - Making connections
 - Building composite actors
 - Saving and running the model



SEEK Opening Kepler

Kepler_alpha8.exe

Opening user library C:\Documents and Settings\sroman\ptolemyII\UserLibrary.xml

...
DEBUG_LEVEL is defaulting to 0 (no output) because the environment variable DBGP
RN was not set.
The value for path //sql...
a
The value for path //sql...
The value for path //sql...
is hsql
KAR Library directories:
8\kar\directors1
The value for path //ser
on01.sdsc.edu:8164/
The selected entity name

Actor Library built from
The selected entity name
The selected entity name
The selected entity name
The selected entity name
The selected entity name
The selected entity name
Done

jar:file:/C:/kepler-1.0.0alpha8/build...jar!/ptolemy/configs/kepler/intro.htm

File Help

Kepler: A System for Scientific Workflows

Version: 1.0.0alpha8

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Welcome to the Kepler scientific workflow tool. You can select from one of the example workflows below or create your own by going to the file menu and selecting new/graph editor. Please send any questions/comments to our developer mailing list at kepler-dev@ecoinformatics.org

Kepler (<http://kepler-project.org>) is a collaboration between computer and domain scientists with:

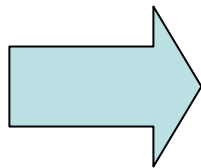
- The SEEK project <http://seek.ecoinformatics.org>
- The SDM Center <http://sdm.lbl.gov/sdmcenter>
- The Ptolemy project <http://ptolemy.eecs.berkeley.edu>
- The GEON project <http://www.geongrid.org>
- The EOL project <http://eol.sdsc.edu>
- The ROADNet project <http://roadnet.ucsd.edu>

December 16, 2005

Opening Kepler



Opening the LV model



jar:file:/C:/kepler-1.0.0alpha8/build. ...jar!/ptolemy/configs/kepler/intro.htm

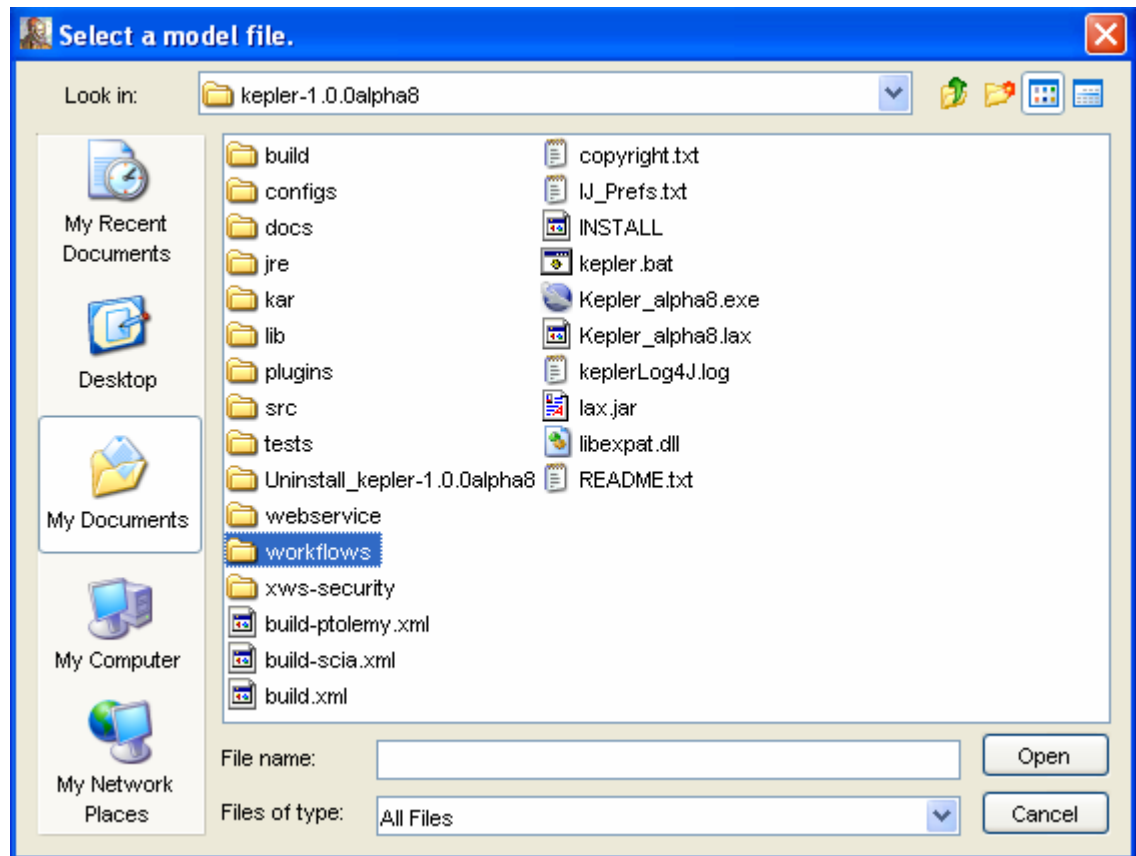
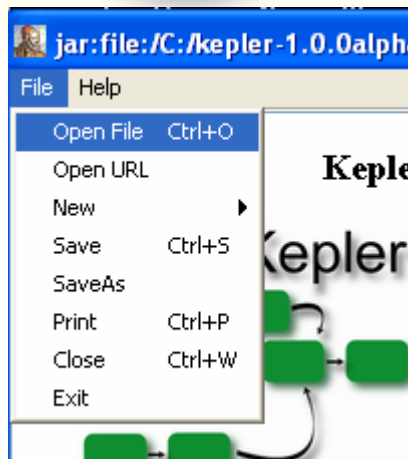
File Help

Using R in Kepler	A link to a collection of workflows which illustrate the use of R in Kepler
EML2 Simple Plot Example	A workflow to test the EML 2.0 ingestion actor.
Promotor Identification Workflow	A workflow that tests a number of the SciDAC actors including the genbank web service query actor and the BLAST actor.
GEON Mineral Classifier	A workflow for modal classification of Igneous rocks.
GEON Map Workflow	GEON geology map integration workflow using web services.
Discrete Logistic	Single species Discrete Logistic model
Lotka-Volterra Predator Prey Model	LV Predator Prey Model
Lotka-Volterra Predator Prey Model with logistic growth	Logistic version of the LV Predator Prey Model
Elk/Wolf Predator Prey Model	Elk/Wolf Predator Prey Model
Biodiversity Index Calculator	Example of Calculations of Various Biodiversity Indices
Orb Image Viewer Workflow	A workflow that displays image data coming from a remote camera via an Antelope ORB server.
Orb Workflow	A workflow that shows a simple use of the Antelope ORB interface.

jar:file:/C:/kepler-1.0.0alpha8/build/kepler-configs.jar!/ptolemy/configs/kepler/workflows/eco/LVPredPrey.xml

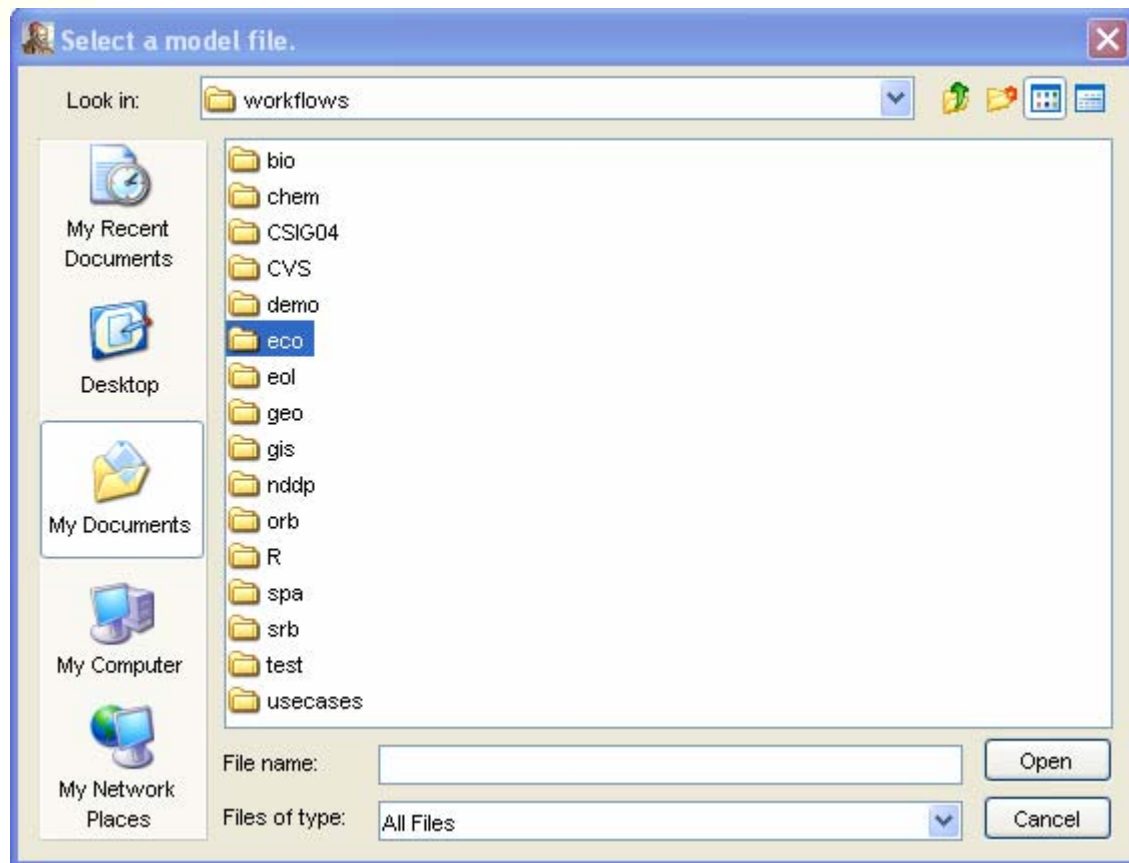


Open Kepler



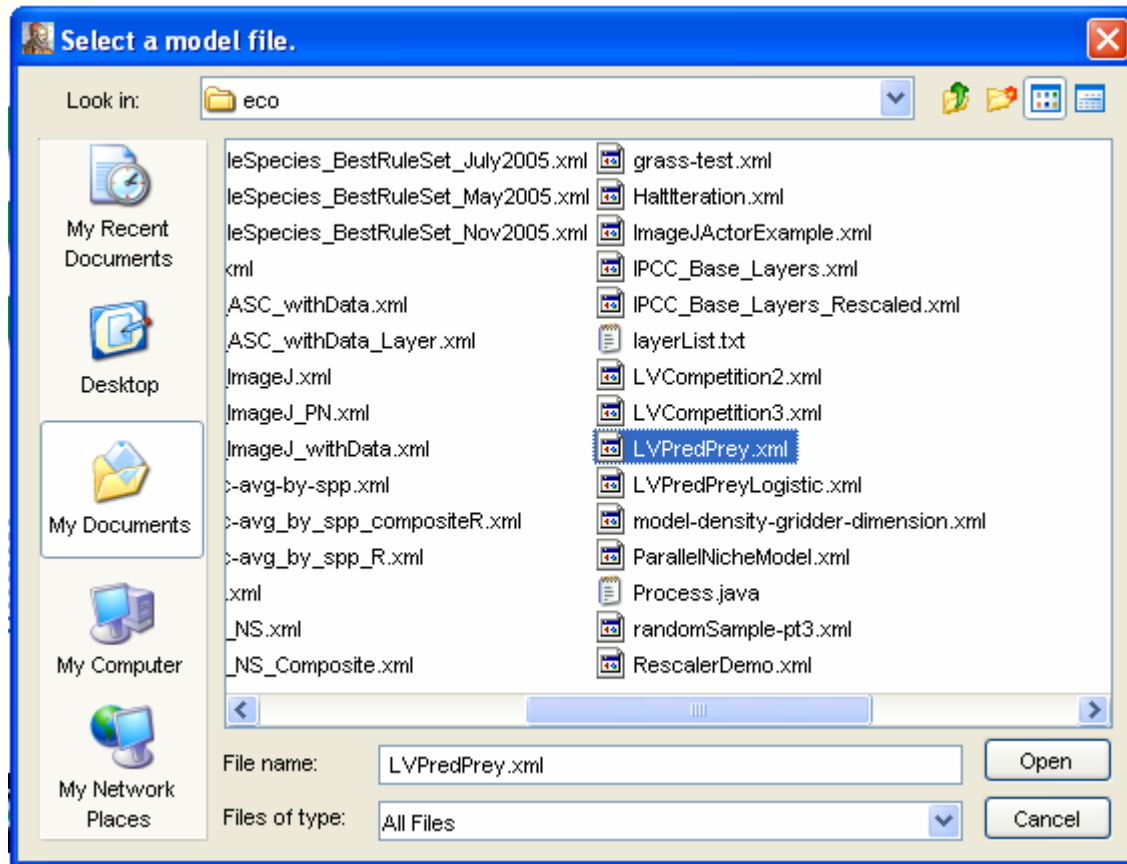


Open the eco folder



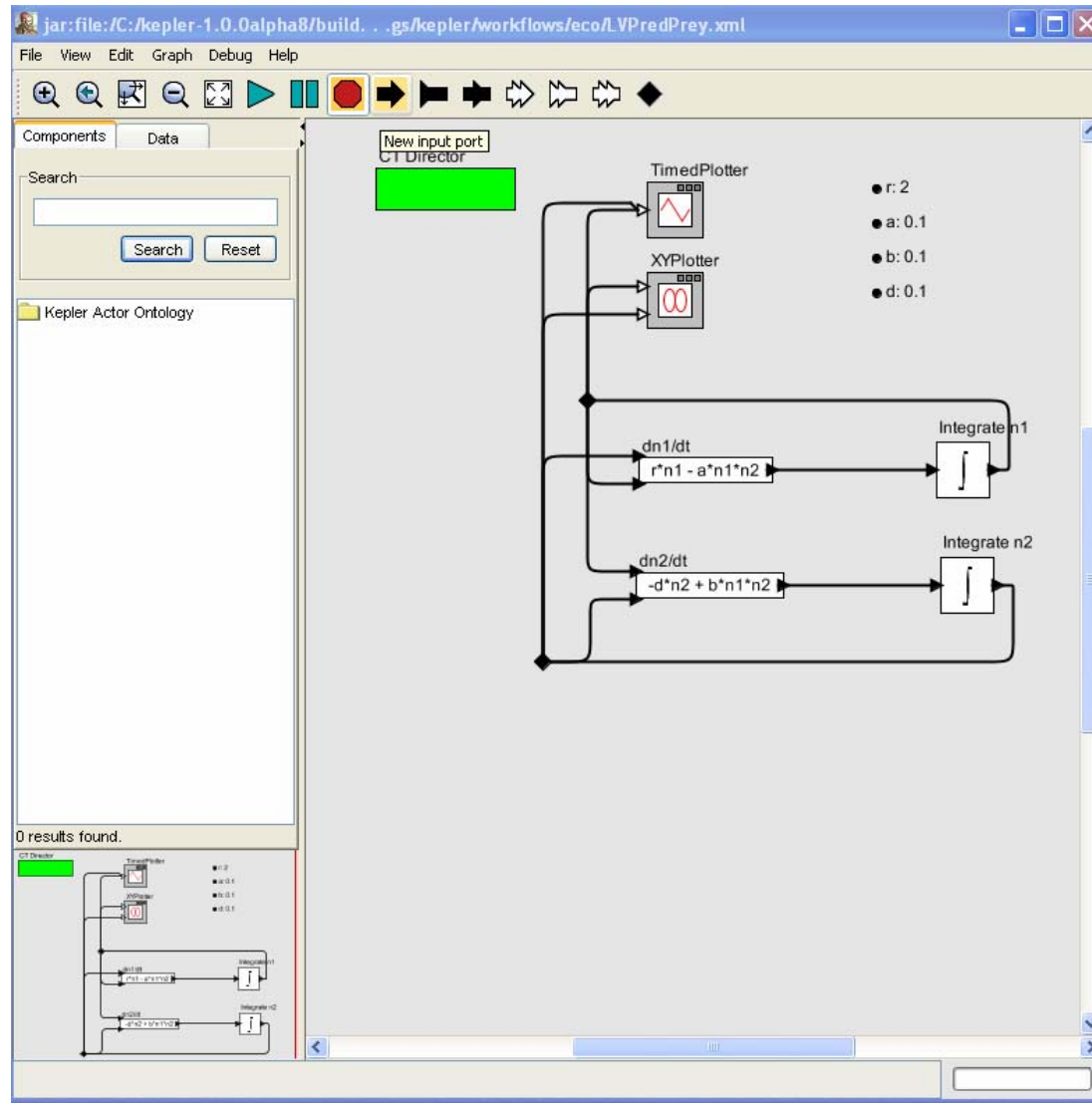


Open LVPredPrey.xml

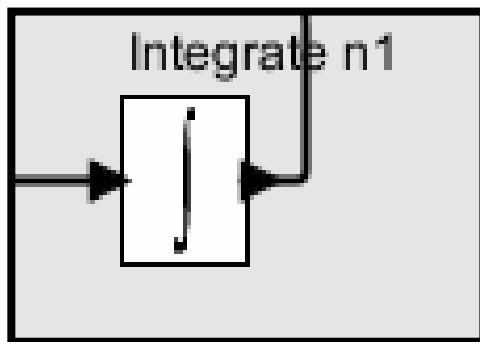
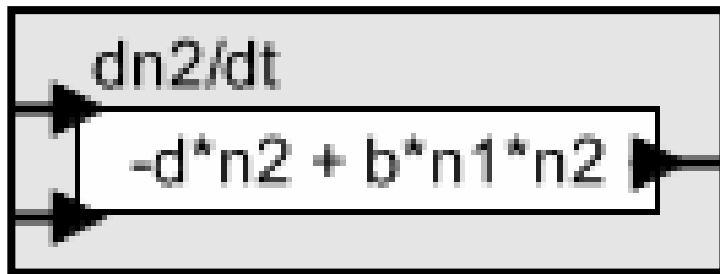




Lotka-Volterra Predator Prey Model

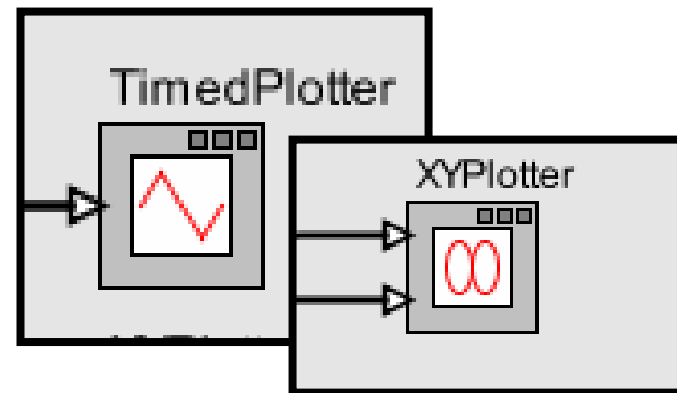


SEEK Actors



□ Integral

- The population growth of species 1 (prey)
- The population growth of species 2 (predator)





Running the model

The screenshot displays the Kepler-1.0.0alpha8 graphical user interface. The main window title is `jar:file:/C:/kepler-1.0.0alpha8/build. . .gs/kepler/workflows/eco/LVPredPrey.xml`. The menu bar includes File, View, Edit, Graph, Debug, and Help. The toolbar contains various icons for zooming, panning, and running the model. A tooltip for the 'Run or Resume the model (Ctrl+R)' button is visible. The 'Components' tab is active, showing a search bar and a list of components including 'Kepler Actor Ontology'. The 'Data' tab is also visible. The 'View' menu is open, showing options like Graph Editor, Run Window, Tree View, XML view, JVM Properties, and zooming options. The 'Run Window' option is highlighted.

jar:file:/C:/kepler-1.0.0alpha8/build. . .gs/kepler/workflows/eco/LVPredPrey.xml

File View Edit Graph Debug Help

Run or Resume the model (Ctrl+R)

CT Director

Search

Search Reset

Kepler Actor Ontology

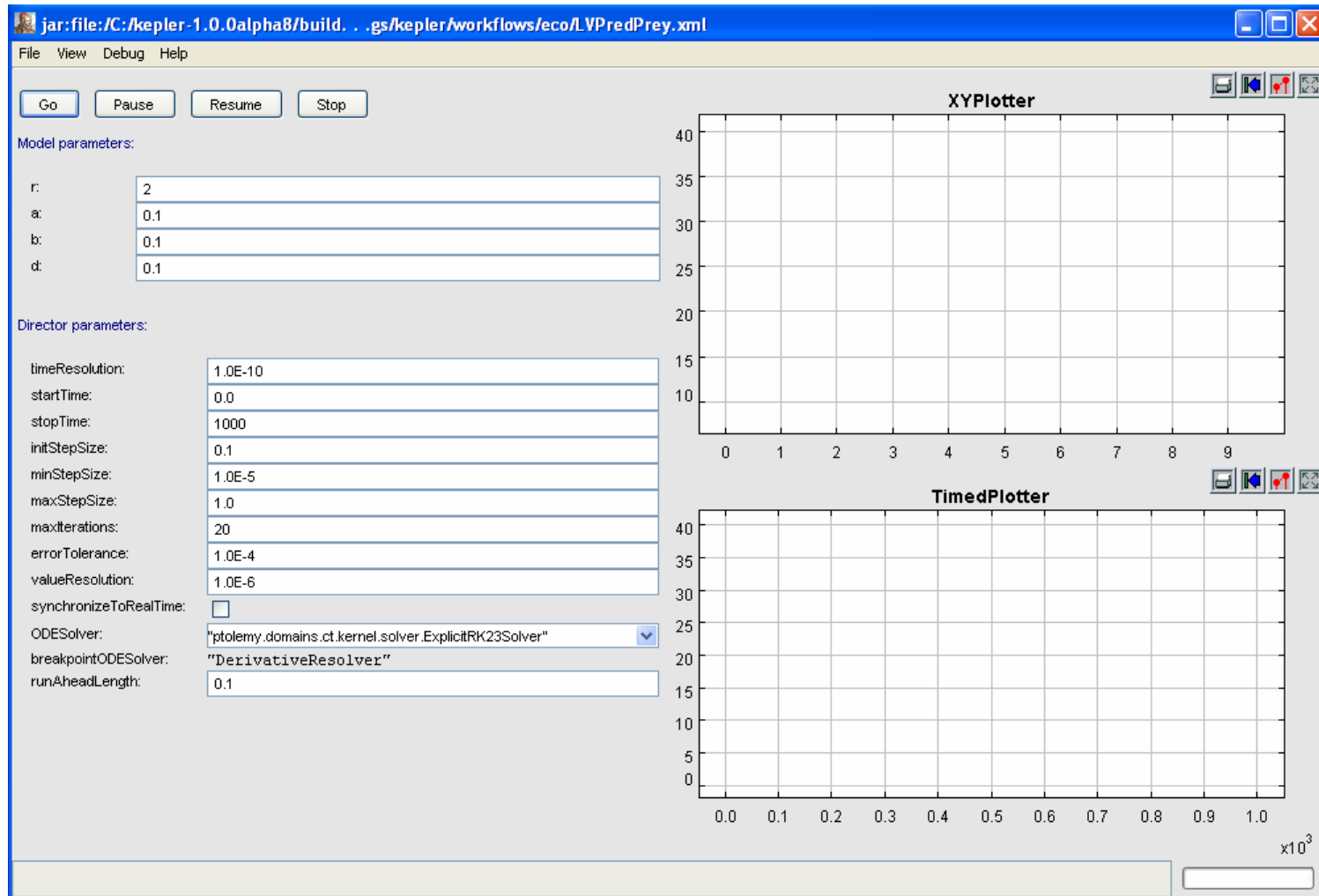
View

- Graph Editor
- Run Window
- Tree View
- XML view
- JVM Properties
- Zoom In Ctrl+Shift+=
- Zoom Reset Ctrl+=
- Zoom Fit Ctrl+Shift+Minus
- Zoom Out Ctrl+Minus
- Full Screen



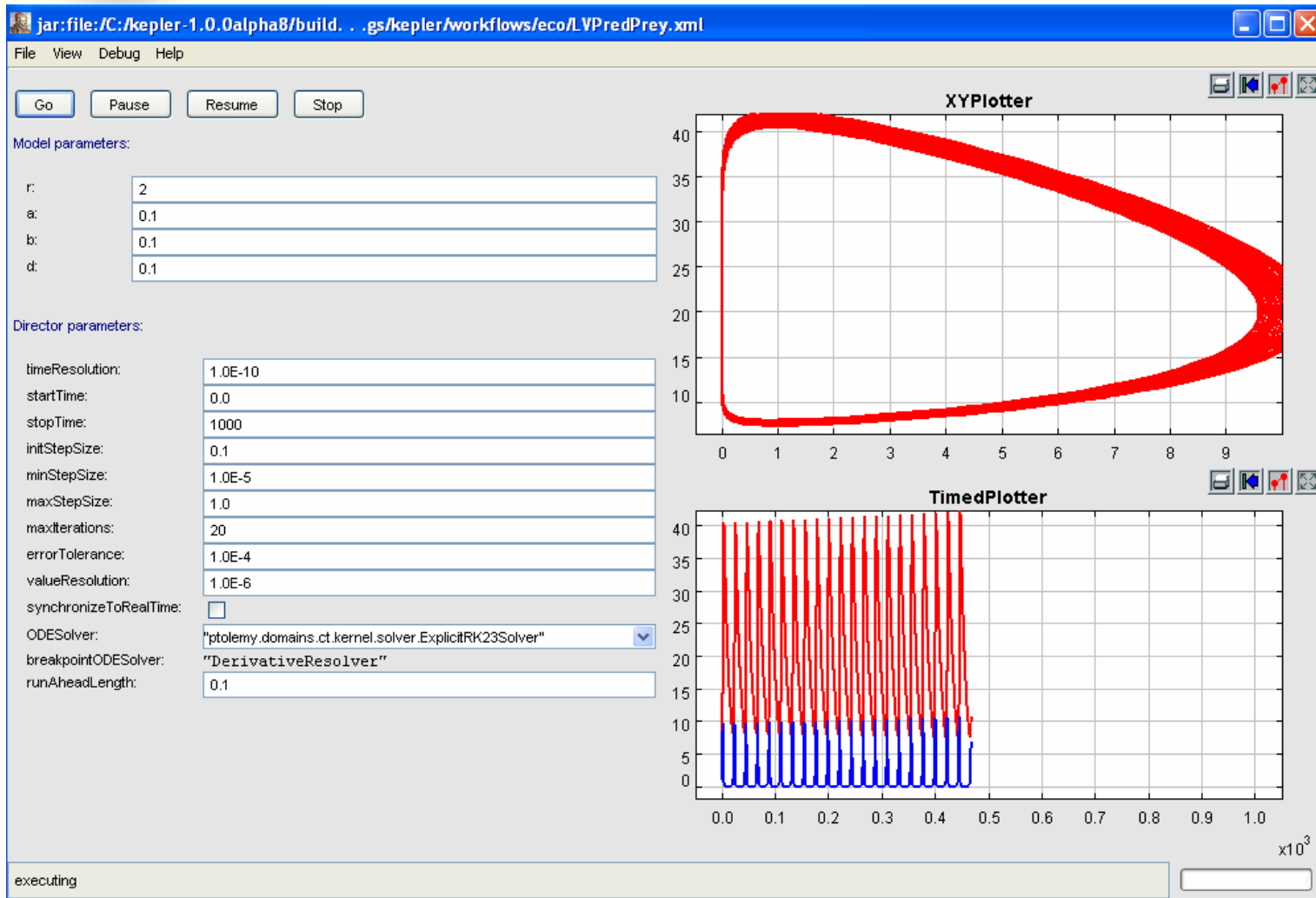


Running the model



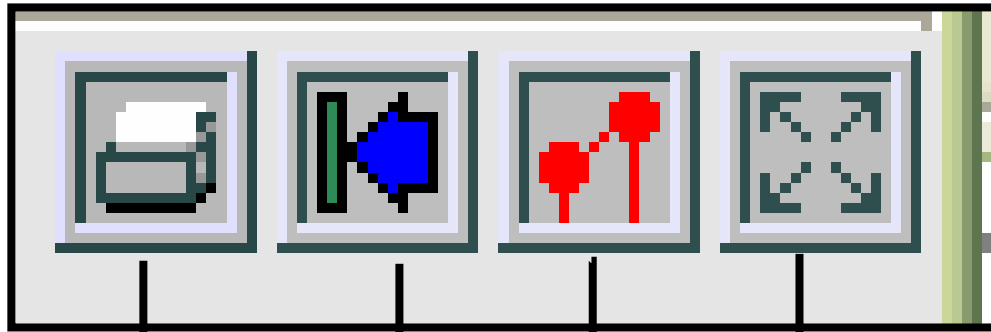


SEEK Running the model





SEEK Plotting Tool bar



printing

Reset X and Y ranges to
their original values

Set plot format


Rescale plot to fit
the data





Setting the Plot format

Set plot format ✕

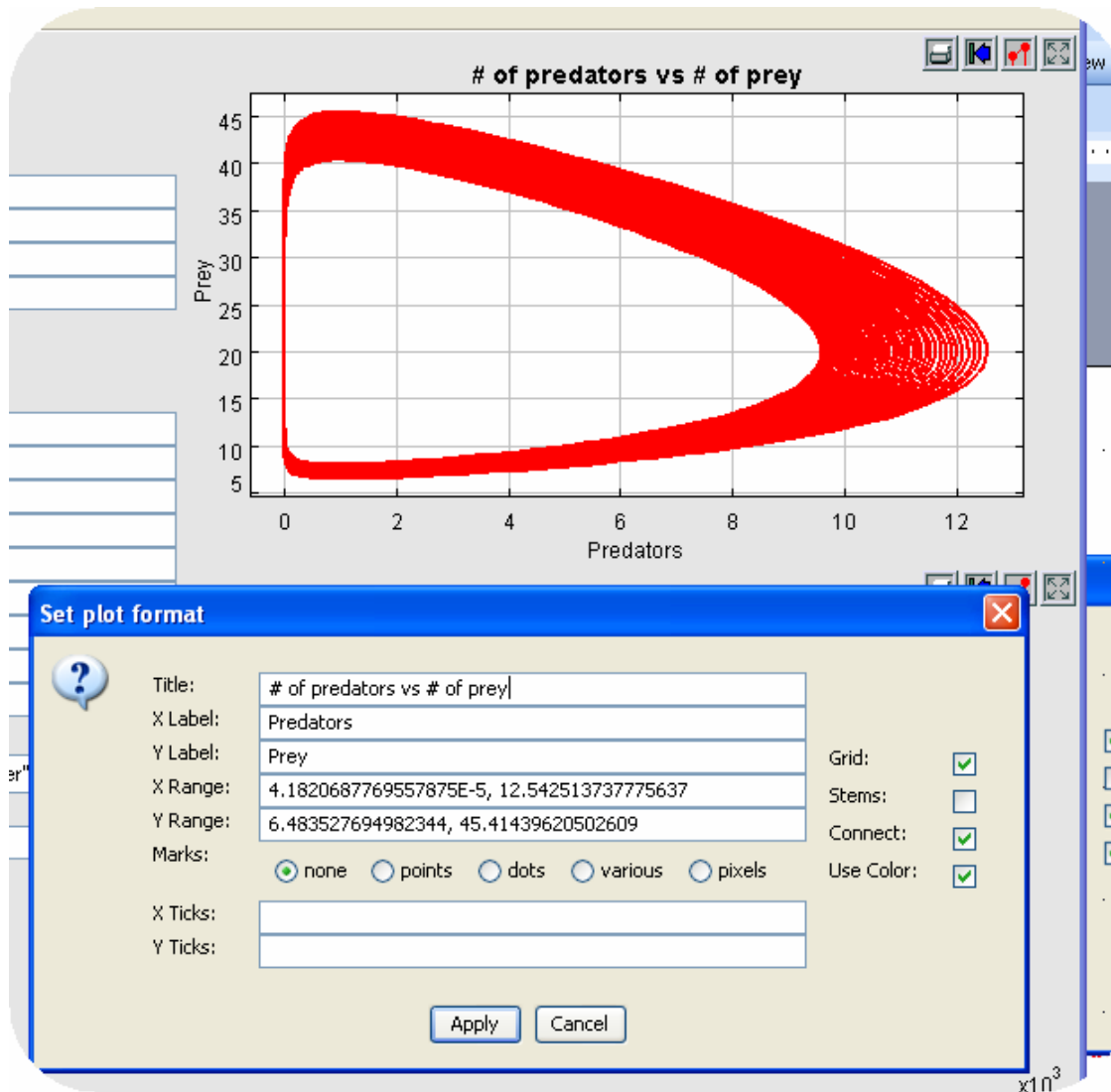
 ?

Title:	XYPlotter					
X Label:						
Y Label:						
X Range:	4.1820687769557875E-5, 12.542513737775637					Grid: <input checked="" type="checkbox"/>
Y Range:	6.483527694982344, 45.41439620502609					Stems: <input type="checkbox"/>
Marks:	<input checked="" type="radio"/> none <input type="radio"/> points <input type="radio"/> dots <input type="radio"/> various <input type="radio"/> pixels					Connect: <input checked="" type="checkbox"/>
X Ticks:						Use Color: <input checked="" type="checkbox"/>
Y Ticks:						



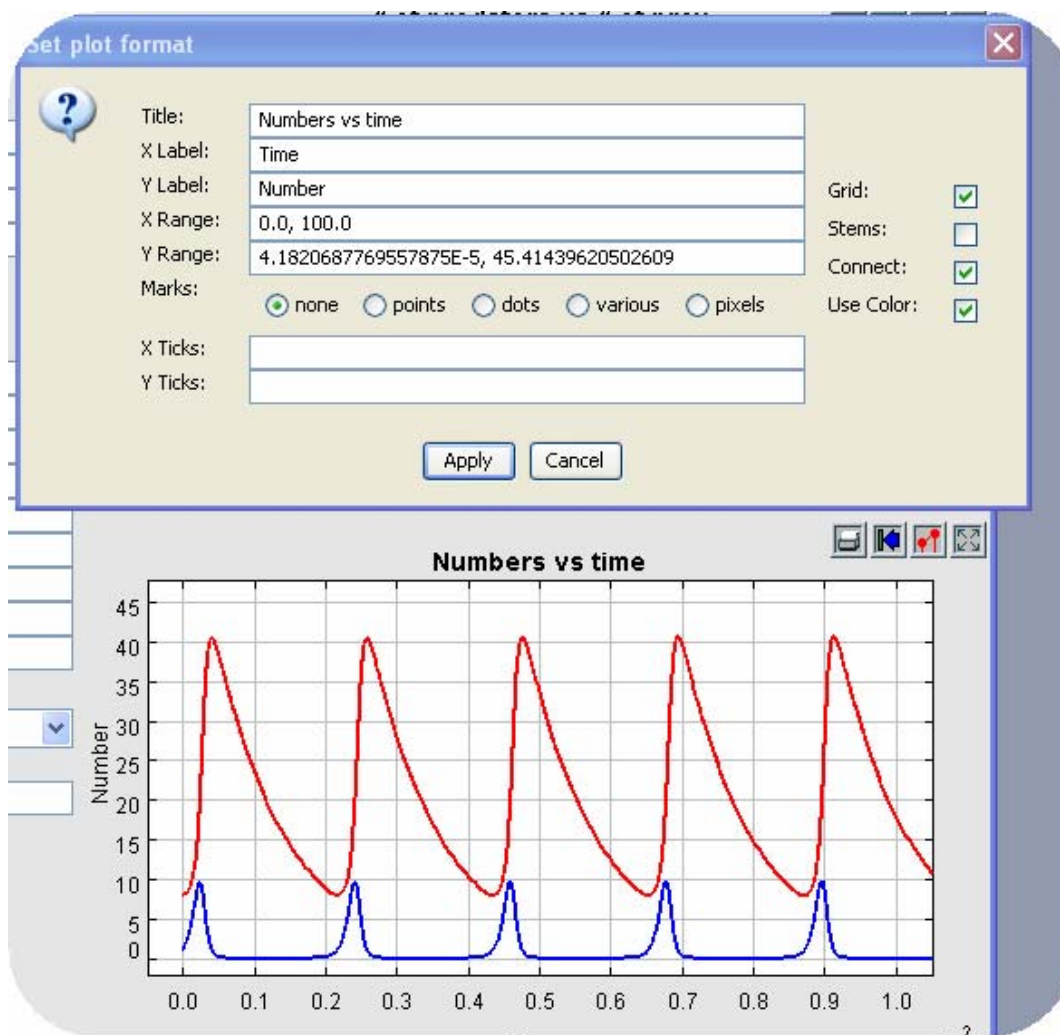


Relabeled plot





Relabeled/rescaled



Go

Pause

Resume

Stop

Model parameters:

r: 2
a: 0.1
b: 0.1
d: 0.1

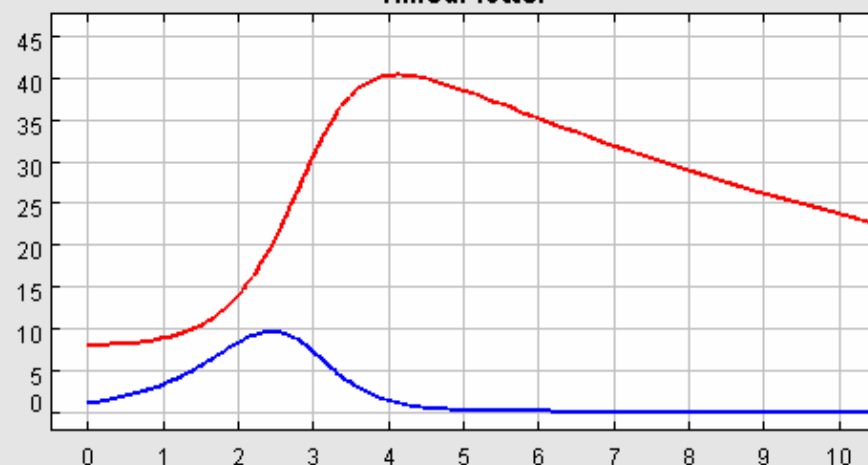
Director parameters:

timeResolution: 1.0E-10
startTime: 0.0
stopTime: 1000
initStepSize: 0.1
minStepSize: 1.0E-5
maxStepSize: 1.0
maxIterations: 20
errorTolerance: 1.0E-4
valueResolution: 1.0E-6
synchronizeToRealTime: ☐
ODESolver: "ptolemy.domains.ct.kernel.solver.ExplicitRK23Solver"
breakpointODESolver: "DerivativeResolver"
runAheadLength: 0.1

XYPlotter

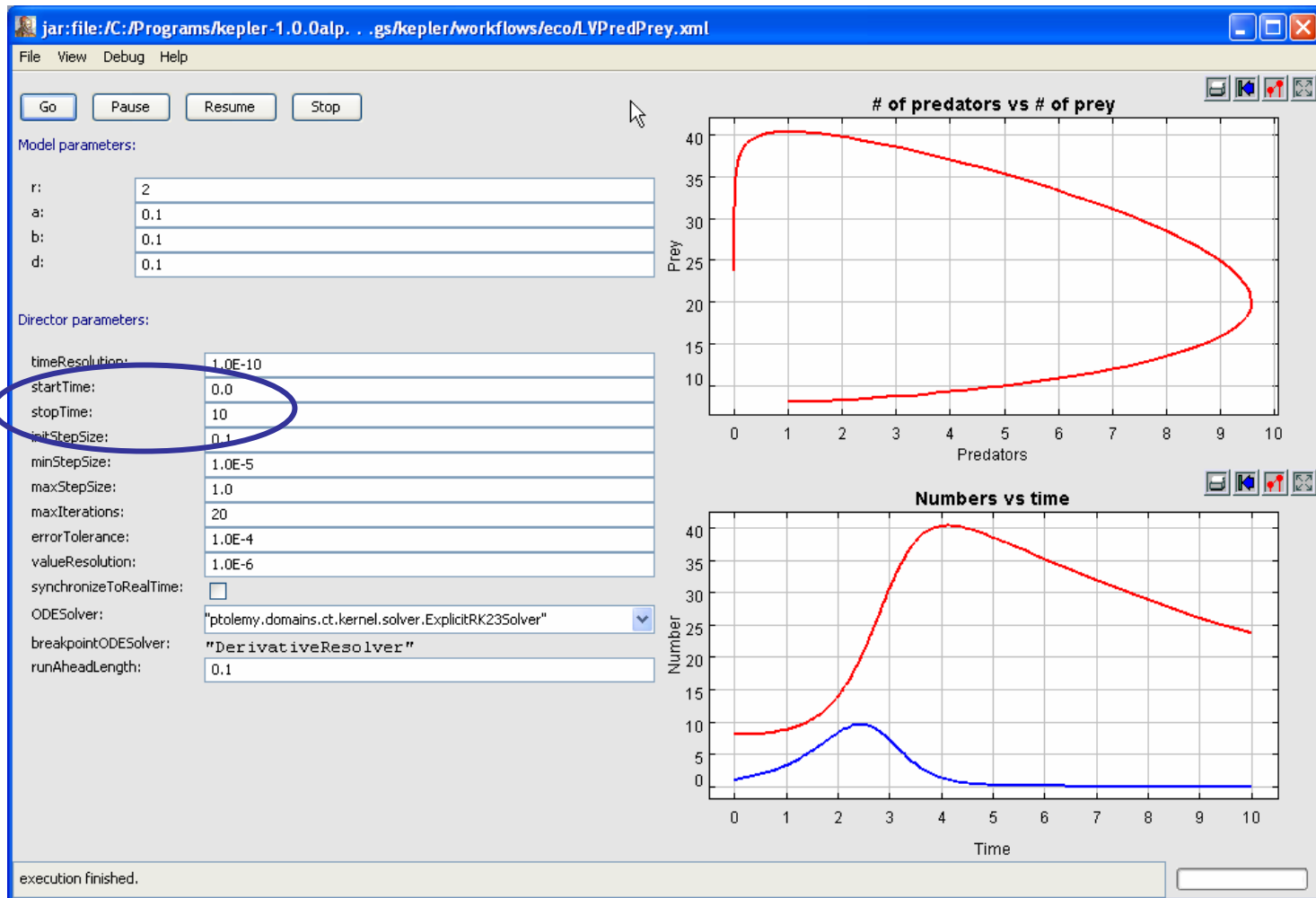


TimedPlotter



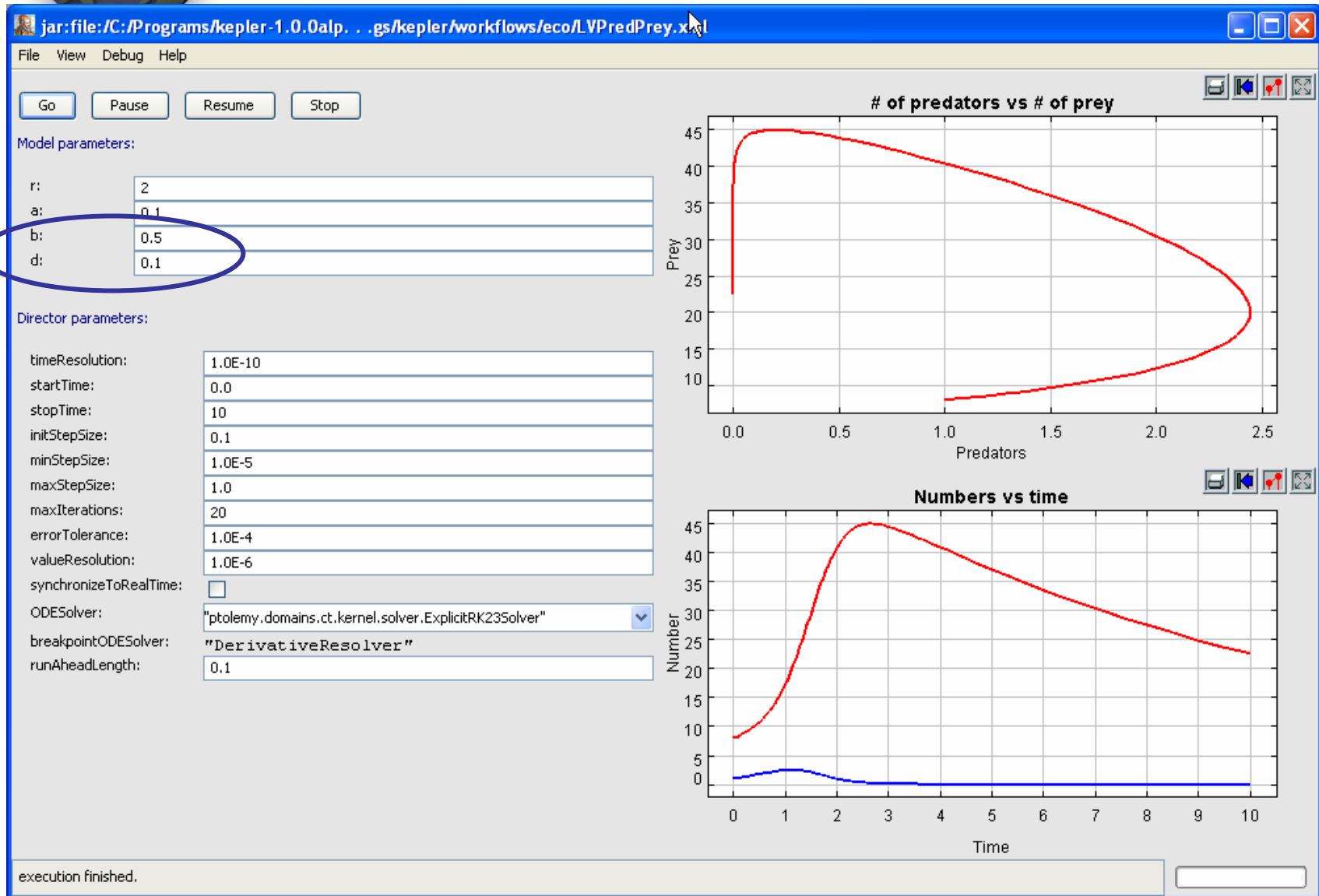


Change director stop time



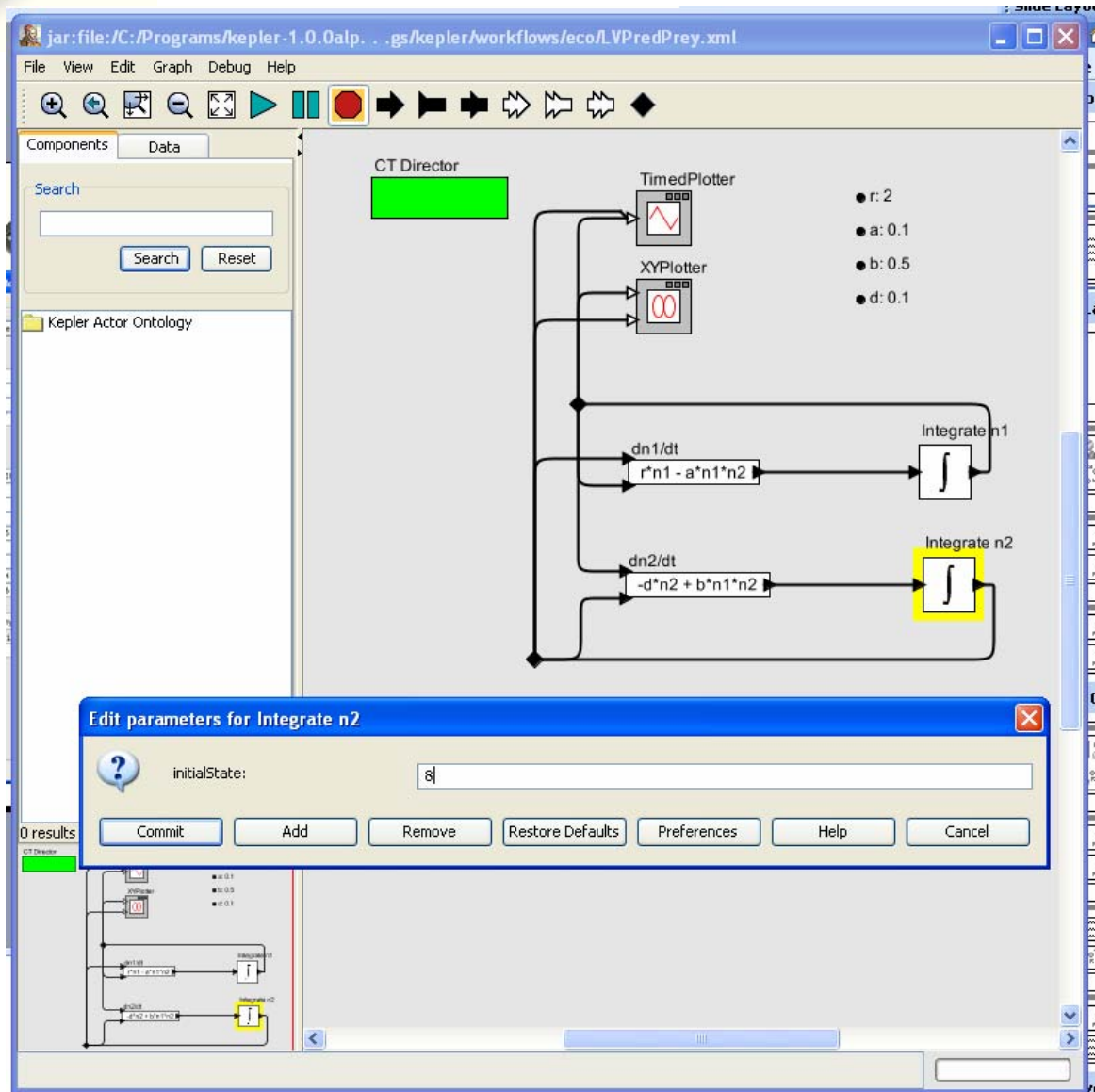


Change parameters



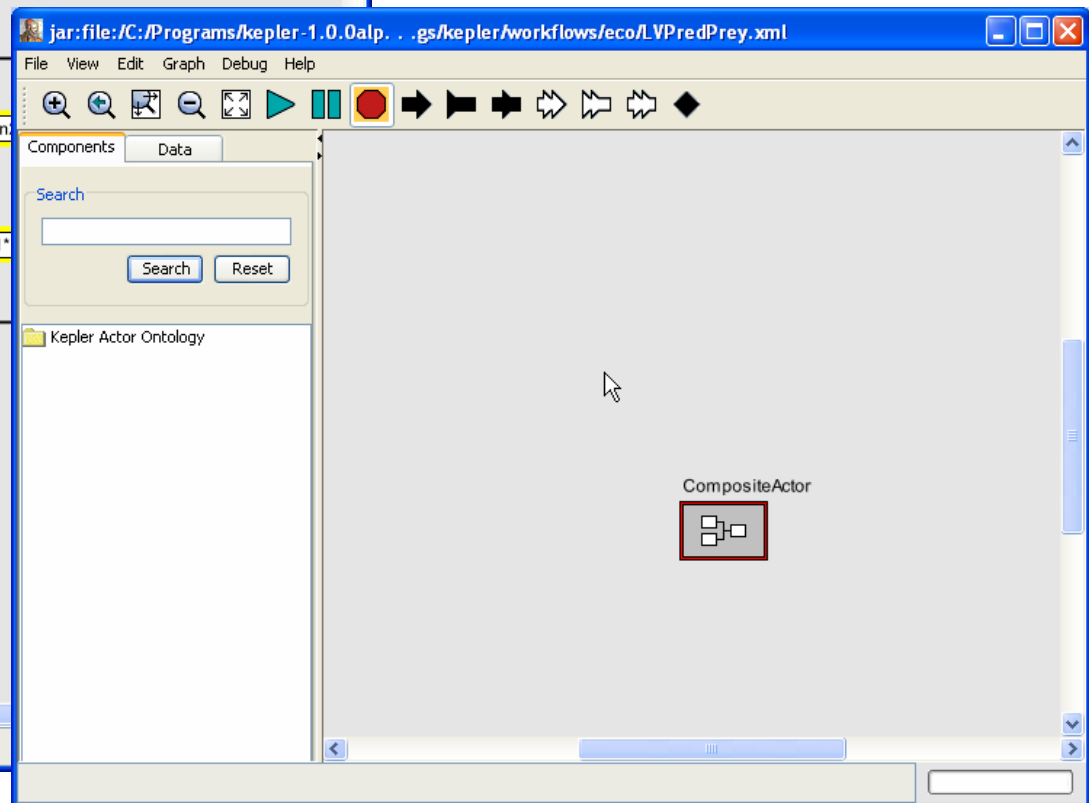
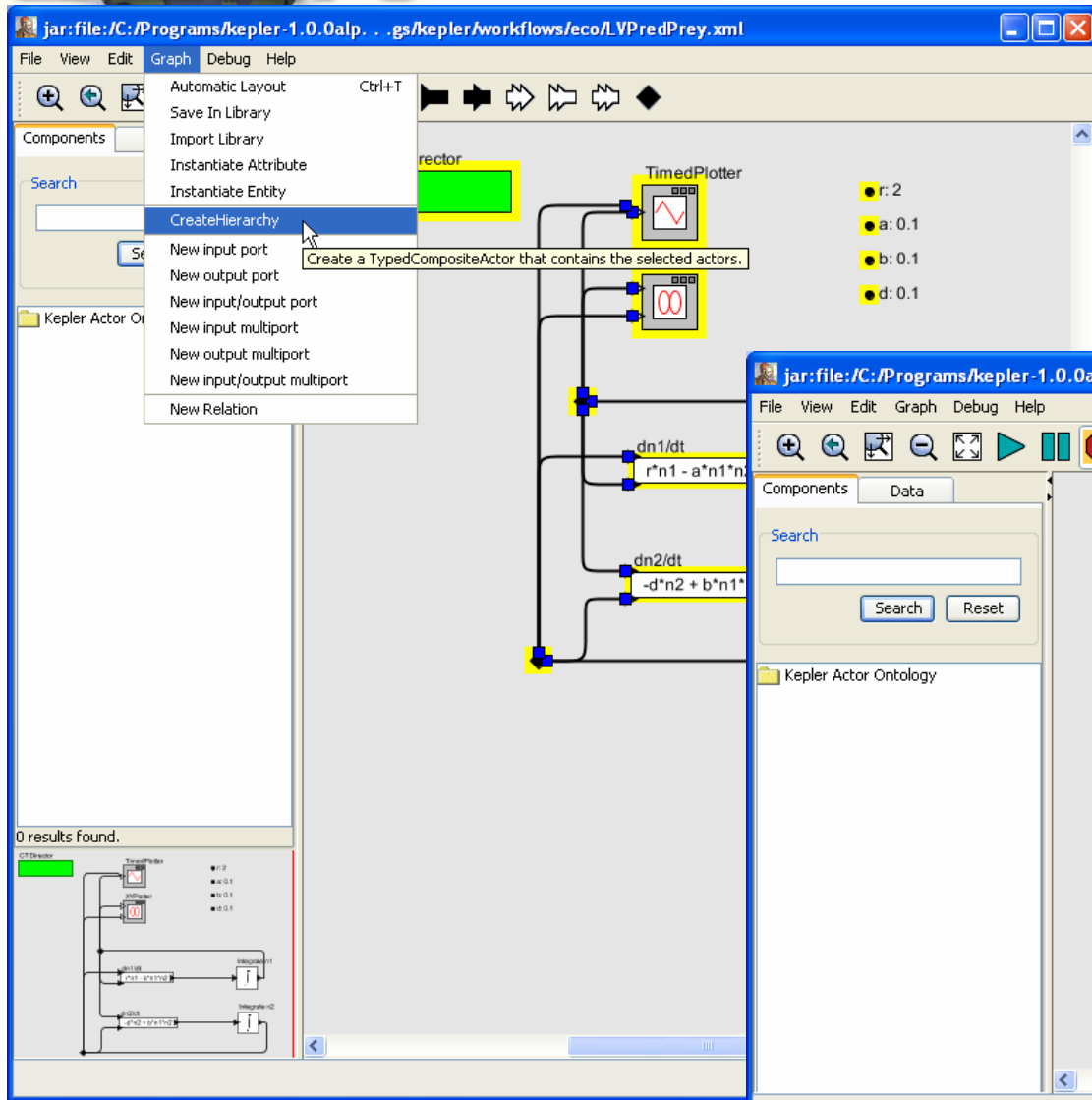


Changing n1 and n2



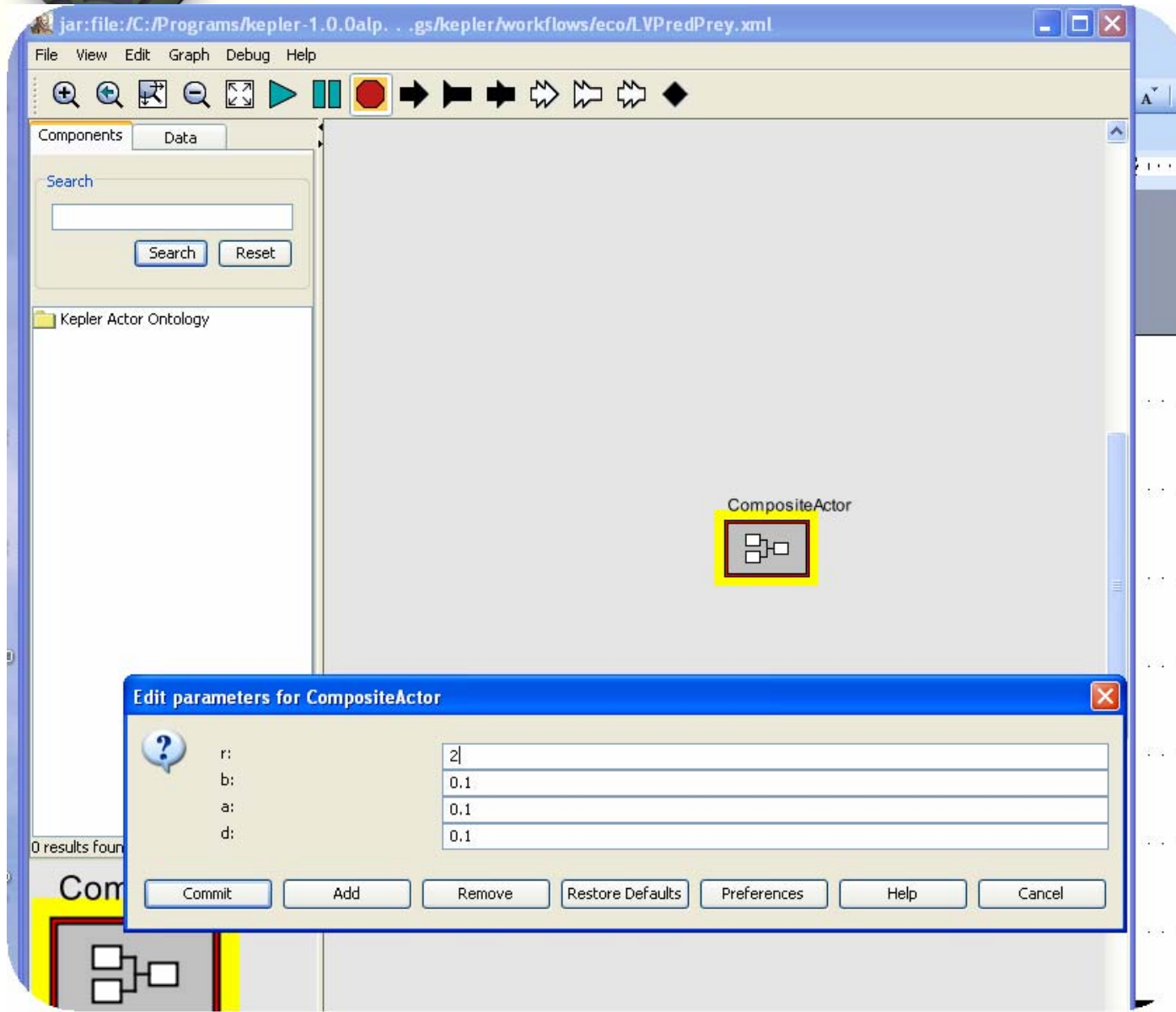


Composite actors



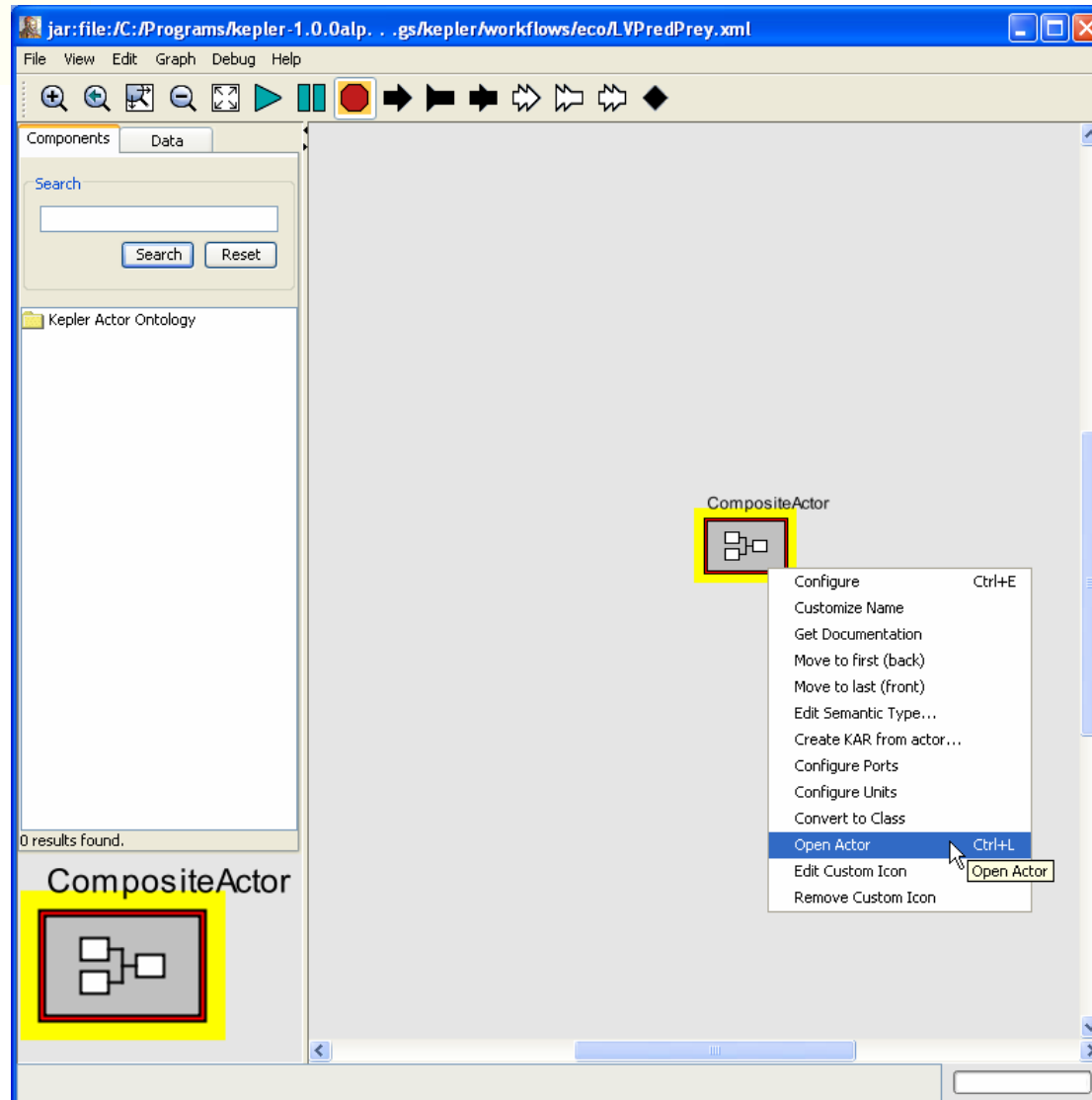


Parameterize





Open actor





General Workflow Construction Procedure

- Open a new workflow
- Add a director
- Search for data (optional)
- Add data source (optional)
- Add an actor
 - Edit parameters
- Add ports (if needed)
 - Configure ports
- Add another actor
- Hook up input/output ports





Kepler Exercise

