



Viskit: Visual Simkit Editor

Don Brutzman and Terry Norbraten

Modeling Virtual Environments Simulation (MOVES) Institute
Naval Postgraduate School (NPS)

10 June 2025

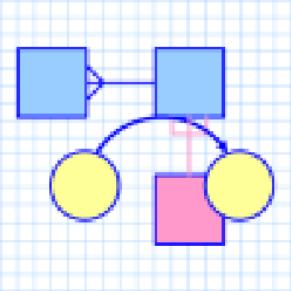
Overview

- Viskit is a modeling application for defining Discrete Event Simulation (DES) models that autogenerate Java source using the Simkit library.
- The Viskit application allows you to build a collection of Simkit event graphs that describe the behavior of various entities in a simulation environment. Each model file is recorded in XML data file.
- Capabilities include **Event Graphs**, **Assemblies**, **Simulation Run** tools, and an **Analyst Report** generator suitable for thesis and research efforts.
- Current release includes a thorough refactoring of the underlying Viskit source code, facilitating ongoing maintenance and development.
- Open-source efforts are ongoing.

About

About Viskit

X



Viskit Event Graph and Assembly Editor
version 2.0.0, last modified: 2025-06-09

Copyright © 1995-2025 under BSD-style open-source license

Developers:

Don Brutzman

Terry Norbraten

with

Mike Bailey

Arnold Buss

Rick Goldberg

Don McGregor

Patrick Sullivan

Visit the Viskit home page at

<https://github.com/open-dis/viskit>

Visit the Simkit home page at

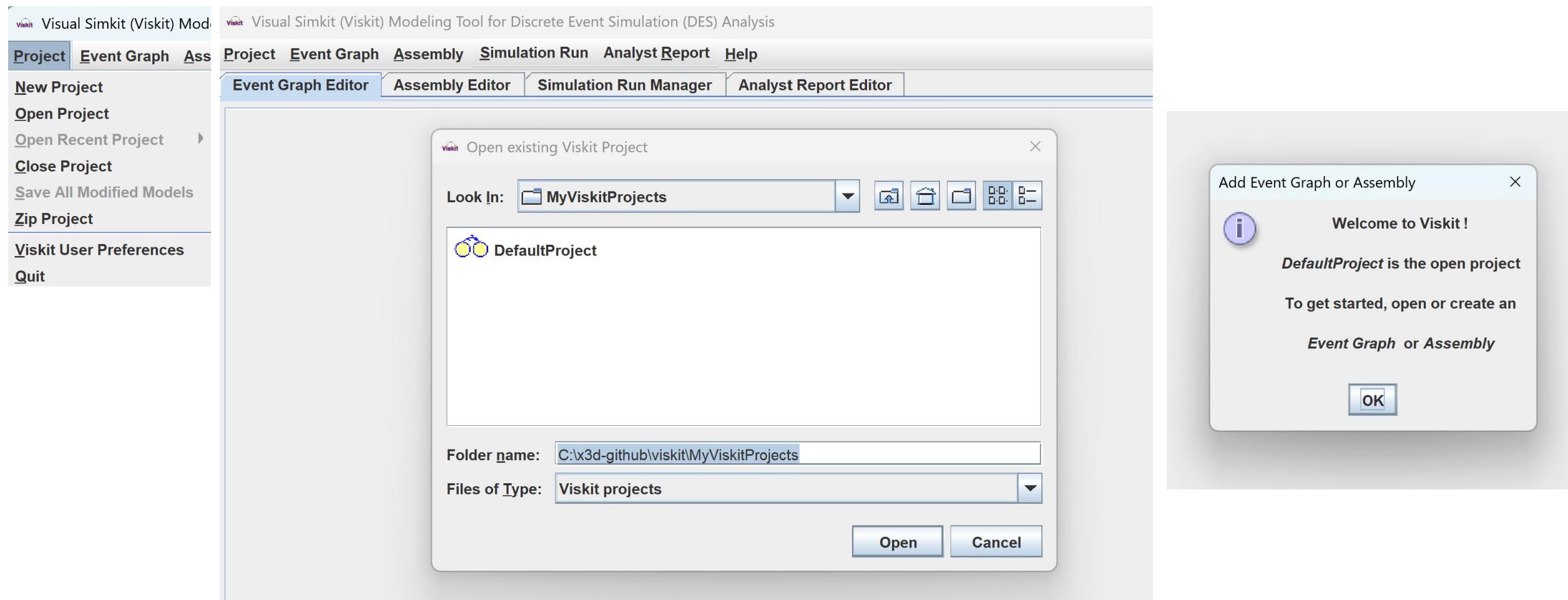
<https://github.com/ahbuss/simkit>

Simkit Version: 1.5.6

Java version: 24.0.1

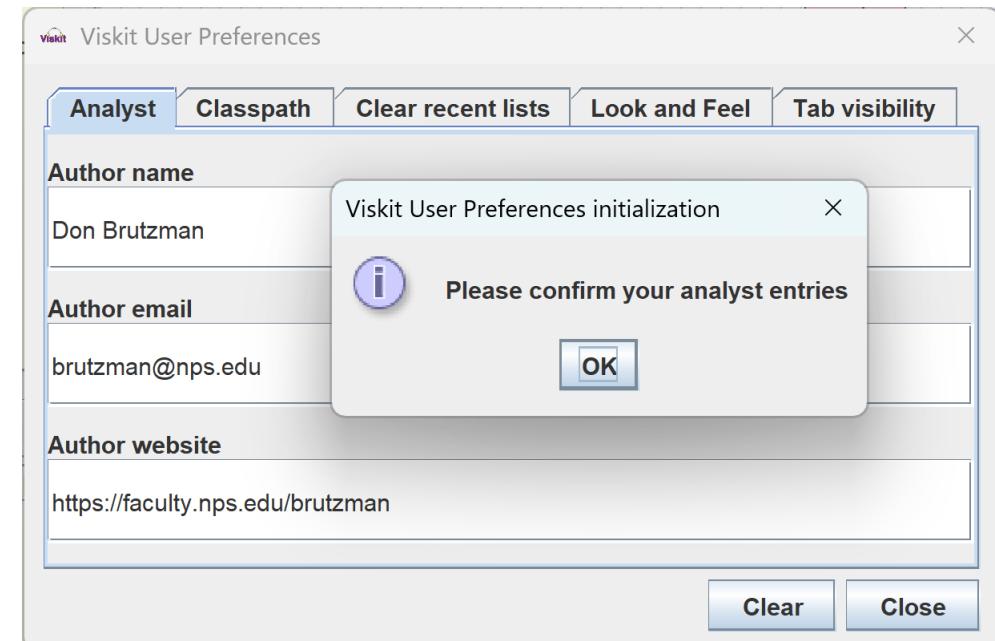
OK

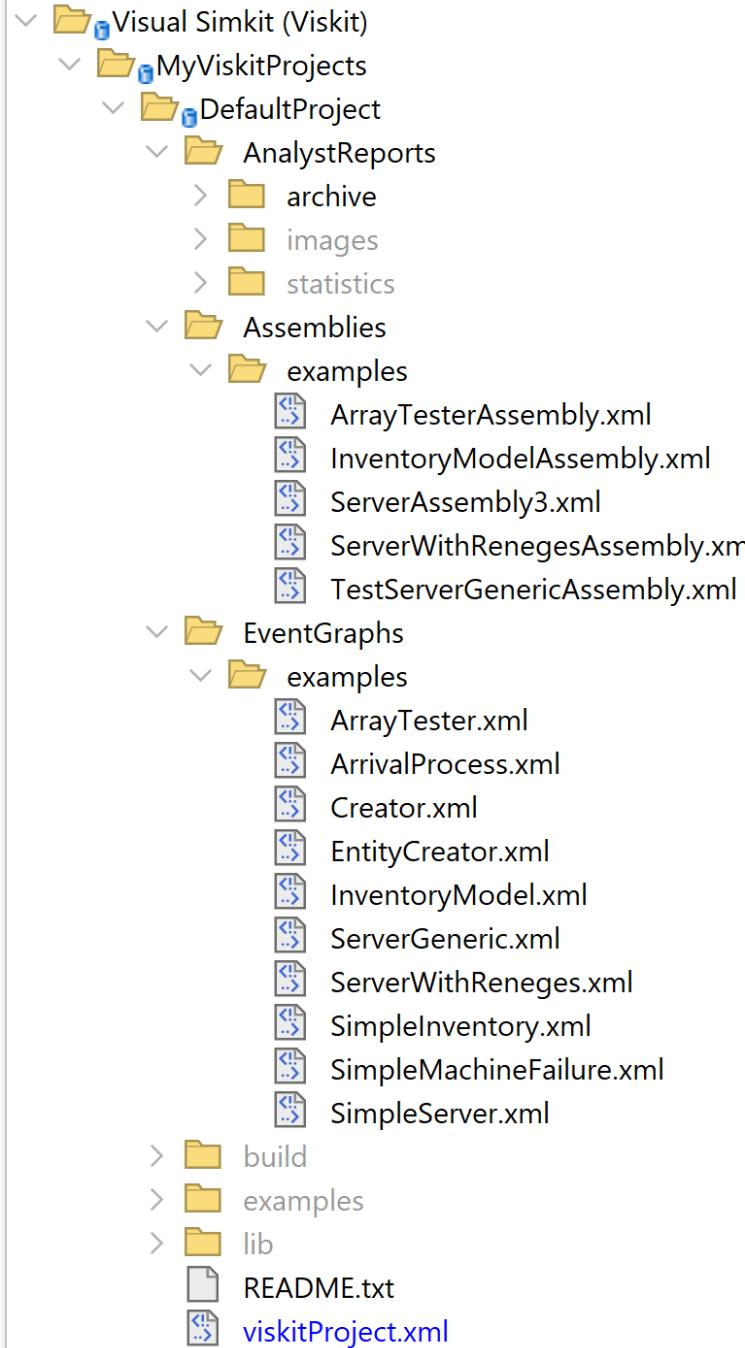
Viskit is organized according to Viskit Projects



Viskit User Preferences

Author information is applied when creating an Analyst Report



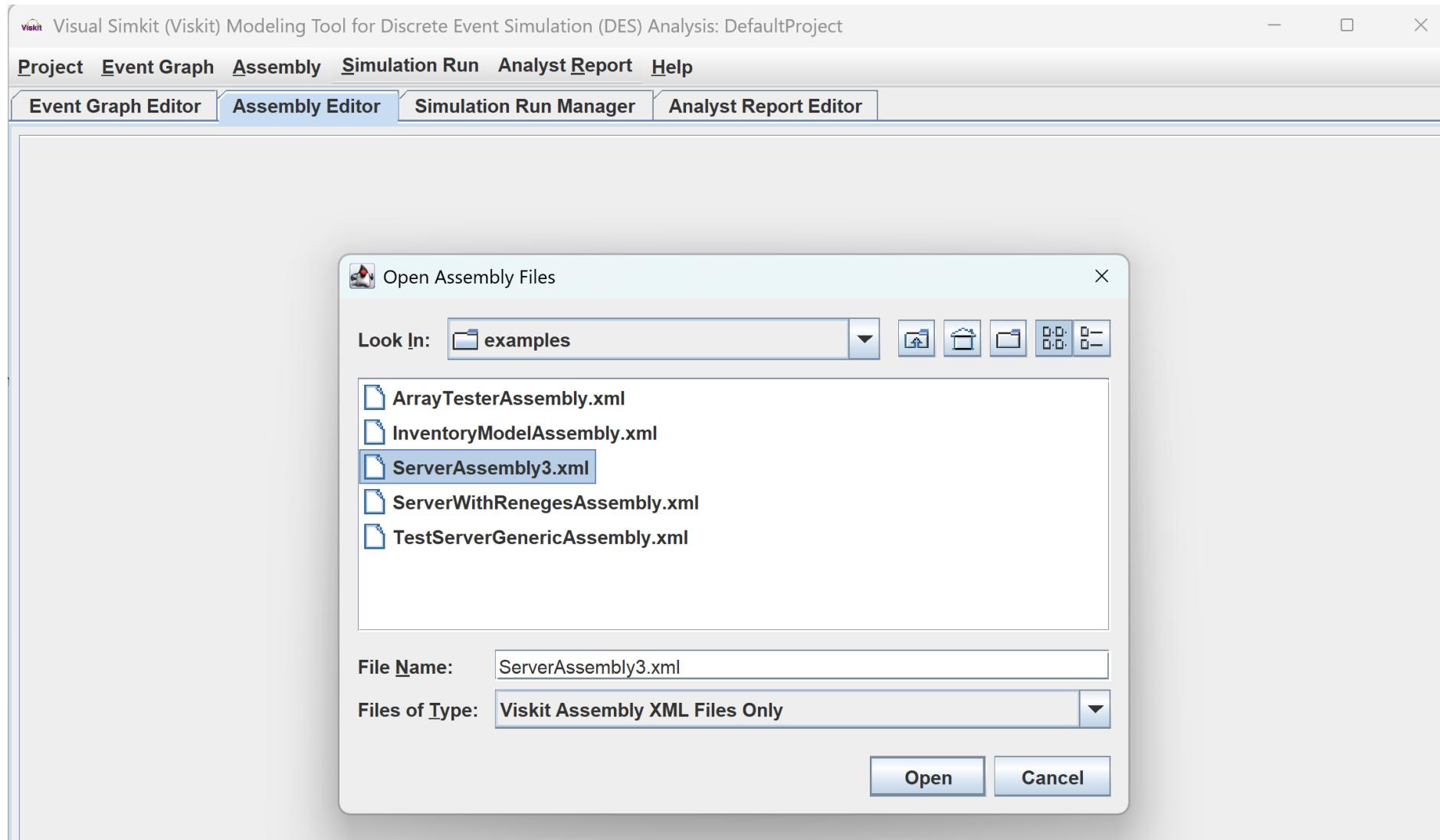


Viskit project files contain multiple assets

The screenshot shows the contents of the `viskitProject.xml` file in an IDE. The XML structure defines a Viskit project with various components and a specific project named "DefaultProject".

```
<?xml version="1.0" encoding="UTF-8"?><ViskitProject>
    <!-- viskitProject.xml -->
    <AnalystReports name="AnalystReports"/>
    <AssembliesDirectory name="Assemblies"/>
    <EventGraphsDirectory name="EventGraphs"/>
    <BuildDirectory name="build">
        <ClassesDirectory name="classes"/>
        <SourceDirectory name="src"/>
    </BuildDirectory>
    <DistDirectory name="dist"/>
    <LibDirectory name="lib"/>
    <Project name="DefaultProject">
        <Cached>
    </Project>
</ViskitProject>
```

Next step: open an assembly



For example

Server Assembly3.xml

Visual Simkit (Viskit) Modeling Tool for Discrete Event Simulation (DES) Analysis: DefaultProject

Project Event Graph Assembly Simulation Run Analyst Report Help

Event Graph Editor Assembly Editor Simulation Run Manager Analyst Report Editor

Metadata: Mode: Zoom: Initialize Assembly for Simulation Run

ServerAssembly3

Event Graph availability

- lib\simkit.jar
- MyViskitProjects\DefaultProject\EventGraph

Property Change Listener availability

- lib\simkit.jar

The diagram illustrates a discrete event simulation model. It features an 'arrival' event source connected to a 'servers' resource node. The 'servers' node has three outgoing transitions, each leading to a 'number InQueue Statistic' monitor. A 'simple Property Dumper' component is also present, likely used for logging or reporting. The interface includes standard simulation controls like zoom and initialize buttons.

arrival → servers

servers → number InQueue Statistic

servers → number Available Servers Statistic

simple Property Dumper

8

Project Event Graph Assembly Simulation Run Analyst Report Help

Event Graph Editor

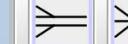
Assembly Editor

Simulation Run Manager

Analyst Report Editor

Metadata:

Mode:



Zoom:

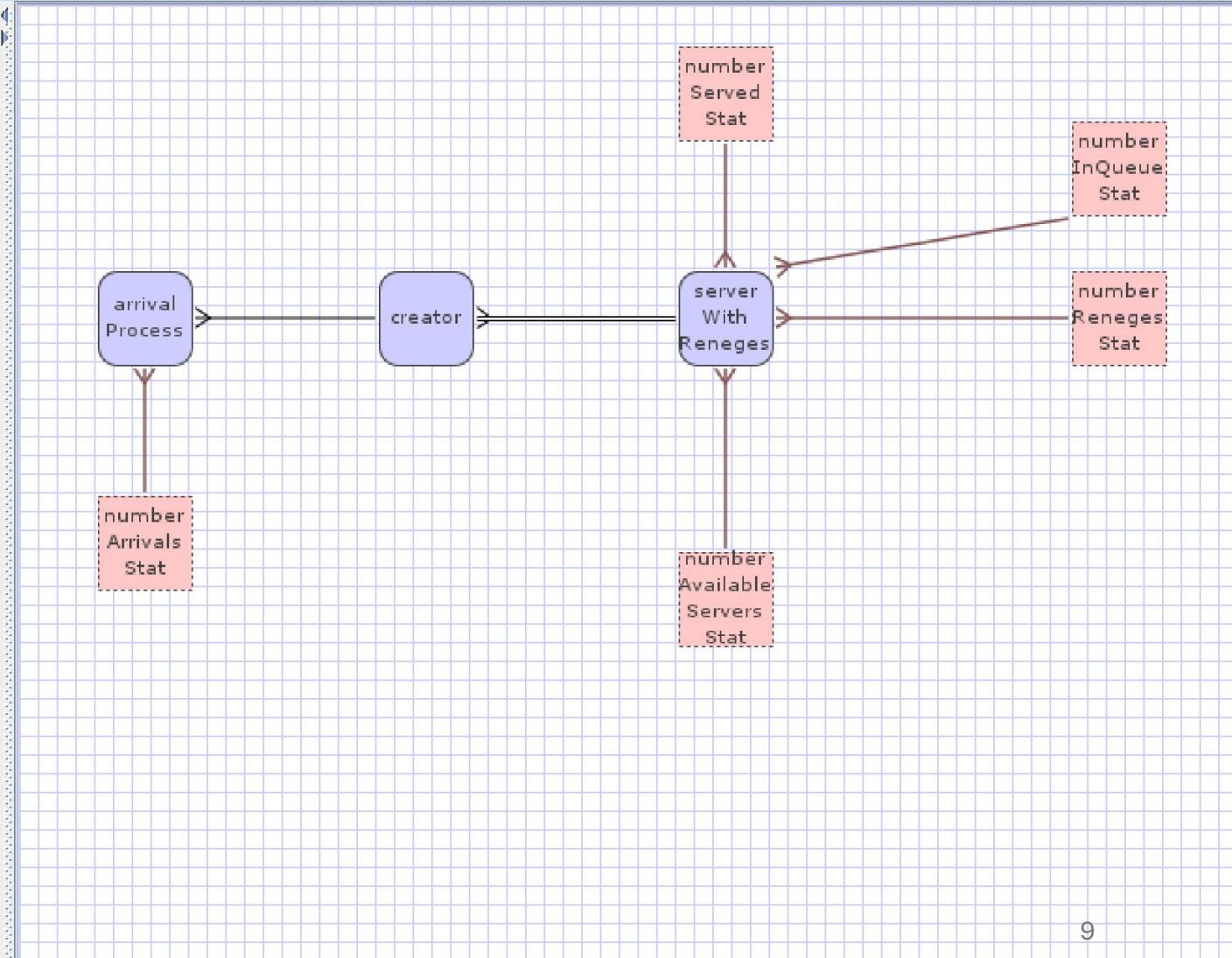


Initialize Assembly for Simulation Run

ServerWithRenegesAssembly

Event Graph availability

- lib\simkit.jar
- MyViskitProjects\DefaultProject\E



For example

Server

WithReneges

Assembly

.xml

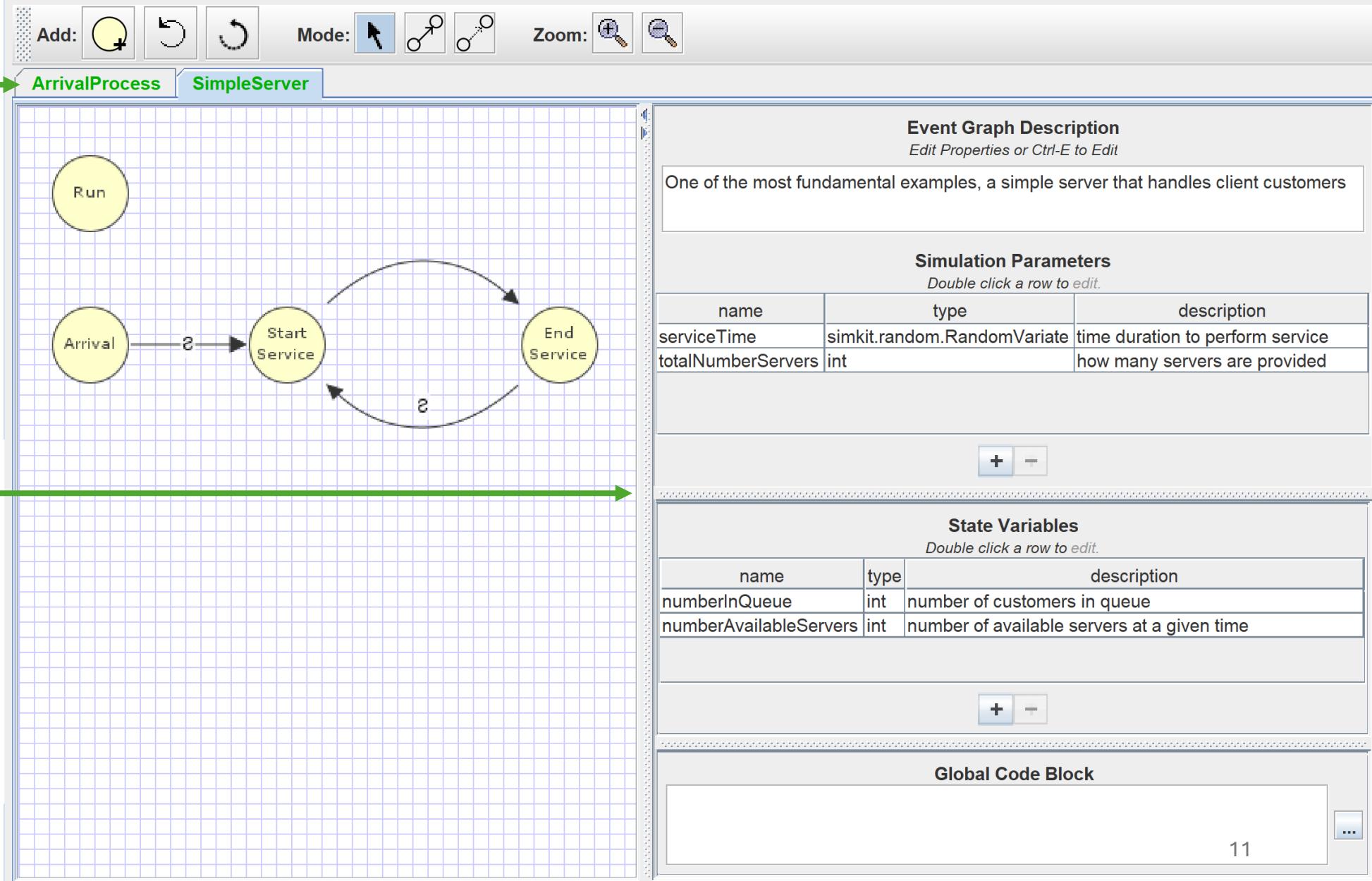
Editing

You can edit Event Graphs, Assemblies, Simulation Run results, and Analyst Report outputs

[Project](#) [Event Graph](#) [Assembly](#) [Simulation Run](#) [Analyst Report](#) [Help](#)[Event Graph Editor](#)[Assembly Editor](#)[Simulation Run Manager](#)[Analyst Report Editor](#)[ArrivalProcess](#)[SimpleServer](#)

Check that
corresponding
Event Graphs
were opened

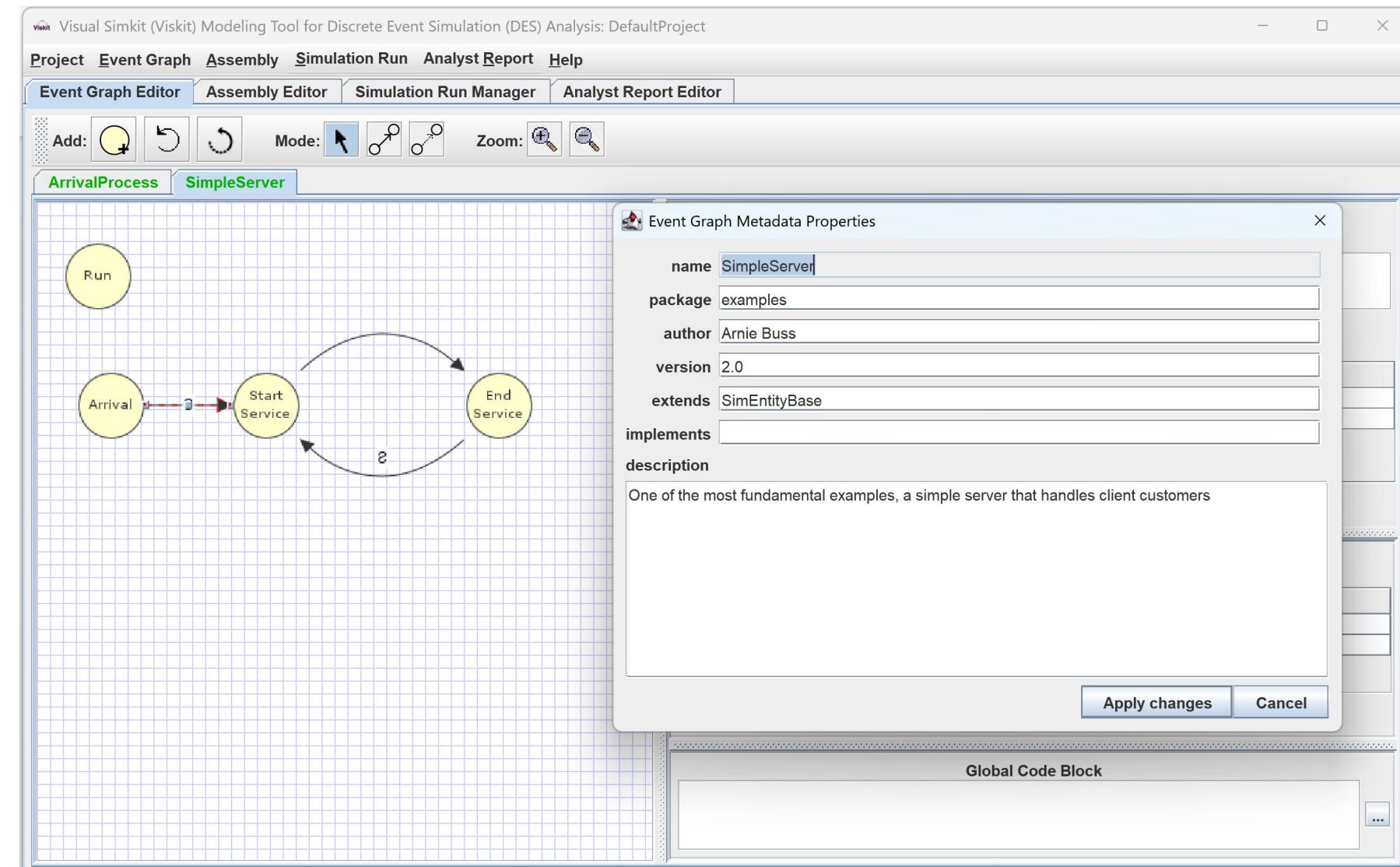
Check out
Event Graphs
Simulation
Parameters and
State Variables



- [Edit selected Event Graph...](#)
- [Edit selected Event Graph Metadata Properties... Ctrl-E](#)
- [New Event Graph Ctrl-N](#)
- [Open Event Graph Ctrl-O](#)
- [Open Recent Event Graph](#)
- [Close Event Graph Ctrl-W](#)
- [Close All Event Graphs](#)
- [Save Event Graph Ctrl-S](#)
- [Save Event Graph as... Ctrl-A](#)
- [Image Save for Event Graph Diagram Ctrl-I](#)
- [Java Source Generation for saved Event Graph Ctrl-J](#)
- [XML View of Saved Event Graph Ctrl-X](#)

Editing an Event Graph

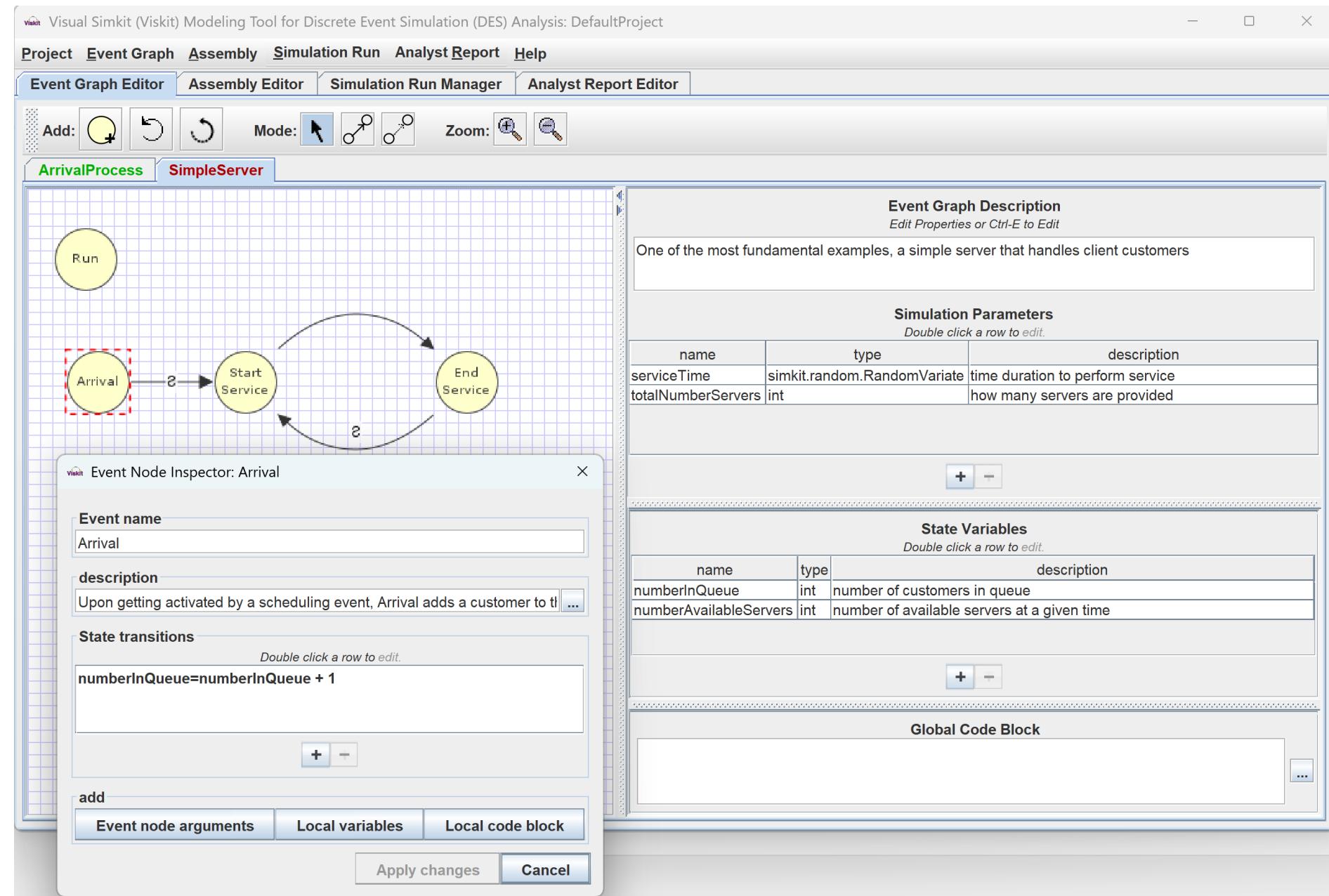
Inspect Metadata



Editing an Event Graph

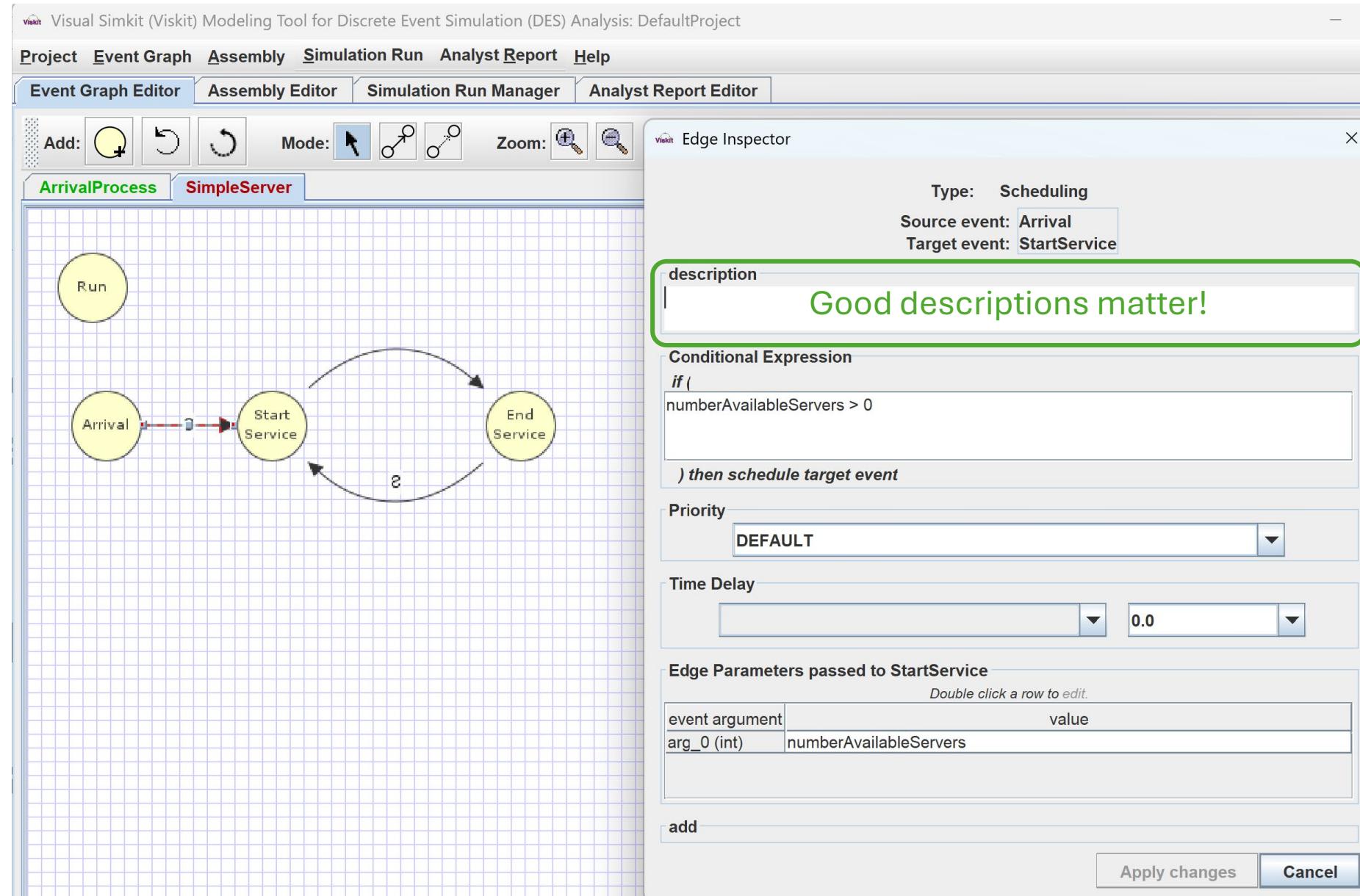
Simple Server.xml

Inspect State Nodes



Editing an Event Graph

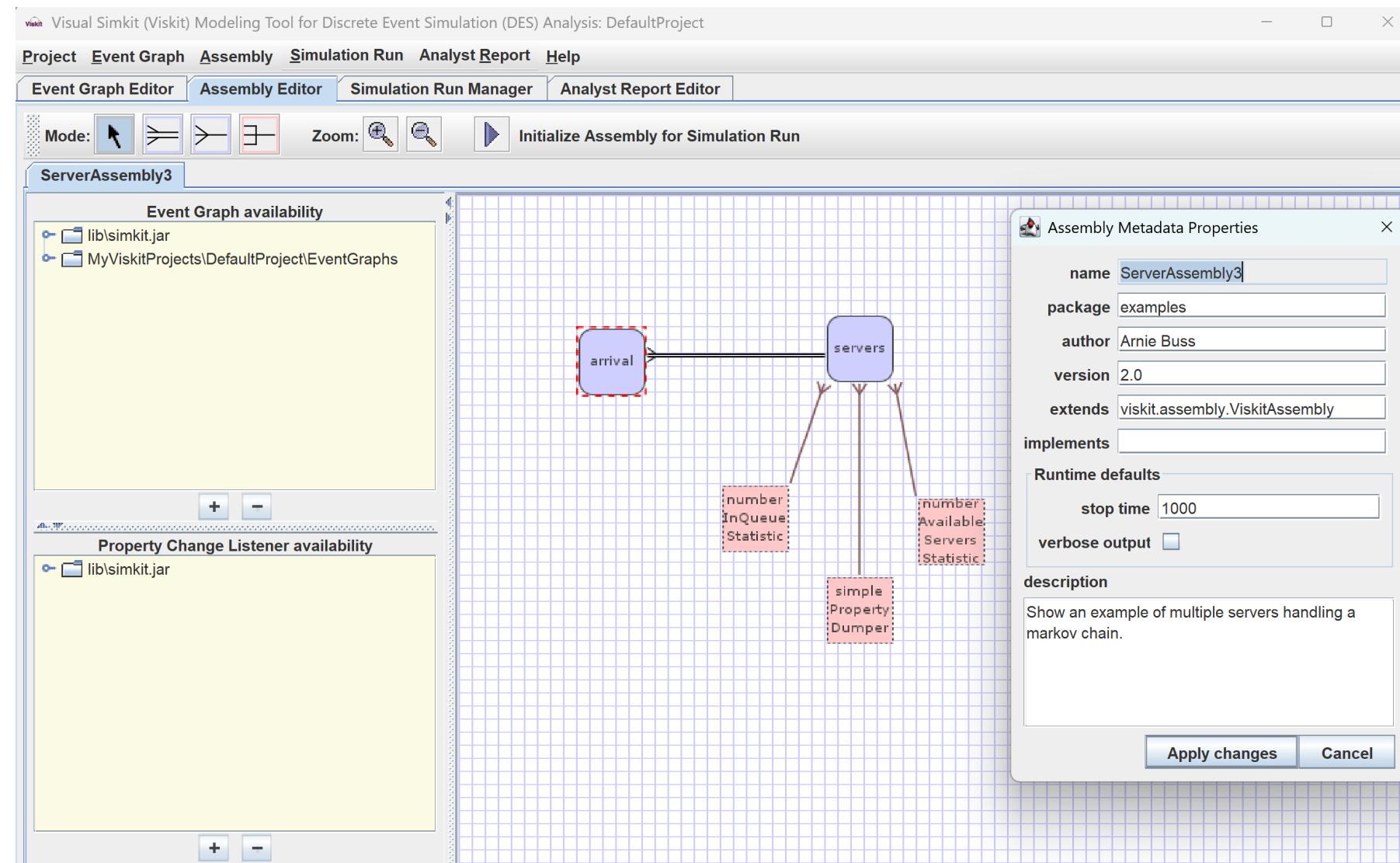
Inspect
Scheduling
(Cancelling)
Edge
Transitions





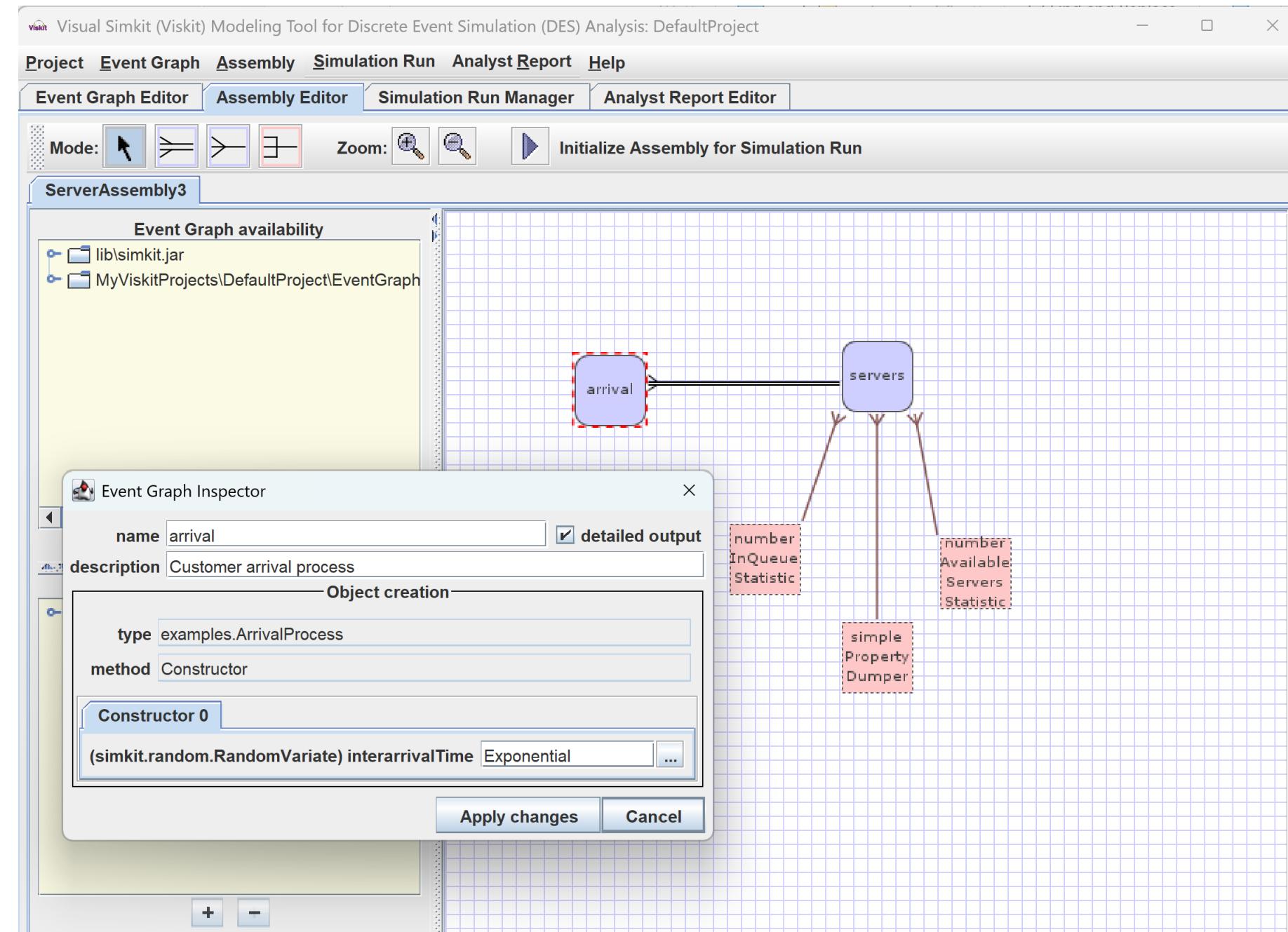
Editing an assembly

Inspect Metadata



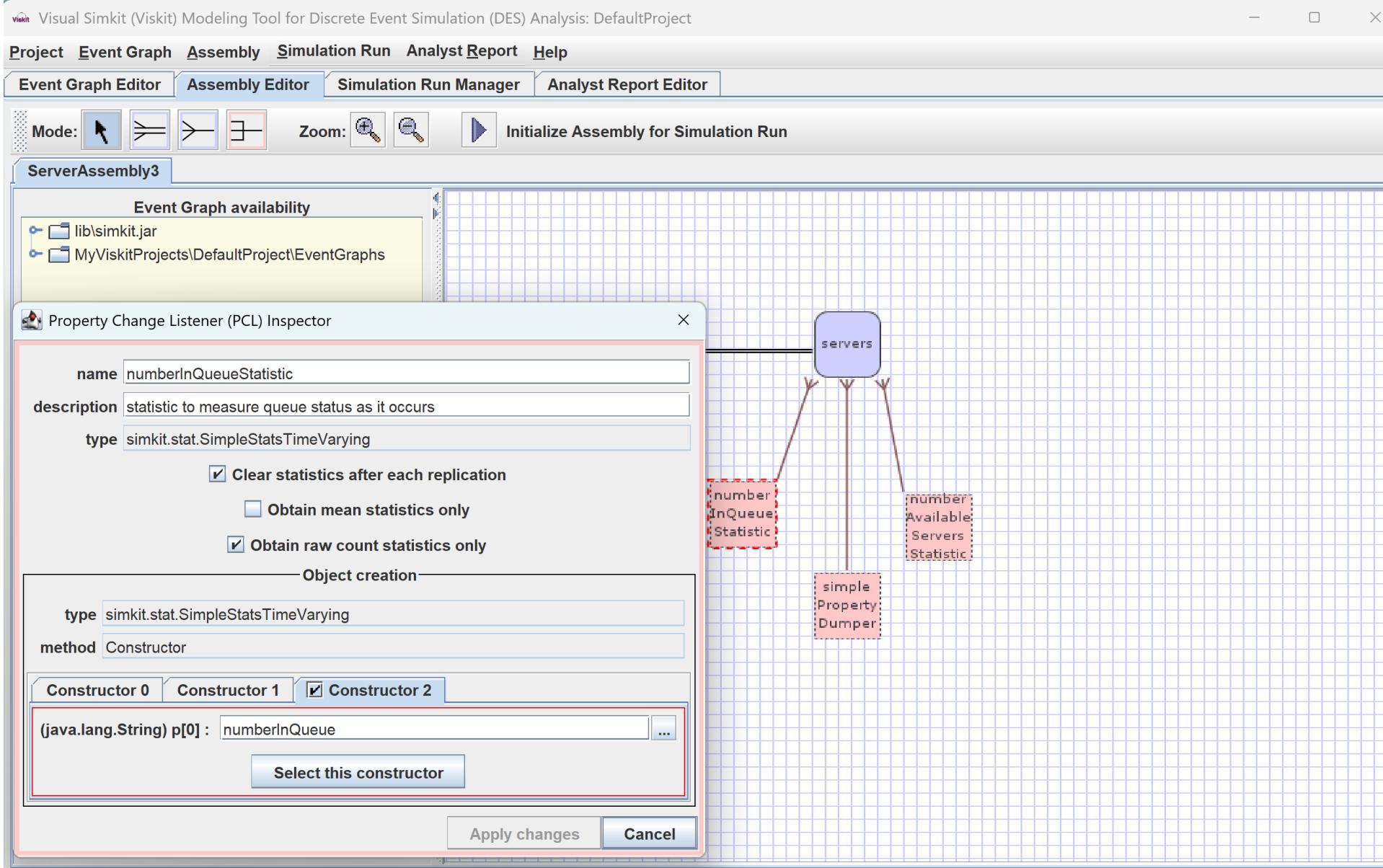
Editing an assembly

Inspect Event Graph nodes



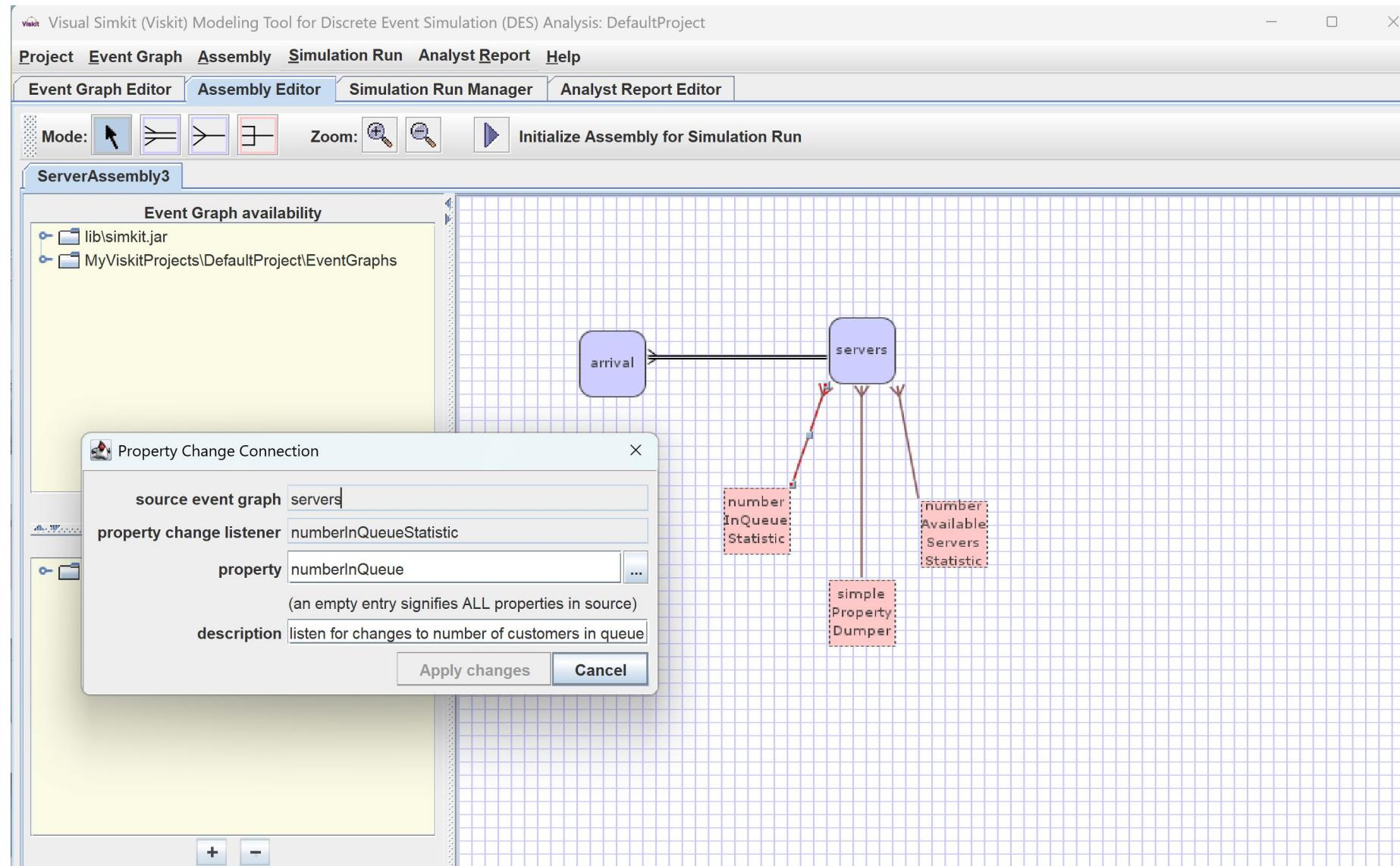
Editing an assembly

Inspect Property Change Listeners PCLs



Editing an assembly

Inspect Property Change Connection



Run Simulation Replications

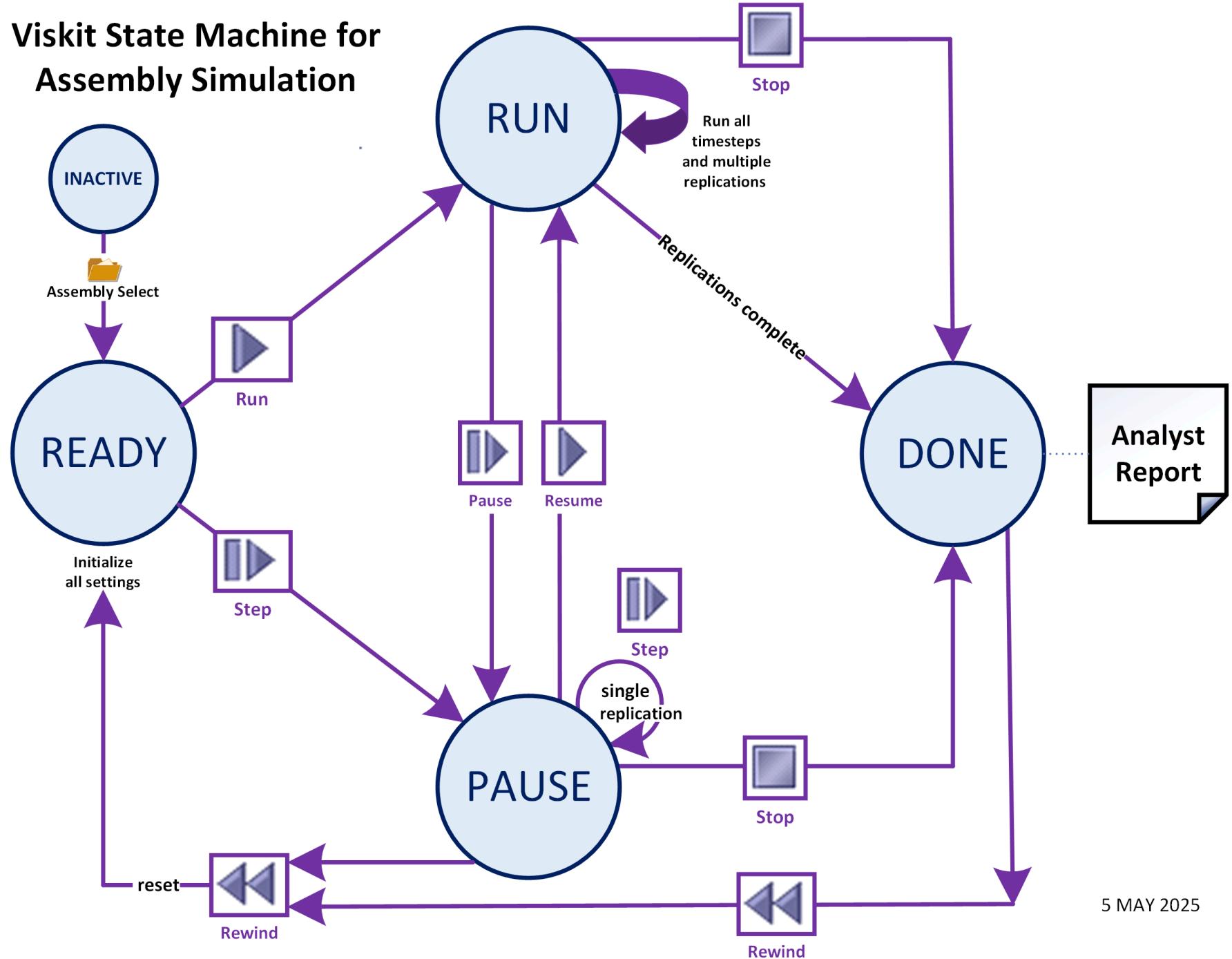
Rehearse and repeat, either for preliminary tests or for numerous repetitions

User buttons
are simple:

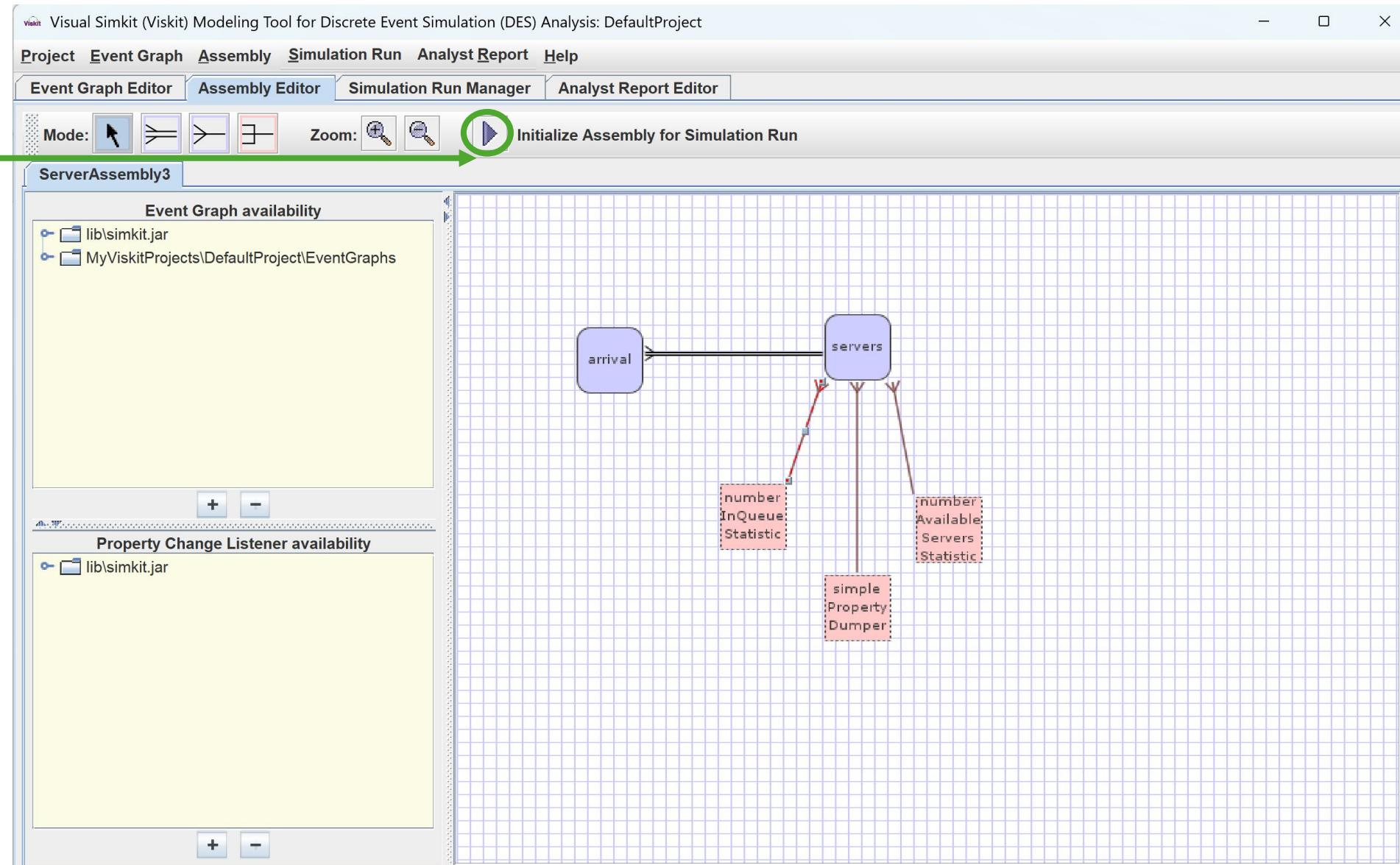
Run Pause Stop

This diagram
shows underlying
Viskit operations

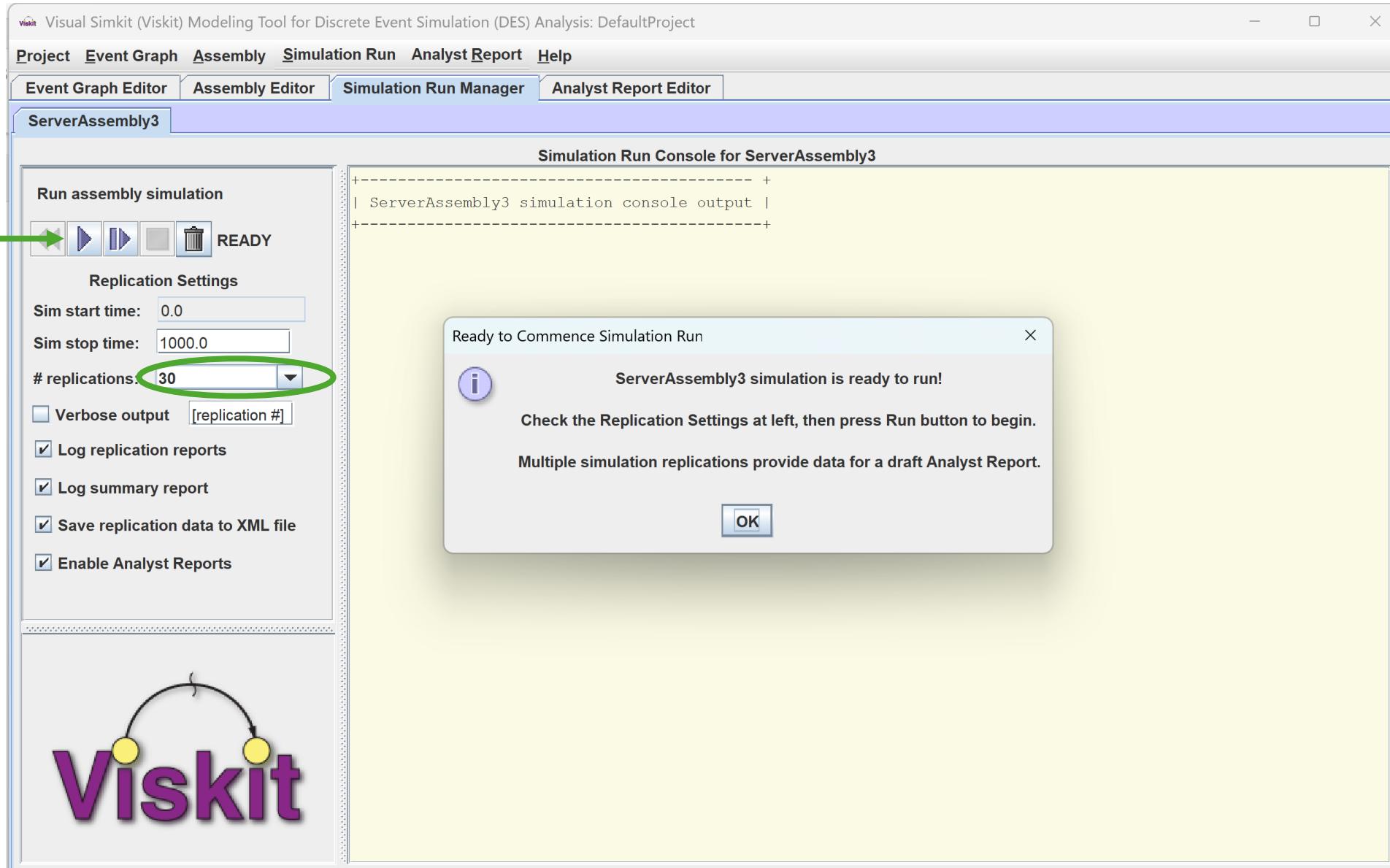
Viskit State Machine for Assembly Simulation



Ready
to run
simulations



Get set to run simulations



Go! Run simulations

Visual Simkit (Viskit) Modeling Tool for Discrete Event Simulation (DES) Analysis: DefaultProject

Project Event Graph Assembly Simulation Run Analyst Report Help

Event Graph Editor Assembly Editor Simulation Run Manager Analyst Report Editor

ServerAssembly3

Simulation Run Console for ServerAssembly3

numberInQueue: 32 => 31
numberAvailableServers: 1 => 0
numberInQueue: 31 => 32
numberAvailableServers: 0 => 1
numberAvailableServers=0
numberInQueue: 27 => 26
numberAvailableServers: 1 => 0
numberInQueue: 32 => 33
numberAvailableServers: 0 => 1
numberAvailableServers=0
numberInQueue: 26 => 25
numberAvailableServers: 1 => 0
numberInQueue: 33 => 34

Output Report following Replication #30

Name	Count	Minimum	Maximum	Mean	Standard Deviation	Variance
numberInQueue	1184	0.0	45.0	13.4026	13.7788	189.8545
numberAvailableServers	1148	0.0	2.0	0.1069	0.3861	0.1491

Summary Output Report: ServerAssembly3

```
numberInQueue.count (TALLY)
30 1,097.000 1,233.000 1,161.067 776.754 27.870
numberAvailableServers.count (TALLY)
30 1,096.000 1,179.000 1,138.833 433.799 20.828
```

+-----+
| ServerAssembly3 simulation replications DONE |
+-----+

Simulation Run Data Collected, Analyst Report Ready X

i 30 total replications performed, with data saved.

ServerAssembly3 Analyst Report

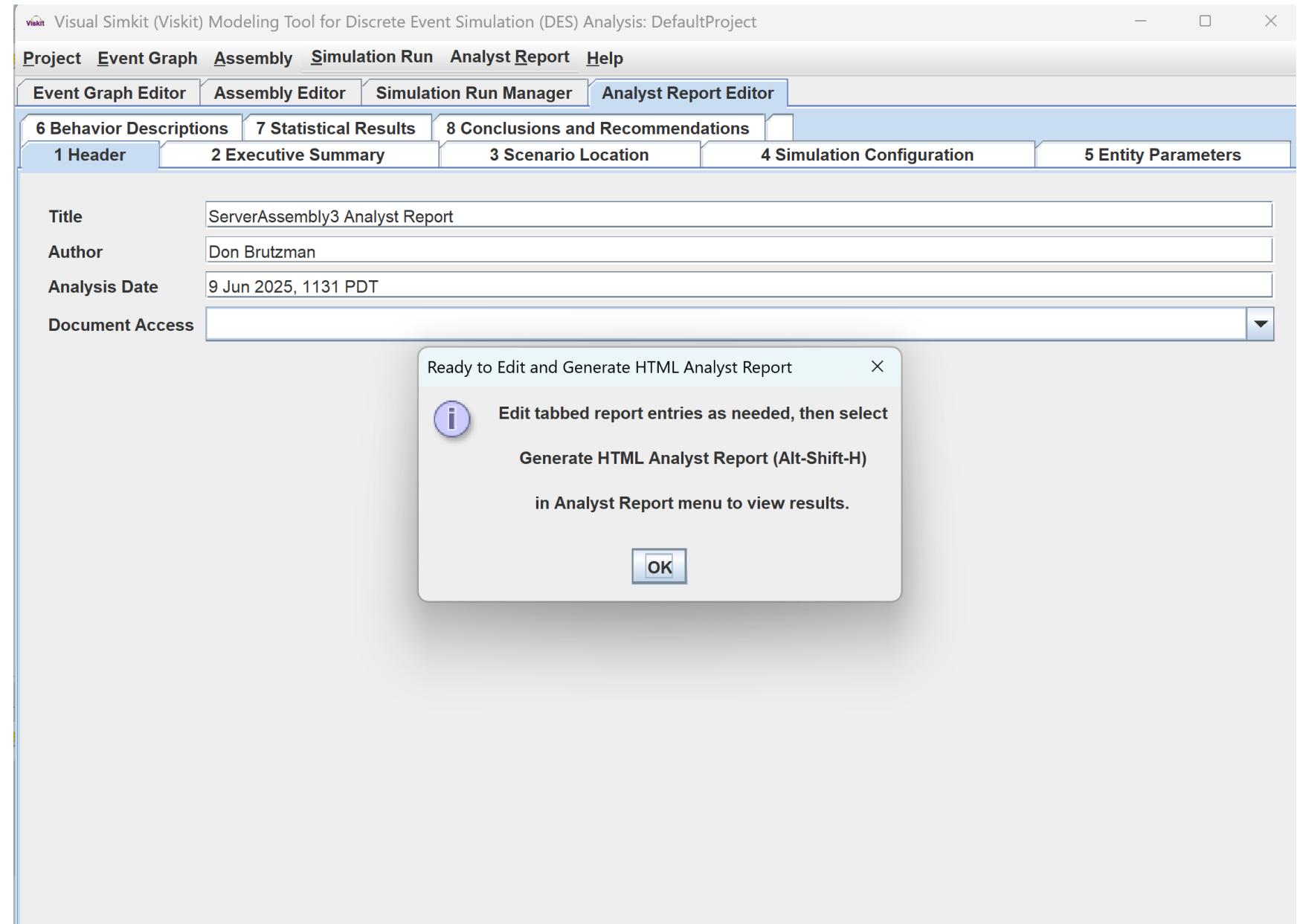
is now loaded and ready for further analysis.

OK

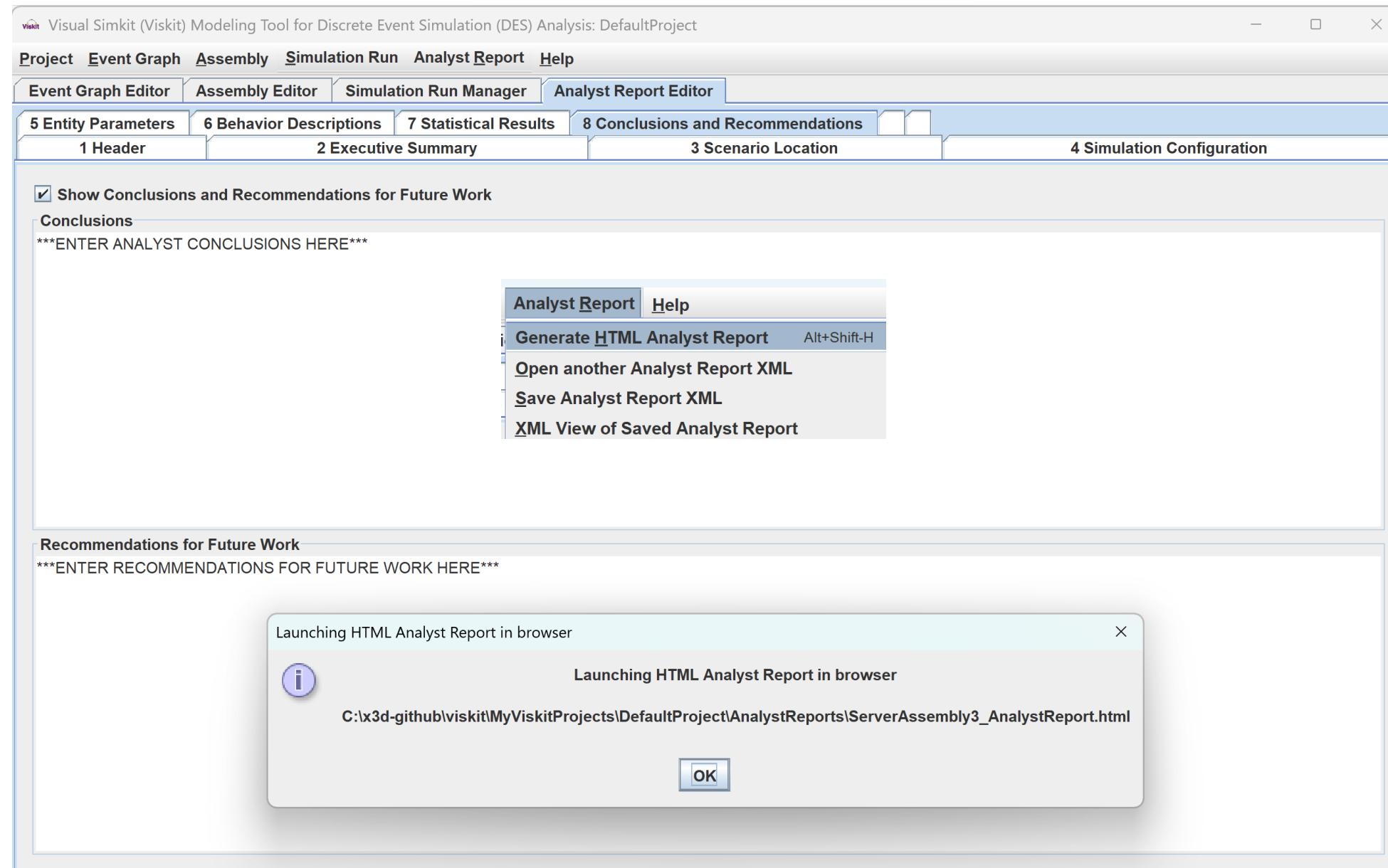


Simulation replications complete

Edit
Analyst
Report data



When
ready,
launch
HTML
Analyst
Report
in browser





ServerAssembly3 Analyst Report

Analyst: **Don Brutzman**

Analysis date: **9 Jun 2025, 1131 PDT**

[Executive Summary](#) | [Scenario Location](#) | [Simulation Configuration](#) | [Entity Parameters](#) | [Behavior Descriptions](#) | [Statistical Results](#) | [Conclusions and Recommendations](#)

Executive Summary

Assessment Overview

ENTER EXECUTIVE SUMMARY HERE

[Back to top](#)

Scenario Location for the Simulation

Description of Scenario Location Features

ENTER SCENARIO LOCATION DESCRIPTION HERE

Production Notes

ENTER SCENARIO LOCATION PRODUCTION NOTES HERE

All units are meters and degrees unless otherwise noted.

Post-Experiment Analysis of Significant Scenario Location Features

ENTER SCENARIO LOCATION CONCLUSIONS HERE

Simulation Configuration: Viskit Assembly Preparation for ServerAssembly3

Simulation configuration is defined by the Viskit Assembly which collects, lists, initializes, and connects all Event Graphs for participating entity models within a single scenario. The runnable assembly is then ready for repeated simulation replications, either for visual validation of behavior or statistical analysis of Measures of Effectiveness (MoEs).

Description: not provided

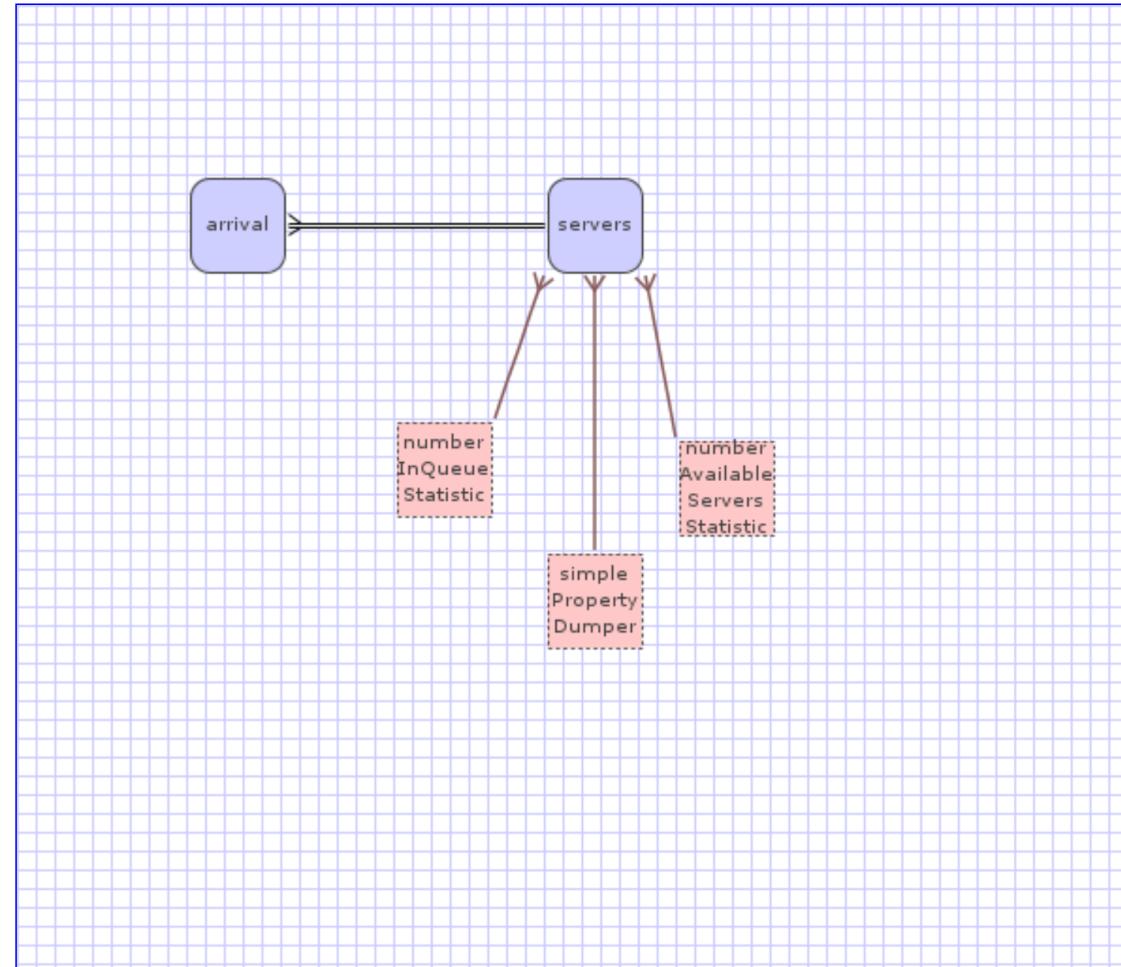


Figure 1: Simulation Assembly Combining all Simulation Entities for this Scenario Experiment

Entity Parameters for configuring Event Graphs

Entity parameters configure the behaviors of connected event graphs.

Initialization Parameters for Simulation Entity

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Entity Initialization Parameters for this Simulation Assembly

Initialization parameters are applied to individualize generic behavior models. These parameters customize the event-graph models.

Entity Parameters Conclusions: Post-Experiment Analysis of Entity Behaviors

ENTER ENTITY PARAMETERS CONCLUSIONS HERE

Initialization Parameters for Simulation Entity

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Behavior Descriptions

Description of Behavior Design

Event Graph Behavior: examples.ArrivalProcess

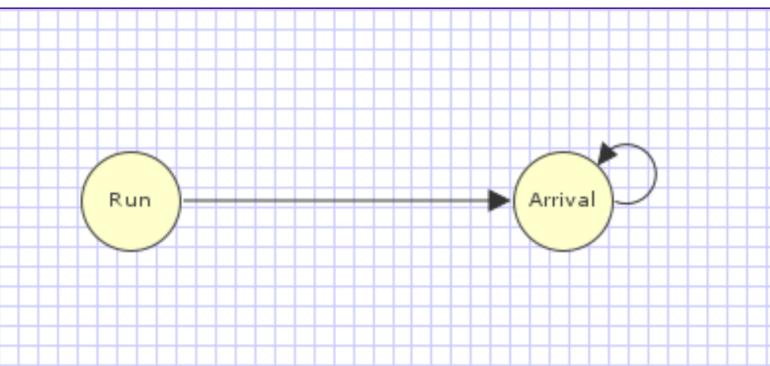


Figure 2: Event Graph for examples.ArrivalProcess

Initialization Parameter Parameter Type Description

State Variable	Variable Type	Description
numberArrivals	int	no description found in Event Graph

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Event Graph Behavior: examples.SimpleServer

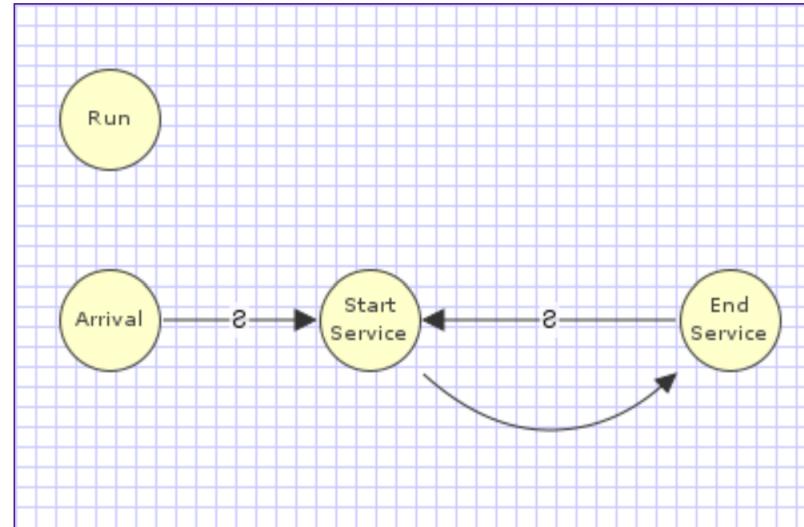


Figure 3: Event Graph for examples.SimpleServer

Initialization Parameter Parameter Type Description

State Variable	Variable Type	Description
numberAvailableServers	int	no description found in Event Graph
numberInQueue	int	no description found in Event Graph

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Statistical Results for the Simulation

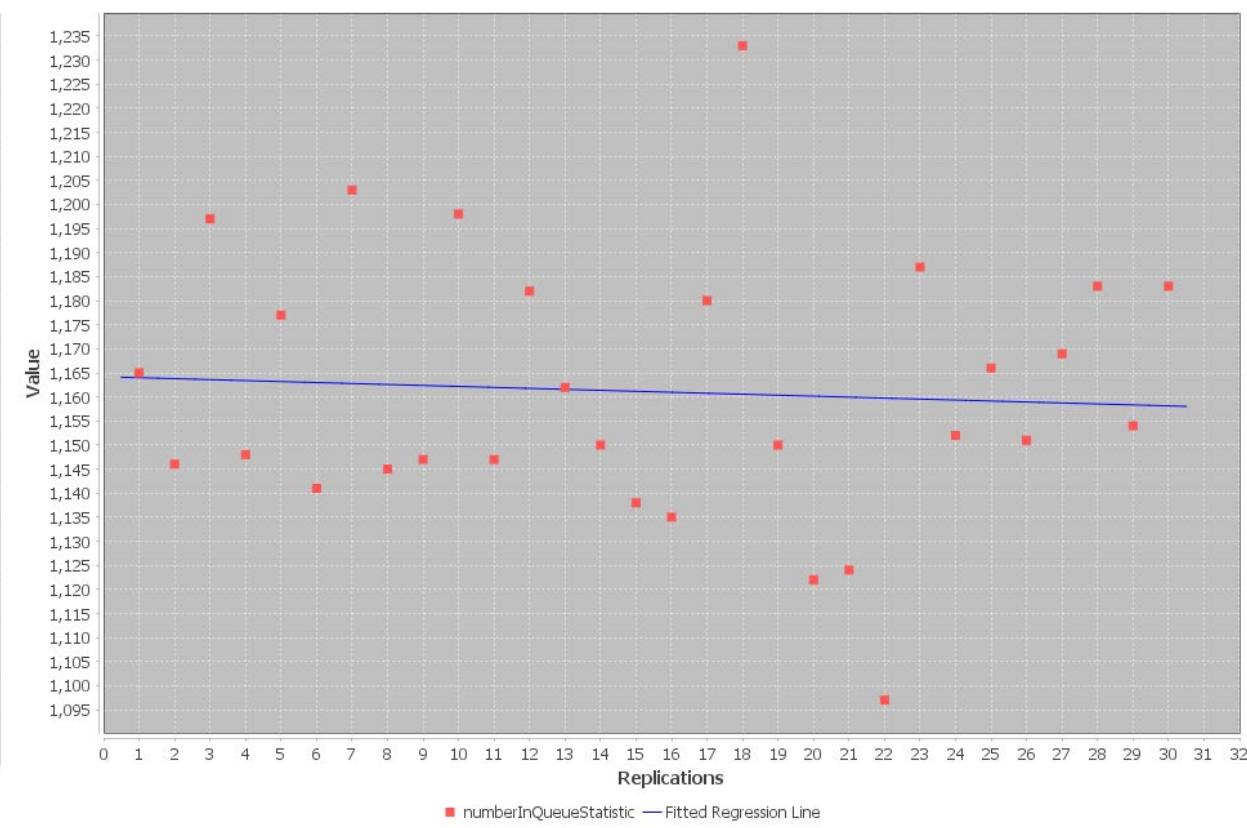
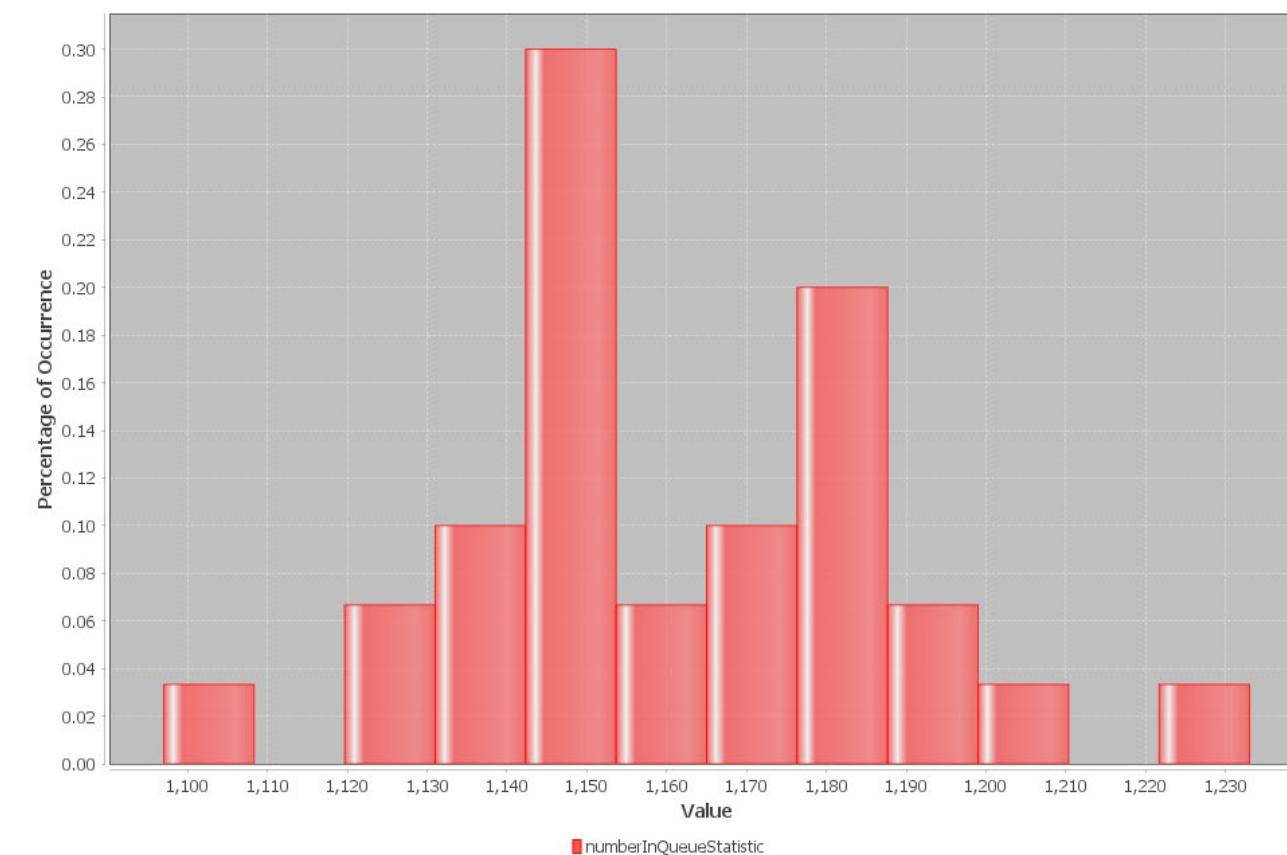
This simulation included 30 replication repetitions for the assembly of interest.

Statistical results are collected and produced by Property Change Listener (PCL) definitions in the Assembly model.

Assembly Simulation Replication Report

Measure of Effectiveness (MoE)

Property: numberInQueueStatistic



Replication #	numberAvailableServersStatistic	Min	Max	Mean	StdDev	Variance
1	1133	0	2	0.054	0.274	0.075
2	1143	0	2	0.100	0.350	0.123
3	1155	0	2	0.027	0.199	0.039
4	1131	0	2	0.028	0.189	0.036
5	1145	0	2	0.032	0.204	0.042
6	1131	0	2	0.175	0.465	0.216
7	1133	0	2	0.006	0.105	0.011
8	1143	0	2	0.187	0.508	0.258
9	1143	0	2	0.147	0.448	0.201
10	1161	0	2	0.056	0.258	0.067
11	1135	0	2	0.080	0.341	0.116
12	1179	0	2	0.071	0.336	0.113
13	1131	0	2	0.063	0.331	0.110
14	1145	0	2	0.113	0.393	0.155
15	1097	0	2	0.127	0.424	0.180
16	1115	0	2	0.160	0.474	0.225
17	1159	0	2	0.150	0.445	0.198
18	1173	0	2	0.019	0.164	0.027
19	1145	0	2	0.177	0.493	0.243
20	1113	0	2	0.093	0.356	0.127
21	1115	0	2	0.087	0.344	0.118
22	1096	0	2	0.233	0.552	0.305
23	1177	0	2	0.045	0.256	0.066
24	1137	0	2	0.030	0.210	0.044
25	1123	0	2	0.003	0.079	0.006
26	1115	0	2	0.117	0.401	0.161
27	1159	0	2	0.102	0.371	0.138
28	1147	0	2	0.056	0.293	0.086
29	1139	0	2	0.059	0.290	0.084
30	1147	0	2	0.107	0.386	0.149

Analyst Report Completion

Conclusions and Recommendations

Conclusions

ENTER ANALYST CONCLUSIONS HERE

Recommendations for Future Work

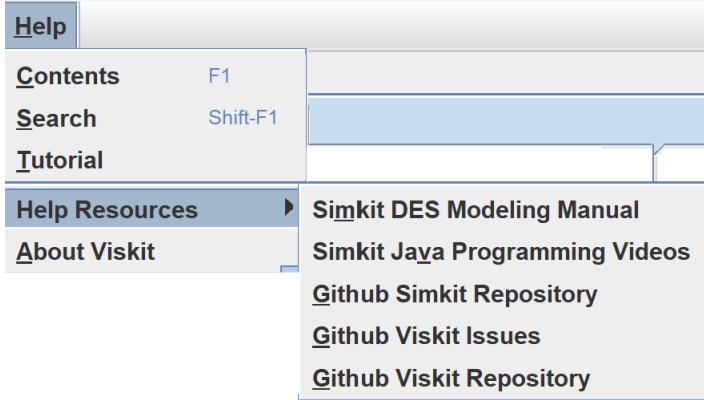
ENTER RECOMMENDATIONS FOR FUTURE WORK HERE

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This report was autogenerated by the Viskit Event Graph and Assembly modeling tool using Simkit discrete-event simulation (DES) libraries. Online at <https://github.com/open-dis/viskit> and <https://github.com/ahbuss/Simkit>.

- Thus well suited for iterative analysis and experimentation
- Report files can be saved and reopened as needed – archival.
- Improvements ongoing and suggestions are always welcome

Help



To learn everything you want from
Professor Arnie Buss:

[Simkit Discrete Event Simulation
\(DES\) Modeling Manual](#)

[Simkit Java Programming Videos](#)

The screenshot shows the Viskit Help application window titled 'Viskit Help'. The left pane is a tree view of the help contents:

- Viskit Help
 - Overview
 - Introduction
 - Contributors
 - Terms
 - Tutorial
 - Event Graph
 - Create an Assembly
 - Simulation Run
 - State Machine
 - Menus
 - Project
 - Event Graph
 - Assembly
 - Simulation Run
 - Analyst Report
 - Help
 - Tabs
 - Event Graph Editor
 - Assembly Editor
 - Simulation Run Manager
 - Analyst Report Editor

The right pane displays the 'Introduction' section:

Introduction

Viskit is an open-source application to build Discrete Event Simulation (DES) models that autogenerate Java source for simulation using the Simkit library.

The Viskit application enables authors to assemble a collection of event graphs that describe the behavior of multiple entities in a simulation environment.

Capabilities include Simkit Event Graphs, Assemblies, simulation replication tools, and an Analyst Report generator suitable for thesis and research efforts.

The 2025 software release is a thorough refactoring of the underlying Viskit source code, facilitating ongoing project maintenance and development.

Expected to return in future distributions: Diskit, which is a Java package of Distributed Interactive Simulation (DIS) utilities and Simkit entities for 3D movement support. The [opendis7-java](#) library is used for state-distribution capabilities that integrates the Distributed Interactive Simulation (DIS) protocol for networked agent behaviors and Live Virtual Constructive (LVC) simulations.

Software and model development efforts are ongoing.

Infrastructure

Open source version control

Viskit codebase, Simkit analytics codebase, model libraries

Open-source license

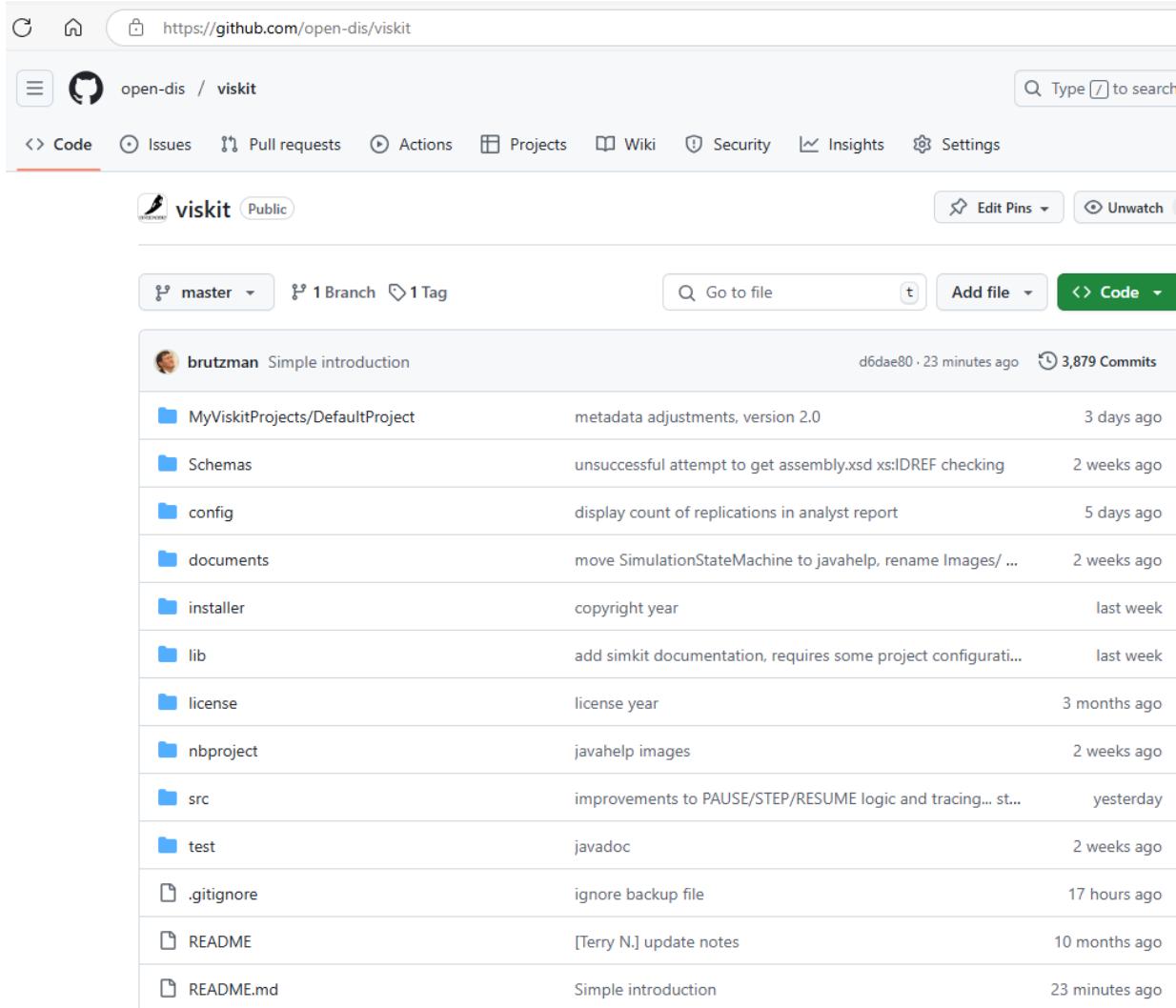
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Open-source repository has moved to github

<https://github.com/open-dis/viskit>



The screenshot shows the GitHub repository page for 'viskit' under the 'open-dis' organization. The repository is public and has 1 branch and 1 tag. The master branch has 3,879 commits. The commits are listed below, showing contributions from 'brutzman' and others. The commits are dated from 23 minutes ago to 10 months ago.

Commit	Message	Date
brutzman Simple introduction	d6dae80 - 23 minutes ago	3,879 Commits
MyViskitProjects/DefaultProject	metadata adjustments, version 2.0	3 days ago
Schemas	unsuccessful attempt to get assembly.xsd xs:IDREF checking	2 weeks ago
config	display count of replications in analyst report	5 days ago
documents	move SimulationStateMachine to javahelp, rename Images/ ...	2 weeks ago
installer	copyright year	last week
lib	add simkit documentation, requires some project configurati...	last week
license	license year	3 months ago
nbproject	javahelp images	2 weeks ago
src	improvements to PAUSE/STEP/RESUME logic and tracing... st...	yesterday
test	javadoc	2 weeks ago
.gitignore	ignore backup file	17 hours ago
README	[Terry N.] update notes	10 months ago
README.md	Simple introduction	23 minutes ago

- Previously hosted at <https://gitlab.nps.edu/Savage/viskit> to all NPS personnel
 - (U.S. and international)
- Inclusion under open-dis project will hopefully encourage broad use and further contributions

MV3500 Networked Graphics for Simulation

<https://gitlab.nps.edu/Savage/NetworkedGraphicsMV3500>

The screenshot shows the GitLab interface for the 'NetworkedGraphicsMV3500' project. The left sidebar has an 'Explore' section with a search bar and a 'Project' section containing 'NetworkedGraphicsMV3500'. The main area displays the project's name, a 'master' branch dropdown, a 'Find file' button, and a 'Code' dropdown. A recent commit from 'brutzman' is shown: 'omit 20203 from SISO-REF-010, update some links' (commit ID 98408467). Below this is a table of files with their last commit and update times.

Name	Last commit	Last update
archive	remove build-impl.xml NetBeans a...	9 months ago
assignments	omit broken links in javadoc	2 months ago
conferences	Update file README.md	1 year ago
documentation	page title icon	2 years ago
examples	Security warnings in comments	2 months ago
lib	updated external jar files	2 months ago
nbproject	[Terry N.] enable viskit run from ID...	7 months ago
presentations	touchups	8 months ago
specifications	omit 20203 from SISO-REF-010, u...	2 months ago
viskit	[Terry N.] update	7 months ago

Course slidesets and examples
soon to migrate to github as well

Viskit demo video

<https://savage.nps.edu/Savage/videos/Viskit-demo-2023MAR4.mp4>

Visual Simkit (VISKIT)

0:01 / 3:23

Event Graph

```
graph LR
    Run((Run)) -- t_A --> Arrival((Arrival))
    Arrival -- "S > 0" --> StartService((Start Service))
    StartService -- "Q > 0" --> EndService((End Service))
    StartService -- "R > 0" --> Reneging((Reneging))
    Reneging -- "R = R + 1, q.remove(c)" --> Arrival
    Reneging -- "S = S + 1" --> StartService
    Arrival -- t_B --> StartService
    StartService -- t_C --> EndService
    StartService -- t_E --> Reneging
    Reneging -- t_D --> Arrival
    Reneging -- t_F --> StartService
```

Figure 4-10. Multiple Server Queue with Customers who Reneging

As shown by the Event Graph in Figure 4-10, an arriving customer schedules the Reneging event upon arrival, so that whenever it occurs, the queue is decremented. If the StartService event occurs first, however, then the Reneging event that corresponds to that customer is removed. Note that the expression $M + R$ that is on the cancelling edge from StartService to Reneging gives the number of the customer who has just started service.

The state variables M , R , and N can be used to compute the proportion of customers who renege (R/N) and the proportion of customers who receive service (M/N). The time-varying averages of S and Q can be used to estimate the average number in the queue and the average utilization of the servers.

Note that Little's formula cannot be applied in this situation to estimate the delays in queue or the time in the system for customers who received service. This is because the queue count includes all customers and can't distinguish (before a Reneging occurs) between those who will eventually renege and those who will receive service. Applying Little's formula would require two state variables, one for served customers and one for reneging customers. Since this cannot be done until after the fact, a model that explicitly computes these times is needed (see below).

4.5. Containers

For certain situations it is convenient to model using containers to hold data, as the previous model illustrated. In Event Graph models a container can be thought of as a state variable with "values" that go beyond simple numerical variables.

Contact

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