Network Environments in AnyLogic

Nathaniel Osgood

3-3-2011

Recall: Spatial Types Supported

- Continuous
  - No interference between agents
  - Continuous movement (via velocity)
  - Only spatial dimensions required
- Discrete
  - Space is divided ("tesselated") into cells
  - Mutual exclusion of agents from a given cell
  - Space information requires dimension & rows/columns (for count of cells in X & Y location)

Networks & Spatial Layouts

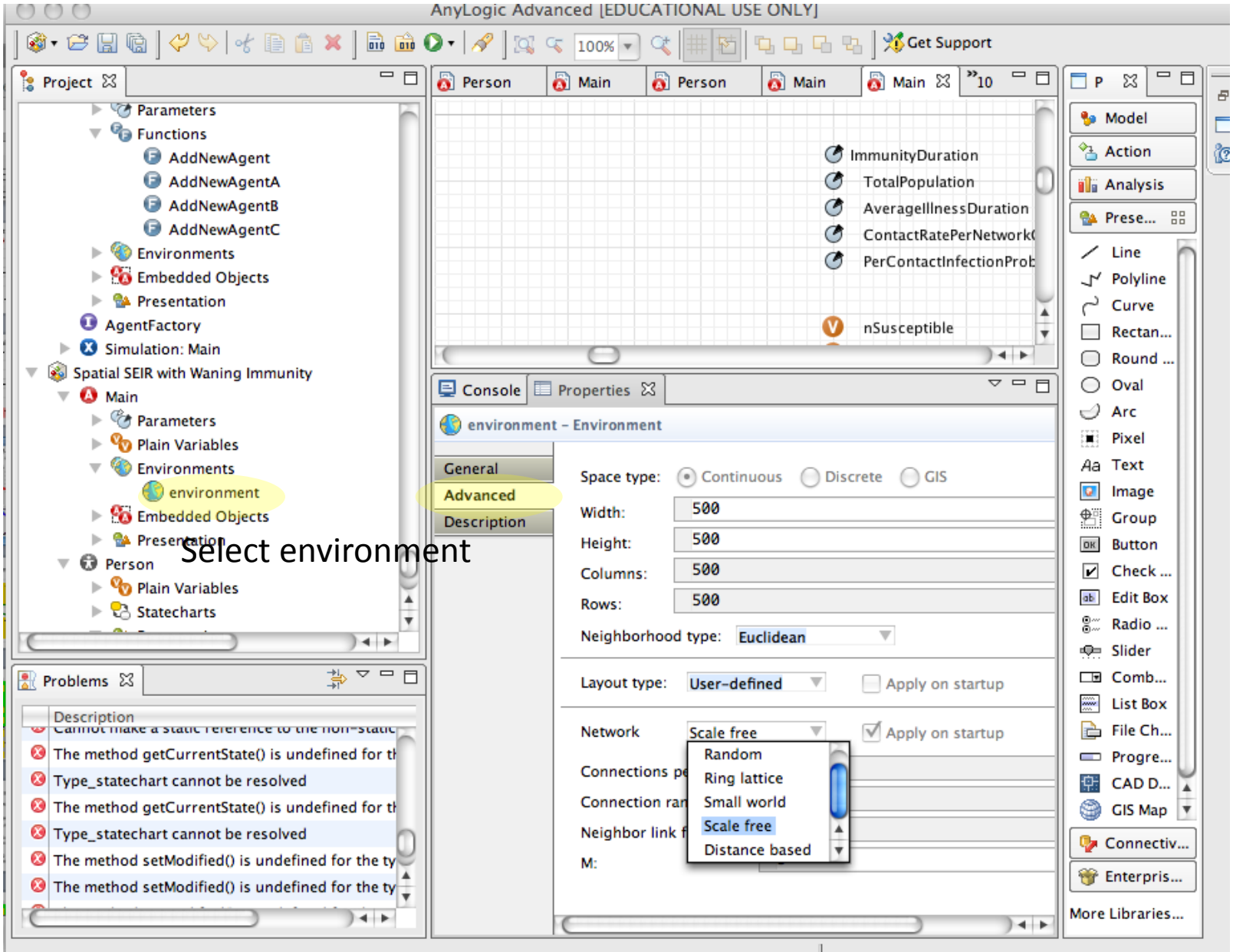
- Distinct node attributes: Location & connections
  - Spatial layouts determine where nodes appear in space (and often on the screen)
  - Network type determines who is connected to who
  - For the most part, these characteristics are determined independently
- Network topologies (connectedness) can be defined either *alternative to* or *in addition to spatial layouts*
  - Agents will have spatial locations in either case

Hands on Model Use Ahead

Load model:

Network Modification of SIR AB

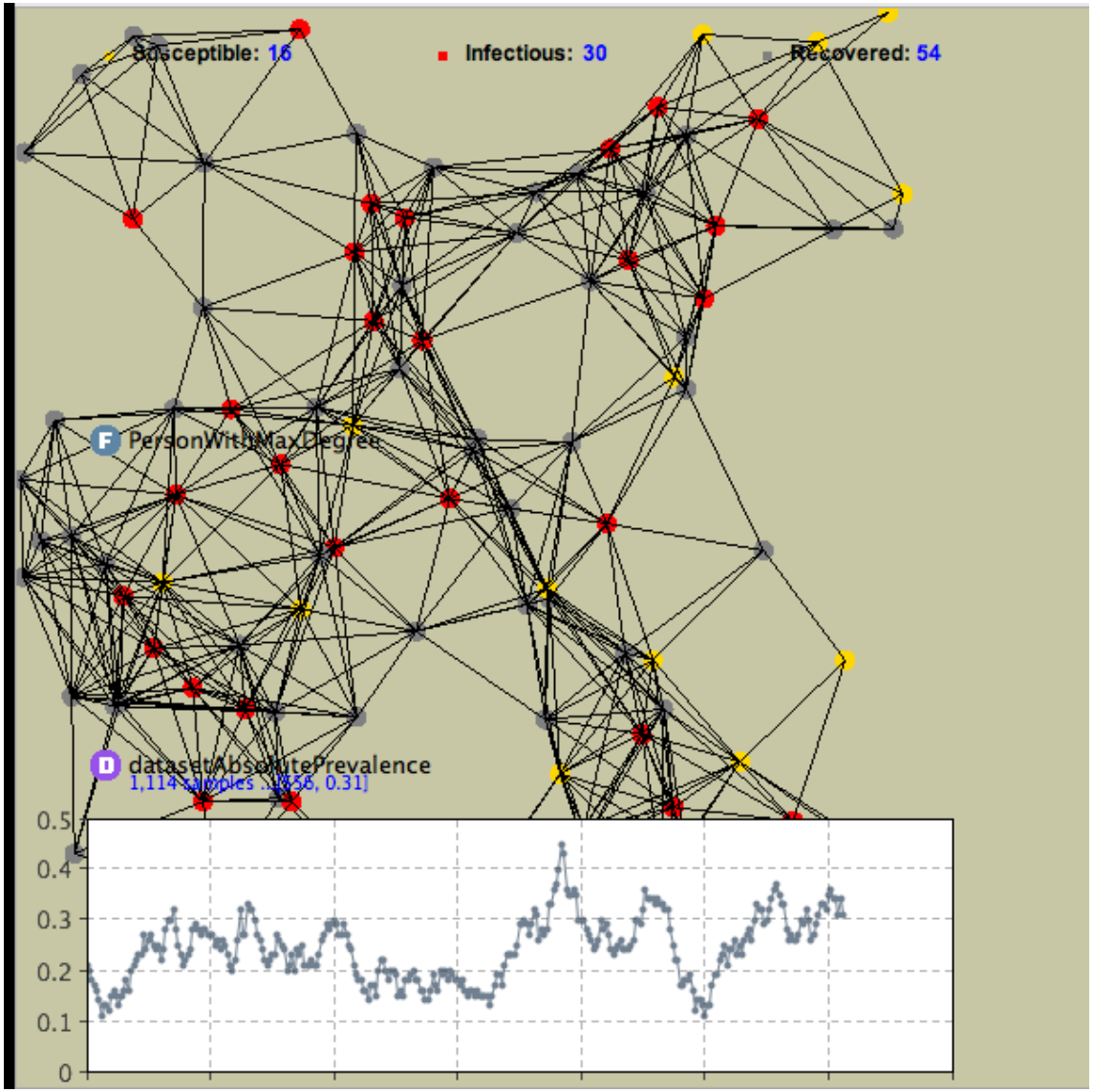
Network Types



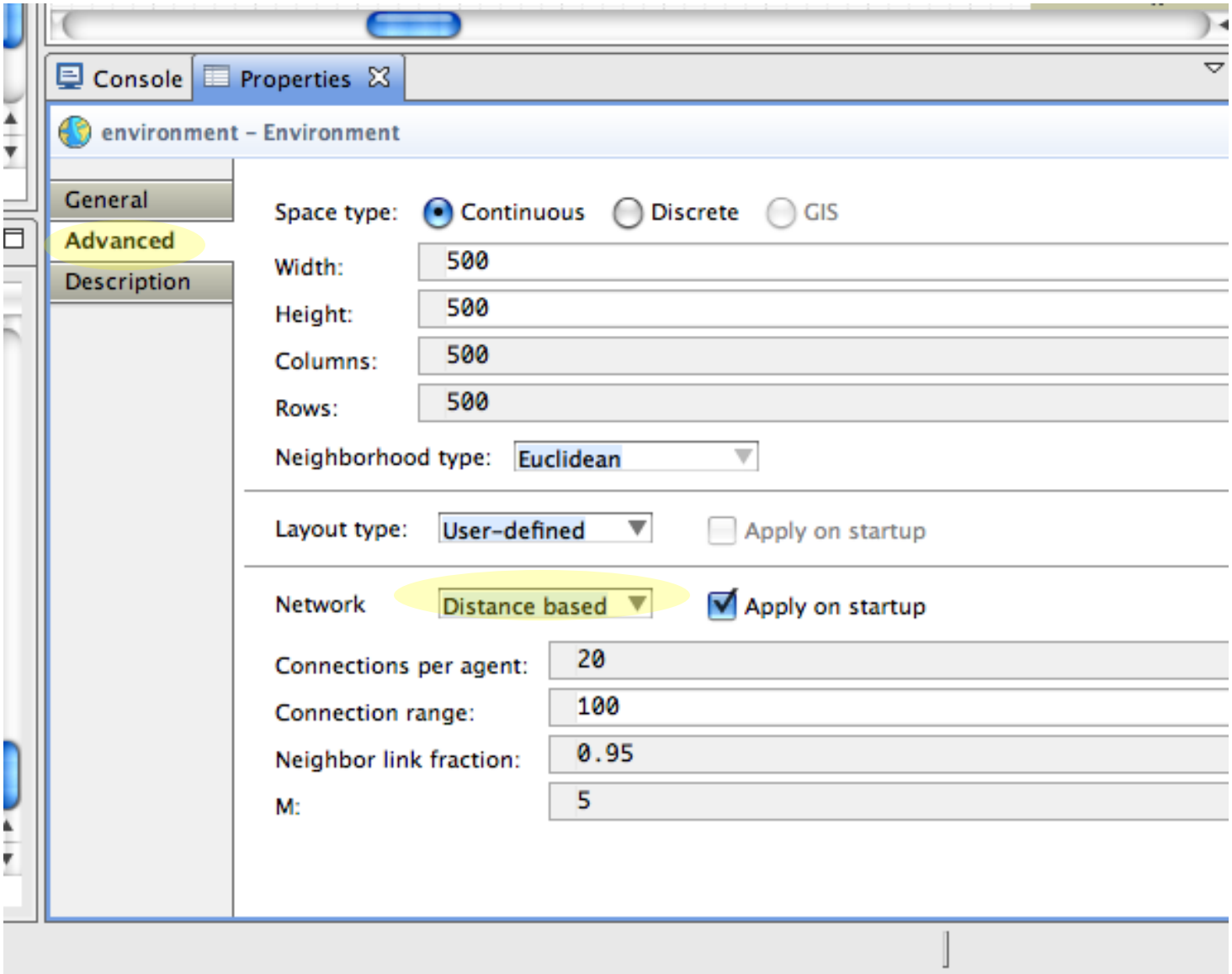
Interaction Between Network&Location 1

- For one type of networks (Distanced Based), whether there is a connection between A and B depends on the distance between A & B
  - This sets connectivity based on location considerations!

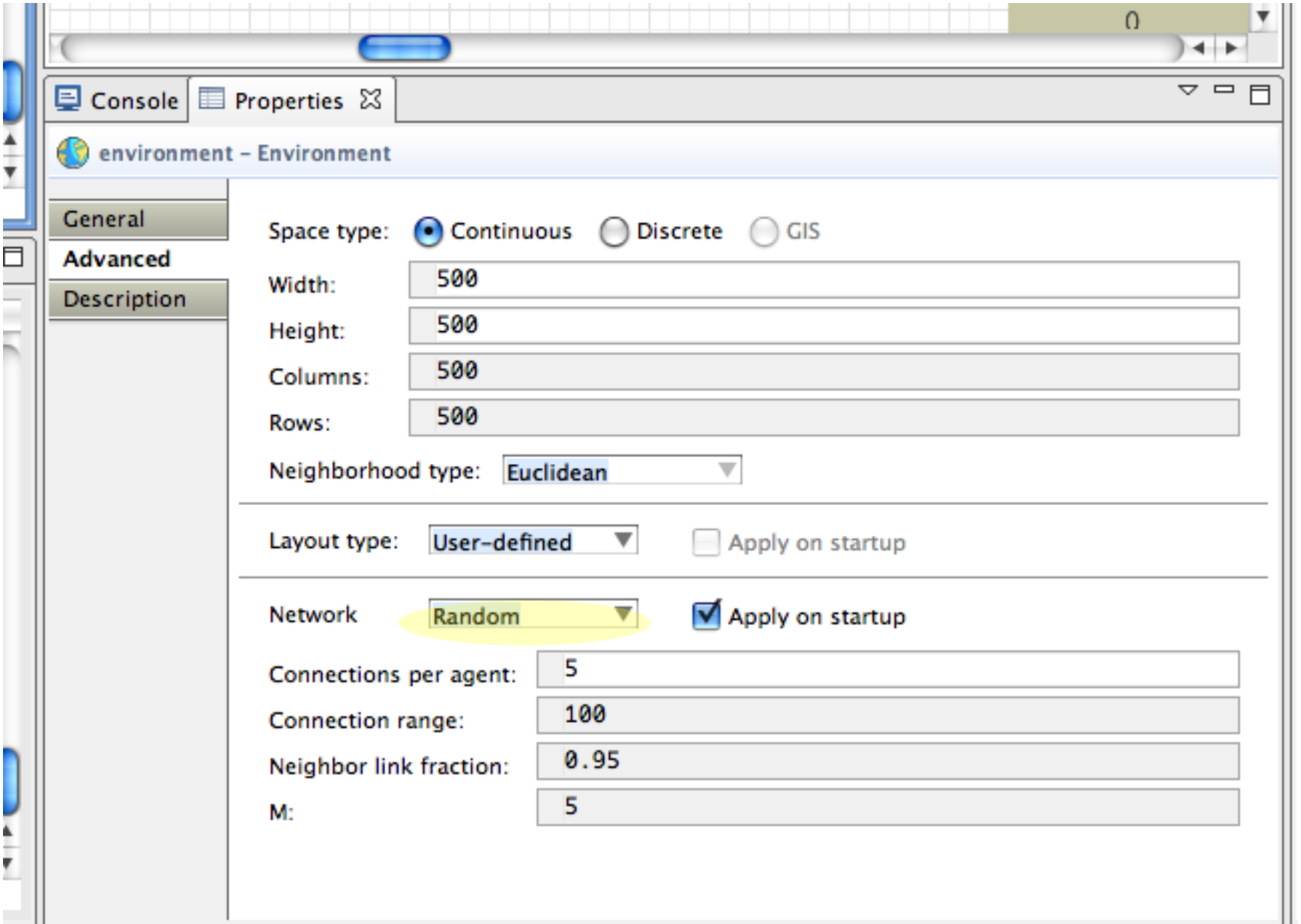
Distance-Based Layout



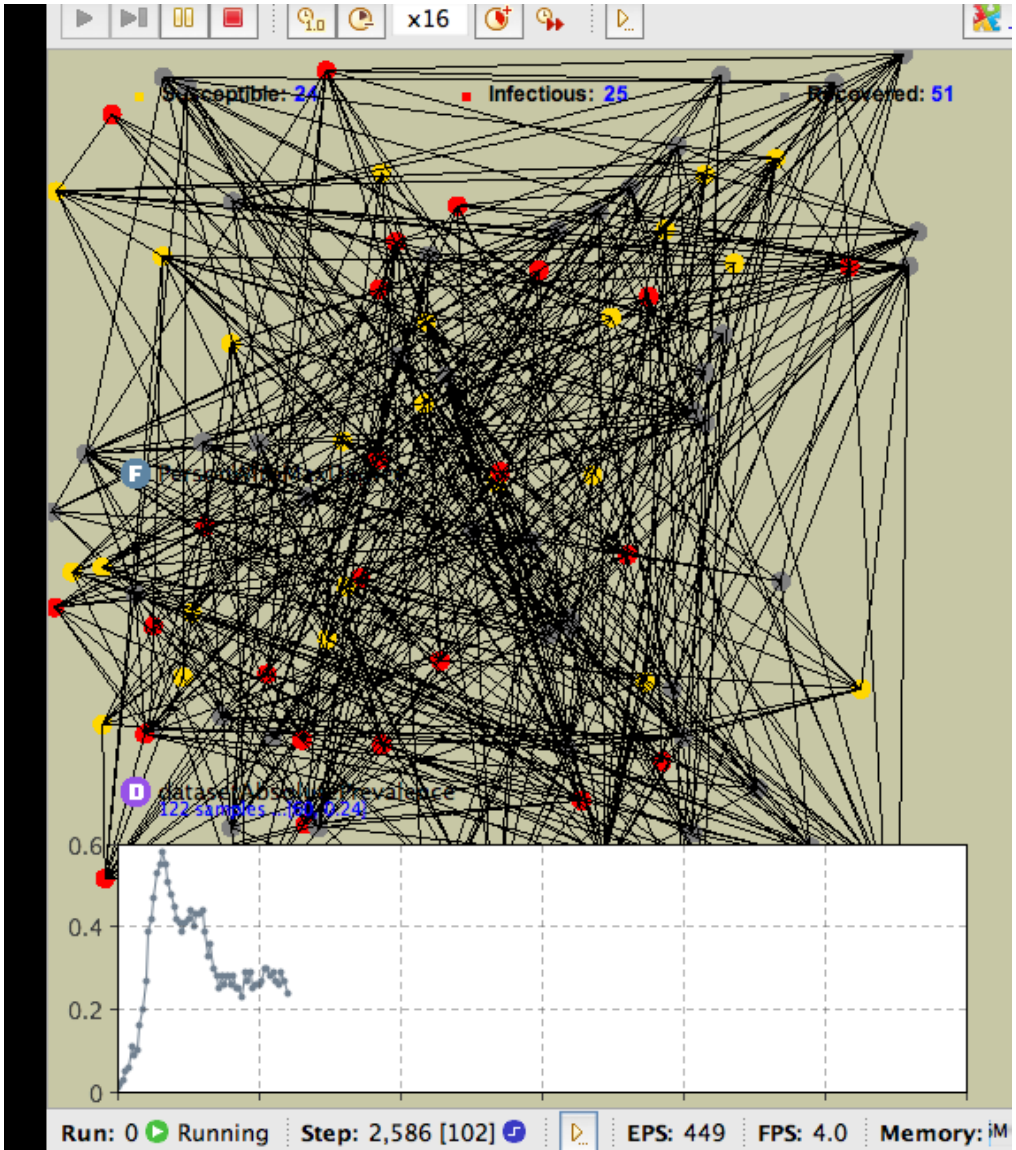
Property for Distance-Based Layout: Distance Threshold



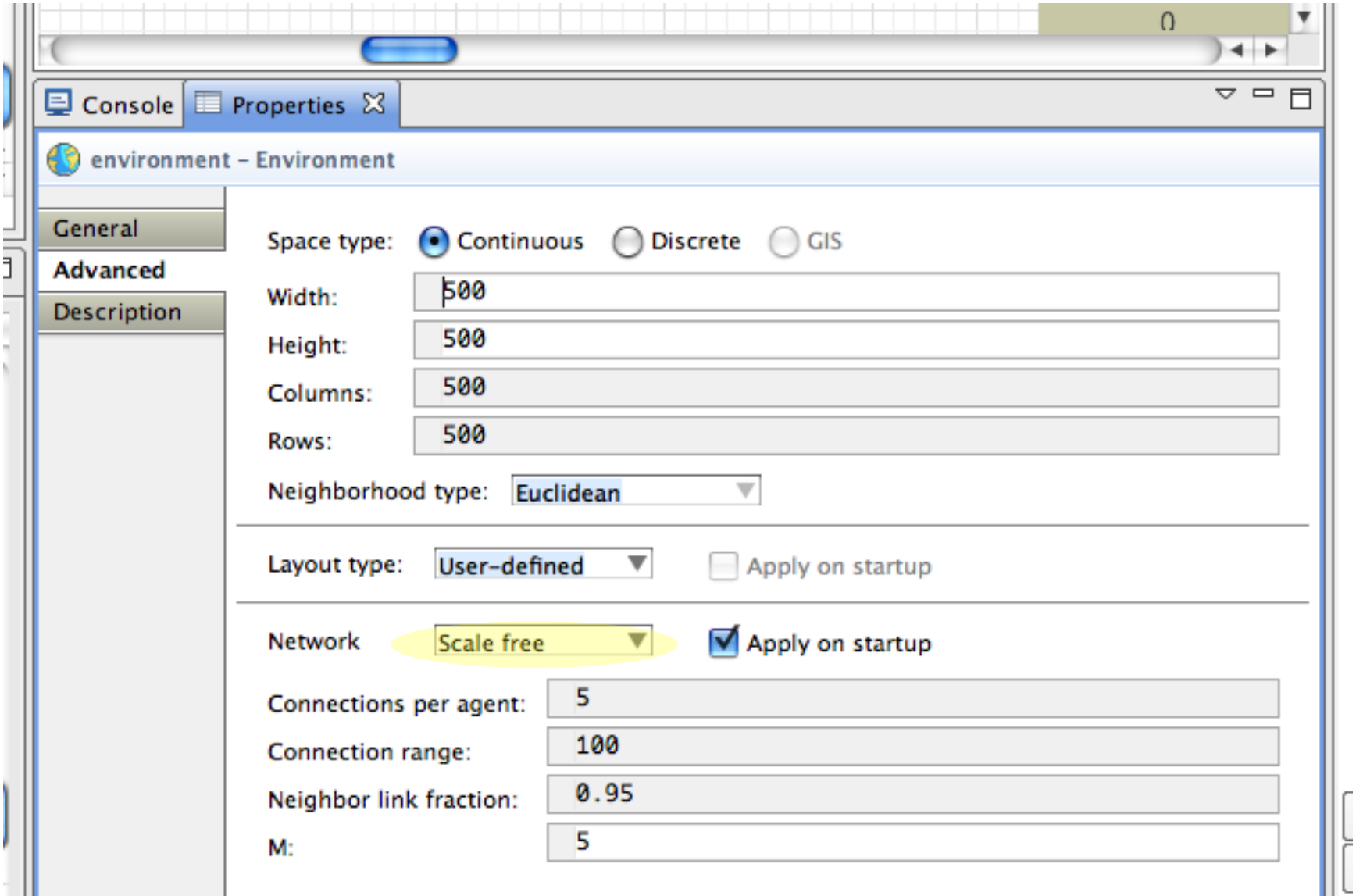
Random Connections



With Random Connections



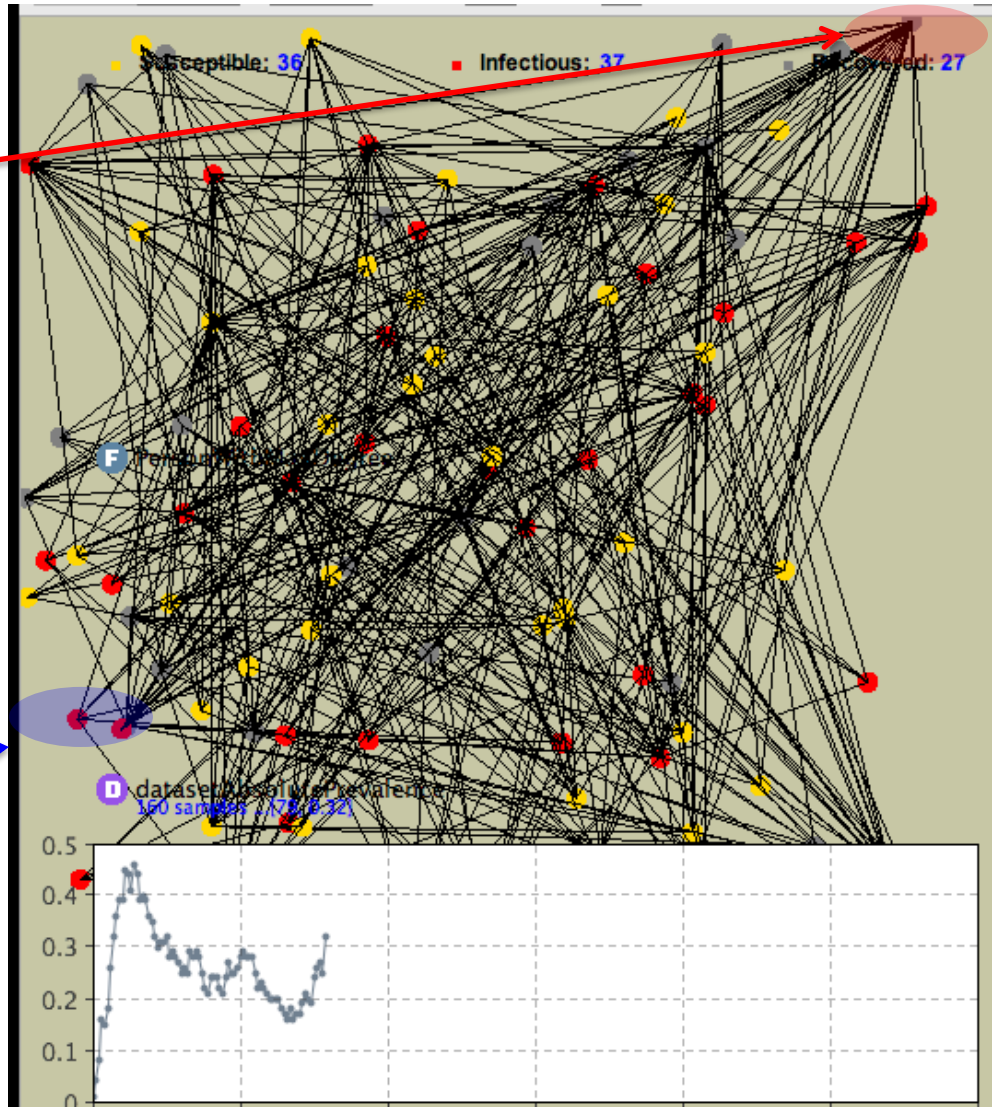
Scale-Free Network



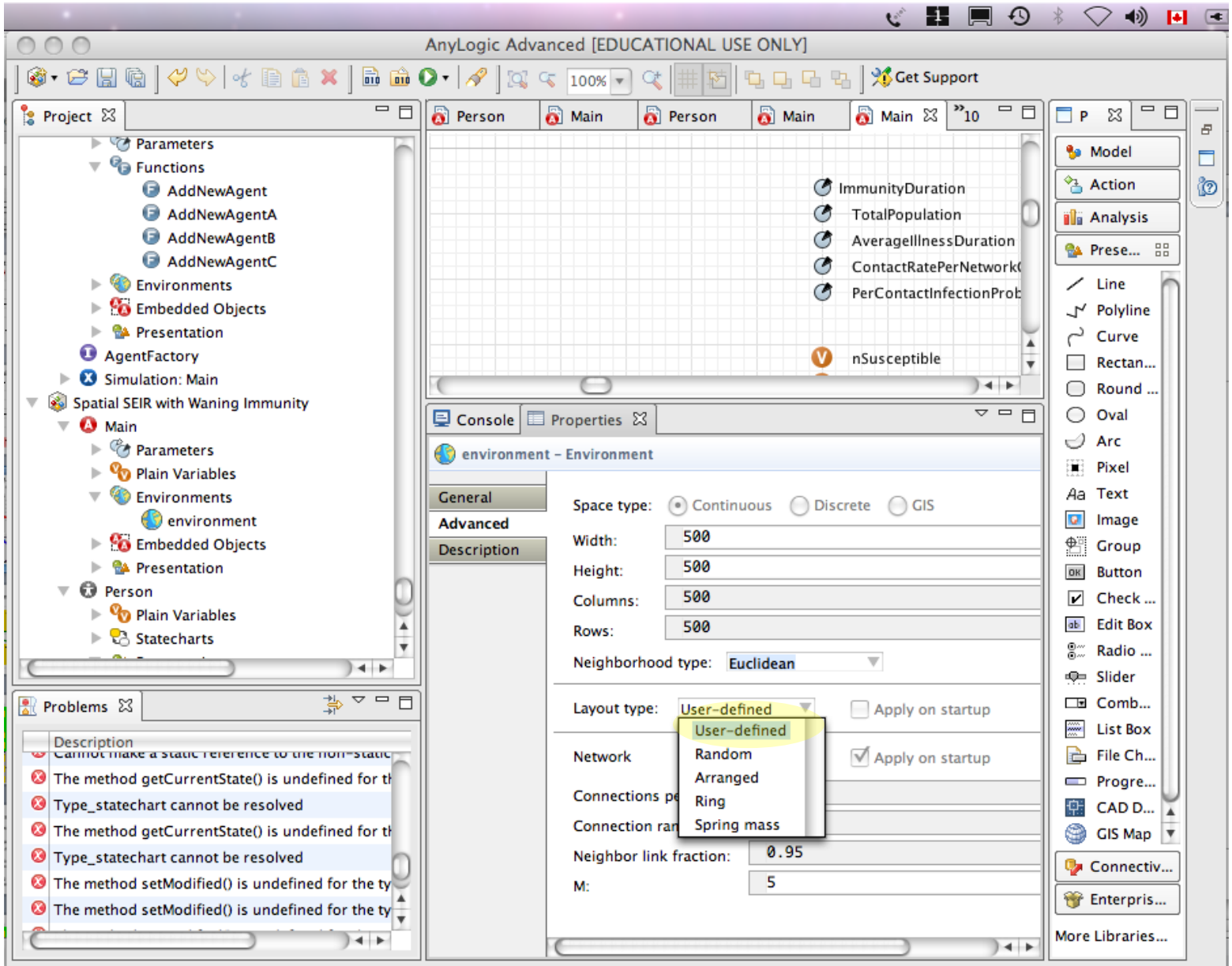
Scale-Free Network

High degree node

Low degree node



Layout Types



Layout Type

- **Random**: Uniformly distribute X and Y position of nodes
- **Arranged**: Set node locations in a regular fashion (normally in a 2D grid)
- **Ring**: Set node locations in periodically spaced intervals around a ring shape
- **Spring Mass**: Adjust node locations such that node locations that are most tightly connected tend to be closer together
  - (Sets location based on network!)
- **User-Defined** User can set location (e.g. in initialization code)

Interaction Between Network & Location 2

- In a Spring-mass layout, the nodes that are highly connected will tend to be clustered
- Here, we are determining the location based on the connectivity!