The goal of PrimoGENI is to incorporate real-time network simulation into the GENI "ecosystem". We are extending our existing real-time large-scale network simulator PRIMEX to become part of the GENI federation.

PrimoGENI will support large-scale GENI experiments with millions of simulated network entities (hosts, routers, and links) and thousands of emulated elements running unmodified network protocols and applications.

### PrimoGENI Architecture

- **Physical resources layer (substrate):** cluster nodes, switches, and other physical resources, which can be queried during resource discovery.
- **Meta resources layer:** virtual machines upon resource assignment during sliver creation.
- **Simulation and emulation execution layer:** simulator instances and emulated hosts, created upon virtual network specification, and mapped to the meta resources at the layer below.
- **Experiment layer:** researchers can conduct live simulation and emulation experiments on the virtual network.

### PRIMEX

- **PRIMEX** is a real-time network simulator, capable of simulating large-scale networks and emulating unmodified network protocols, services, and applications.
  - **Scalable network models:** Capable of conducting large-scale experiments on parallel and distributed platforms.
  - **High-speed emulation:** Provide high-performance interoperability between network applications running on virtual machines and the network simulator.
  - **Real-time interaction:** User can directly monitor and modify the state of the network model during experiments.
  - **Network scripting:** User can construct large complex network experiments using simple scripting languages (in Java and Python).
  - **Model databases:** Existing network models and experiment results are stored in databases for reusability and validation.

### Slingshot

**Slingshot** is an Integrated Development Environment (IDE), which aims to provide an end-to-end solution for PrimoGENI experiments.
- **Model development:** Use a python console for constructing large complex network models.
- **Model visualization:** Use prefun for visualizing the network configurations.
- **Experiment setup:** Deploy and launch experiments on ProtoGENI/Emulab environments.
- **Experiment monitoring and control:** Monitor the experiment and possibly change the state of the network entities during experiment run time.

### PrimoGENI Experiments

**PrimoGENI uses ProtoGENI/Emulab suite to manage physical and meta resources**

- **To configure PrimoGENI:**
  I. The user needs to install Slingshot at the client side.
  II. The user needs to acquire and install ProtoGENI credentials in Slingshot.
  III. The user needs to install PrimoGENI customized images at the ProtoGENI site.
- **After instantiating an experiment**, the user can access individual emulated hosts (i.e., openvz containers) through ssh.

PrimoGENI is available at [http://groups.geni.net/geni/wiki/PrimoGENI](http://groups.geni.net/geni/wiki/PrimoGENI).