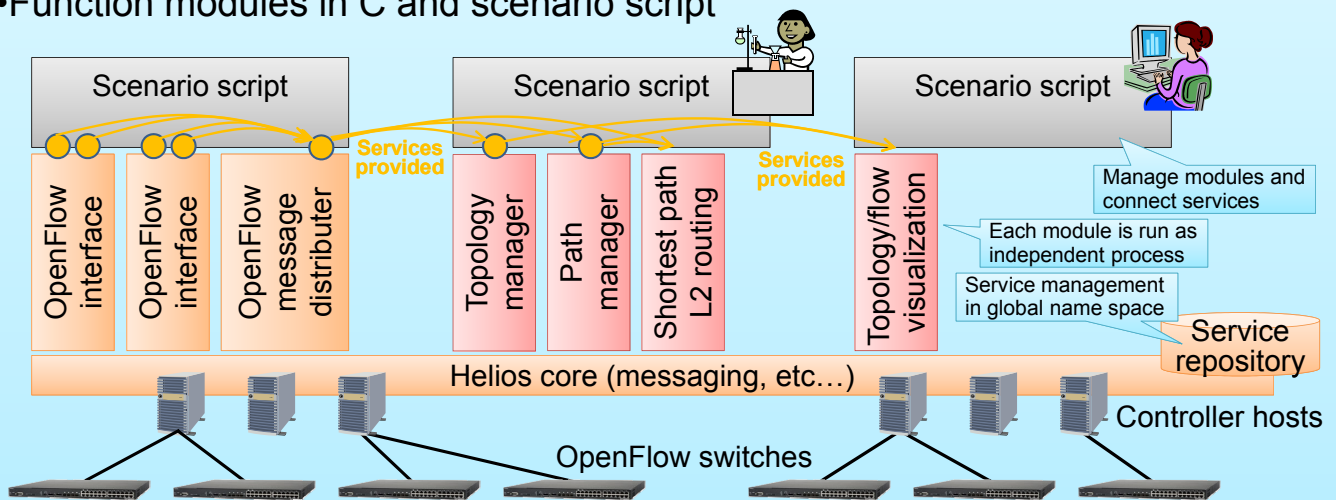# Global Environment for Network Innovation (GENI)

Helios: Fully distributed OpenFlow controller platform

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Architecture

- Scalable for large experiments (1 million flow handling demonstrated)
  - Module is instantiated as a process and deployed on arbitrary host at runtime
- Multiple researchers cooperate via "service" on a single Helios instance
  - Running module maintenance without stopping infrastructure operation
- Function modules in C and scenario script

Scenario script

Services provided

OpenFlow interface | OpenFlow interface | OpenFlow message distributer | Topology manager | Path manager | Shortest path L2 routing | Topology/flow visualization

Manage modules and connect services

Each module is run as independent process

Service management in global name space

Service repository

Helios core (messaging, etc…)

Controller hosts

OpenFlow switches

Core functions

- Messaging framework
  - Service repository
  - Multiple host version (*)
- Application framework
  - OpenFlow (v1.0)
- Logging and configuration
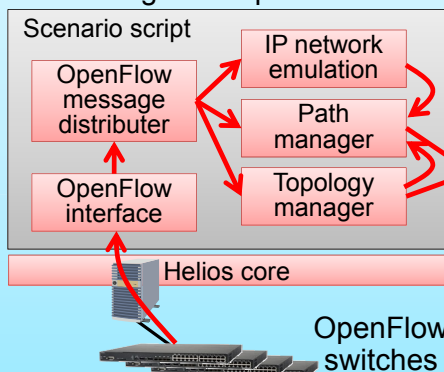- Module management

Modules provided

- OpenFlow interface
  - Switch slicing (*)
- OpenFlow message distributer
- Path manager
  - Shortest path calculation
  - Automatic reroute on path failure
- Topology manager
- Learning L2 switch
- Shortest path L2 routing
- IP network emulation with ACL (*)
- Database for centralized information sharing (*)
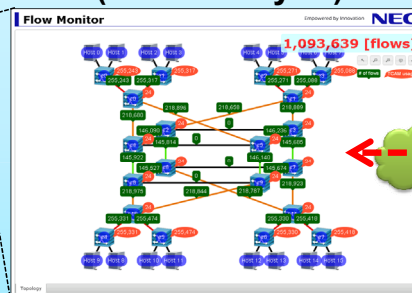
(*) Under development

Demonstration

- Millions of concurrent flow handling
- Multi-path load-balancing and core-stateless flow handling (Source Flow)

Helios usage example for this demo

Scenario script

OpenFlow message distributer → IP network emulation → Path manager → Topology manager → Flow DB → Topology/flow visualization

OpenFlow interface

Helios core

OpenFlow switches

Real-time Flow Monitor (in front of you)

Testbed @ NEC