GENI Workshop
Floating Cloud Tiered (FCT) Network Architecture

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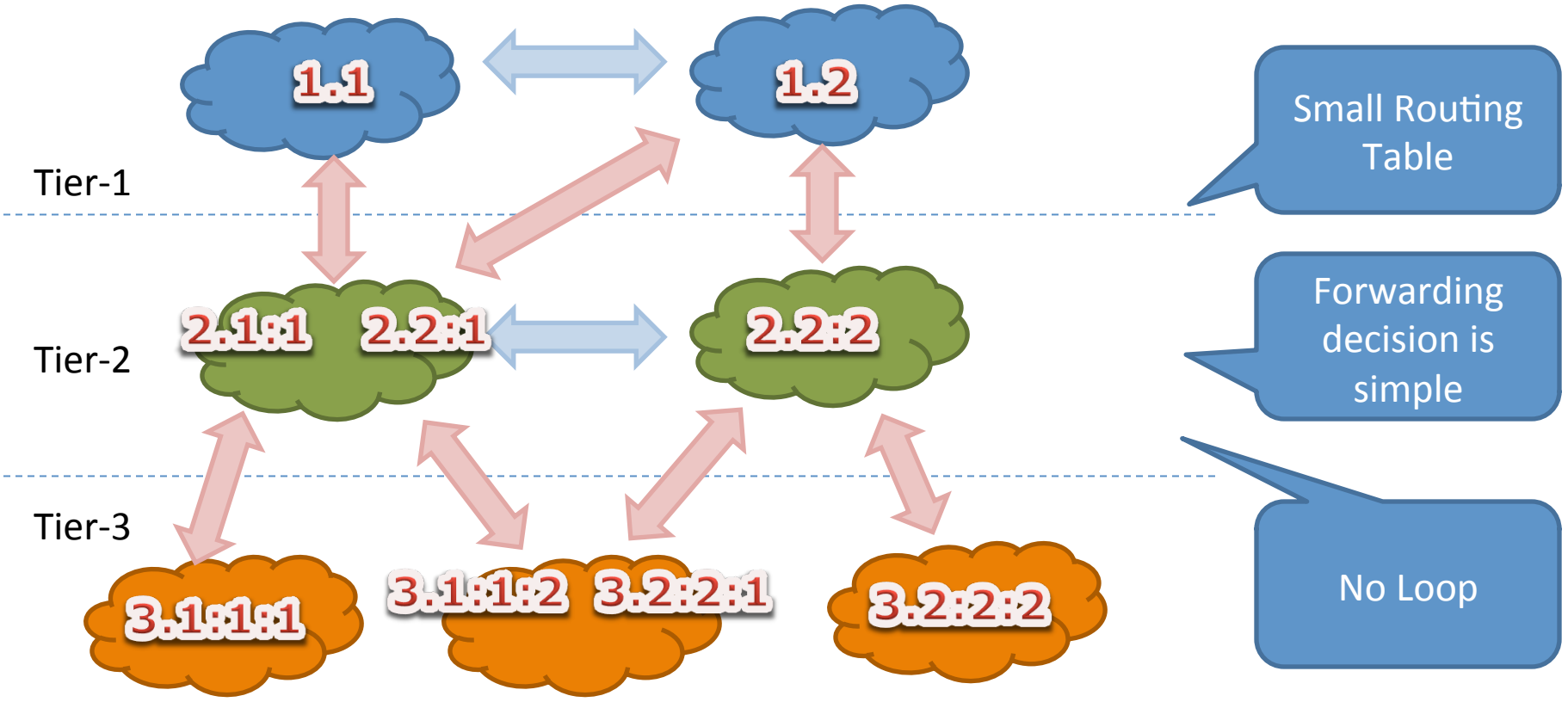
1. Floating Cloud Tiered Architecture

- A candidate future Internet architecture
  - Define *network clouds* and apply *tiered model*
    - Scalable and Manageable
  - Structure of tiers can be dynamic
    - Flexible, Business models
  - Achieved by new tiered addressing scheme
    - Efficient, Routing, Simple
- Funded by the NSF Future Internet Design research initiative

Floating Cloud Tiered with Routing




```
Source Cloud ID     : 3.1:1:1
Destination Cloud ID: 3.2:2:2 ---> 1.2:2:2
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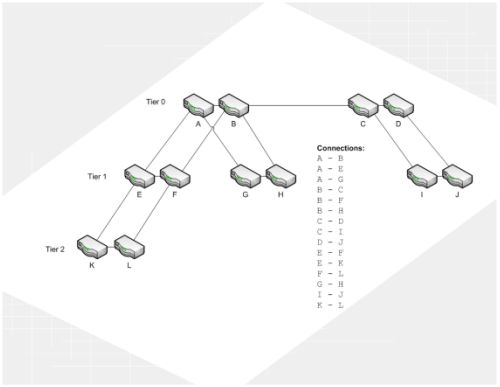
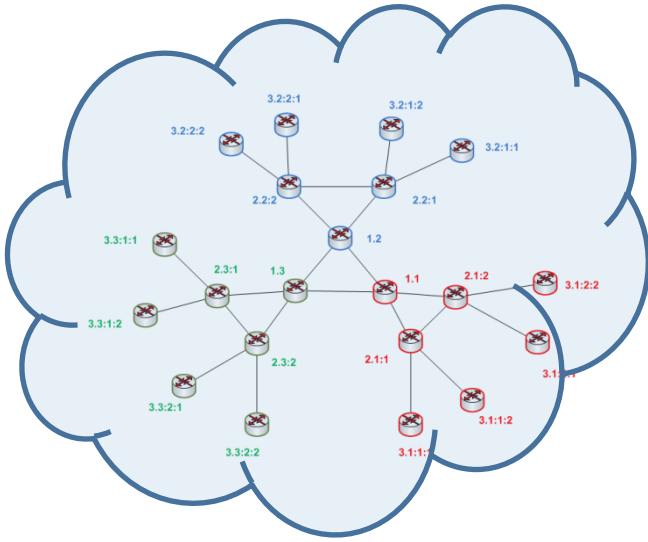
Our Goal with GENI testbed

- Enable real world comparative studies
- Realistic performance analysis
- FCT router is implemented in Linux
  - FCT validation testing
  - FCT performance optimization
- Compare with current routing protocols
  - OSPF
  - BGP
- Transition from IP -> FCT
  - Encapsulate IP packet
  - Use Multi Protocol Label Switching (MPLS)

2. Testbed

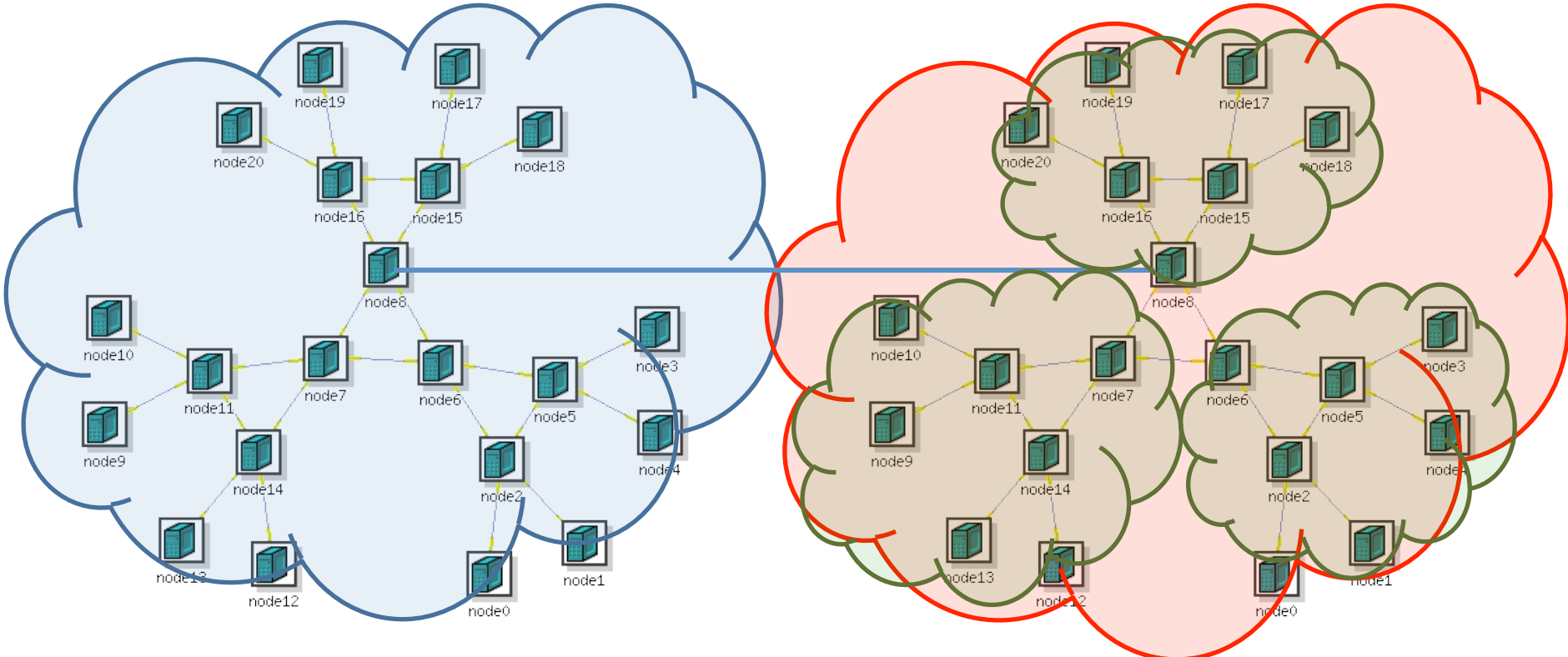
- We started from RIT testbed
  - 12 nodes
  - Linux based FCT router
  - Generates FCT packets
  - Forwards FCT packets
- Next, tested in Emulab
  - Expanded network - nodes and size
  - Intra-Cloud/Domain level
  - Compare with other protocols





GENI testbed

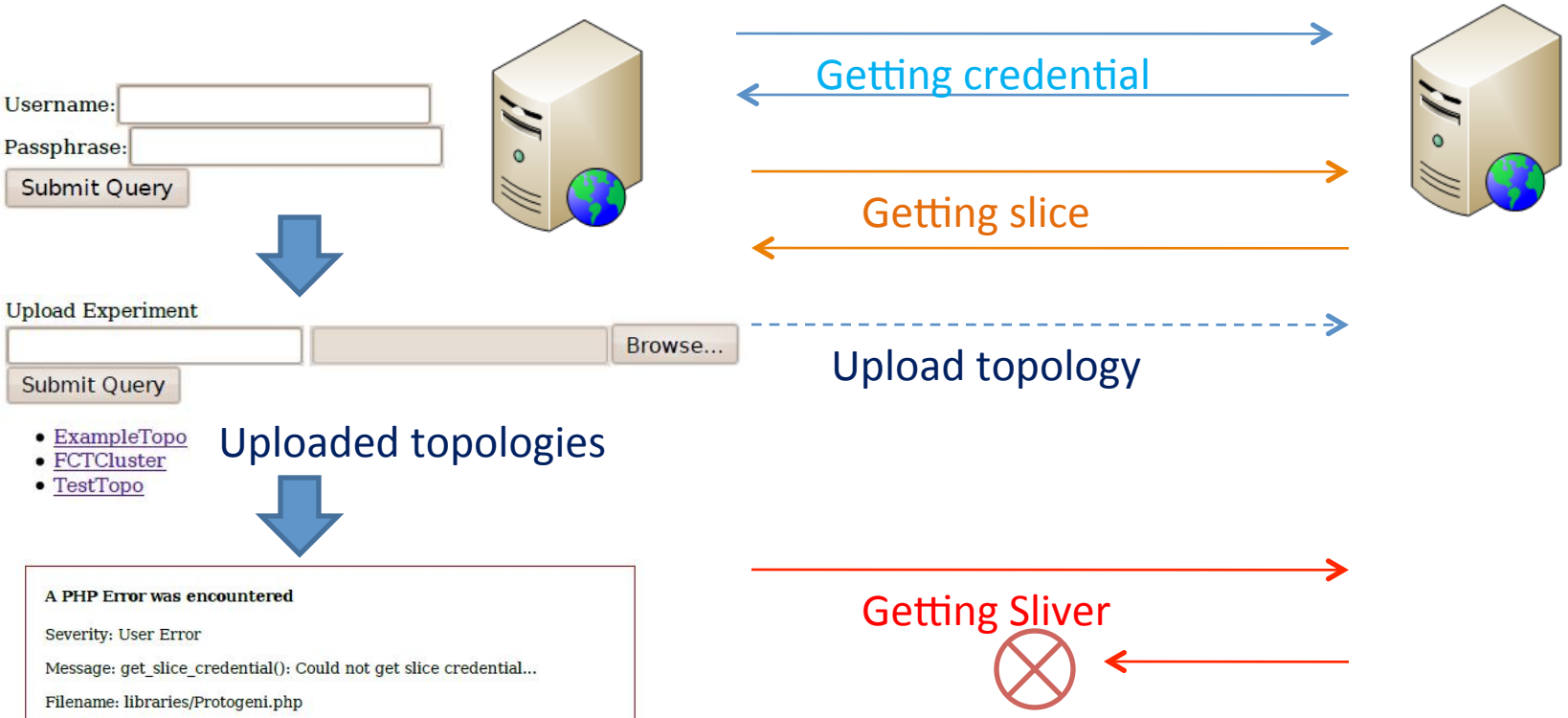
- Multi-sites nation wide network
  - Both intra- and inter- clouds/domain
  - Near realistic scenarios



GENI testbed

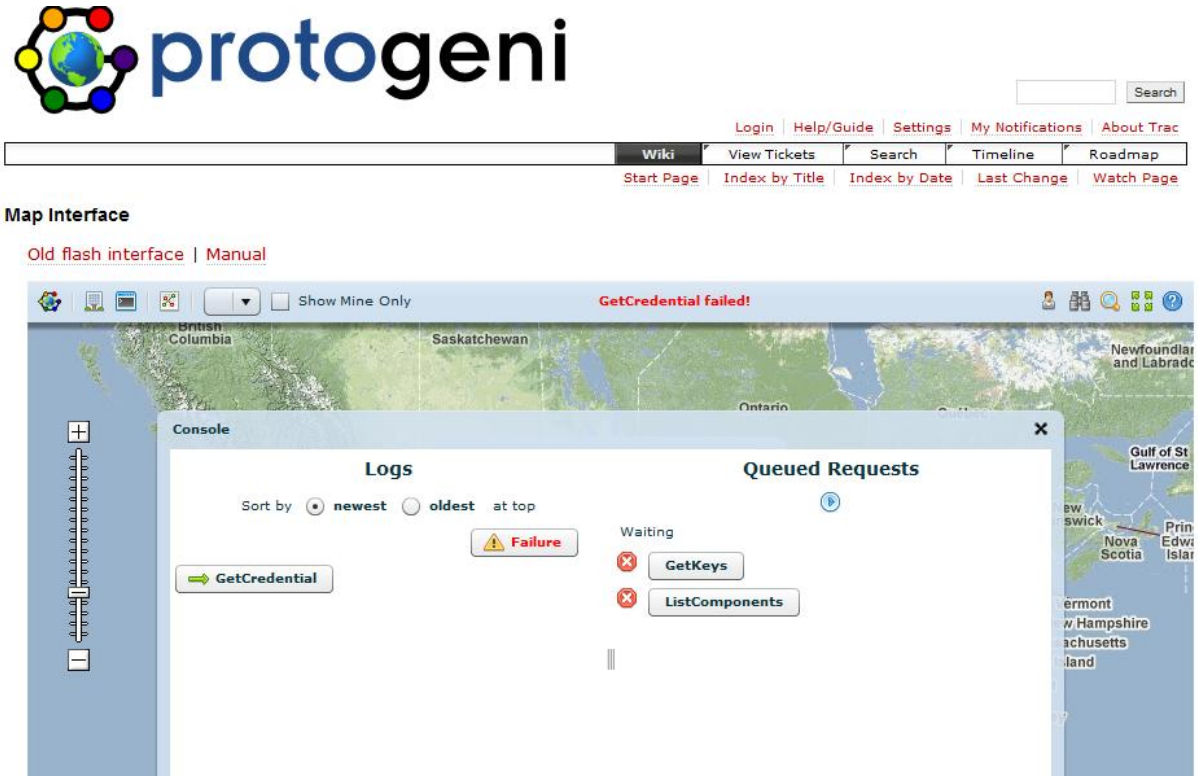
- We have tried to create WEB-based User Interface (Web-UI) for GENI
  - Multiple sites to be established
  - PHP based
    - Used Python test scripts to develop our PHP application
  - Uses Jquery, Codeigniter and some basic Ajax calls
  - Supported most of the GENI API calls
    - PHP function did not work with the CreateSliver API call
    - Encoding method of parameters may be different?

WEB-UI for GENI



WEB-UI

- New Interface…

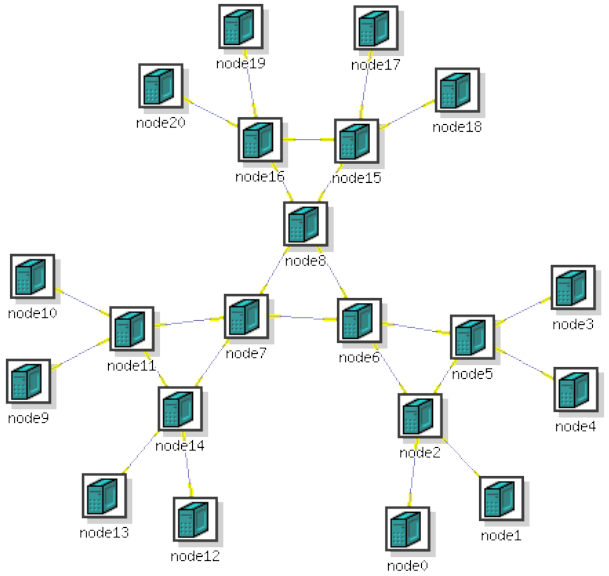


3. Preliminary Results & Feedbacks

- OSPF
- FCT

- OSPF tested using QUAGGA
- FCT using our own code

- Statistics
  - Initial convergence time
  - Node Failure Convergence time
  - Number of Control Packets
  - Data Packets loss during convergence
  - Routing Table size



Issues

- Issues
  - Availability of number of nodes
  - Number of Ethernet ports is limited (5 in Emulab)
    - Control port is dynamically assigned
  - Unable to setup native OSPF routing (i.e. gated)
- Questions
  - Nodes synchronization across sites
  - Any standard routing protocols which can be used for comparison study in (multi-sites) test bed
  - Statistics Measurements tools