Virtual Topology Service (VTS) Features for GENI Experimenters

Resources

- Forwarding Elements with multiple control plane protocols
  - L2 MAC Learning
  - OpenFlow 1.0
  - OpenFlow 1.2
  - OpenFlow 1.3

- Built-in Network Functions
  - SSL VPN
  - WAN Acceleration
  - User-configurable images

- Multi-site WAN topologies
  - Some sites supporting 10G

- Fast sliver creation / teardown
  - No waiting!

- Native compute connectivity
  - InstaGENI Shared VLANs
  - ExoGENI External Stitch Ports

Real-Time Sliver Data

- Controller connection state
- Client-ID mapping to OF data
  - DPID, Port Names

Dynamic Resource Operations

- "Operational Action" support
  - Set port up/down
  - Change Controller URL and OpenFlow version per element
  - Dump flow tables (with/without hidden flows)
  - Clear flow tables
  - Insert static flow rules (Using client-ids)
  - Capture pcap for any port

Sample `vts:of:dump-flows` Output

```
>>> PP(VTSAM.UtahDDC.dumpFlows(context, "sdntrace", ["dp0", "dp1","dp2","dp3","dp4"]))
{'dp0': [],
 'dp1': ['duration=22190s, priority=50, n_packets=54, n_bytes=4644, priority=50,ipv6,actions=drop',
         'duration=22190s, priority=100, n_packets=0, n_bytes=0, priority=100,dl_type=0x8820,actions=CONTROLLER:65509',
         'duration=22190s, priority=50, n_packets=27, n_bytes=1620, priority=50,ip,nw_dst=224.0.0.0/4,actions=drop'],
 'dp2': [],
 'dp3': ['duration=2396s, priority=50, n_packets=0, n_bytes=0, priority=50,ipv6,actions=drop',
         'duration=2396s, priority=100, n_packets=0, n_bytes=0, priority=100,dl_type=0x8820,actions=CONTROLLER:65509',
         'duration=2396s, priority=50, n_packets=0, n_bytes=0, priority=50,ip,nw_dst=224.0.0.0/4,actions=drop'],
 'dp4': ['duration=36315s, priority=50, n_packets=289, n_bytes=24854, priority=50,ipv6,actions=drop',
         'duration=36315s, priority=100, n_packets=2, n_bytes=224, priority=100,dl_type=0x8820,actions=CONTROLLER:65509',
         'duration=36315s, priority=50, n_packets=289, n_bytes=17340, priority=50,ip,nw_dst=224.0.0.0/4,actions=drop',
         'duration=36290s, priority=1000, n_packets=5, n_bytes=452,
priority=1000,in_port=1,dl_dst=02:29:cc2:fd:fa:c1,actions=output:2',
         'duration=36290s, priority=1000, n_packets=4, n_bytes=354,
priority=1000,in_port=2,dl_dst=02:d6:c3:00:e6:ec,actions=output:1']}
```

Sample `sliverstatus` Output

```
>>> PP(VTSAM.UtahDDC.sliverstatus(context, "sdntrace")
{'geni_resources': [{'geni_error': '',
                     'geni_status': 'ready',
                     'geni_urn': 'urn:publicid:IDN+ch.geni.net:bss-sw-test+slice+sdntrace:37201b9c-
c2d3-49f4-9c8d-2655db59ba7c'}],
 'geni_status': 'ready',
 'geni_urn': 'urn:publicid:IDN+ch.geni.net:bss-sw-test+slice+sdntrace:37201b9c-c2d3-49f4-9c8d-2655db59ba7c',
 'vts_datapaths': [{'client-id': 'dp0',
                    'connected': True,
                    'dpid': '00:00:de:c3:0a:85:c2:4d',
                    'ports': [{'client-id': 'dp0:1', 'name': 'vlan3624'},
                              {'client-id': 'dp0:0',
                               'name': '6108483676591'}]},
                   {'client-id': 'dp1',
                    'connected': True,
                    'dpid': '00:00:fa:1b:db:80:cf:45',
                    'ports': [{'client-id': 'dp1:0',
                               'name': '9781150395503'},
                              {'client-id': 'dp1:1',
                               'name': '3471562435966'}]},
                   {'client-id': 'dp2',
                    'connected': True,
                    'dpid': '00:00:5e:8d:fc:cf:a8:43',
                    'ports': [{'client-id': 'dp2:1',
                               'name': '2642646820723'},
                              {'client-id': 'dp2:0',
                               'name': '592155474849'}]}]}}
```
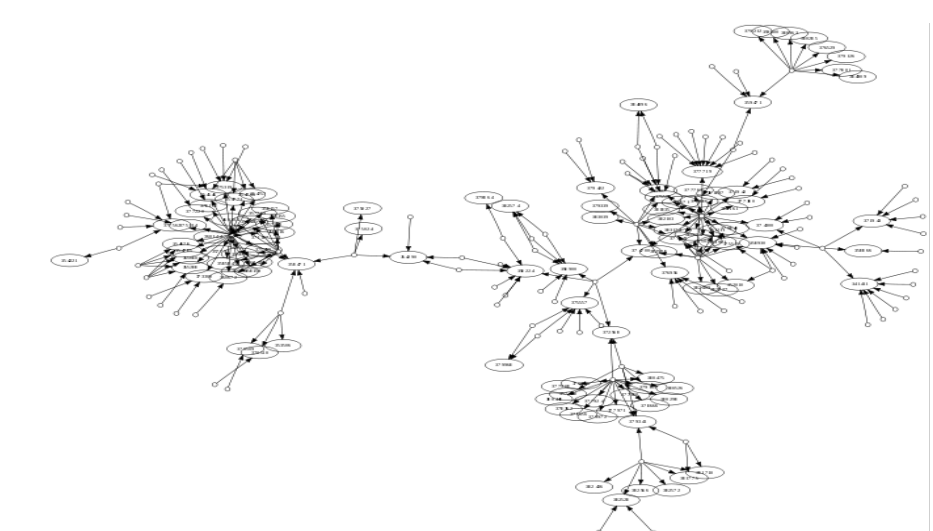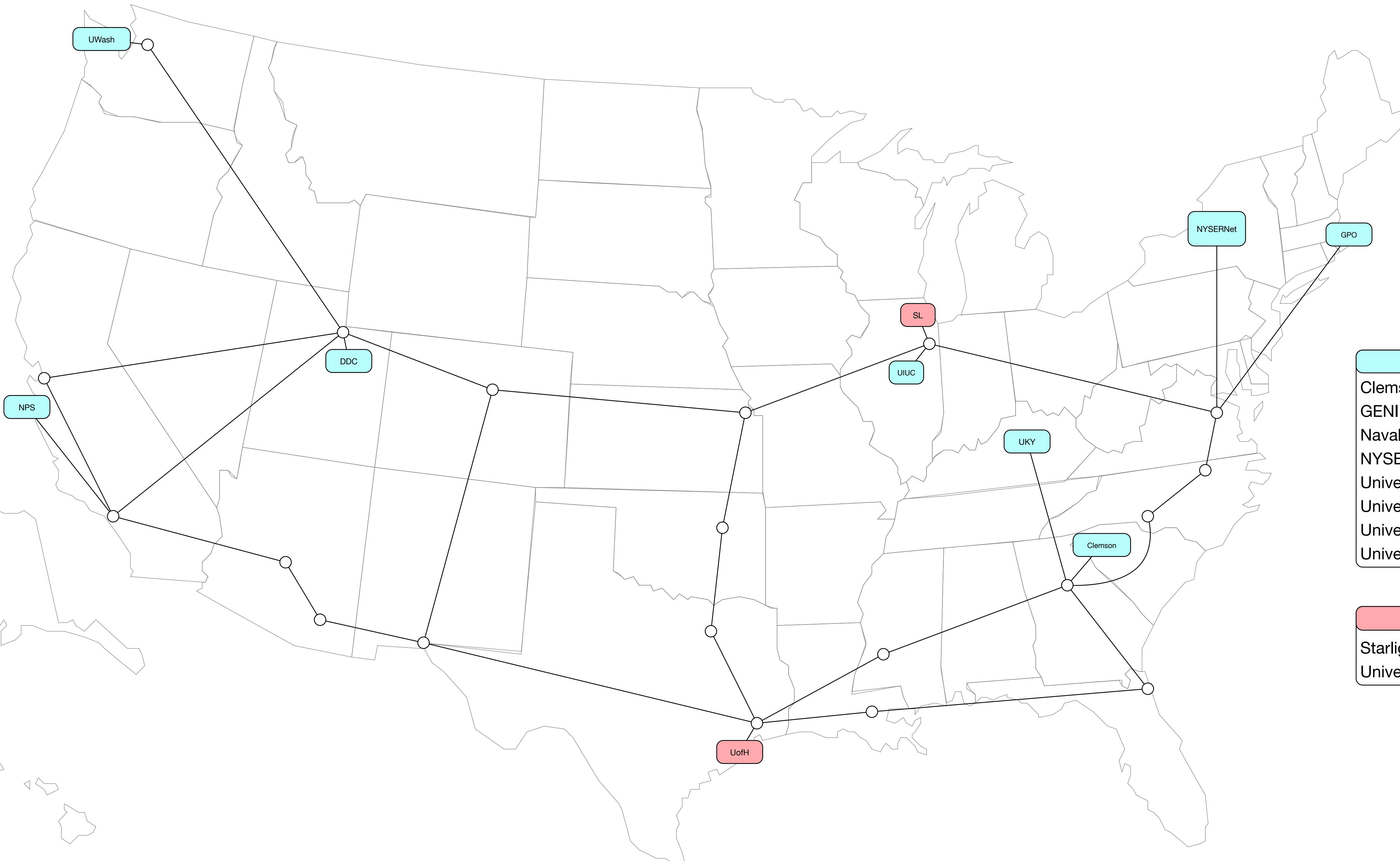
3rd Party Tool Integrations

- sFlow Export
  - http://www.inmon.com
  - Real-time protocol and flow data

- Hyperglance (via geni-lib)
  - http://www.real-status.com
  - Visualize topology and state
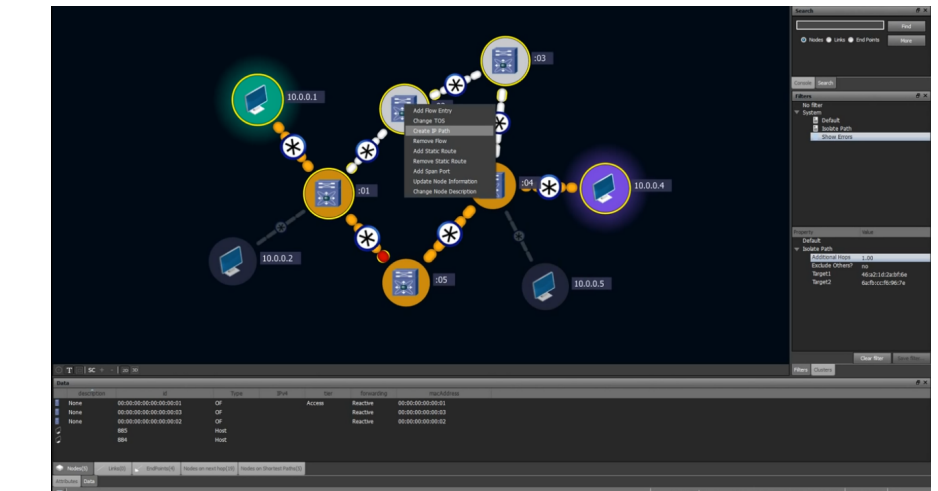
- GraphViz dotfile export
  - http://www.graphviz.org
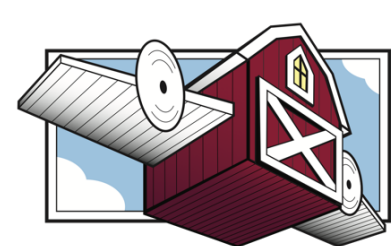 - Static topology layout
  - Import into a variety of tools

WAN Deployment Sites

InstaGENI Sites

Clemson University
GENI Project Office
Naval Postgraduate School
NYSERNet
University of Illinois
University of Kentucky
University of Utah (DDC)
University of Washington

ExoGENI Sites

Starlight
University of Houston