

# Federating CRON with ProtoGENI

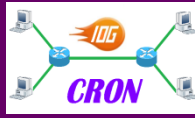
## Status Report

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November 02, 2010



# CRON



## Cyber-infrastructure for Reconfigurable Optical Networks

### Objective

- Developing virtual 10Gbps networking and high-end computing cyberinfrastructure

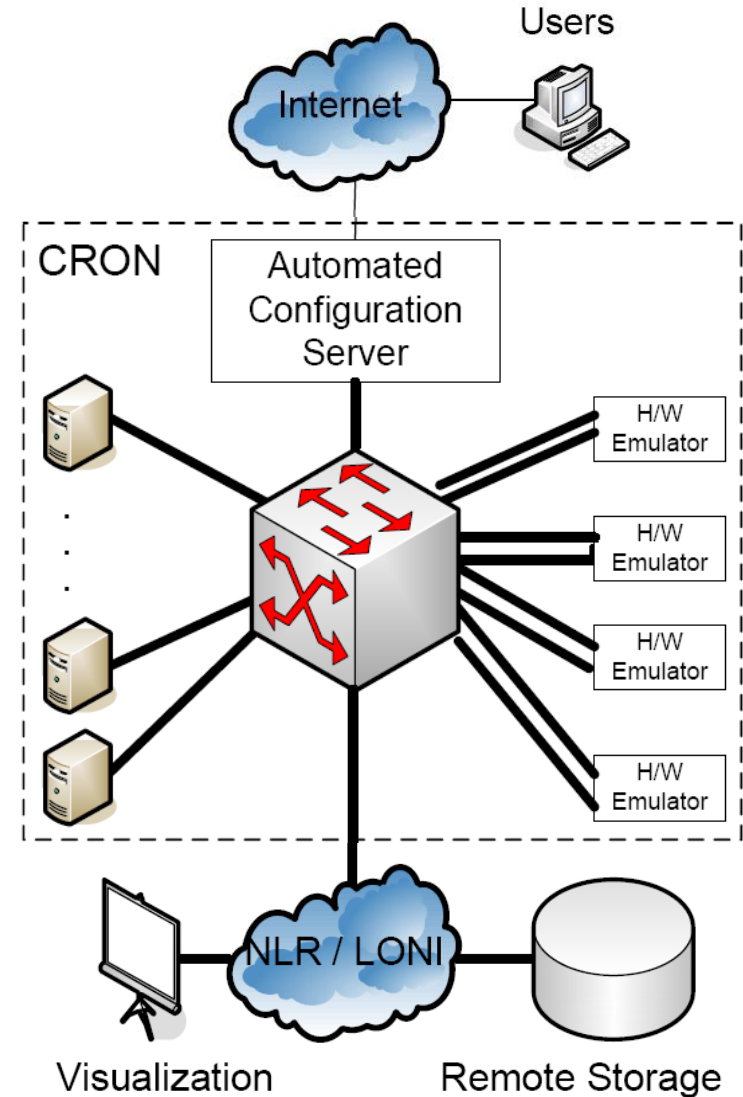
### Components

#### Hardware

- Cisco N5000 switch
  - With 48 X 10Gbps ports
- High-end servers with 10GE NICs
- 10Gbps hardware emulators

#### Software

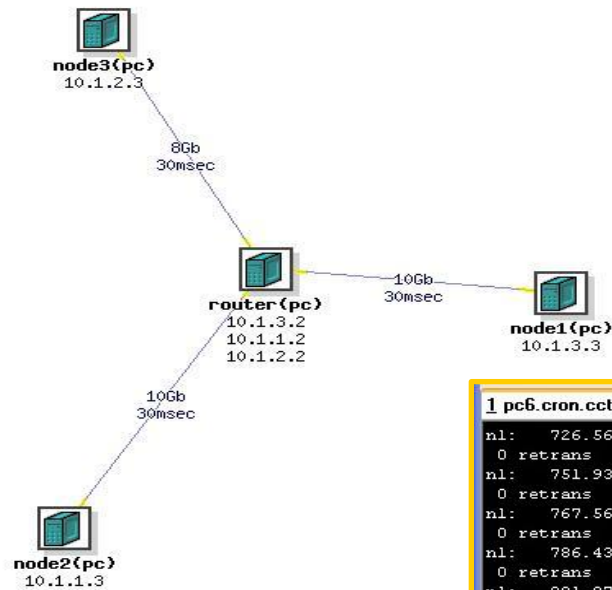
- Emulab-based GUI interfaces
- 10Gbps software emulators
  - Dummynet



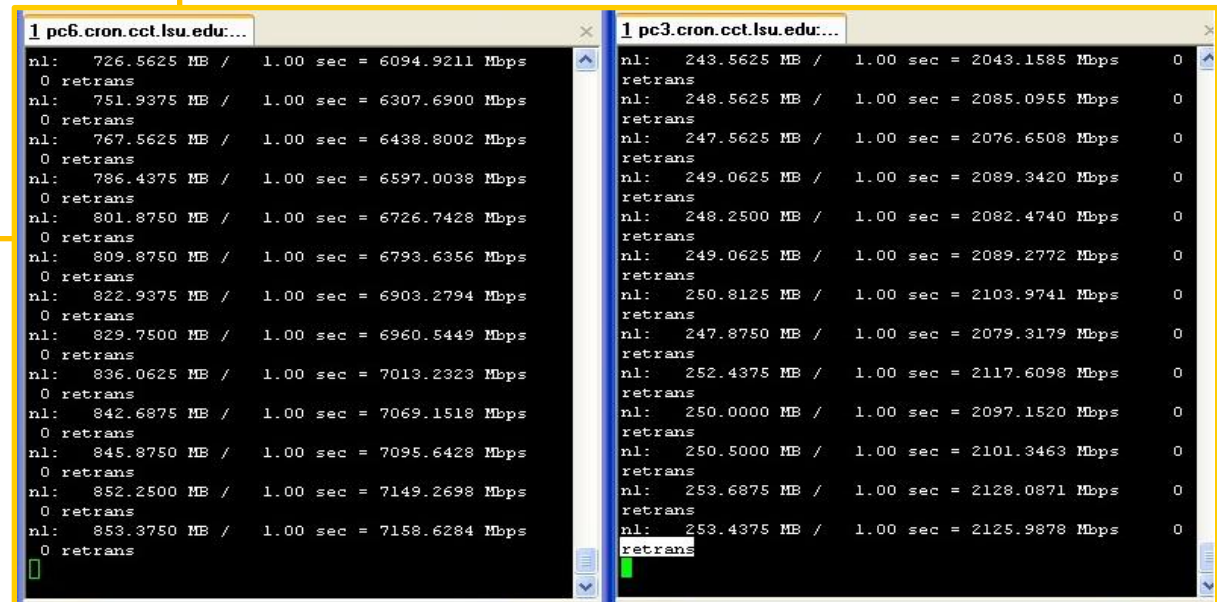
# CRON Experiment

## Visualization, NS File, and Details

Experiment **CRONtest/Test**



- ❑ Emulab GUI and interface
  - [WWW.CRON.CCT.LSU.EDU](http://WWW.CRON.CCT.LSU.EDU)
- ❑ Resource Allocation to GENI
  - Up to 20 Servers
    - Quad-cores with 10GE NIC
    - 64bit Ubuntu and 64bit FreeBSD
- ❑ Measurement services available
  - OnTimeMeasure

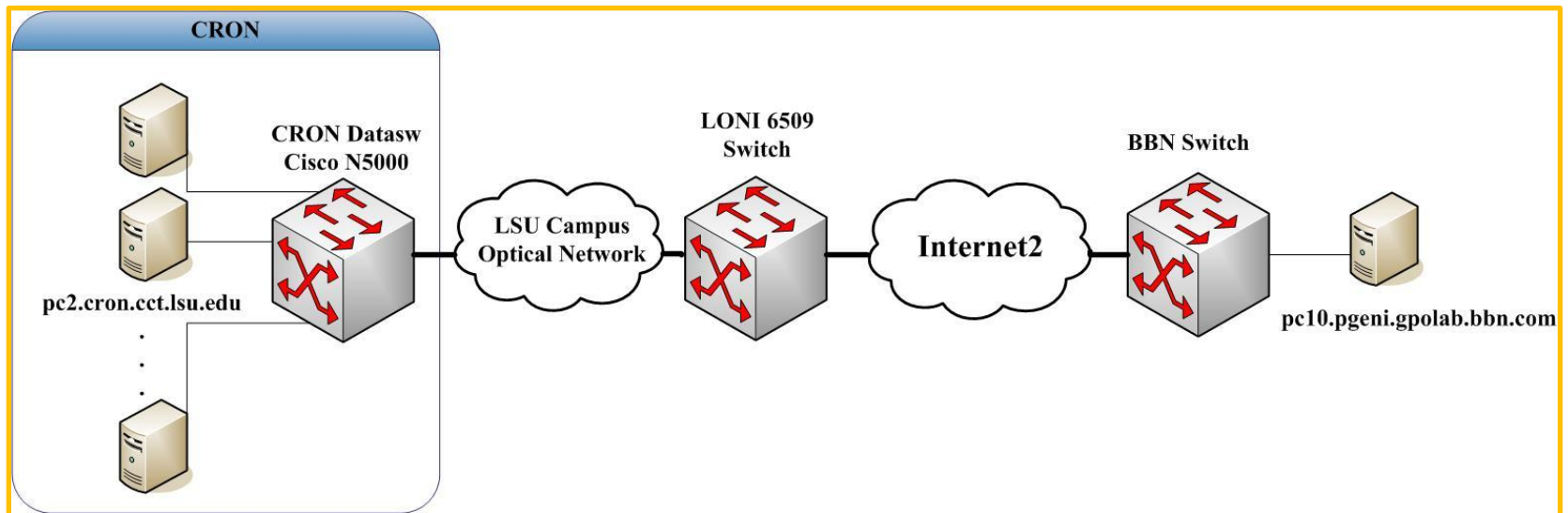


```

1 pc6.cron.cct.lsu.edu...
nl: 726.5625 MB / 1.00 sec = 6094.9211 Mbps
0 retrans
nl: 751.9375 MB / 1.00 sec = 6307.6900 Mbps
0 retrans
nl: 767.5625 MB / 1.00 sec = 6438.8002 Mbps
0 retrans
nl: 786.4375 MB / 1.00 sec = 6597.0038 Mbps
0 retrans
nl: 801.8750 MB / 1.00 sec = 6726.7428 Mbps
0 retrans
nl: 809.8750 MB / 1.00 sec = 6793.6356 Mbps
0 retrans
nl: 822.9375 MB / 1.00 sec = 6903.2794 Mbps
0 retrans
nl: 829.7500 MB / 1.00 sec = 6960.5449 Mbps
0 retrans
nl: 836.0625 MB / 1.00 sec = 7013.2323 Mbps
0 retrans
nl: 842.6875 MB / 1.00 sec = 7069.1518 Mbps
0 retrans
nl: 845.8750 MB / 1.00 sec = 7095.6428 Mbps
0 retrans
nl: 852.2500 MB / 1.00 sec = 7149.2698 Mbps
0 retrans
nl: 853.3750 MB / 1.00 sec = 7158.6284 Mbps
0 retrans

1 pc3.cron.cct.lsu.edu...
nl: 243.5625 MB / 1.00 sec = 2043.1585 Mbps
0 retrans
nl: 248.5625 MB / 1.00 sec = 2085.0955 Mbps
0 retrans
nl: 247.5625 MB / 1.00 sec = 2076.6508 Mbps
0 retrans
nl: 249.0625 MB / 1.00 sec = 2089.3420 Mbps
0 retrans
nl: 248.2500 MB / 1.00 sec = 2082.4740 Mbps
0 retrans
nl: 249.0625 MB / 1.00 sec = 2089.2772 Mbps
0 retrans
nl: 250.8125 MB / 1.00 sec = 2103.9741 Mbps
0 retrans
nl: 247.8750 MB / 1.00 sec = 2079.3179 Mbps
0 retrans
nl: 252.4375 MB / 1.00 sec = 2117.6098 Mbps
0 retrans
nl: 250.0000 MB / 1.00 sec = 2097.1520 Mbps
0 retrans
nl: 250.5000 MB / 1.00 sec = 2101.3463 Mbps
0 retrans
nl: 253.6875 MB / 1.00 sec = 2128.0871 Mbps
0 retrans
nl: 253.4375 MB / 1.00 sec = 2125.9878 Mbps
0 retrans
  
```

- ❑ Network Connections
  - Vlan through Internet2 ION between CRON and ProtoGENI@BBN
- ❑ Emulab-based Component Manager & Slice Authority
  - Receive user credentials
  - Register a slice at the Clearinghouse@Utah
- ❑ Resource reservation between component managers
  - Creating slivers
  - Exchanging Rspec



Currently, GRE tunnel is used to setup a link between two CMs, but it can only support traffic through Internet:

❑ **Rspec:**

```
<rspec xmlns="http://www.protogeni.net/resources/rspec/0.1"
```

```
.....
```

```
<link virtual_id="link0"
```

```
  link_type="tunnel">
```

```
    <interface_ref virtual_node_id="pc10"
      virtual_interface_id="control"
      tunnel_ip="192.168.0.1" />
```

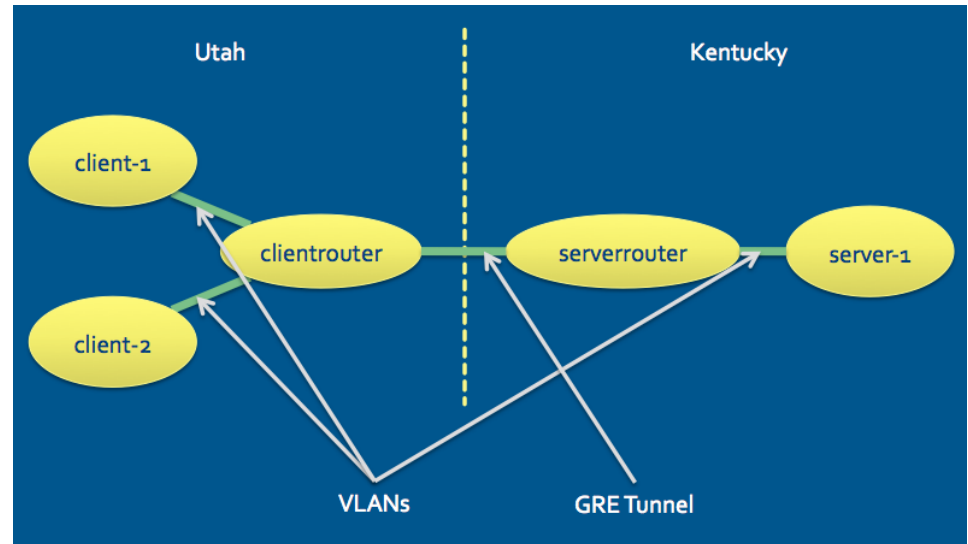
```
    <interface_ref virtual_node_id="pc4"
      virtual_interface_id="control"
      tunnel_ip="192.168.0.2" />
```

```
</link>
```

```
</rspec>
```

❑ **NS file:**

```
tb-set-link-encap $routerlink gre
```



# Internet2 Layer 2 Tunnel

Add layer2 tunnel to support Internet2 links between different CMs.

Suppose to support the Internet2 ION circuit creation and vlan setup at both sides of CMs.

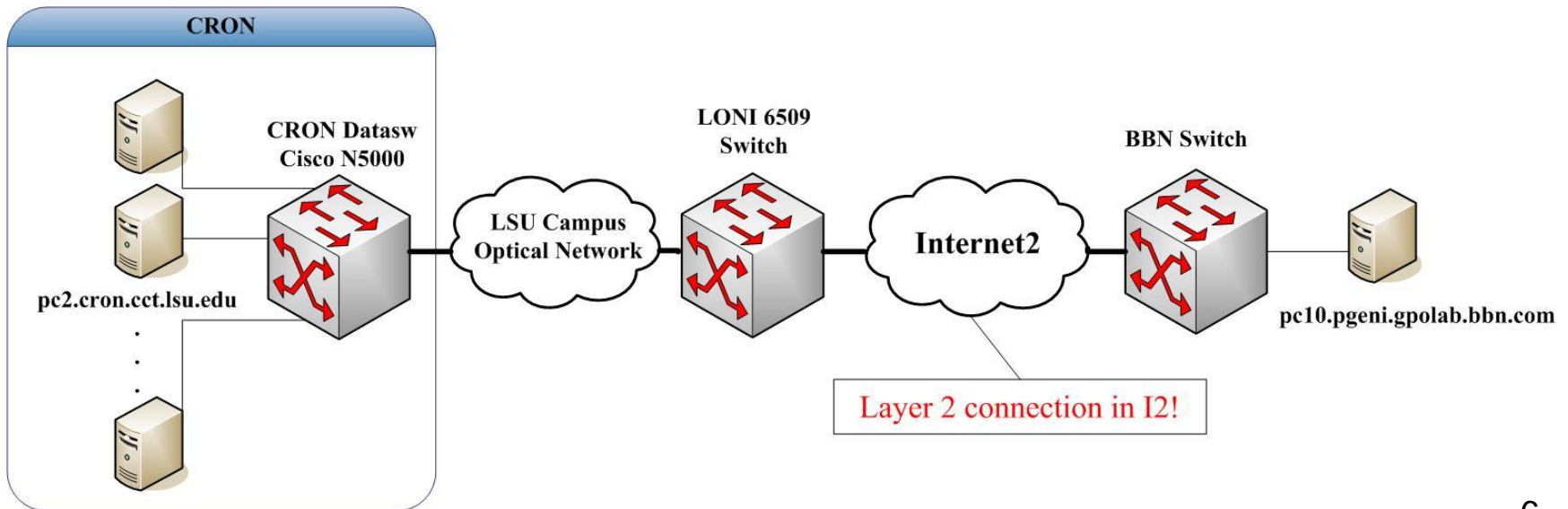
```
<rspec...
```

```
...
```

```
<link virtual_id="link0"
      link_type="layer2_tunnel">
```

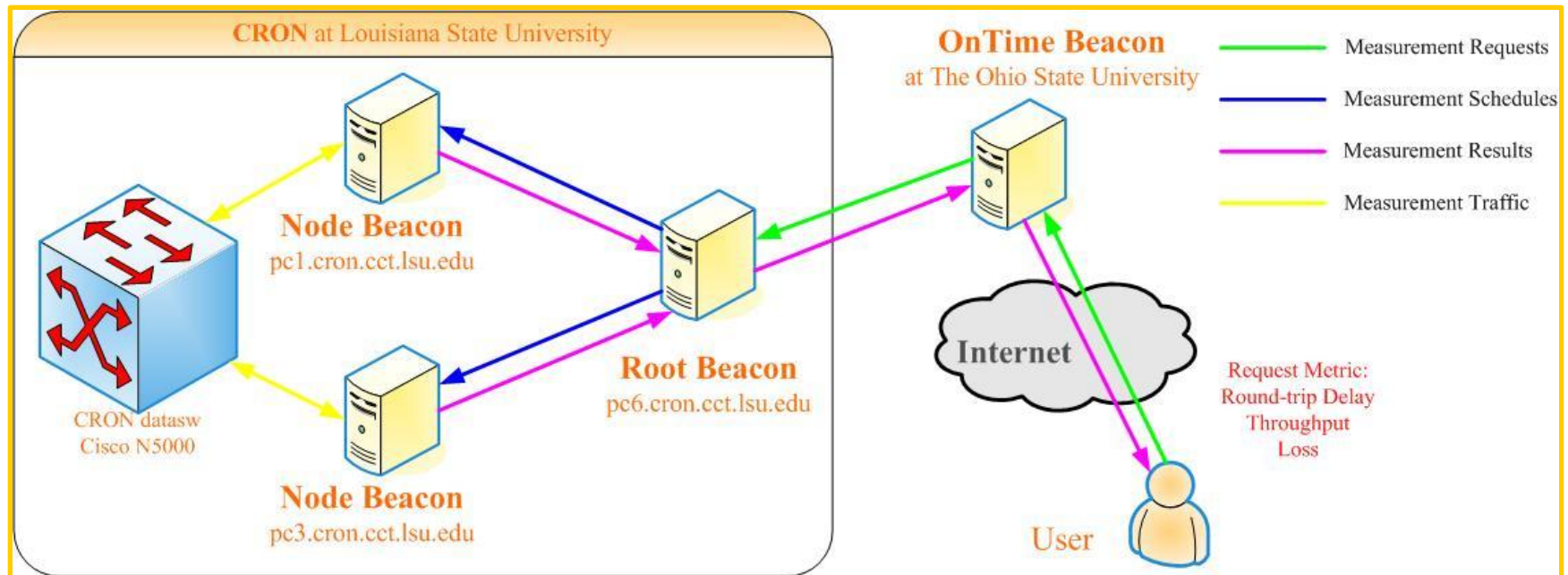
```
...
```

```
</rspec>
```



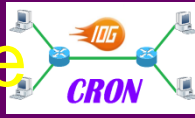
## □ Procedure

- Install a beacon at each node after loading OS image
- Collect measurement data from each beacon and send to OnTime Beacon at OSU

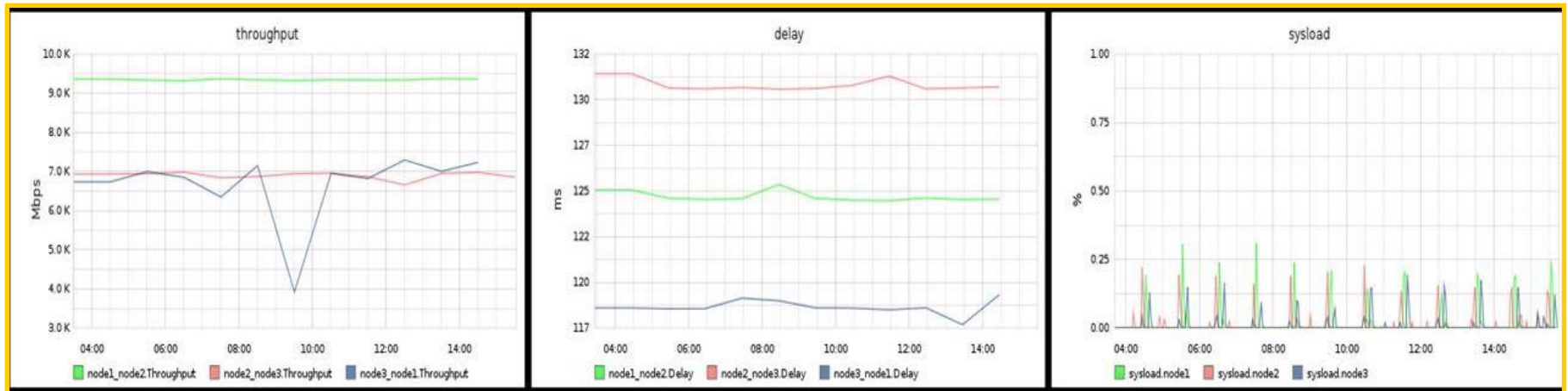




# Spiral 2: Aggregating OnTimeMeasure Service



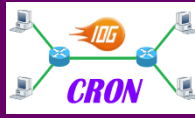
- ❑ Measurement data
  - ❑ Throughput, delay, jitter, etc., from each link
  - ❑ CPU load from each node







# Spiral 3



- Aggregating with other control framework groups (e.g., PlanetLab) with GENI API
- Aggregating with other monitoring services, such as perfSONAR and GMOC
- Integrating an openflow switch an a virtual router over 10Gbps NetFPGA board
- Workshop and demos about CRON federation