Performance and Security Evaluation of Single System Image over Wide Area Network using ProtoGENI
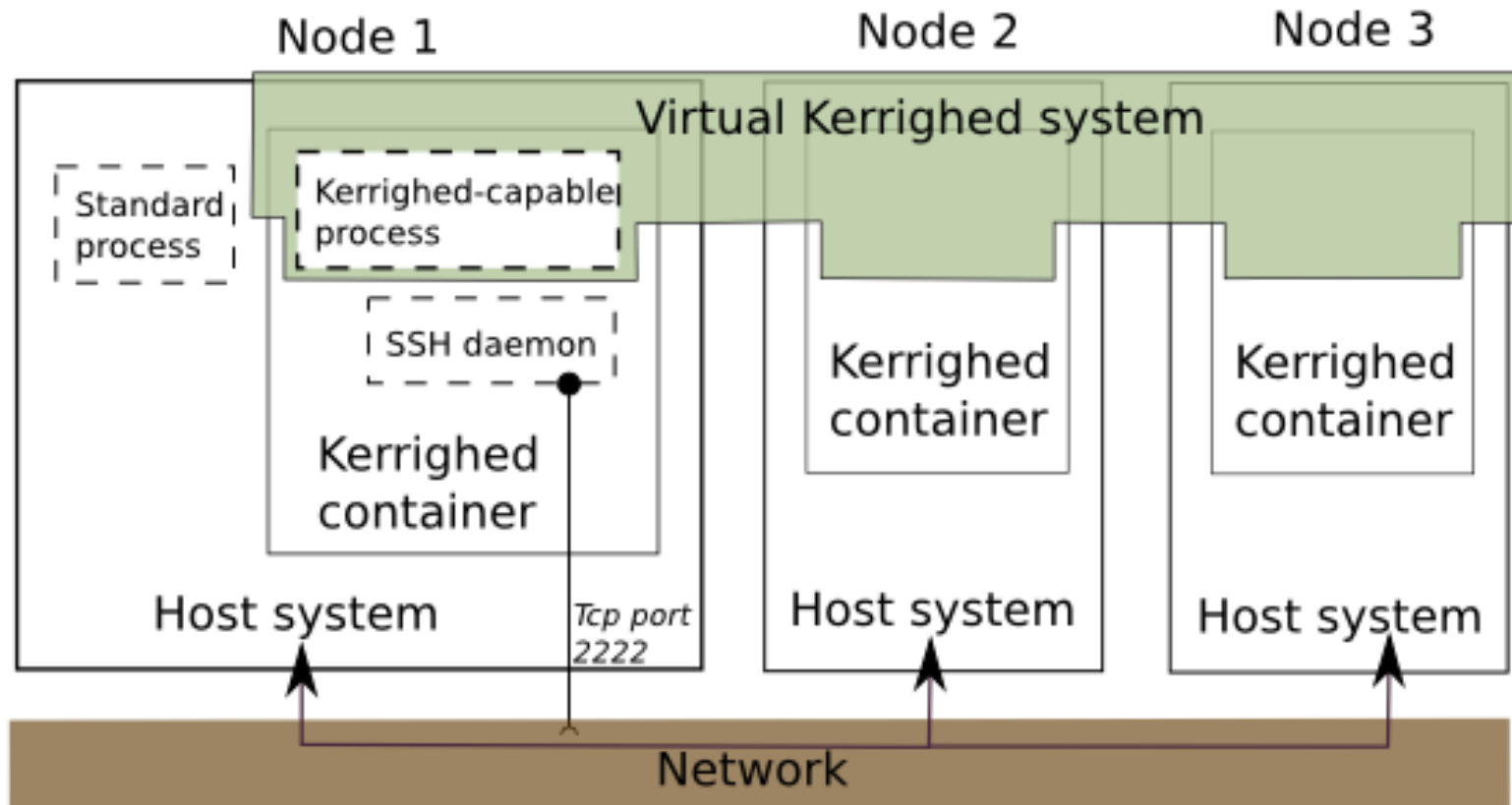
Mohammad Iftekhar Husain

Lokesh Mandvekar

Biswajit Biswal

GENI Summer Camp 2012

Kerrighed SSI

Courtesy: Prof. Morin, INRIA

The Big Picture

- Explore/evaluate performance and security issues in forming wide-area SSI

- Applicability of GENI
  - Use ProtoGENI nodes at different sites to mimic wide area SSI
  - Does OpenFlow provide mechanisms to improve performance of wide area SSI?
  - May be a potential application for IGNITE?

Summer Camp Goals

1. Have the basic setup for wide area SSI up and running
2. Basic performance evaluation and comparison with local area SSI
3. Analyze the network packets in both settings to explore security issues

Road Blocks

- Kerrighed requires L-2 connectivity
- Tried VLAN between Kentucky and Utah
  - Could submit the Rspec and have the slice ready
  - Could SSH in to the machines
  - No address on the VLAN interfaces
- Tried I-2 nodes (geni-pg)
  - Could submit the Rspec and have the slice ready
  - Could not SSH in to the machines

Work Around

- Use delay nodes to mimic the environment of wide area nodes

- Example RSpec available at:

  - http://groups.geni.net/geni/attachment/wiki/UDTExampleExperiment/udt.rspec

Slice
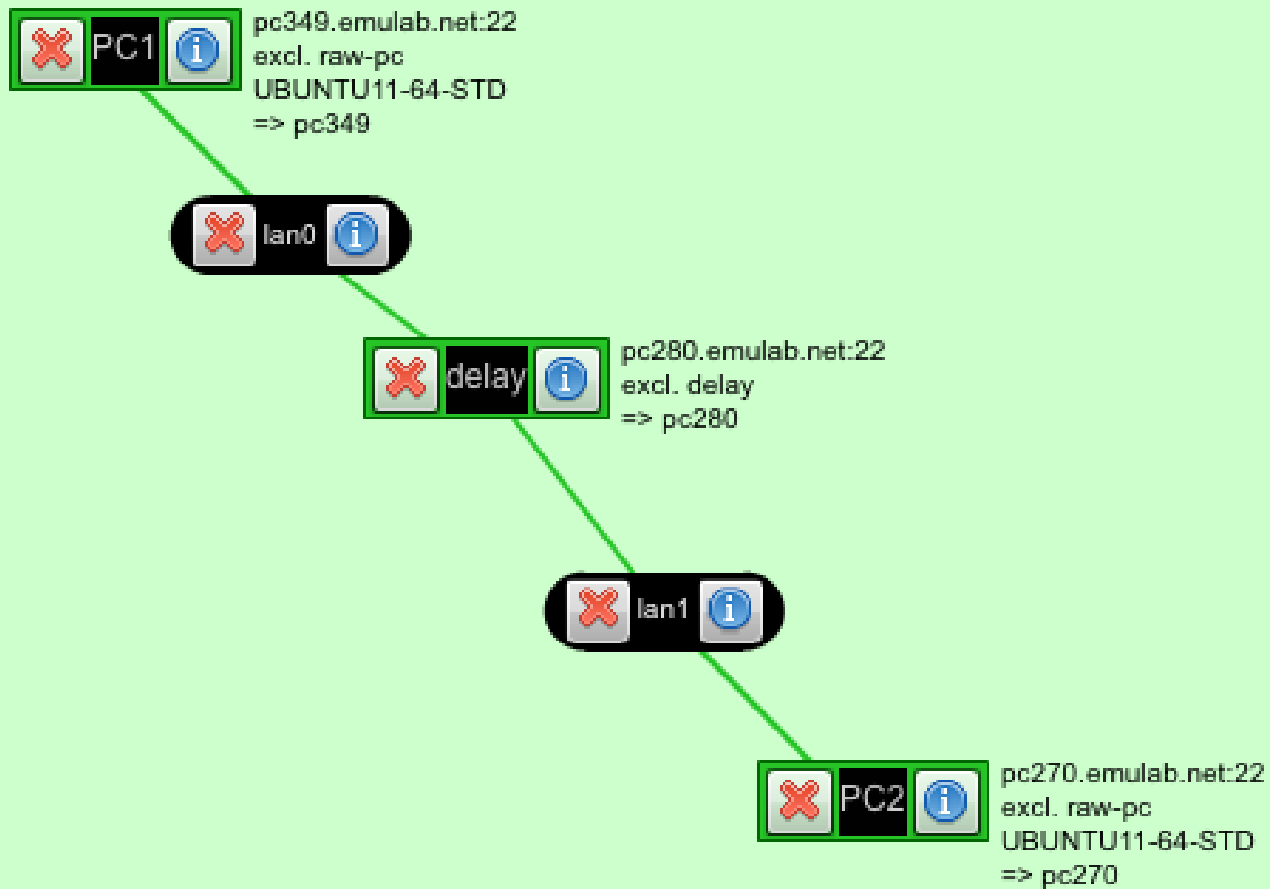
Test Application

- Based on the multicore package of R

- The script processes any statistical calculation in parallel

- More on:
  - http://cran.r-project.org/web/packages/doMC/vignettes/gettingstartedMC.pdf

Scenarios

1. Single node
2. SSI with 2 nodes, default BW (1 Gbps) and default delay (0 ms)
3. SSI with 2 nodes, limited BW (100 Mbps) and default delay
4. SSI with 2 nodes, default BW and increased delay (10 ms)

Measurements

Performance Comparison of SSI in Different Setups

	1	2	3	4
■ Single	74.719	96.795	112.757	135.142
■ 2nodeSSI	50.545	62.683	76.087	87.517
■ SSI1MBW	49.012	62.833	76.272	89.2
■ SSI10msD	49.61	63.043	77.277	87.865
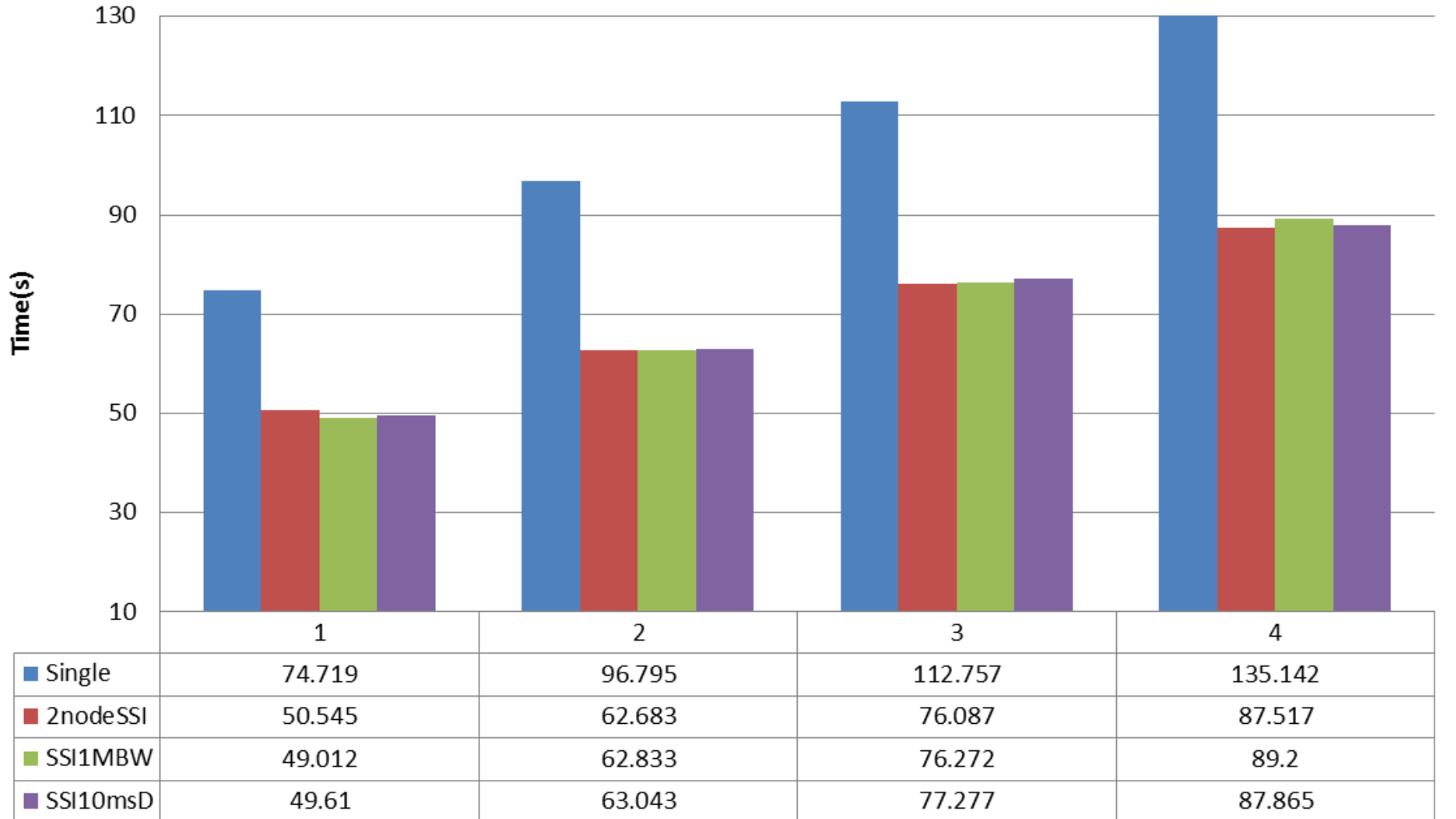
Network Monitoring (tshark)

No.	Time	Source	Destination	Protocol	Length	Info
51	14.992918	1.1.2	1.1.3	TIPC	70	Link State State
52	15.013213	1.1.3	1.1.2	TIPC	70	Link State State

```
⊞ Source: Broadcom_56:ac:18 (00:10:18:56:ac:18)
    Type: Transparent Inter Process Communication (0x88ca)
⊟ Transparent Inter Process Communication(TIPC)
    010. .... .... .... .... .... .... .... = Version: 2
    ...0 111. .... .... .... .... .... .... = User: Link State Maintenance Protocol (7)
    .... ...1 010. .... .... .... .... .... = Header size: 10 = 40 bytes
    .... .... ...0 .... .... .... .... .... = Non-sequenced: 0
    .... .... .... ...0 0000 0000 0011 1000 = Message size: 56
    000. .... .... .... .... .... .... .... = Message type: State (0)
    ...0 0000 .... .... .... .... .... .... = Broadcast Sequence Gap: 0
    .... .... 0000 0000 .... .... .... .... = Sequence Gap: 0
    .... .... .... .... 0000 0000 0000 0000 = Broadcast Acknowledge Number: 0
    0000 0000 0000 0000 .... .... .... .... = Link Level Acknowledge Number: 0
    .... .... .... .... 1000 0000 0000 0000 = Link Level Sequence Number: 32768
    Previous Node: 1.1.2
```

```
0000   00 10 18 56 b0 18 00 10  18 56 ac 18 88 ca 4f 40   ...V.... .V....O@
0010   00 38 00 00 00 00 00 00  80 00 01 00 10 02 00 00   .8...... ........
0020   00 01 19 ad 1a 8a 01 00  10 02 01 00 10 03 02 84   ........ ........
0030   a3 f8 00 00 00 00 65 74  68 34 00 00 00 00 00 00   ......et h4......
0040   00 00 00 00 00 00                                  ......
```

Summary

- Basic configuration is up and running
  - Will be great if I-2 nodes work!
- Collecting and analyzing data
- Updated results in GEC, hopefully!

Thanks!