

EE / Cpre / SE 492 - sdmay 36

Self Healing 5-G

Week 5 Report

March 16 - March 29

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Team Members:

Matthew Johnson

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Weekly summary

This week we worked on creating something similar to the GENI experiment on the ORBIT testbed. We went through and figured out how the network interfaces are set up on ORBIT (node to node, node to central controller etc). This allowed us to “rewire” the connections to emulate two client nodes, two server nodes, and a broader network node. Once we figured out how to set up the nodes we created linux scripts so that experiments can be easily created. Our scripts first set up the node baselines, then configure the nodes to our test’s specifications, then finally execute the test in three different scripts.

Past Week Accomplishments

- Explored the network interfaces of ORBIT nodes to have a better understanding of how they interact with each other
- Figured out how to reroute connections to better simulate a client-server connection
- Wrote out linux scripts to make testing in the future easier and more consistent
- Experimented with network traffic tools for future use and implementation
- Wrote a configuration script that will configure all nodes to our specifications
- Wrote a routing script that will set up our custom network topology
- Wrote a experiment script that will detect connection outage and will reroute the path
- Made an interface with a whole new set of nodes to ping other nodes and then deleting the existing nodes, as shown in the screenshot below.

Beginning of configuration script:

```
#!/bin/bash

echo "Begin script"

echo "Turning node off-----"
omf tell -a offh -t node1-1
omf tell -a offh -t node1-1

echo "Loading baseline-----"
omf load -i baseline.ndz -t node1-1

echo "Turning node on-----"
omf tell -a on -t node1-1
omf tell -a on -t node1-1
echo "Next node-----"
```

Beginning of experiment routing script:

```
#!/bin/bash
echo "-----CONFIGURING NODE 1-----"
ssh -o "StrictHostKeyChecking no" -tt root@node1-1 <<- EOT
apt-get install -y net-tools;
apt-get install -y traceroute;
ifconfig enp94s0f0 10.19.2.1 netmask 255.255.255.0 up;
sudo ip addr add 10.19.3.1/24 dev enp94s0f0;
sudo route add -net 10.19.5.0 netmask 255.255.255.0 gw 10.19.2.2 enp94s0f0;
sudo route add -net 10.19.6.0 netmask 255.255.255.0 gw 10.19.3.3 enp94s0f0;
sudo route del -net 10.19.2.0 netmask 255.255.255.0 gw 0.0.0.0 enp94s0f0;
sudo route del -net 10.19.3.0 netmask 255.255.255.0 gw 0.0.0.0 enp94s0f0;
sudo route add -net 10.19.2.2 netmask 255.255.255.255 gw 10.19.2.1 enp94s0f0;
sudo route add -net 10.19.3.3 netmask 255.255.255.255 gw 10.19.3.1 enp94s0f0;
sudo route add -net 10.19.4.0 netmask 255.255.255.0 gw 10.19.3.3 enp94s0f0;
sudo route add -net 10.19.4.0 netmask 255.255.255.0 gw 10.19.2.2 enp94s0f0;
exit;
EOT

echo "-----CONFIGURING NODE 2-----"
ssh -o "StrictHostKeyChecking no" -tt root@node1-2 <<- EOT
```

Beginning of experimentation script:

```
#!/bin/bash

echo "Self Healing script:"

ssh root@node1-1 <<- EOT

echo "Client 1 Connecting to internet";

traceroute 10.19.6.5 -i enp94s0f0;

while true
do

ping -c 1 -I enp94s0f0 10.19.6.5 >ping.txt;
cat ping.txt;
pingtime=$(awk 'NR==2 {print NR,$7}' ping.txt);
length=${#pingtime};

if [ "$length" != "2" ]
then
echo "connected";
fi

if [ "$length" == "2" ]
then
```

Pending Issues

- We still need to find a better way to replicate actual network traffic rather than using simple pings, so far iperf seems fairly promising as it can easily be installed and ran on nodes
- Currently we need a better way to test the health of a connection for further evaluation. Right now we can detect if a connection is completely gone.
- We need to simulate more test cases for failing networks.

Individual Contributions

Adam Tiedeman : Helped to write scripts and looked into future traffic generation methods

Parnumart Hanthiradej : Tried to write the scripts and tested on ORBIT

Yuin Choon Ng : Conducted scripts testing on ORBIT

Amber Chin : Conducted scripts testing on ORBIT

Matthew Johnson : Wrote scripts, ported old test script to orbit syntax

<u>Team Member</u>	<u>Contribution</u>	<u>Weekly hours</u>	<u>Total Hours</u>
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<i>Adam Tiedeman</i>	<i>Helped to write scripts and looked into future traffic generation methods</i>	<i>12</i>	<i>56.5</i>
<i>Amber Chin</i>	<i>Conducted scripts testing on ORBIT</i>	<i><u>10</u></i>	<i><u>55</u></i>
<i>Matthew Johnson</i>	<i>Wrote configuration and routing scripts</i>	<i>15</i>	<i>65</i>
<i>Parnumart Hanthiradej</i>	<i>Tried to write the scripts and tested on ORBIT</i>	<i>9</i>	<i>54</i>
<i>Yuin-Choon Ng</i>	<i>Conducted scripts testing on ORBIT</i>	<i>7</i>	<i>50</i>

**Counted total hours for only this semester*

Plan for coming week

- Write a more complex script for different routing situations
- Work on traffic generation that more closely simulates actual data transmission
- Create a system to not only test connection failure but also connection strength
- Add more failure cases and their respective paths to recovery