G E N I

Global Environment for Network Innovations

GENI Quarterly Status Report

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Under Project Nr. 1733
"Programmable Measurements over Texas-based Research Network: LEARN"

Document Revision History

The following table provides the revision history for this document, summarizing the date at which it was revised, who revised it, and a brief summary of the changes. This list is maintained in chronological order so the earliest version comes first in the list.

Revision	Date	Revised By	Summary of Changes
1.0	06/19/10	D. Majumder	Initial draft
1.1	06/20/10	Shade EL-Hadik	

Programmable Measurements over Texas-based Research Network: LEARN
GENI Quarterly Status Report
Project no: 1733

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[1]   Major Accomplishments

This project involves collaboration with three other GENI projects: (i) ORCA-BEN for integration with LEARN [LEARN_1] and measurement handler testing/implementation on Infinera Digital Transport Node (DTN) units; (ii) ERM [ERM_1] and (iii) IMF on interface definitions between measurement handler software (MHS) modules and the integrated and unified measurement frameworks. All projects integrate with ORCA in Cluster D with extensibility considerations towards integration with any cluster in the future.

With respect to the ORCA-BEN integration with LEARN: initial planning of Texas sites that have volunteered to host ORCA network elements and corresponding VLAN connections have been achieved. The integration plans were presented during GEC6. We are in collaboration with the GPO system engineer, Harry Mussman, to complete the integration of LEARN into GENI using the ORCA control framework. We have successful installed and deployed an ORCA instance at our lab and we also build an ORCA Node Agent machine configured to run driver actions on behalf of the first ORCA instance.

With respect to the Infinera DTN remote access through ORCA-BEN: VPN mechanisms, access to BEN, and access to the DTNs have been achieved. An NDA with Infinera was established. We collaborated with the ORCA-BEN project, and RENCI provided sample Perl modules/scripts to follow when accessing the Infinera DTN for measurement handler software implementation.

With respect to the ERM and IMF projects, MHS has been created and integrated into IMF, which was showcased during GEC7. MHS is a server program which retrieves measurement from network elements (Polatis, Infinera DTN) and sends them to client over XMLRPC protocol. This is a collaboration with Columbia University as a co-PI of this project and a PI of ERM.

[2]   Milestones

Milestone LEARN: S2.h Draft measurement data file format (*Completed on* 11/16/09, GEC6)

Collaborate with the ERM project to draft data file format for transfer of measurement data between the Measurement Handler software and the Integrated Measurements Framework; complete specifications for the Measurement Handler software, which will utilize an existing interface (TL1 over SSH) into the Infinera Digital Transport Node (DTN) to make optical measurements.

A draft data file format has been delivered at GEC6 in collaboration with Columbia University. The data file format follows the TL1 command/response format of the Infinera DTN. [LEARN_2]

Specifications for the MHS part of the deliverable was delayed due to lack of equipment access by the LEARN team. When this milestone was first drafted, Dr. Gurkan's lab was hosting an Infinera DTN through an evaluation agreement between LEARN of Texas and Infinera. However, the evaluation period expired at the same time as start of the project. ORCA-BEN project has graciously given the LEARN team access and a login to their DTN boxes to perform this milestone. An NDA has been issued between the teams and Infinera during the second week of December of 2009.

Milestone S2.h-part2: Specifications for the Measurement Handler Software (Completed on 01/08/10)

Extension of the previous milestone. The specifications for Measurement Handler Software part of the deliverable.

The design of the Measurement Handler Software(MHS) is created and all the Perl modules and functions defined.

Milestone LEARN: S2.c Establish ORCA framework (Completed late 04/22/10)

Establish local ORCA control framework, for eventual integration with LEARN network.

We have installed all the pre-requisites necessary for creation of an ORCA Framework. We followed guidelines provided through the following GENI WIKI page "https://geni-orca.renci.org/trac/wiki/Prerequisites" We have a dedicated PC in our lab for this installation. The prerequisite packages include but not limited to

- Java version 1.5.x,
- Ant 1.7.0+ ,
- Maven 2.2.1+ ,
- Subversion client with *https* support,
- ssh client…etc

We have installed the official release of ORCA and established a new security certificate for that particular build, as instructed by the ORCA wiki page at https://geni-orca.renci.org/trac/wiki/buildInstructions.   As per directions on another orca wiki page "https://geni-orca.renci.org/trac/wiki/instructions", we have deployed an ORCA instance locally after installing Tomcat (java application server) and populated MSQL database with the corresponding ORCA schema. We ran and tested this build locally and we managed to run ORCA web application under the following URL "http://localhost:8080/orca".

Finally, we installed a node agent on another machine. Therefore, and as per instructions found on this wiki page https://geni-orca.renci.org/trac/wiki/DeployNodeAgent, we installed a Node Agent Host, and then the real Node Agents (NA) with their network drivers. NA machine is configured to run driver actions on behalf of the first ORCA instance. However, the NA will not be used to initiate switch control as instructed by the ORCA team during the GEC7. Therefore, we will be developing a handler based on the Cisco 6509 version for the Cisco 3750 switches.

We have been testing handlers with NA components until March 2010, and in the process, ORCA team informed us that the driver we were trying to utilize in order to establish VLAN is not ready to work in the approved manner. Furthermore, we have learnt that the approach to run drivers from a Node Agent service happened to be problematic for researchers to bring into play. The ORCA team informed us that their future release of drivers will not use the node agent model And Since our CISCO 3750 provides SSH version of remote access, we now are developing a customized version of a java driver using SSH/Telnet API, which will run directly on the ORCA instance.

With the support of ORCA team, especially Ilia Baldine and Aydan Yumerefendi, we have customized a java driver using the following steps.

1. Obtaining an ORCA source code (from trunk) and then conducting the usual preparation and building instructions.

2. Making sure that the java class "Cisco6509Device" exists in the network/handlers project and more specifically under the following package "orca.handlers.network.router"

```java
public class Cisco6509Device extends
CiscoRouterDevice {

    public Cisco6509Device(String deviceAddress,
String uid, String password, String
adminPassword)
{
        super(deviceAddress, uid, password,
adminPassword);
        basepath =
"/orca/handlers/network/router/cisco/6509";
    }
}
```

3. Defining a class to represent the 3750 switch device in the same way by changing the "`basepath`" string to point to the expected xml files for the 3750 switch.
    - For example: Change the expected output from "6509" to "3750" as in the following example. "<expect>6509</expect>" should be changed to "<expect>3750</expect>"
    - Please refer to "Appendix A" for a complete list of 6509 xml commands files as found in the ORCA system.

4. Using "test.xml" file, in the root of the project, to invoke the ant tasks. This ant task works as a *temporary handler* for the purpose of testing the customized driver. Later on we will develop a customized handler that will take in consideration the proposed architecture for integrating LEARN.

5. Modifying the property file "`handlers/network/ant/tests.properties`" where properties to be used by test.xml are stored. The new file will include the following properties:

```
emulation=false
test.mode=true
router.user=teamion
router.password=uhcotnet230dt2
router.adminpassword=uhcotnet230dt2
router=208.117.132.141
vlan.tag=100
router.ports=gigabitethernet 1/25
router.src.vlan.tag=123
router.dst.vlan.tag=456
router.map.port=gigabitethernet 1/26
```

You can invoke the test handler from the command line "`ant -f test.xml -D test.mode=false cisco.6509.createVlan`"

Milestone LEARN: S2.i Implement and integrate Measurement Handler (*Completed on 3/16/10, GEC7*)

Collaborate with the ERM project to complete specification of the data file format for transfer of measurement data between the Measurement Handler software and the Integrated Measurements Framework; implement the Measurement Handler software to make optical measurements using Infinera Digital Transport Nodes (DTNs); integrate the Measurement Handler software with the UMF provided by the ERM project; demonstrate the Measurement Handler software using DTNs that are part of BEN (at RENCI). (*Modified after Infinera DTN has been removed from Dr. Gurkan's lab.*)

The Measurement Handler Software has been created and integrated with IMF. It was demonstrated during GEC7 with measurements from the Polatis and Infinera DTNs in Duke.

Milestone LEARN: S2.j Deliver release of Measurement Handler (*Completed on* 5/1/10)

Deliver release of Measurement Handler code for Infinera DTN and documentation to GPO.

The code and documentation of the Measurement Handler Software has been delivered to GPO.

Milestone LEARN: S2.k List of measurement handlers for GENI (*Due on* 7/20/10, GEC8)

Based upon results of Data Plane Measurements project, collaborate with GPO and other projects in Cluster D, to establish a list of measurement handlers that are needed for commercial transport and measurement equipment that will be used in GENI.

Milestone LEARN: S2.d Initial integration LEARN into ORCA (*Due on* 7/20/10, GEC8)

Complete initial integration of the LEARN network into the ORCA control framework (GENI Cluster D), to enable GENI researchers to utilize the LEARN network for L2 (VLAN) transport between a limited number of sites, e.g., University of Houston and Rice University.

Milestone LEARN: S2.e Move broker to clearinghouse (*Due on* 9/30/10)

Move broker to Cluster D clearinghouse, and make control of L2 (VLAN) connections in LEARN available via the ORCA control framework to other GENI users.

Milestone LEARN: S2.f POC to GENI response team (*Due on* 9/30/10)

Provide POC to GENI Prototype Response and Escalation team.

Milestone LEARN: S2.g POC to GENI security team (*Due on* 9/30/10)

Provide POC to Security team.

Milestone LEARN: S2.l Contribution to GENI outreach (*Due on* 9/30/10)

Specific contribution to GENI outreach plan for Spiral 2.

[3]   Deliverables Made

Milestone LEARN: S2.j Deliver release of Measurement Handler (*Completed on* 5/1/10)

[4] Description of Work Performed During the Last Quarter

Release code for the Measurement Handler Software (MHS):

The code and documentation for the Measurement Handler Software was delivered to GPO.

Feasibility Study for Integration of Measurement Handler Software into perfSONAR:

perfSONAR is an infrastructure for network performance monitoring. We are studying the perfSONAR architecture in order to integrate the MHS into it. In collaboration with Internet2, we are creating a communication model using XML schema language RELAX NG. On 7-9 July we will attend the perfSONAR workshop in Arlington.

[5] Activities and Findings

The perfSONAR ps software is installed in the lab, and the structure of the source code is being studied. We are also working on the basic architecture and design for implementing the MHS in perfSONAR.

[6] Project Participants

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[7] Publications

D. Majumder, I. Baldine, D. Gurkan, M. S. Wang, C. P. Lai, K. Bergman "Deliver release of Measurement Handler" (Project Nr. 1733, Milestone S2.j), May 2010

[8] Outreach Activities

None.

[9] Collaborations

Cluster D: Renaissance Computing Institute (RENCI) and Duke University: Ilia Baldine, Yufeng Xin, Jeff Chase, and Varun Marupadi.

We are working with RENCI on finding a common software interface definition between physical remote access to Infinera DTNs on BEN and then delivering the outputs to UMF

and IMF. Specifically, Yufeng Xin has provided us with the Perl scripts that RENCI uses to access their specific network elements. Ilia Baldine provides us the tools to become ORCA users on BEN with remote access through VPN. We are working with Varun Marupadi in Jeff Chase's group on the installation and implementation of the ORCA framework in Dr. Gurkan's lab and then on LEARN of Texas.

GENI ERM Project: Columbia University: Michael Wang, Caroline Lai, and Keren Bergman

We work closely with Columbia University as Prof. Bergman is a co-PI in this project. Interfacing with ERM deliverables and specifications of the measurement handler software module are the main collaborations. We delivered milestone S2.h of LEARN through our collaborative work.

GPO: Harry Mussman

We closely cooperated with Harry Mussman to create an updated version of the GENI Wikipage and to submit milestone reports and quarterly status reports. Discussions via e-mail on the design and planning of LEARN VLAN delivery to the GENI infrastructure were conducted.

LEARN of Texas: Akbar Kara, CTO of LEARN and G. Paul Roberts, University of Houston

We present developments to integrate LEARN to the GENI infrastructure to the constituents of LEARN community. During Technical Advisory Group meetings and otherwise, LEARN is updated on its developing presence in GENI.

[10] Other Contributions

None.

[11] Bibliography

[1] [LEARN_1] Programmable Measurements over Texas-based Research Network: LEARN [Online]. Available: http://groups.geni.net/geni/wiki/LEARN
[2] [ERM_1] C. P. Lai, M. S. Wang, K. Bergman, "Unified Measurement Framework: NetFPGA Cube Prototype," Dec. 2009 [Online]. Available: http://groups.geni.net/geni/attachment/ticket/279/ERM_S2a_Dec09.pdf
[3] [LEARN_3] D. Gurkan and G. Paul Roberts, "Cluster plan for VLANs between testbeds and Plan for VLANs on LEARN," November 2009 [online]. Available: http://groups.geni.net/geni/attachment/ticket/270/GENI_MS2andb_LEARN_Nov09.pdf
[4] [LEARN_2] M. Wang, D. Gurkan, C. P. Lai, K. Bergman, "Draft Measurement Data File Format," November 2009 [online]. Available: http://groups.geni.net/geni/attachment/ticket/270/GENI_S2H_LEARN_Nov09.pdf