Yearly Status Report (Y1)

Control, Measurement, and Resource Management Framework for Heterogeneous and Mobile Wireless Testbeds

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Major Accomplishments

In the first year the following were the major project accomplishments:

1. Extending OMF to support multiple heterogeneous testbeds
2. Extending OMF with the support for mobile (potentially disconnected) experimental nodes
3. Design of extended OMF interfaces to support WiMAX basestation aggregate manager
4. Integration of support for wide area (L2) connectivity

The project conducted demonstrations at all three GECs covering thesel 4 major accomplishments.

GEC4: Demonstration of mobile/disconnected operation
GEC5: Demonstration of wide-area heterogeneous testbed coordination
GEC6: Demonstration of WiMAX support

The project has released an external website dedicated to OMF with publicly available source code repository and wiki and mailing lists that are supporting a wide user community. We also released two new major versions of OMF software (5.1 and 5.2) with each version adding a subset of features corresponding to major accomplishments. This website is located at: http://www.mytestbed.net/

Activities and Findings

Extending OMF to support multiple heterogeneous testbeds

Towards this goal, we have so far completed the following tasks: migration of all domain specific configuration parameters to the Inventory database for that domain and introduce support for different PC-based hardware. We have also expanded the number of supported platforms to include low power deployments as well as more powerful (Quad Core) CPUs.

Furthermore, we are currently working on modification of OMF communication to follow publish-subscribe paradigm.

Supporting mobile nodes: local OMF/OML caching and distributing experiment scripts

The OMF was extended to support disconnected operation. The experiment script is installed over (possibly wireless) control link in the vehicular node at the start of the experiment. If this control connection becomes disconnected during the experiment, the resource controller will continue to run governed by the time-orchestrated experiment script. We have refactored our measurement framework (OML v2) and added temporary caching of collected measurement on disconnected nodes, and automatic data retrieval upon reconnection.

We have demonstrated these capabilities at GEC4 and GEC5.

We have also started work on the year 2 milestone to support experimentation driven by context, particularly by geographic location.

Support for wide-area (L2) connectivity

Early in the year, we worked with the NJEdge regional consortium to connect us to regional center MAGPI East (Philadelphia). As part of this process, we acquired dedicated fiber along the Route 1 corridor jointly with NJEdge. In the first half of the year the section of missing fiber link between the Rutgers Food Science building and the Route 1 fiber corridor (~1 mile) was installed and optical lambda service from NJEdge was provisioned. This created 1Gbps optical link between our current location (Rt. 1 Technology Center, North Brunswick NJ) and carrier hotel (MagPI East) at 401 Broad Street in Philly on the 9th floor. The ION connection was not provisioned due to missing cross connect between I2 and MagPI. To avoid delays for other dependant deliverables, we used L2 tunneling protocol (L2TP) over the excess capacity of 400Mbps on Rutgers University's existing commodity feed to emulate expected L2 connectivity and implement wide area networking. This link was used for a variety of testing scenarios, including a single experiment with a mixture of individual resources on both ends of the tunnel (with experiment coordination from both ends of the tunnel over multicast traffic), running an aggregate manager for the resource on the opposite end of the tunnel and measurement collection across endpoints.

We have successfully conducted a GEC demo that utilised L2 wide area network link from the New Jersey based ORBIT testbed to testbed facilities at NICTA in Sydney, Australia.

Integrating OMF with WIMAX Basestation

During the course of the first year, the WiMAX basestation was integrated into the ORBIT network. This setup enables full accessibility of both the RF and ASN portions of the basestation. In addition, we designed interfaces for two new OMF components: RF Aggregate Manager (Gridservice) and ASN Aggregate Manager (Gridservice) that will allow experimental end-users to access the features of the WiMAX device and to control basestation settings from OMF experiment scripts. We created a reference implementation that allows access to RF parameters for each node that participates in the experiment and allows creation of virtual machines on the ASN aggregate manager (to support multiple simultaneous experiments).

The GEC5 demonstration included preliminary integration with the Wimax project, by showing a video transmission over a Wimax link within the vehicular experiment, GEC6 demonstration illustrated OMF interfaces to control basestation settings from OMF experiment scripts.

Publications

"Mobile Experiments Made Easy with OMF/Orbit" Christoph Dwertmann, Ergin Mesut, Guillaume Jourjon, Max Ott, Thierry Rakotoarivelo, Ivan Seskar, ACM SIGCOMM Demonstration Session, Barcelona, Spain, Aug. 2009

"OMF: A Control and Management Framework for Networking Testbeds", Thierry Rakotoarivelo, Max Ott, Guillaume Jourjon, and Ivan Seskar. ROADS'09 workshop, Big Sky, MT, October 14th, 2009.

"Mobility Emulator for DTN and MANET Applications", Hayoung Yoon, JongWon Kim, Thierry Rakotoarivelo, Max Ott, 4th ACM International Workshop on Wireless Network Testbeds, Experimental Evaluation and Characterization (WiNTECH), Beijing, China, Sept. 2009

Collaborations

GENI Internal: During the first year, Cluster E framework group started a collaboration with Brian Levine's team from UMass with the objective of aligning control and measurement interfaces for our mobile testbed. We also started collaborating with Orca tema (Ilia Baldin) on more formalized resource description.

External: In the first year, project was collaborating with two European program: OneLab and 4WARD. Also, OMF software is also being actively used in 15 testbeds around the world.

Outreach

Number of minority/under-represented students continues to be involved in the project: Tripti Singh and Janani Chandrasekaran worked on mobility support while Manasi Jagannatha worked on WiMAX integration. As part of WINLAB Summer Internship we also had 6 undergraduate students using various elements of Orbit testbed and working with OMF.

Other Contributions

We have also conducted a site visit with GPO in June and a demo of the current framework to members of the GPO in November. We have also participated in numerous panels at various GECs and participated in 3 workshops organized by the GPO.

We provided input for the GENI security architecture draft, provided examples of ORBIT O&M data and our current data format in use, and are continuously supporting external experimenters on the stationary ORBIT testbed.