

## ViSE Milestone 3

Prashant Shenoy, Michael Zink, Jim Kurose, Deepak Ganesan, and David Irwin  
{shenoy, zink, kurose, dganesan, irwin}@cs.umass.edu

University of Massachusetts, Amherst  
140 Governors Drive  
Amherst, MA 01003-9264

The ViSE project has completed milestone M3, due 4 months from contract start date of October 1st, 2008. Milestone 3 is as follows:

- **Milestone 3.** Initial Orca integration. Xen and Orca software running on three sensor nodes, non-slivered, no radar control via Xen. Due February 1st, 2009.

The Orca control framework comprises a set of three distinct *actor* servers that correspond to GENI Experiments, Clearinghouses, and Aggregate Managers<sup>1</sup>. GENI experiments correspond to Orca service managers, GENI Clearinghouses correspond to Orca brokers, and GENI Aggregate Managers correspond to Orca site authorities. Each server runs in the context of a Java virtual machine and communicates with other servers using local or remote procedure calls. The ViSE project has setup one instance of an Orca service manager, an Orca broker, and an Orca site authority within the same Java virtual machine that communicate using local procedure calls.

The Orca actor servers run on a gateway node connected to both the public Internet (otg.cs.umass.edu) and the sensor node on the roof of the UMass-Amherst CS department. The sensor node on the UMass-Amherst roof, in turn, has a connection to the sensor node on Mount Toby via 802.11b using a long-distance directional antenna, and the Mount Toby node has a connection to the sensor node on the MA1 tower. Each sensor node runs an instance of the Xen virtual machine monitor and an instance of an Orca node agent. The Orca site authority communicates with the Orca node agent to instantiate virtual machines for experiments.

Each node is primed with the software necessary to create Xen virtual machines and sliver their resources. The local storage is a 32gb flash drive partitioned using logical volume manager. The Orca node agent snapshots a template virtual machine image pre-loaded on each node to create each experiment virtual machine. Additionally, `tc` is installed on each node to shape and limit each experiment's network traffic.

Using the default Orca web portal, users are able to login and request slices on the ViSE testbed. Currently, only the sensor node on the CS roof is accessible by end-users. We have decided to wait until the end of winter to install the Orca node agent software on the two other ViSE nodes, since they are difficult to access in the winter. We expect to access them in early-to-mid April depending on the weather and the snow melt.

In addition to the software to support Orca, each node has the appropriate foundation software/drivers to operate the sensors, wireless and wired NICs, an attached Gumstix Linux embedded control node, and a GPRS cellular modem. These software artifacts are accessible through `Domain-0` in Xen. The wireless NIC is used for communication with other sensor nodes. The wired NIC attaches to the Gumstix Linux embedded control node, which, in turn, is connected to the public Internet using a GPRS cellular modem. The control node is for remote Operations and Management. We have documented the process to create compliant `Domain-0` and `Domain-U` images at <http://vise.cs.umass.edu>.

The milestone is a pre-cursor to our sensor virtualization work. While users are able to create slices composed of Xen virtual machines bound to slivers of CPU, memory, bandwidth, and local storage, they are not able to access any sensors from their virtual machines yet. We are actively working on this capability and are due to complete it on time in late summer/early fall as specified in our SOW.

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<sup>1</sup>Note that in Orca an Aggregate Manager assumes the role of Management Authority