ORCA-BEN QSR

Period: Oct. 1, 2009 – Dec. 31, 2009

Overview

ORCA-BEN Project is adapting the existing ORCA (Open Resource Control Architecture) software developed at Duke as a control framework prototype for GENI. It uses BEN (Breakable Experimental Network, https://ben.renci.org) as the networked substrate, which exposes equipment at different layers: optical, circuit, packet as well as edge resources. The main goals for Spiral 2 are to

- harden the software
- make it more user-friendly
- provide mechanisms for federation with other frameworks
- aid Cluster-D projects in integrating their various heterogeneous substrates into the ORCA framework.

This QSR combines reports for the original ORCA-BEN project (1528) as well as the ORCA Augmentation project (1700), initiated 10/1/2009. Consistent with the GPO nomenclature, project milestones are pre-pended with project names ORCABEN and ORCAAUG, respectively.

In the indicated period the team has been concentrated on adding new features to ORCA, as pre-scribed in the ORCA roadmap. Specifically, the following features are currently either in development or have been completed:

- ORCA controller with a protoGENI-like XML-RPC interface, intended to enable the use of protoGENI-compatible experiment tools with ORCA. This controller translates between protoGENI resource reservation API and ORCA API. Initial capability enabling protoGENI's CreateSliver(), DeleteSliver() and DiscoverResources() API calls will be included in the Bella 2.1 release scheduled for Feb. 2010.
- Extended NDL+ resource descriptions for edge resources. This will allow to describe computational resources in NDL, in addition to the existing capability to describe multi-layered connectivity.
- NDL-based algorithms to perform site description coalescing (coalesce a multi-node site into a single node with outward-facing interfaces), inter-domain path computation (based on coalesced descriptions) and redeem dependency computation (to enable stitching of multiple segments/domains together).
- NLR Sherpa driver to enable dynamic ORCA-initiated provisioning of NLR FrameNet dynamic VLAN service.
- Substrate API modifications – a substantial software effort to abstract the existing ORCA substrate APIs to allow for future integration of more heterogeneous types of substrates.

- Actor registry – a single registry of all ORCA actors known to the clearinghouse (brokers, site authorities and service managers). This feature, in conjunction with extended query capabilities will allow users locate distributed brokers and query them about available resources.
- Eucalyptus integration – integration of open-source Amazon EC2 equivalent called 'Eucalyptus' as the new type of computational substrate (in addition to the existing COD-based Xen provisioning). This feature is meant to significantly simplify computational substrate setup for ORCA by using a robust out-of-the-box solution such as Eucalyptus

In addition to developing new features the team continued to harden the existing ORCA codebase:

- Debug and harden clearinghouse to prepare it for production level service
- Debug substrate drivers to speed them up and enable more complex substrate deployments

The ORCA-BEN team also continued to work with Cluster-D members in revising the roadmap and helping them integrate their substrates into ORCA CF. The team also devised the Cluster-D connectivity plan to help interconnect cluster sites together using a combination of static VLAN segments and dynamic VLAN provisioning over NLR FrameNet.

Jeff Chase also created and made available to Cluster-D and GPO a document titled 'ORCA Control Framework Architecture and Internals' which describes in high-level of details the various architectural assumptions of ORCA architecture, as well as implementation details of the various parts of the code-base.

Activities performed during specified period

Activities

Activity	Description	GPO target milestone
ORCA protoGENI controller	Controller/site-manager that speaks XML-RPC protoGENI API on one end and ORCA SOAP API on the other	ORCABEN S2.k, ORCABEN S2.a
Actor registry	Automated registry of distributed ORCA actors	ORCAAUG S2.e, ORCAAUG S2.a
NDL+ extensions	Ontology schema and policy/algorithm extensions to support broader range of substrates through NDL+.	ORCAAUG S2.e, ORCAAUG S2.a, ORCAAUG S2.j, ORCAAUG S2.i

NLR Sherpa driver	Driver to trigger FrameNet VLAN provisioning via NLR Sherpa	ORCABEN S2.j (completed), ORCABEN S2.g (completed)
Substrate API modifications	Create a more abstract substrate API in ORCA to enable driving more heterogeneous types of substrates	ORCAAUG S2.h, ORCABEN S2.h
Eucalyptus integration	Integrate support for provisioning Eucalyptus VMs through ORCA (driver and extended substrate support needed)	ORCAAUG S2.h
Debug and stabilize clearinghouse	Code and operational enhancements to make the Cluster-D ORCA CH more stable	ORCABEN S2.e (completed)
Debug drivers	Debug and improve networking drivers	ORCABEN S2.a

Participants

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Outreach

- Held discussions with Cluster-D members regarding the 'VLAN connectivity plan'
- Discussed ORCA architecture with members of DoE's ESNet4 effort