ORCA/BEN and Cluster D Demo
GEC7

Jeff Chase
Duke University
and "GENI Cluster D"
ORCA

Experiments

Etc.

Application Services

Broker

Open Resource Cloud Control Plane

Federation or “Coalition”

“Guests”

Substrate provider “sites” or “aggregates” (AMs)
**Demo**: orchestrated end-to-end VLAN linking ViSE CASA radars at UMASS with Eucalyptus cloud at Duke through NOX, Starlight, BEN, NLR/Sherpa, Monitoring: IMF, ERM, LEARN.

**GEC7 iGENI Cluster D Demo Network**
EUCALYPTUS IS PRIVATE CLOUD®

NASA uses Eucalyptus. No need to be a rocket scientist. Easily transform your machines into a private cloud.

Getting started with Eucalyptus is as simple as...

- Open source and supported
- Runs at 1000s of sites w/ Xen, KVM, etc.
- Amazon/EC2 compatible (“standard”)
- Bring power of Eucalyptus/EC2 clouds into GENI
- Bring power of GENI to the Cloud

Featured Quote about Eucalyptus...
"The exciting thing on the horizon for us is you’ve got this Eucalyptus open standard for Cloud Computing, because once you get a standard that’s developed across industry, then I move up and make more of the IT stack a commodity."

AM Interface to Substrate Providers

```
<lease>
  <issuer>site ABC public key</issuer>
  <signed_part>
    <holder>guest’s public key</holder>
    <rset>resource description</rset>
    <start_time>...<start_time>
    <end_time>...<end_time>
    <sn>unique ID at Site</sn>
  </signed_part>
  <signature>site ABC</signature>
</lease>
```

AMs issue lease contracts for sliver/slice instances.
A Coalition of Substrate Providers

Transit AM
- leasing service interface
- assign policy
- lease status notify
- setup/teardown handlers

Site AM
- leasing service interface
- assign policy
- lease status notify
- setup/teardown handlers

Plug-in setup scripts

Declarative substrate representations (NDL/OWL)

Substrate-specific back-end code
Slice Manager (SM) Service

Slice Manager/SM

- controller resource request policy
- leasing API
- lease event interface
- join/leave handler for guest

Guest “experiment”

Configuration properties

Authority/AM

- leasing service interface
- assignment policy
- lease status notify
- setup/teardown handlers

Unit properties

Breakable Experimental Network (BEN)
ORCA Servers (Actor) Roles
ORCA Servers (Actor) Roles

For GENI the ORCA SMs run as hosted services.
Operator portal interface to RENCI Clearinghouse (CH), listing AMs with substrate registered for brokering.
Operator portal interface to AMs managed by this operator (RENCI).
Operator portal interface to a Resource Pool: NLR/Sherpa VLAN tags.
User portal interface: view slices.
The Demo Slice

StarLight

NLR FrameNet + Sherpa

iGENI

6509

65xx

NLR

ViSE

Dome

UMass

NOX

NLR

6509

EX3200

6509

VM

BEN

BEN@RENCI

BEN@Duke

6509

VM

DukeCS

Dynamic VLAN

Static VLAN

ORCA-controlled substrate
# Elements of a Slice

**Manage Slice**

- **Slice**: ben  
  - **Action**: ganglia

GUID: 10553e14-db1c-4ba3-a575-784136454fc  
Owner: service (af7b4558-23e7-11df-bf65-000c29b1c193)  
Description: no description

- **Request Properties**: Show  
  - **Configuration Properties**: Show  
  - **Local Properties**: Show

- **Reservations**:

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<th>No</th>
<th>Slice Type</th>
<th>Units [R]</th>
<th>Units [A]</th>
<th>Start</th>
<th>End</th>
<th>Broker</th>
<th>Site</th>
<th>State</th>
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<td>duke-vm-site</td>
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Request Resources

Resource Selection
- Lease Start: 03/16/2010 14:44
- Lease End: 03/17/2010 14:44

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<tr>
<th>Resource Provider</th>
<th>Resource Type</th>
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Resource Map

Query NDL-OWL Store  Cancel Selection  Check Request  Submit Request
Lease activity (from logs)
A Closer Look
A Closer Look: Instantiation

- 85E000D6-orca.duke-net-site
- 774ED726-orca.service
- BD6A2160-orca.duke-vm-site
- 3C7C52DA-orca.nlr-site
- 600214FB-orca.starlight-site
- 6FABB02B-orca.ben-site
A Closer Look: Instantiation

Request to ViSE immediately

Request NLR/Sherpa link to Starlight immediately

When NLR/Sherpa path is ready, stitch one end to ViSE through Starlight...

VLAN tag through DukeNet to BEN

Start Duke Eucalyptus when DukeNet VLAN tag is known

...stand up BEN path and stitch to Sherpa path at one end, and to Duke Eucalyptus VM on the other.
<!--Polatis-Renci-->
<ndl:Device rdf:about="#Polatis-Renci">
  <rdfs:label>Polatis-Renci</rdfs:label>
  <ndl:locatedAt rdf:resource="#Renci"/>
  <ndl:hasInterface rdf:resource="#Polatis-Renci:f1"/>
  <ndl:hasInterface rdf:resource="#Polatis-Renci:f17"/>
  <ndl:hasInterface rdf:resource="#Polatis-Renci:f2"/>
  <ndl:hasInterface rdf:resource="#Polatis-Renci:f18"/>
</ndl:Device>

<!--Polatis-Renci:f1-->
<ndl:Interface rdf:about="#Polatis-Renci:f1">
  <rdf:type rdf:resource="http://.../ndl/wdm#FiberNetworkElement"/>
  <rdfs:label>Polatis-Renci:f1</rdfs:label>
  <ndl:connectedTo rdf:resource="#Polatis-Duke:f1"/>
</ndl:Interface>
Stitching

RENCI/GENI clearinghouse

Broker Engine

Guest/experiment Slice controller

tickets

leases

Multiple aggregate managers/authorities

Exchange of labels, tokens, configuration attributes etc. through SC
• Discovery and selection of brokers
• Trust management and key exchange
• How much substrate info to expose?
• How much allocation power to delegate?
• Overbooking vs. reserve capacity