Contextualization: Providing One-Click Virtual Clusters

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Nimbus: http://workspace.globus.org
Cloud Computing

Infrastructure-as-a-Service (IaaS)

How do I log in?
How does my colleague log in?
How do I point my VM at the server I need?
Not this server; the other server...
How can I make all these things happen automatically?

Nimbus: http://workspace.globus.org
**Parameterizable Appliance**

- **Appliance =** environment for application
- **Parameterizable =** can be customized

\[\text{deployment time} \quad \text{boot time}\]

To learn more:
- Open Virtualization Format (OVF) Specification

**Nimbus:** http://workspace.globus.org
What if not all information is available at deployment?

Tightly-Coupled Cluster

Reciprocal exchange of information

Nimbus: http://workspace.globus.org
Solution: Brokering
Context Information

Nimbus: http://workspace.globus.org
More generally:

- Who orchestrates this exchange?
- Will this entity work with my service/appliance?
- Will my appliance work with your service?
- How do we exchange this information securely?
- Can we orchestrate this exchange over multiple providers?

**Nimbus:** http://workspace.globus.org
Roles and Responsibilities

Appliance Providers
- marketplaces
- commercial providers
- communities

Deployment Orchestrator
orchestrate the deployment of environments across possibly many resource providers:
Context Broker

VMM/datacenter/laaS

Resource Providers

Nimbus: http://workspace.globus.org
The Architecture

Nimbus: http://workspace.globus.org
Interactions

- **Appliance Provider**
  - Ctx template including generic information
  - Means of integrating information

- **Appliance Deployer/Resource provider**
  - Obtain and provide generic context information securely

- **Deployment Orchestrator**
  - Interpret and broker non-generic information

_Nimbus:_ [http://workspace.globus.org](http://workspace.globus.org)
Implementation (Context Broker)

- WSRF service
  - Create: security context and id
  - AddWorkspace: register an appliance
  - AddInformation (poll for information release)

- Contextualization template
  - provides and requires
  - roles

Nimbus: [http://workspace.globus.org](http://workspace.globus.org)
Implementation (Generic Context)

- EC2: use instance metadata (user-data field -- up to 16K of unstructured information)

- Nimbus (WSRF): provide information by appliance patching (OVF-like)

- In both cases:
  - provide information to the service secured using HTTPS channel
  - rely on secure networking within the implementation

**Nimbus**: http://workspace.globus.org
Example (NFS Server)

NFS Server
10.0.0.1
Provides:
id: 10.0.0.1
label: nfsserver
Requires:
role: nfsserver
10.0.0.2
10.0.0.3

NFS Client
10.0.0.2
Provides:
id: 10.0.0.2
label: nfsserver
Requires:
role: nfsserver
10.0.0.1

NFS Client
10.0.0.3
Provides:
id: 10.0.0.3
label: nfsserver
Requires:
role: nfsserver
10.0.0.1

Nimbus: http://workspace.globus.org
What is this good for?

- Production STAR clusters of up to 100 nodes on Science Clouds and EC2
- Deployment and integration into community infrastructure of Alice nodes
- Evaluating Montage Workflows, Hoffa et al
- CloudBLAST, Matsunaga et al.
- Ready-to-use generic OSG cluster

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Appliance Providers

• Right now VMs are contextualized manually
  • Black Art
  • But: contextualize once -- deploy many times

• Working with appliance providers
  • rPath: review and implementation
  • Bcfg2: contextualizing generic appliance

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Related Work

- Open Virtualization Format (OVF) Specification
- Configuration on the fly
  - VMPlant and “Cluster on the Fly”
- Sapuntzakis et al., “Virtual Appliance in the Collective”
- Configuration Tools
  - Bcfg2, rBuilder, Quattor, Puppet, etc.

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Conclusions

• Increasing importance of appliance providers
  • We need higher-level languages to “code” appliances

• Standards in many dimensions
  • “rough consensus and working code”

• Increased interest in cloud interoperability

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  • Come see us at http://workspace.globus.org/

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