Overlay Cloud
- Yet another approach to Inter-cloud -

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@jxta
Background
**What’s NII?**

**National Institute of Informatics**
(http://www.nii.ac.jp/en)

Research Institute + **Academic Service Provider**

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Cloud Services provided by NII

- **Education Cloud** (2010.5 - )
  - Multi-clouds architecture with modified Eucalyptus

- **Research Cloud** (2012.7 - )
  - Bare metal NII private cloud with modified OpenStack

- **Academic Inter-Cloud** (2013.12 - )
  - Bare metal community cloud with modified OpenStack
**Research cloud**
- Cloud that can handle physical machine and can utilize existing assets -

Existing clusters

- Mapping existing cluster VLAN_ID and cluster ID in the cloud
- Cluster -A
- Cluster -B

Research cloud

- Expand (gunniii)
- Allocate
- Return

- As if a cluster is added to project segment
- As if a cluster is deployed like a VM through GUI/CLI

Physical machine pool

Cluster sharing
Object Store Service
tinii
Academic Community Cloud

Regional cloud is spreading
Linking through Inter-cloud infrastructure
Academic Inter-Cloud

(mapping university’s cluster VLAN_ID and cluster ID in the cloud)

Academic Inter-Cloud (compute)

Academic Inter-Cloud (storage)

Cooperate

As if a cluster is added to university cluster

As if multiple universities use one data center

Inter-cloud Object Store Service colony

As if an object store is same as local

NII National Institute of Informatics
Cloud Federation Approaches

Cloud Standard Approach

Cloud Standards make cloud federations possible.

On-demand Cloud Approach

Separate hardware providers from cloud providers.
Cloud providers deploy clouds on-demand.

Network with Glue software

Application Cluster-β

Cloud-A
Hardware-1
Cloud-A Provider

Cloud-C
Hardware-2
Cloud-C Provider

Application Cluster-α

Application Cluster-γ

Separation

Hardware-1

Hardware-1 Provider

SINET

Hardware-2

Hardware-2 Provider
On-demand cloud approach works but …

- On-demand cloud approach works fine in our academic community cloud environment with a limitation.

Public clouds do not always support bare metals.
Overlay Cloud
## Container Revolutions in Two Industries

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1950s -

2000s -

1950s -

2000s -
Separation of Concerns in Transport Industries

Separation of Concerns
“Container” = Virtual Machine?

Cloud Standards

VM VM VM VM VM VM

Cloud Provider

Cloud Provider

Cloud Provider

Cloud Provider

OpenStack

Gunnii

edubase Cloud

DigitalOcean

Amazon Web Services
“Container” = Container

New System

IT Industries
Overlay Cloud

Virtual Cloud Provider

Overlay network compute

Real Cloud Provider

Real Cloud Provider

Real Cloud Provider

Real Cloud Provider

Private/Community Cloud

Public Cloud

BM: Bare-metal Machine / VM: Virtual Machine
Overlay Cloud Prototyping

- Automatic High Availability
- Secure
- Location Awareness
- Cost Effective
- Portability
- Simple / Easy

Virtual Cloud Provider
- Resource Aggregator
- Container Manager
- AICN

- Academic Inter-Cloud
- Hokudai Cloud
- CloudLab
- Public Cloud

Virtual Cloud
- # JAIRO Backup Site
- # Mesos Cluster

SINET

Internet

Virtual Cloud
- # other

console / dashboard

Administrator

App Templ
Image

Container Hub
Extension to public clouds

• Extend to the public clouds by using container technologies like docker.
Extensions to Edges

• Extend to small geographically distributed clouds by using container technologies like docker.

Distributed Cloud Architecture for real-time data processing
Data Center to Distributed Cloud

- Cloud Data Center
- Traditional Data Center
- Distributed Data Center

Centralized vs. Distributed
Multi-tenancy vs. Single-tenancy

by Overlay Cloud
Distributed Cloud

New System
Thank you