Inter-cloud computing: Use cases and requirements

lessons learned 3.11

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Global Inter-Cloud Technology Forum (GICTF)
Institute of Information Security (IISEC)

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Secure cloud computing is promising

Consumers
- Individuals
- Small and medium-sized enterprises/municipalities
- Large enterprises/governments

Enterprise / Organizations
- Home ICT
- Tele-work
- Development Support Systems
- Limited Use in Enterprise / Organizations

Social infra-structures
- Mission-critical tasks
- e-Government

Current Cloud areas
- Public cloud (for Internet use)
- Public cloud
- Private cloud

Quality
- Home ICT
- Entertainment
  Blogs, SNS
- Tele-work
- Development Support Systems
- Limited Use in Enterprise / Organizations

Reliability
- High
- Low

Safety
Secure cloud computing for Lifeline Services

1. Various Quality requirements
   ✓ Availability (even in emergency situation), Latency, Bandwidth, Security, Cost, Green

2. Various Functional requirements
   ✓ To increase user benefits, quick delivery, etc.

Can “single cloud” satisfy everything?

“Inter-Cloud computing” technologies is promising.
Inter-cloud Computing

On-demand reassignment of cloud resources
Transfer/share workloads across clouds

Cloud A
- E-Gov
- Medical
- Finance
- CDN
- Application
- Server
- Storage

Cloud B
- E-Gov
- Medical
- Finance
- CDN

interworking

Standard Interface
Provisioning and Monitoring

Network

SLA assurance
SLA assurance
Communication facilities were the worst affected.
Communication facilities were the worst affected

- Transmission lines: 90 routes were cut off
- 18 buildings were fully destroyed, and 23 buildings were flooded
- 65000 telephone poles were destroyed by the flood
Rolling Blackout

Schedule of rolling blackout

http://www.tepco.co.jp/keikakuteiden/about-j.html
Lessons learned: **The East Japan Earthquake**

*Flexibly reassigning resources among cloud providers and network providers on a global scale*

- Serious damage on ICT facilities in the disaster area
- Serious power shortage / rolling blackout in wide area of East Japan
Use case: Disaster recovery

Finding and selecting available cloud resources among clouds in other areas, then *dynamically* rebuilding cloud services in the event of a disaster or a large-scale failure.

- **Service 1** (life line)
  - Cloud A
  - Cloud B
  - Cloud C
- **Service 2** (Entertainment)
- **Disaster**
- **End user**
  - Rerouting end user access as continue to provide service 1
- **DBs are synchronized in advance**
- **Power shortage**
- **Not selected**
Requirements for inter-cloud computing

Integrated service operation across clouds

On-demand system configurations across clouds

Seamless service deployment for end users

Cloud management system

Cloud A

Cloud B

VPN

Network

End user
Requirements for Inter-Cloud computing

[On demand system configuration across clouds]
- Search for available resources across clouds
- Rebuild cloud services in heterogeneous environment (different machine specs, different OS and different hypervisor)
- Reconfigure networks (network within datacenter and network between datacenters) dynamically

[Integrated service operation across clouds]
- SLA and policy negotiations among clouds
- Centralized monitoring and auditing of services across clouds

[Seamless service deployment for end users]
- Automatic rerouting / distributing user access
- Mutually exchanging information for tenant / end-user authentication across clouds
Global Inter-Cloud Technology Forum

- Promote international standardization of “inter-cloud” interface through industry-academia-government collaboration and cooperation with standards bodies.
GICTF Main activities

• Identify technical needs for secure “inter-cloud technology”

• The first white paper “Use case and functional requirements for Inter-Cloud Computing” Aug 2010

• Draft interfaces for Inter-Cloud computing (2011 4Q)

• Requirements for network virtualization in Inter-Cloud computing(2011 4Q)

• Raise awareness of users both in industry, government and communities
GICTF Membership

(as of September 2011)

• **78** enterprises: NTT, KDDI, NEC, Hitachi, Fujitsu, Toshiba Solution, Microsoft, IBM, Oracle, Cisco, BIGLOBE, IIJ and others

• Independent administrative institution, National laboratory

• University professors, etc.

• Ministry of Internal Affairs and Communications of Japan (Observer)

• Ministry of Economy, Trade and Industry (Observer)
Highly Reliable Inter-Cloud Systems R&D project funded by Japanese government

Application

Server Storage

Network

Open Flow

Sensor Node

Physical World

GICTF 2011/10/12

Cloud Resource Provisioning (Univ. Tokyo)

Cloud Resource Federation and Reconfiguration (NTT R&D, NTT Data, NTT Communications)

Dynamically Reconfigurable NW based on Open Flow (NEC, KDDI, Univ. of Tokyo)

Real-time Sensor Node (Hitachi)

<2009 - 2011: total 20M$>
DISCUSSION TOWARDS GLOBAL COLLABORATION IS VERY IMPORTANT!