Security and the Cloud

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The cloud is many things to many people

- Software as a service and hosted applications
- Processing as a utility
- Storage as a utility
- Remotely hosted servers
- Anything beyond the network card

Clouds are hosted in different ways

- Private Clouds
- Public Clouds
- Hosted Private Clouds
- Hybrid Clouds
- Clouds for federated enterprises
The Cloud is Federated

Securing the cloud will require some form of

• Federated Identity Management
• Federated Policy Management

Today these federations are ad-hoc

• Pair-wise coordination or
• Multiple registration
• How do we coordinate while still maintaining local control.
Risks of Cloud Computing

Reliability

• Must ensure provider’s ability to meet demand and to run reliably

Confidentiality and Integrity

• Service provider must have their own mechanisms in place to protect data.
• The physical machines are not under your control.

Back channel into own systems

• Hybrid clouds provide a channel into ones own enterprise

Less control over software stack

• Software on cloud may not be under your enterprise control

Harder to enforce policy

• Once data leaves your hands
Defining Policy

**Characterize Risk**
- What are the consequences of failure for different functions

**Characterize Data**
- What are the consequences of integrity and confidentiality breaches

**Mitigate Risks**
- Can the problem be recast so that some data is less critical.
  - Redundancy
  - De-identification
- Control data migration within the cloud
Controlling Migration

**Characterize Node Capabilities**

- Security Characteristics
  - Accreditation of the software for managing nodes and data
- Legal and Geographic Characteristics
  - Includes data on managing organizations and contractors
- Need language to characterize
- Need endorsers to certify

**Define Migration Policies**

- Who is authorized to handle data
- Any geographic constraints
- Necessary accreditation for servers and software
  - Each node that accepts data must be capable for enforcing policy before data can be redistributed.
- Languages needed to describe
Enforcing Constraints

With accredited participants

• Tag data and service requests with constraints
• Each component must apply constraints when selecting partners
  • Sort of inverting the typical access control model

When not all participants are accredited

• Callbacks for tracking compliance
• Trusted computing to create safe containers within unaccredited systems.
Summary

Great potential for cloud computing

• Economies of scale for managing servers
• Computation and storage can be distributed along lines of a virtual enterprise.
• Ability to pay for normal capacity, with short term capacity purchases to handle peak needs.

What needs to be addressed

• Forces better assessment of security requirements for process and data.
• Accreditation of providers and systems is a must.
• Our models of the above must support automated resolution of the two.
For More Information

For updates and related information

- [http://clifford.neuman.name/](http://clifford.neuman.name/)
- [http://ccss.usc.edu/](http://ccss.usc.edu/)