Hierarchical Secure Information and Resource Sharing in OpenStack Community Cloud

Cyber Incident Response
An Model for Information and Resource Sharing

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Aug 15, 2015

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Community Cloud

• Community cloud provides services for exclusive use by a specific community, which contains organizations with shared concern, such as mission, security requirements, business models, etc.
  • A community of financial organizations
  • OpenStack
Cyber Collaboration Initiatives

• Cyber attacks are becoming increasingly sophisticated.
  – Hard to defend by a single organization on its own.

• Collaborate to enhance situational awareness
  – Share cyber information in community
    • Malicious activities
    • Technologies, tools, procedures, analytics.

Ref: [www.huffingtonpost.co.uk/2013/04/23/uk-government-faces-1000-cyber-attacks-a-day_n_3138164.html](http://www.huffingtonpost.co.uk/2013/04/23/uk-government-faces-1000-cyber-attacks-a-day_n_3138164.html)
Traditional Cyber Collaboration

- Traditional collaboration
  - Subscription services
  - Limitations
    - Organizations Sharing information through subscription.
    - Organizations are not actively participating in analyzing and processing the cyber information they submit.
    - Organizations don't directly interact with each other on sharing activities.
Cyber Collaboration in Community Cloud

• Cloud platform (community)
  – Cyber Security Committee.
  – Organizations routinely collect cyber information.
  – Cross organization cyber collaborations.
Community Cyber Incident Response Governance

- Incident Response Group
  - Cyber Security Committee
  - Organization Security Specialists
  - External Experts

Conditional Membership
Shared Information

UTSA
Assumptions and Scope

- In a community cloud platform
- OpenStack
- Sharing amongst a set of organizations
  - Sensitive cyber information, infrastructure, tools, analytics, etc.
  - May share malicious or infected code/systems (e.g. virus, worms, etc.)
- Focus on access control model
OpenStack

• Dominant open-source cloud IaaS software
  – OpenStack software controls large pools of compute, storage, and networking resources throughout a datacenter, managed through a dashboard or via the OpenStack API.

Ref: http://www.openstack.org
OpenStack HMT

- HMT: Hierarchical Multitenancy
OSAC Model with HMT
OSAC-HMT-SID Model

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OSAC-HMT-SID Administration Relation and Resources Ownership

Cloud admin

Domain admin
- Project admin
- Security Project admin

SID admin (Cloud admin)
- Core Project admin

SIP admin

Community Cloud
- Domains
  - Projects
    - child Projects
  - Secure Projects
    - child Secure Projects
- SID
  - Core Project
  - Open Project
    - SIPs
      - child SIPs
OSAC-SID Administrative Model

- SipCreate(uSet, sip)
  /* A subset of Core Project/domain admin users together create a sip */
- SipDelete(uSet, sip)
  /* The same subset of Core Project/domain admin users together delete a sip*/
- UserAdd(adminuser, r, u, sp, p)
  /* CP/Sip admin can add a user from his home domain Security Project to CP/sip*/
- UserRemove(adminuser, r, u, sp, p)
  /* CP/Sip admin can remove a user from the Core Project/sip */
- OpenUserSubscribe(u, member, OP)
  /* Users subscribe to Open Project */
- OpenUserUnsubscribe(u, member, OP)
  /* Users unsubscribe from Open Project */
- CopyObject(u, so1, sp, so2, p)
  /* Copy object from Security Project to Core Project/SIP */
- ExportObject(adminuser, so1, p, so2, sp)
  /* Export object from Core Project/SIP to Security Project */
- ExpertUserCreate(coreadmin, eu)
  /* Core Project admin users can create an expert user */
- ExpertUserDelete(coreadmin, eu)
  /* Core Project admin users can delete an expert user */
- ExpertUserList(adminuser)
  /* Admin users of Core Project and SIPS can list expert users */
- ExpertUserAdd(adminuser, r, eu, proj)
  /* Core Project/sip admin can add an expert user to Core Project/sip*/
- ExpertUserRemove(adminuser, r, eu, proj)
  /* Core Project/sip admin can remove an expert user from Core Project/sip */
Enforcement

- Set up the cloud
Enforcement

SID: Cloud Admin

Create SIP/child SIP/…, assign domain admins as

Core Project: Admin

Assign domain admins as
Assign users from home domain as Assign expert users as

Core Project: member

SIP: Admin

Assign users from home domain as Assign expert users as

child SIP: Admin

Assign users from home domain as Assign expert users as

child SIP: member

child SIP’s … child SIP: Admin

child SIP’s … child SIP: member
Conclusion and future work

• Suggested OSAC-HMT-SID model to OpenStack
  – Cyber collaboration across organizations
    • cyber incident response
    • Self-service
    • Cyber Security Committee.
    • Share data, tools, vms, etc.
  – Potential blueprint for official OpenStack adoption

• Future work
  – Explore other model options.
  – Explore local roles in the model.
  – Explore models in other dominant cloud platforms.
Thanks!