Community-Based Secure Information and Resource Sharing in Azure Cloud IaaS

Cyber Incident Response
Models for Information and Resource Sharing

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Overview

- Motivations
- Scope
- Background
- Secure Isolated Domain (SID) Concept
- Azure Access Control Model
- Azure SID Model
- Enforcement
- Conclusion
Motivations

• 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
      • Malicious activities
      • Technologies, tools, procedures, analytics.

• Dominant IaaS cloud platforms are lacking models for group sharing

Ref: www.huffingtonpost.co.uk/2013/04/23/uk-government-faces-1000-cyber-attacks-a-day_n_3138164.html
Scope

• Sharing models — sharing amongst a set of organizations
  – Information, infrastructure, tools, analytics, etc.
  – May want to share malicious or infected code/systems (e.g. virus, worms, etc.)
  – Sensitive

• Cloud service models — focus on Infrastructure as a Service (IaaS) — Microsoft Azure

• Scenario — Cyber Incident Response
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.
Cloud IaaS Advantages for Cyber Incident Sharing

• Virtualized resources
  – Theoretically, one can take a snapshot and mobilize

• Operational efficiency
  – Light-weight and agile
  – Rapid deployment and configuration
  – Dynamic scaling
  – Self-service
Sharing Model in Cloud IaaS

Sharing Group

Participant A
Add/Remove Data
Join/Leave Users
Add/Remove Data

Participant B
Add/Remove Data
Join/Leave Users
Add/Remove Data

Participant C
Add/Remove Data
Join/Leave Users
Add/Remove Data

View #1: Org A

View #1: Org B

View #1: Org C

refer paper: Towards a framework for group-centric secure collaboration.
Community Cyber Incident Response Governance

Incident Response Group

Cyber Security Committee
Organization Security Specialists
External Experts

Conditional Membership

Shared Information

refer paper: RT-based administrative models for community cyber security information sharing.
Cyber Collaboration in Cloud

• Cloud platform — IaaS
  – Community in Cloud
  – Cyber Security Committee.
  – Organizations routinely collect cyber information.
  – Cross organization cyber collaborations.
Secure Isolated Domain (SID) Model

Core Project (CP)

Open Project (OP)

Secure Isolated Domain (SID)

Secure Isolated Project SIP-1

Secure Isolated Project SIP-n

Org-1

Org-m

Community

Expert-1

Expert-k

Experts
Sharing Model in Cloud IaaS

Can create multiple secure isolated projects (SIPs) within SID with different controls.
Microsoft Azure

• Popular public cloud software
  – **Microsoft Azure:** is a cloud computing platform and infrastructure created by Microsoft for building, deploying, and managing applications and services through a global network of Microsoft-managed datacenters.

Ref: https://azure.microsoft.com/
Azure Access Control Model
Azure Access Control Model with SID Extension

- **SIDs**
  - SID-Association (assoc)
  - Organization Accounts (OA)
- **Roles (R)**
  - User Assignment (UA)
  - Resource Co-Ownership (RO)
- **Resource Groups (RG)**
  - RG-R pair
  - RG Ownership (RGO)
- **Resources (RS)**
  - Resource Co-Ownership (RO)
  - OT Ownership (OTO)
- **Object Types (OT)**
  - PRMS
- **Services (S)**
  - RG Ownership (RGO)
  - Resource Co-Ownership (RO)
  - SIP/CP/OP Ownership (SIPO/CPO/OPO)
- **User Ownership (UO)**
- **User Assignment (UA)**
- **Expert Users (EU)**
- **Users (U)**
- **PRMS**
- **Organization Accounts (OA)**
- **SID-Association (assoc)**
- **Setup**
- **UTSA**

**Key Concepts**
- **User**
- **Role**
- **Resource Group**
- **Resource**
- **Object Type**
- **Service**
- **Ownership**
- **SID Association**
- **User Assignment**
- **Expert User**
- **User**
SID Service

Org1
Sec Admin1

Org2
Sec Admin2

Org3
Sec Admin3

OrgN
Sec AdminN

Sid1
uSet

Core Project
Open Project

Sip1
......
SipM
Enforcement

• Azure Account Resource Division
Enforcement

• Setting up SID service
  – Create two roles in the Core Project account: _CPadmin_ and _CPmember_
    – _CPadmin_ allows the user have limited administrative power to use the role _CPmember_ and specify policies for users from his organization.
  – Create one role in the Open Project account: _OPmember_
    – _CPadmin_ allows all users from the community to access the Open Project account.
  – SID manager maintains a list of security administrative users (uSet) from organizations.
Enforcement

- SIP request
Conclusion and future work

• Developed sharing models
  – Formal specification

• Enhanced Azure Cloud IaaS with SID/SIP capabilities
  – Cyber incident response capabilities
    • Self-service
    • SID/SIP specific security
    • Share data, tools, etc. in an isolated environment
    • Ability to execute and analyze malicious code in an isolated environment

• Future work
  – more fine grained access control within a SIP
  – compare SID/SIP enforcement on dominant IaaS cloud platforms (OpenStack, AWS and Azure)
Thanks!