Self Adaptation for Security Monitoring in IaaS clouds
Anna Giannakou, Louis Rilling, Christine Morin, Jean-Louis Pazat

To cite this version:

HAL Id: hal-01340460
https://inria.hal.science/hal-01340460
Submitted on 1 Jul 2016

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
Self Adaptation for Security Monitoring in IaaS clouds

Anna Giannakou*, Louis Rilling∞, Christine Morin*, Jean-Louis Pazat*
* Inria, ∞DGA

**Con**text: IaaS cloud environments. Frequent infrastructure-related changes:
• VM creation, migration, destruction
• Service addition or removal

**Proble**m: Frequent changes make traditional security monitoring fail

**Objective**s

- **Self adaptability:** react to changes in virtual and physical infrastructures
- **Customization:** allow tenants to request inspection of specific types of attacks
- **Scalability:** adapt to traffic load and changes in the size of the infrastructure
- **Cost minimization:** for tenants and the provider

**SAIDS Features**

- Adaptation probes: detect a change and reconfigure the components involved
- Customized rules: include IDS rules targeting a tenant’s deployed services
- New sensor deployment: rebalance traffic analysis when a local intrusion detection sensor is overloaded
- Component sharing: tenants may share local IDS sensors

**SAIDS architecture**

**Scenario**

- Load balanced setup representative of a production env.
- 3 interconnected VMs: web, mail, DNS services
- 2 IDSs: one per virtual switch

**Technology**s

- Cloud deployed with Openstack
- Inter VM communication through GRE tunnels on Open vSwitch

**Future Work**

- Combine monitoring for provider and tenants
- Add other devices: collectors, aggregators
- Offer tenants partial control of the framework

**Related work:** Projects that partially address tenant-driven customization and scalability issues [1][2] but fail to adapt to frequent changes. [3] addresses self-adaptation but not multi-tenancy, tenant-driven customization or cost-effectiveness.


**Early Evaluation**

**Goals**

Evaluating the reconfiguration overhead & quality of detection

**Technologies**

- Cloud deployed with Openstack
- Inter VM communication through GRE tunnels on Open vSwitch

**Results**

<table>
<thead>
<tr>
<th>Option</th>
<th>Time in secs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without adapt</td>
<td>2.1</td>
</tr>
<tr>
<td>With adapt</td>
<td>1.7</td>
</tr>
</tbody>
</table>

**Options**

- Snort reconfiguration
- Actual Migration

**Scenario**

1. **Infrastructure monitoring probes** notify the adaptation manager that a topology change occurs and relate the necessary information: VM id, VM IP, hostname of physical host.

2. **Adaptation manager** decides which additional rules have to be activated in the local IDS (IDS) responsible for the new host of the VM. Decision based on:
   - Deployed services (VM info)
   - Specific requests from tenants (SLA info)

3. The adaptation manager adapts the IDS through remote execution of the adaptation driver

**Related work:** Projects that partially address tenant-driven customization and scalability issues [1][2] but fail to adapt to frequent changes. [3] addresses self-adaptation but not multi-tenancy, tenant-driven customization or cost-effectiveness.