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Self Adaptation for Security Monitoring in IaaS clouds

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Context: IaaS cloud environments.
Frequent infrastructure-related changes:
- VM creation, migration, destruction
- Service addition or removal

Problem: Frequent changes make traditional security monitoring fail


Objectives

- **Self adaptability:** react to changes in virtual and physical infrastructures
- **Customization:** allow tenants to request detection 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
- **New sensor deployment:** rebalance traffic analysis when a local intrusion detection sensor is overloaded
- **Component sharing:** tenants may share local IDS sensors

SAIDS architecture

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 (IIDS) 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 IIDS through remote execution of the adaptation driver

Early evaluation

Goals
Evaluating the reconfiguration overhead & quality of detection

Technologies
- 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

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

Results

- Snort reconfiguration
- Actual Migration

<table>
<thead>
<tr>
<th>Time in secs</th>
<th>Without adaptation</th>
<th>With adaptation</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.7</td>
<td>2.1</td>
<td>2.3</td>
<td>4</td>
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