Closed-Loop Automation Requirements for Beijing Release

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What we have done in R1?

Onset
Clear

DCAE

DMaaP
Holmes
DMaaP

Guest
EPC S/P-GW

Host

EMS
Adapter

Multi-Cloud

Holmes

VES Collector

VM Alarm
VNF Alarm

Restart VNF

Action Execution
VF-C

Rest

VNF Alarm
Standby MPU is offline

VM Alarm
VM OS abnormal, Kernel Panic, …
What we want to extend in R2?

- **Enhanced alarm-correlation**
  - Add more kinds of rules.
  - Consider how to deal with a large number of rules.
  - Add UI to show rules LCM and alarm-correlation results.

- **Add new function of auto-scaling**
  - Support two kinds of auto-scaling. Alert or condition.
  - Set threshold values.

- **Collect more data from host and VM**
  - Alarm
  - KPI Metrics
# Alarm-correlation I

## Alarm-correlation Classification

<table>
<thead>
<tr>
<th>Relation</th>
<th>Direction</th>
<th>Hierarchy</th>
<th>Description &amp; Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homologous</td>
<td>Intra Horizontal</td>
<td>VNF/VM/Host</td>
<td>Do the correlation for the alarms from the same VNF/VM/Host, e.g.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- the host is abnormal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- CPU usage of the host &gt; threshold value</td>
</tr>
<tr>
<td>Primary &amp; Secondary</td>
<td>Horizontal</td>
<td>VNF/VM/Host</td>
<td>Do the correlation for the alarms from different VNF/VM/Host, e.g.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- TAS is offline</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- S-CSCF cannot link to TAS</td>
</tr>
<tr>
<td></td>
<td>Vertical</td>
<td>VNF-VM-HOST</td>
<td>Do the correlation for the alarms from VNF, VM or Host (at least two neighbors), e.g.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- S-CSCF is abnormal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- VM (S-CSCF) failure</td>
</tr>
<tr>
<td></td>
<td>Hybrid</td>
<td></td>
<td>Do the correlation for the alarms from both horizontal and vertical.</td>
</tr>
</tbody>
</table>
Alarm-correlation II

• Infrastructures + services ‡ -> alarms ‡ -> rules ‡
• How to deal with a large number of rules to ensure efficiency?
  • Classify the rules?
    • e.g.,
      Rules for host
      Rules for VoLTE
      …
Alarm-correlation III

• UI related to Holmes
  • Rules CRUD
  • Alarm-correlation topology / results
## Auto-Scaling I

### Auto-Scaling Classification

<table>
<thead>
<tr>
<th>Based on Alert</th>
<th>Description &amp; Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Data -&gt; VES -&gt; TCA -&gt; (Holmes -&gt;) Policy -&gt; Action Execution -&gt; Alert clear, e.g. Alert - the call volume &gt; threshold value Action - Scaling VNF</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Based on Condition</th>
<th>Description &amp; Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Condition -&gt; Policy -&gt; Action Execution, e.g. Condition - set 8 pm as the peak hour Action - Scaling VNF</td>
</tr>
</tbody>
</table>

### Thresholds Definition

- Single source threshold, e.g. the number of users
- Cross source thresholds, e.g. the number of users + the CPU usage

- Based on human experience.
- Based on algorithm to calculate, e.g. use machine learning algorithm to train the model based on history data.
## Alarm + KPI Metrics Collection

<table>
<thead>
<tr>
<th>Alarm</th>
<th>KPI Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>R1</td>
</tr>
<tr>
<td>R2</td>
<td>R2</td>
</tr>
<tr>
<td>VF-C</td>
<td>Real-time</td>
</tr>
<tr>
<td></td>
<td>Full set from EMS</td>
</tr>
<tr>
<td>Multi-Cloud</td>
<td>insufficient Alarm</td>
</tr>
<tr>
<td></td>
<td>Real-time</td>
</tr>
<tr>
<td></td>
<td>Host + VM</td>
</tr>
<tr>
<td></td>
<td>Periodical</td>
</tr>
<tr>
<td></td>
<td>Full set from EMS</td>
</tr>
<tr>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Non-real-time</td>
</tr>
<tr>
<td></td>
<td>Host + VM</td>
</tr>
</tbody>
</table>
Summary

• Enhanced alarm-correlation
  - Add more kinds of rules.
  - Consider how to deal with a large number of rules.
  - Add UI to show rules LCM and alarm-correlation results.

• Add new function of auto-scaling
  - Support two kinds of auto-scaling. Alert or condition.
  - Set threshold values.

• Collect more data from host and VM
  - Alarm
  - KPI Metrics
Alarm-correlation: Future

- Pre-defined: √ (pre-trained)
- Human Experiential: √ × (history data)
- Manual: Automatic

Now → Future
Thanks