Which Information Model for Autonomic Mechanisms?

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Outline

- MOTIVATION
- UMF-FRAMEWORK FOR AUTONOMIC MECHANISMS
- INFORMATION MODEL BASICS
- STANDARDIZATION OPPORTUNITIES: INFORMATION MODEL FOR AUTONOMIC MECHANISMS
Motivations

Context

Issues

- Operators today have hundreds of millions of customers and need to ensure mass of customization
- Operators rely on thousands of different network elements with their proprietary implementations
- Operators are spending millions of euros for the adaptation and integration of network element and element manager
- Operators need to handle thousands of alarms per day are received ... in a medium size NOC

Goals

- Operators are seeking for advanced management operations which implements Self* functions to handle complexity in management operations.
- Operators are looking for approaches to alleviate the integration issues to reduce CAPEX/OPEX and improve TTM.
Framework for Autonomic mechanisms (UniverSelf Vision)
Unified Management Framework & Network Empowerment Mechanisms

* NEM stands for Network empowerment Mechanism = Autonomic Mechanisms
Framework for Autonomic mechanisms (UniverSelf Vision)

Information view

*NEM stands for Network empowerment Mechanism
An information model is “an abstraction and representation of the entities in a managed environment. It includes definition of their properties, operations and relationships. It is independent of any specific type of repository, software usage, platform, or access protocol.”

- “The Internet Engineering Task Force, IETF, RFC 3198, Terminology for Policy-Based Management

An information model is a representation of business concepts, their characteristics and relationships, described in an implementation independent manner.

- TMF-SID v12.5

Information Model: Information Model denotes an abstract, formal representation of entity types, including their properties and relationships, the operations (e.g. read, write...) that can be performed on them, and related rules and constrains. In the information model, entities might have network topology relationship with each other.

- 3GPP, terminology 32.181
IM- INFORMATION MODEL BASICS
Why do we need an Information Model?

IM is an enabler for convergence/federation/unification of management systems

- For current and legacy management systems
  - IM is mainly used as a reference model to define management system interfaces and to define repository data model

- For future systems in particular Autonomic mechanisms
  - IM is also an enabler for defining communication interfaces between application and upper management layers.
  - IM is an enabler for software development (good feedback from implementers inside the project)
  - IM is an enabler for ontology development
    - for reasoning
    - model transformation (MDA, MDE, etc) An IM will enable semantics and reasoning, opening the door to automatic translation
INFORMATION MODEL BASICS
Overview of UniverSelf approach

**Approach**

1. Select a standardized Information-Model: TMF-SID
   - TMF-SID covers various domains, and abstracts/represents policy
2. Identify the exchanged data
3. Find equivalent concepts if available in TMFSID or the published subsets of DEN-ng
4. Else add new concepts with respect to the SID pattern and extension methodology

**Results**
STANDARDIZATION OPPORTUNITIES
Extension of TMF SID with the NEM layer
STANDARDIZATION OPPORTUNITIES
NEM linked to TMF-SID root diagram
class NEMStructure

NEMSpecification
+ atomicLoop: Boolean
+ id: NEMSpecID
+ isComposite: Boolean
+ manageableEntities: List<ManagedEntitySpecification>
+ possibleHost: List<OS>
+ releaseDate: Date

NEMSpecID
+ name: String
+ provider: String
+ version: int

NEM
+ loopImpact: Map<UMFInformationSpecification, List<NEMImpact>>
+ managedResource: List<URI>
+ regime: Regime
+ state: NEMStates
+ url: URL

NEMComposite
+ mainComponent: NEMMainComponent
+ slaveComponent: List<NEMMainComponent>

NEMAtomic

NEMMainComponent
+ host: Host
+ URL: iURI

knowledgeexchangeInterface

«enumeration»

NEMStates
operational
void
Instantiated
ready

defines

has

expose

identifiedBy

specifiedBy

STANDARDIZATION OPPORTUNITIES
NEM Structure
STANDARDIZATION OPPORTUNITIES
NEM Information

class NEMInformation

Root Business Entities ABE::
ManagementInfo
- mgmtInfoValidFor: TimePeriod
- retrievalMethodCurrent: int
- retrievalMethodsSupported: string

UMFInformation
+ content: ManagementInfo
+ isAggregated: boolean
+ isAggregationNeeded: boolean
+ monitoringFrequency: int
+ typeOfMonitoringInformation: String

specifiesNEMInformation

«enumeration»
InformationUsage
- knowledge, rawData

ManagementInfoSpecification
+ contentType: Class
+ descriptor: String
+ genericImpacts: List<Impact>
+ informationUsage: InformationUsage
+ type: InfoType

«enumeration»
InfoType
- knowledge, rawData

NEM
+ loopImpact: Map<UMFInformationSpecification, List<NEMImpact>>
+ managedResource: List<URI>
+ regime: Regime
+ state: NEMStates
+ url: URL

specifiedBy

specifiesNEMInformation

UMFInformationSpecification
+ contentType: ManagementInfo
+ context: Context
+ impacts: List<Impact>
+ name: int

NEMSpecification
+ atomicLoop: Boolean
+ id: NEMSpecID
+ isComposite: Boolean
+ manageableEntities: List<ManagedEntitySpecification>
+ possibleHost: List<OS>
+ releaseDate: Date

advertises/registers

1

advertises

uses/providers

has

has
STANDARDIZATION OPPORTUNITIES

Key messages

- **Autonomic Mechanisms need to be managed and integrated**
  - UMF CORE BLOCKS + Information Model for Autonomic Mechanisms

- **Information Model for Autonomic Mechanisms is an enabler to abstract and represent what operators need to know in order to deploy, configure and activate efficiently autonomic mechanisms**

- **WITHOUT Information Model, Autonomic Mechanisms are**
  - “vendors specific” with “proprietary implementations”
  - sometimes black boxes
  - increase of integration issues

- **Room for discussion in**
  - NGMN NGCORE (part of the Umbrella Model)?
  - ETSI AFI for the WI#2 (MBTS?)
  - TMF-SID extension for managing Autonomic Mechanisms
  - 3GPP while specializing the IM for 3GPP SON
Acknowledgments

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- Christian DESTRE (Technical Manager), Orange Labs France
QUESTIONS & ANSWERS
Reduced integration efforts / Reduced operational efforts = Potential savings

Increasing complexity with multiple EMSs and technologies

Expenditures for OSS deployment & operations workforce

Low grade of standardisation / harmonisation

High grade of standardisation / harmonisation

No of EMSs
SDN & UMF

- **Application Layer**
- **Control Layer**
  - Network services
- **Infrastructure**
  - Network Element

- **UMF Core**
  - **GOVERNANCE**
  - **COORDINATION**
  - **KNOWLEDGE**

- **NEM**
  - NEM_x
  - NEM_y
    - adaptor
    - network element

**NEM**: Network Empowerment Mechanisms

**FB**: Functional Blocks
## Manifest – description of the NEM class

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>NEMSpecID</td>
<td>To have a unique identifier of the NEM class</td>
</tr>
<tr>
<td>Name</td>
<td>String</td>
<td>Name of the NEM class</td>
</tr>
<tr>
<td>Provider ID</td>
<td>String</td>
<td>Name of the NEM developer (name of the company)</td>
</tr>
<tr>
<td>Version</td>
<td>Int[]</td>
<td>Version of the NEM</td>
</tr>
<tr>
<td>Release Date</td>
<td>Date</td>
<td>Date of release of the NEM</td>
</tr>
<tr>
<td>Features</td>
<td>String</td>
<td>Text field used to describe what is the feature achieved by the NEM</td>
</tr>
<tr>
<td>User Guide URL</td>
<td>URL</td>
<td>Optional - Used to have a link onto a web server providing guidance for</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the use of the NEM</td>
</tr>
<tr>
<td>Possible Hosts</td>
<td>List&lt;OS&gt;</td>
<td>Lists the OS on which the NEM (or more precisely the NEM Component)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>can be installed</td>
</tr>
<tr>
<td>Manageable Entities</td>
<td>List&lt;Managed EntitySpecification&gt;</td>
<td>Lists the type of equipments/services that can be managed by the NEM</td>
</tr>
<tr>
<td>Is Composite</td>
<td>Boolean</td>
<td>Depicts whether the NEM is atomic or composite</td>
</tr>
<tr>
<td>Is Atomic Loop</td>
<td>Boolean</td>
<td>Depicts whether the algorithm of the NEM works as a single control loop</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or as a set of cooperating control loops.</td>
</tr>
<tr>
<td>Acquired Inputs</td>
<td>List&lt;Management InfoSpecification&gt;</td>
<td>Lists the nature of information acquired by the NEM itself</td>
</tr>
<tr>
<td>Optional External</td>
<td>List&lt;Management InfoSpecification&gt;</td>
<td>Lists the nature of information that the NEM should receive from</td>
</tr>
<tr>
<td>Inputs</td>
<td></td>
<td>KNOWLEDGE (directly or indirectly)</td>
</tr>
<tr>
<td>Mandatory External</td>
<td>List&lt;Management InfoSpecification&gt;</td>
<td>Lists the nature of information that the NEM must receive from</td>
</tr>
<tr>
<td>Inputs</td>
<td></td>
<td>KNOWLEDGE (directly or indirectly)</td>
</tr>
<tr>
<td>Available Outputs</td>
<td>List&lt;Management InfoSpecification&gt;</td>
<td>Lists the nature of information that can be provided by the NEM to any</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UMF entity. This list does not repeat what can be deduced from the other</td>
</tr>
<tr>
<td></td>
<td></td>
<td>fields of the manifest, i.e. every acquired input can be shared.</td>
</tr>
<tr>
<td>Possible Actions</td>
<td>List&lt;Management ActionSpecification&gt;</td>
<td>Lists the nature of actions that the NEM can apply onto the managed entities</td>
</tr>
<tr>
<td>Configuration Options</td>
<td>List&lt;Specific NEMPolicySpec&gt;</td>
<td>Lists the configuration options that can be applied to the NEM. The NEM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>specific policies must be depicted here.</td>
</tr>
</tbody>
</table>