Overview and update for 2. Multi-SDO workshop

30 November, 2016

Presenting on behalf of the TOSCA TC:
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Agenda

- **What is TOSCA?**
- **Key Modeling Concepts**
  - *Topology, Composition, Policy, workflows*
- **TOSCA's Growing Eco-System**
  - *in open source & standards*
- **Work Group Activities & What's Next**
- **NFV related activities**
  - *Plan, Progress, Issues*

What is TOSCA?

An important **Open standard**, that is enabling a unique **Cloud eco-system** supported by a large and growing number of international industry leaders…

TOSCA uses a domain-specific language (DSL) to define interoperable descriptions of :

- Cloud applications, services, platforms, infrastructure and data components, along with their ***relationships***, ***requirements***, ***capabilities***, ***configurations*** and operational ***policies***…
- …thereby enabling ***portability*** and ***automated management*** across cloud providers regardless of underlying platform or infrastructure thus expanding customer ***choice***, improving ***reliability*** and ***time-to-value*** while ***reducing costs***.

TOSCA Milestones and Participation

- **TOSCA Version 1.0 Specification**
  — *Nov 2013, XML format (approved OASIS standard)*
- **The TOSCA Simple Profile in YAML Specification Pipeline**

  Aspiring to an aggressive 6 month cadence to meet the needs of diverse and growing community of TOSCA implementers

  — ***v1.0 spec: Official OASIS Deliverable (implementable); June 2016***

  — *v1.1 spec: TC-approved (1st Public draft completed); Nov. 2016*

  — *v1.2 spec: Launched (under development)*

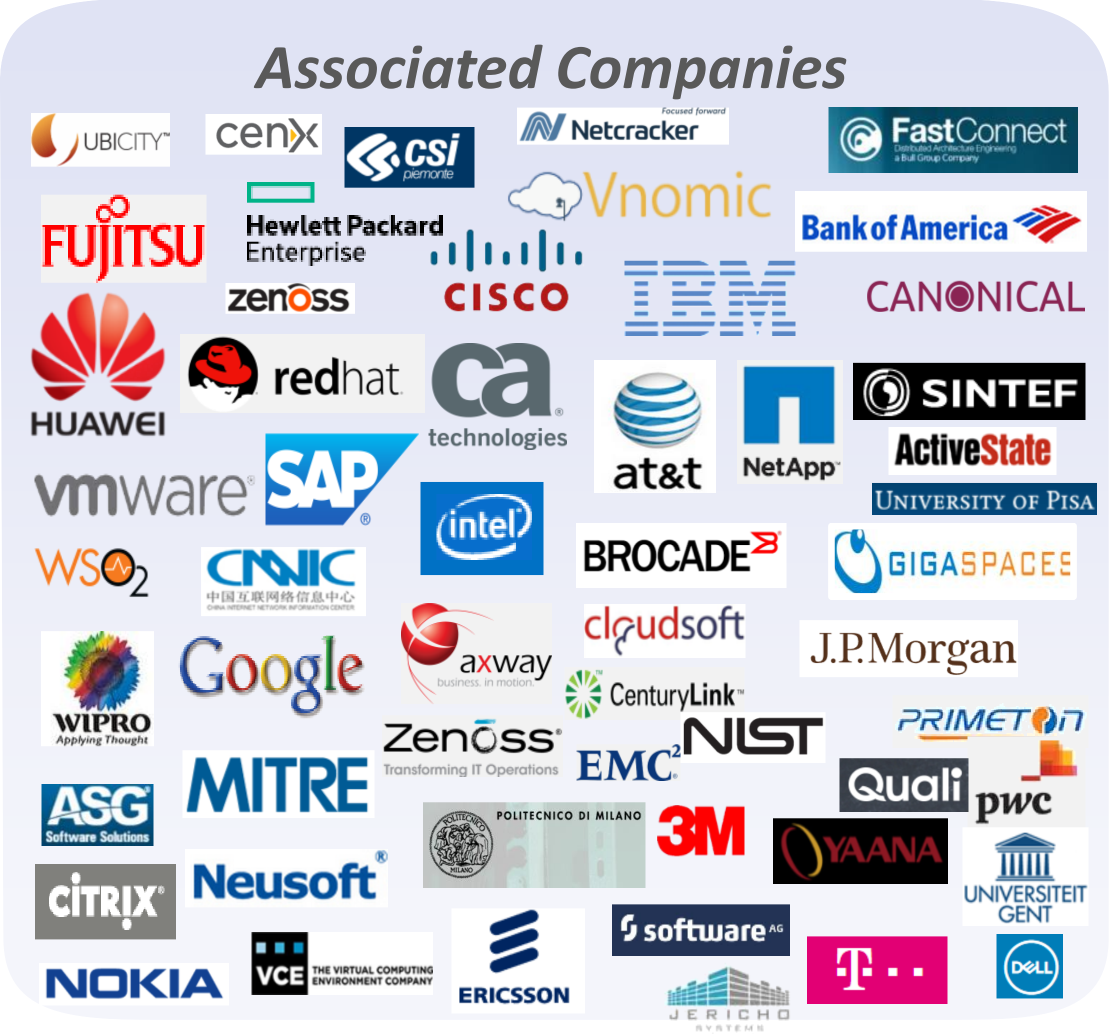
- **Also Supports Domain-Specific Profile Specifications**:

  Delivery plans now aligned to latest TC liaison statement to ETSI NFV

  - ***Network Function Virtualization (NFV) Profile***
    - *v1.0 csd04 spec: Under development (IFA)*
    - *v1.0 csd03 spec: TC-approved (MAN-01);*

- **Government and Corporate Awareness**:
  - **OASIS**: 600+ organizations, 5000+ participants (65+ countries)
  - **TOSCA Committee**: 180+ people, 45+ companies/organizations
  - **International**: ISO/IEC JTC 1 liaison, EU FP7, ETSI NFV liaison, etc.

- **Multi-company Interoperability Demonstrated**:
  - *EuroCloud 2013, ODCA 2014, OSCON 2015, OpenStack Summit 2016 (Indigo DataCloud)*



Associated Companies

Only contributors, reviewers, implementers, users, and supporters of the TOSCA Standard within OASIS are listed

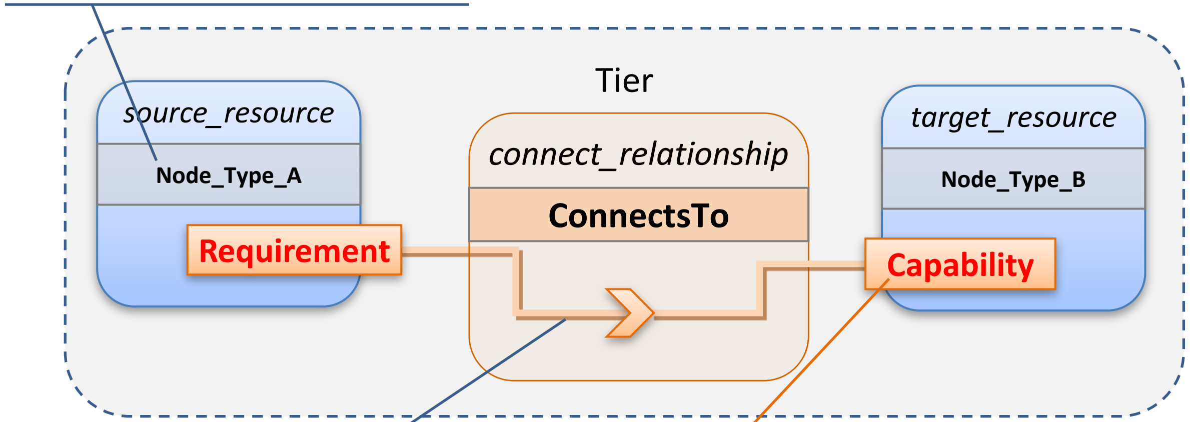
TOSCA Key Modeling Concepts

- **Topology and Composition**
- Policy
- Workflows

Topology and Composition

A. TOSCA is used first and foremost to describe the topology of the **deployment view** for cloud applications and services

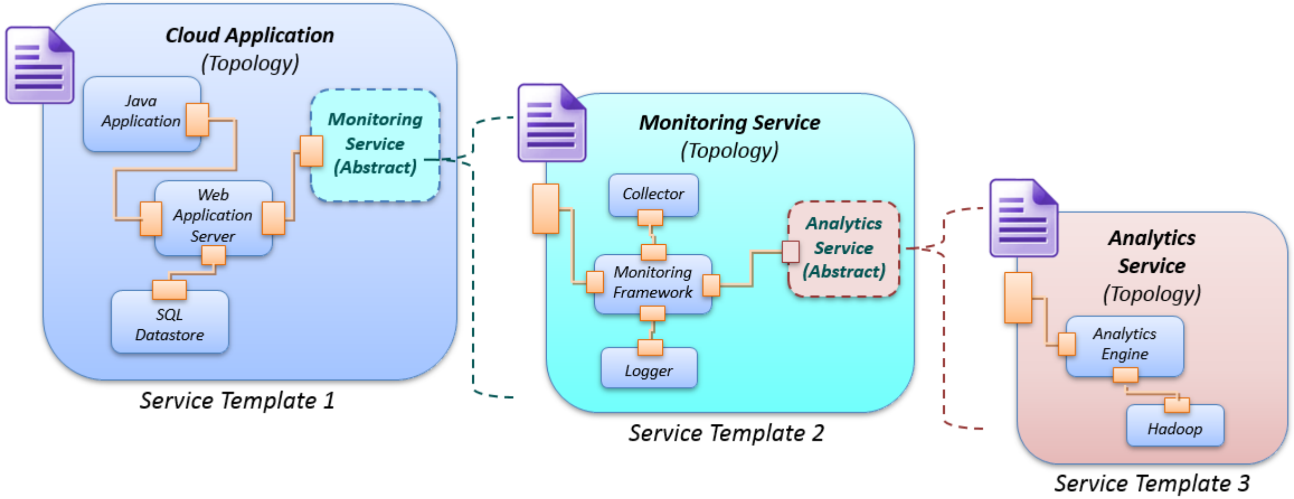
Node templates *to describe components in the topology structure*



Relationship templates *to describe connections, dependencies, deployment ordering*

Requirement - Capability
Relationships can be customized to match specific source requirements to target capabilities

B. Any node in a TOSCA topology can be an abstraction of another layer or sub-topology



*Orchestrators can "**substitute**" for abstract nodes…*

*… as long as all declared "**requirements**" are met:*

- ***Monitoring Service*** *can be* ***substituted*** *in* ***Cloud Application***
- ***Analytics Service*** *can be* ***substituted*** *in* ***Monitoring Service***

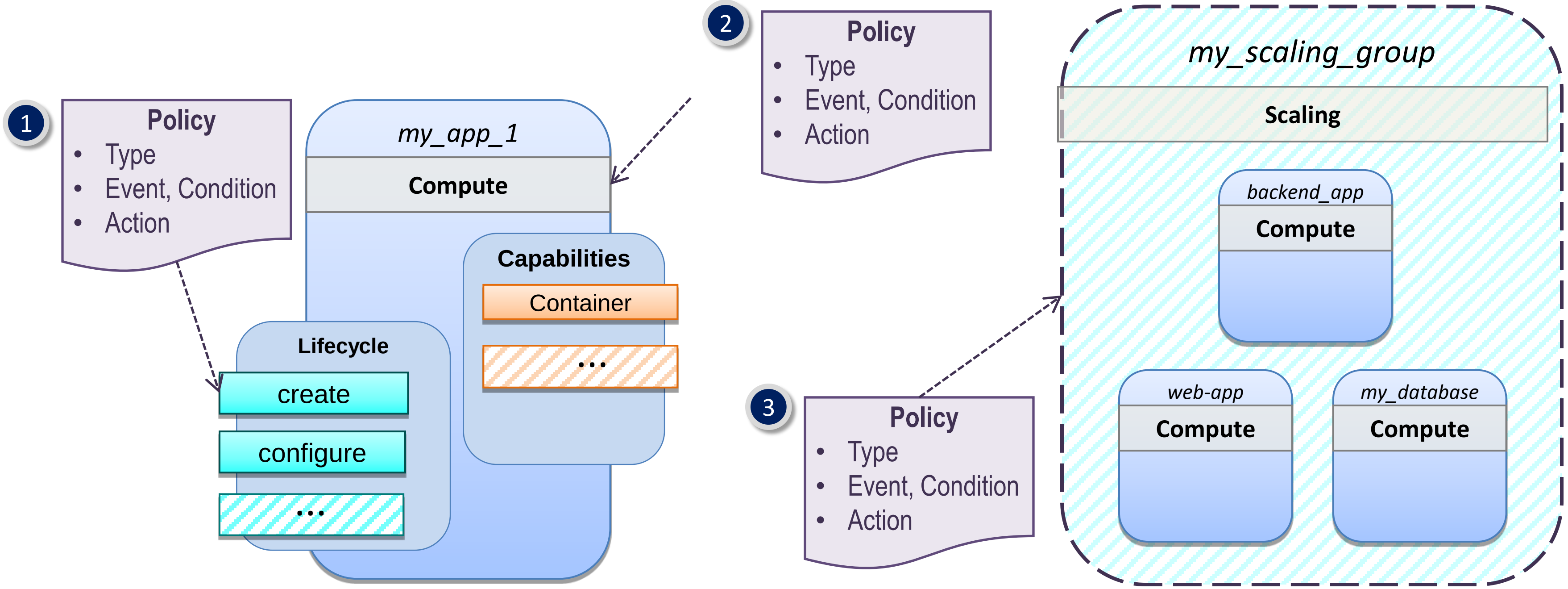
TOSCA Key Modeling Concepts

- Topology and Composition
- **Policy**
- Workflows

Policy – Focus on Operational Policies

v1.0 includes the groundwork for Placement (Affinity), Scaling and Performance Policies

- *Orchestrators can evaluate **Conditions** based on **Events** that trigger Automatic or Imperative **Actions***



Policies can be declared independently and attached to various points in your models

1. *That can be attached to **Interfaces** or specific **Operations**,*
2. ***Nodes** and*
3. ***Groups** of Nodes*

"Policies are non-functional Requirements independent of nodes"

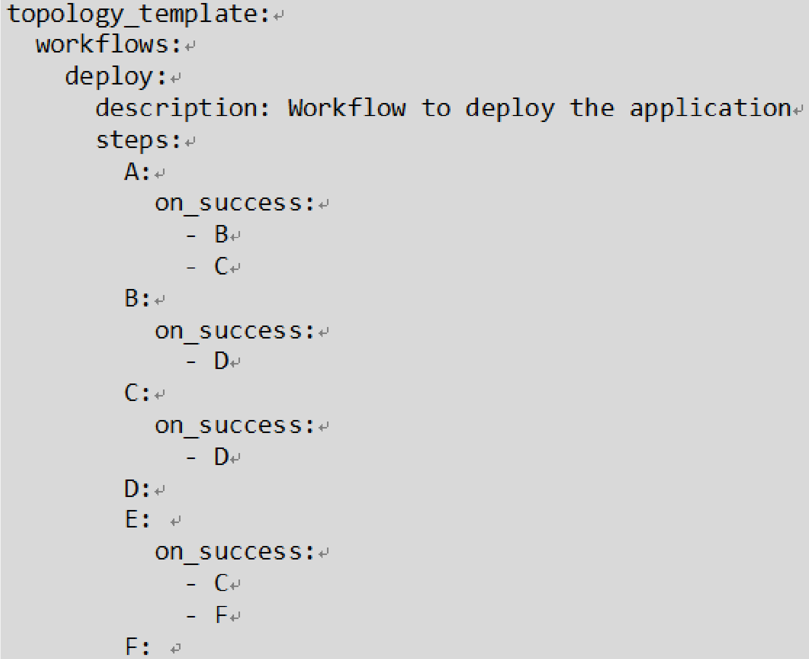
TOSCA Key Modeling Concepts

- Topology and Composition
- Policy
- **Workflows**

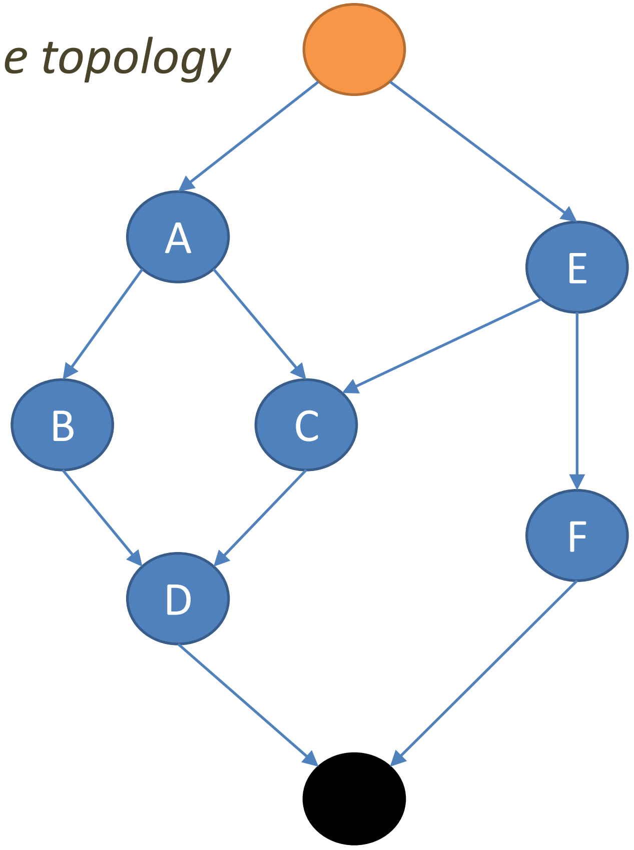
Workflows – Deployment of a topology

TOSCA defines two different kinds of workflows that can be used to deploy a TOSCA topology.

- *Declarative workflows: automatically generated based on the nodes, relationships, and groups defined in the topology*
- *Imperative workflows: manually specified by the author of the topology*



```
topology_template:
  workflows:
    deploy:
      description: Workflow to deploy the application
      steps:
        A:
          on_success:
            - B
            - C
        B:
          on_success:
            - D
        C:
          on_success:
            - D
        D:
        E: 
          on_success:
            - C
            - F
        F: 
```



Defining sequence of operations in an imperative workflow

- ***Using on_success to define steps ordering***
- ***Every step that doesn't define any successor is considered as final. When all the final nodes executions are completed then the workflow is considered as completed.***

TOSCA’ s Growing Eco-system – Use in Open Source (representative subset)

Cloudify

Service Orchestration & Management

http://getcloudify.org/

ARIA

Multi-Cloud Orchestration

(Amazon, Azure, VMware, OpenStack)

Open Sourced from Cloudify

http://ariatosca.org//

alien4cloud

Topology, Type & LCM Design

http://alien4cloud.github.io/

seaclouds

AGILITY AFTER DEPLOYMENT

Modelling Planning Controlling

Open, Multi-Cloud Management

www.seaclouds-project.eu/media.html

CERN

INNO INDIGO POLICY

Data/computing platform targeted at scientific communities

http://information-technology.web.cern.ch/about/projects/eu/indigo-datacloud

OPNFV

Parser

Deployment Template Translation

https://wiki.opnfv.org/display/parser/Parser

Note*: ETSI NFV ack. TOSCA can be used as an input model/format*

openstack

Heat-Translator (IaaS, App Orchestration)

Tacker (Network Function Orchestration)

Senlin (Clustering & Policy (on roadmap))

App Catalogs (Community & Murano)

Parser (standalone)

https://wiki.openstack.org/

OPEN-O

Open Orchestrator Project

http://www.open-o.org/

DICER

Model-driven continuous architecting for BigData deployment

http://github.com/DICERs/DICER

UBICITY

Cloud-based template validator

http://ubicity.com/validator.html

What’ s Next? - Some Other TOSCA Work Group Activities

TOSCA TC

Interoperability

***Goal**: Conformance test suite for v1.0; includes tests for each section of Simple Profile v1.0 specification*

- *Each test is a TOSCA Service Templates with metadata describing test using the OASIS Test-Assertion (TAG) Standard*
- Work underway using a new **GitHub repo**. First TC review finished. First TC-approved Committee Spec Draft est. December 2016

Instance Model

***Goal**: Developing new schema for an Instance Model (reuse existing schema where possible)*

- Discussing API potentially enabling *capture*, *export* and *management* of deployed application

Monitoring

***Goal**: Create normative event types for basic operational events*

- Focus on events types for ***Health***, ***Scaling*** & ***Performance*** **(**Support basic “***Red***-***Yellow***-***Green***” and ***Percentage***-based monitoring (dashboard-like)
- Currently socializing preliminary recommendations with the Instance Model and YAML work groups prior to full TC presentation/review

NFV & SDN

Goal: *Complete v1.0 Specification based on ETSI NFV IFA*

- Can model complete ETSI NFV descriptors, VDU, CP, VL, VNFD, VNFFGD, NSD.

***Expanded Scope**: include **Software-Defined Network (SDN)** use cases*

Containers and Clustering

***Goal**: Create preliminary recommendations for new Cluster capability definitions, container, and data cluster use cases for Simple Profile v1.2*

- Completed and approved by TOSCA TC. Assigned to YAML workgroup.

NFV related activities

- **Plan**
- Progress
- Issues

Plan

Feb 2016:
ETSI NFV has approved a new WI– SOL001 (NFV descriptors based on TOSCA Specification)

Inform OASIS TOSCA

April 2016:

OASIS TOSCA acknowledges its interest to update tosca-nfv-profile

July 2016:
IFA011 and IFA014 are stable.

August 2016:
Made a plan after analyzing the difference between IFA and MAN001

Share its plan to ETSI NFV

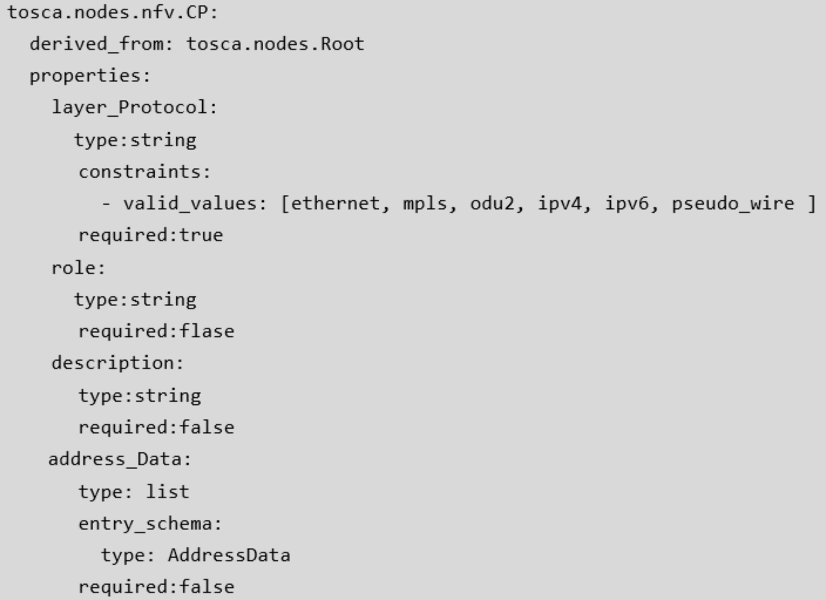
Milestone	Target date	Content
Committee Specification Draft (CSD)	November 2016	A new CSD document including portions of VNFD, including VNF, VDU, CP, VL, External CP, Virtual Storage, Virtual compute, Software image, and deployment flavor, and portions of the NSD.
	March 2017	A new CSD document including the remainder of the requirements for VNFD, and portions of the NSD.
	July 2017	A new CSD document including the remainder of the requirements for NSD, and submission of the specification for OASIS public review.
Committee Specification Public Review Draft (CSPRD)	September 2017	
Committee Specification (CS)	November 2017	

NFV related activities

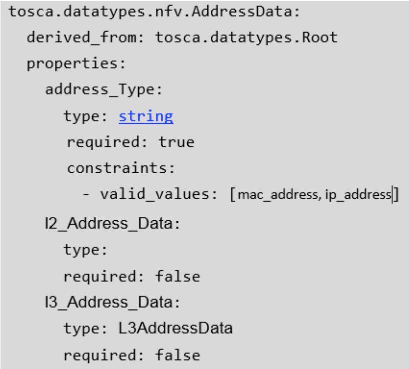
- Plan
- **Progress**
- Issues

Progress

- Latest documents: tosca-nfv-v1.0-wd04-rev04
  - Connection point and Virtual link models have been updated based on IFA011.
  - Note: This version is updated based on the CSD03 version, it still contains some legacy contents which are not align with IFA specification, those contents will be updated or deleted in the later version.

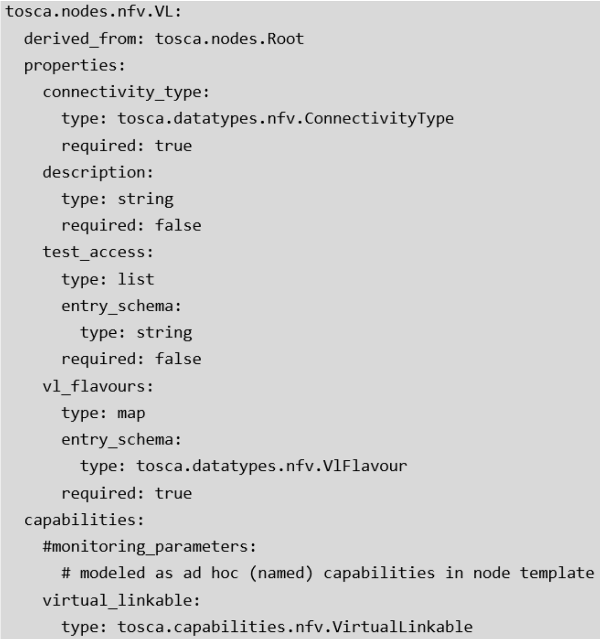


```
tosca.nodes.nfv.CP:
  derived_from: tosca.nodes.Root
  properties:
    layer_Protocol:
      type:string
       constraints:
         - valid_values: [ethernet, mpls, odu2, ipv4, ipv6, pseudo_wire ]
       required:true
    role:
      type:string
       required:flase
    description:
       type:string
       required:false
   address_Data:
       type: list
       entry_schema:
         type: AddressData
       required:false
```



```
tosca.datatypes.nfv.AddressData:
  derived_from: tosca.datatypes.Root
  properties:
    address_Type:
      type: string
       required: true
       constraints:
         - valid_values: [mac_address, ip_address]
    l2_Address_Data:
      type:
      required: false
    l3_Address_Data:
      type: L3AddressData
      required: false
```

- Things have been discussed and will be included in CSD04 (December 2016):
  - VNFD: Connection Point, Virtual Link，VDU, Virtual Storage, Virtual compute, Software image, External CP
- Things still need to be discussed:
  - VNFD: deployment flavor, monitoring, scaling aspect



```
tosca.nodes.nfv.VL:
  derived_from: tosca.nodes.Root
  properties:
    connectivity_type:
      type: tosca.datatypes.nfv.ConnectivityType
      required: true
    description:
      type: string
      required: false
    test_access:
      type: list
      entry_schema:
        type: string
      required: false
    vl_flavours:
      type: map
      entry_schema:
        type: tosca.datatypes.nfv.VlFlavour
      required: true
  capabilities:
    #monitoring_parameters:
      # modeled as ad hoc (named) capabilities in node template
    virtual_linkable:
      type: tosca.capabilities.nfv.VirtualLinkable
```

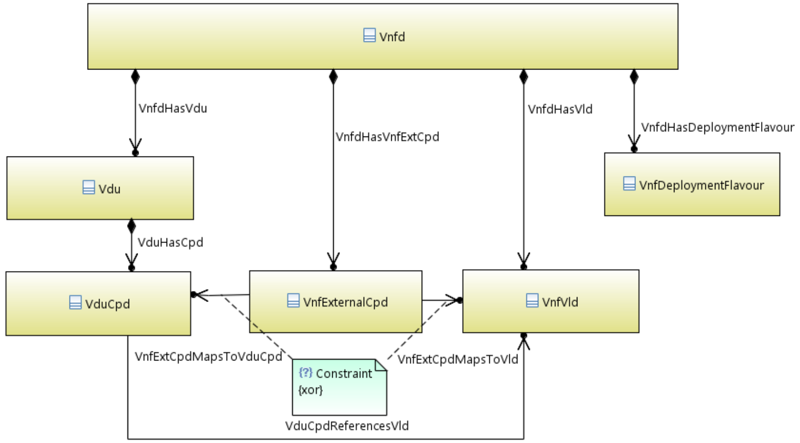
NFV related activities

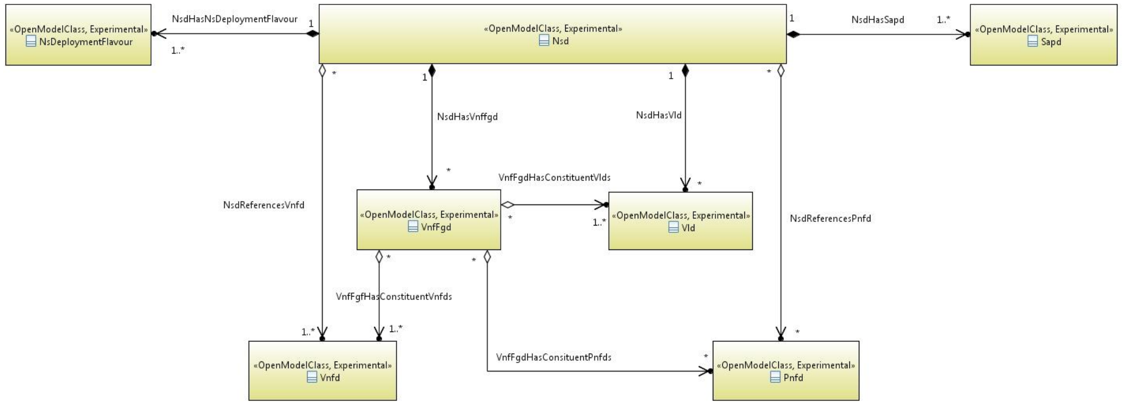
- Plan
- Progress
- **Issues**

Issue - UML to TOSCA mapping

ETSI NFV uses UML to describe their information model.

◆composition, ◇aggregation,→ association

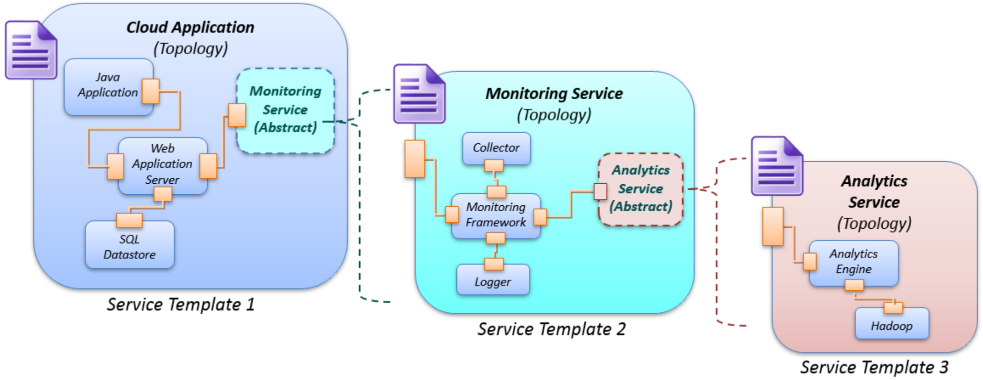




«OpenModelClass, Experimental» NsDeploymentFlavour
NsdHasNsDeploymentFlavour
1
1..*
«OpenModelClass, Experimental» Nsd
1
NsdHasSapd
1..*
«OpenModelClass, Experimental» Sapd
*
1
NsdHasVnffgd
1
NsdHasVld
*
*
VnfFgdHasConstituentVlds
*
NsdReferencesVnfd
«OpenModelClass, Experimental» VnfFgd
*
1..*
«OpenModelClass, Experimental» Vld
NsdReferencesPnfd
*
*
VnfFgfHasConstituentVnfds
1..*
1..*
VnfFgdHasConsituentPnfds
*
*
«OpenModelClass, Experimental» Vnfd
«OpenModelClass, Experimental» Pnfd

TOSCA uses topology template to describe composition and aggregation, and has defined several relationship types to describe the association between two nodes.

- *DependsOn*
- *HostedOn*
- *ConnectsTo*
- *AttachesTo*
- *RoutesTo*



The mapping work between UML model and TOSCA model has interested TOSCA members for a long time. Considerations:

- The mapping rules or an automatic transfer tool between UML and TOSCA might be needed.
- TOSCA members indicated interest in working with other SDOs in the future to consider the possibility of specifying mapping rules.
-

TOSCA Resources – Learn More

- **TOSCA Technical Committee (TC) Public Page** *(TC approved updates on documents, strategy, and more)*
  - https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=tosca
- **OASIS TOSCA LinkedIn Group:** *(latest news, community and eco-system updates, etc.* ***Join now to stay informed!****)*
  - https://www.linkedin.com/groups/8505536
- **OASIS YouTube Channel, TOSCA Playlist**
  - https://www.youtube.com/user/OASISopen , http://bit.ly/1BQGGHm
- **TOSCA Simple Profile in YAML v1.0** *(TC-approved Committee Spec, implementable; June 2016)*
  - http://docs.oasis-open.org/tosca/TOSCA-Simple-Profile-YAML/v1.0/cs01/TOSCA-Simple-Profile-YAML-v1.0-cs01.zip
- **TOSCA Simple Profile for NFV v1.0**
  - https://www.oasis-open.org/committees/document.php?document_id=59355&wg_abbrev=tosca (wd4, rev4 (IFA); WIP)
  - http://docs.oasis-open.org/tosca/tosca-nfv/v1.0/tosca-nfv-v1.0.html *(Rev 3 (MAN-01), TC-approved; April 2016)*
- **Contacts:**
  - Technical Committee (TC) Co-Chairs: Paul Lipton, paul.lipton@ca.com; John Crandall, jcrandal@brocade.com
  - Today's Presenters: Shitao Li, lishitao@Huawei.com; Juergen Meynert, juergen.meynert@ts.fujitsu.com

Questions?

Q&A

What' s Next? - TOSCA Simple Profile

Version 1.0

- Approved Committee Specification, *12 June 2016*
    - ***Target Fall 2016 for full OASIS Standard***
    - *http://docs.oasis-open.org/tosca/TOSCA-Simple-Profile-YAML/v1.0/cs01/TOSCA-Simple-Profile-YAML-v1.0-cs01.html*

Version 1.1

- *Approved Public Draft 01, June 2016*
- **Metadata** *(completed)*
    - now supported in all Types (Node, Relationship, Capability, Data, etc.)
    - Conformance Testing metadata
- **Group Type** *(completed)*
    - Expanded Group Type to allow management of member resources (i.e., Lifecycle)
    - Has its own Capabilities and Requirements
- **Policy Definition** *(completed)*
    - Event-Condition-Action model
    - Includes *Event Filters* and *Triggers*
- **Workflow** *(completed)*
    - Intermix declarative with Imperative *(e.g., Ansible, Chef, Ant, Bash)*
    - Preserve investment in existing scripts for complex installations / configurations

Version 1.2

- Target Sept. 2017, public draft.
- **Improve import of Service Templates**
    - Using template naming / versions (expressions) to be used with Catalogs / Repostiories
- **Allow Composition of Group Type**
    - Provide use cases using Clusters Differentiate from Abstract Node Types
- **Cluster Type** *(75% completed)*
    - Add support for Cluster normative type; based upon new Group Type
    - Will support new normative **LoadBalancer** , **Scalable** and **Router** Capability Types
    - Data Clusters *(e.g., Cassandra, MongoDB, etc.)* – In-Progress

TOSCA “Hello World” Illustrative, Single Server

```
tosca_definitions_version: tosca_simple_yaml_1_0

description: >
  Template for deploying a single server with predefined properties and input parameter

topology_template:
  inputs:
     cpus:
      type: integer
      description: Number of CPUs for the server.
      constraints:
        - valid_values: [ 1, 2, 4, 8 ]

  node_templates:
    my_server:
      type: tosca.nodes.Compute
      capabilities:
        host:
          properties:
           num_cpus: { get_input: cpus }
           disk_size: 10 GB
           mem_size: 512 MB
        os:
          properties:
            architecture: x86_64
            type: linux
            distribution: rhel

   outputs:
     server_address:
       description: IP address of server instance.
       value: { get_attribute: [server, private_address] }
```

Complete Source: https://github.com/openstack/heat-translator/blob/master/translator/toscalib/tests/data/tosca_single_server.yaml