ONAP Model Driven Orchestration with TOSCA

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AGENDA

- Why TOSCA is one of ONAP's main Pillars?
- The Model driven Vision
- How TOSCA Works?
- TOSCA in ONAP
  - OPNA R1(Amsterdam) and R2(Beijing)
- **TOSCA Hands On Lab with Apache ARIA-TOSCA**

Linux Foundation Framework, Governance, Control

Bringing the best of both worlds together

+

OPEN-O

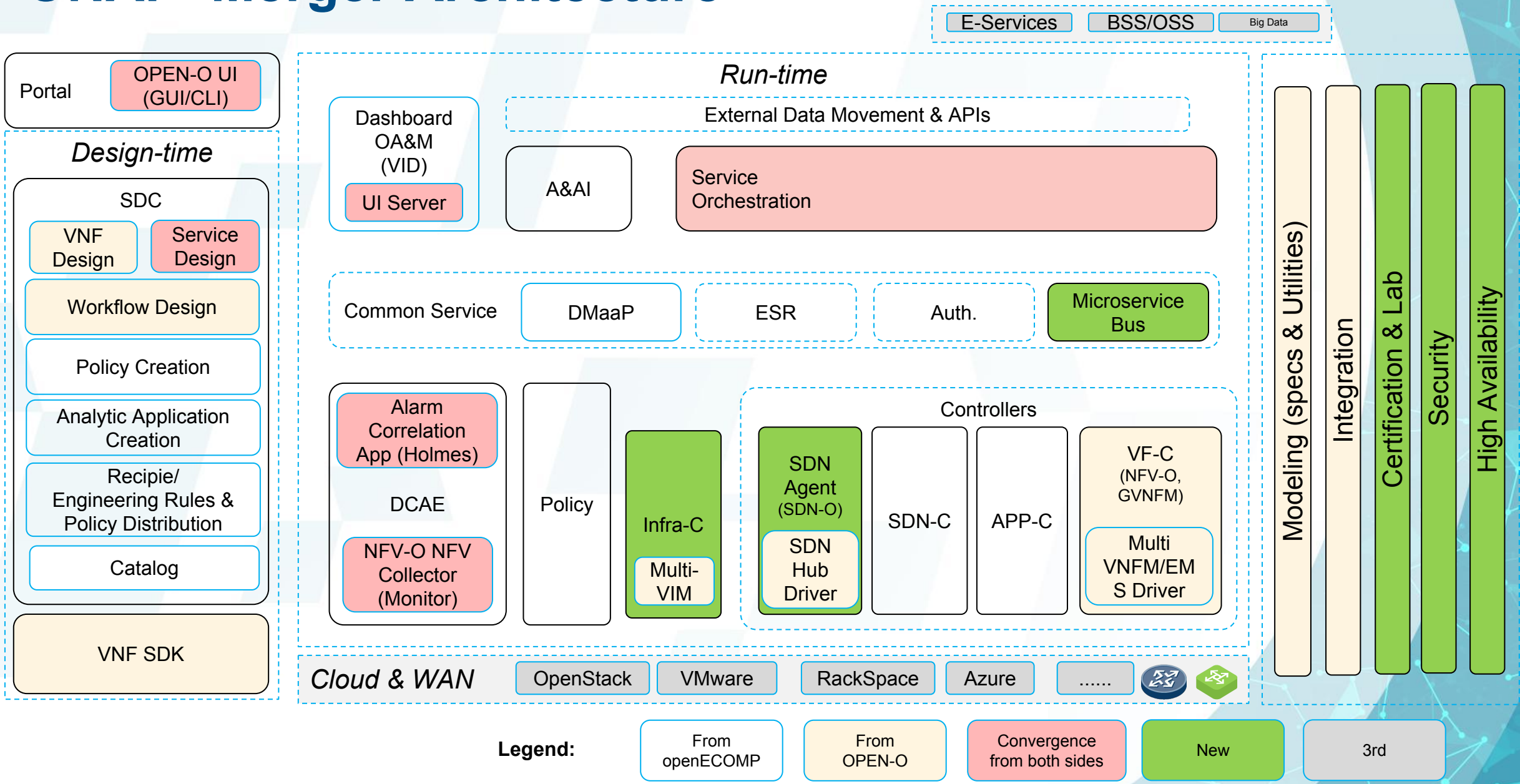
- 2+ years of Deployment Maturity at AT&T
- Comprehensive: Design +Orchestration + Control + Policy + Analytics
- Model-based design enabling self-serve capabilities for instantiation and closed loop automation

- Open TOSCA model
- Most Advanced Open Source Process & tool chain
- Architected for ease of VNF insertion (SDK)

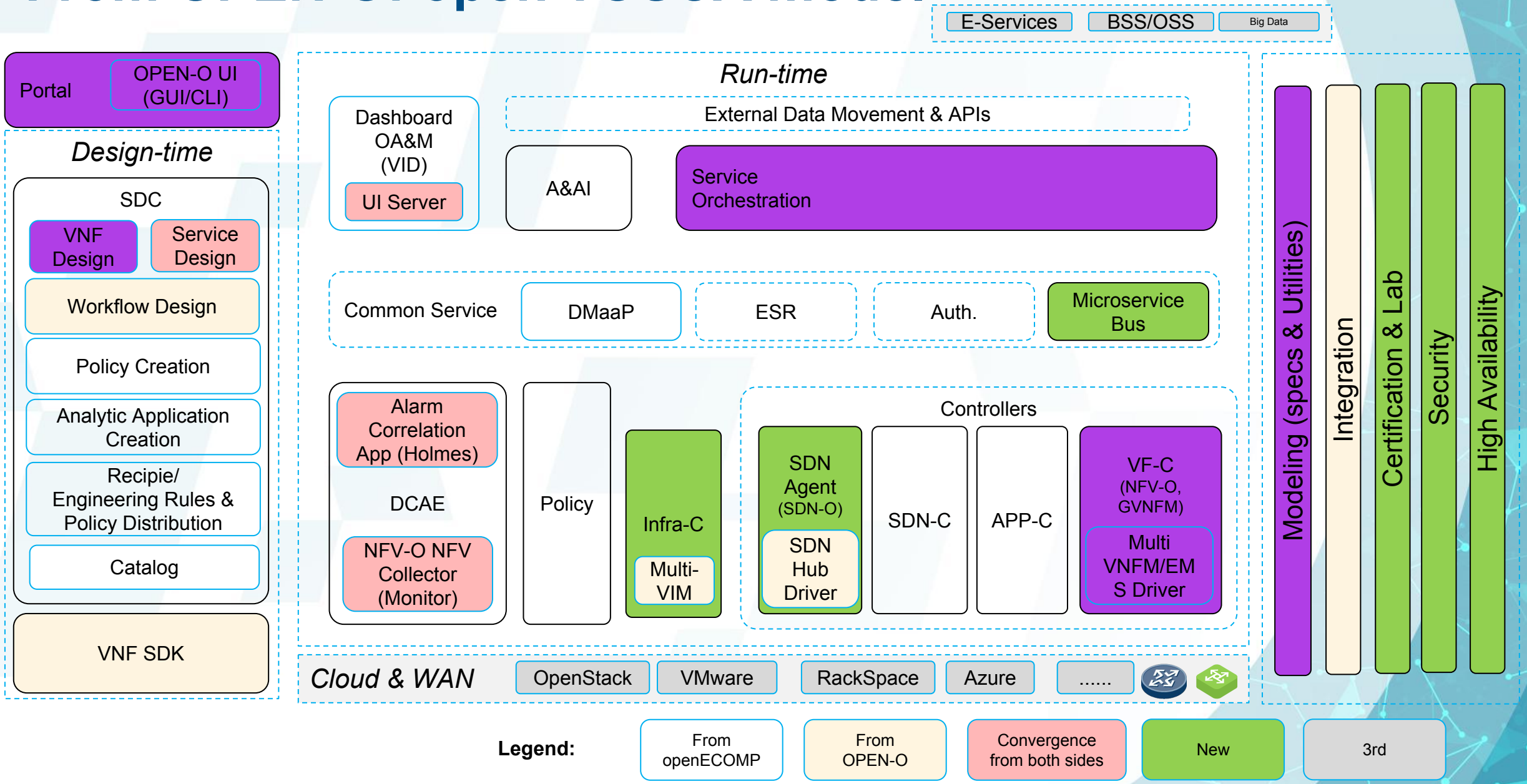
ONAP

OPEN NETWORK AUTOMATION PLATFORM

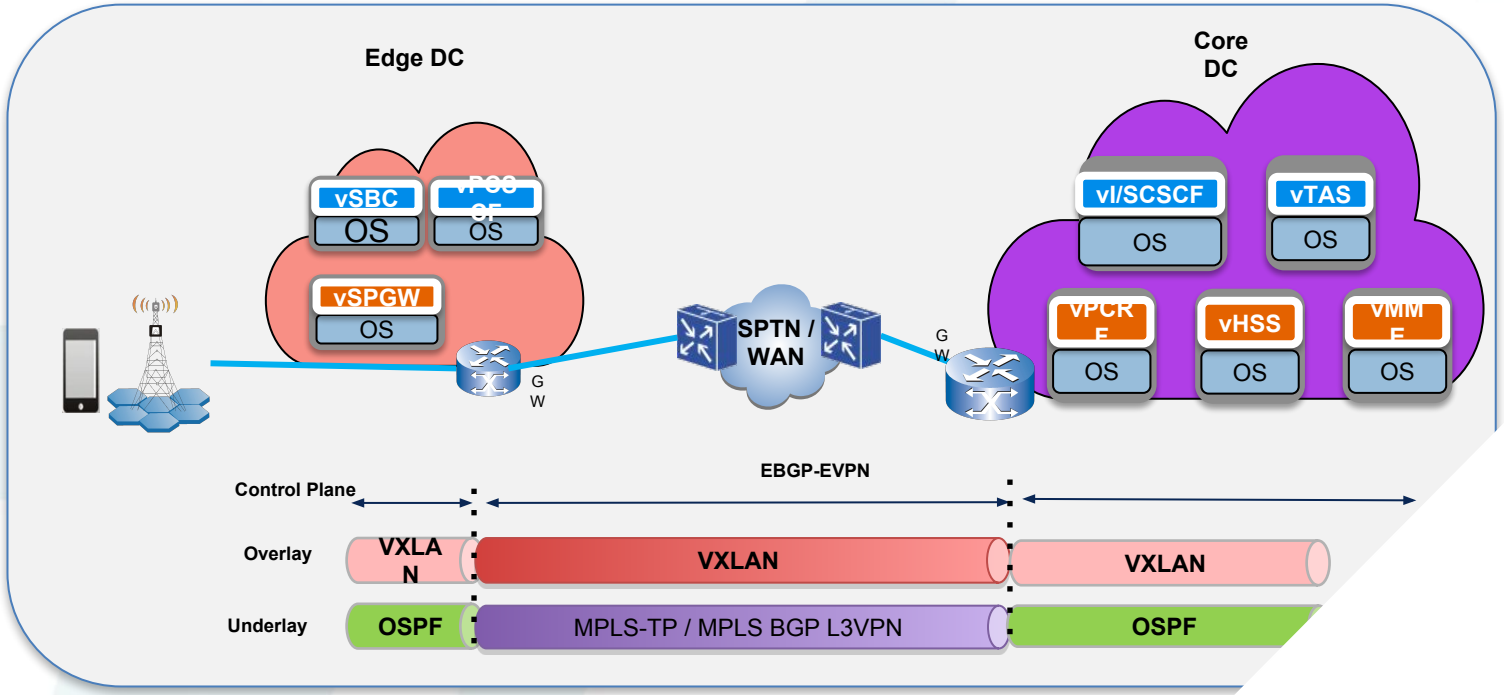
ONAP Merger Architecture



From OPEN-O: open TOSCA model

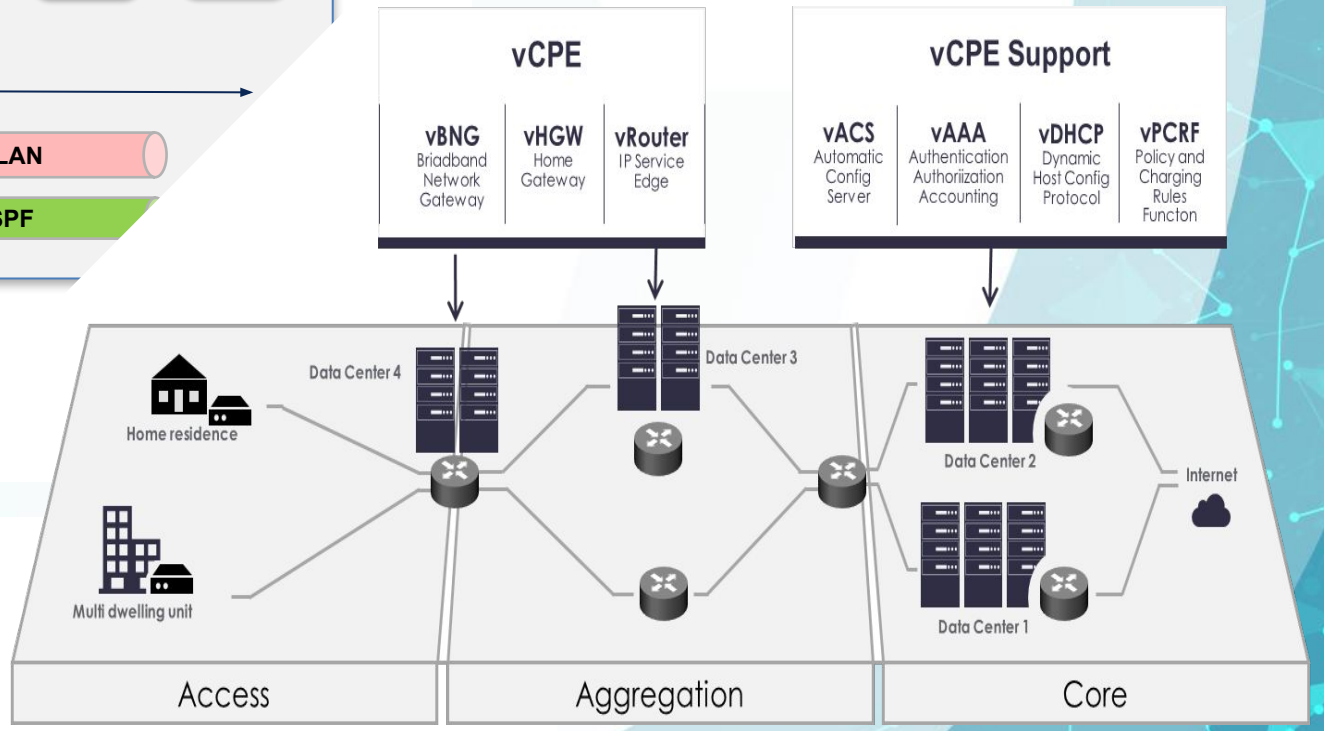


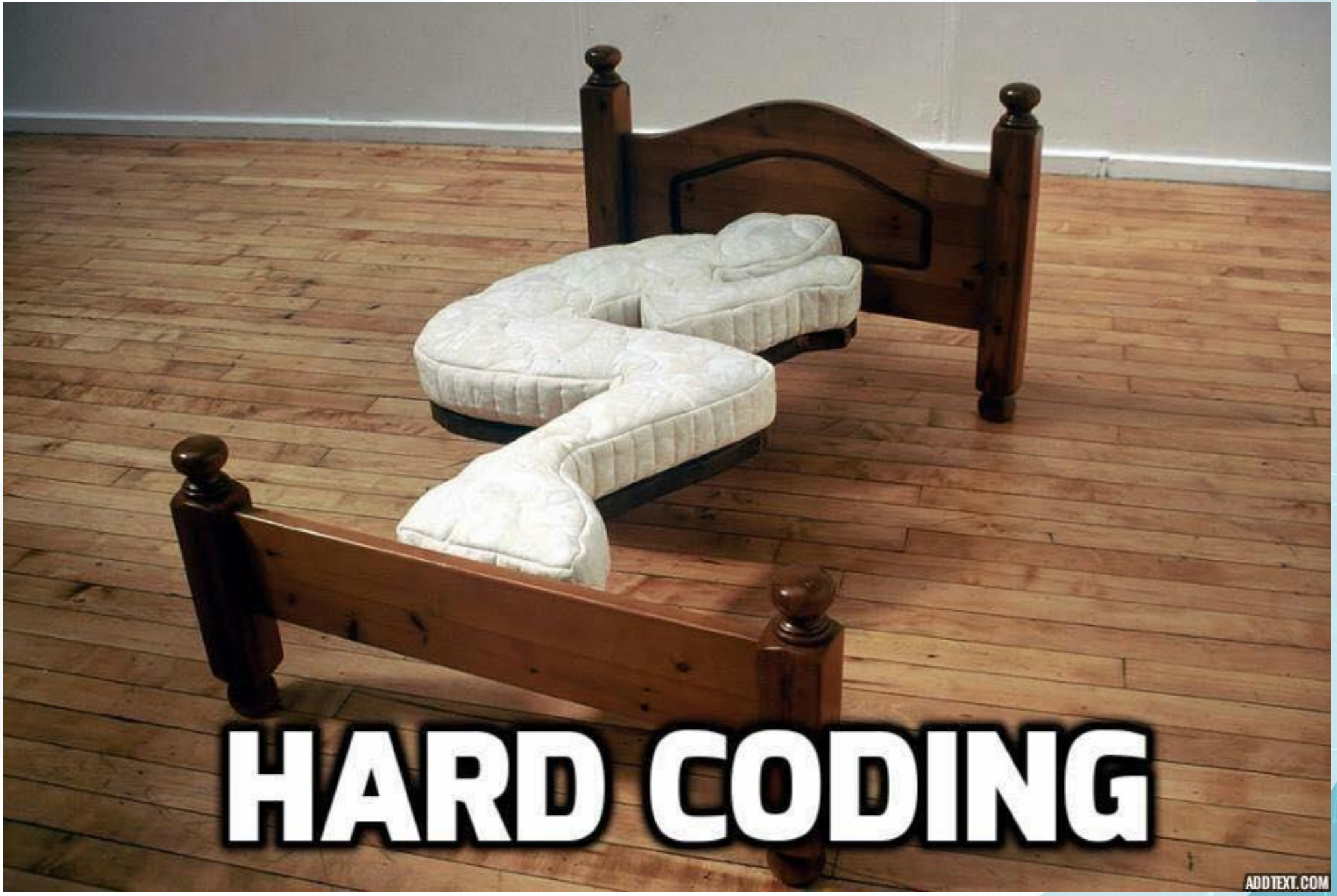
ONAP Amsterdam Use Cases



vVoLTE

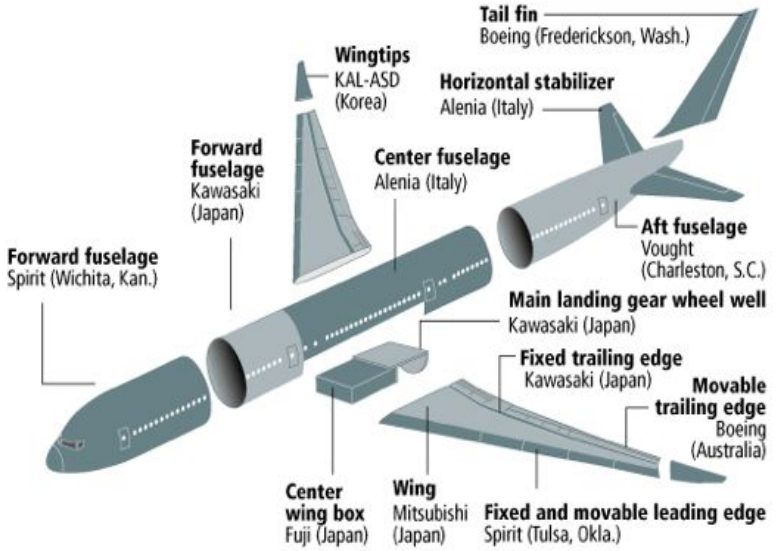
vCPE




HARD CODING
ADDTEXT.COM

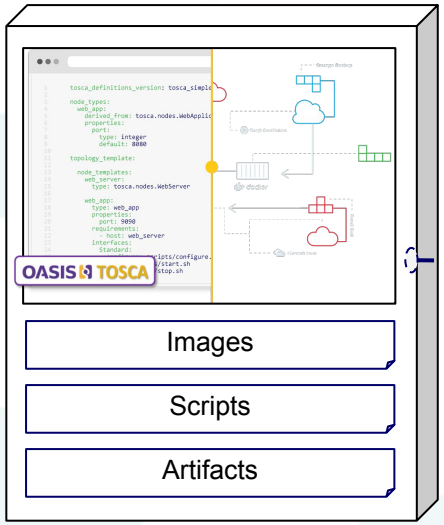
Standard Modeling is Automation at Scale

Example from the Manufacturing Industry



The Boeing 787 could not be produced without standard modeling

Declarative Model Driven Orchestration



ONAP TOSCA
Service Orchestrator
(SO+Apache ARIA)

Service Description

OASIS TOSCA

Service Instantiation

Any Cloud

openstack.
vmware
amazon web services

Config MGT

SALTSTACK
CHEF
puppet
ANSIBLE

Networking

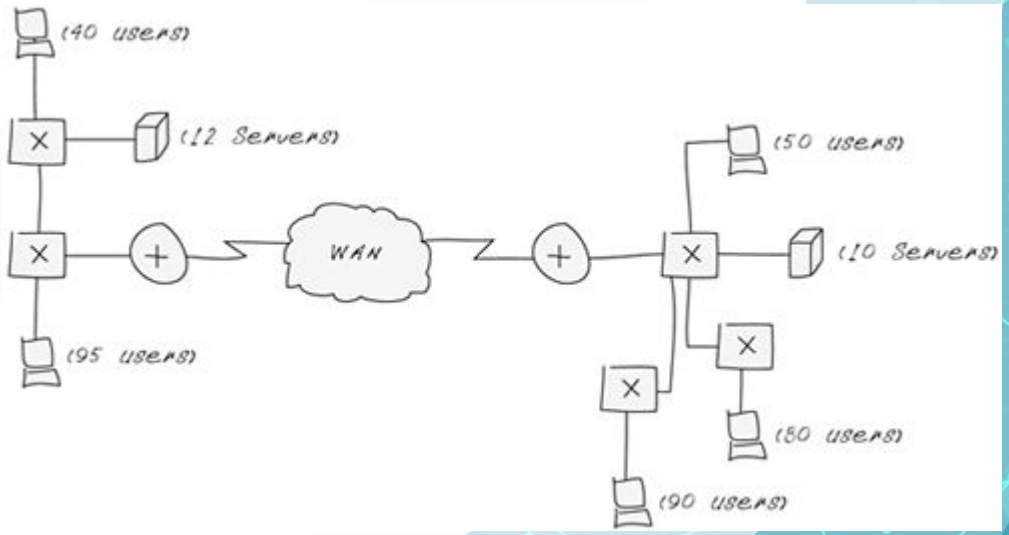
OPEN DAYLIGHT
vmware NSX
tail-f
netconf

Containers

docker
kubernetes

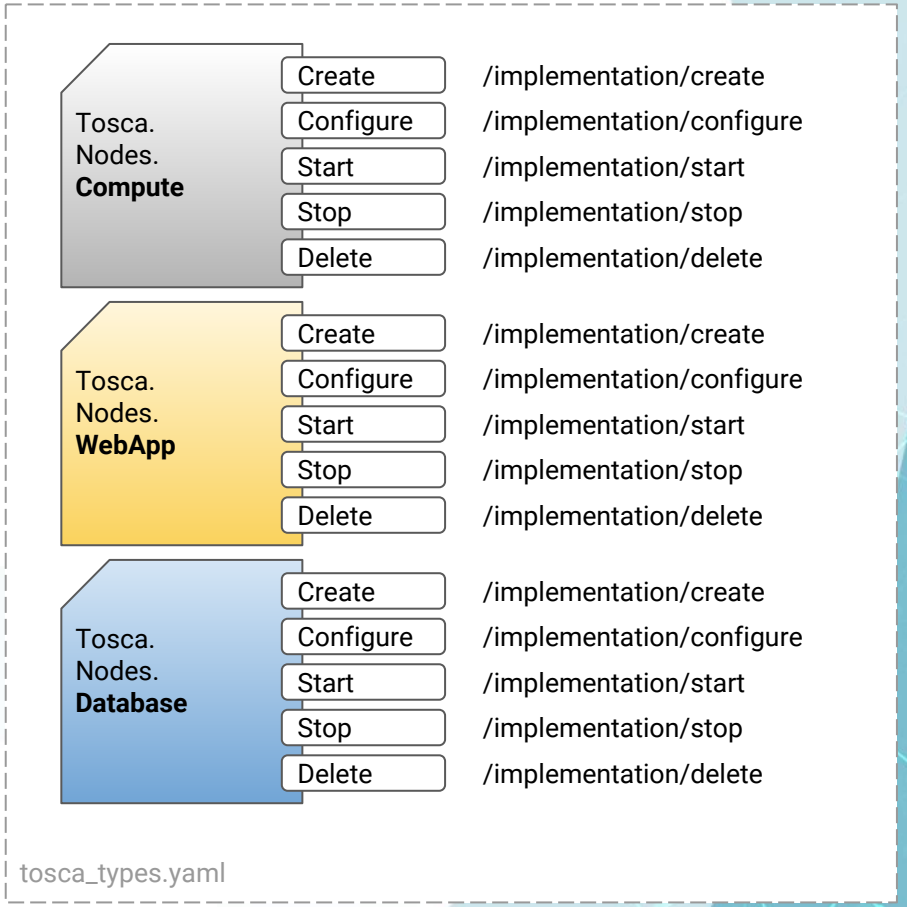
Declarative Model Driven Orchestration

- Declarative Orchestration separates the **WHAT** from the **HOW**
- The declarative defines a model (what) and an orchestrator (how)
- Model provides info for orchestrator to remain generic
- A Model Driven Approach allows:
  - The allure of no coding
  - Orchestrator implementation hidden
  - Simple versionable artifact(s)
  - Designer focus on value/solution



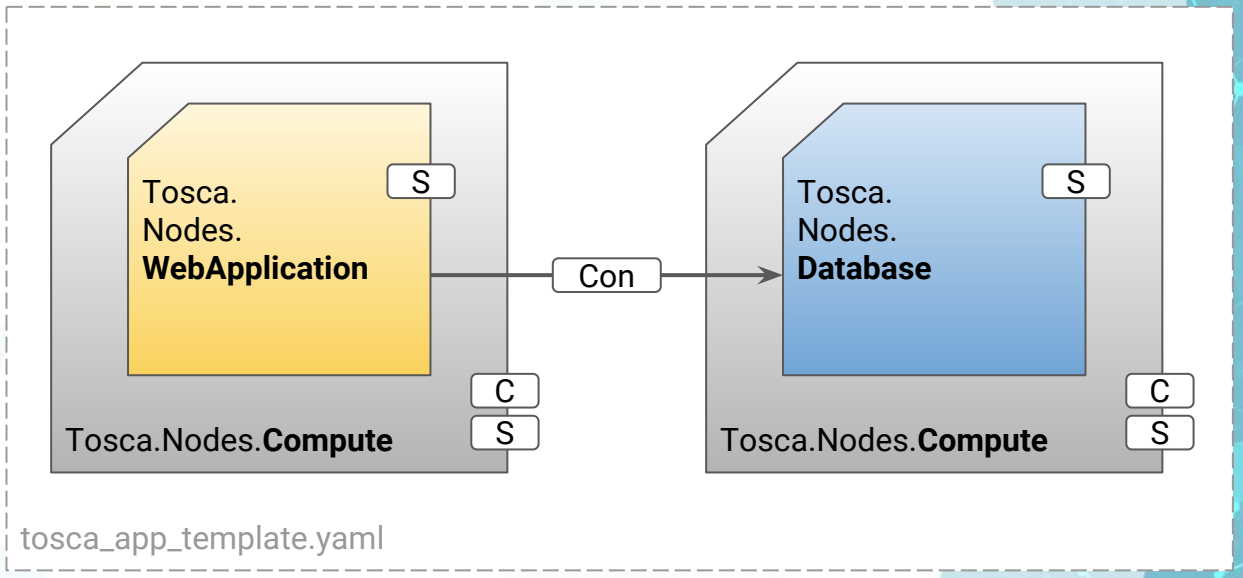
TOSCA Basics - Node Types

- Node Types > Node Templates
- Nodes are associated with
  - Properties(Static)
  - Attributes(Runtime)
  - Life-cycle Interfaces
    - Lifecycle operations and implementations (create, configure, start and others)
- Normative node types (Compute, Network, etc’)
- Direct Relationship types
  - Connected-to, Hosted-on

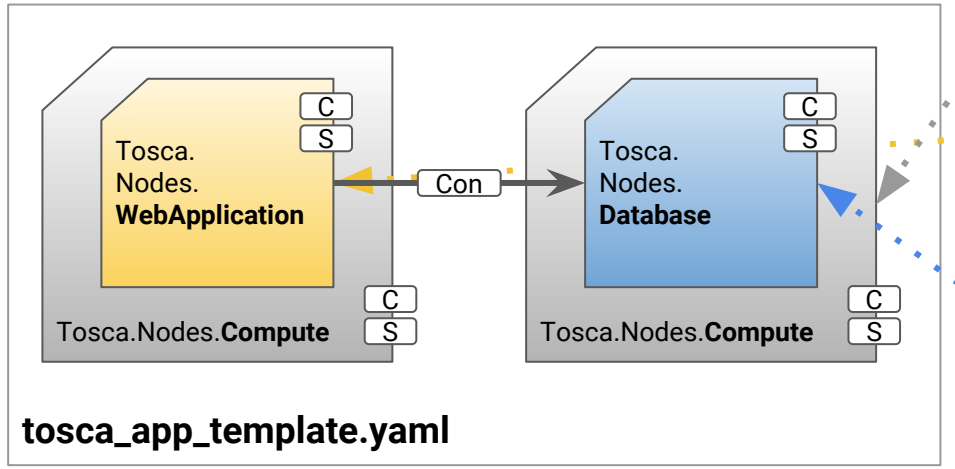


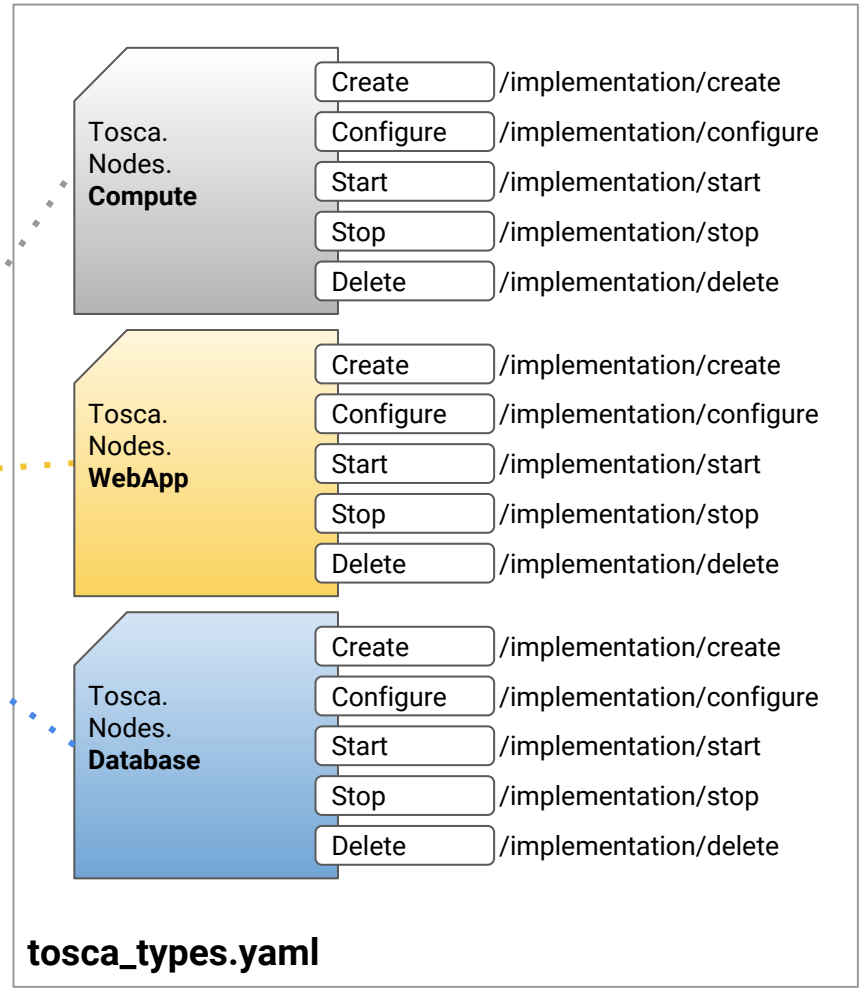
TOSCA Basics - Application Template

- TOSCA Template YAML file describes the topology of the application.
- Normative and custom types can be used
- Topology templates use TOSCA node types describing the nodes and their relationships
  - Containment Relationship
  - Connection Relationship
  - Requirements and Capabilities
- Templates also define implementations for lifecycle operations.

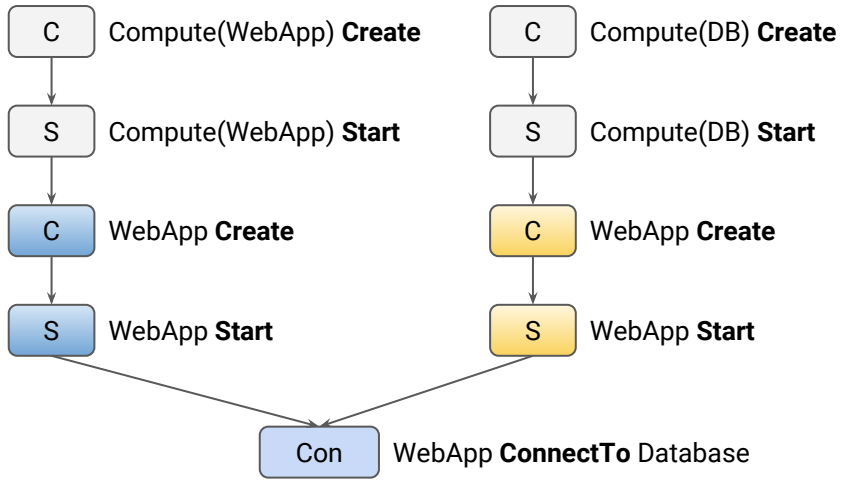


Model Driven Orchestration





Deployment STATE



INSTALL
Workflow
Execution

TOSCA Hello World

Node Types

Inputs

Node Templates

Requirements and Capabilities

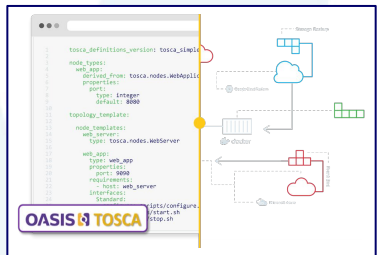
Lifecycle Interfaces

Outputs

```yaml
tosca_definitions_version: tosca_simple_yaml_1_0

node_types:
 WebServer:
   derived_from: tosca:Root
   capabilities:
     host:
       type: tosca:Container
 WebApp:
   derived_from: tosca:WebApplication
   properties:
     port:
       type: integer

topology_template:
 inputs:
    web_port:
     type: integer
     Default: 9090

 node_templates:
   web_server:
     type: WebServer
   web_app:
     type: WebApp
     properties:
       port: { get_input: web_port }
     requirements:
       - host: web_server
     interfaces:
       Standard:
         configure: scripts/configure.sh
         start: scripts/start.sh
         stop: scripts/stop.sh

 outputs:
   port:
     type: integer
     value: { get_property: [ web_app, port ] }
```

https://github.com/apache/incubator-ariatosca/blob/master/examples/hello-world/hello-world.yaml

TOSCA In ONAP



TOSCA Template

Images

Scripts

Artifacts

Service Design and Creation **(SDC)**

ONAP Service Package

VID

Service Orchestration **(SO)**

BPMN

TOSCA Engine

DCAE

A&AI

Multi-VIM

SDN-C

App-C

VF-C

ONAP R1 SO TOSCA

Requirements and R1 Contributions

- **ARIA must be callable from Camunda and/or seed code**
  - Contribution: REST API https://gerrit.onap.org/r/gitweb?p=so.git;a=tree;f=aria/aria-rest-server
  - Contribution: ARIA Java Binding
    https://gerrit.onap.org/r/gitweb?p=so.git;a=tree;f=aria/aria-rest-java-client
- **ARIA needs to fit in ONAP deployment model & be a microservice**
  - Contribution: ARIA Docker Image
    https://gerrit.onap.org/r/gitweb?p=so.git;a=blob;f=packages/docker/src/main/docker/docker-files/Dockerfile.aria
- **ARIA needs to communicate with MultiVIM service**
  - Contribution: ARIA ONAP MultiVIM plugin
    https://gerrit.onap.org/r/gitweb?p=so.git;a=tree;f=aria/multivim-plugin
- **vCPE use case**
  - TOSCA VNF vCPE infrastructure template (HEAT equiv)
    https://gerrit.onap.org/r/gitweb?p=demo.git;a=blob;f=tosca/vCPE/infra/base_vcpe_infra_rackspace_tosca.yaml

ONAP R2 SO TOSCA

Full Integration With Core BPMN

- Approach: Post SDNC/OF fork
- Implications:
  - ONAP Base types for AAI, MultiVIM, APPC
  - Python APPC/DMaaP API
  - SDC ONAP Base type integration (potentially)
  - SDNC & OF ONAP types recognition/compatibility
  - SO/ARIA BPMN recognition and handoff (via inputs)
    - includes mapping tenant info to ARIA template names & processing outputs
  - ONAP aware workflows (at least install/uninstall)
  - DCAE init (BPMN or TOSCA workflow)
  - Enhance/complete ARIA REST API, improve microservice impl
- Minimum proof of work: pure TOSCA vCPE install/uninstall

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Apache ARIA-TOSCA

Fortinet Fortigate Firewall

https://github.com/dfilppi/fortigate-tosca-example

Fortigate Image(DEMO Purpose)

`https://s3-eu-west-1.amazonaws.com/cloudify-labs/images/FG562-DZ.img`

Env:

VNF TOSCA Model Generator(Alpha)

http://185.43.218.204

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Apache ARIA-TOSCA Workshop

1. SSH Into ARIA Machine

   $ssh cloudify@185.98.149.13 (password:'#######')
2. Sudo into root
3. $ sudo su - (password again)
4. Run your ARIA-Workshop Docker container:
5. # docker run -ti --rm --name <MY-COMP> aria-workshop /bin/bash

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Apache ARIA-TOSCA Workshop

aria service-templates store fortigate-vnf-baseline-tosca.yaml <SERVICE-NAME>

aria services create -t <TEMPLATE>

aria executions start -s <SERVICE> install

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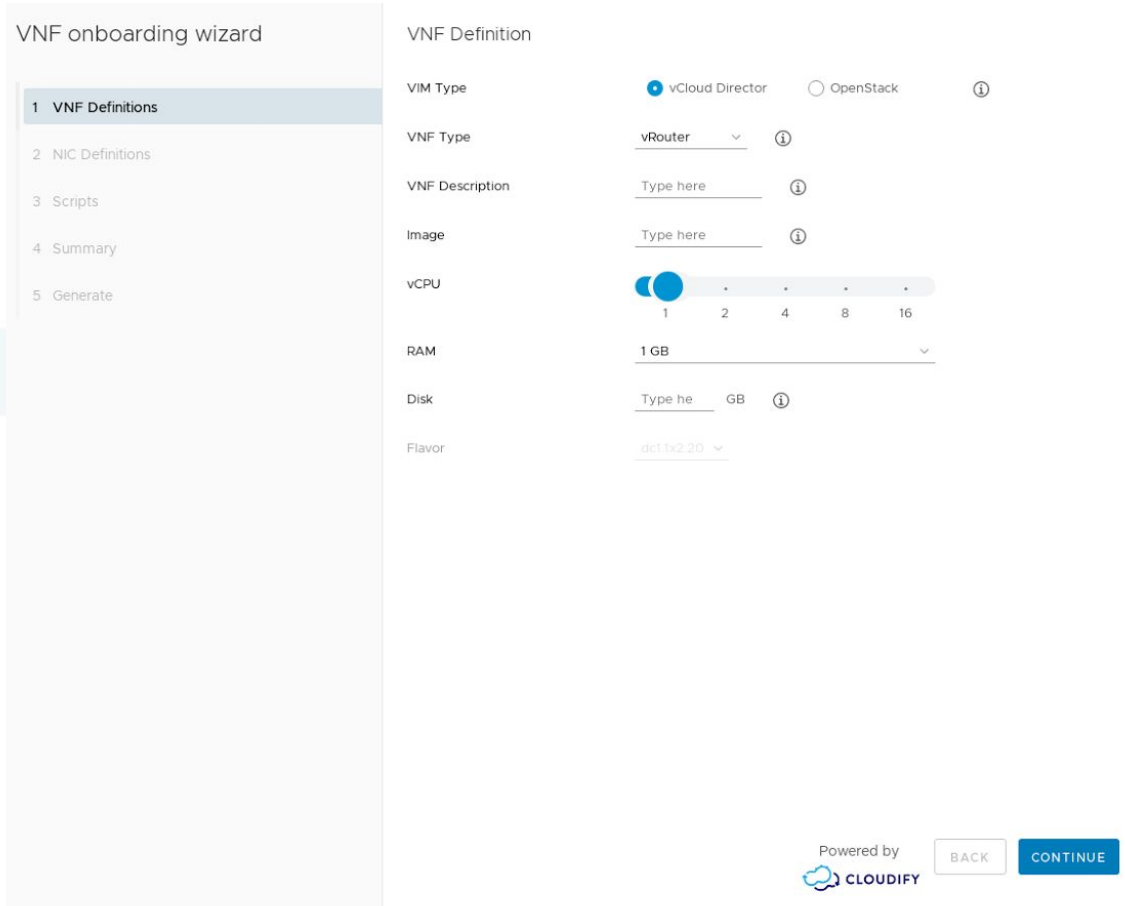
ARIA-TOSCA Examples and Resources

- Hello World
  - https://github.com/apache/incubator-ariatosca/tree/master/examples/hello-world
- ClearWater IMS(On pre installed VM)
  - https://github.com/apache/incubator-ariatosca/tree/master/examples/clearwater
- Fortinet Fortigate Firewall(OpenStack)
  - https://github.com/dfilppi/fortigate-tosca-example
- TOSCA 1.0 Simple Profile SPEC Use Case Implementations
  - https://github.com/apache/incubator-ariatosca/tree/master/examples/tosca-simple-1.0/use-cases

TOSCA VNF Model Generator Wizard

http://185.43.218.204/#!/w/vnf



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Apache ARIA-TOSCA Workshop

http://tinyurl.com/tosca-workshop

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Thanks

Arthur@Cloudify.co

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Experience VNF onboarding, ONAP hackathon

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```
FROM centos
RUN yum install -y gcc python-devel epel-release && yum install -y
 python-pip
RUN pip install apache-ariatosca[ssh]
CMD aria -h
```

ARIA Workshop Dockerfile

```
[root@openstack-kilo-t2 aria-workshop]# cat Dockerfile
FROM centos

RUN yum install -y gcc git python-devel epel-release && yum install -y python-pip
RUN pip install apache-ariatosca[ssh] wagon

RUN git clone https://github.com/cloudify-cosmo/aria-extension-cloudify.git /root/aria-extension-cloudify
RUN pip install -r /root/aria-extension-cloudify/requirements.txt
RUN pip install /root/aria-extension-cloudify/

RUN git clone -b 2.0.1 https://github.com/cloudify-cosmo/cloudify-openstack-plugin /root/cloudify-openstack-plugin
RUN wagon create /root/cloudify-openstack-plugin
RUN aria plugins install cloudify_openstack_plugin-2.0.1-py27-none-linux_x86_64.wgn

RUN git clone -b 1.3.0 https://github.com/cloudify-incubator/cloudify-utilities-plugin /root/cloudify-utilities-plugin
RUN wagon create /root/cloudify-utilities-plugin
RUN aria plugins install cloudify_utilities_plugin-1.3.0-py27-none-linux_x86_64.wgn

RUN git clone https://github.com/rtpro/fortigate-tosca-example.git

CMD aria -h


aria-workshop]# docker build -t aria-workshop .
```

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TOSCA Model Driven