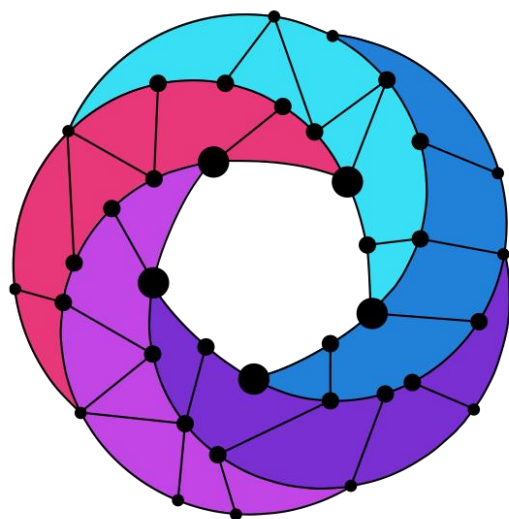
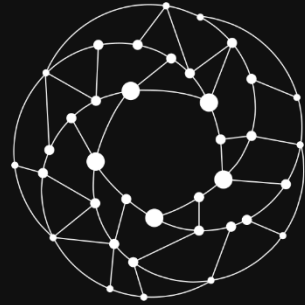




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RELEASE 1 F2F DISCUSSIONS

June 2016

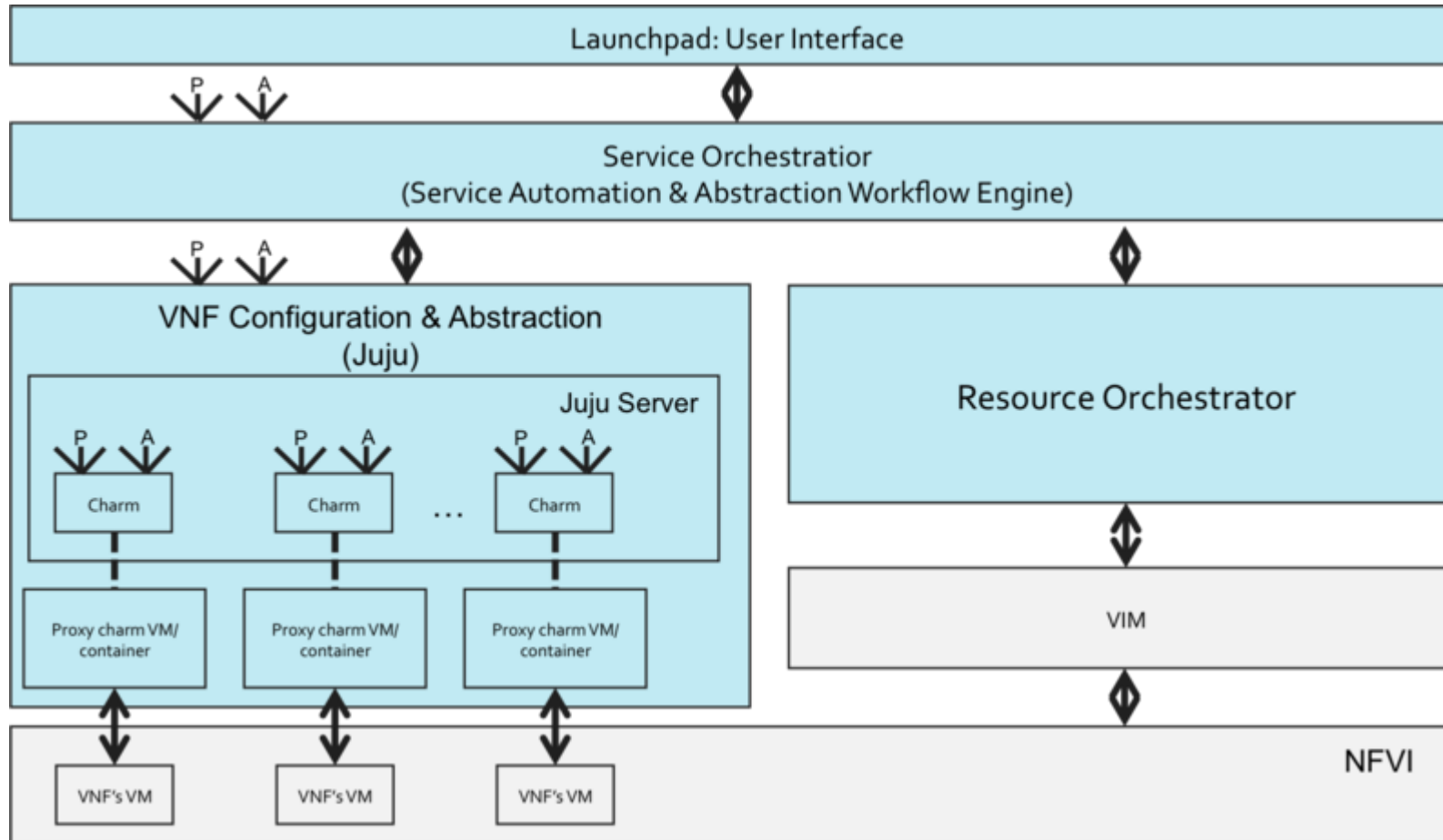


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DATA MODEL OVERVIEW RELEASE 0

Anil Gunturu

OSM ARCHITECTURE



MODELS: INFORMATIONAL MODEL (IM) VS DATA MODEL (DM)



- **RFC-3444 defines IM and DM**
- **IM**
 - Conceptual/Abstract Model
 - Specify relationship between objects
 - Can be expressed in plain English or UML
- **DM**
 - Concrete/Detailed Model
 - Contains implementation details
 - YANG/TOSCA/JSON Schema/YAML Schema
- **Descriptor Formats**
 - Can be XML/JSON/YAML
 - Validated using a DM.

ETSI-OSM APPROACH



- **Align with ETSI**
- **Data Modeling**
 - Use YANG
 - TOSCA Simple for NFV
- **Descriptor**
 - YAML format
- **YANG model driven:**
 - Composer
 - Toolchain

https://osm.etsi.org/wikipub/index.php/Release_0_Data_Model_Details

DESCRIPTOR PACKAGES



Network Service Package

- Network Service Descriptor (NSD)
- Scripts for lifecycle events
- Icons
- Miscellaneous: checksum file, README

VNF Package

- VNF Descriptor
- VDU Software Images
- Scripts for VNF lifecycle events
- Icons
- Miscellaneous: checksum file, README
- Configuration Artifacts (e.g. Charms)

NSD Package Structure

NS Package (tar.gz)

- |-- checksums.txt (Contains md5 checksum for each file)**
- |-- README (Contains README about this VNF package)
- |-- nsd.yaml (NS descriptor file in YAML format)**
- |-- scripts\ (Directory containing custom scripts)
- |-- icons\ (Directory containing the icons)
- |-- images\ (Directory containing all the VM images for this VNF)

VNFD Package Structure

VNF Package (tar.gz)

-- checksums.txt (Contains md5 checksum for each file)

-- README (Contains README about this VNF package)

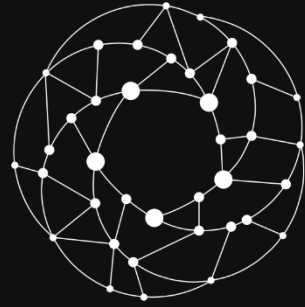
-- vnfd.yaml (VNFD descriptor file in YAML format)

-- scripts\ (Directory containing custom scripts)

-- icons\ (Directory containing the icons)

-- images\ (Directory containing all the VM images for this VNF)

-- charms\ (Directory containing the configuration charms/plugins)



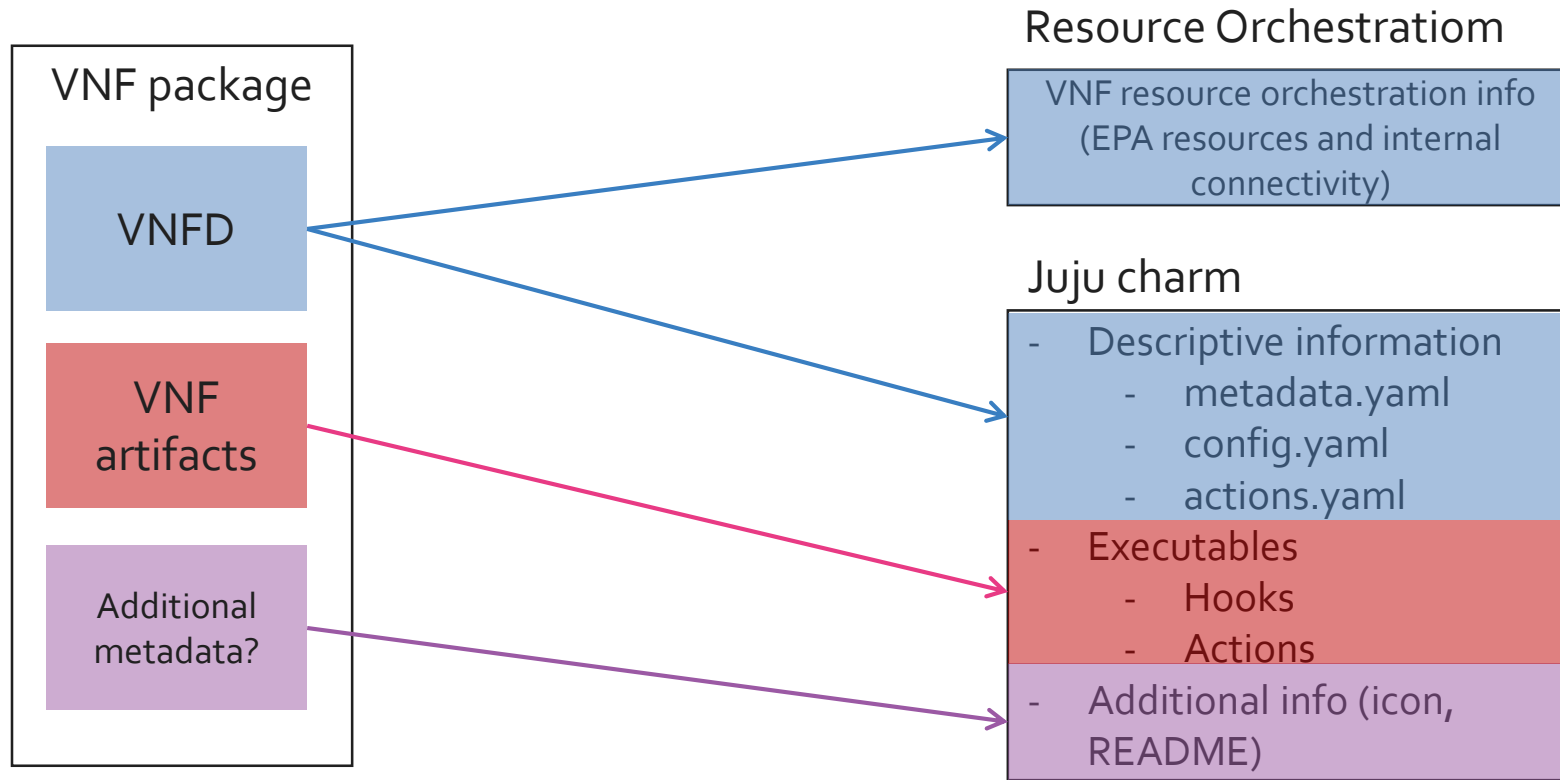
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VNF DESCRIPTOR

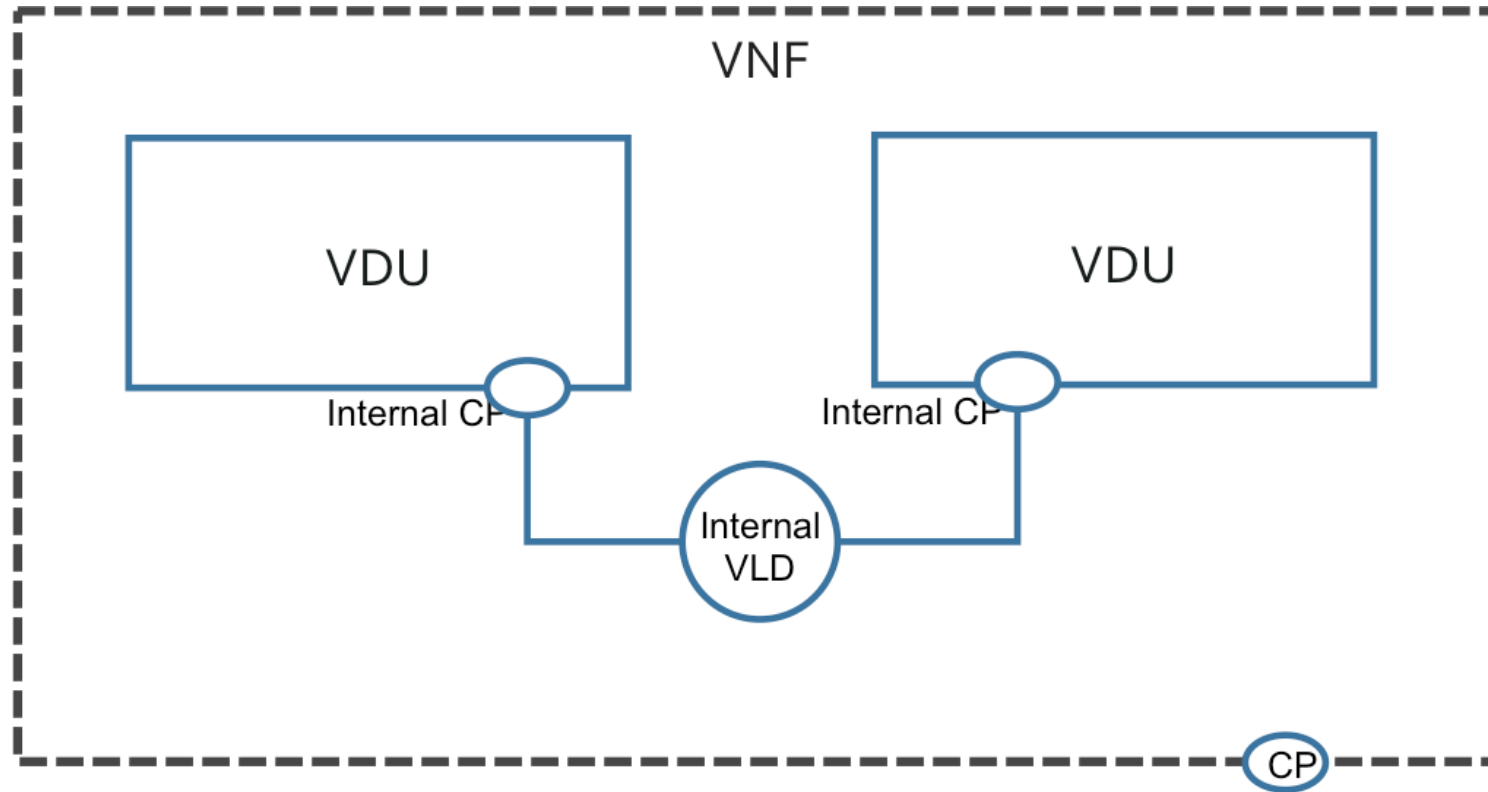
Anil Gunturu

VNf Packaging: OSM Data Model

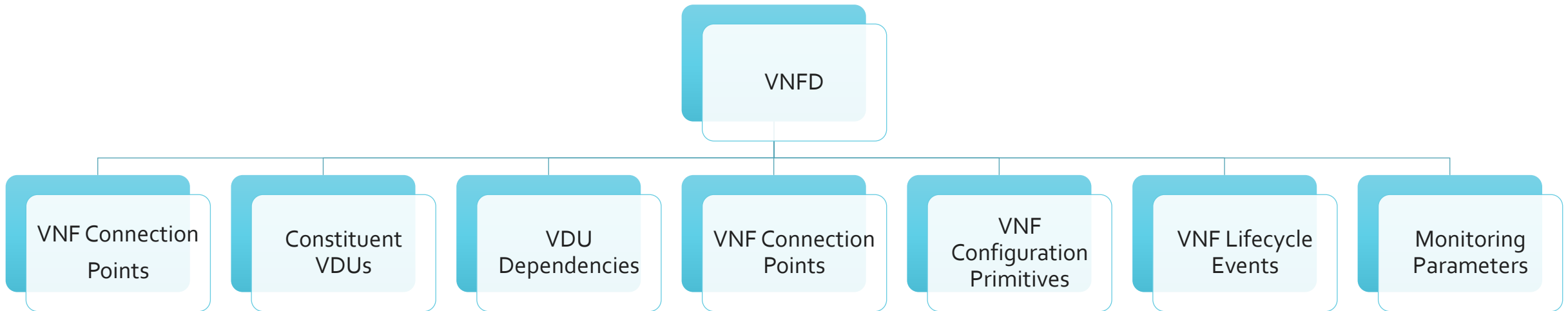
One Model to Rule All



VNF



VNF DESCRIPTOR



VDU (1/3)

Field	Type	Description
id	list	Unique id for the VDU.
name	string	Unique name for the VDU
description	enum	Description of the VDU.
count	bool	Is this field mandatory
mgmt-vpci	string	Specifies the virtual PCI address. Expressed in the following format dddd:dd:dd.d. For example 0000:00:12.0. This information can be used to pass as metadata during the VM creation.
vm-flavor	element	Captures basic information such as memory, vcpu and storage requirements.
guest-epa	element	Captures guest NUMA topology, CPU pinning and other attributes
vswitch-epa	element	Specifies vswitch related EPA
host-epa	element	Specifies host EPA attributes.

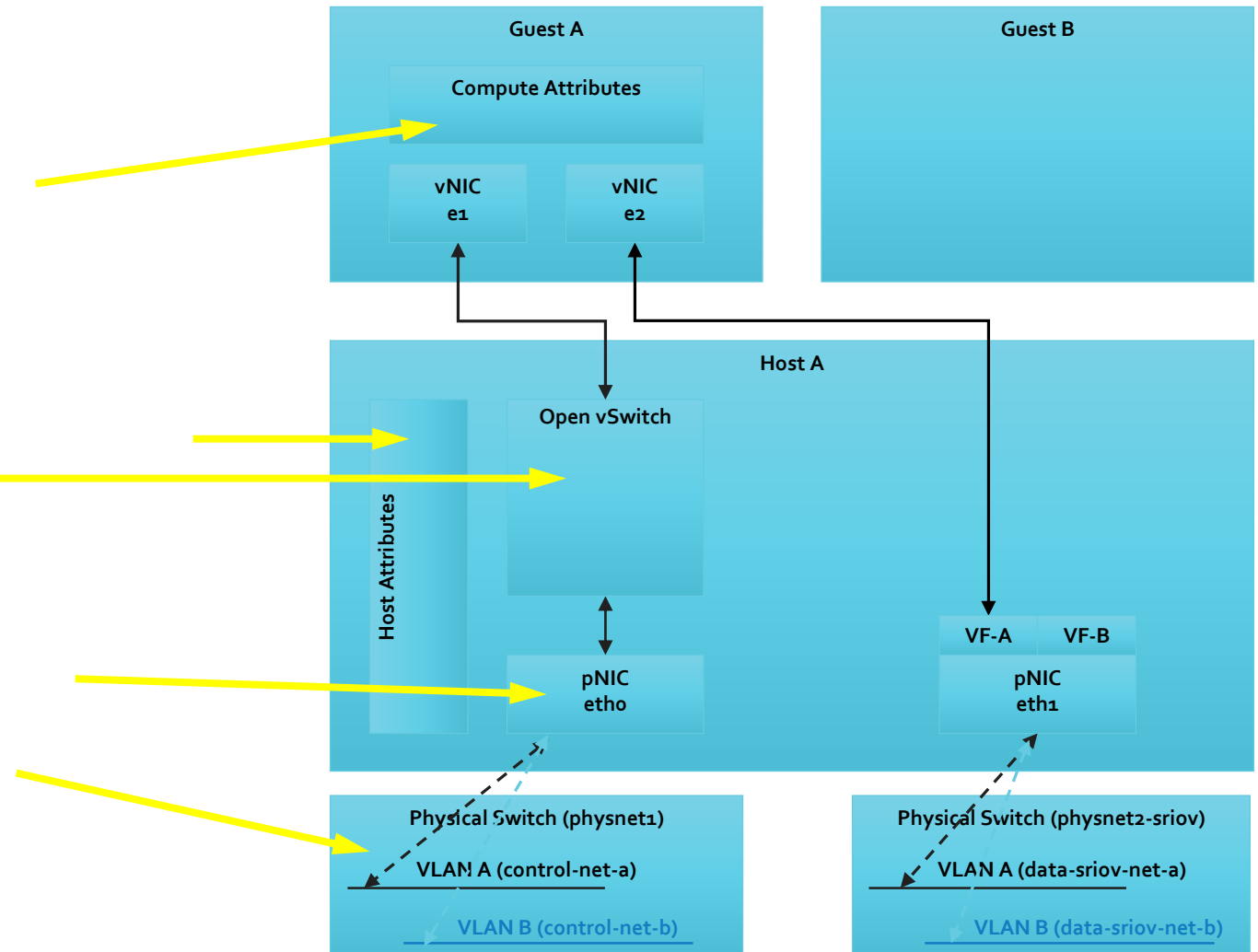
VDU (2/3)

Field	Type	Description
image	string	Image name for the software image. If the image name is found within the VNF package it will be uploaded to all cloud accounts during onboarding process. Otherwise, the image must be added to the cloud account with the same name as entered here.
image-checksum	string	Image md5sum for the software image. The md5sum, if provided, along with the image name uniquely identifies an image uploaded to the CAL
cloud-init	string	Content of cloud-init script
internal-connection-point	list	List for internal connection points. Each VNFC has zero or more internal connection points. Internal connection points are used for connecting the VNF components internal to the VNF. If a VNF has only one VNFC, it may not have any internal connection points.
internal-interface	list	List of internal interfaces for the VNF
external-interface	list	List of external interfaces for the VNF. The external interfaces enable sending traffic to and from VNF."

VDU EPA (3/3)

VDU Descriptor

- Image: <path>
- Flavor: { vcpus: <count>, memory: <mb>, storage: <GB> }
- Guest- EPA: { **mempage-size**: <large|small|prefer-large>, **trusted-execution**: <true|false>, **cpu-pinning-policy**: <dedicated|shared|any>, **thread-pin-policy**: <avoid|separate|isolated|any>, numa: { node-cnt: <count>, mem-policy: <strict|preferred>, nodes: { id: <id>, memory: <mb>, vcpu-list: <comma separated list> } } }
- Host-EPA: { processor: { model: <model>, features: <64b, iommu, cat, cmt, ddiio, etc> } }
- vSwitch-EPA: { **ovs-acceleration**: <true|false>, **ovs-offload**: <true|false> } }
- Hypervisor: { type: <kvm|xen>, version: <> }
- Interface:
 - Name: <string>
 - Type: **direct-sr-io** | **normal** | **direct-pci-passthrough**
 - NIC-EPA: { **vlan-tag-stripping**: <boolean>, **ovs-offload**: <boolean>, vendor-id: <vendor-id>, datapath-library: <name-of-library>, bandwidth: <bw> }
 - Network: <name-of-provider-network>



CONNECTION POINT

Field	Type	Description
List for external connection points. Each VNF has one or more external connection points. As the name implies that external connection points are used for connecting the VNF to other VNFs or to external networks. Each VNF exposes these connection points to the orchestrator. The orchestrator can construct network services by connecting the connection points between different VNFs. The NFVO will use VLDs and VNFFGs at the network service level to construct network services.		
name	string	Name of the connection point
short-name	string	
type	enum	Type of the connection point.

CONFIGURATION PRIMITIVES

Field	Type	Description
configuration-primitive		
name	string	Name of the service primitive
parameter	list	List of parameters to the service primitive.
user-defined-script	string	A user defined script
parameter		
name	string	Name of the parameter
data-type	enum	Data type of the parameter
mandatory	bool	Is this field mandatory
default-value	string	The default value for this field
hidden	bool	The value should be hidden by the UI. Only applies to parameters with default values.
read-only	bool	The value should be greyed out by the UI. Only applies when default value is specified.
Parameter-pool	string	NSD Parameter pool name to use for this parameter

MONITORING PARAMETERS (1/4)

Field	Type	Description
name	string	Name of the monitoring parameter.
http-endpoint-ref	ref	Reference to http endpoint
Json-query-method		The method to extract a value from a JSON response NAMEKEY - Use the name as the key for a non-nested value. JSONPATH - Use jsonpath-rw implementation to extract a value. OBJECTPATH - Use objectpath implementation to extract a value."
json-query-params	element	Parameters for json query
description	string	Description of the monitoring parameter
group-tag	string	A simple tag to group monitoring parameters
value-type	enum	Integer, decimal, string
numeric-constraints		Constraints for integers
text-constraints	element	Constraints for string

MONITORING PARAMETERS (2/4)

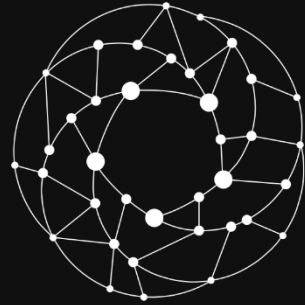
Field	Type	Description
value-integer	string	Current value for an integer parameter
value-decimal	string	Current value for an decimal parameter
value-string	ref	Current value for an string parameter
widget-type	enum	HISTOGRAM, BAR, GAUGE, SLIDER, COUNTER, TEXTBOX
units	string	Units to display in UI
Json-query-params		
json-path	string	The jsonpath to use to extract value from JSON structure
object-path	string	The objectpath to use to extract value from JSON structure
numeric-constraints		
min-value	uint	Minimum value for the parameter
max-value	uint	Maximum value for the parameter

MONITORING PARAMETERS(3/4)

Field	Type	Description
text-constraints		
min-length	uint	Minimum string length for the parameter
max-length	uint	Maximum string length for the parameter
http-endpoint		
path	string	The HTTP path on the management server
https	bool	Pick HTTPS instead of HTTP , Default is false
port	uint	The HTTP port to connect to
username	string	The HTTP basic auth username
password	string	The HTTP basic auth password
polling_interval_secs	uint	The HTTP polling interval in seconds
method	enum	This is the method to be performed at the uri. GET by default for action
headers	list	Custom HTTP headers to put on HTTP request

MONITORING PARAMETERS (4/4)

```
{  
  'id': '1',  
  'name': 'Cpo Tx Rate',  
  'json_query_method': "OBJECTPATH",  
  'value_type': "INT",  
  'numeric_constraints': {'min_value': 0, 'max_value': 1000},  
  'json_query_params': {'object_path': "$..*[@.portname is  
'trafgen_vnfd/cpo'].counters.'tx-rate-mbps'"},  
  'description': 'Outgoing byte rate of interface',  
  'group_tag': 'Group1',  
  'widget_type': 'GAUGE',  
  'units': 'mbps'  
}
```

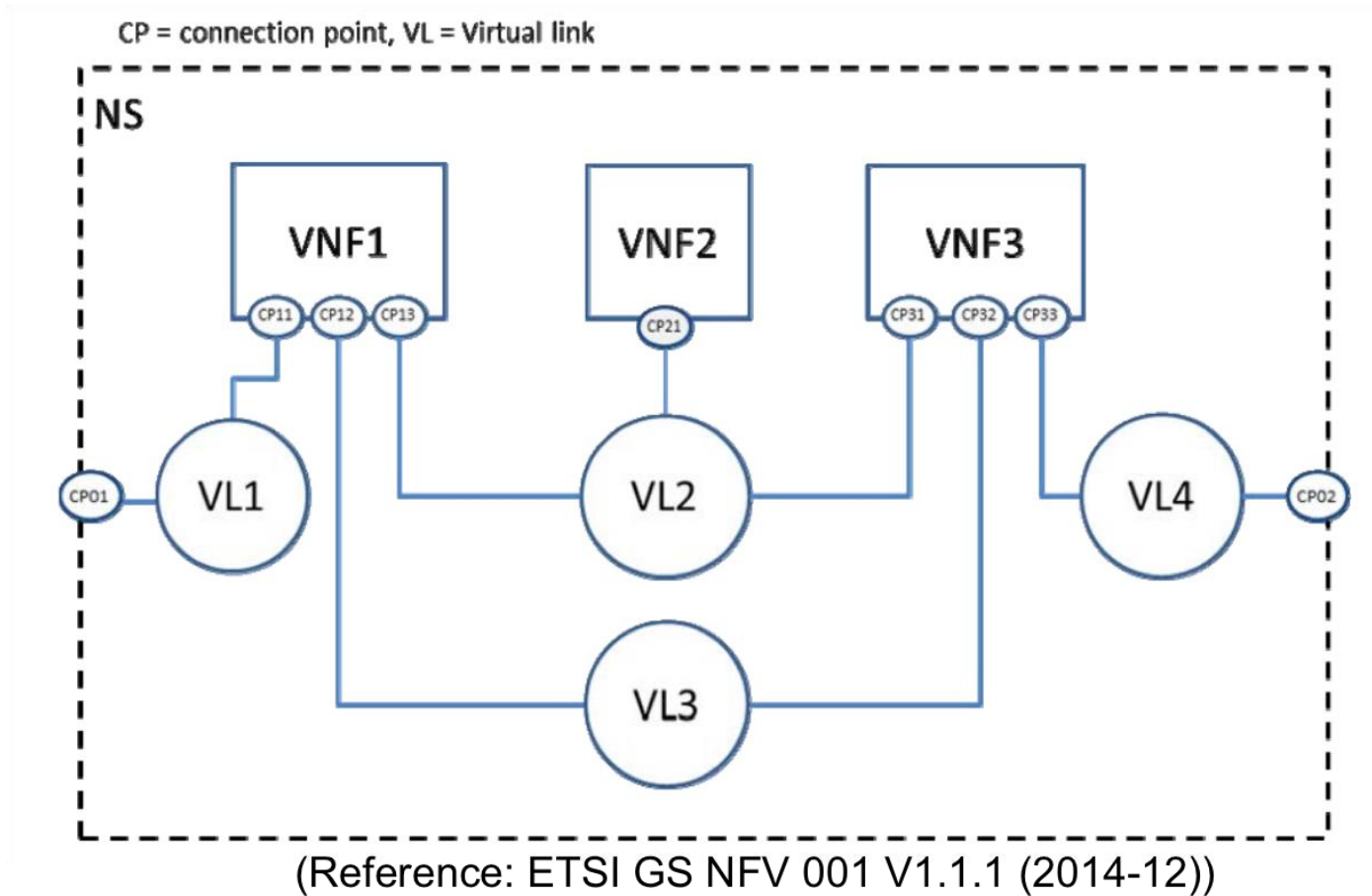


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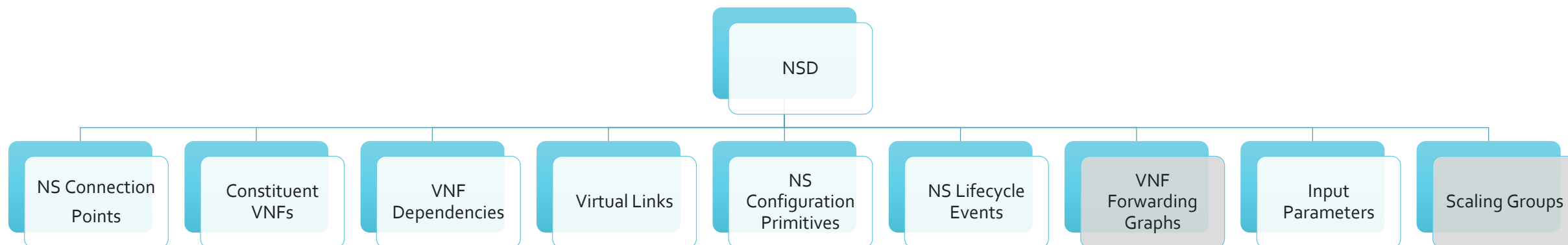
NETWORK SERVICE DESCRIPTOR

Anil Gunturu

Reference NS



NETWORK SERVICE DESCRIPTOR



CONSTITUENT VNF

Field	Type	Description
member-vnf-index	uint64	Identifier/index for the VNFD. This separate id is required to ensure that multiple VNFs can be part of single NS
vnfd-id-ref	ref	Identifier for the VNFD.

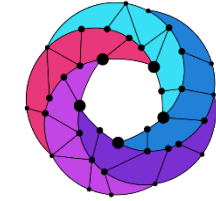
VLD (1/2)

Field	Type	Description
id	uuid	Identifier for the VLD
type	enum	Type of virtual link ELAN: A multipoint service connecting a set of VNFs
vnfd-connection-point-ref	list	A list of references to connection points.
provider-network	element	Container for the provider network.
vnfd-connection-point-ref		
member-vnf-index-ref	ref	Reference to member-vnf within constituent-vnfd
vnfd-id-ref	ref	A reference to a vnfd.
vnfd-connection-point-ref	ref	A reference to a connection point name in a vnfd.

VLD (2/2)

Field	Type	Description
"provider-network"		
physical-network	string	Name of the physical network on which the provider network is built.
overlay-type	enum	Type of the overlay network (FLAT/VLAN/VXLAN)
segmentation_id	Uint	Segmentation ID

VLD EXAMPLE



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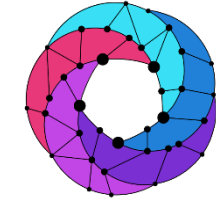
```
{
  "nsd:id": "76611fc8-c44e-11e5-b325-fa163eb18cb8",
  "nsd:name": "6WindTR1.1.2__2 entry point",
  "nsd:short-name": "6WindTR1.1.2__2 entry point",
  "nsd:type": "ELAN",
  "nsd:vnfd-connection-point-ref": {
    "nsd:member-vnf-index-ref": "2",
    "nsd:vnfd-id-ref": "b7a3d170-c448-11e5-8795-fa163eb18cb8",
    "nsd:vnfd-connection-point-ref": "xe2"
  },
  "manotypes:provider-network": {
    "-xmlns:manotypes": "urn:ietf:params:xml:ns:yang:nfvo:nsd",
    "manotypes:physical-network": "mwc16data2",
    "manotypes:overlay-type": "VLAN"
  }
},
```

VLD Type

List of
Connection
Points

Provider
Network
Details

VLD EXAMPLE (GWCORPA)



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```
<nsd:vld>
  <nsd:id>5947888c-c46c-11e5-8576-fa163eb18cb8</nsd:id>
  <nsd:name>connection 4</nsd:name>
  <nsd:short-name>connection 4</nsd:short-name>
  <nsd:type>ELAN</nsd:type>
  <nsd:vnfd-connection-point-ref>
    <nsd:member-vnf-index-ref>1</nsd:member-vnf-index-ref>
    <nsd:vnfd-id-ref>11115d5e-c474-11e5-990a-fa163eb18cb8</nsd:vnfd-id-ref>
    <nsd:vnfd-connection-point-ref>xeo</nsd:vnfd-connection-point-ref>
  </nsd:vnfd-connection-point-ref>
  <manotypes:provider-network xmlns:manotypes="urn:ietf:params:xml:ns:yang:nfvo:nsd">
    <manotypes:physical-network>mwc16data1</manotypes:physical-network>
    <manotypes:overlay-type>VLAN</manotypes:overlay-type>
    <manotypes:segmentation_id>101</manotypes:segmentation_id>
  </manotypes:provider-network>
</nsd:vld>
```

VLD Type

List of
Connection
Points

Can specify
Segmentation
Id

SERVICE PRIMITIVES (1/2)

Field	Type	Description
service-primitive		
name	string	Name of the service primitive
parameter	list	List of parameters to the service primitive.
parameter-group	list	Grouping of parameters which are logically grouped in UI.
user-defined-script	string	A user defined script
parameter		
name	string	Name of the parameter
data-type	enum	Data type of the parameter
mandatory	bool	Is this field mandatory
default-value	string	The default value for this field
hidden	bool	The value should be hidden by the UI. Only applies to parameters with default values.
read-only	bool	The value should be greyed out by the UI. Only applies when default value is specified.
Parameter-pool	string	NSD Parameter pool name to use for this parameter

SERVICE PRIMITIVES (2/2)

Field	Type	Description
parameter-group		
name	string	Name of the service primitive.
parameter	list	List of parameters in the group.
mandatory	bool	Is this field mandatory.
user-defined-script	string	A user defined script.

ADD CORPORATION

```
{
  "nsd:name": "Add Corporation",
  "nsd:parameter": [
    {
      "nsd:name": "Corporation
Name",
      "nsd:data-type": "string",
      "nsd:mandatory": "true",
      "nsd:default-value": "CorpA"
    },
    {
      "nsd:name": "Tunnel Key",
      "nsd:data-type": "integer",
      "nsd:mandatory": "true",
      "nsd:default-value": "1",
      "nsd:hidden": "true"
    }
  ],
}
```

```
"nsd:parameter-group": [
  {
    "nsd:name": "PE1",
    "nsd:parameter": [
      {
        "nsd:name": "Vlan I
PE1 Group
",
        "nsd:data-type": "integer",
        "nsd:mandatory": "true",
        "nsd:default-value": "101",
        "nsd:read-only": "true"
      },
      {
        "nsd:name": "Interface Name",
        "nsd:data-type": "string",
        "nsd:mandatory": "true",
        "nsd:default-value": "eth3"
      }
    ]
  },
]
```

```
{
  "nsd:name": "Corp. Network",
  "nsd:data-type": "string",
  "nsd:mandatory": "true",
  "nsd:default-value":
"10.0.1.0/24"
},
{
  "nsd:name": "Corp. Gateway",
  "nsd:data-type": "string",
  "nsd:mandatory": "true",
  "nsd:default-value": "10.0.1.1"
}
],
"nsd:mandatory": "false"
},
}
```

ADD CORPORATION

```
{
  "nsd:name": "PE2",
  "nsd:parameter": [
    {
      "nsd:name": "Vlan ID",
      "nsd:data-type": "integer",
      "nsd:mandatory": "true",
      "nsd:default-value": "102",
      "nsd:read-only": "true"
    },
    {
      "nsd:name": "Interface Name",
      "nsd:data-type": "string",
      "nsd:mandatory": "true",
      "nsd:default-value": "eth3"
    }
  ],
  "nsd:group": "PE2 Group"
},
{
  "nsd:name": "Corp. Network",
  "nsd:data-type": "string",
  "nsd:mandatory": "true",
  "nsd:default-value": "10.0.2.0/24"
},
{
  "nsd:name": "Corp. Gateway",
  "nsd:data-type": "string",
  "nsd:mandatory": "true",
  "nsd:default-value": "10.0.2.1"
},
{
  "nsd:mandatory": "false"
}
}
```

ADD CORPORATION

```
{  
  "nsd:name": "PE3",  
  "nsd:parameter": [  
    {  
      "nsd:name": "Vlan ID",  
      "nsd:data-type": "integer",  
      "nsd:mandatory": "true",  
      "nsd:default-value": "108",  
      "nsd:read-only": "true"  
    },  
    {  
      "nsd:name": "Interface Name",  
      "nsd:data-type": "string",  
      "nsd:mandatory": "true",  
      "nsd:default-value": "eth4"  
    }  
  ],  
}
```

PE3 Group

```
{  
  "nsd:name": "Corp. Network",  
  "nsd:data-type": "string",  
  "nsd:mandatory": "true",  
  "nsd:default-value": "10.0.4.0/24"  
},  
{  
  "nsd:name": "Corp. Gateway",  
  "nsd:data-type": "string",  
  "nsd:mandatory": "true",  
  "nsd:default-value": "10.0.4.1"  
}  
],  
"nsd:mandatory": "false"  
}  
],  
"nsd:user-defined-script":  
  "/home/rift/.install/usr/bin/add_corporation.py"  
}
```

User
Defined
Script

INPUT PARAMETERS

Field	Type	Description
input-parameter-xpath		
xpath	string	An xpath that specifies the element in a descriptor.
label	string	A descriptive string
default-value	string	A default value for this input parameter

INPUT PARAM EXAMPLE (1/2)

```
"nsd:input-parameter-xpath" :  
  [  
    {  
      "nsd:label" : "net-corp-vlan",  
      "nsd:default-value" : "55",  
      "nsd:xpath" :  
        "/nsd:nsd-catalog/nsd:nsd[nsd:id=a53fe54e-f1c7-11e5-9b7a-  
001b21b98a9d]/nsd:vld[nsd:id=a541b1da-f1c7-11e5-9b7a-  
001b21b98a9d]/nsd:provider-network/manotypes:segmentation_id"  
    }  
  ],
```

INPUT PARAM EXAMPLE (2/2)

Select Cloud Account

openmano

Data Center

mydc

1. SELECT NSD



cwims_juju_nsd
cwims_juju_nsd
RIFT.io / v1



cwims_juju_nsd
cwims_juju_nsd
RIFT.io / v1

2. REVIEW EPA PARAMS

- ▼ cwims_vnfd
 - ▼ vm-flavor
 - memory-mb = 4096
 - vcpu-count = 2
 - storage-gb = 40
 - ▼ guest-epa
 - cpu-pinning-policy = ANY

3. CONFIGURE NSD

net-corp-vlan

SCALING PRIMITIVES (1/2)

Field	Type	Description
scaling-group-descriptor		
name	string	Name of the scaling group.
vnfd-member	list	List of VNFs in this scaling group.
max-instance-count	uint	Maximum instances of this scaling group that are allowed in a single network service. The network service scaling will fail, when the number of service group instances exceed the max-instance-count specified.
scaling-config-action	list	List of scaling config actions.
vnfd-member		
member-vnf-index-ref	ref	Member VNF index of this member VNF
count	uint	Count of this member VNF within this scaling group. The count allows to define the number of instances when a scaling action targets this scaling group.

SCALING PRIMITIVES (2/2)

Field	Type	Description
scaling-config-action		
trigger	enum	Scaling trigger (pre-scale-in, post-scale-in, pre-scale-out, post-scale-out)
ns-config-primitive-name-ref	ref	Reference to the NS config name primitive

LIFECYCLE EVENTS

Field	Type	Description
parameter-group		
event	enum	Name of the lifecycle event.
user-defined-script	string	A user defined script.

VNFFGD (1/3)

Field	Type	Description
id	uint	Unique Identifier for the VNFFGD
name	string	VNFFGD Name.
rsp	list	List of Rendered Service Paths (RSPs)
classifier	list	List of classifier rules
rsp		
name	string	
vnfd-connection-point-ref	list	A list of references to connection points.
vnfd-connection-point-ref		
member-vnf-index-ref	ref	Reference to member VNF in constituent VNFDs.
order	uint	A number that denotes the VNF in a chain.
vnfd-id-ref	ref	A reference to a VNFD.
vnfd-connection-point-ref	ref	A reference to connection point name in a VNFD.

VNFFGO (2/3)

Field	Type	Description
classifier		
id	uint	Unique Identifier for the classifier.
name	string	Classifier name.
rsp-id-ref	list	List of Rendered Service Paths (RSPs).
member-vnf-index-ref	ref	Reference to member VNF in constituent VNFDs.
vnfd-id-ref	ref	A reference to a VNFD.
vnfd-connection-point	ref	A reference to connection point name in a VNFD.
match-attributes	list	List of match attributes.

VNFFGO (3/3)

Field	Type	Description
match-attributes		
id	uint	Unique Identifier for the classifier.
ip-proto	uint8	IP Protocol
source-ip-address	inet:ip-address	Source IP address
destination-ip-address	inet:ip-address	Destination IP address
source-port	inet:port-number	Source port
destination-port	inet:port-number	Destination port