

# PNF Onboarding & Modeling to Support 5G RAN



- ONAP Modeling
- PNF Onboarding

# Onboarding and Design Time



	Onboarding Package	Onboarding Descriptor	Platform ONAP Model	NF Instance
WHAT		 <p>PNF Descriptor Model</p>	 <p>Platform Information Model Platform Data Model</p>	
WHEN	<p>Package Delivery</p> 	<p>Onboarding Process</p> 	<p>Design Time</p> 	<p>Run Time</p> 
WHO	<p>Vendor</p>  <p>SOL 001 PNFD</p>	<p>Technology Specialist Asset Manager</p>  <p>SOL 004 Package</p>	<p>Service Designer Operations Specialist</p>  <p>-</p>	<p>Operations Specialist</p>  <p>-</p>

# Onboarding and Design Time



- Onboarding Package
- Onboarding
- Vendor

- NF Descriptor
- Onboarding
- Asset Manager

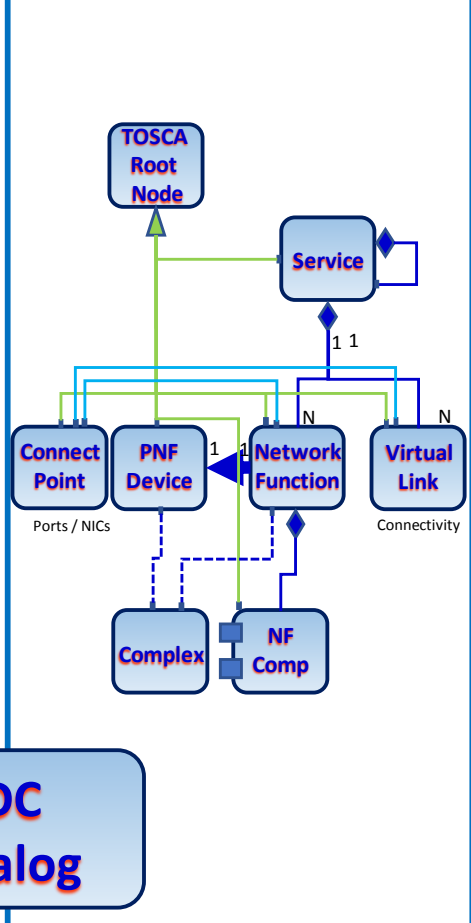
- Platform Model
- Design Time
- Service Designer

- NF Instance
- Run Time
- Operations

- NF Descriptor**
- NF Registration**
- PM Schema**
- Informational Artifacts**
- Configuration Files**
- Ansible Playbooks**

**PNF Onboarding Package**

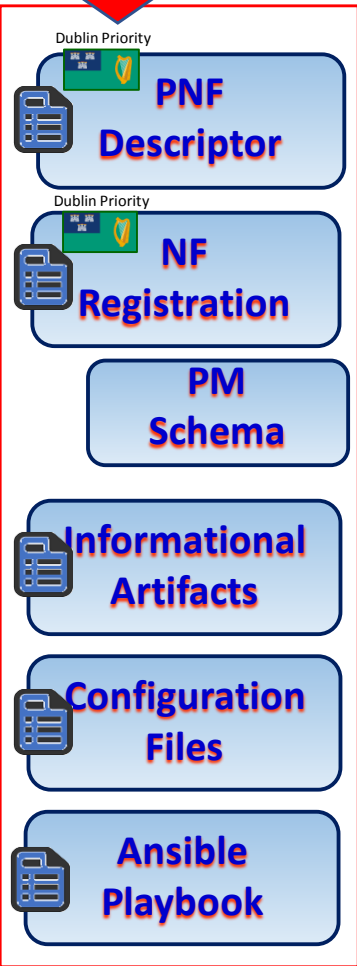
**SDC Catalog**



- A&AI**
- PNF Instance**

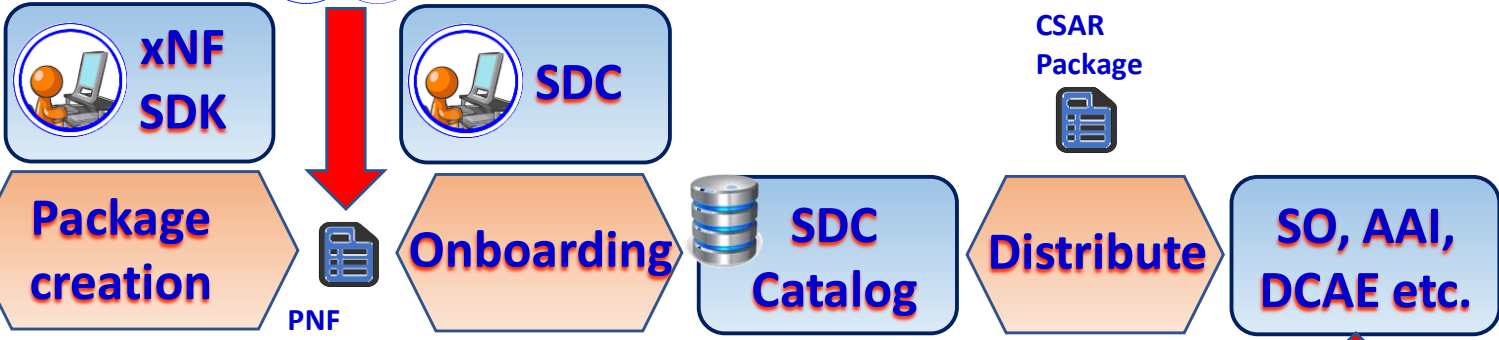
# PNF ONBOARDING DUBLIN ACTIVITIES

**1 PNF PACKAGE:** Create Package with PNF artifacts



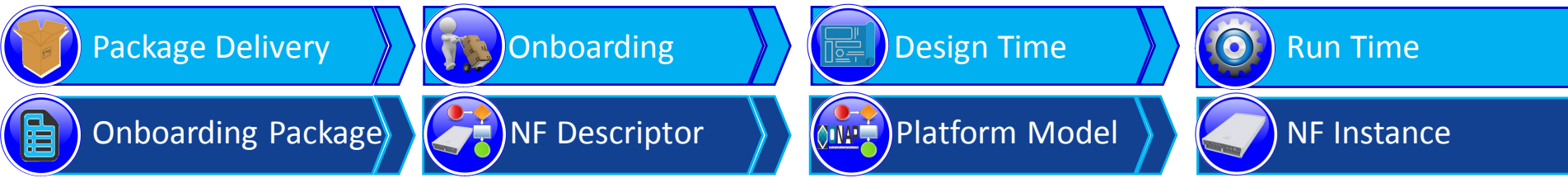
**2 PNF SDK:** Development to create PNF Onboarding Package

**3 PNF Onboarding package:** Package created



**4 SDC:** NF OB Package > SDC catalog




**5 ONAP RT Components:** Ingest and use CSAR package



# PNF PACKAGE CREATION



Benjamin Cheung, PhD

Onboarding Package	
Onboarding	
Vendor	

# PNF ONBOARDING PACKAGE



PNF-D

Dublin Priority



**NF  
Descriptor**

VES Event  
Registration  
Specification

Dublin Priority



**NF  
Registration**

PM Schema

**PM  
Schema**

Manuals, Help files  
CuDo Products



**Informational  
Artifacts**

Configuration Info



**Configuration  
Files**

Ansible Playbooks



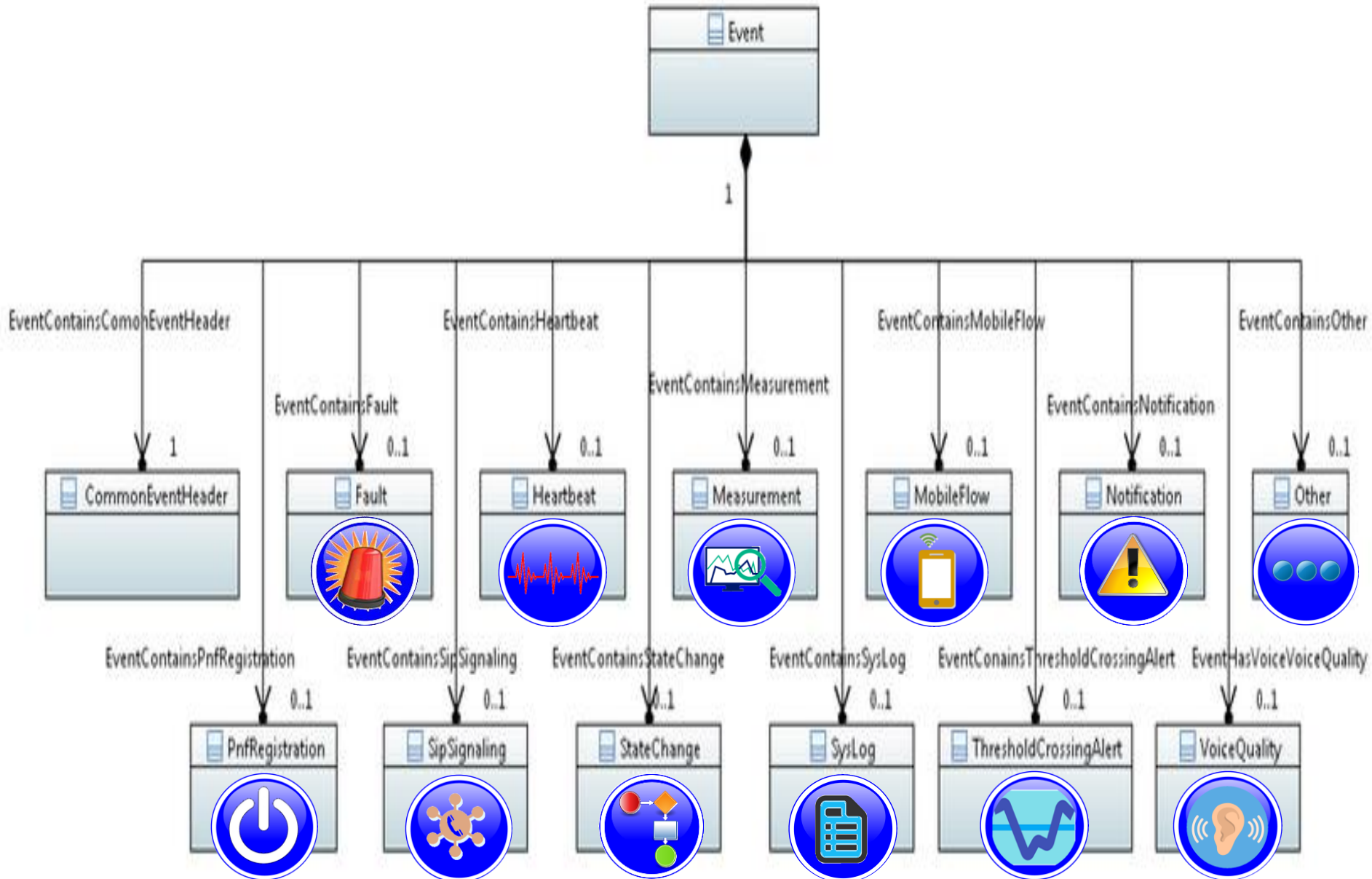
**Ansible  
Playbooks**



Onboarding Package



# R4: Modelling VES Events



# NF Registration (YAML) Onboarding





# NF ONBOARDING ARTIFACTS



## DEPLOYMENT ARTIFACT

The screenshot shows the ONAP interface for managing Deployment Artifacts. On the left, a sidebar lists various artifact types: General, Deployment Artifact (selected), Information Artifact, TOSCA Artifacts, Composition, Operation, Activity Log, Deployment, and Properties Assignment. The main area displays a table with columns for Name, Version, and UUID. A context menu is open over the table, listing various artifact types. The 'DCAE\_POLICY' option is highlighted in blue. A modal dialog box is also visible, containing a 'Browse' button and a 'Description' text area.

Choose Type

- YANG\_XML
- VNF\_CATALOG
- VF\_LICENSE
- VENDOR\_LICENSE
- MODEL\_INVENTORY\_PROFILE
- MODEL\_QUERY\_SPEC
- LIFECYCLE\_OPERATIONS
- VES\_EVENTS
- PERFORMANCE\_COUNTER
- APPC\_CONFIG
- DCAE\_TOSCA
- DCAE\_JSON
- DCAE\_POLICY**
- DCAE\_DOC
- DCAE\_EVENT
- OTHER
- SNMP\_POLL
- SNMP\_TRAP
- PLAN

VES\_EVENTS

Done Add Another



## **INFORMATION ARTIFACT (SDC Design Studio)**

- Cloud Questionnaire
- Features
- Vendor Test Scripts
- Resource Security Template
- HEAT Template (Vendor)
- Capacity Descriptive
- Other Informational Artifacts

## ONBOARDING PROCESS (PNF SDK)



Benjamin Cheung, PhD

NF Descriptor



Onboarding





Asset Manager



# PNF SDK DEVELOPMENT



PNF-D   **NF  
Descriptor**

VES Event  
Registration  
Specification   **NF  
Registration**

PM Schema  **PM  
Schema**

Manuals, Help files  
CuDo Products  **Informational  
Artifacts**

Configuration Info  **Configuration  
Files**

Ansible Playbooks  **Ansible  
Playbooks**

**2 PNF SDK:** Development to create  
PNF Onboarding Package

 **xNF  
SDK**

**Package  
creation**

WinZIP  
Validating Content




PNF  
Onboarding  
Package

# PNF ONBOARDING



PNF-D   **NF Descriptor**

VES Event Registration Specification   **NF Registration**

PM Schema **PM Schema**

Manuals, Help files  
CuDo Products  **Informational Artifacts**

Configuration Info  **Configuration Files**

Ansible Playbooks  **Ansible Playbooks**

   **PNF Onboarding package: Package created**

 **xNF SDK**

 **SDC**

**Package creation**



**Onboarding**

 **SDC Catalog**

WinZIP  
Validating Content

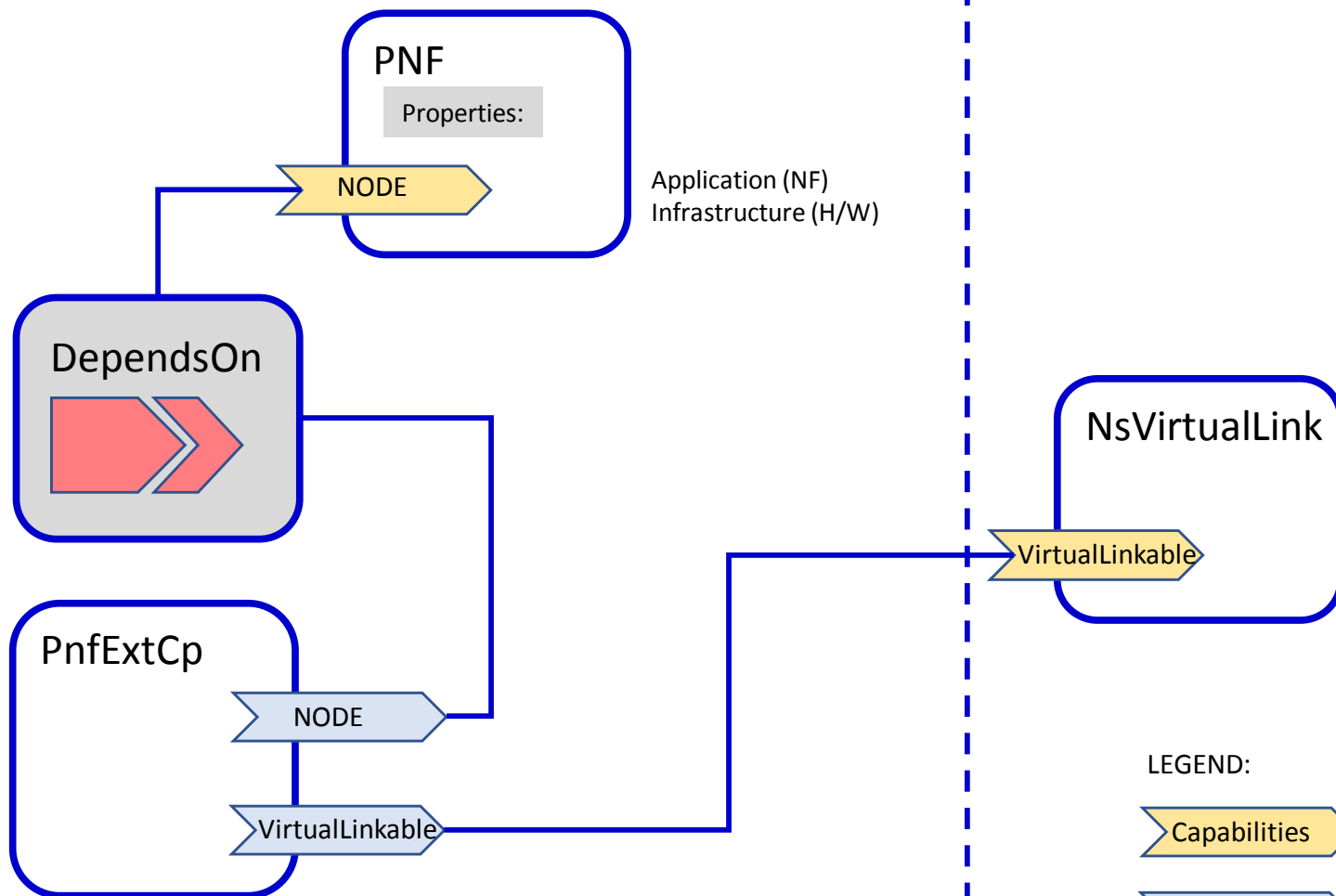
PNF Onboarding Package

+VENDOR META DATA

# PNF Descriptor (ETSI SOL 001)



## PNFD Service Template



LEGEND:

Capabilities

Requirements



# SDK ENHANCEMENTS



sdsc.api.fe.simplifiedemo.onap.org:30206/sdc1/portal#/dashboard

SDC v.1.3.3-SNAPSHOT

HOME CATALOG ONBOARD DCAE-DS WORKFLOW

ACTIVE PROJECTS 4

- Check Out 4
- Check In 0

FOLLOWED PROJECTS 16

- Ready For Testing 0
- In Testing 0
- Certified 16

ADD

Import VFC

Import VSP

Import DCAE asset

Import VF

Select one of the software product component below:

Name	Vendor	Category
1541f87b-cf09-4597-8076	cd18cbda-7af7-41d5-9df4	Generic Abstract
<b>VSP Description:</b> vendor software product		
<b>VSP's Meta Data:</b> Name: 1541f87b-cf09-4597-8076 Lifecycle: CERTIFIED Creator: Carlos Santana		
UUID: c988a8d5-aaf5-481f-a33f-0aaa307e016 Version: 1.0 Modifier: Carlos Santana		
6977b558-4f67-4dc7-8cce	c94dfaad-d116-41db-8178	Generic Abstract
774350dc-b0df-48c0-bc12	a9236f3b-9b13-45b2-a172	Generic Abstract
7ad18697-c393-4841-8599	fcc57795-7368-4600-98d5	Generic Abstract
934d85cd-01ff-493c-bcbe	07599e05-7cea-4a40-b978	Generic Abstract
ac743abf-b235-44ef-8493	4cedaeca-7762-4395-adcc	Generic Abstract
afb1efb7-90b9-419f-9a43	ed8e0862-e5a8-4bef-b2aa	Generic Abstract
e18314f7-91ff-4e56-a55d	b7265786-80f5-4c39-adf5	Generic Abstract

Opening 17443e162775491394bcc77f62ec64d6.csar

You have chosen to open:

- 17443e162775491394bcc77f62ec64d6.csar  
which is: csar File (43.7 KB)  
from: blob

What should Firefox do with this file?

- Open with
- Save File
- Do this automatically for files like this from now on.

OK Cancel

# SDK ENHANCEMENTS



Demo1

V0.1

IN DESIGN CHECK OUT

Certify

Check

General

Information Artifact

TOSCA Artifacts

Composition

Activity Log

Properties Assignment

## TOSCA Artifacts

Name	Type	Version
Tosca Model	TOSCA_CSAR	0
Tosca Template	TOSCA_TEMPLATE	0

# PLATFORM MODEL / MODELING A SERVICE



Benjamin Cheung, PhD

Platform Model



Design Time



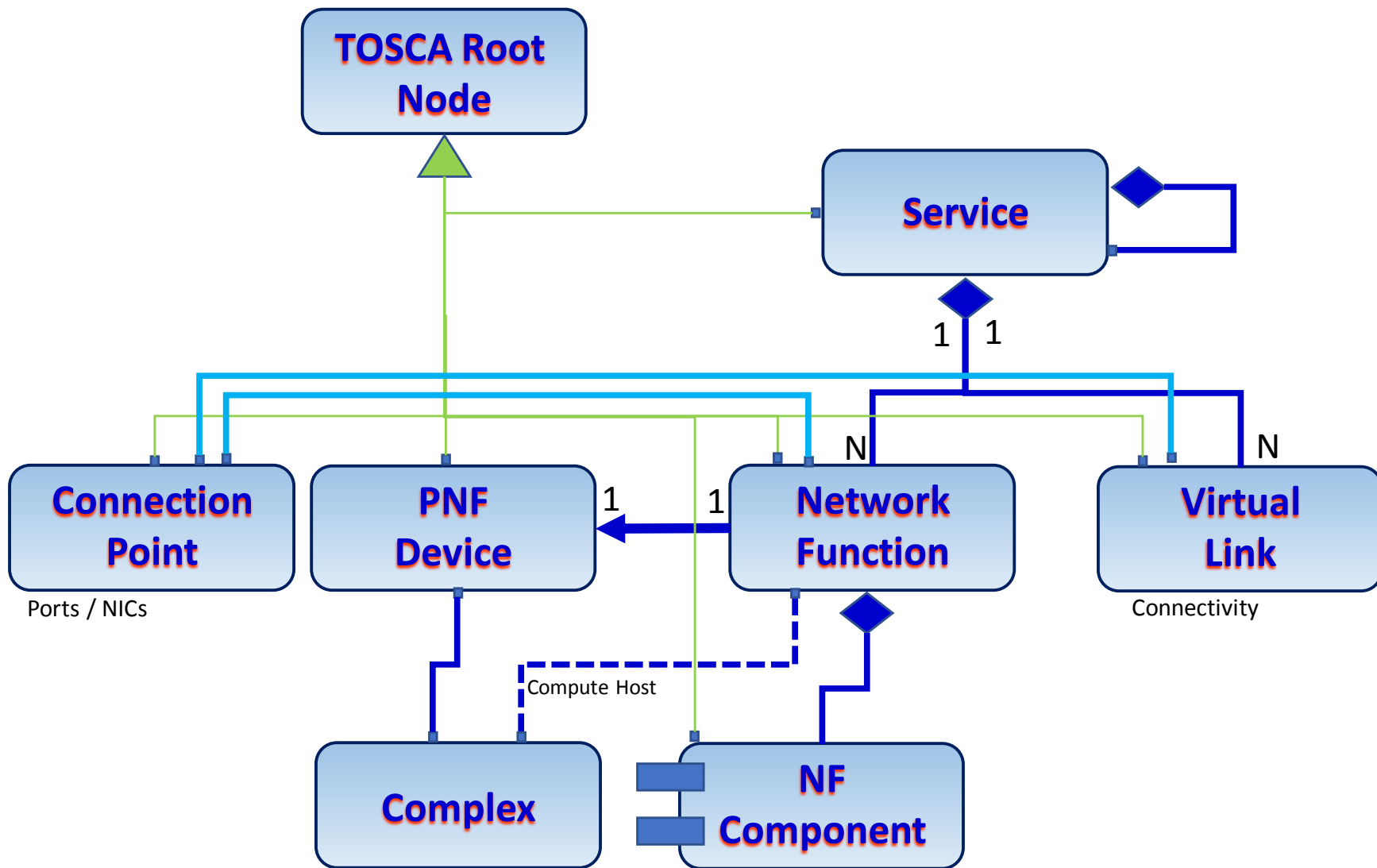
Service Designer



# Platform Data Model

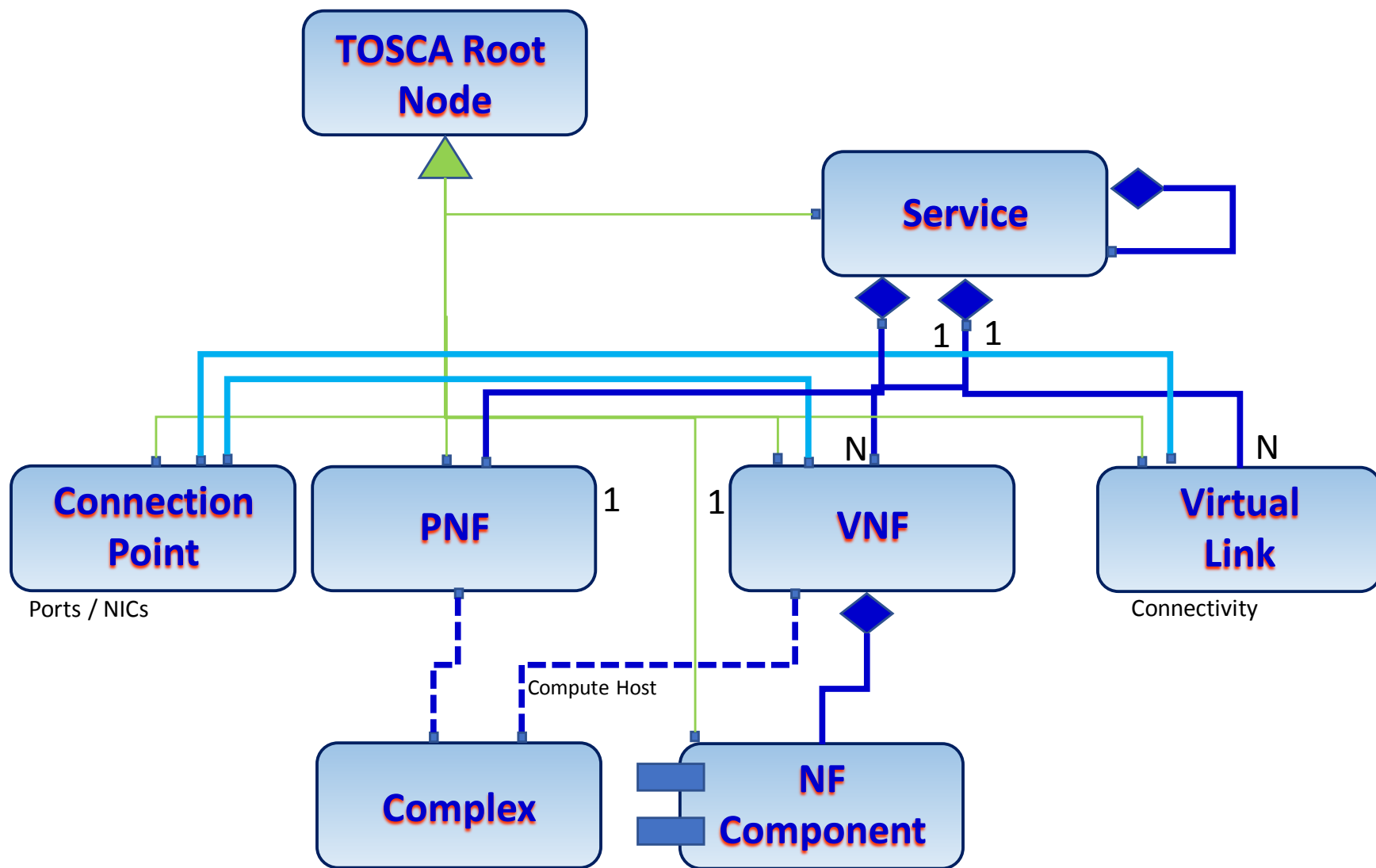


Difference PNF vs  
VDU compute?  
(VDU compute refactoring?)



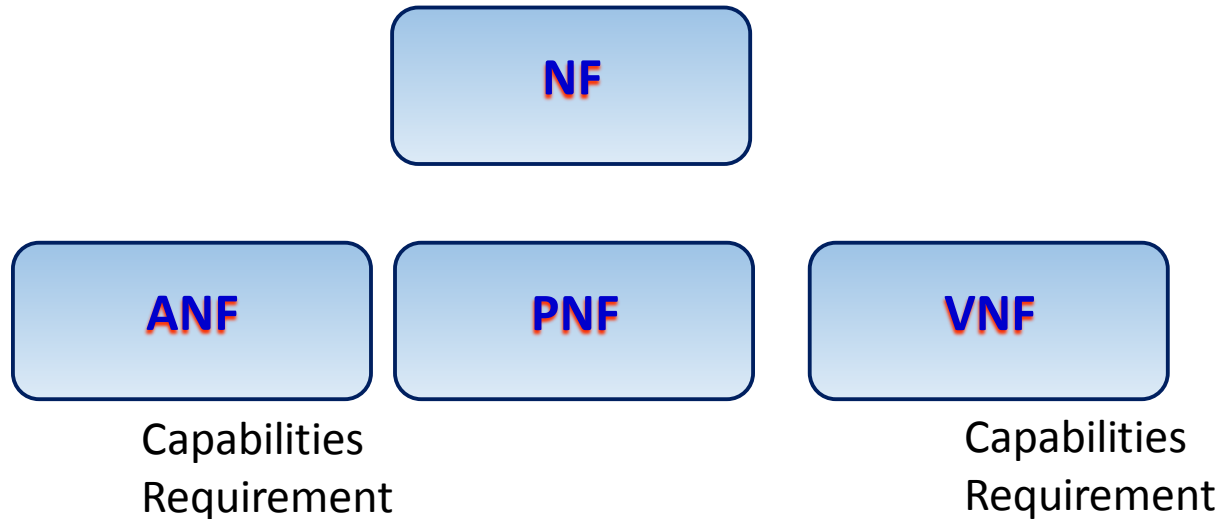
Design time view of a service  
Internal representation of a model  
Onboarding Model > SDC produces

# Platform Data Model



Design time view of a service  
Internal representation of a model  
Onboarding Model > SDC produces

# Platform (Internal) Information Model



Capabilities  
Requirement

Capabilities  
Requirement

Create "PNF"  
Assign (registers)/connpts  
Configure

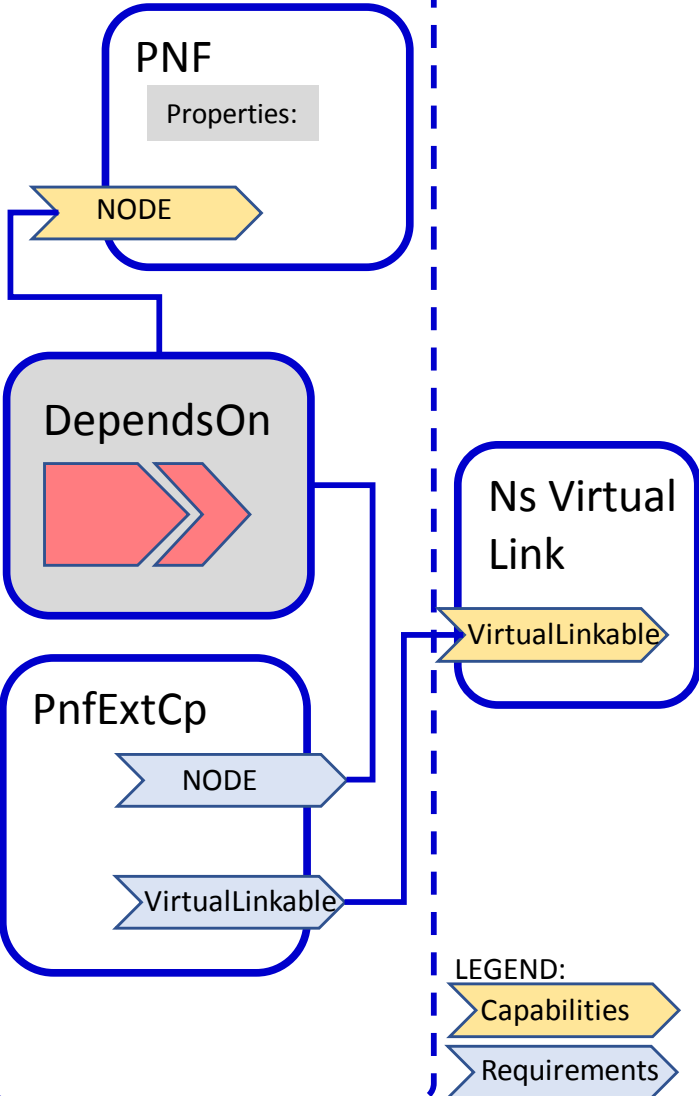
Assign [connections pts]  
Create  
Configure



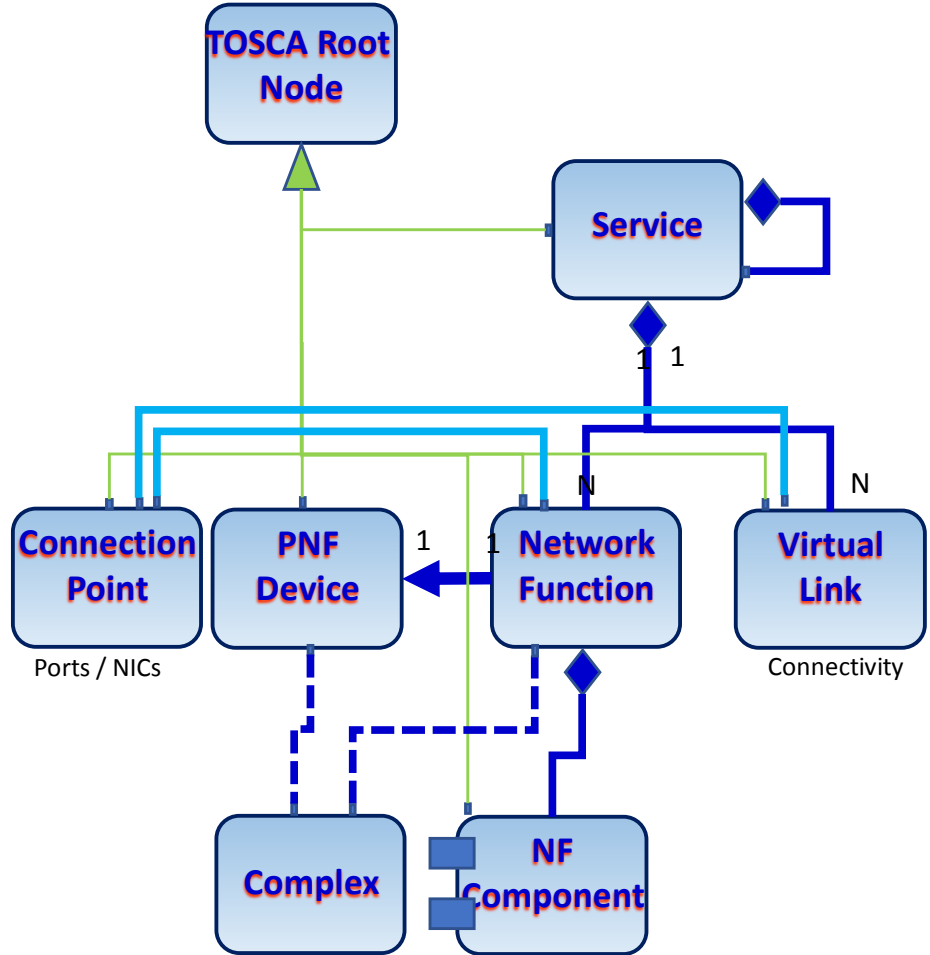
# PNF Descriptor > ONAP Platform Model



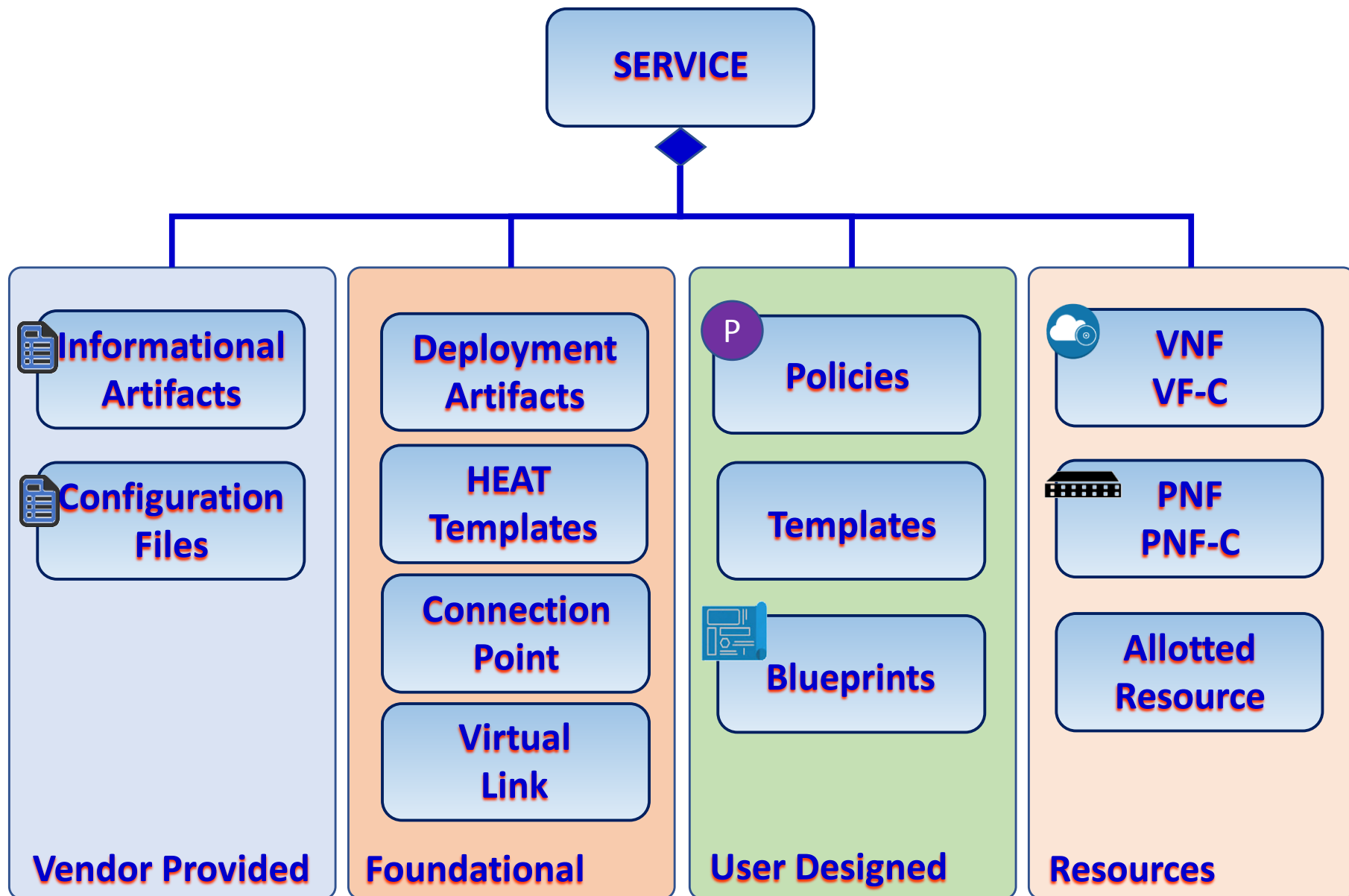
## PNFD DESCRIPTOR



## PLATFORM MODEL (INTERNAL MODEL)



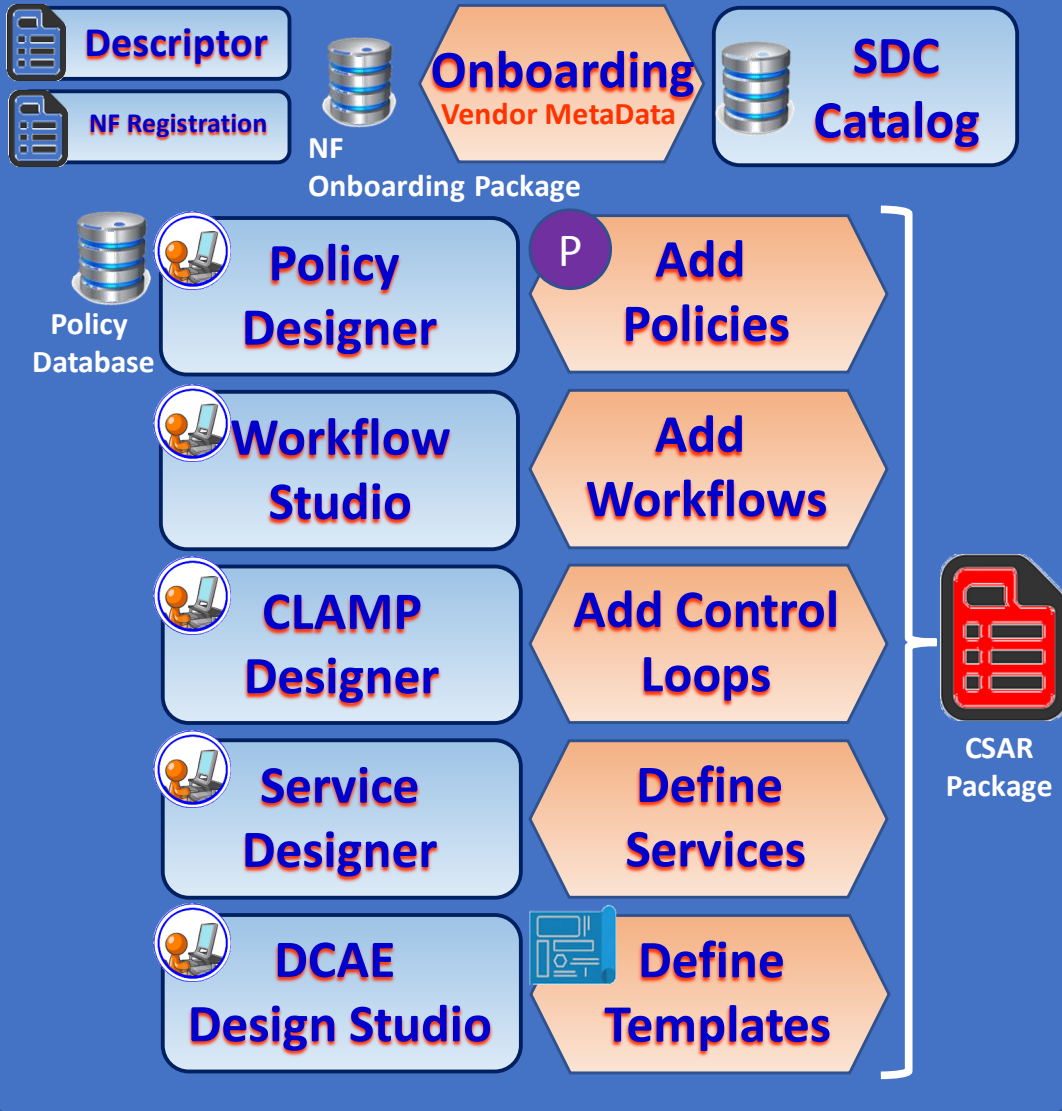
# Defining a Service



# Design-Time Process



## DESIGN-TIME (SDC)



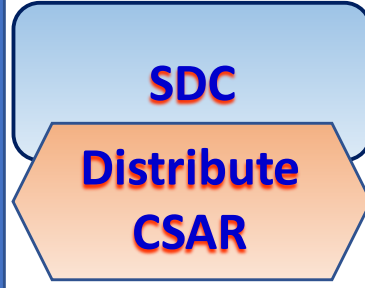
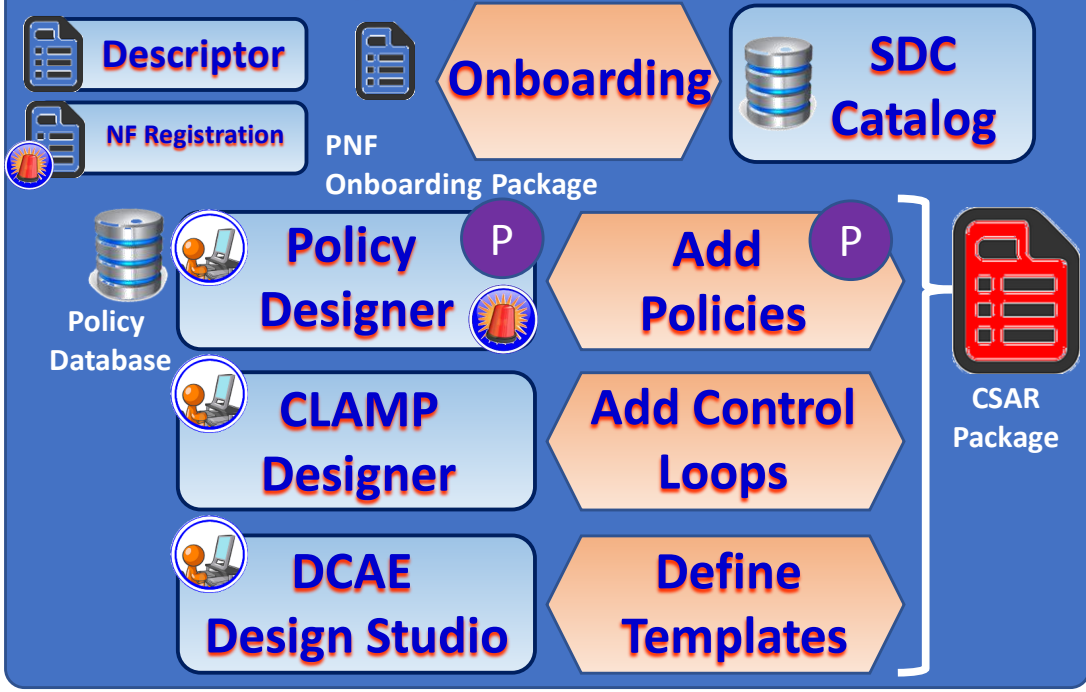
## ONAP RUN-TIME



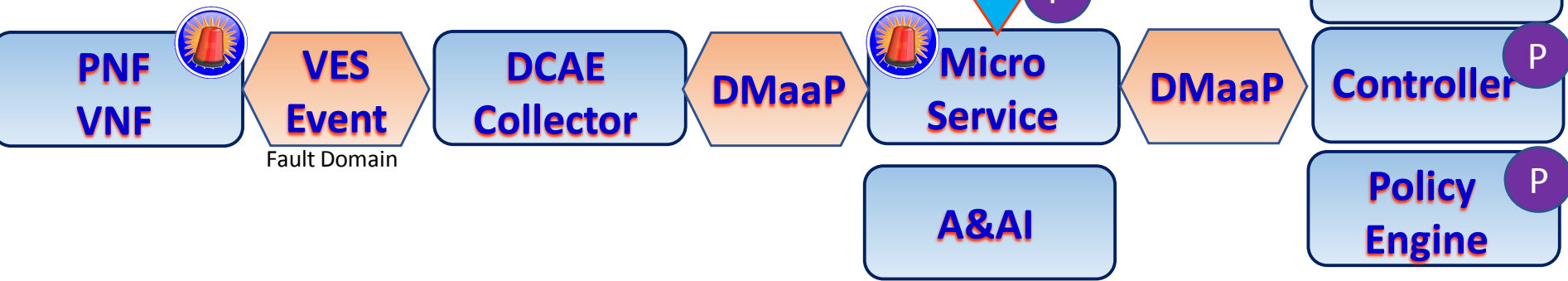
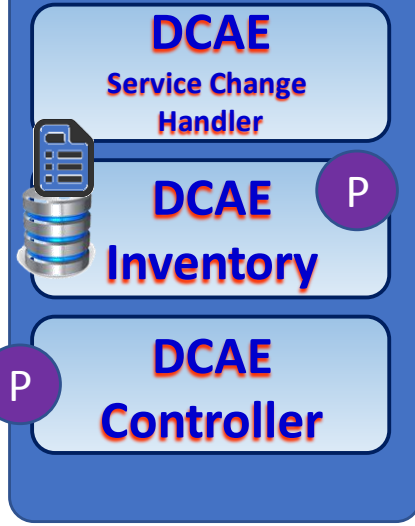
# Policy Example



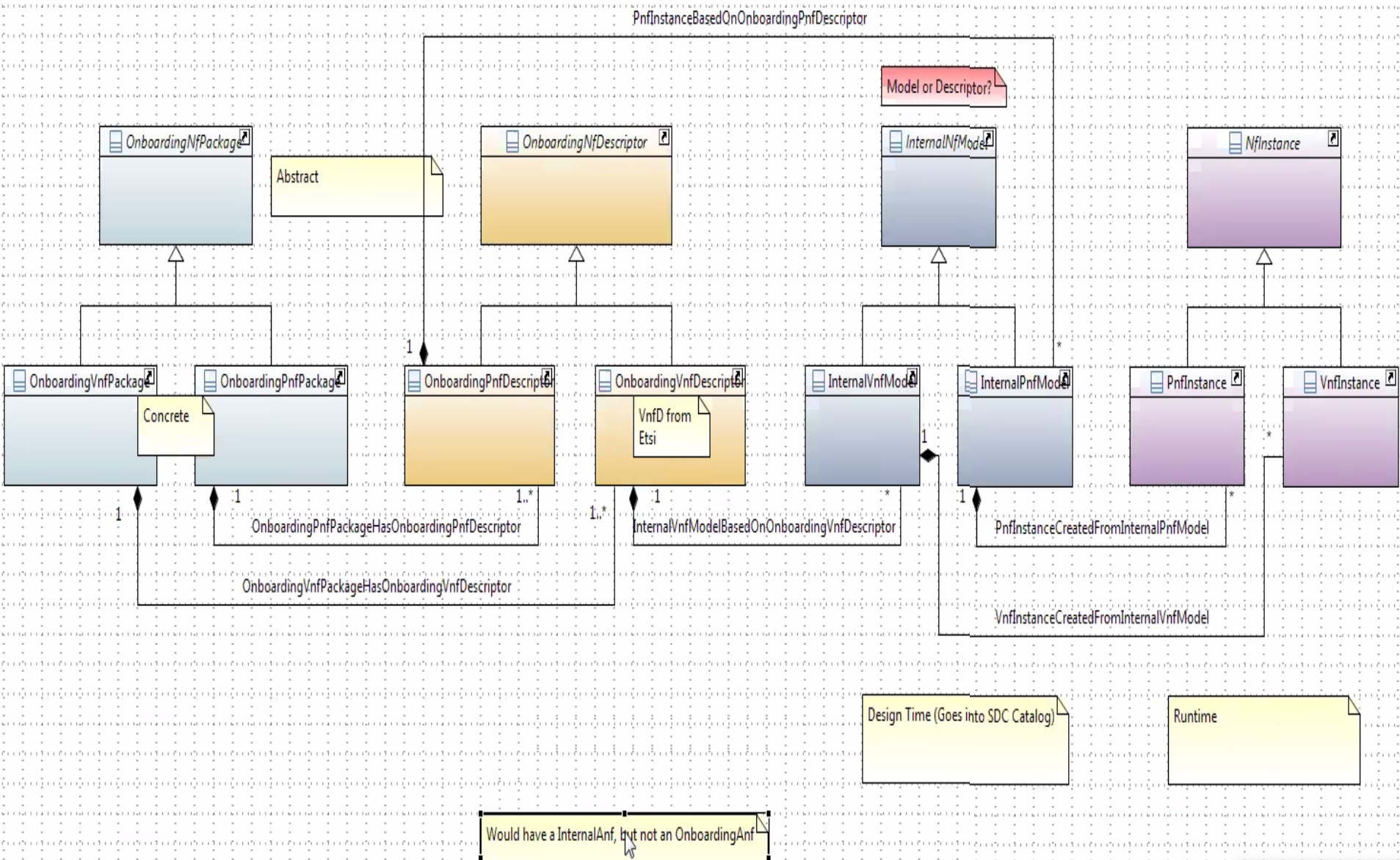
## DESIGN-TIME (SDC)



## DCAE (Run Time)



# Onboarding and Design Time





# 5G RAN Wireless Systems



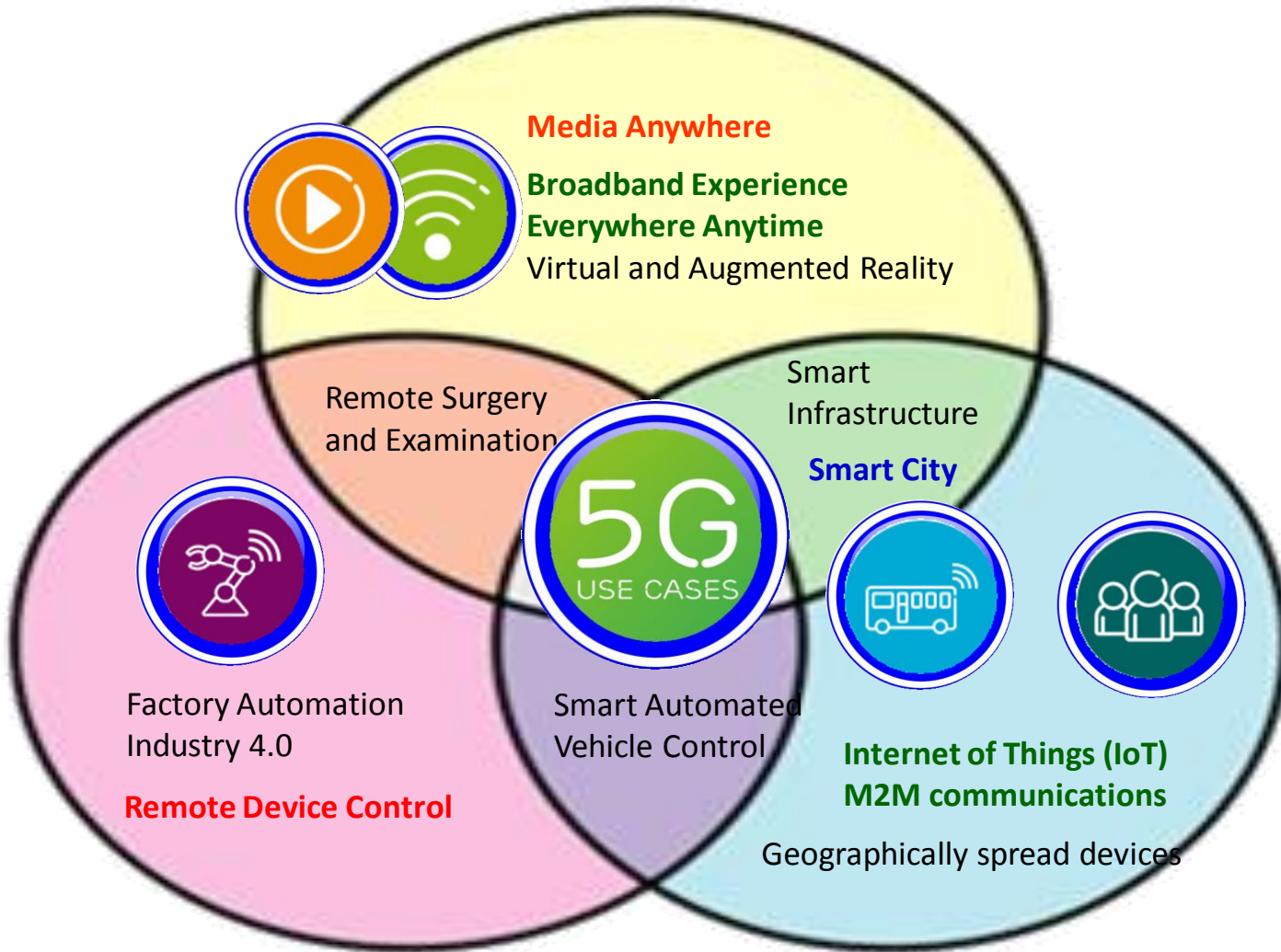
Benjamin Cheung, PhD



# 3GPP Release 15, IMT-2020 = 5G



## eMBB (enhanced Mobile Broadband)



**URLLC (Ultra Reliable Low Latency Communications)**

**mMTC (massive Machine Type Communications)**

- Smart**
- Connected**
- Collaborate**
- Access**
- Interactive**
- Aware**

# 5G Key Technology Components



**New Spectrum (Rel 15, 52.6 GHz/39 GHz, Rel 16 > 52.6 GHz)**



**Advanced Beamforming**



**Multi-Connectivity (NSA, SA, Option 3, 4, 7)**



**Network Slicing**



**Edge Computing**



**Software Defined Networking (SDN)**



**Network Functions Virtualization (NFV)**



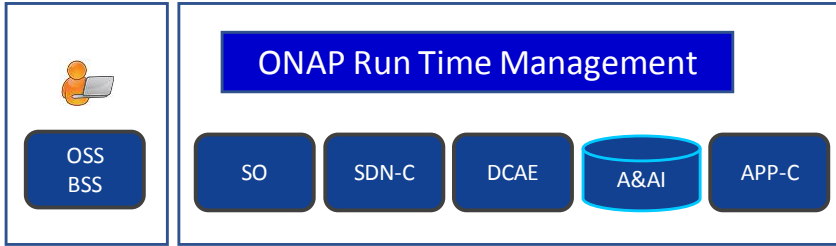
**Fog Computing (FC)  
Mobile Edge Computing (MEC)**



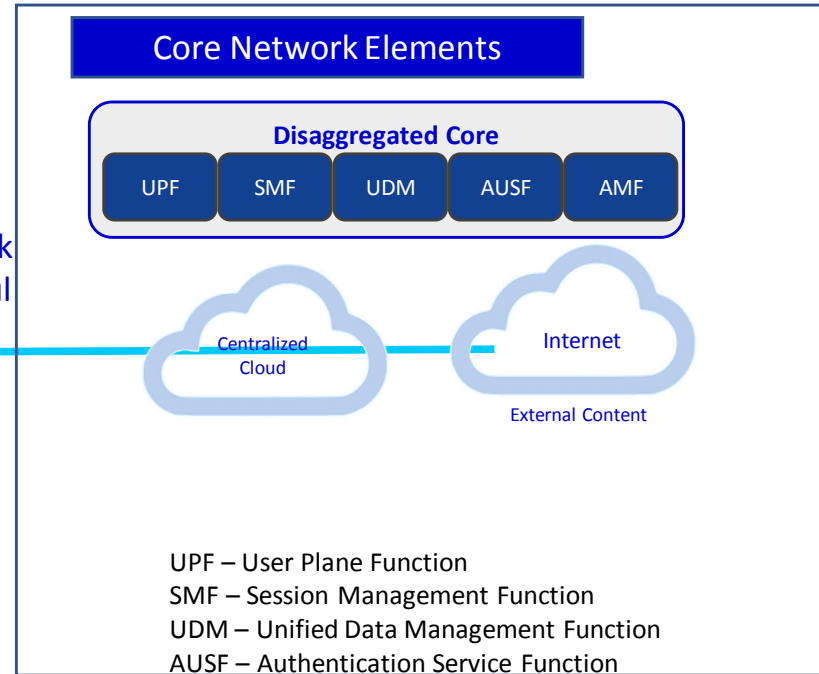
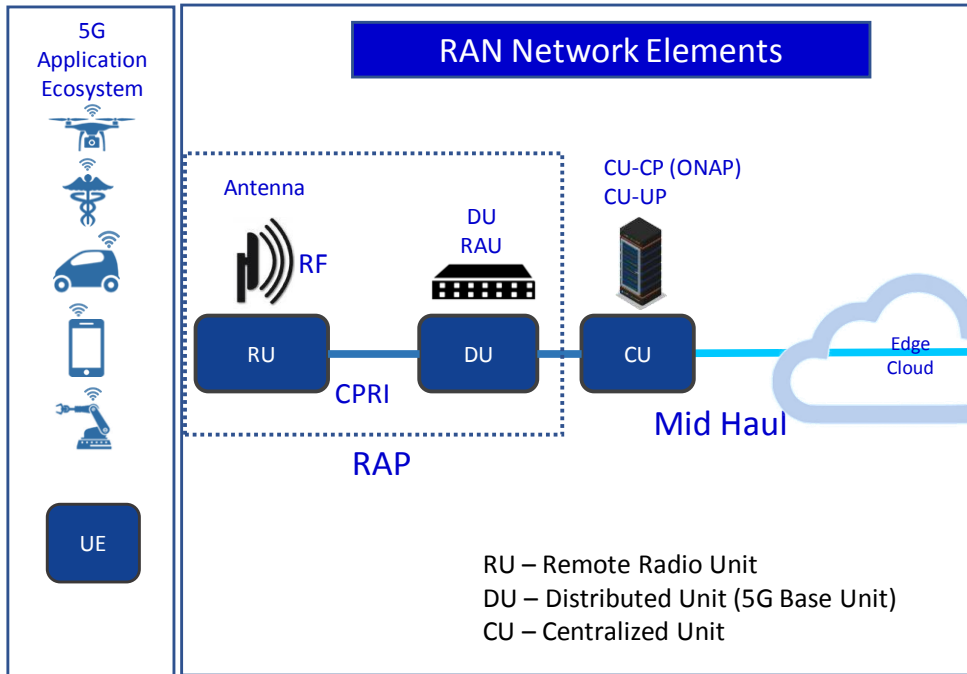
# 5G RAN Wireless Systems & ONAP



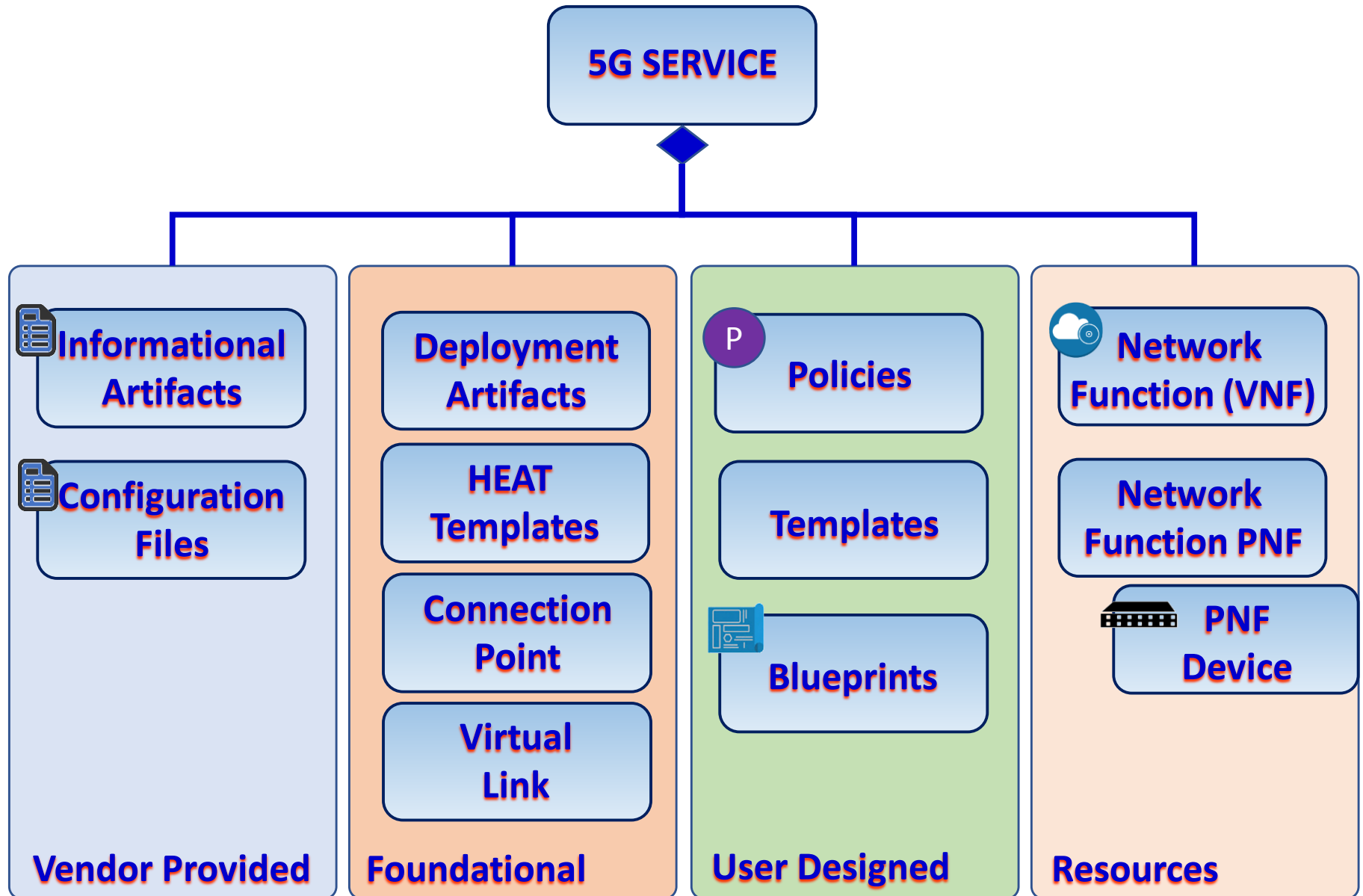
# 5G RAN Wireless Network



SO – Service Orchestrator  
 SDN-C – Service Design Network Controller  
 DCA&E – Data Collection Analytics & Events  
 A&AI – Available & Active Inventory  
 APP-C – Application Control



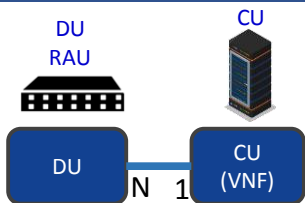
# R4: Modeling a 5G Service



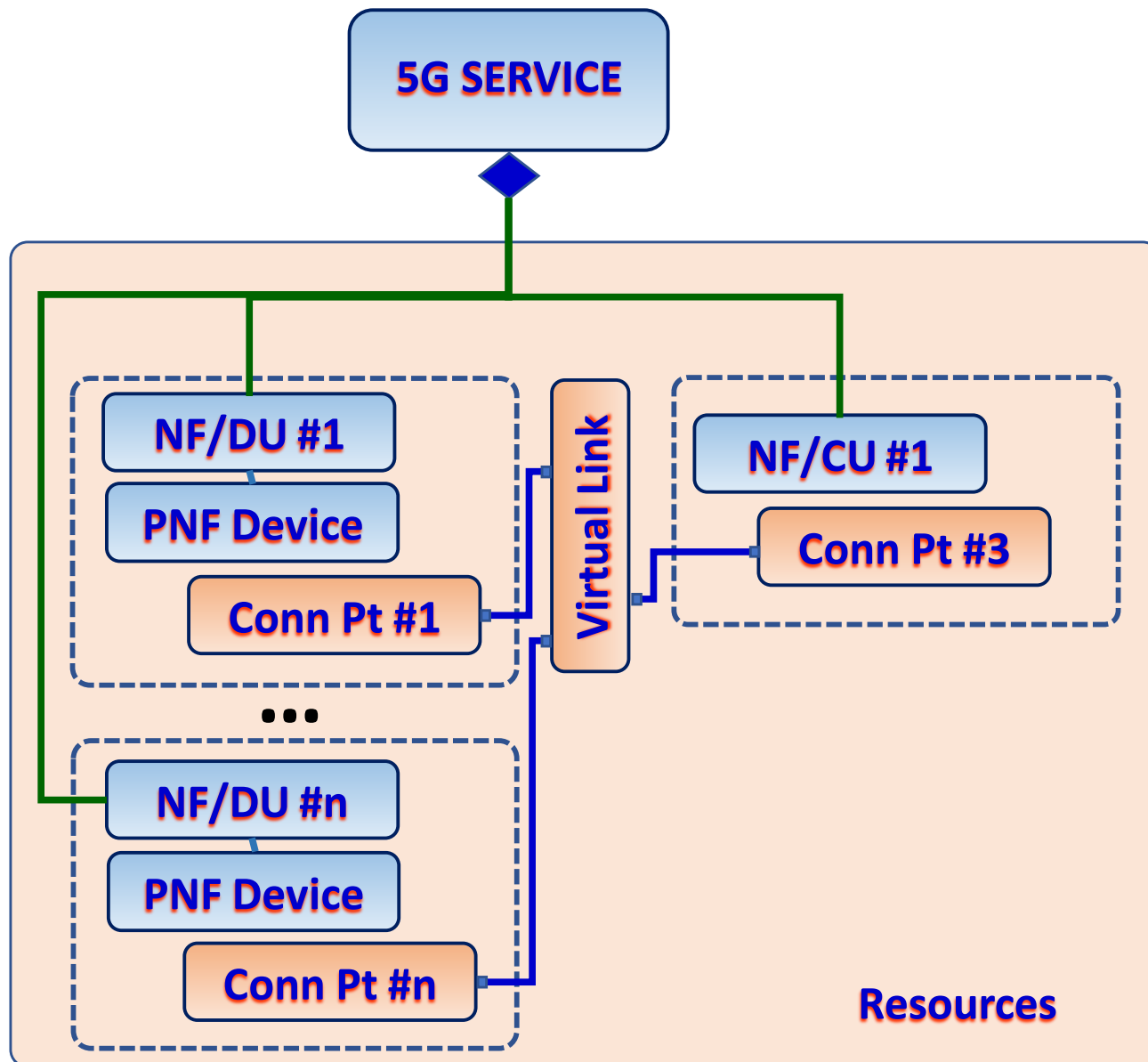
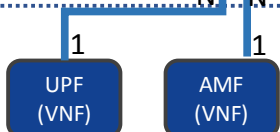
# R4: 5G Base Station (gNodeB)



## RAN Network Elements



## Core Network Elements





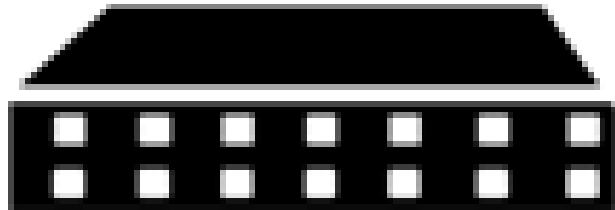
# Configurations



# MODELING WITHIN A PNF (DU)

## 5G DU (PNF)

NF PNF – “Application” S/W does 5G voice/data  
N/F Node Type  
Hardware PNF - Modem (5G DU) [Hardware]  
H/W Node Type



Sub-Component #1



Sub-Component #2



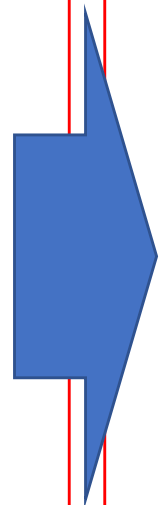
Sub-Component #n



SFP #1 = Port #1



SFP #n = Port #n



Software Function of a DU

**Network Function**

“Hardware Aspects of a PNF”

**Connection Point**

Ports / NICs

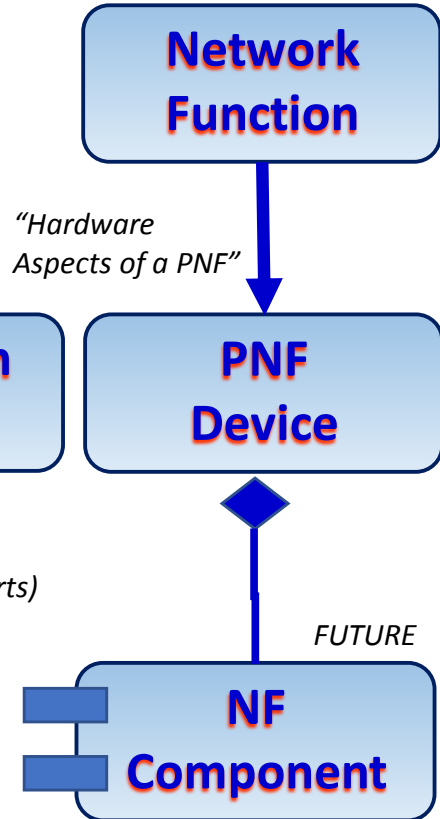
The hardware Ports  
(e.g. SFP/Backhaul Ports)

**PNF Device**

FUTURE

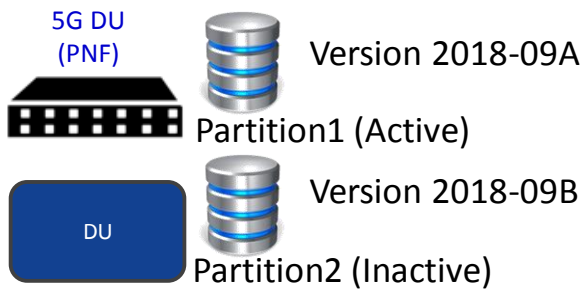
**NF Component**

Sub-components within PNF

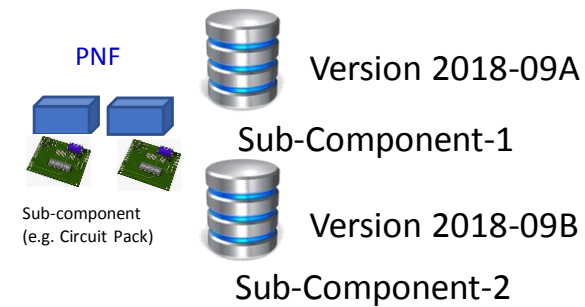


# DU Configurations

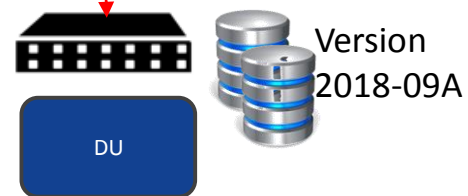
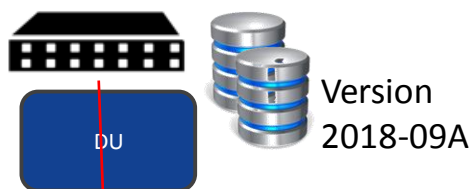
## DRIVE PARTITIONS



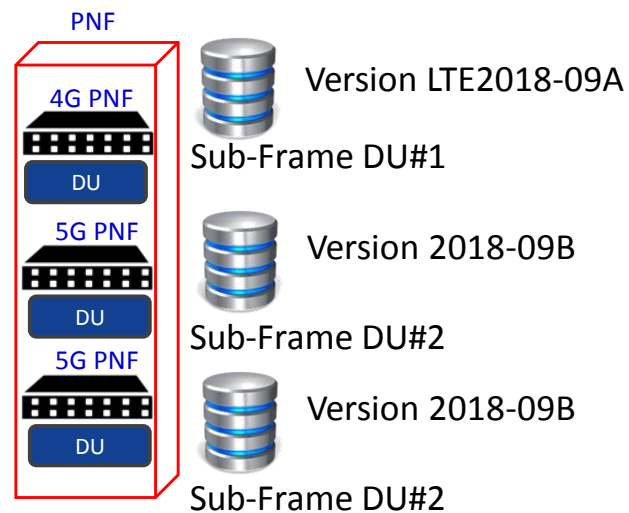
## SUBCOMPONENTS (R4+)



## MULTI-PNF DAISY CHAIN CONFIG



## TANDEM CHASSIS CONFIGURATIONS



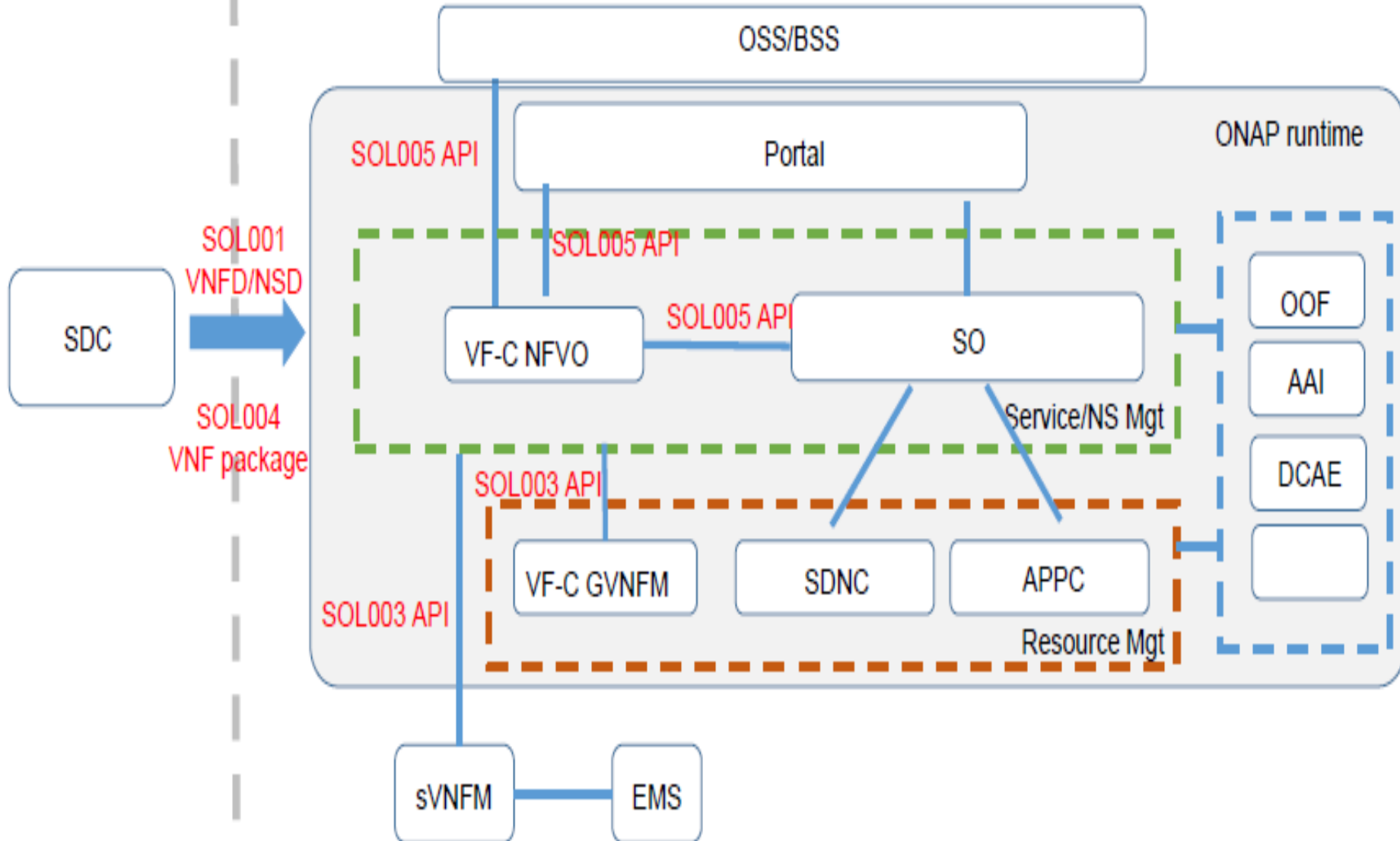
ETSI (SOL 001, SOL 004, SOL005, SOL 007)



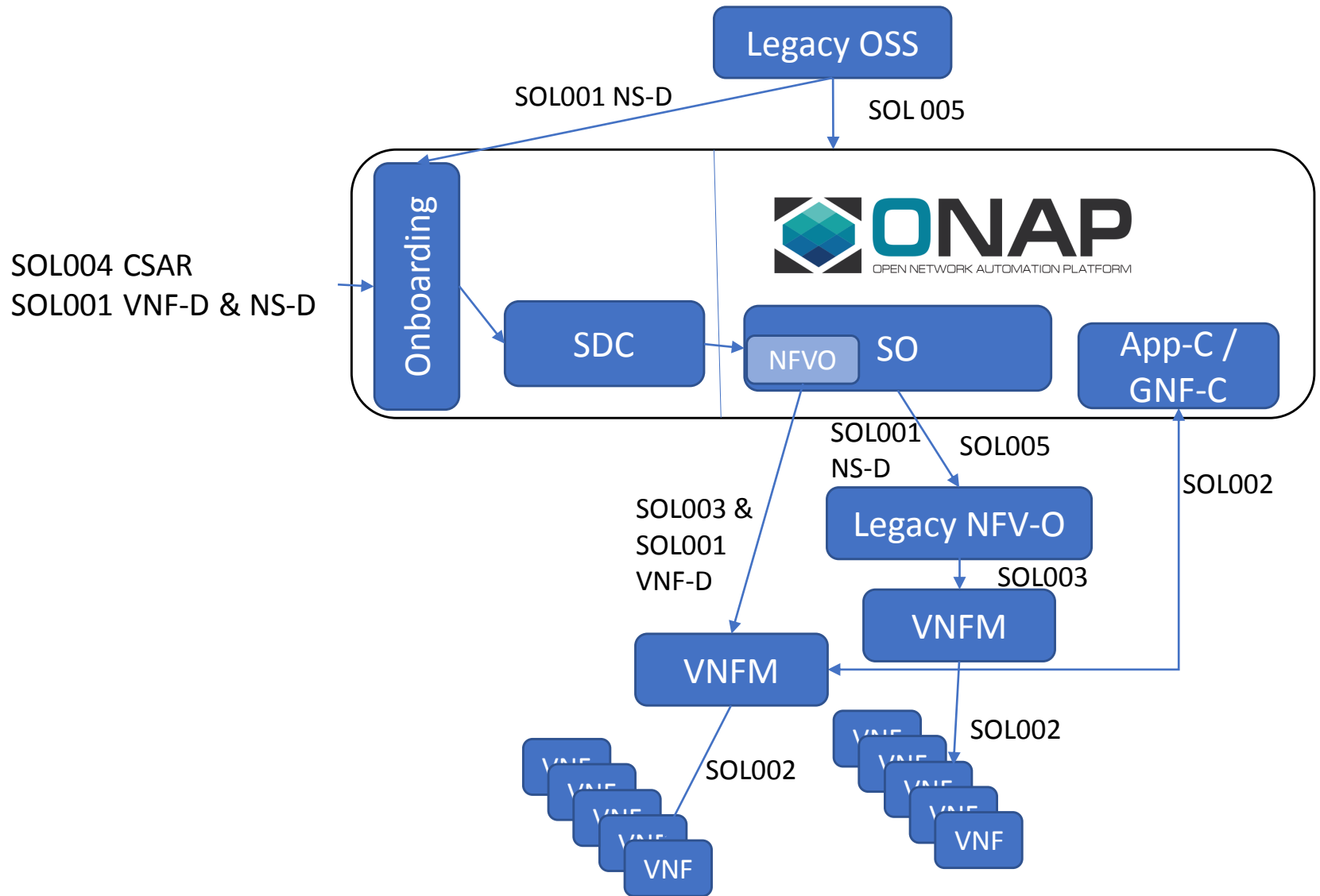
# ETSI SOL Standards

Design Time

Run Time



# ETSI SOL Standards Alignment

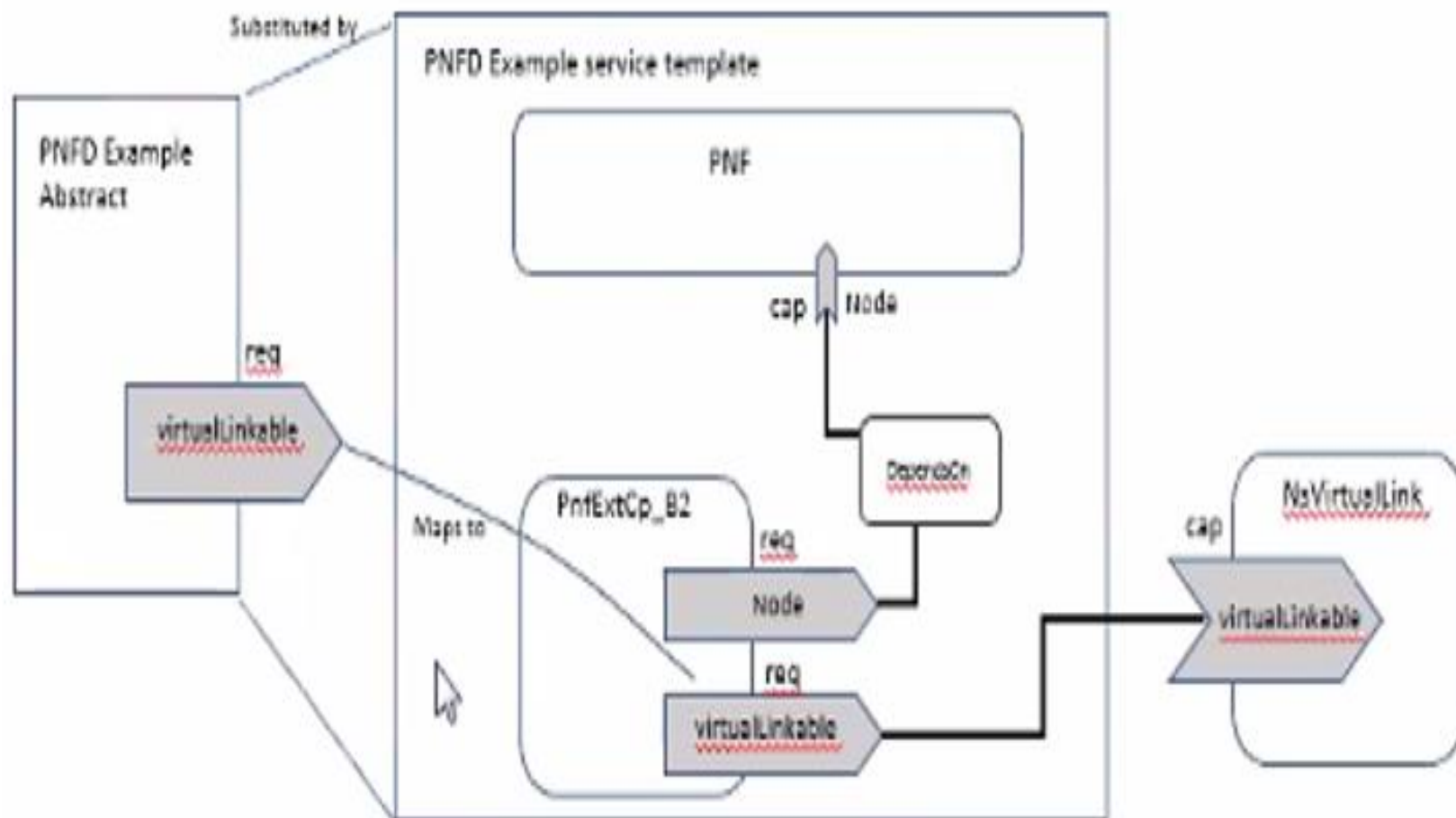




# REFERENCES / APPENDIX / BACKUP SLIDES

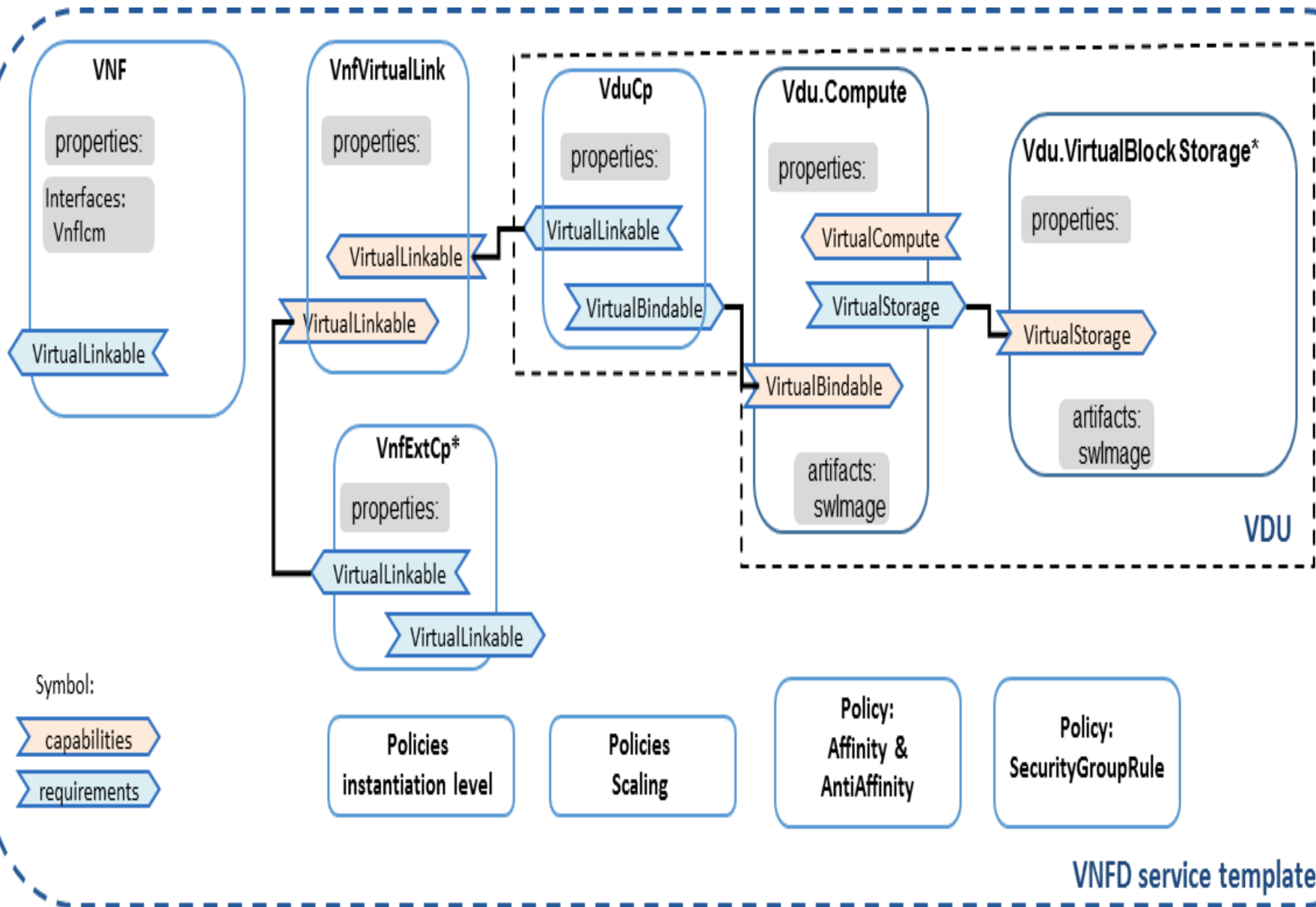
Benjamin Cheung, PhD

# ETSI (SOL 1) PNF Descriptor Model





# ETSI (SOL 1) VNF Descriptor Model



# Current R3 DM (Based on ETSI NFV)

- **ONAP R3 Resource DM Proposal based on R2+ clean Version**
  - Reference ETSI NFV SOL001 v0.6.0
  - <https://wiki.onap.org/pages/viewpage.action?pageId=38113915>
    - [Artifact Type](#) (1)
    - [Capabilities Type](#) (6)
    - [Data Type](#) (33)
    - [Interface Type](#) (1)
    - [Node Type](#) (6)
    - [Relationship Type](#) (2)