



# Use Case Realization



- Use Case Realization

<https://wiki.onap.org/pages/viewpage.action?pageId=45298907>

**[Platform Evolution for Use Case Realization w/ SO, AAI, DCAE, SDC, VID, SDNC](#)**

**ONAP10, Tue UTC 15:00 / China 22:00 / Eastern 10:00 / Pacific 07:00**

**Meeting Owner: [Benjamin Cheung](#)**

**Created Nov. 3, 2018**

ONAP Meeting 10 is inviting you to a scheduled Zoom meeting.

Join from PC, Mac, Linux, iOS or Android: <https://zoom.us/j/723094623>

Or iPhone one-tap :

US: +16699006833,,723094623# or +16465588656,,723094623#

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Dial(for higher quality, dial a number based on your current location):

US: +1 669 900 6833 or +1 646 558 8656 or +1 877 369 0926 (Toll Free) or +1 855 880 1246  
(Toll Free)

Meeting ID: 723 094 623

International numbers available: <https://zoom.us/u/aBoSd2UTS>

There are many Use Cases (VCPE, PNF SW Upgrade, 5G Use Cases etc) that require coordination across multiple Platform components and teams.

This meeting will be focused on technical discussions for realizing and delivering Use Cases.

Sample topics would be: *Controller to NF Association, Bulk PM Mapper development, 5G gNB service creation, PNF software upgrade evolution, Model evolution to support 5G Service etc.*

Nov 13, 2018

PNF Software Upgrade – what's already been in CM in VNF in-place upgrade.  
code inside for PNF/VNF. Smart to try to reconcile the two.

[5G Use Case Sub Team Wiki \(Dublin\)](#)

[CCVPN Use Case Extension \(Dublin\)](#)

[Change Management Dublin Extensions](#)

[Consistent ID of a Cloud Region \(Dublin\)](#)

[Edge Automation Functional Requirements for Dublin](#)

[K8S based Cloud-region support](#)

[Scaling Use Case \(Dublin\)](#)

[SP priorities for Dublin](#)

[Use case proposal: BBS Broadband Service \(Dublin\)](#)

[5G - Bulk PM \(Casablanca carry-over items\)](#)

[5G - OOF and PCI \(Casablanca carry-over items\)](#)

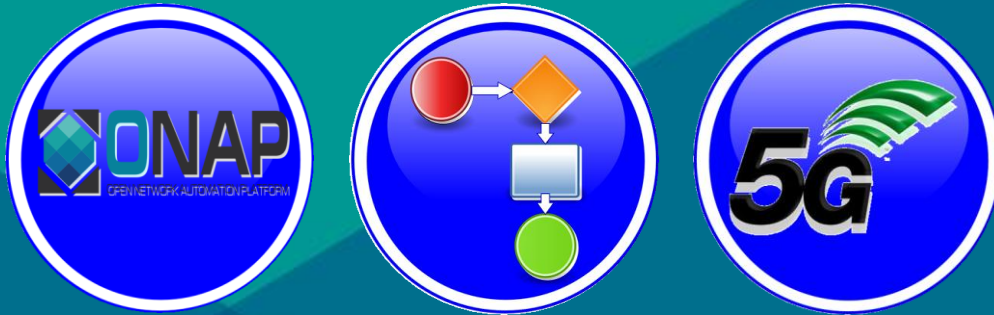
[5G - PNF Plug and Play \(Casablanca carry-over items\)](#)

[5G - PNF SW Upgrade \(Casablanca carry-over items\)](#)

[5G - Real time PM \(Casablanca carry-over items\)](#)

[5G - Slicing](#)

## 5G Modeling

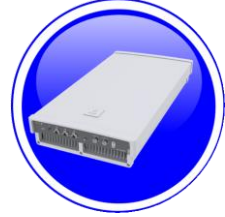


- Use Case Realization

# Onboarding and Design Time



WHAT	Onboarding Package	Onboarding Descriptor	Platform ONAP Model	NF Instance
WHEN	Package Delivery	Onboarding Process	Design Time	Run Time
WHO	Vendor	Technology Specialist Asset Manager	Service Designer Operations Specialist	Operations Specialist
	SOL 001 PNF-D	SOL 004 Package	-	-



# Onboarding and Design Time



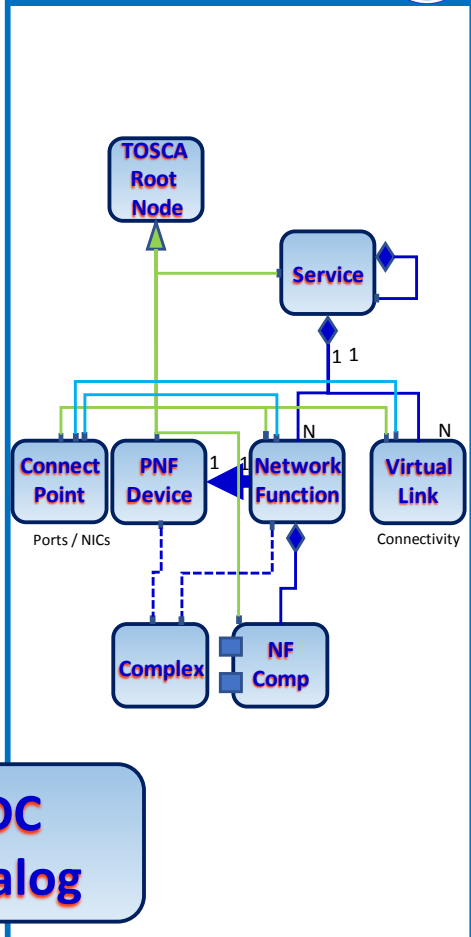
Onboarding Package	
Onboarding	
Vendor	

- PNF Descriptor
- PNF Registration
- PM Schema
- Informational Artifacts
- Configuration Files
- Ansible Playbooks

NF Descriptor	
Onboarding	
Asset Manager	



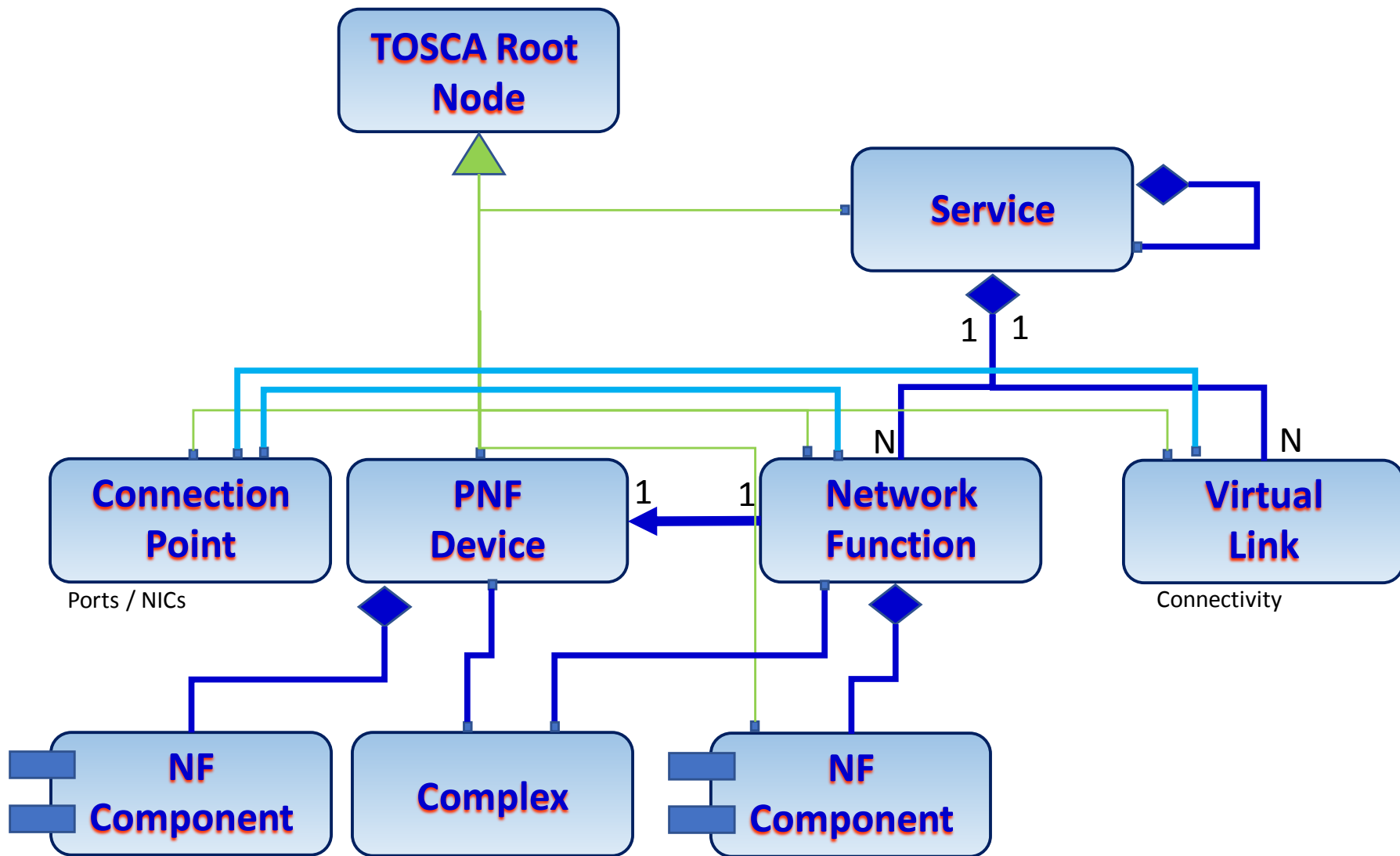
Platform ONAP Mode	
Design Time	
Service Designer	



NF Instance	
Run Time	
Operations	

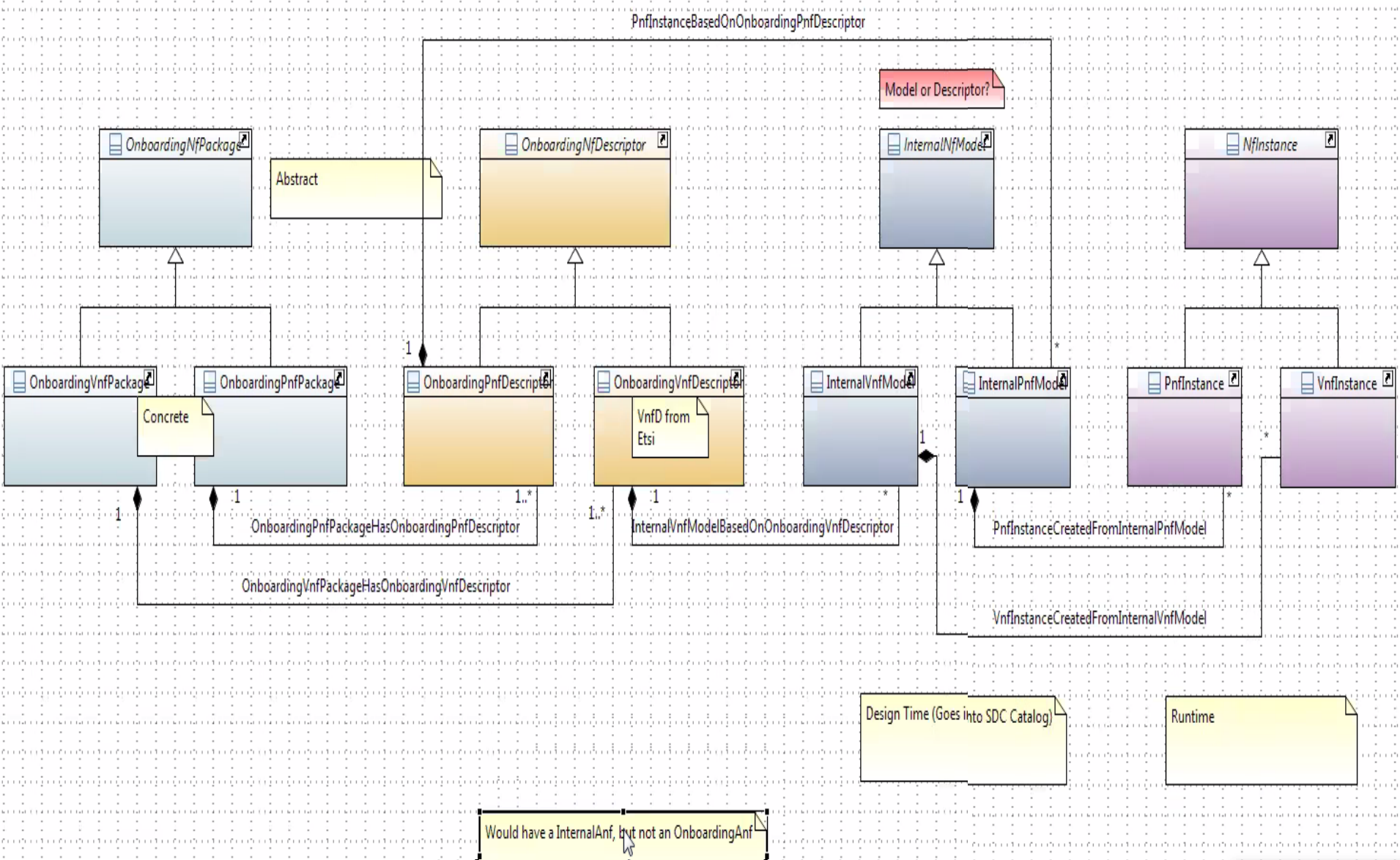


# ONAP Platform Data Model

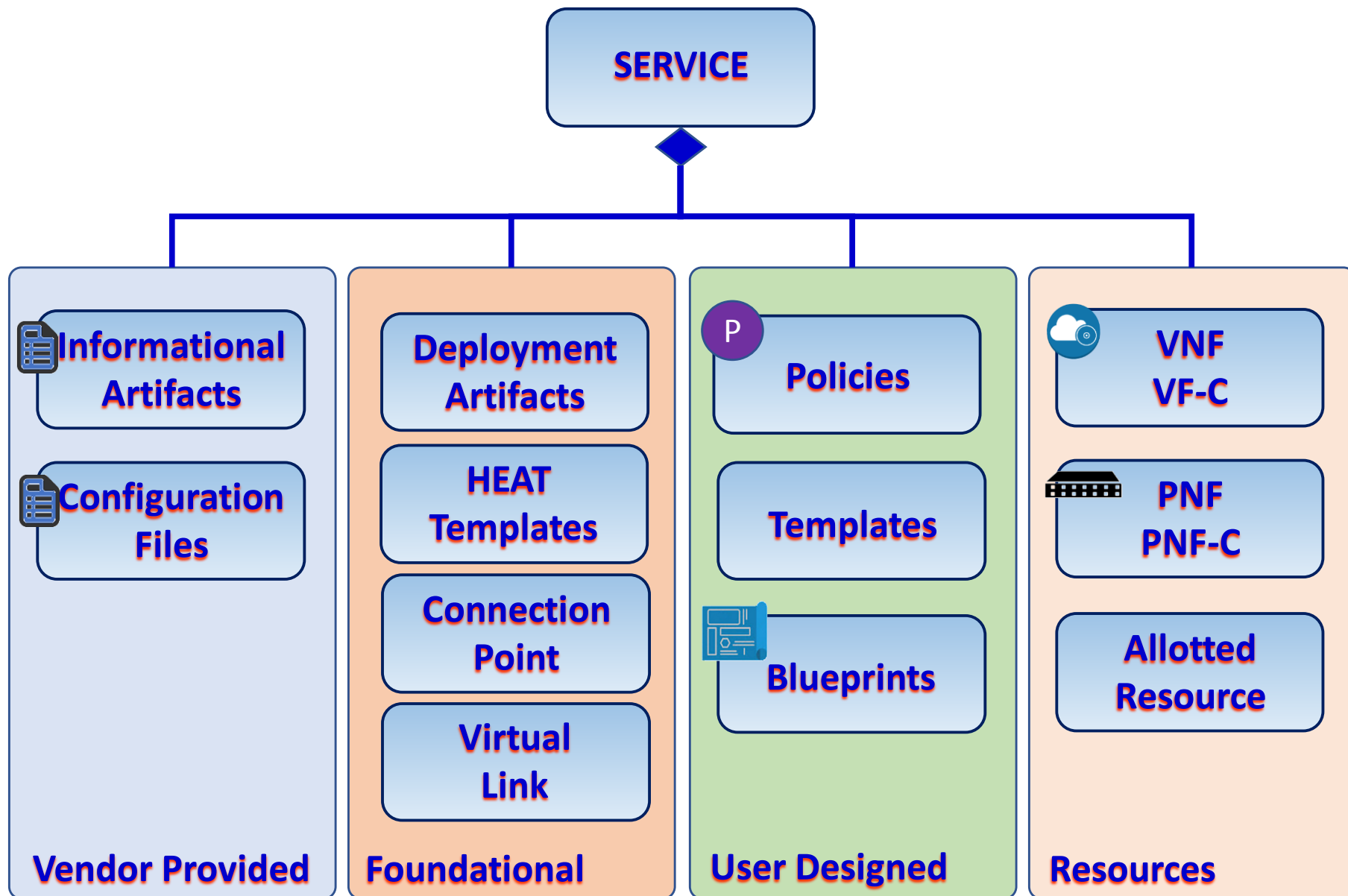




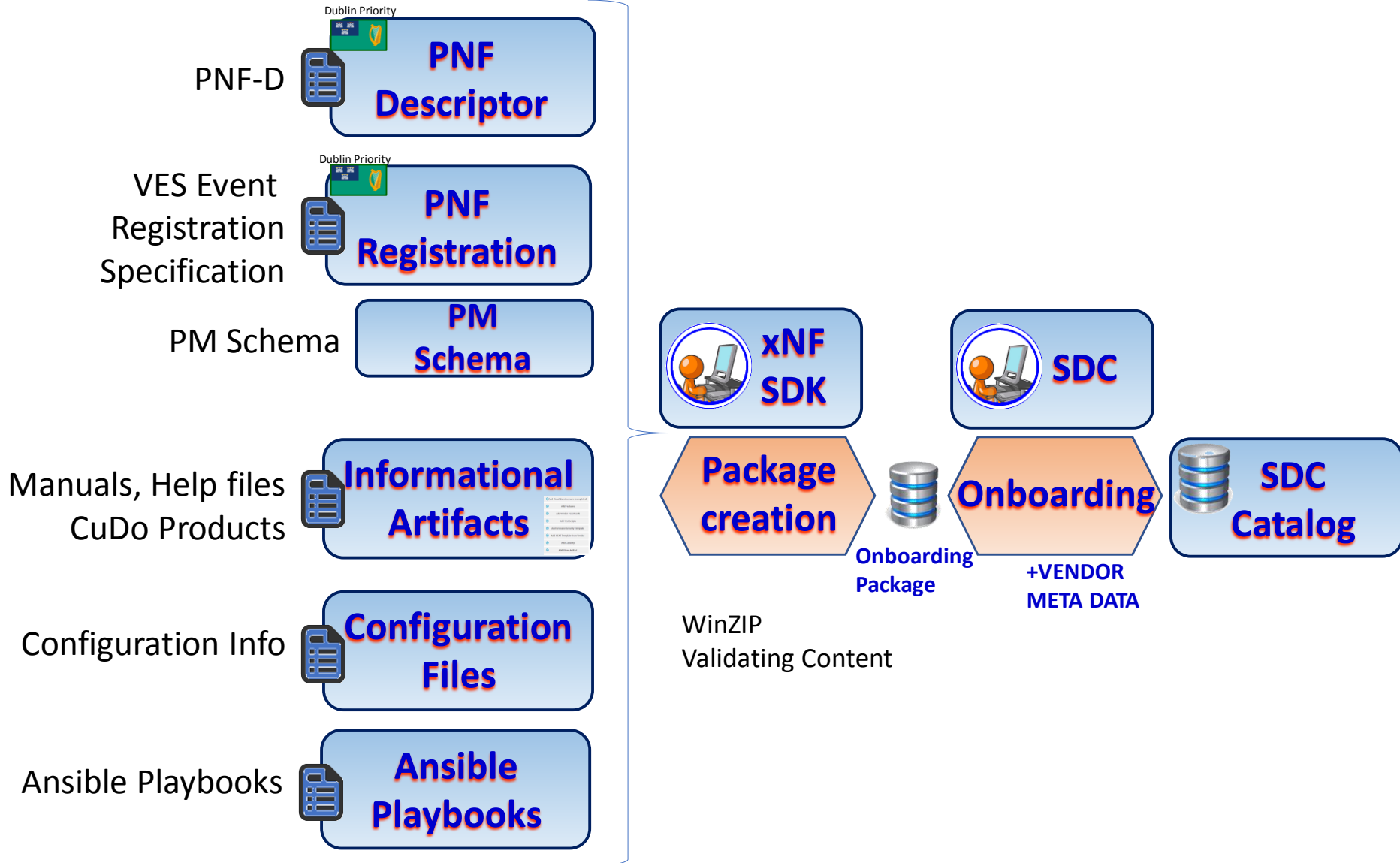
# Onboarding and Design Time



# Defining a Service



# PNF ONBOARDING



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



## eMBB (enhanced Mobile Broadband)

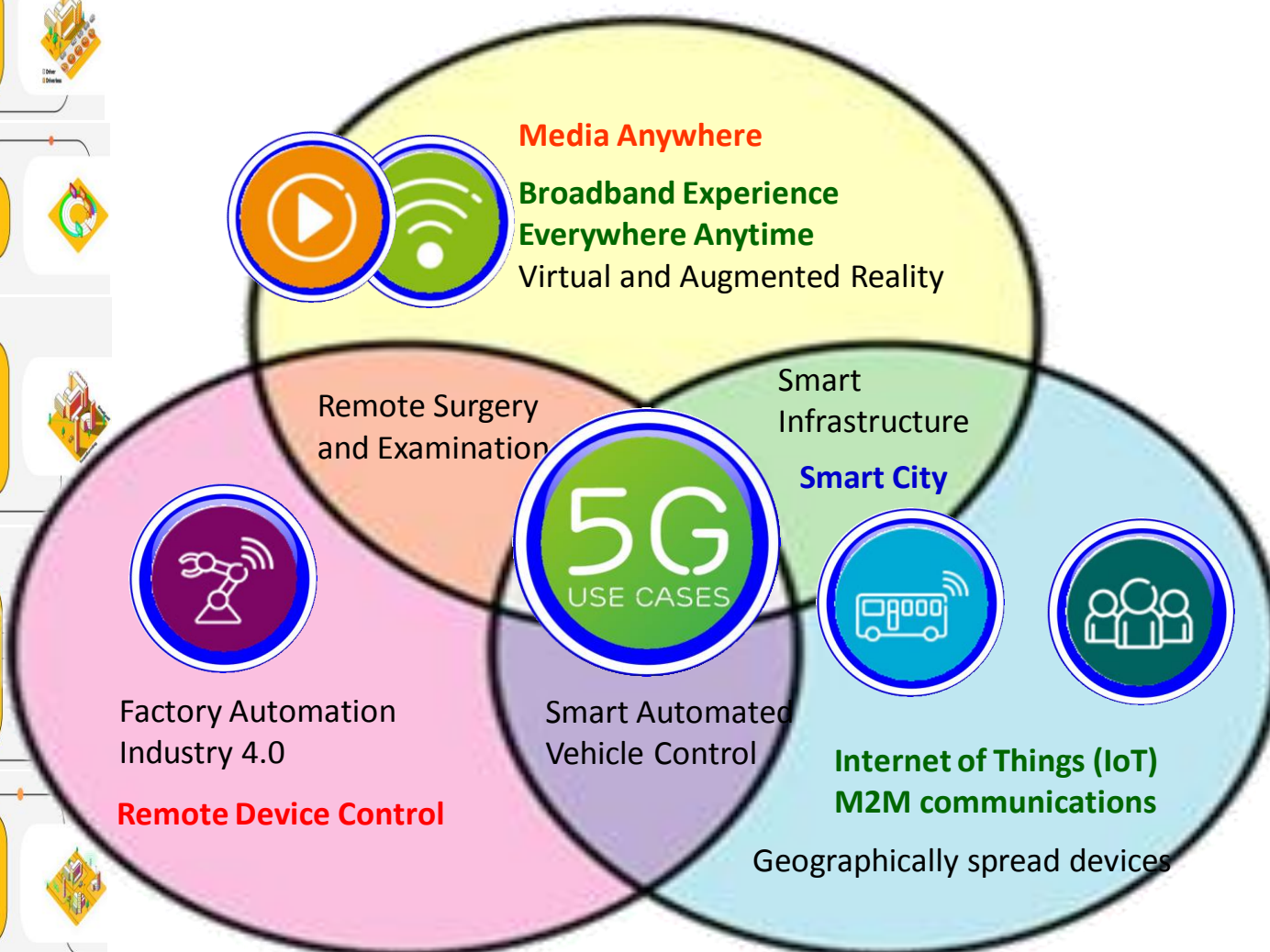
**LATENCY**  
Humans don't have instant reaction times. When every driver has a slightly delayed response to instant stimuli, we end up with traffic jams. 5G is the first generation of networking that's being designed for machines like autonomous cars. By reducing network latency, it's enabling near instantaneous reaction times.

**SPEED**  
5G isn't just faster than 4G, it's at least ten times faster. Think about what your business does for customers today. And then think about what it could do with a 10x uplift in speed.

**COVERAGE**  
Until now, network coverage strategies were optimized for one primary use case: people with smartphones, moving around. 5G will combine new technologies in new ways to provide better coverage. Smaller antennas in massive arrays will make a single base station act like many, and beamforming techniques will focus data streams at specific users, landing them as they move—even bouncing signals off walls to maintain the connection.

**CAPACITY**  
Serving a few hundred users with new connected experiences is a challenge. Serving 50,000 at the same time? That's not. We have a capacity challenge. Today's network capacity can't come close to handling the volume of new technology 5G networks can. Partly because they'll use multiple types of spectrum. 4G uses MIMO. That means each tower uses, for example, four transmitters. With 5G Massive MIMO, we'll use 64 transmitters. This means network capacity will increase by 10x what's available today.

**DENSITY**  
People and IoT devices are never evenly distributed. They cluster in places like cities, stadiums, airports, and airports. 5G can handle that because it's being designed to connect a world with hundreds of thousands—over millions—of devices per square mile. In a 5G world, every streetlight, road sign, car, parking space, shipping container, and crowd will be connected.



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

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

**mMTC (massive Machine Type Communications)**

# 5G Key Technology Components



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



**Software Defined Networking (SDN)**



**Advanced Beamforming**



**Network Functions Virtualization (NFV)**



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



**Network Slicing**



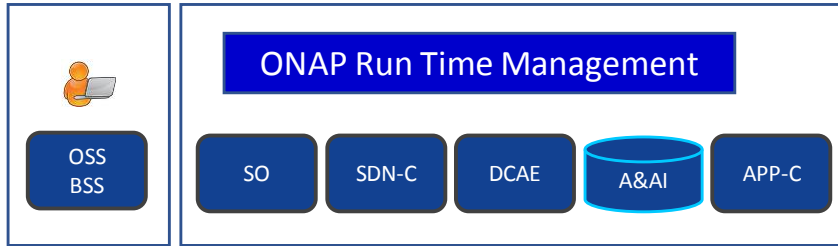
**Edge Computing**



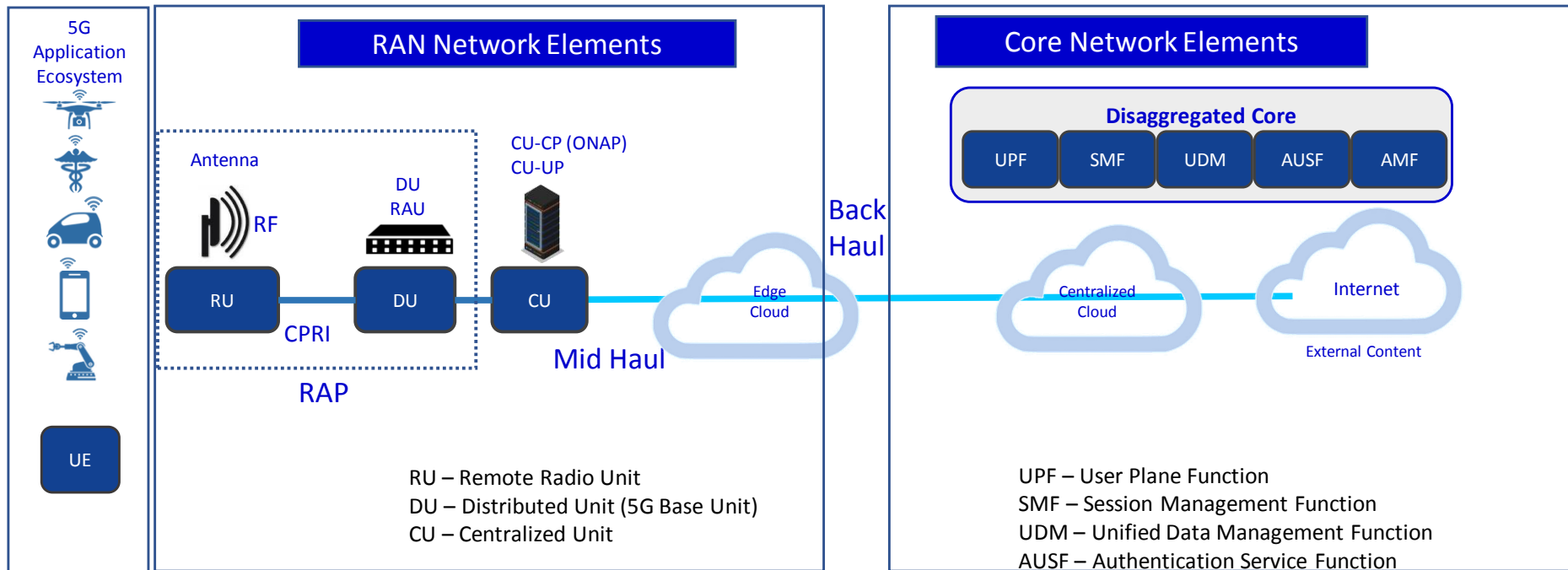
**Fog Computing (FC)  
Mobile Edge Computing (MEC)**



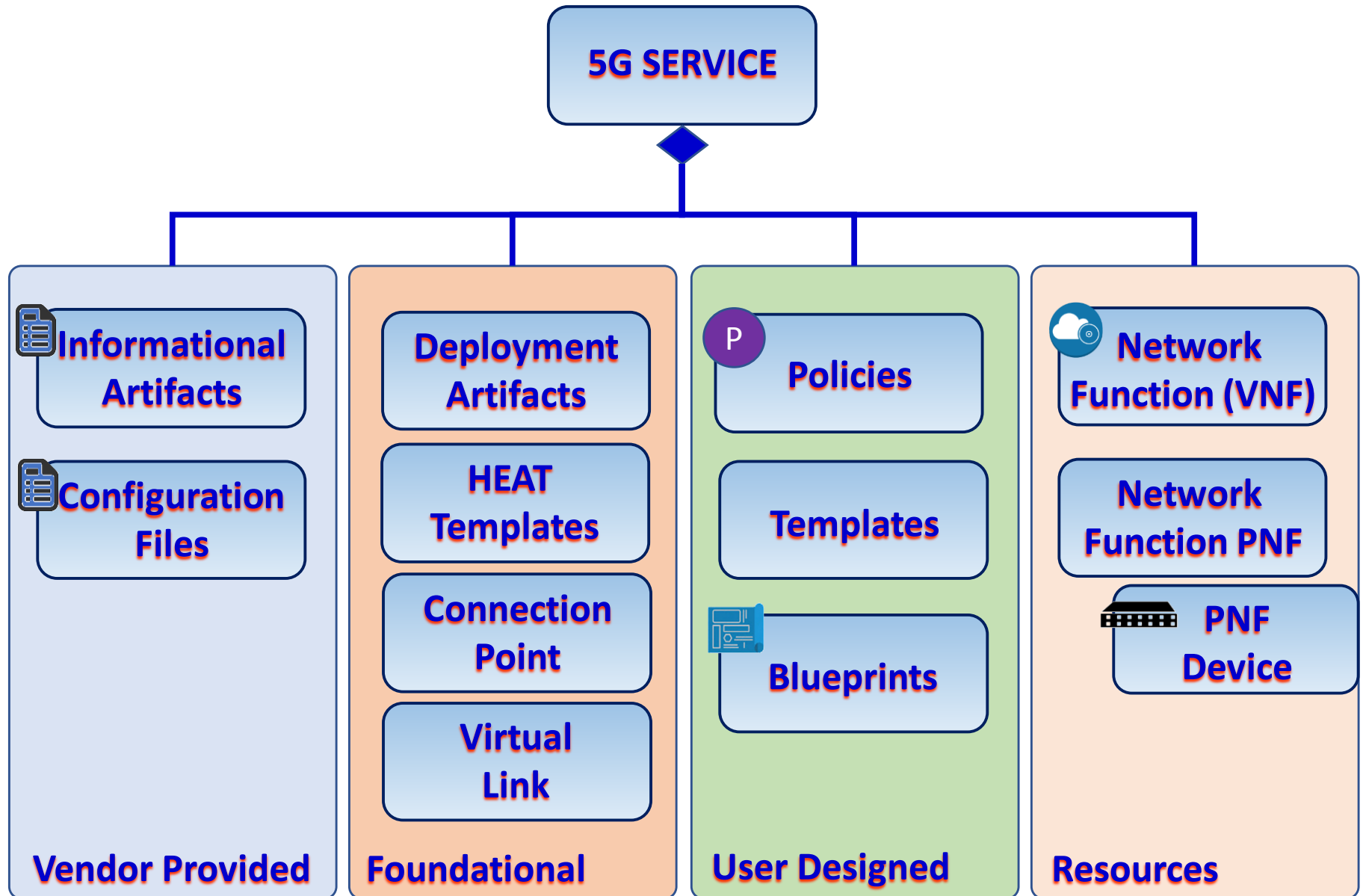
# 5G RAN Wireless Network



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



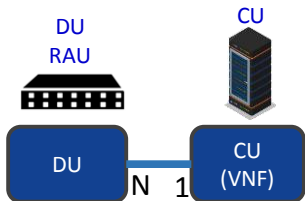
# R4: Modeling a 5G Service



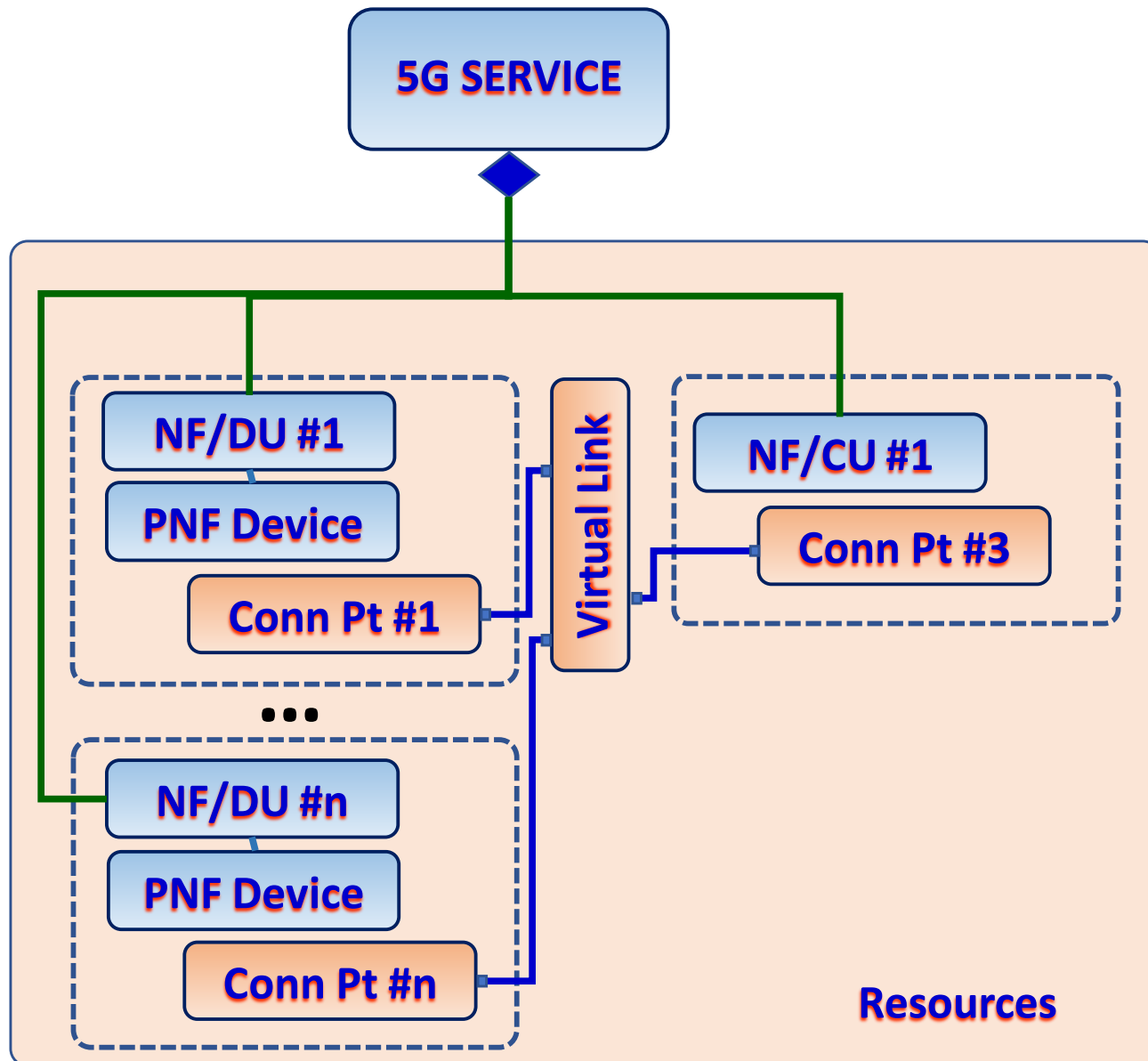
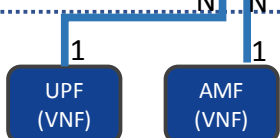
# R4: 5G Base Station (gNodeB)



## RAN Network Elements



## Core Network Elements



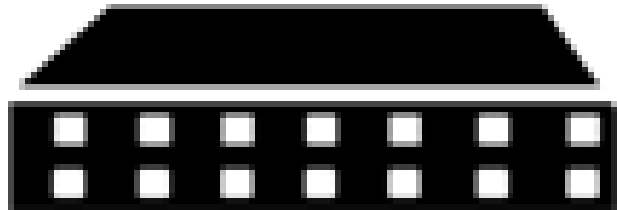


# Configurations



# MODELING WITHIN A PNF (DU)

## 5G DU (PNF)



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**

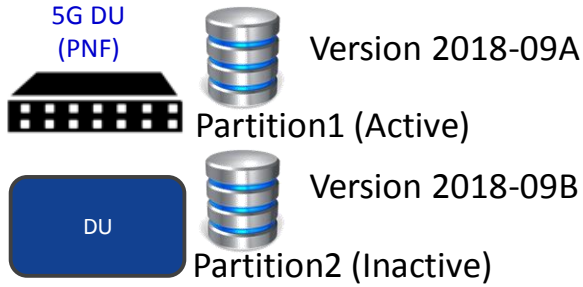
*FUTURE*



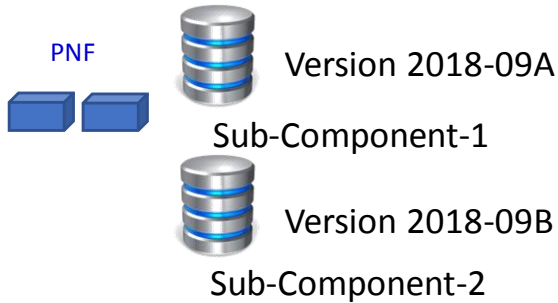
*Sub-components within PNF*

# DU Configurations

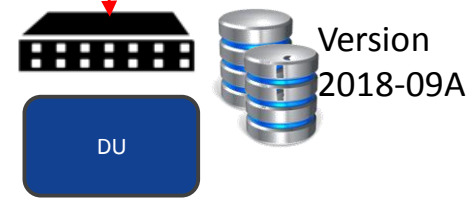
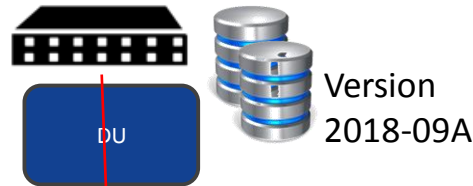
## DRIVE PARTITIONS



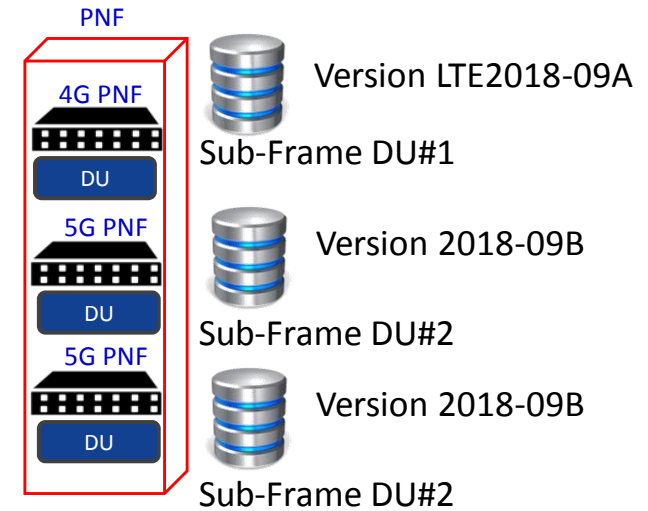
## SUBCOMPONENTS (R4+)



## MULTI-PNF DAISY CHAIN CONFIG



## TANDEM CHASSIS CONFIGURATIONS





# CONTROLLER TO NF ASSOCIATION



Benjamin Cheung, PhD

# TECHNOLOGY DOMAINS

## ONAP Deployment

### ONAP Platform Controller (Run Time)

VF-C

SDN-C  
SDN-R

APP-C

[New/Future]  
X controller

**Technology Domain**  
(Service Provider Specified)

### Wireless RAN

PNF-A

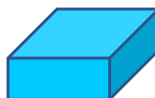


VNF-A



### Optical

PNF-B



VNF-B



### IoT

PNF-C



VNF-C



### PROBLEM DESCRIPTION

Pictured above are three different kinds of PNFs. In orange are wireless (RAN) base stations, such as 5G DU units and their corresponding 5G VNFs. For Optical, there are SOTN PNFs for example as used in the CCVPN use case. Then pictured in green are IoT PNFs. These might include things like smart home units, smart doorbells and the like. Each of these PNFs fall into a domain category, Wireless, Optical, IoT. These categories are just example categories. There will be many other divisions. Each of these categories of PNFs & VNFs will have attending Controllers. For any service provider, (w/ a mix of different vendor NFs, they will have the same Controller)

# DYNAMIC ASSOCIATION APPROACH

Tech Domain	NF (PNF/VNF)	ONAP Platform Controller	Function (API)
Wireless	E// 5G DU	SDN-C	SDN-C Generic API
Wireless	Nokia 5G DU	SDN-C	SDN-C Generic API
Wireless	Huawei 5G DU	SDN-C	SDN-C Generic API
Wireless (Vendor xyz)	Xyz 5G DU	SDN-C	SDN-C
Wireless Subdomain 1	Xyz 5G DU	VF-C	VF-C
Wireline	Wireline PNF	APP-C	APP-C Assign > APP-C Modify Config Restart Stop/Start

# INSTANTIATION / ONBOARDING



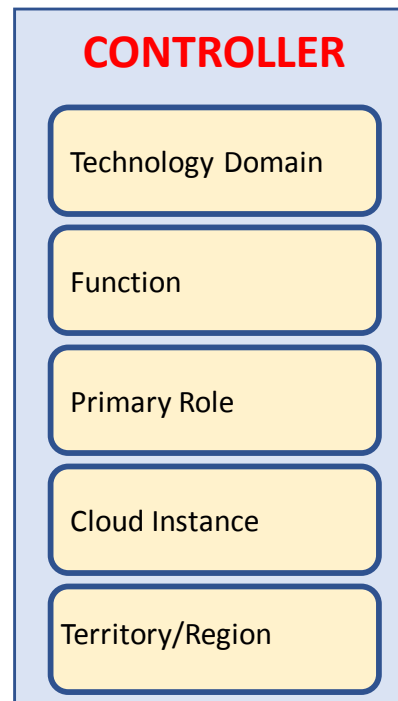
## DESIGN TIME:

### INSTANTIATE CONTROLLER (ONAP Installation)

**WHO:** Capacity/Network Planning Team (Service Provider),  
ONAP Installation Team (Service Provider)

1. **EMPTY TABLE** – In ONAP Build, an Empty Table is Created with no values
2. **ONAP INSTANCE** - SP provisioning/setup of ONAP instance/installation. i.e. SO, SDN-C, APP-C configuration
3. **CONTROLLER INSTANCES** - SP Create instances of ONAP Platforms Controller (SDN-C, APP-C, VF-C)
4. **ONBOARD CONTROLLERS** - Onboard Profile Controller (tech domain, function, role, cloud instance, territory/region)
5. **CONTROLLER PART OF TABLE** - Fill in the Controller part of Table.
6. **SO** - SO spins up, **Controller Registration MSvc**, Controller spins up it uses the Controller Registration Micro-Service (CRMS).

Tech Domain	NF (PNF/VNF)	ONAP Platform Controller Instance	Function (API)



# DESIGN TIME : SDC

## STEP 1: DESIGN TIME

**WHO: SDC Design Studio, Service Operator**

**INSTANTIATE CONTROLLER (Design Time)**

1. **xNF-SDK** - Input to SDC TOSCA template from xNF-SDK (or manual) that specifies what the NF needs from a controller and NF properties. VNF SDK describe attribute functionalities needed within the TOSCA model those capabilities are mapped into a controller based on the table.
2. **Onboard** – Onboard xNF-D, Defining Models & Artifacts, Updating SDC Catalog
3. **CSAR** - NF information put into the SDC artifacts/CSAR Package
4. **SDC UPDATES** - (optional) SDC could also update the Controller section of the table (by specifying controller information). Tool/Script to controller information if necessary (due to typos, adaptations for congestion, migrations, new technology domains, etc).
5. **DISTRIBUTE** - SDC distributes Artifacts (CSAR) to ONAP components & listeners
6. **INGEST MODEL** - ONAP Components ingesting the model (SDC artifacts), **SO populates the table** (NF part of the table “new”, UPDATES the rest of the table from Optional updates [in step 1d.]).

## STEP 2: DESIGN TIME

**NF MODEL (Design Time)**

NF Model ingestion/onboarding

NF part of table updated (Vendor Class of NF)

CSAR > VNF SDK

Tech Domain	NF (PNF/VNF)	ONAP Platform Controller Instance	Function (API)	NF (Type)
Wireless	E// 5G DU	SDN-C	Generic API	Technology Domain
Wireless	Nokia 5G DU	SDN-C	Generic API	Function
	Huawei 5G DU	SDN-C	Generic API	Primary Role
Wireless	Xyz 5G DU	SDN-C	SDN-C	Cloud Instance
				Territory/Region

**NF PACKAGE**

**CSAR file**

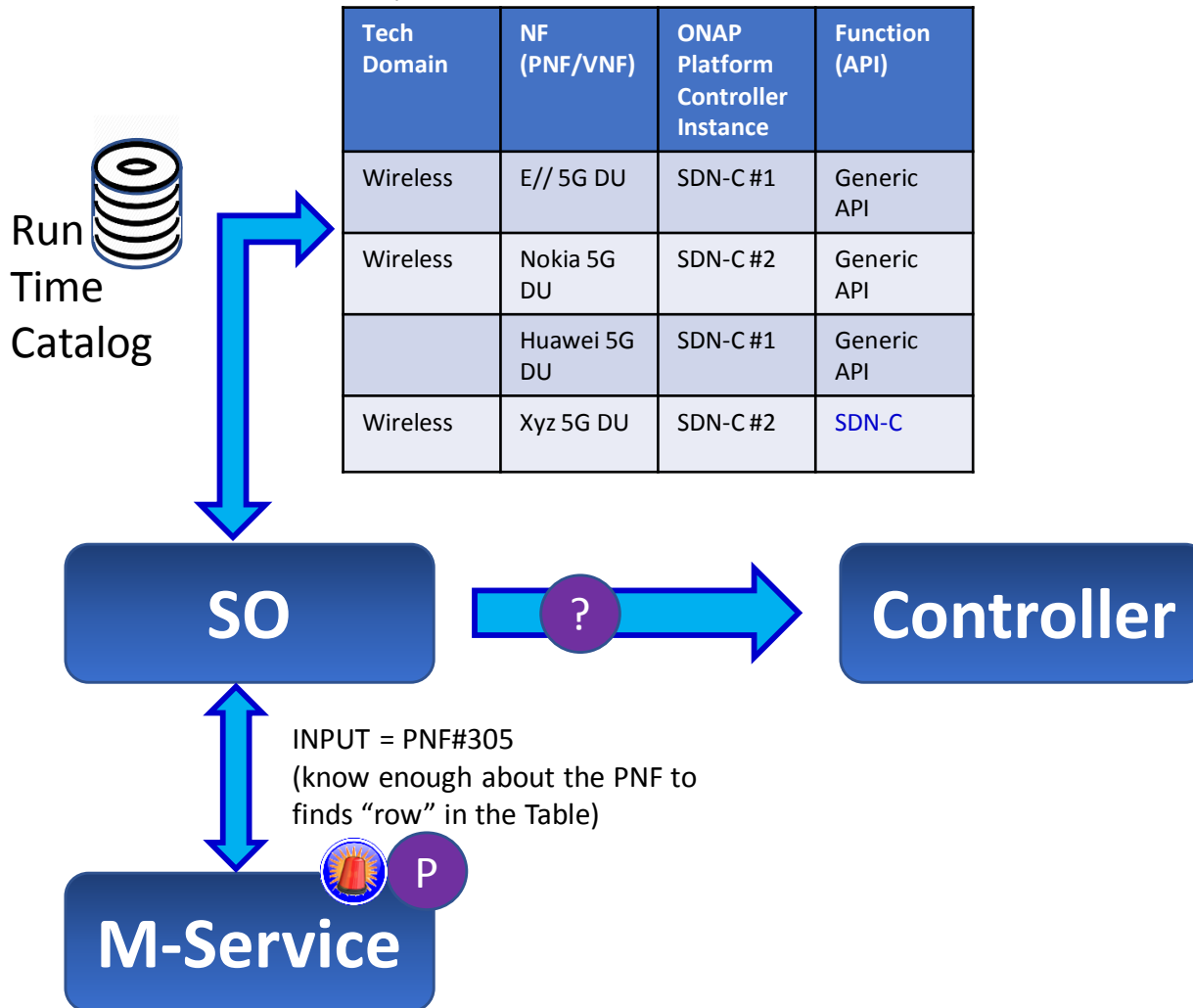




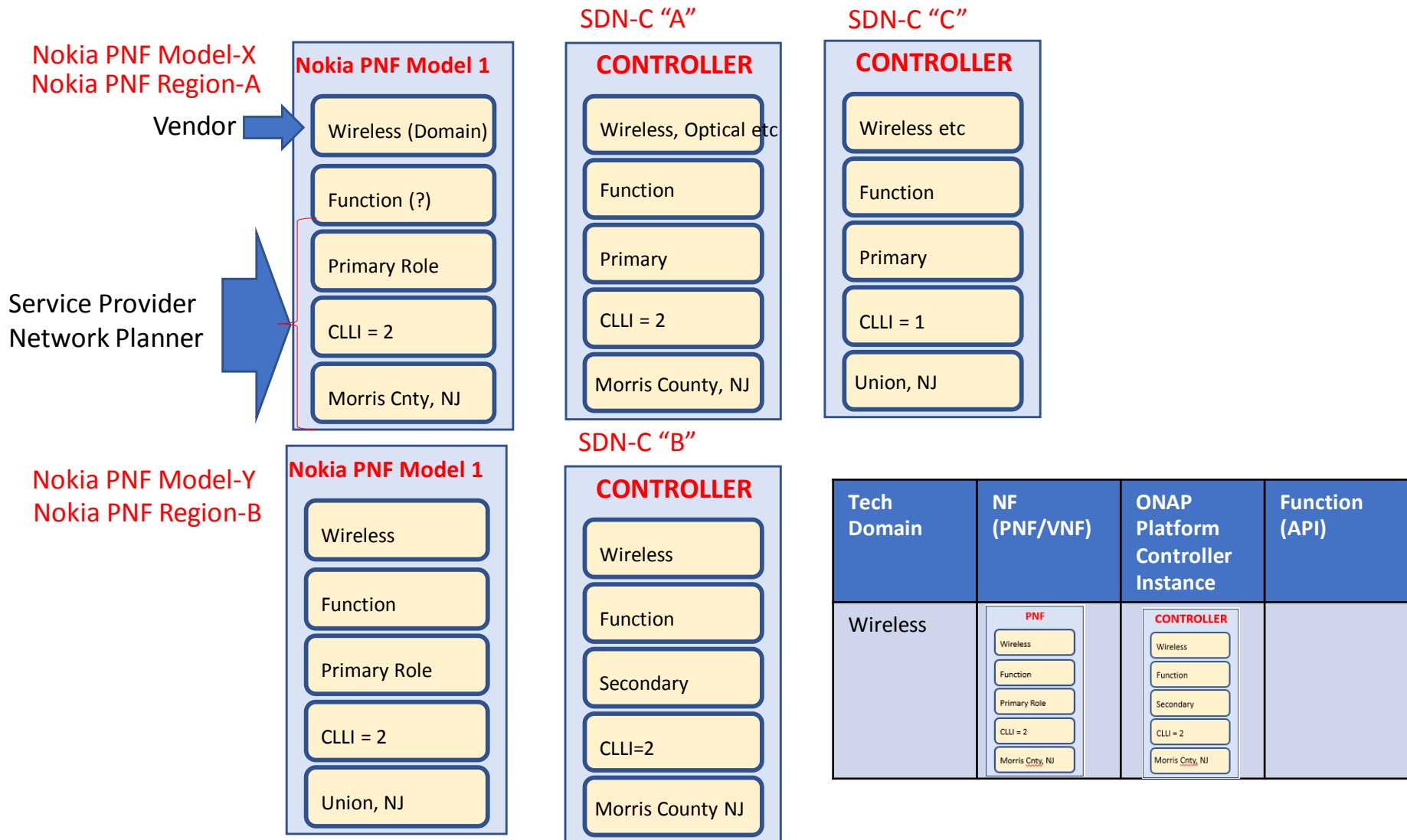
# RUN TIME

## STEP 3: (RUN TIME OPERATION)

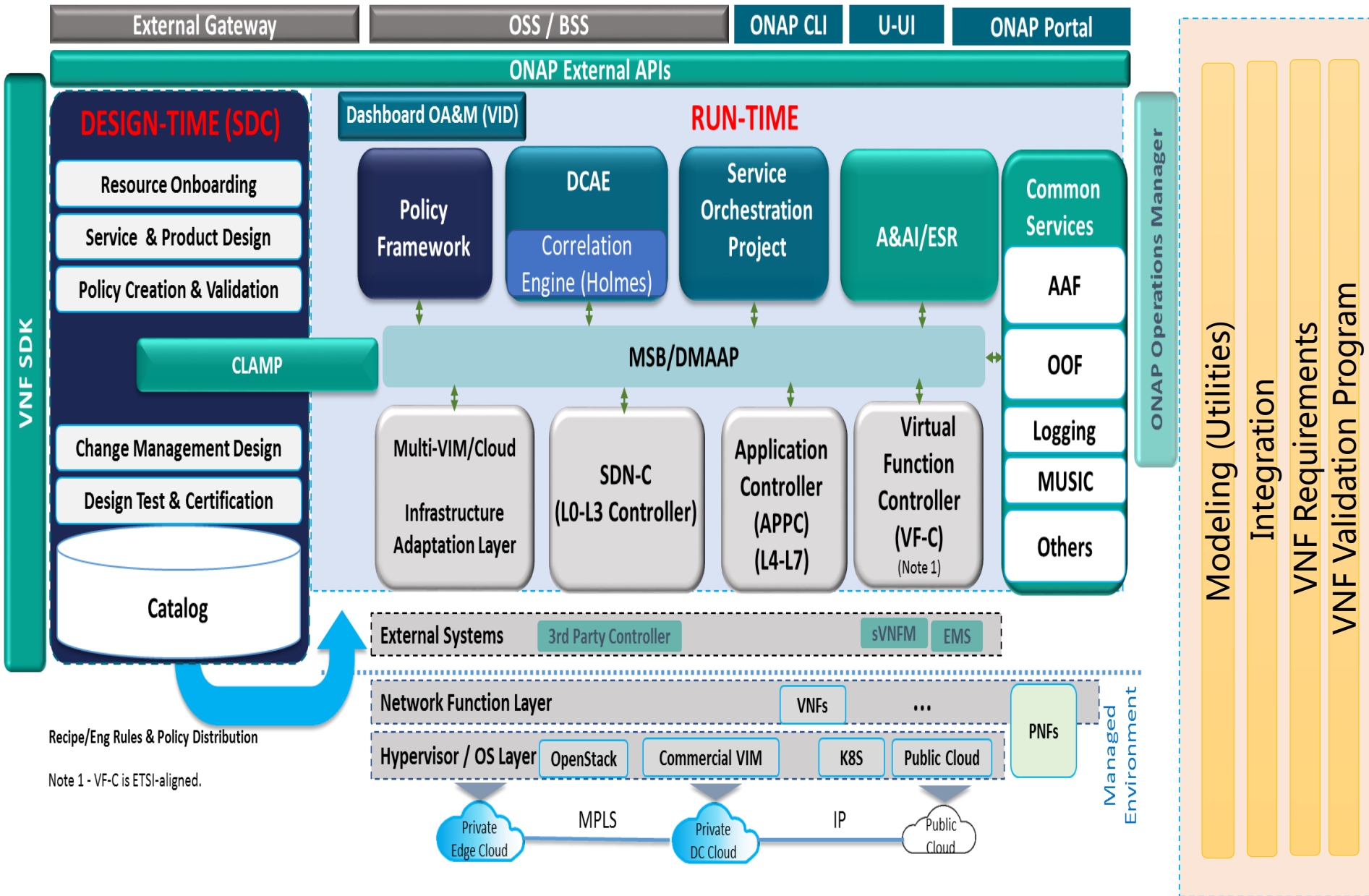
1. **USE TABLE** - Components in ONAP (e.g. SO, policy) USE the table to find the appropriate controller & APIs for a NF.
2. **POLICY ACTION** - When policy's action require a controller look at the table. When policy's action is to consult w/ SO it knows how to talk to SO. EXAMPLE: Message from NF, executing a Use Case. e.g. Threshold > NF > DCAE > Policy > Action > SO: Controller to interact w/ NF



# RUN TIME



# ONAP Architecture



Recipe/Eng Rules & Policy Distribution

Note 1 - VF-C is ETSI-aligned.

Nov 6,

**ATTENDEES** – Ben Cheung, Chesla Wechsler, Oskar Malm, Rebecca Lantz, Li Xiang, Peter McCann, William Diego, Guobiao Mo, Min Yoon, Ning Zhu, Martin Skorupski, Scott Blandford, Gil Hellmann, John, Lukasz Grech, Zu Qiang, Yan, Ahmad Khalil, David Smith, Gerard Hynes, Yao Guang

Nov 14, 2018

**ATTENDEES** – Chesla Wechsler, Gil Bullard, Ulas Kozat, Oskar Malm, Jimmy Forsyth, Li Xiang, Zu Qiang, Jacqueline Beaulac, Scott Blandford, Dermot Melia John Ng, Marge Hillis, N. K. Shankaranarayanan, Gerard Kelly, Yao Guang wang, Rebecca Lantz, Abhay Narayan Katare