

# ONAP 5G USE CASE ENHANCEMENTS FOR PNF DEPLOYMENTS

- ONAP and 5G USE CASE Enhancements
- PNF (Radio Network) Deployments
- R3 CASABLANCA RELEASE







- 5G Use Case Team

# ONAP PNF Plug and Play Enhancements

- ONAP and PNF Plug and Play Enhancements
- PNF (Radio Network) Deployments
- For R3 Casablanca (and onwards)

- 5G Use Case Team

# PNF PNP ENHANCEMENTS OVERVIEW

TOPIC	ICON	DESCRIPTION
<b>PNF Registration Handler (PRH) Improvements</b>		New VES Event domain for PNF registration with corresponding support in VES collector, DMaaP and PRH.
<b>SO Workflow enhancements</b>		Introduction of dedicated 5G use case work-flow
<b>Service Configuration Improvement</b>		Service configuration improvements from APP-C/SDN-R to PNF after PNF registration to PRH
<b>Security Enhancements</b>		Authentication, Certificates, User name & password and intra-ONAP security.
<b>Modeling enhancements</b>		Modeling enhancements to support 5G PNF in ONAP. Inheritance, and PNF characteristics for sharing. Focusing on PNF connectivity. PNF-SDK.
<b>PNF Onboarding / Package</b>		Defining <i>PNF Onboarding Package</i> . Extending framework to work with PNFs. Defining PNF Package framework.

# PNF PnP: PNF REGISTRATION HANDLER ENHANCEMENTS

## DESCRIPTION

*PNF Registration Handler (PRH) Enhancements.*

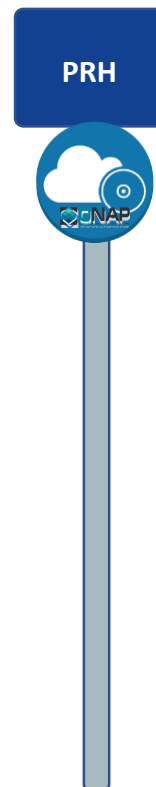
### (1) New VES Event domain for PNF Registration –

Create new VES event domain for PNF registration with corresponding support in VES collector, DMaaP and PRH. PnP Use case was using the “other” domain to register VES events. For Casablanca, we propose using a dedicated domain. VES separation of events. VES agent update in PNF.

**(2) VES EXTENSIONS** - As a result, VES collector and VES agent content will change with field updates using the new domain. Extensions for PNF registration fields. Corresponding VES Schema change (requires approval and coordination from ONAP community).

**(3) PNF REGISTRATION EXCHANGE UPDATE** – The registration VES event used by the DU Simulator (or actual PNF) will need to update its JSON payload to match the changes above.

## OVERVIEW



## PROJECTS

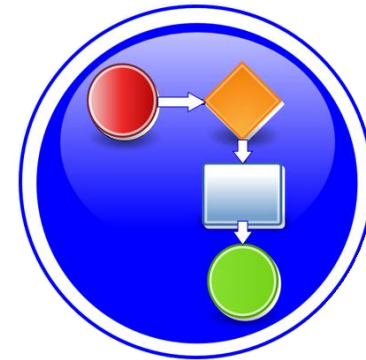
PNF Registration Handler, AAF

# PNF PnP: SO WORKFLOW ENHANCEMENTS

## DESCRIPTION

- (1) **SO WORKFLOW ENHANCEMENTS** – Dedicated 5G BTS Workflow in SO. (If not model-driven would need special 5G BTS workflow)
- (2) **PNF WORKFLOW** – Extensions to Beijing SO Workflow (part of VCPE workflow). Developed in Beijing not tested or integrated.
- (3) **MODEL DRIVEN** – SO not yet model driven. Need to solve vis-à-vis a SO work flow specific to service & resource use case.
- (4) **UPDATE PNF WORKFLOW** – needs to be officially tested, accepted (in Casablanca).
- (5) **SDN-R TO SO INTERACTION** –SO calls SDN-R (Generic API call vs REST call)
- (6) **DFX (Design for Excellence)** – Resilience, Performance, Scalability, Stability, Multi-site.

## OVERVIEW



## PROJECTS

PNF Registration Handler, DCAE

# PNF PnP: SERVICE CONFIGURATION ENHANCEMENTS

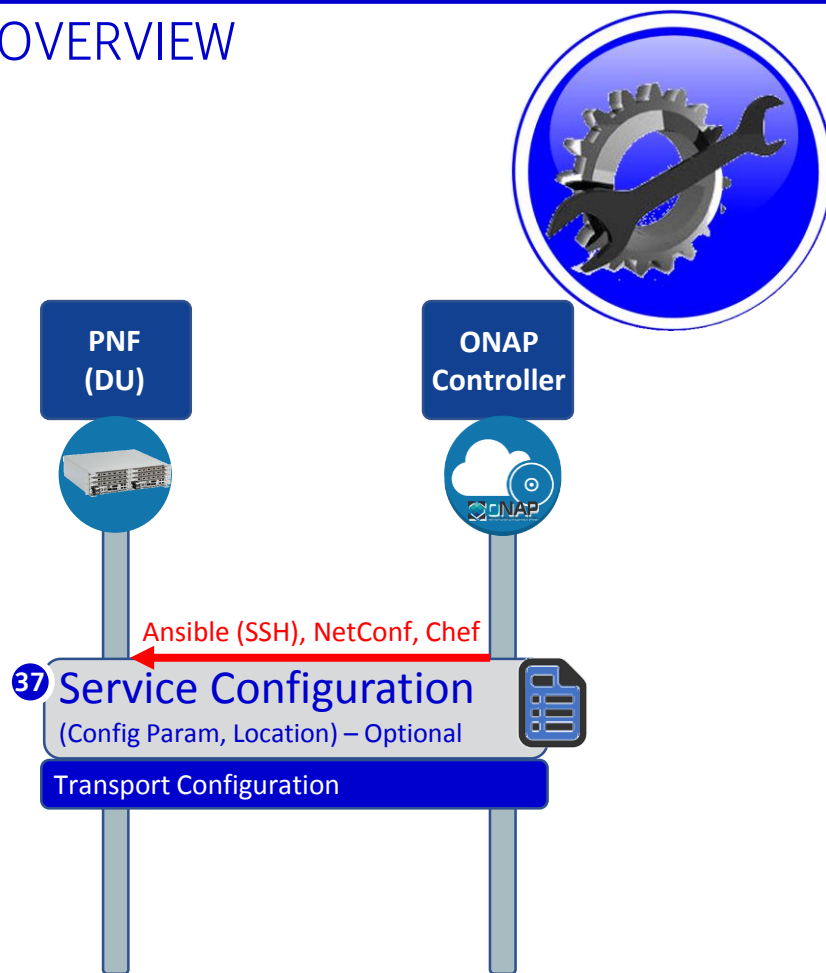
## DESCRIPTION

- (1) **Service configuration Enhancements** to ONAP Controller to PNF *service configuration* exchange with PNF.
- (2) **PROTOCOL DEFINITION** – Better definition around the Protocols supported (and/or support more protocols). What ONAP controller supports what PNF and what protocols are supported. NetConf, Ansible, Chef. (SDN-R = NetConf)(?)
- (3) **Configuration Extensions** – New parameters needed for Casablanca use cases. Vid script to pushing data, ID config, ID where data comes from. Generic configuration support.
- (4) **PNF PnP Config** – Finishing PNF PnP by sending down config data.
- (5) **(OPTIONAL) Vendor Data** – Extensions to Service Configuration with Vendor specific configuration data can be developed (vendor dependent).

## PROJECTS

PNF Registration Handler, ONAP Controller VID

## OVERVIEW



ONAP communicates to PNF in approved protocol (*Ansible, NetConf, Chef*)

Template defines Protocol

# PNF PnP: SECURITY ENHANCEMENTS

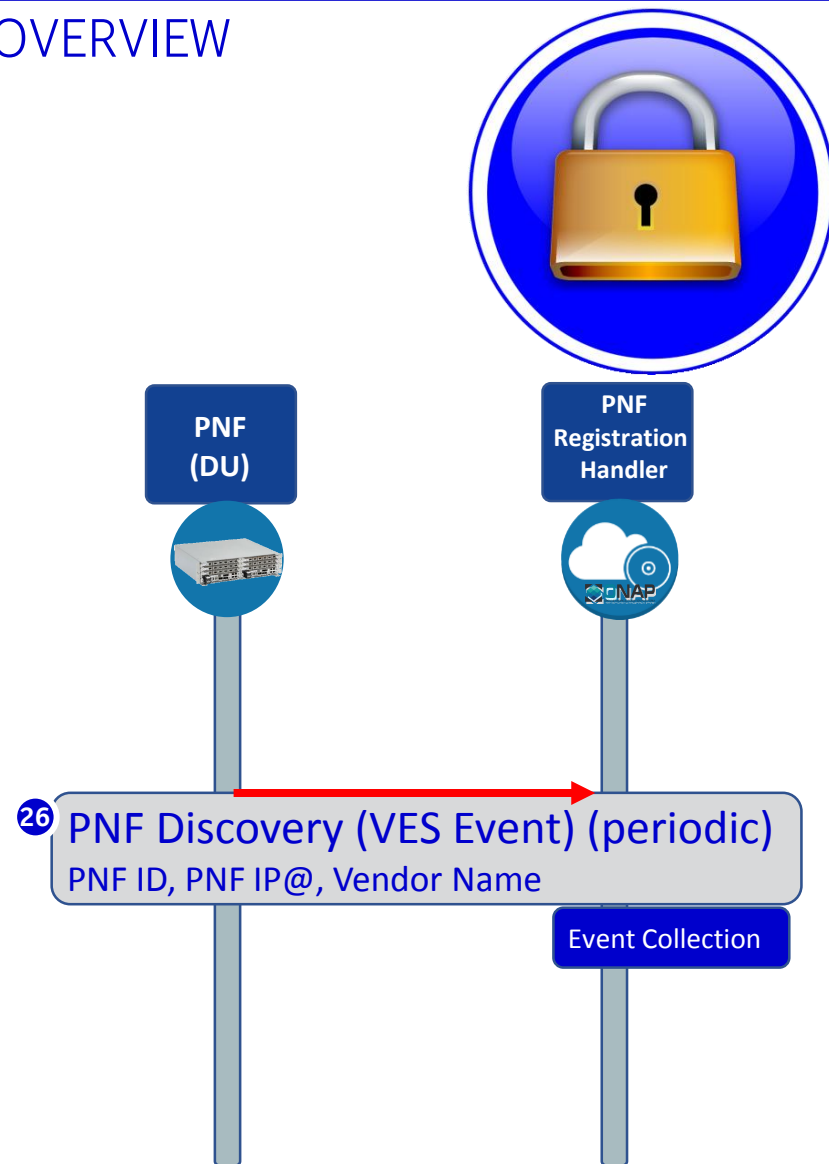
## DESCRIPTION

- (1) PNF AUTHENTICATION** – VES authentication framework integrated. DCAE needs to authenticate the PNF.
- (2) VENDOR CERTIFICATES** – Handling Vendor Certificates for TLS/SSH for PNFs.
- (3) USER NAME & PASSWORDS** – Provisioning. DCAE & PNF management of *User Name & Passwords*.
- (4) SECURITY BETWEEN COMPONENTS** – DMaaP & PRH to authenticate w/ other ONAP components.

## PROJECTS

PNF Registration Handler, DCAE, AAF, ONAP Controller, DMaaP

## OVERVIEW



# PNF PnP: MODELING ENHANCEMENTS

**(1) PNF MODELING** – Modeling enhancements to support 5G PNF in ONAP. Model Inheritance definitions for PNF. SDC modeling improvements from Beijing PnP use case.

**(2) PNF SHARING** – SDC model updates for PNF characteristics focusing on PNF inter-connectivity. DCAE-DS Micro-service modeling.

**(3) PNF-SDK** – SDK provided from Vendors. This will help modeling the Physical “Box” (PNF) and network functions.

## OVERVIEW



Notes:

- 1) **EXTERNALS** - Not trying to model the internals of PNFs. What is exposed by the box is what is modeled.
- 2) **INTERRELATIONS** - Focus on relations of PNFs/VNFs. Interworking between PNFs/VNFs.
- 3) **VISIBILITY** - CP/UP visibility  
Not M-Plane (as this is 3GPP standardized)
- 4) **MODELING ANALYSIS** - Modeling activity to assess PNF, and check SDC model is sufficient to cover Casa use cases if additional parameters need to be added (e.g. relations between other NFs). Expanding the “Release 0 model” for Casa. PNF type vs PNF instance. Design-time vs Run-time model.

## PROJECTS

SDC, CDT



# PNF PnP: PNF ONBOARDING / PNF PACKAGE

## DESCRIPTION

PNF Onboarding and PNF Package

**(1) PNF PACKAGE DEFINITION** – Defining *PNF Onboarding Package*. Extending framework to work with PNFs. Defining Package framework.

- A. **PNF ARTIFACTS DEFINITION** – Vendor specific/provided artifacts to add to the (new PNF) package.
- B. **PNF ARTIFACTS DISTRIBUTION**

## OVERVIEW





PROJECTS:  
SDC, APP-C

# 5G USE CASE: OPTIMIZATION

- ONAP and Event Collection
- PNF (Radio Network) Deployments

- 5G Use Case Team

# EVENT COLLECTION OVERVIEW

TOPIC	ICON	DESCRIPTION
<b>Bulk Performance Measurements (PM) Collection</b>		Performance Measurements Collection with ONAP. Development and evolution of event collection through VES collector.
<b>High Volume &amp; Real-Time Performance Measurements (RTPM) Collection</b>		Performance Measurements Collection for Real-Time collection from PNF for sub-minute intervals (configurable). Introduces a High-Volume VES collector for high-volume data management (in DCAE) using a persistent connection. Introduces new data encoding (GPB). Distributed collection at cloud edge (for scalability).

# EVENT COLLECTION – PERFORMANCE MANAGEMENT

## DESCRIPTION

Events Collection with ONAP. Development and evolution of event collection through VES collector.

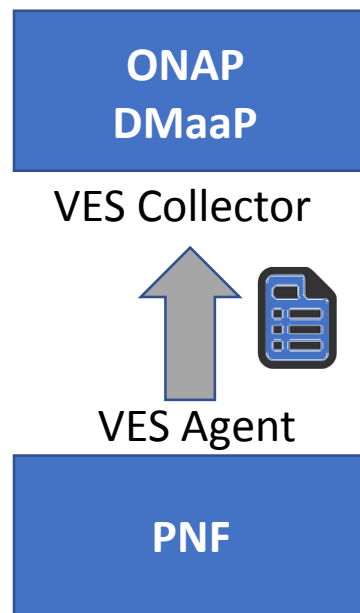
Forms basis of Performance Measurements collection through ONAP.

- (1) COLLECTION MECHANISM** – How will data be moved to ONAP in RAN domain.
- (2) VOLUMETRICS** – Volume of data.

## PROJECTS

DCAE, DMaaP, VES

## OVERVIEW



# EVENT COLLECTION – HIGH VOLUME COLLECTION

## DESCRIPTION

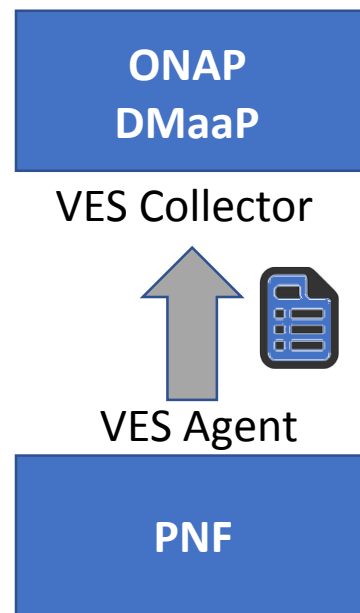
High Volume Data Event Collection

- (1) COLLECTION MECHANISM** – How will data be moved to ONAP in RAN domain vis-à-vis high volume events (for streaming)
- (2) STREAMING MANAGEMENT** – Topics related to high volume management. VES Streaming collector.
- (3) VOLUMETRICS** – Volume of data. High volume applications will see use in 5G.

## PROJECTS

DCAE, DMaaP, VES

## OVERVIEW



RESP. Generic collector.  
Sync/Async/Stream.  
DMaaP/Kafka DDS or bus  
Keep collectors agnostic from data distribution bus  
Streaming collector in VES.







# ONAP PNF Deployment & Management Enhancements

- ONAP and PNF Deployment & Management
- PNF (Radio Network) Deployments

- 5G Use Case Team

# ENHANCEMENTS OVERVIEW

TOPIC	ICON	DESCRIPTION
<b>CDT Integration to SDC</b>		<i>Configuration Design Tool (CDT)</i> which provides a GUI to build artifacts to be used by APP-C (using Tosca models) to configure Templates incorporated into SDC.
<b>PNF Software Version Checking</b>		Reporting PNF S/W version to ONAP controller (SDN-R) & A&AI. Demonstrate the PNF S/W version has been updated in A&AI.
<b>PNF &amp; CU Application Level Configuration</b>		Enhancements for SDN-R. Single Persona to control/create 5G PNFs (NE).
<b>Life-Cycle Management Support</b>		Change management and CLAMP for life-cycle support for PNF.

# INTEGRATED CDT

## DESCRIPTION

Next Generation *Configuration Design Tool* (CDT) which provides a GUI to build artifacts to be used by APP-C (using Tosca models) to configure Templates. However, this duplicates (in principle) the function of SDC.

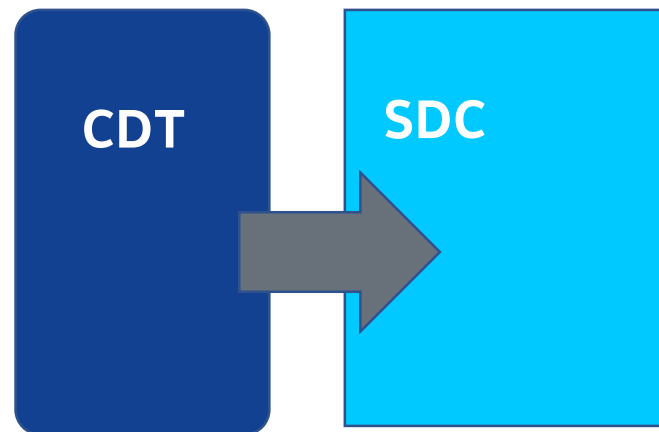
This effort would integrate CDT (used by APP-C today) into SDC [for General Development]. The result would be an Integrated design tool for configuration design for 5G NEs.

Extend to allow use with any controller persona

## PROJECTS:

SDC, APP-C

## OVERVIEW





# PNF S/W VERSION CHECKING

## DESCRIPTION

Check version of **PNF** S/W Version

Reporting S/W version transmittable across ONAP controller & A&AI.

Demonstrate the S/W version has been updated in A&AI.

## OVERVIEW

## PROJECTS

A&AI, SDC, APP-C/SDN-C/R, DCAE/DMaaP  
VNF-SDK

# APPLICATION LEVEL CONFIGURATION

## DESCRIPTION

SDN-R adaptation of SDN-C for PNFs (RAN Controllers).

*“ONAP controller”* (SDN-R vs APP-C/MNF-C)

[Unified generic controller for wireless mobility]

SDN-R and PNF. [Currently supports NetConf-Yang]

Support Ansible API to configure PNF

Support full application level configuration & Ansible, allow various mobile network elements to be controlled from same controller persona created from CC-SDK.

Single Persona to control/create 5G PNFs (NE)

## OVERVIEW

## PROJECTS

SDN-R, SDN-C, APP-C, CC-SDK

# LIFE CYCLE MANAGEMENT FUNCTIONS

## DESCRIPTION

Add lifecycle management functions to controller persona

Plan, setup, Build, Test, Deploy, Monitor, Manage, Meter, Charge, Optimize Health Check, Software Upgrade

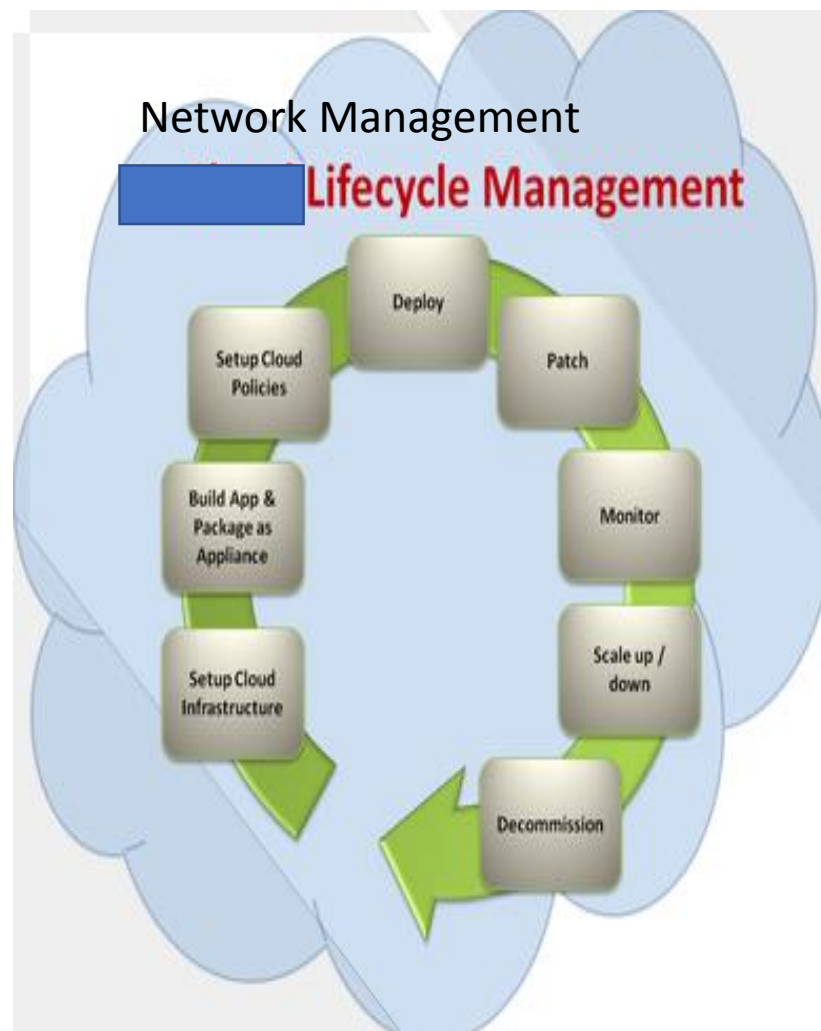
Setup, Build, Policies, Deploy, Patch, Monitor, Scaleup/Scale down

**MULTI-RELEASE EFFORT**

## PROJECTS

SDC

## OVERVIEW



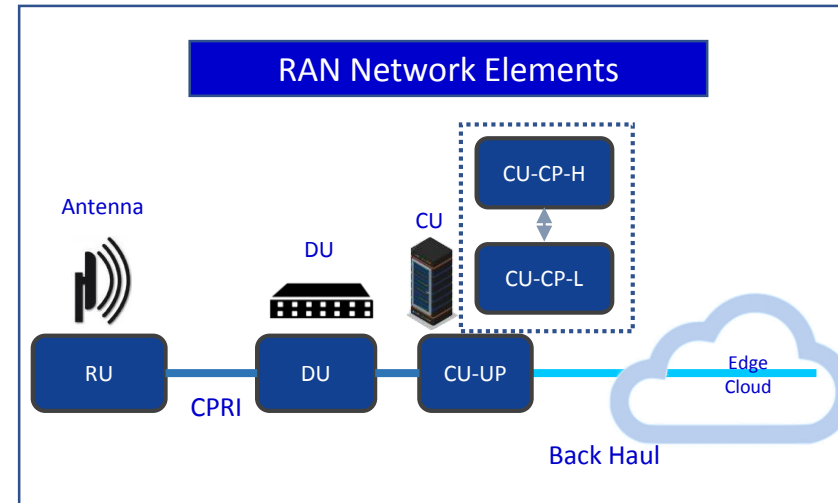
# EDGE CLOUD SUPPORT

## DESCRIPTION

Support for deploying mobility virtual network element (e.g. CU) at the Edge Locations

## MULTI-RELEASE EFFORT

## OVERVIEW



## PROJECTS

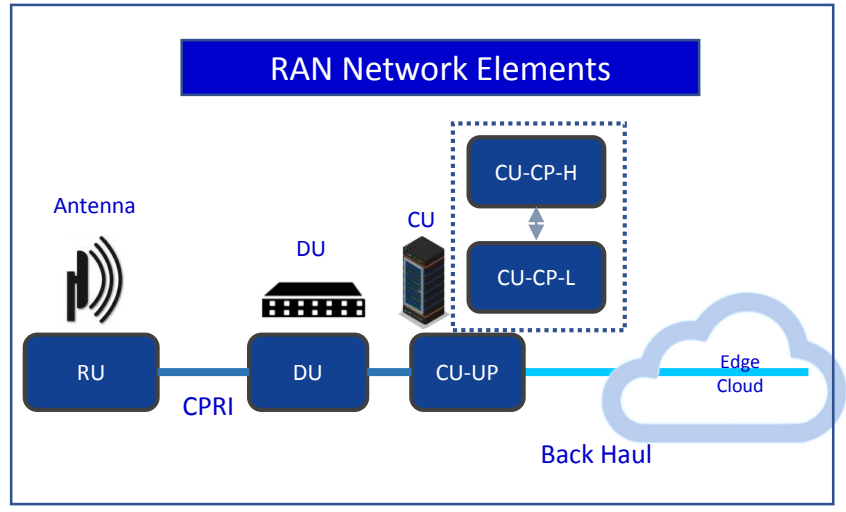
# MOBILITY EDGE VNF (CU) INTEGRATION

## DESCRIPTION

Support for deploying mobility virtual network element (e.g. CU) at the Edge Locations

### MULTI-RELEASE EFFORT

## OVERVIEW



## PROJECTS

# CHANGE AND CONFIGURATION MANAGEMENT

## DESCRIPTION

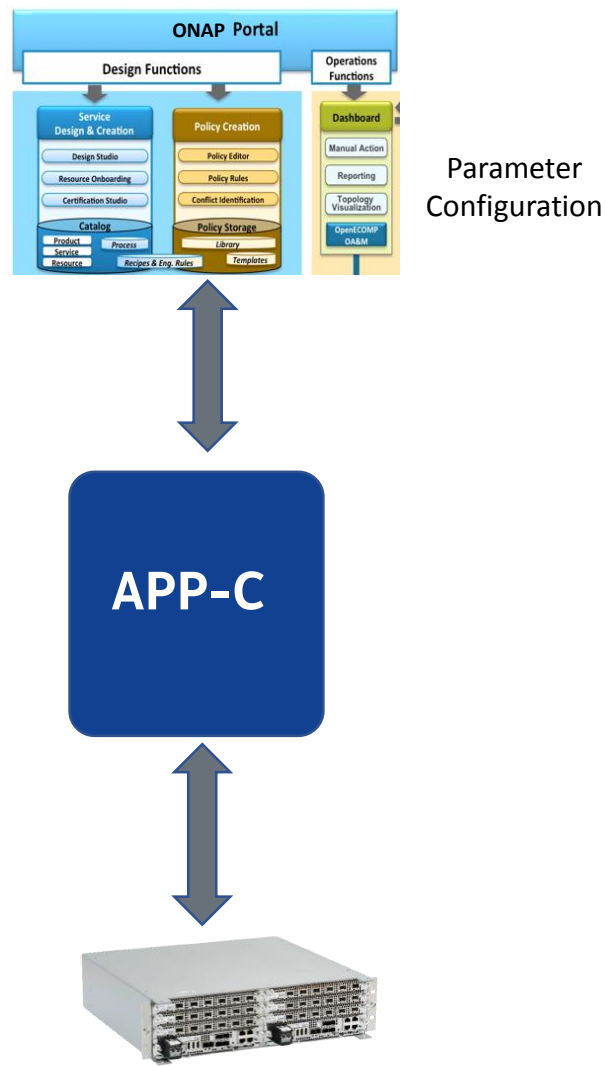
Pre-provisioning with VID. Bulk Provision a 1000 PNFs. O&M IP@, model, configuration, radio parameters. Modeling for PNFs.

**MULTI-RELEASE EFFORT**

## PROJECTS

A&AI, SDC, APP-C/SDN-C/R, DCAE/DMaaP, VID

## OVERVIEW



# ONAP PNF Deployment PROJECT IMPACTS

- ONAP and PNF Deployment Requirements for 5G RAN
- For Casablanca (R3) Release

- 5G Use Case Team

# PNF DEPLOYMENT – A&AI IMPACTS



# PNF DEPLOYMENT – DCAE IMPACTS

# PNF DEPLOYMENT – SO (Service Orchestrator) IMPACTS

# PNF DEPLOYMENT – SDC IMPACTS

# PNF DEPLOYMENT – VID IMPACTS

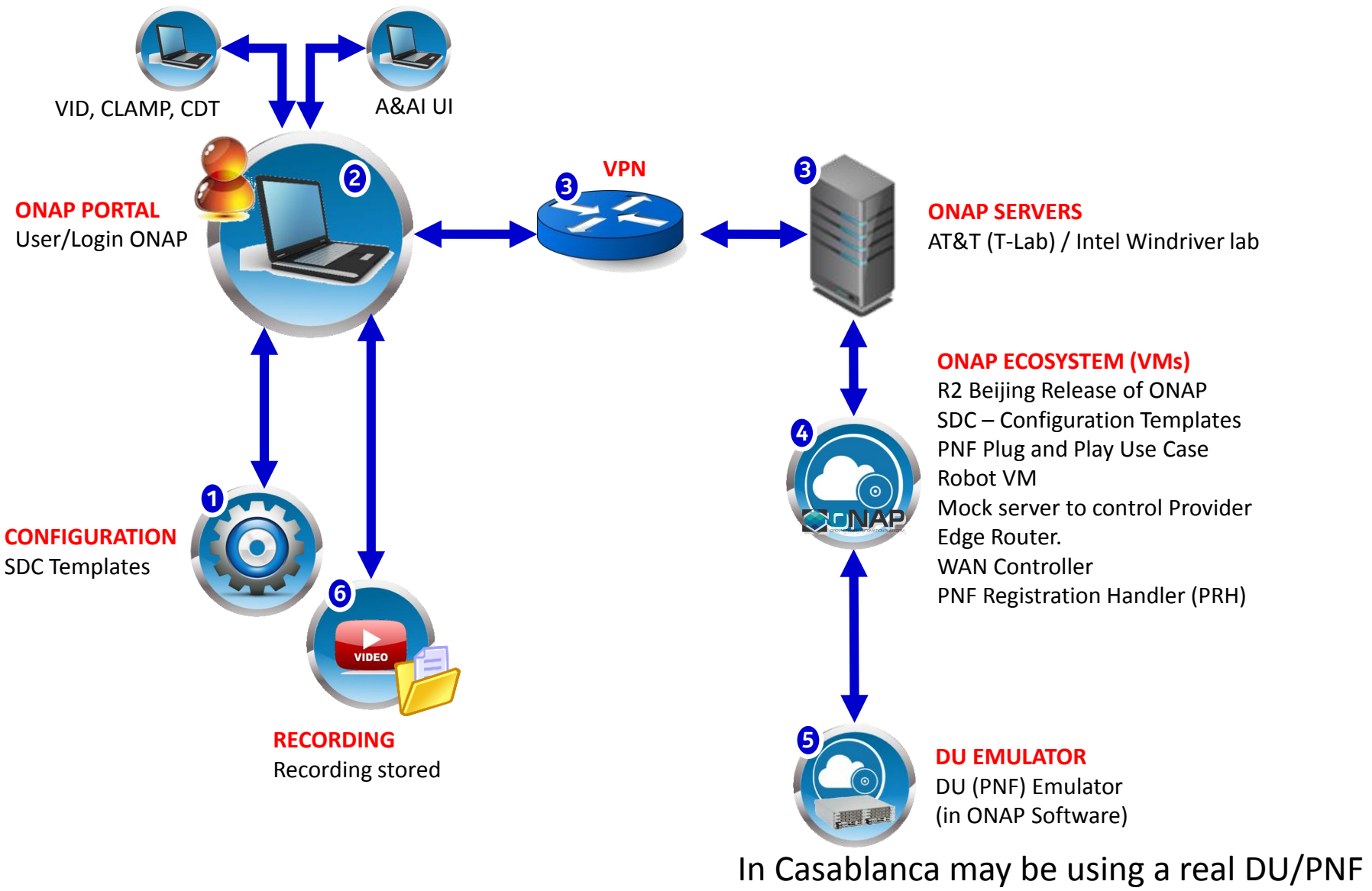


# ONAP PNF Deployment INTEGRATION AND SHOWCASING

- ONAP and PNF Deployment Requirements for 5G RAN
- For Casablanca (R3) Release

- 5G Use Case Team

# PNF DEPLOYMENT – INTEGRATION & SHOWCASING



# PNF DEPLOYMENT – INTEGRATION & SHOWCASING

STEP	DESCRIPTION
1	<b>CONFIGURATION</b> – SDC Design templates need to be configured in preparation of the Demo & Showcasing. The appropriate PNF and VNF designs are designed, validated and exported to the other components of ONAP.
2	<b>PORTAL &amp; GUI</b> – The ONAP Portal is used to access the appropriate GUIs and interfaces necessary to operate and configure ONAP. The VID and CLMAP GUI are used to configure the appropriate information for the showcase. The A&AI GUI are used to show the created entries in A&AI for the PNF.
3	<b>VPN</b> – The appropriate security gateways and/or VPN networks are configured. The appropriate security setups are authenticated against. Passwords and IP addresses that are needed to connect to the ONAP servers go through this VPN or security gateway (as appropriate)  <b>ONAP SERVERS</b> – The ONAP Servers that host the ONAP ecosystem are connected to
4	<b>ONAP ECOSYSTEM (VM)</b> – The ONAP ecosystem has all of the appropriate Virtual Machines necessary to operate. This has the R2 Beijing Release of ONAP. All of the PNF Plug and Play Use Case updated software is available in the ONAP Ecosystem. The Robot VM, Mock server to control Provider Edge Router, and WAN Controller are established.  The PNF Registration Handler a new DCAE plug-in are available in this ONAP ecosystem which is used to register the PNF into ONAP.
5	<b>DU EMULATOR</b> – The DU Emulator is used to emulate the responses and connection to ONAP. The DU emulator establishes a VES HTTPS connection with the PRH during the registration process and receives a APP-C response back via ansible.
6	<b>RECORDING</b> – A recording is made of the showcase and demo for later upload/download and playback for demonstration purposes.

# ONAP PNF Deployment APPENDIX

- ONAP and PNF Deployment Requirements for 5G RAN
- For Casablanca (R3) Release

- 5G Use Case Team



# A: 5G Radio Network Deployment Requirements

## Description

Disaggregated 5G RAN may include PNFs and VNFs, in which case cloud infrastructure deployment at the edge is required. Beijing implemented the first phase of PNF discovery and instantiation. Our goal for Casablanca is expand on that work, include VNF deployment at the edge, and fully integrated lifecycle management. Key enhancements needed are:

- Support full Application level Configuration (+Ansible), allow various mobile network elements to be controlled from same controller persona created from CC-SDK
- Add Lifecycle management functions to controller persona
- Support an integrated configuration design tool in SDC that can be used with any controller persona (next gen CDT)
- Add support for PNF Software Management and Change management
- Edge Cloud Support
- Add needed support for deploying Mobility Virtual Network Elements (e.g. CU) at the Edge locations
- Further automation of PnP Discovery for PNF

## Rationale

Support for deploying and managing 5G mobility network is critically important for most ONAP members.

## Impacted ONAP components

**SDC, SO, CC-SDK (SDN-C, APP-C), AAI, DCAE, (V/P)NF-SDK**

## Participating Companies

AT&T Amdocs China Mobile Ciena Cisco Ericsson Huawei Intel Nokia VMWare Others

For details regarding the requirements, please see <https://wiki.onap.org/display/DW/Missing+Platform+capabilities>

Apr 5, 2018

QUESTION – PNF Heart-beating (after PnP/Registration). Monitoring.

Updates to A&AI if PNF goes off-line.

VNF-SDK (package from vendors) wanted PNF-SDK a package that describes what can be done, what ONAP should do w/ the PNF.

Generic vs Vendor added PNF onboarding Package. Onboard a Generic PNF w/ a “generic PNF onboarding package.

Topic: Licensing PNF S/W. (Post Casablanca – Future)

Topic: Fault Management/Alarms, State-Stateful events.

# POST CASABLANCA

- ONAP and PNF Deployment Requirements for 5G RAN
- For Casablanca (R3) Release

- 5G Use Case Team

# SOFTWARE MANAGEMENT

## DESCRIPTION

ONAP Integrated PNF software management and change management could be a long-term goal. In R3 Casablanca release, as a simple first step the software load for one PNF could be managed within a repository, but not actually downloaded to a PNF.

### MULTI-RELEASE EFFORT

- Version checking
- S/W upgrade

## PROJECTS

- A&AI, SDC, APP-C/SDN-C/R, DCAE/DMaaP
- VNF-SDK

## OVERVIEW

