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

Apr 13, 2018 version 4

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

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PNF PNP ENHANCEMENTS OVERVIEW

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

PNF PnP: PNF REGISTRATION HANDLER ENHANCEMENTS

DESCRIPTION

PNF Registration Handler (PRH) Enhancements.

(1) Stand-alone own domain – New PRH domain. In Beijing used an adder (Beijing work around). For Casablanca, we propose using a dedicated domain. VES separation of events.

(2) VES CONTENT - As a result, VES collector content will change with additional fields. VES may also be extended Physical PNF location.'

PROJECTS

PNF Registration Handler, AAF

OVERVIEW

DMaaP

AAF

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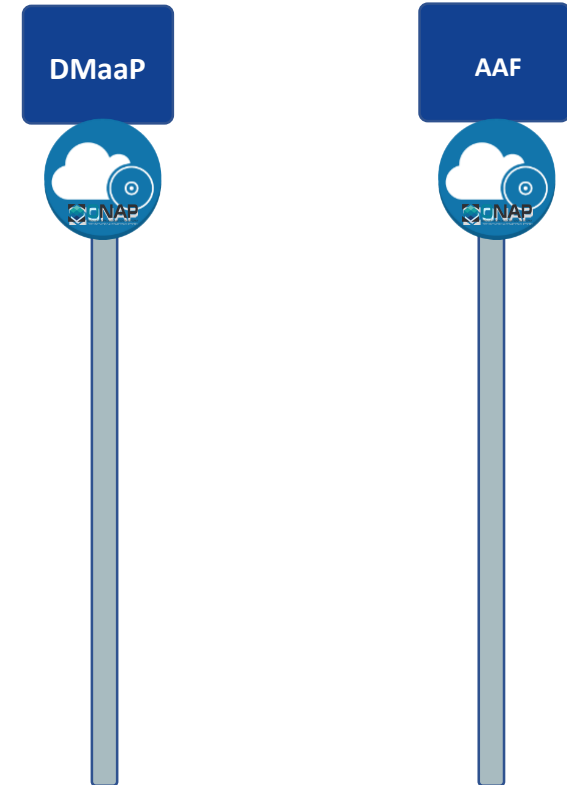
PNF PnP: SO WORKFLOW ENHANCEMENTS

DESCRIPTION

(1) SO WORKFLOW ENHANCEMENTS –
Dedicated 5G BTS Workflow in SO.

(2) 5G PNF WORKFLOW – Extensions to Beijing
SO Workflow (part of VCPE workflow)

OVERVIEW

PROJECTS

PNF Registration Handler, DCAE

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PNF PnP: SERVICE CONFIGURATION ENHANCEMENTS

DESCRIPTION

(1) **Service configuration Enhancements** to ONAP Controller to PNF *service configuration* exchange with PNF. Better definition around the Protocols supported (and/or support more protocols).
What ONAP controller supports what PNF And what protocols are supported.

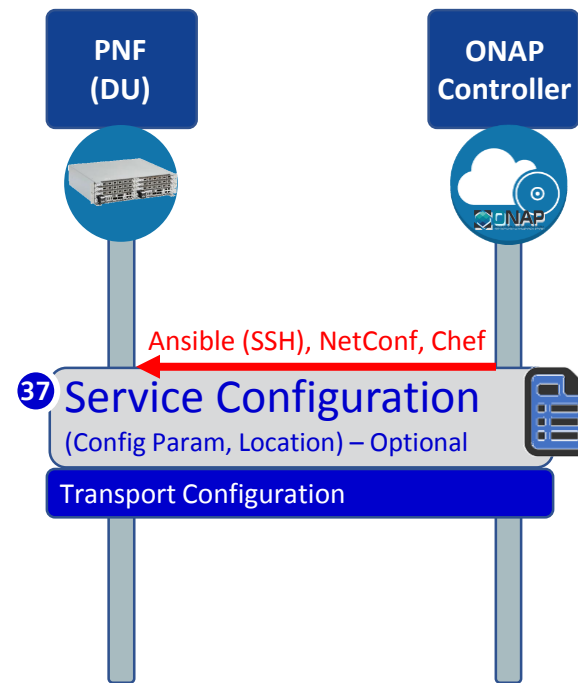(2) **Configuration Extensions** – New parameters needed for Casablanca use cases. Vid script to pushing data, ID config, ID where data comes from. Generic configuration support.

(3) **PNF PnP Config** – Finishing PNF PnP by sending down config data.

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 (DU)

PNF Registration Handler

26 PNF Discovery (VES Event) (periodic)
PNF ID, PNF IP@, Vendor Name

Event Collection

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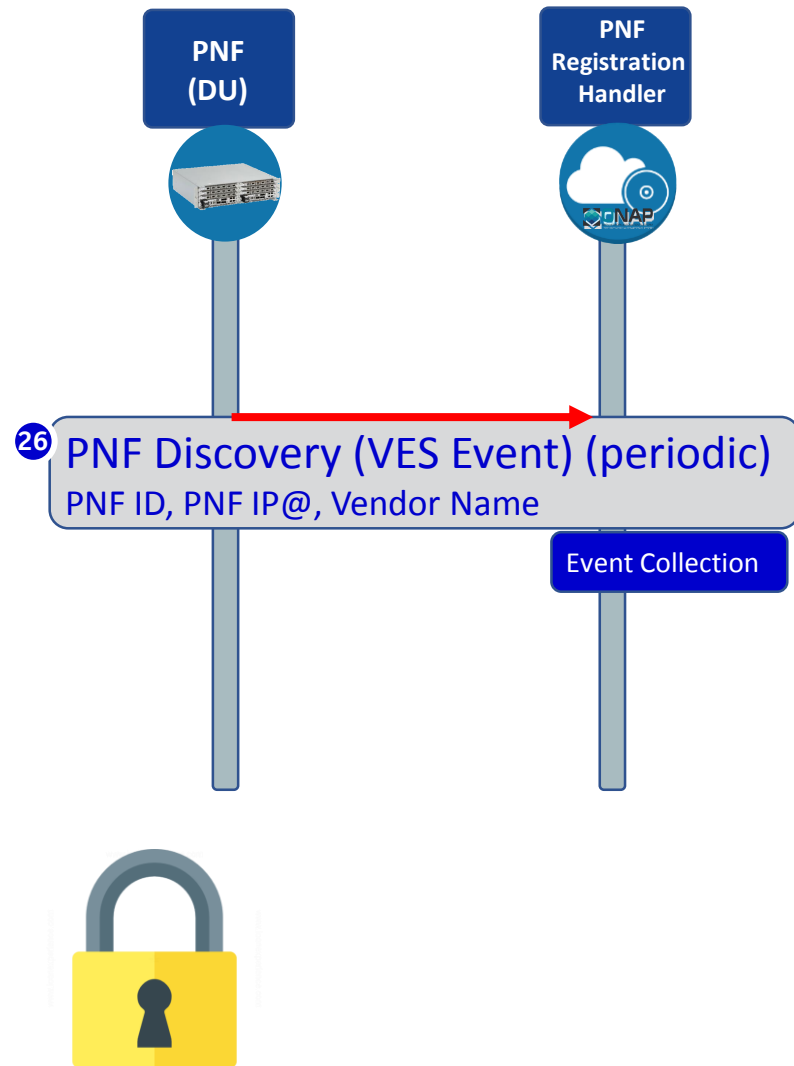
PNF PnP: MODELING ENHANCEMENTS

DESCRIPTION

(1) **PNF MODELING** – Modeling enhancements to support 5G PNF in ONAP. Inheritance, and PNF characteristics for sharing. Focusing on PNF connectivity. PNF-SDK (from vendors). Modeling the Physical "Box" (PNF).

PROJECTS

 SDC, CDT

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.

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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

PROJECTS:

SDC, APP-C

OVERVIEW

5G USE CASE: OPTIMIZATION

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

- 5G Use Case Team

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EVENT COLLECTION OVERVIEW

TOPIC	ICON	DESCRIPTION
Bulk Performance Measurements (PM) Collection		Performance Measurements Collection with ONAP. Development and evolution of event collection through VES collector.
High Volume & Real-Time Performance Measurements (RTPM) Collection		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).

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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.

OVERVIEW

ONAP
DMaaP

VES Collector

VES Agent

PNF

PROJECTS

DCAE, DMaaP, VES

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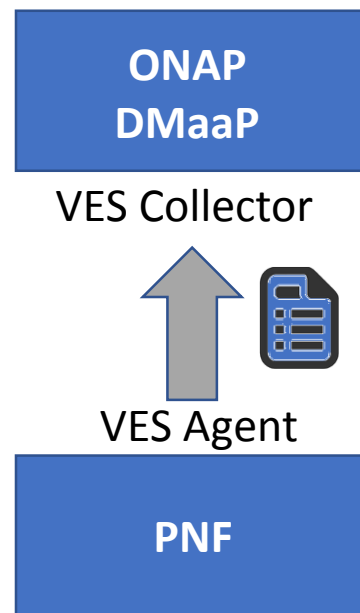
RESP. Generic collector.
Sync/Async/Stream.
DMaaP/Kafka DDS or bus
Keep collectors agnostic from data distribution bus
Streaming collector in VES.

ONAP PNF Deployment & Management Enhancements

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

- 5G Use Case Team

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ENHANCEMENTS OVERVIEW

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

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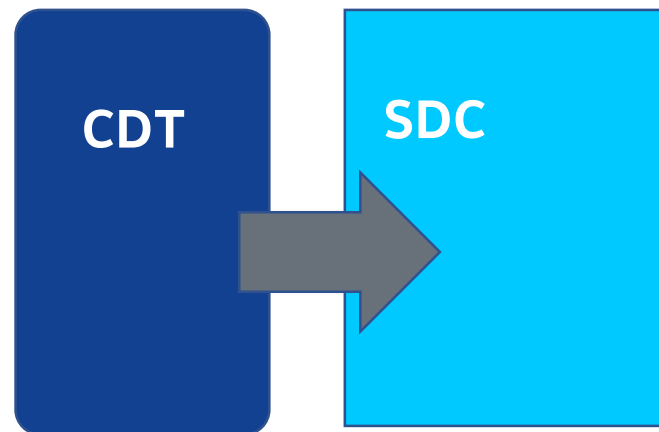
PNF S/W VERSION CHECKING

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.

PROJECTS

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

OVERVIEW

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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

Network Management

Lifecycle Management

Deploy · Patch · Monitor · Scale up / down · Decommission · Setup Cloud Infrastructure · Build App & Package as Appliance · Setup Cloud Policies
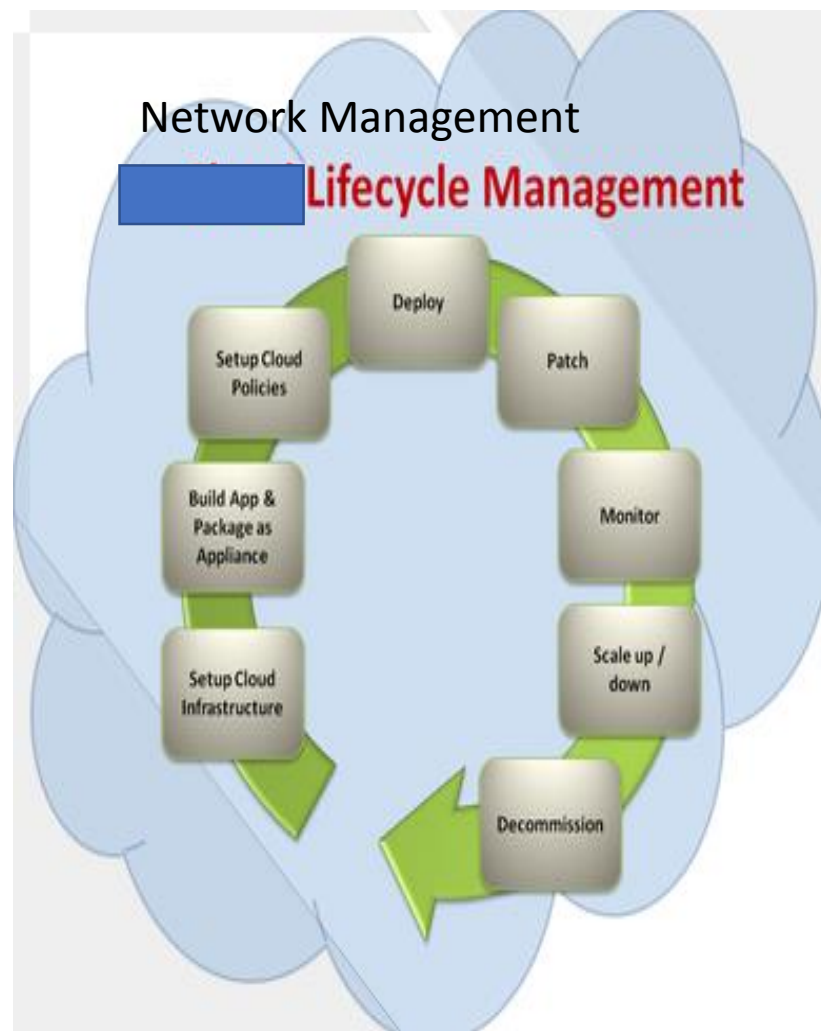
EDGE CLOUD SUPPORT

DESCRIPTION

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

MULTI-RELEASE EFFORT

PROJECTS

OVERVIEW

RAN Network Elements

Antenna

DU

CU

CU-CP-H

CU-CP-L

RU — CPRI — DU — CU-UP — Edge Cloud

Back Haul

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OPEN NETWORK AUTOMATION PLATFORM
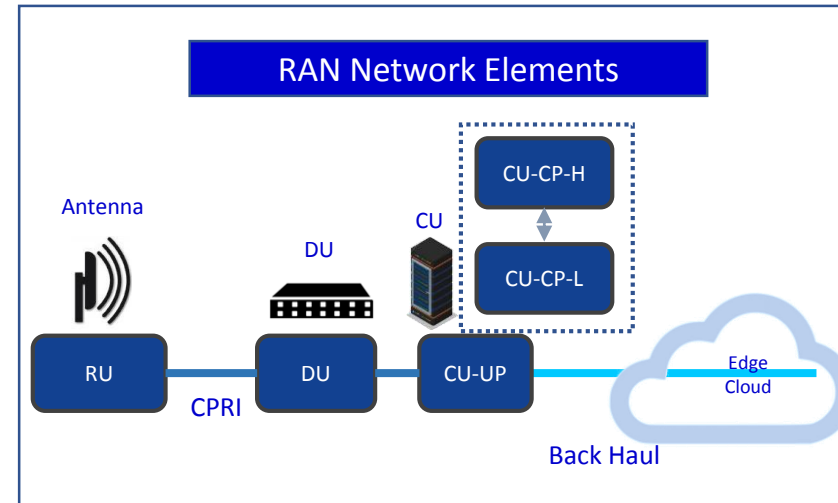
MOBILITY EDGE VNF (CU) INTEGRATION

DESCRIPTION

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

MULTI-RELEASE EFFORT

PROJECTS

OVERVIEW

RAN Network Elements

CU-CP-H

CU-CP-L

Antenna

DU

CU

RU

DU

CU-UP

CPRI

Edge Cloud

Back Haul

ONAP
OPEN NETWORK AUTOMATION PLATFORM
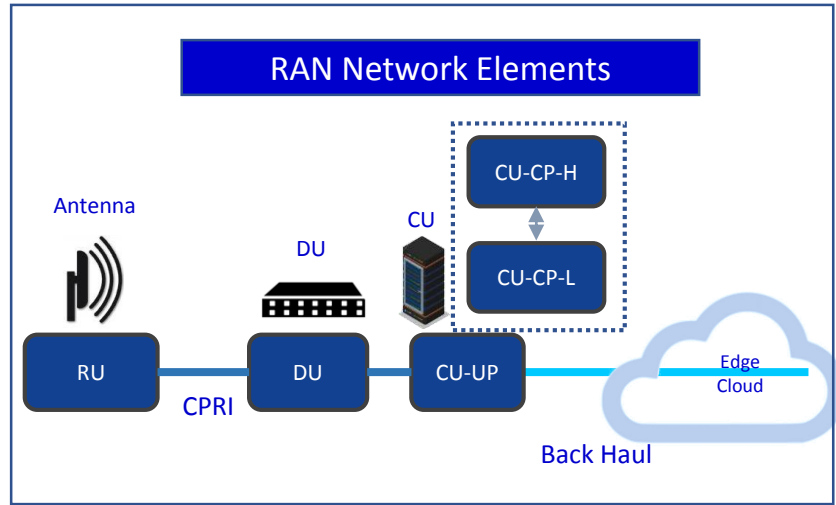
CHANGE AND CONFIGURATION MANAGEMENT

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

Parameter Configuration

APP-C
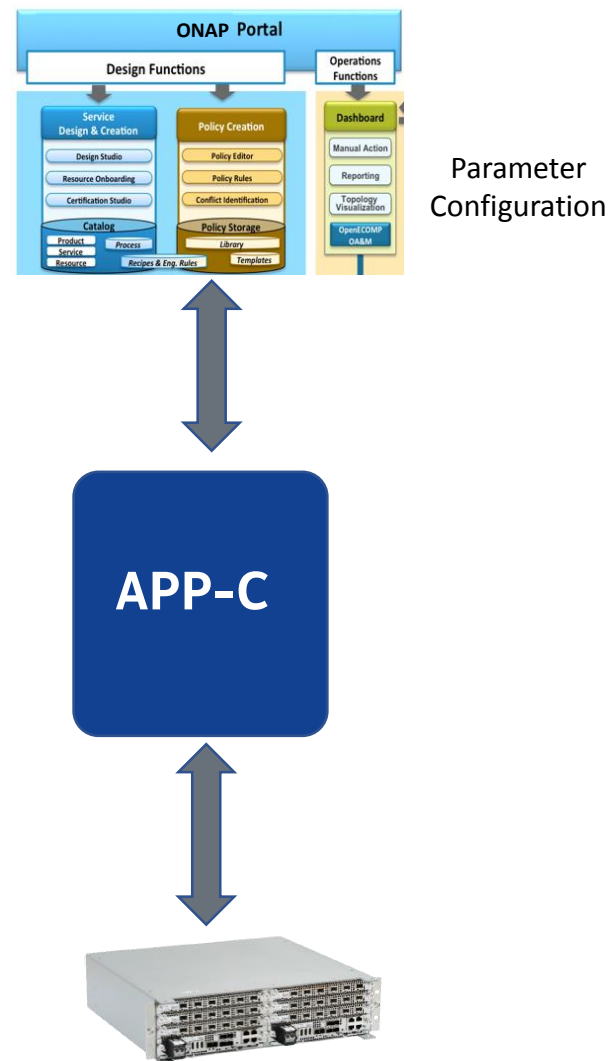
ONAP PNF Deployment
PROJECT IMPACTS

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

- 5G Use Case Team

Mar 23, 2018 version 1

ONAP PNF Deployment
INTEGRATION AND SHOWCASING

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

- 5G Use Case Team

Mar 23, 2018 version 1

PNF DEPLOYMENT – INTEGRATION & SHOWCASING

VID, CLAMP, CDT

A&AI UI

ONAP PORTAL
User/Login ONAP

VPN

②

③

③ **ONAP SERVERS**
AT&T (T-Lab) / Intel Windriver lab

ONAP ECOSYSTEM (VMs)
R2 Beijing Release of ONAP
SDC – Configuration Templates
PNF Plug and Play Use Case
Robot VM
Mock server to control Provider
Edge Router.
WAN Controller
PNF Registration Handler (PRH)

④

CONFIGURATION
SDC Templates

①

⑥ **RECORDING**
Recording stored

VIDEO

⑤ **DU EMULATOR**
DU (PNF) Emulator
(in ONAP Software)

In Casablanca may be using a real DU/PNF

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PNF DEPLOYMENT – INTEGRATION & SHOWCASING

STEP	DESCRIPTION
1	**CONFIGURATION** – 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	**PORTAL & GUIS** – 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	**VPN** – 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) **ONAP SERVERS** – The ONAP Servers that host the ONAP ecosystem are connected to
4	**ONAP ECOSYSTEM (VM)** – 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	**DU EMULATOR** – 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	**RECORDING** – A recording is made of the showcase and demo for later upload/download and playback for demonstration purposes.

ONAP
OPEN NETWORK AUTOMATION PLATFORM

ONAP Casablanca Release Calendar Draft Proposal

Month	April	May	June	July	August	September	October	November

Release

National Holidays **Events**

05/25   ONAP R3   11/16

F2F China   F2F virtual ?   F2F Europ

Project Team

M0: 05/25
Open Intent To Participate

E2E Release Use Case Approved

06/07 06/14
Projects Sub'd   Project Proposl App'd

M1: 06/28
Project Planning

M2: 07/26
Functionality Freeze

Test Case Def'd

M3: 08/30
API Freeze

Test Case 50% Impl'd

M4: 09/20
Code Freeze

Test Case 100% Impl'd

RC0: 10/11 RC1: 10/25 RC2: 11/09 11/15

RC0   RC1   RC2   Sign-Off

Test Case Stitch'd

Integration Testing

E2E Release Test Case Def'd

E2E Release Test Case Impl'd

Hardware Labs

Lab Ready

Modelling

High Level Model Requirements   Model Plan Established   Model Frozen   Model Final   Kick-Off for next Release

Architecture

Functional Architecture Def'd   Architecture Approved   API Doc Freeze

Documentation

Plan Def'd   Ready for Review   Doc Complete

Training

Plan Def'd   Ready for Review   Training Completed

Deployment Upgrade

Strategy Def'd   E2E Deployment Code Freeze

SWIMLANES DELIVERABLES

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2

First Stage / RC0 -

Component Integration, Integration tests, S/W Run-time

Complete system

Second Stage / RC1

Neighboring modules (module connections)

CSIT completed

RC2

Neighboring tests completed

Third Stage / RC3

End-to-End Use Case (all modules, all ONAP components)

ONAP PNF Deployment APPENDIX

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

- 5G Use Case Team

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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 the 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

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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.
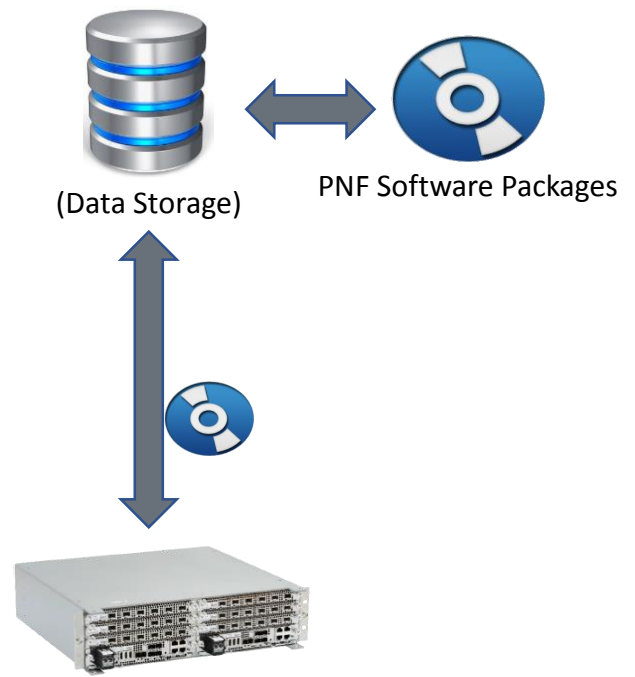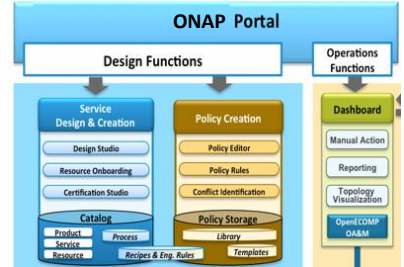
MULTI-RELEASE EFFORT

Version checking
S/W upgrade

PROJECTS

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

OVERVIEW

(Data Storage)   PNF Software Packages

Apr 12, 2018 5G Use Case team

Benjamin Cheung (Nokia), Oskar Malm (Ericsson), Vimal Begwani (ATT), Ulas Kozat, Aaron Hay,
Eric Multanen, Pasi Vaananen, Shekar Sundaramurthy (ATT), Sigmar Lust
Yang Xu, Yoav Kluger (Amdocs), Slawek Stawiarski (ATT), Tracy Van Brakle,
Abinash (Netcracker), Gershon Schatzberg (Intel), Itamar Eshet, John Burgess (Nokia)
John Quilty (Ericsson), Kenneth Shi, Linda Horn (Nokia), Marge Hillis (Nokia),
Michela Bevilacqua (Ericsson), Mohamad Yassin,
Padma Sudarsan (Nokia) , Peter Loborg (Ericsson), Run Yue, Ulas Kozat,
Vishnu Ram OV, Shekar Sundaramurthy (ATT), Michael Z (ATT), MHuan12, Melanie Sater
Ramki Krishnan

Apr 16, 2018 Use Case subcommittee

Gil Bullard (ATT), Oskar Malm (Ericsson), Ram Krishnan, Vimal Begwani (ATT) Ajay Mahimkar, Phil Blackwood (ATT), Scott Blandford (ATT), Srini Addepalli (Intel), Sumithra Bhojan, Vladimir Yanover (Cisco), Yoav Kluger (Amdocs), Arash Hekmat (Amdocs), David Perez (Swisscom), Evgeniy Zhukov (Netcracker), Benjamin Cheung (Nokia), Joe Bullimore, Linda Horn (Nokia), Mao Peng, Marcus, Marge Hillis (Nokia), Matti Hiltunen (ATT), Mohamad Yassin, Ranny Haiby, Shankar Narayanan (ATT), Shawn Ying, Timo Perala (Nokia), Vivien Yang (Intel), Yang Xu, Yayoi Kobayashi, Yusuke Nakano (KDDI), Zhuoyao Huang, Parviz Yegani, Shekar Sundaramurthy (ATT)