

5G RAN Deployment (A) - Casablanca

Input to Team Discussion

Ericsson, 04192018v2

5G RAN Deployment (A) Description

Objectives and description from 5G UC presentation for Casablanca

High Level Objectives

Deployment of the hybrid 5G Radio Network (PNFs & VNFs)

- Complete PNF Support
- Platform Enhancements to Deploy Edge Virtual Radio Network Functions (e.g. CU)

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

RAN Lifecycle Overview (ONAP-centric)

Both design and run-time activities



Separate workgroup started for EC

- Edge Cloud Support
- Deploy transport and security infrastructure
- Deploy vendor-specific supporting infrastructure

- Further automation of PnP Discovery for PNF
- Support an integrated configuration design tool in SDC
- Support full Application level Configuration (+Ansible)
- Add needed support for deploying Mobility Virtual Network Elements (e.g. CU) at the Edge locations

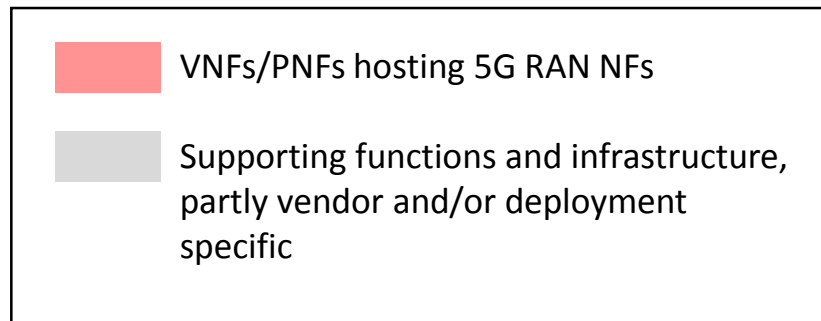
- Network monitoring – FM, PM
- Add support for PNF Software Management and Change management
- Add Lifecycle management functions to controller persona
- Closed loop automation

Discuss Casablanca scope

■ Original deployment work item

■ Additional tasks (some may not need additional ONAP enhancements)

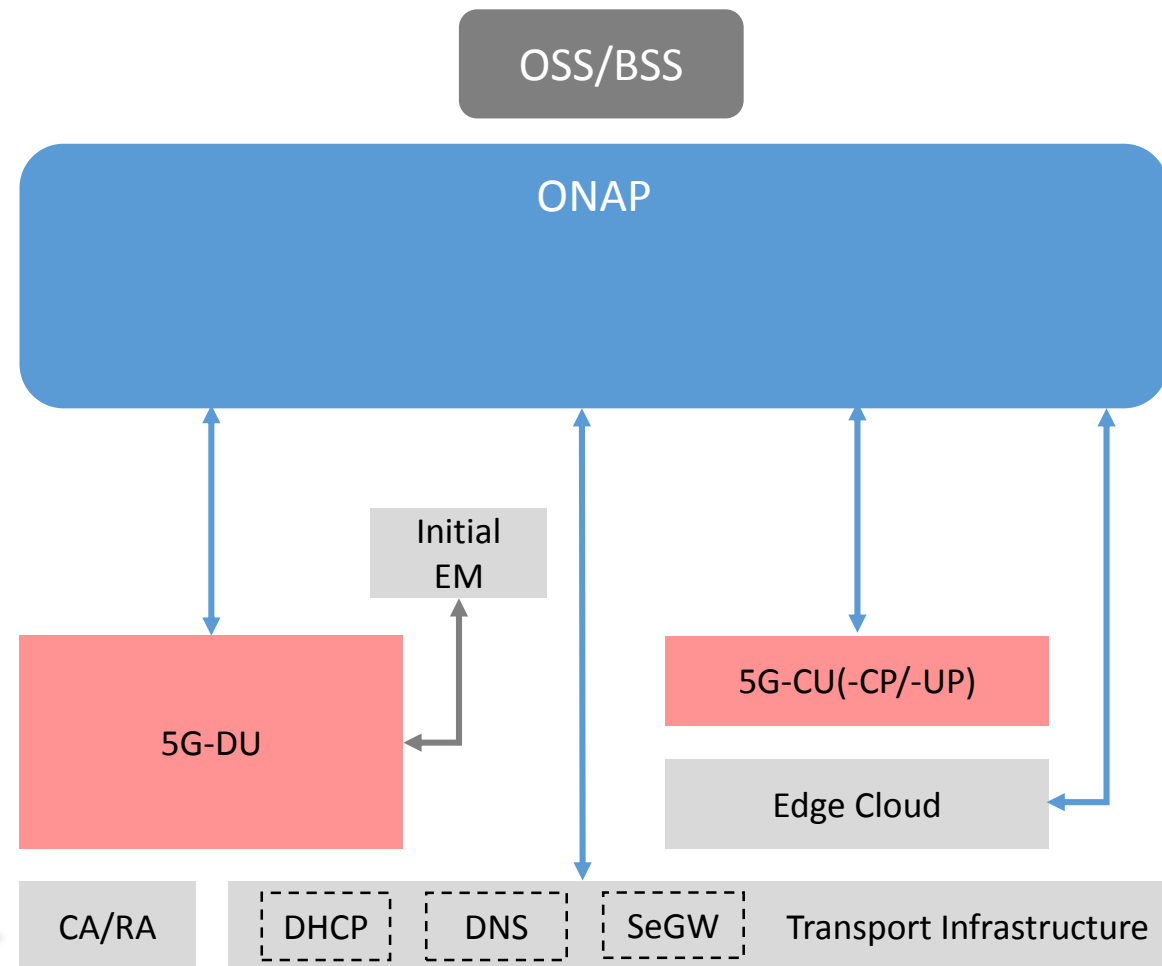
High Level Proposal – Network View



Notes about 3GPP CU/DU split:

- The radio unit (RU) is logically and management-wise part of the DU
- 3GPP allows but does not specify that CU is implemented as VNF

Some of these functions might be virtualized



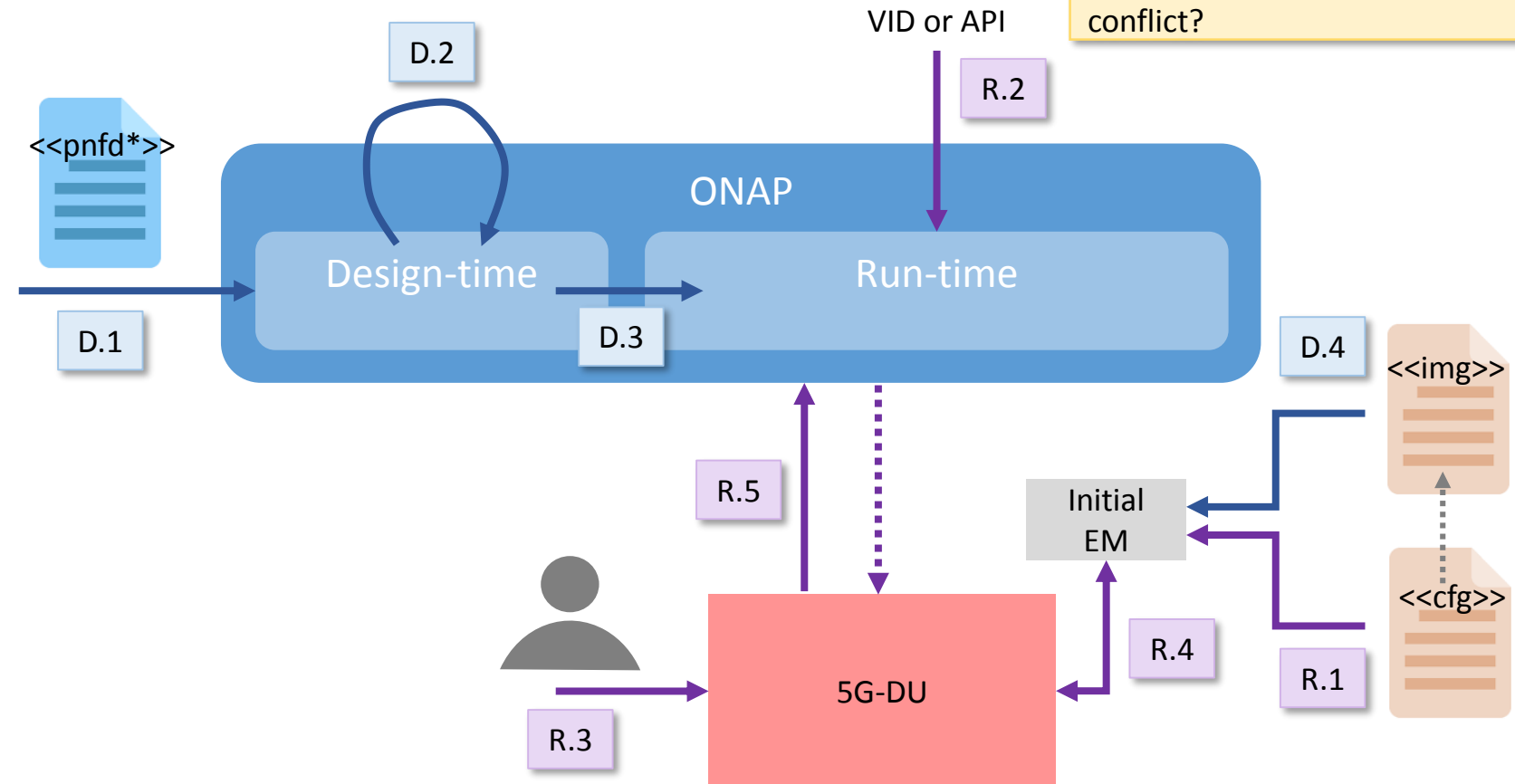
PNF Support (5G-DU)

- Topics
 - PNF bootstrap/PnP
 - SW handling details
 - Application level configuration
- Builds on PNF registration and orchestration support from Beijing

PNF Bootstrap/PnP (partly vendor-specific)

- Design-time (template)
 - [D.1] Onboard PNF descriptor/package*
 - [D.2] Perform resource and service design
 - [D.3] Distribute to run-time
 - [D.4] Upload SW image
- Run-time (instance)
 - [R.1] Upload bootstrap configuration for PNF ID
 - [R.2] Service request including PNF ID
 - [R.3] “Zero-touch” PNF installation
 - [R.4] PNF gets SW and bootstrap configuration from Initial EM
 - [R.5] PNF registers itself with ONAP which allows service request to complete

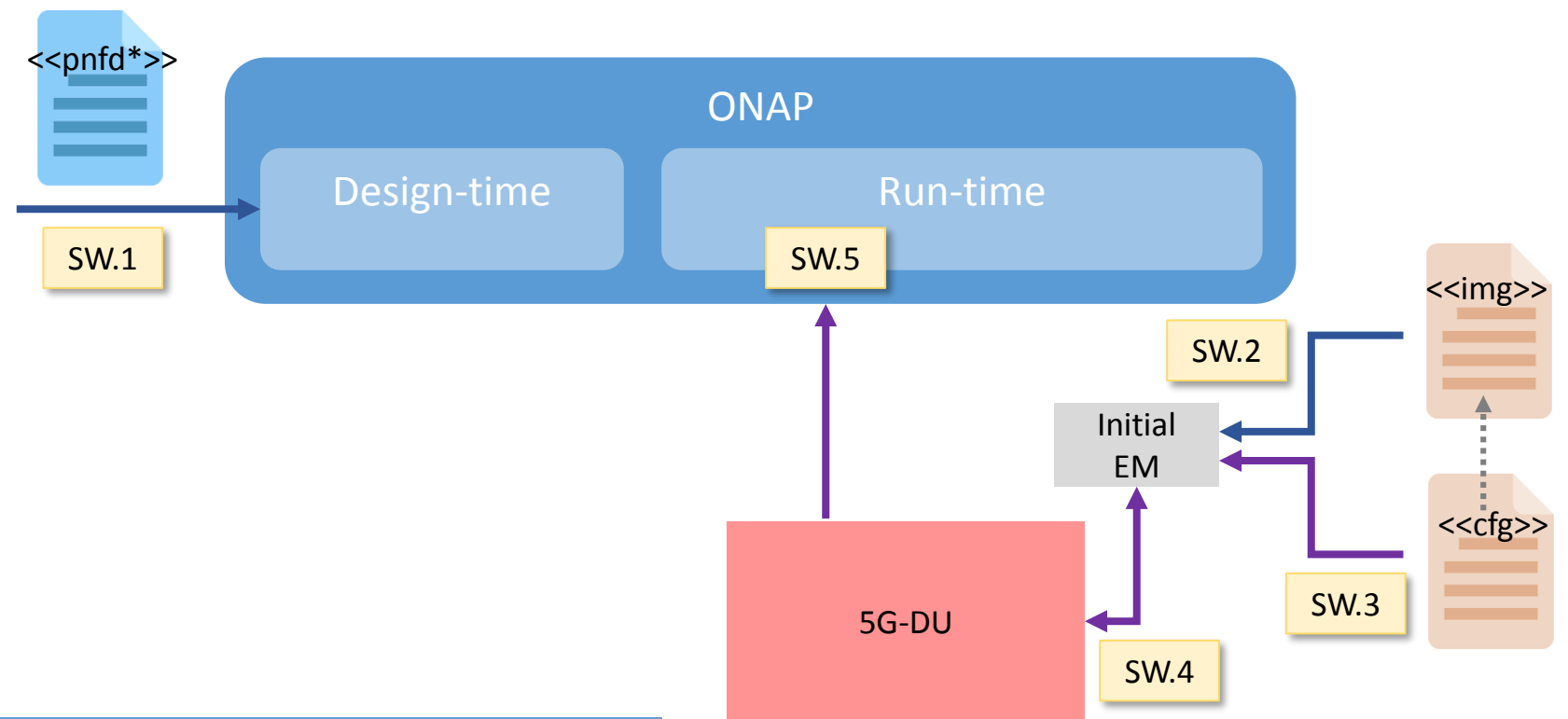
*) Different content than ETSI NFV PNF descriptor due to extended scope. Use other name to avoid conflict?



Projects: SDC, VID, SO, AAI, DCAE/PRH, VNF/PNF Reqs & SDK

PNF SW Handling Details (part of Bootstrap/PnP)

- Steps involving SW
 - [SW.1] The onboarded PNF descriptor includes SW version matching the other metadata
 - [SW.2] An operational SW image is uploaded to Initial EM
 - [SW.3] A bootstrap configuration file for a PNF instance is uploaded, containing SW version/image reference
 - [SW.4] On startup, the PNF will fetch the configured SW image
 - [SW.5] The PNF registration event contains SW version information allowing ONAP to check if it is compatible with the PNF descriptor

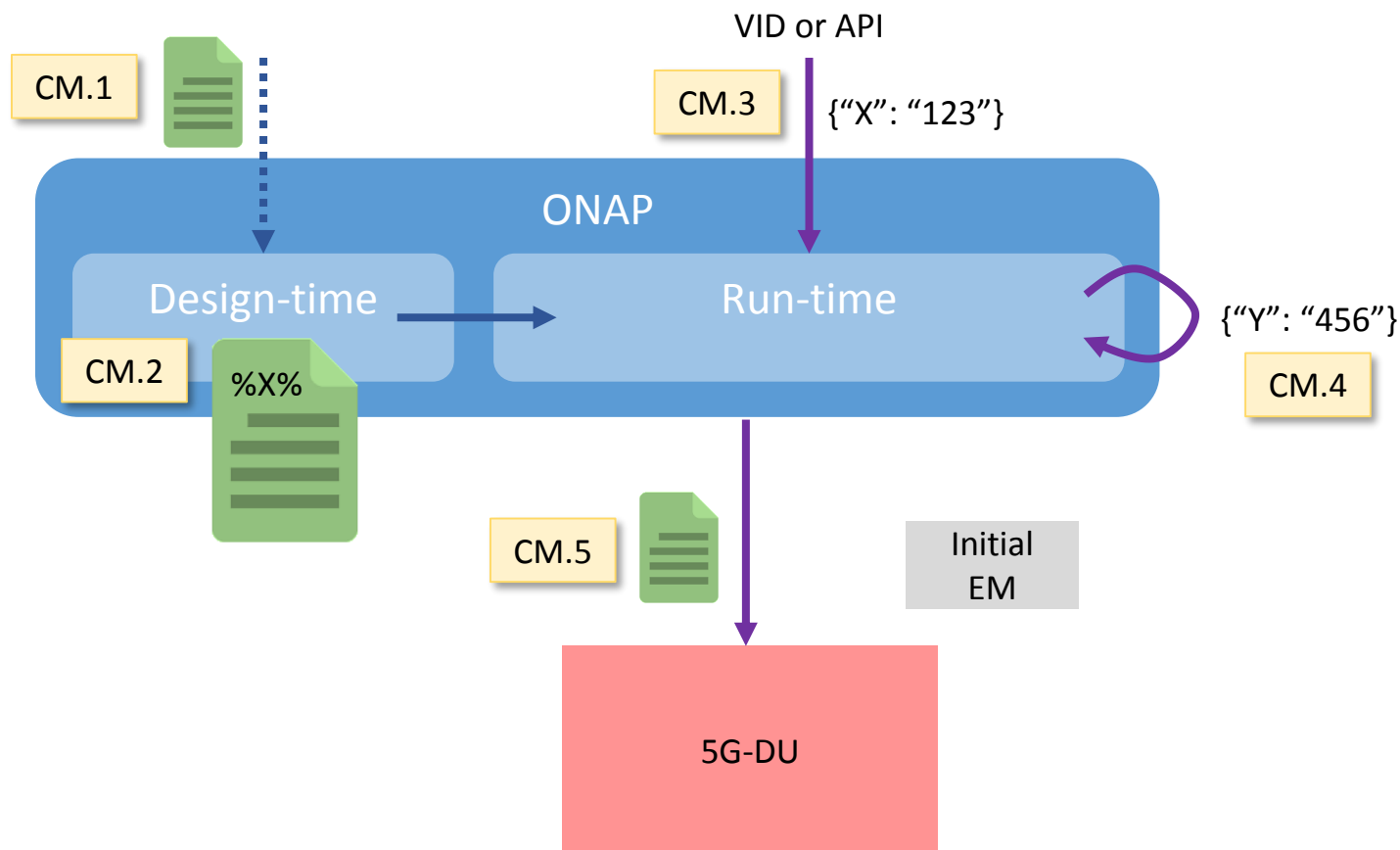


Added or more flexible ONAP workflow to expect operational SW when registering

Application-level Configuration

For further discussion

- Configuration Steps
 - [CM.1] Configuration templates are either created within SDC or onboarded
 - [CM.2] The configuration templates are connected as artifacts to service/resource
 - [CM.3] At run-time parameter values are provided by ONAP user and used for substitution in template engine
 - [CM.4] Some parameter values are assigned by ONAP itself
 - [CM.5] The final configuration file(s) with instance specific values are sent to the PNF, e.g. using NETCONF (merge)
- Use of Configuration Templates
 - Templates are vendor, product and deployment type specific
 - Assumes sufficient commonality between PNF instances
 - Other UC cases such as closed-loop may need different mechanisms to modify individual attributes



Projects: SDC, VID, SO, AAI, Controller

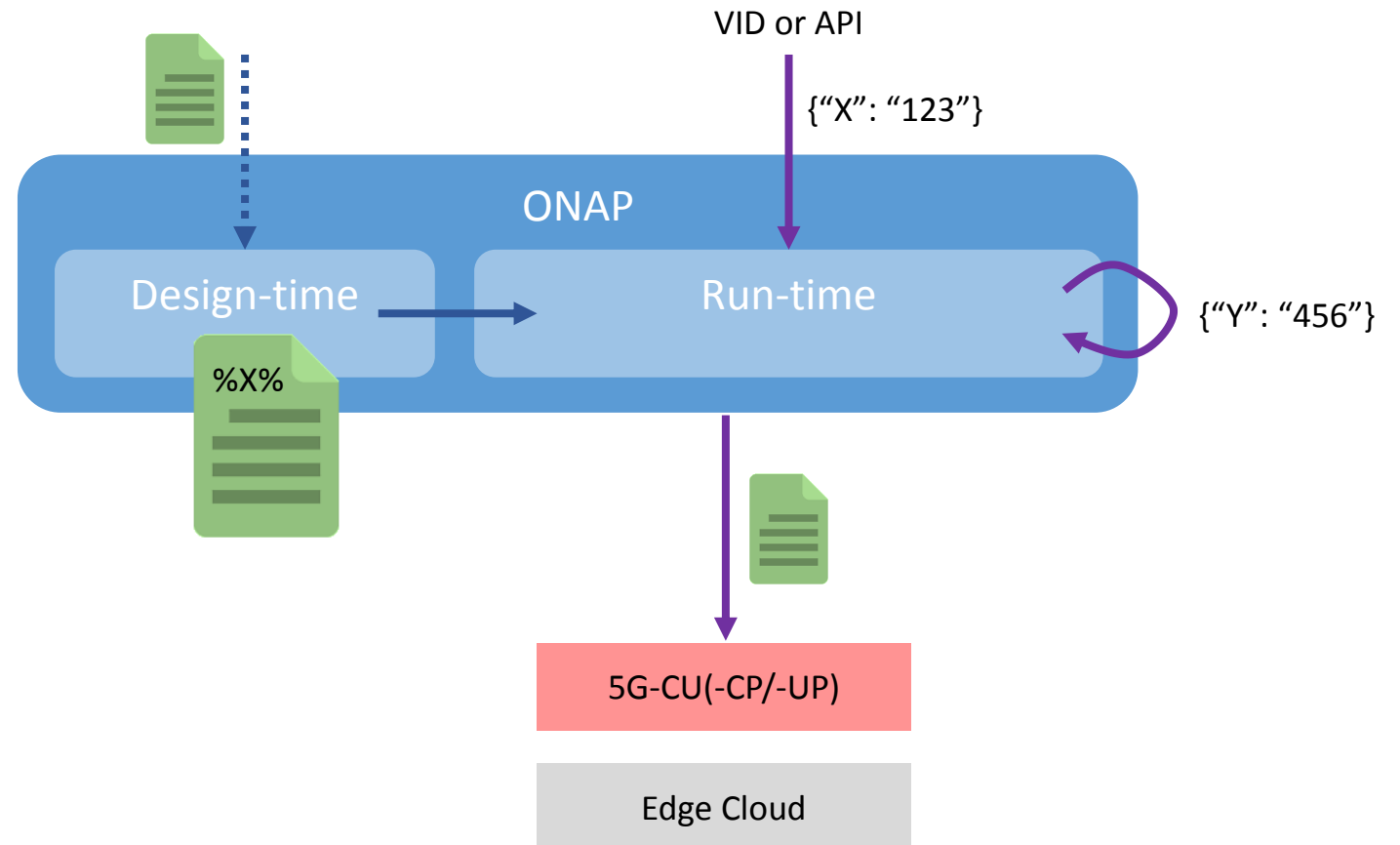
VNF Support (5G-CU)

- Topics
 - Application level configuration
 - VNF placement on edge cloud
- Several aspects of VNF support is already implemented in Amsterdam/Beijing or addressed by separate use cases such as scaling and change management

Application-level Configuration

- Once OAM IP address is known, follows same steps as for PNF
 - Expected that a common controller will manage both 5G PNFs and VNFs

Details of what to configure on 5G-DU vs 5G-CU is still being studied in 3GPP, e.g. TS 28.541 (NR NRM)



Projects: SDC, VID, SO, AAI, Controller

VNF Placement on Edge Cloud

- Assumptions
 - Main problem is to automate and optimize VNF placement with respect to location of PNFs
 - Placement is decided by SO using OOF and policies
- The algorithm will need input data about location of the PNFs as well as available edge clouds (NFVI-PoP)
 - E.g. geo-location or more detailed information about physical transport topology
 - This information should exist in AAI, added from OSS/BSS or by cloud/infrastructure/PNF itself
 - Run-time (instance) rather than design-time (template) attribute
- Additional notes
 - It is necessary that services are designed in a way that SO has information about both PNFs and VNFs
 - E.g. if 5G-DU PNF is added later to already deployed 5G-CU VNF, it is not possible to optimize the VNF placement
 - 5G-DU can be geographically distributed, e.g. remote radio or multiple antenna locations
 - But location of the connection point to the transport network is most important for the placement decision

Projects: SDC, SO, OOF, AAI, DCAE/PRH, Multi-Cloud

Performance Management

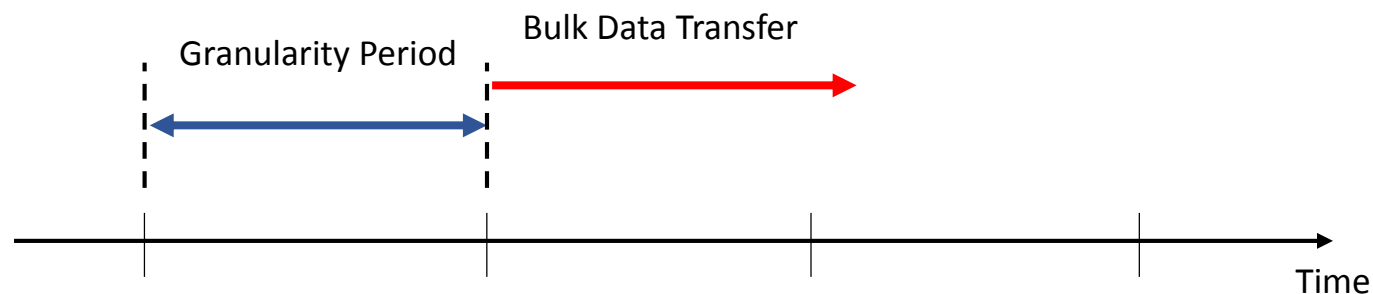
- Topics
 - PM Use Cases
 - Bulk PM Proposal

PM Use Cases

- **Bulk PM data transfer, suitable for non real-time PM use cases**
 - Configuration data at the xNF defines the content (e.g. which measurement types) and collection interval for each. This approach is suitable for large data volumes in support of non real-time PM use cases. The output is collected at the xNF and transferred to external consumers in bulk. Such bulk data is used for analysis such as KPI monitoring, and machine learning requiring large data sets collected over multiple collection periods.
- **PM event streaming, suitable for near real-time PM use cases**
 - This approach is suitable for xNF events intended for consumers requiring very large volumes of data, at the lowest possible latency. Such streams are often intended for specific consumers and produce data intended for specific purposes, e.g. RAN call summary logs.

Bulk PM Overview

- Measurements are collected by the NE (xNF) during each granularity period according to configured measurement jobs
- A report is generated at the end of the period
- Data for one or multiple granularity periods is transferred to an operations system



Measurement Definitions

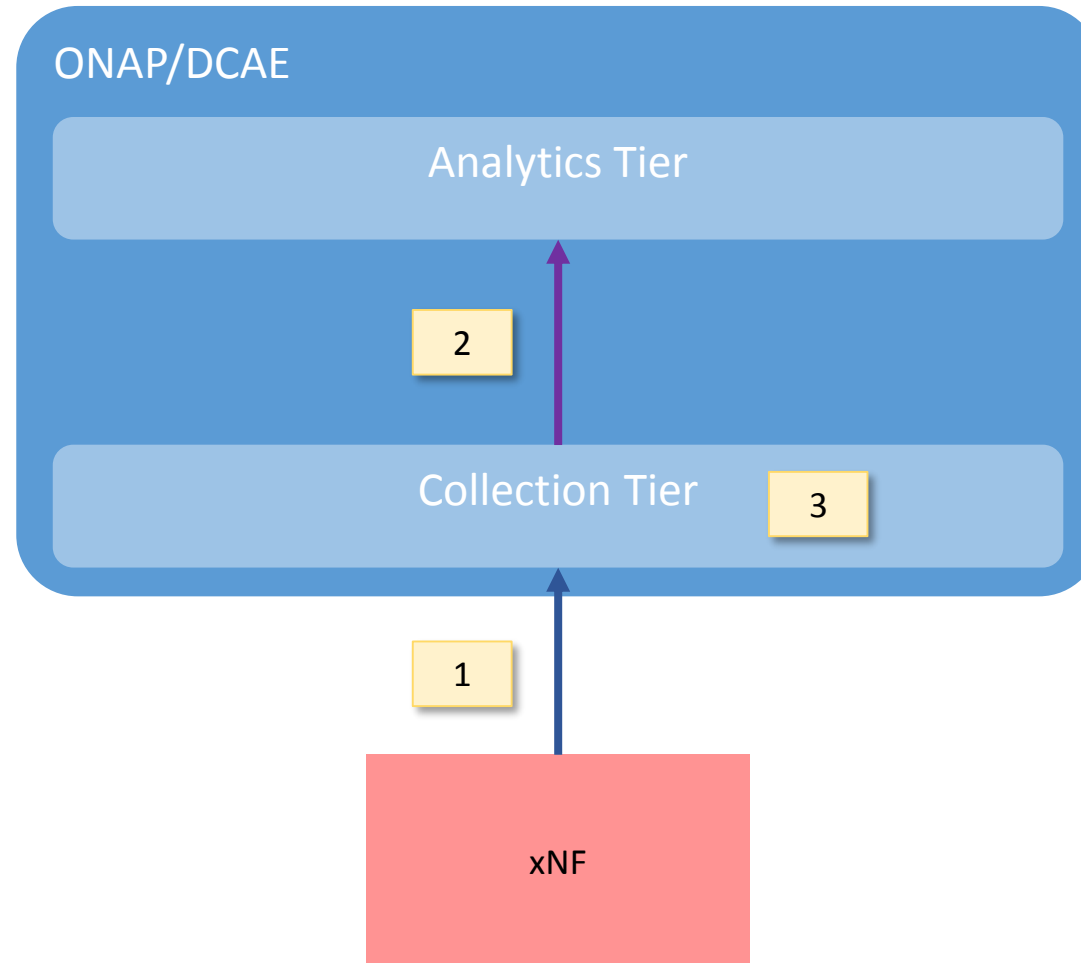
- Example for LTE (E-UTRAN)

Measurement Name	Attempted RRC connection establishments
Description (a)	This measurement provides the number of RRC connection establishment attempts for each establishment cause.
Collection Method (b)	CC (Cumulative Counter)
Condition (c)	Receipt of an RRCConnectionRequest message by the eNodeB/RN from the UE. [...]
Measurement Result (d)	Each measurement is an integer value. [...]
Measurement Type (e)	The measurement name has the form RRC.ConnEstabAtt. <i>Cause</i> where <i>Cause</i> identifies the establishment cause.
Object Class (f)	EUtranCellFDD, EUtranCellTDD

- Standard LTE measurements are defined in TS 32.425 (3GPP)
- Standard 5G RAN measurements will be defined in TS 28.552

Solution Principles and Requirements

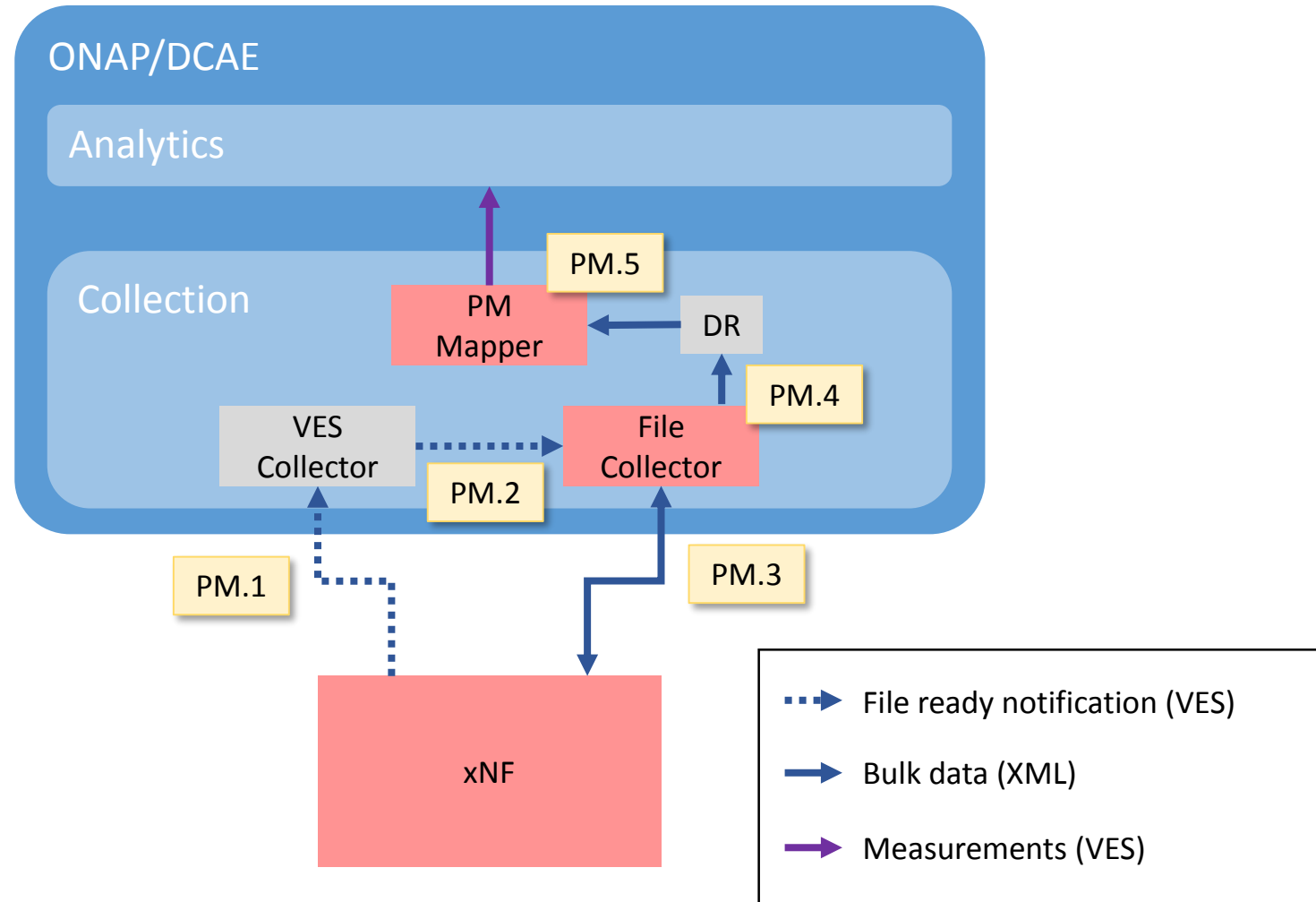
- The following aspects should be considered
 1. Support efficient transfer of bulk measurement data
 2. Support VES-formatted measurements for use by existing ONAP analytics components such as TCA
 3. Modular solution enabling component re-use as well as co-existence of multiple approaches for producers (xNF) and consumers (e.g. analytics)



High Level Proposal

Steps

- [PM.1] At the end of each reporting period, a FileReady notification is sent to DCAE as a VES event
 - Location of the file is indicated in notification via URL
- [PM.2] The notification is received and forwarded on DMaaP topic to the File Collector
- [PM.3] The File Collector schedules and executes file retrieval using indicated protocol in URL, e.g. FTP(ES)
 - Format is 3GPP XML (TS 32.435) with gzip compression
- [PM.4] The file contents are published on a DMaaP Data Router feed
 - Data Router is being developed in DMaaP
- [PM.5] The PM Mapper receives XML data from the DR feed and publishes mapped VES events on a DMaaP topic for further processing
 - A new VES domain is proposed for 3GPP measurements

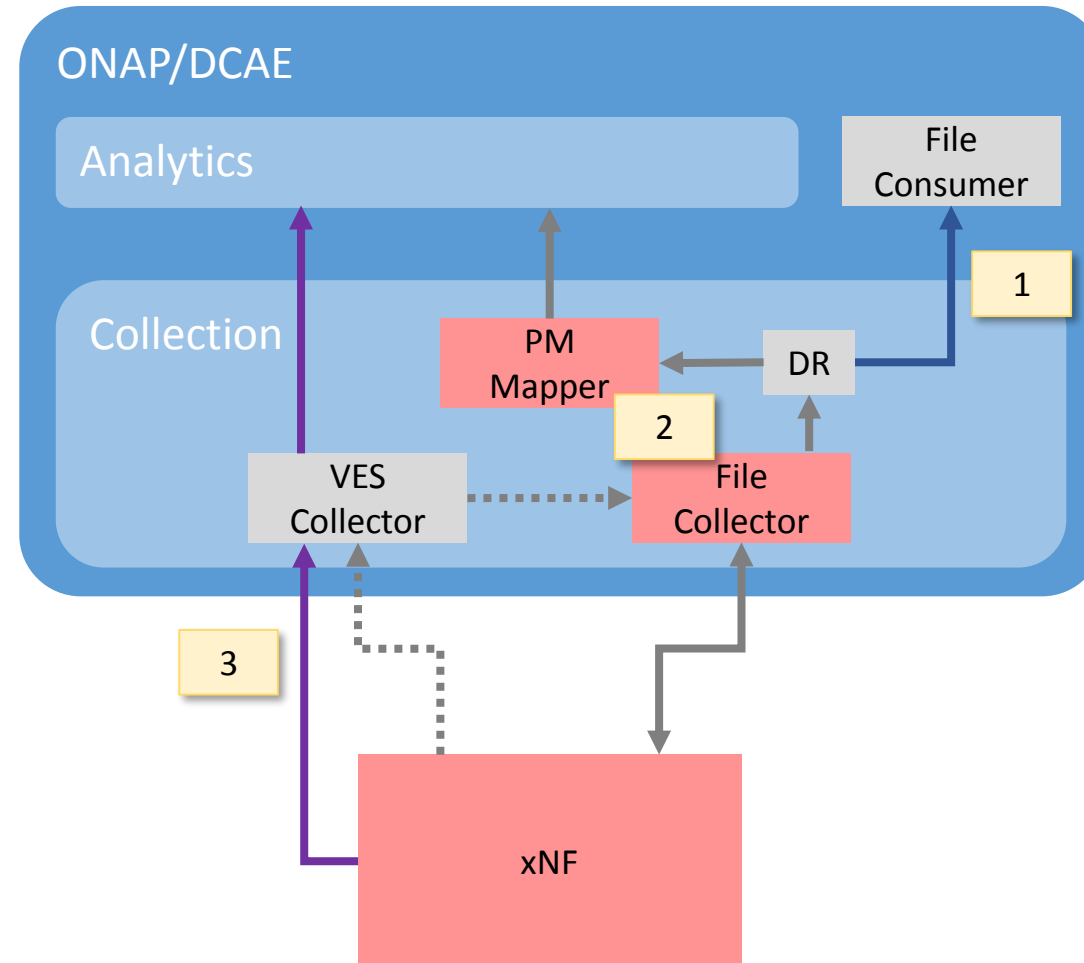


Preconditions

- At least one measurement job must have been configured on the xNF
 - Measurements are not automatically enabled
 - Job administration in first step via vendor-specific configuration interface
- DCAE micro-services and DMaaP topics and feeds must have been deployed and configured
 - Includes some design-time work

Modularity

- The modular approach can support additional scenarios
 1. Non-VES data consumers are supported via direct subscription to feed on the Data Router
 2. Separation of file collector and mapper services means that file collector can be used for multiple types of files and mapper can get data from multiple sources
 3. xNF can send performance data directly on the new VES measurement domain
 - Not suitable for high volume data



Solution Summary

- Main parts of the proposed solution are
 - New VES domains
 - FileReady events
 - Measurement events
 - New DCAE micro-services
 - File Collector
 - PM Mapper
- Dependency to DMaaP Data Router function
- There may be some impact on additional ONAP projects

Projects: SDC, CLAMP, DMaaP, DCAE, VNF/PNF Reqs



ONAP

OPEN NETWORK AUTOMATION PLATFORM

Thank You