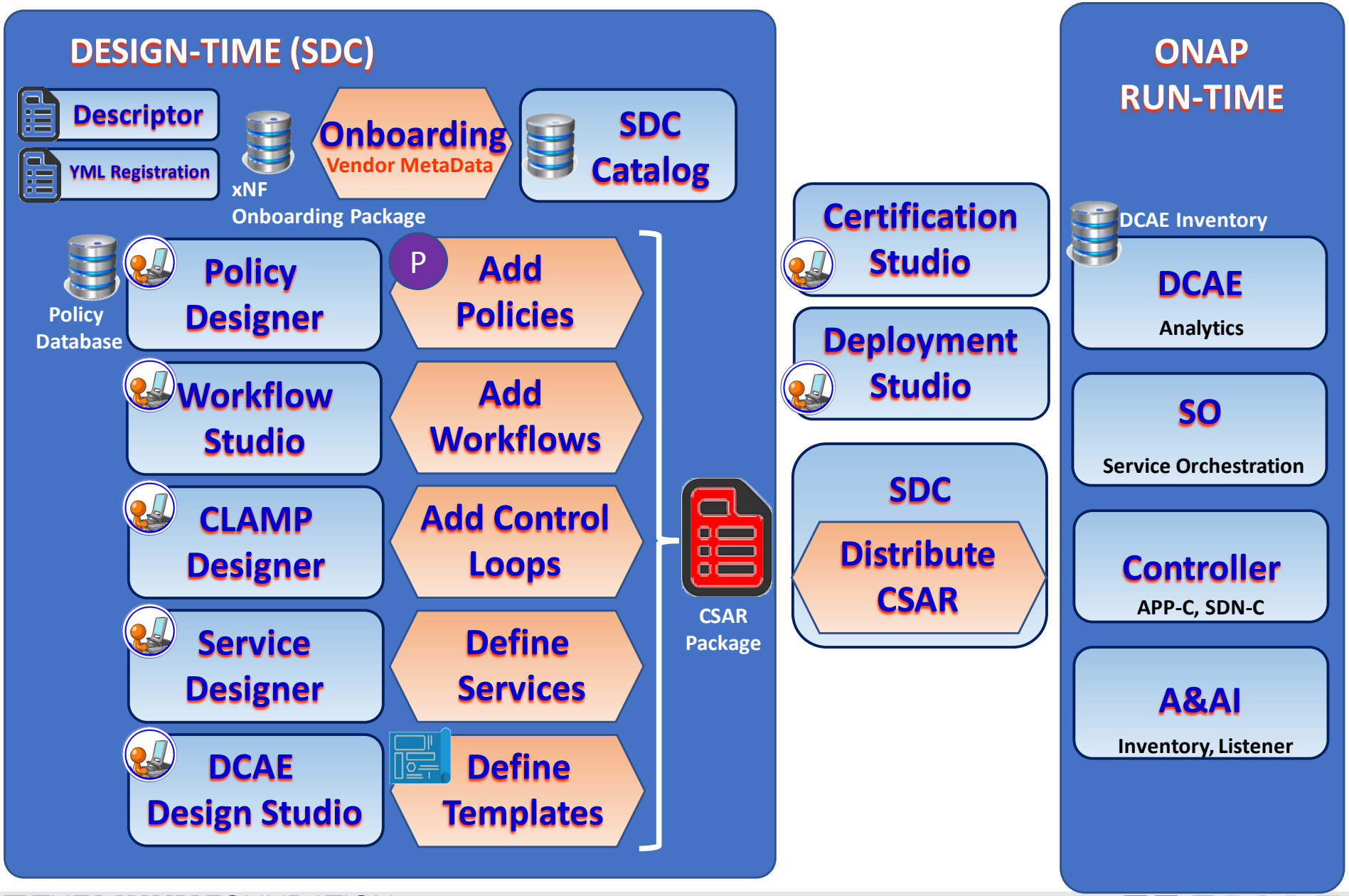
FM Meta Data & FM GUI Display

- 5G Use Case Subcommittee

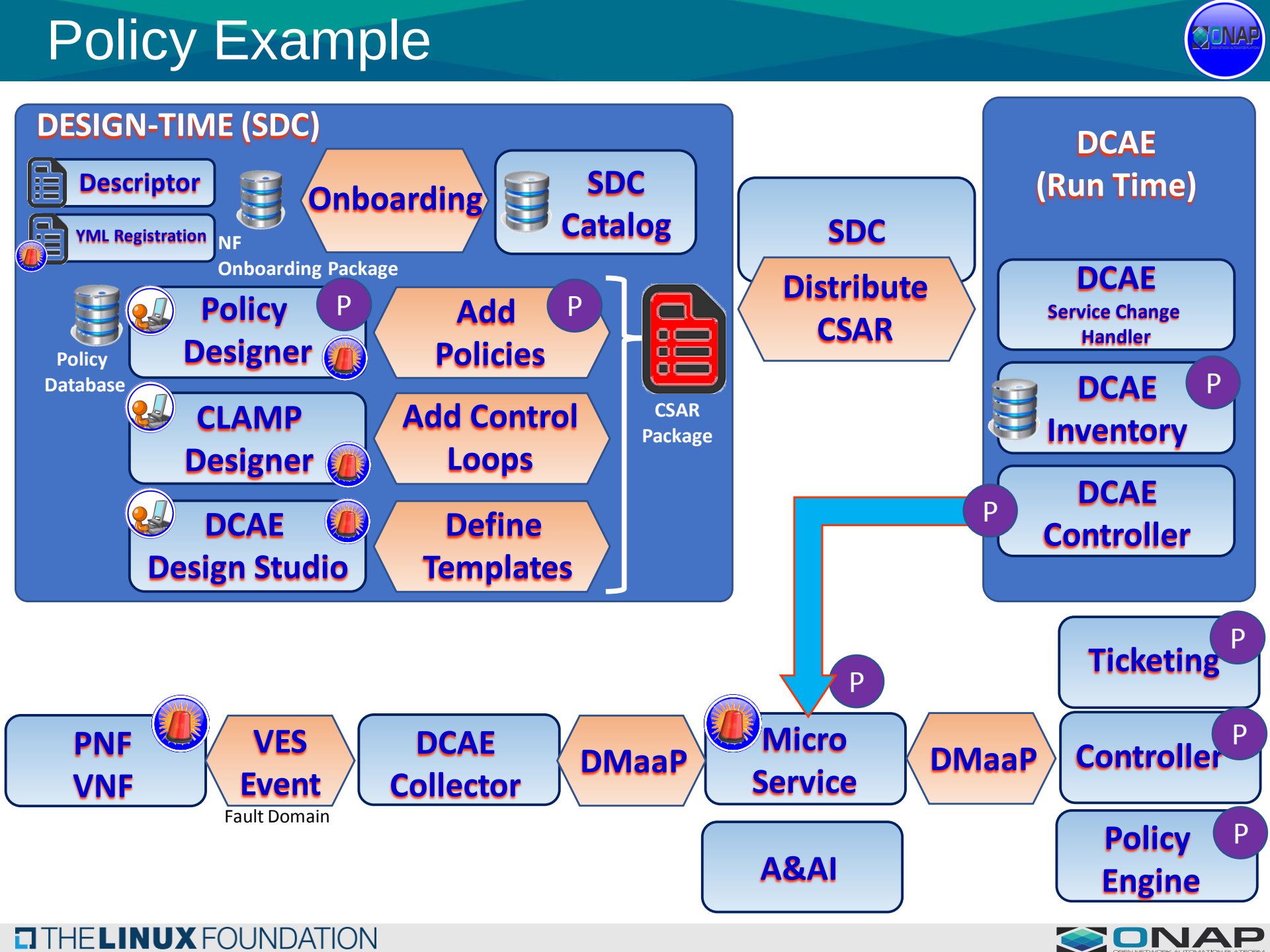
Benjamin Cheung

Feb 25, 2018 version 2

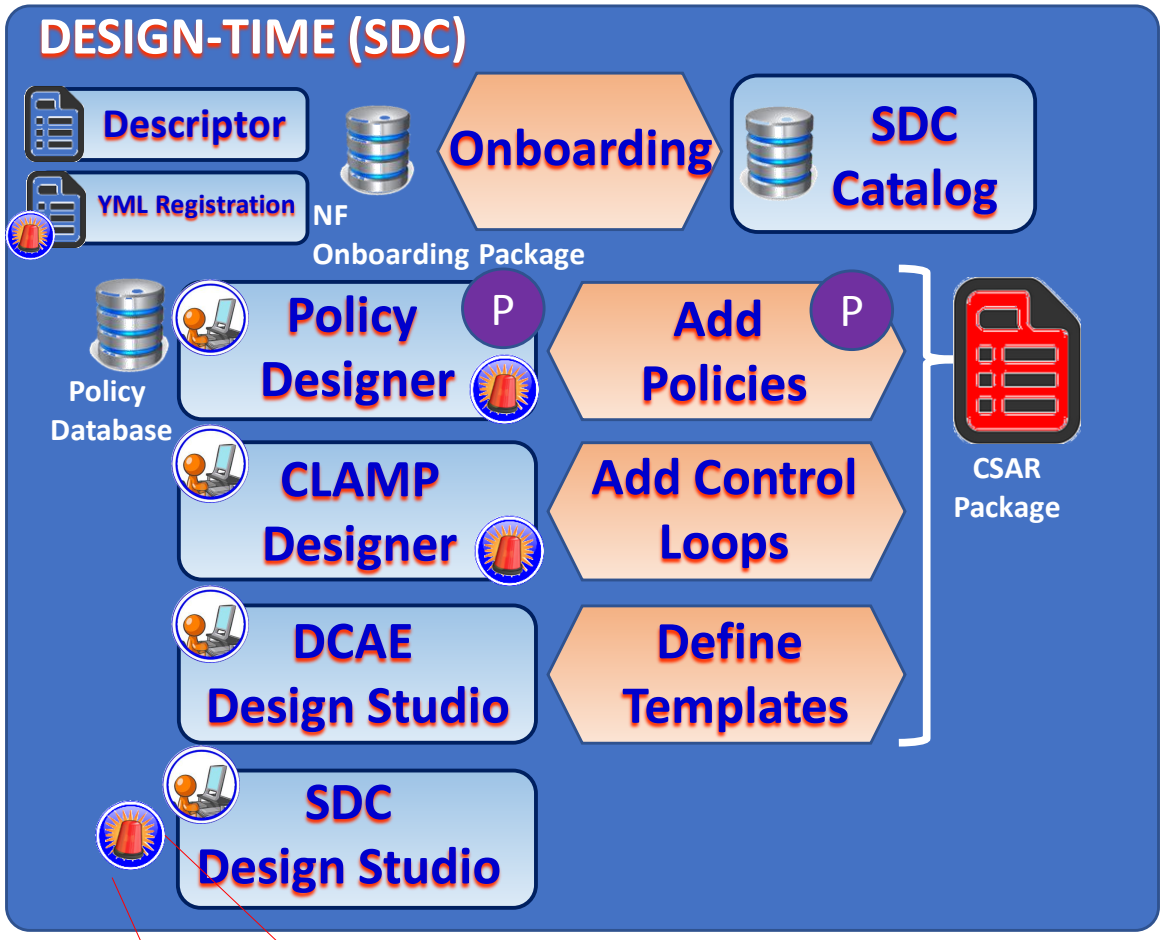
Design-Time Process

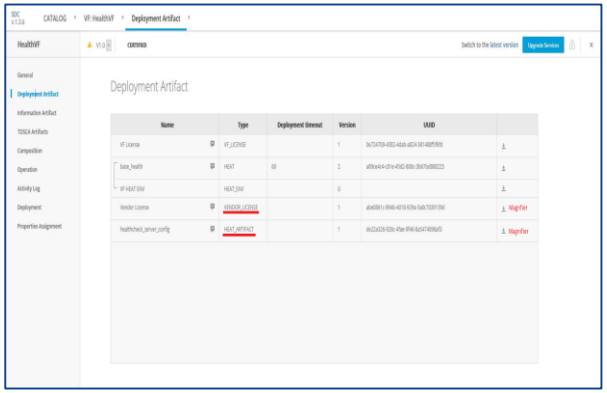


Policy Example



FM Meta Data





SDC VF resource
Mgmt pages

Dublin Priority

Dublin (R4) Goal is to be able to view the onboarded FM Meta-Data (from the PNF onboarding package) in a GUI (either SDC-DS, Policy Designer, CLAMP, DCAE DS).

FM Meta Data

U/C DESCRIPTION

Support the following work items for FM Meta Data for 5G xNFs:

1. Review and finalize VES Event Listener Specification v7.1 and VES Event Registration Specification v3.2 which contains the FM metadata format and content.
2. Onboard the FM metadata for an xNF as part of the VES Event Registration YAML file. Note: Processing of the FM meta data is covered the PNF Pre-onboarding & onboarding Use Case
3. Display the FM metadata in a GUI to allow an ONAP User to create Policies for handling alarms.
4. Update VNF Requirements for FM metadata artifact.

Wiki

https://wiki.onap.org/pages/viewpage.action?pageId=40206485

ONAP RT COMPONENT IMPACTS

RT COMPONENT	IMPACT	PTL INVOLVEMENT
VES Specifications	Review and finalize VES Event Listener Specification v7.1 and VES Event Registration Specification v3.2	PTL Notified Updated VES Doc
GUI Display of FM Meta Data	Display the FM Meta data in a GUI (either DCAE-DS, Policy GUI and/or SDC GUI) to allow an ONAP User to create Policies for handling alarms	TBR (To be reviewed)
VNF Requirements	Update to VNF requirements for FM Dictionary metadata artifact creation	TBR

FM Meta Data

Fault Events carry key information about a fault that is occurring.

Additional meta data about the fault needs to be provided to help explain the fault and determine subsequent actions.

- In legacy RAN products, a fault dictionary or fault meta data file was provided by RAN vendors to fill this need.
- Fields that described the meta data were not commonly defined across providers.

In this proposal, we identify the FM meta data fields that a NF could provide, and that the YAML registration event can include, containing information not already provided in the fault event.

- Agree upon a common name for the fields and definition for the fields.
- Identify which fields are recommended (R) and which are optional (O).

Providing the information in the fault registration record obviates the need for a separate dictionary artifact to be provided.

FM Meta Data

Example

Alarm event is defined to be Fault_car_ToyotaCamary2018_LowTirePressure

There are four underlying faults that could cause this to be raised
FaultId1 leftRearTireLowPressure
FaultId2 rightRearTireLowPressure
FaultId3 leftFrontTireLowPressure
FaultId4 rightFrontTireLowPressue

We know what the name of the fault is if we get a particular fault id
We know what the meaning
We know what instructions would be provided
We know what the effect is

We would like to be able to provide all of this information in the registration event so the fault event itself would only have to provide the faultId and perhaps the fault name since Farideh wants that to be the specific problem. That also could be populated based on the faultID

FM Meta Data – ALARM FIELDS

DEFINITION FIELD	R / O	DESCRIPTION
ALARM ID	O	Gives a unique numerical identifier for the alarm. The identifier will be unique per NF per vendor.
ALARM NAME	R	Gives a short, concise meaningful name of the alarm in camel format with no spaces, for example baseStationSynchronizationProblem. Note: Alarm Name meta data must match the name used in *alarmCondition* in the *faultFields* of the VES Fault Event to provide the cross reference between the Fault Event and its associated FM Meta Data.
EVENT TYPE	O	Indicates the type of alarm. Event Types are specified in 3GPP TS 32.111 Annex A. The types are: Communications Alarm, Processing Error Alarm, Environmental Alarm, Quality of Service Alarm, Equipment Alarm, Integrity Violation, Operational Violation, Physical Violation, Security Service or Mechanism Violation, or Time Domain Violation. Note: The *eventCategory* in the *faultFields* of the VES Fault Event may optionally contain the Event Type.
ALARM DESCRIPTION	R	Provides a descriptive meaning of the alarm condition. This is intended to be read by an operator to give an idea of what happened.
ALARM EFFECT	R	Provides a description of the consequences when this alarm condition occurs. This is intended to be read by an operator to give a sense of the effects, consequences, and other impacted areas of the system.
MANAGED OBJECT CLASSES	R	Indicates the list of possible managed object classes (MOCs) associated with this alarm. The managed object classes are provided by the vendor. Note: The *eventSourceType* in the *faultFields* of the VES Fault Event contains the specific MOC against which the particular alarm occurrence was raised.
PROBABLE CAUSE	O	Provides the probable cause qualifier for the alarm. Probable causes are found in 3GPP TS 32.111 Annex B drawn from ITU-T M.3100 and from ITU-T Recommendation X.721, X.733, and X.736.
PROBABLE CAUSE NUMBER	O	Provides a corresponding number for the Probable Cause. Note: Probable Cause numbers are found in IANA-ITU-ALARM-TC-MIB DEFINITIONS at https://www.iana.org/assignments/ianaitualarmtc-mib/ianaitualarmtc-mib .
PROPOSED REPAIR ACTIONS	R	Indicates proposed repair actions. May be used to provide recovery instructions to the operator in free form text.
CLEARING TYPE	R	Indicates whether the alarm is automatically or manually cleared. Valid values are Automatic or Manual.
ADDITIONAL TEXT	O	Contains further vendor-provided information on the alarm in free form text. See ITU-T Recommendation X.733 clause 8.1.2.13.
ASSOCIATED FAULTS	O	Indicates the list of possible fault IDs that could have triggered this alarm. Note: The fault IDs provide the cross reference to the FAULT ID in the FM Meta Data FAULT FIELDS.

FM Meta Data – FAULT FIELDS

DEFINITION FIELD	R / O	DESCRIPTION
FAULT ID	O	Gives a numerical Identifier for the fault. The identifier will be unique per NF per vendor. Note: A *faultId* in the *alarmAdditionalInformation* in the *faultFields* of the VES Fault Event can be cross referenced to the FAULT ID in the FM Meta Data.
FAULT NAME	O	Gives a short, concise meaningful name for the fault in free form text.
FAULT DESCRIPTION	O	Provides a descriptive meaning of the fault condition. This is intended to be read by an operator to give an idea of what happened.
FAULT EFFECT	O	Provides a description of the consequences when this fault occurs. This is intended to be read by an operator to give a sense of the effects, consequences, and other impacted areas of the system.
PROPOSED REPAIR ACTIONS	O	Indicates proposed repair actions. May be used to provide recovery instructions to the operator in free form text.
ADDITIONAL TEXT	O	Contains further information on the fault in free form text. See ITU-T Recommendation X.733 clause 8.1.2.13.

FM Meta Data – YAML REGISTRATION

NFs provide separate YAML registration “documents” for each of the Fault Events they emit.

- Fault Event YAML documents are combined into a single YAML Event Registration file per NF.

FM meta data that is particular to the specific Fault Event is included in the registration document for that event

- Provides all of the meta data for the fault so that a separate fault/alarm dictionary does not have to be provided by the NF vendor
- YAML Registration provides a “comment” capability which the registration processing can use to extract the meta data information for Policy creation.
- FM meta data keywords are in all CAPS to make them easy to find.

Example file follows

FM Meta Data

registration for Fault_gnb-Nokia_baseStationSynchronizationProblem
Constants: domain, eventName, version, vesEventListenerVersion, eventCategory, faultFieldsVersion, specificProblem.
Variables (to be supplied at runtime): eventId, eventSeverity, eventSourceType, lastEpochMicrosec, priority, reportingEntityName, sequence,
sourceName, startEpochMicrosec, timeZoneOffset, additionalFields, alarmInterfaceA, alarmAdditionalInformation, vfStatus.
Comments contain FM meta data about a Fault Event that is constant for this alarm and can be permanently populated for
the event in this YAML file. This eliminates the need for the NF to send this information in the Fault event.
Comments include Alarm meta data: ALARM ID, ALARM NAME, ALARM DESCRIPTION, ALARM EFFECT, MANAGED OBJECT CLASSES, EVENT TYPE,
PROBABLE CAUSE, PROBABLE CAUSE NUMBER, ASSOCIATED FAULTS, CLEARING TYPE, PROPOSED REPAIR ACTIONS, ADDITIONAL TEXT.
These are commented at the event level at the beginning of the event registration.
Fault specific information is in the alarmAdditionalInformation field.
Comments may contain Fault meta data: FAULT ID, FAULT NAME, FAULT DESCRIPTION, FAULT EFFECT, PROPOSED ACTIONS, ADDITIONAL TEXT.
These are commented at the fault level in the alarmAdditionalInformation field.

event: {presence: required, action: {any, any, baseStationSynchronizationProblem, RECO-contact Nokia technical support }, comment: "
ALARM NAME: baseStationSynchronizationProblem
ALARM ID: 7108
ALARM DESCRIPTION = 'A fault has occurred in the base station synchronization. For example: the base station reference clock signal is lost or is unstable or inaccurate.'
ALARM EFFECT = 'The effect of the fault on the functioning of the network element depends on the fault id raised. See FAULT EFFECT below.'
MANAGED OBJECT CLASSES: NRBTS
EVENT TYPE: 'Equipment Alarm'
PROBABLE CAUSE: 'Timing Problem'
PROBABLE CAUSE NUMBER: 66
PROPOSED REPAIR ACTIONS: 'See PROPOSED REPAIR ACTIONS for the underlying fault under alarmAdditionalInformation.'
ASSOCIATED FAULTS: 9, 1818
CLEARING TYPE: Automatic
",

FM Meta Data

```
structure: {
    commonEventHeader: {presence: required, structure: {
        version: {presence: required, value: 3.0},
        domain: {presence: required, value: fault},
        eventName: {presence: required, value: Fault_gnb-Nokia_baseStationSynchronizationProblem},
        eventId: {presence: required),
        sourceName: {presence: required},
        reportingEntityName: {presence: required
        priority: {presence: required},
        startEpochMicrosec: {presence: required},
        lastEpochMicrosec: {presence: required},
        timeZoneOffset: {presence: required},
        sequence: {presence: required}
    }},

    faultFields: {presence: required, structure: {
        faultFieldsVersion: {presence: required, value: 3.0},
        eventCategory: {presence: optional, comment: “Equipment Alarm”},
        alarmCondition: {presence: required, value: 'baseStationSynchronizationProblem'},
        eventSourceType: {presence: required},
        alarminterfaceA: {presence: required},
        specificProblem: {presence: required},
        eventSeverity: {presence: required},
        nfStatus: {presence: required, default: Active},
```

Provides capability to set a default for an optional f
Eliminates the need to send this field for each fault e

FM Meta Data

alarmAdditionalInformation: {presence: required, array: {
keyValuePair: {presence: required, structure: {
key: {presence: required, value: 'faultId'},
value: {presence: required}},
comment: "

Provides capability to supply Fault meta data at the fault level; detailed information about each fault condition that could cause a particular alarm to be raised.

FAULT ID: 9,

FAULT NAME: 'BTS time not corrected',

FAULT DESCRIPTION: 'The reference frequency that the BTS master clock receives has changed by about 200 ppb or more (which equals the change magnitude of 204 DAC steps or more (with 12bit DAC)) during the measurement period, compared to the BTS master clock frequency.

Causes can be:

1. The reference frequency …..
2. The reference frequency fluctuates …',

FAULT EFFECT: 'This fault does not immediately affect the operations of the BTS, but it is a notification …',

PROPOSED REPAIR ACTIONS: 'Follow the instructions below:

1. In case of a fault in the transmission network synchronization, …
2. If the basic accuracy of the signal used for synch is correct…
3. In case of a BTS equipment fault, the location might be:
4. After the fault situation has been cleared, ….',

FAULT ID: 1818,

FAULT NAME: 'BTS master clock tuning failure',

FAULT DESCRIPTON: 'Master clock frequency is tuned to within 5% of its minimum or maximum tuning limit.',

FAULT EFFECT: 'The BTS can operate properly for months ….

Effects in Frequency Synchronization mode: …

Effects in Phase Synchronization mode: ….',

PROPOSED REPAIR ACTIONS: 'Perform the steps below in the listed order until the fault disappears.

Not tracking satellites:

1. The most common reason ….
2. There might be a malfunction in the GPS receiver. Perform a (remote) power reset for the GPS receiver.
3. There might be a HW fault in the GPS receiver. Check the operation and change the GPS module, if needed.'

",

FM Meta Data

```
            keyValuePair: {presence: required, structure: {
                key: {presence: required, value: ‘alarmId’},
                value: {presence: required}
            }},
        additionalFields: {presence: required, keyValuePairString: {|, =, keyValuePairs: [
            keyValuePair: {presence: required, structure: {
                key: {presence: required, value: ‘btsName'},
                value: {presence: required}
            }},
            keyValuePair: {presence: optional, structure: {
                key: {presence: required, value: ‘cellName'},
                value: {presence: required}
            }}
        ]}}
    }}
}}
```

FM Meta Data - HEADER

Field	Type	Required	Description
version	string	Yes	Version of the event header (currently: 4.0.1) **4.0.1**
eventName	string	Yes	***Fault_nfType-nfVendor_alarmName,*** where nfType is defined by the NF provider e.g. gnb, gnbCu, gnbDu, etc. and ***alarmName*** is the name of the alarm bein raised.--example ***Fault_gnb-Nokia_baseStationSynchronizationProblem***
domain	enum	Yes	Event domain enumeration: 'fault', 'heartbeat', 'measurement', 'mobileFlow', 'other', 'pnfRegistration', 'sipSignaling', 'stateChange', syslog', thresholdCrossingAlert', voiceQuality**, 'fault'**
eventId	string	Yes	Event key that is unique to the event source ***faultyyyyyy*** **where fault is the domain and eventId is incremented for each unique occurrence of an alarm—helps ONAP determine if a fault event missed. Do NOT INCREMENT the eventId for subsequent reporting of the same fault or for the clearing of the fault—only increment if there is a ne occurrence. If NF reboots go back to 0 so the first fault is fault000001**
eventType	string	No	Not used
nfcNamingCode	string	No	Network function component type: 3 characters (aligned with vfc naming standards) Not used
nfNamingCode	string	No	Network function type: 4 characters (aligned with vnf naming standards) Not used
sourceId	bytes	No	UUID identifying the entity experiencing the event issue (note: the AT&T internal enrichment process shall ensure that this field is populated) Not used
sourceName	string	Yes	Name of the entity experiencing the event issue **NF Name (pnf-name or vnf-name) as entered in A&AI uniquely identifying this instance of the NF**
reportingEntityId	bytes	No	UUID identifying the entity reporting the event, for example an OAM VM (note: the AT&T internal enrichment process shall ensure that this field populated) Not Used
reportingEntityName	string	Yes	Name of the entity reporting the event, for example, an EMS name. May be the same as the sourceName. For synthetic events generated by DCAE, it is th name of the app generating the event. **NF Name (pnf-name or vnf-name) as entered in A&AI uniquely identifying this instance of the NF**
priority	enum	Yes	Processing priority enumeration: is High, Medium, Normal, Low' **Priority is based on eventSeverity. Critical is High, Major is Medium, Cleared is Normal, Minor/Warning is Low**
startEpochMicrosec	number (uint64)	Yes	The earliest unix time aka epoch time associated with the event from any component--as microseconds elapsed since 1 Jan 1970 not including leap seconds This is always the same value and that is the first observation time that was reported until alarm is cleared. **13172659790000000**
lastEpochMicrosec	number (uint64)	Yes	The latest unix time aka epoch time associated with the event from any component--as microseconds elapsed since 1 Jan 1970 not including leap seconds When raised, set to same time as startEpochMicrosec. If raised multiple times or periodically, it's the current time. If it's cleared, it's the time it was cleare **13172659790000000**
timeZoneOffset	string	No	Offset to GMT to indicate local time zone for device +06:00
sequence	number (uint32)	Yes	Ordering of events communicated by an event source instance (or 0 if not needed) ***1 when initially occurs. Integer incremented when same fault occurrence reported until a clear is sent. The clear will be the last occurrence to increme the sequence number. After a clear, the sequence number is reset to 1.*** **1**
vesEventListenerVersion	String	Yes	Version of the VesEvent Listener 7.0.1

PNF Onboarding Package (CSAR)

PNF Onboarding (CSAR file)

Note:
- Package Example
- Not all files are listed.
- Folder / file name in blue is requested by SOL004.
- Folder / file name in black is example only.

TOSCA-Meta-Version: 1.0
CSAR-Version: 1.1
Created-By: Ericsson (Zu Qiang 2018-12-03)
Entry-Definitions: Definitions/MainServiceTemplate.yaml
Entry-Manifest: MainServiceTemplate.mf
Entry-Change-Log: Artifacts/ChangLog.txt
Entry-Tests: Artifacts/Tests
Entry-Certificate: Artifacts/License_term.txt

ROOT
- TOSCA-Metadata
- Definitions
- Artifacts
- MainServiceTemplate.mf

TOSCA.meta

NF descriptor

MainServiceTemplate.yaml

Not supported by ONAP Casablanca

- ~~Images~~
- Deployment
- Scripts
- Tests
- ChangeLog.txt
- MainServiceTemplate.cert
- License_term.txt

Not used yet

- Configuration
- Yang_module
- Measurements
- Events
- ...

yang-module.yang

pm-dictionary.yaml

ves-dictionary.yaml

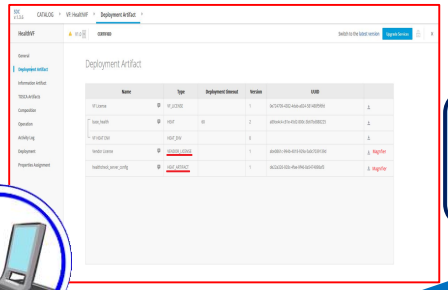
- Install.csh
- ...

metadata:
pnf_product_name: gNB
pnf_provider_id: Ericsson
pnf_package_version:1.0
pnf_release_date_time:2018-12-03T08:44:00-05:00
non_mano_artifact_sets:
Events:
source: Artifacts/Deployment/Events/VES_registration.yaml

FM Meta Data – GUI R4

Alarm ID	Alarm Name	Alarm Fields
7108	Base station synchronization problem	ALARM NAME: baseStationConnectivityLost ALARM ID: 7107 ALARM DESCRIPTION = 'A fault has occurred in the base station connection to the core network elements or neighbor elements.' ALARM EFFECT = 'The effect of the fault on the functioning of the network element depends on the fault id raised. See FAULT EFFECT below.' MANAGED OBJECT CLASSES: NRBTS EVENT TYPE: 'Communications Alarm' PROBABLE CAUSE: 'Loss of Signal' PROBABLE CAUSE NUMBER: 8 PROPOSED REPAIR ACTIONS: 'See PROPOSED REPAIR ACTIONS for the underlying fault under alarmAdditionalInformation.' ASSOCIATED FAULTS: 75, 76 CLEARING TYPE: Automatic
7120	Over-temperature	ALARM NAME: baseStationOverTemperature ALARM ID: 7120 ALARM DESCRIPTION = 'The base station has detected an over temperature condition.' ALARM EFFECT = 'Over temperature may affect power-up or operations.' MANAGED OBJECT CLASSES: NRBTS EVENT TYPE: 'Equipment Alarm' PROBABLE CAUSE: 'Over Temperature' PROBABLE CAUSE NUMBER: 200 PROPOSED REPAIR ACTIONS: 'See PROPOSED REPAIR ACTIONS for the underlying fault under alarmAdditionalInformation.' ASSOCIATED FAULTS: 199 CLEARING TYPE: Automatic
7200	Under-temperature	ALARM NAME: baseStationUnderTemperature ALARM ID: 7120 ALARM DESCRIPTION = 'The base station has detected an under temperature condition.' ALARM EFFECT = 'Over temperature may affect power-up or operations.' MANAGED OBJECT CLASSES: NRBTS EVENT TYPE: 'Equipment Alarm' PROBABLE CAUSE: 'Under Temperature' PROBABLE CAUSE NUMBER: 201 PROPOSED REPAIR ACTIONS: 'See PROPOSED REPAIR ACTIONS for the underlying fault under alarmAdditionalInformation.' ASSOCIATED FAULTS: 199 CLEARING TYPE: Automatic

FM Meta Data



SDC Deployment Artifact GUI

Define Templates

User at DCAE-DS Sees the Alarms from PNF Resource

R4: Limited Filtering
R5: Enhanced Filtering

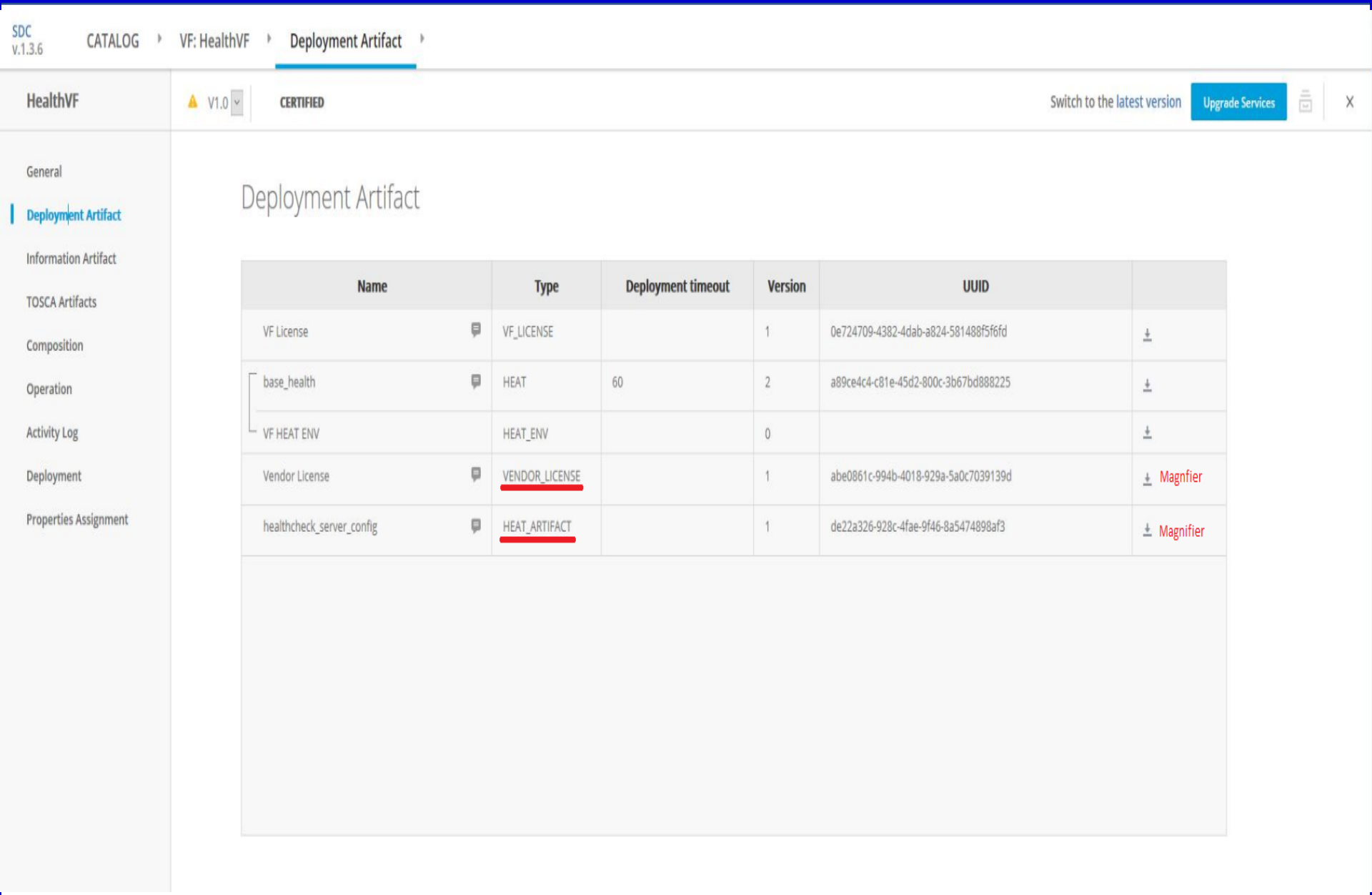
User defines templates In DCAE-DS GUI

Alarm GUI Display at DCAE-DS

Alarm ID	Alarm Name	Event Type	Alarm Description	Alarm Effect	Managed Object Classes	Probable Cause	Probable Cause Number	Proposed Repair Actions	Clearing Type	Additional Text	Associated Faults
7108	Base station synchronization problem	Equipment Alarm	A fault has occurred in the base station synchronization. For example: the base station reference clock signal is lost or is unstable or inaccurate.'	The effect of the fault on the functioning of the network element depends on the fault id raised. See FAULT EFFECT below.'	NRBTS	Timing Problem	66	See PROPOSED REPAIR ACTIONS for the underlying fault under alarm Additional Information	Automatic		9, 1818
7120	Over-temperature	Equipment Alarm	The base station has detected an over temperature condition	Over temperature may affect power-up or operations	NRBTS	Environmental	100	See PROPOSED REPAIR ACTIONS for the underlying fault	Automatic		2019
7200	Under-temperature	Equipment Alarm	The base station has detected an under temperature condition	Under temperature may affect power-up or operations	NRBTS	Environmental	101	See PROPOSED REPAIR ACTIONS for the underlying fault	Automatic		2020

Alarms info pulled from SDC Internal PNF CSAR

SDC Deployment Artifact Screen



FM Meta Data – GUI R5

Alarm ID	Alarm Name	Event Type	Alarm Description	Alarm Effect	Managed Object Classes	Probable Cause	Probable Cause Number	Proposed Repair Actions	Clearing Type	Additional Text	Associated Faults
7108	Base station synchronization problem	Equipment Alarm	A fault has occurred in the base station synchronization. For example: the base station reference clock signal is lost or is unstable or inaccurate.'	The effect of the fault on the functioning of the network element depends on the fault id raised. See FAULT EFFECT below.'	NRBTS	Timing Problem	66	See PROPOSED REPAIR ACTIONS for the underlying fault under alarmAdditionalInformation	Automatic		9, 1818
7120	Over-temperature	Equipment Alarm	The base station has detected an over temperature condition	Over temperature may affect power-up or operations	NRBTS	Environmental	100	See PROPOSED REPAIR ACTIONS for the underlying fault	Automatic		2019
7200	Under-temperature	Equipment Alarm	The base station has detected an under temperature condition	Under temperature may affect power-up or operations	NRBTS	Environmental	101	See PROPOSED REPAIR ACTIONS for the underlying fault	Automatic		2020

Introduction Search Function

Angular JS

PNF Onboarding Package (CSAR)

PNF Onboarding (CSAR file)

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Entry-Change-Log: Artifacts/ChangLog.txt
Entry-Tests: Artifacts/Tests
Entry-Certificate: Artifacts/License_term.txt

ROOT

- TOSCA-Metadata
- Definitions
- Artifacts
- MainServiceTemplate.mf

TOSCA.meta

NF descriptor

MainServiceTemplate.yaml

Not supported by ONAP Casablanca

- ~~Images~~
- Deployment
- Scripts
- Tests
- ChangeLog.txt
- MainServiceTemplate.cert
- License_term.txt

Not used yet

- Configuration
- Yang_module
- Measurements
- Events
- ...

yang-module.yang

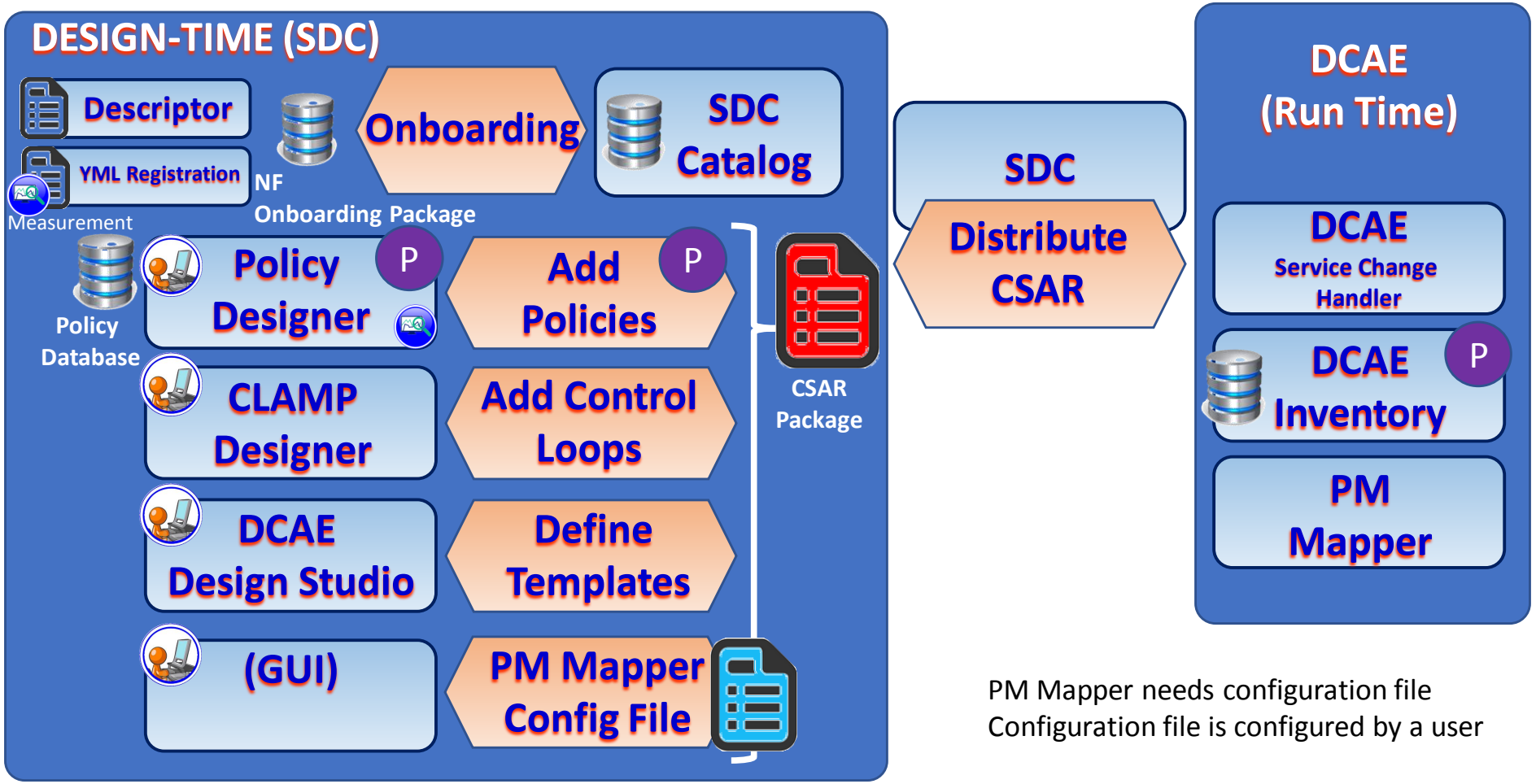
pm-dictionary.yaml

ves-dictionary.yaml

- Install.csh
- ...

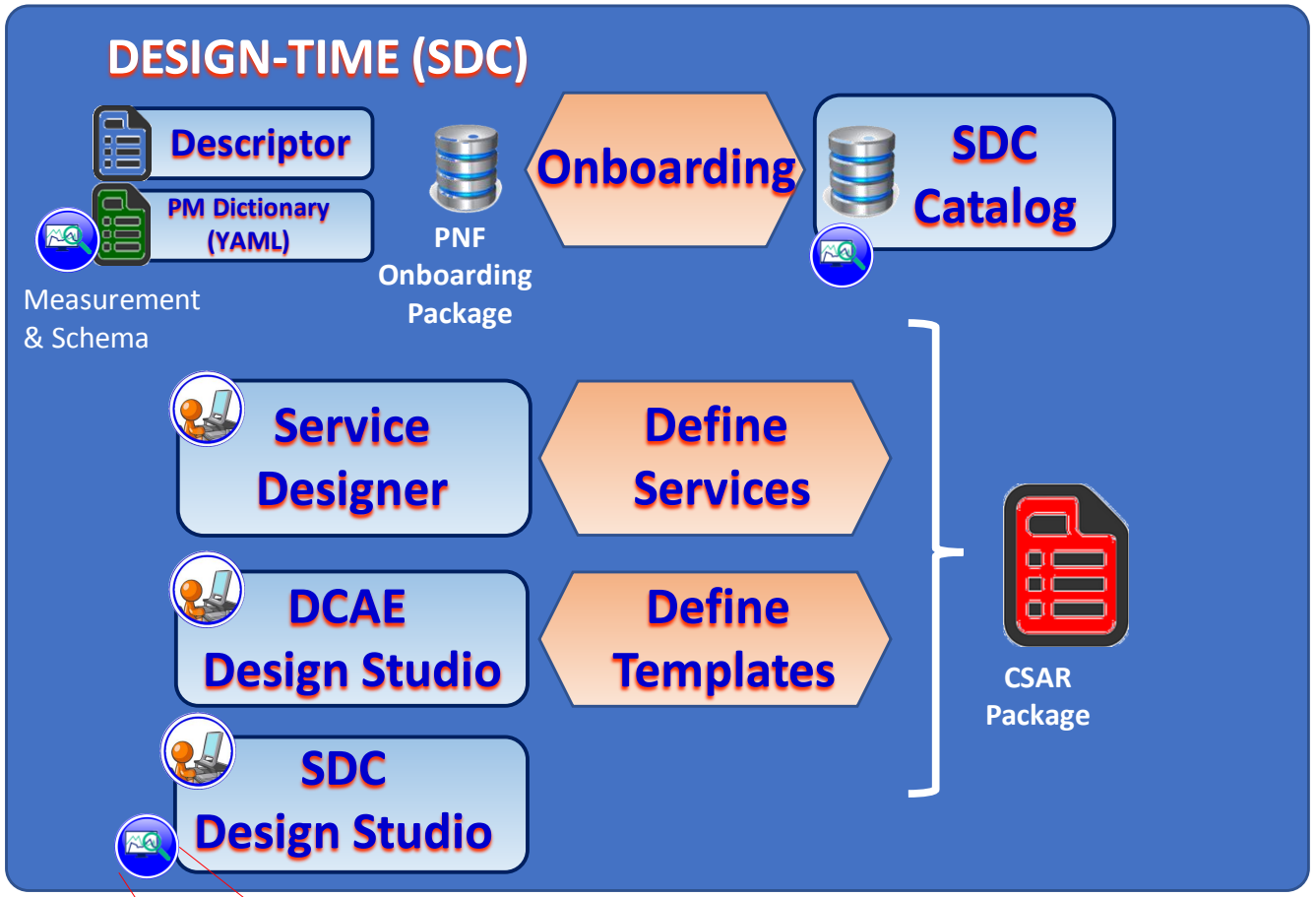
metadata:
pnf_product_name: gNB
pnf_provider_id: Ericsson
pnf_package_version:1.0
pnf_release_date_time:2018-12-03T08:44:00-05:00
non_mano_artifact_sets:
Events:
source: Artifacts/Deployment/Events/VES_registration.yaml

PM Measurements (Bulk PM)



PM Mapper needs configuration file
Configuration file is configured by a user

PM Dictionary



SDC VF resource Mgmt pages

Dublin (R4) Goal is to be able to view the onboarded PM Dictionary (from the PNF onboarding package) in a GUI (either SDC-DS, SDC Service Designer or DCAE-DS).

Dublin Priority

PM Dictionary

U/C DESCRIPTION

Support the following work items for PM Dictionary for 5G xNFs:

1. Review and finalize VES Event Listener Specification v7.1 and VES Event Registration Specification v3.2 which contains the PM Dictionary format and content.
2. Onboard the PM Dictionary for an xNF as a PM Dictionary YAML file. Note: Onboarding of the PM Dictionary artifact is covered under the PNF Onboarding Use Case.
3. Display the PM Dictionary in a GUI to allow an ONAP User to create PM Mapper configuration files for Perf3gpp event generation.
4. Update VNF Requirements for PM Dictionary artifact.

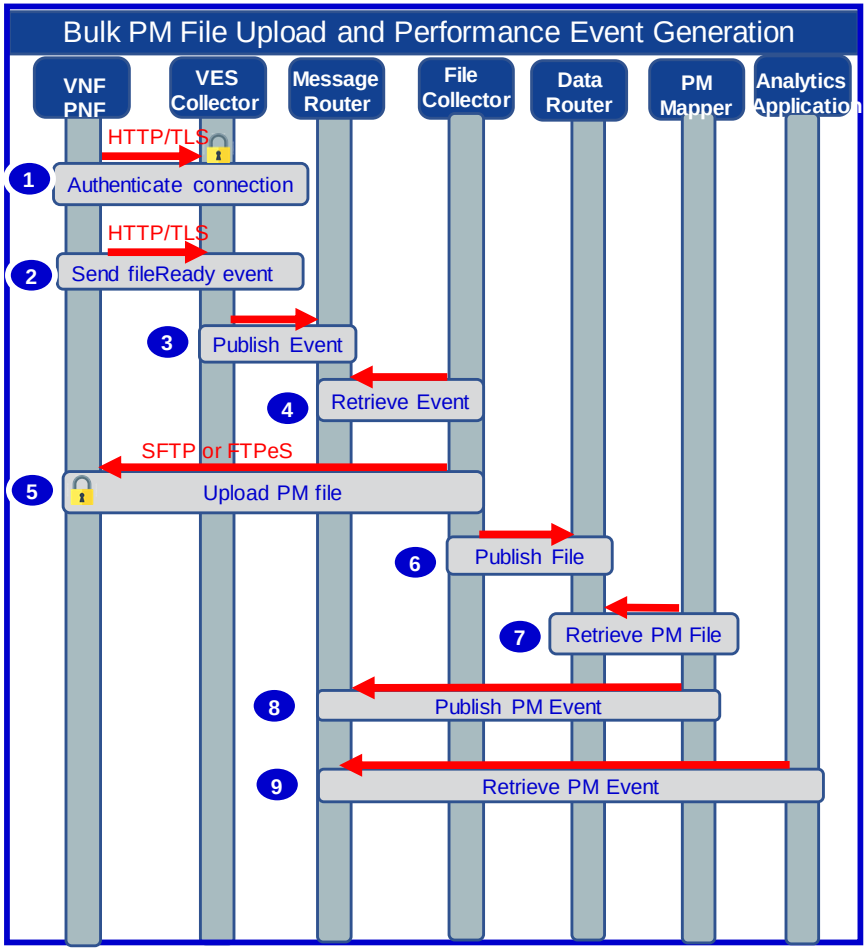
Wiki

https://wiki.onap.org/pages/viewpage.action?pageId=40206485

ONAP RT COMPONENT IMPACTS

RT COMPONENT	IMPACT	PTL INVOLVEMENT
VES Specifications	Review and finalize VES Event Listener Specification v7.1 and VES Event Registration Specification v3.2	PTL Notified Updated VES Doc
GUI display of PM dictionary	Display the PM Dictionary in a GUI (either DCAE-DS or SDC-DS GUI) to allow an ONAP User to create PM Mapper configuration files for Perf3gpp event generation	TBR
VNF Requirements	Update to VNF requirements for PM Dictionary artifact creation	TBR

PM Dictionary



Data Driven PM Event Generation Scenario

1. Network Function (NF) establishes a HTTP/TLS connection to the DCAE VES Collector. DCAE authenticates the certificate for TLS.
2. NF sends fileReady notification Event to DCAE VES Collector. Event is encoded in JSON and sent via HTTP/TLS. HTTP/TLS connection is set up and torn down every time a fileReady notification event is sent.

   DCAE VES Collector publishes the event to appropriate topic in DMaaP Message Router (MR).
3. DCAE File Collector retrieves the fileReady notification event from DMaaP MR.
4. File Collector uploads PM File from NF using a secure file transfer protocol; SFTP (Nokia) or FTPeS (Ericsson). NF authenticates the connection.

   File Collector publishes PM File to DMaaP Data Router (DR).
6. PM Mapper retrieves PM file from DR and generates performance events as configured by PM Mapper File.
7. PM Mapper publishes performance events to MR.
8. Analytics Applications (AA) retrieve the performance events of interest from MR. AA analyze the data to produce statistics and KPIs
9. and optimization recommendations.

PM Dictionary

Proposal

- Provide the ONAP Operator with the ability to define flexible, customizable PM events.
- Events can be dynamically generated and targeted for specific analytics applications in ONAP.

Define Custom PM Events

- ONAP displays list of available measurements for a NF Type.
- ONAP Operator selects the desired measurements from the list of measurements.
- A PM Mapping File is generated so the PM Mapper knows how to create the events.
- A YAML document is generated so the Analytics Application (AA) knows to which events to subscribe and the content and format of the event.

PM Dictionary is needed to display the list of available measurements for this NF Type.

PM Dictionary may be needed by AA to understand the measurements it receives so that it can automatically and dynamically process them (future goal).

Create Custom PM Events

- NF notifies DCAE that a PM file is available for upload.
- File Collector uploads PM Files from NF and stores them in Data Router.
- PM Mapper creates custom performance events from the PM File data according to PM Mapping File.
- Analytics Applications use these performance events for targeted analysis of network operations.

PM Dictionary

PM Dictionary is used by Analytics Applications to retrieve information about the measurements in the Performance events and RTPM events and in the Bulk PM XML File.

- PM Dictionary provides detailed information about each Measurement that a NF produces, including Measurement Name, Measurement ID, Measured Object Class, Description, Collection Method, Value Ranges, Unit of Measure, Triggering Conditions and other information.
- A very important value of the PM dictionary is to separate the meta data from the actual data so that new measurements can be defined/deleted/updated anytime without requiring any change to the transport framework, since all the data is sent using the same format/structure. As such, use of the data requires the dictionary so that the data can be properly interpreted.
- Initially,
  - PM Dictionary is used by the Analytics Application developers to update the Analytics Application code as needed to process the measurements.
  - PM Dictionary may be used by the Analytics Applications to translate a measurement ID (numeric value) in a RTPM event into a measurement type (name). Alternately, AA may use the numeric values directly. This depends on how the AA code is written.
- Ultimately,
  - Goal is for the Analytics Applications to use the PM Dictionary directly to be able to dynamically process new measurements based on the information in the PM Dictionary.

PM Dictionary

The set of PM Measurements produced by a NF changes with each new NF SW Release.

PM Dictionary is used by ONAP operators to determine the PM changes associated with a new NF SW release so they can update performance events, associated PM Mapper Files, YAML documents and impacted Analytics Applications if needed.

- PM Dictionary contains a Last Change indicator for each measurement.
  - Identifies the PM Dictionary version for the last time each measurement changed. For example, measLastChange="5G18A_1807_003" or measLastChange="5G19_1906_002".
  - Makes it possible to easily identify performance events that are candidates for update due to a new SW release.

- At onboarding, ONAP Operator filters the PM Dictionary for the current version.
  - Cross check against PM Mapper event definitions.
  - Events that use measurements that were modified or deleted in the current version of the PM Dictionary need to be analyzed to see if they are still applicable and if the event definition and/or the Analytics Application needs to be updated.
  - Measurements that were added in the current version need to be analyzed to see if they should be included in a new or existing PM Mapper event definition and if an Analytics Application needs to be updated to process them.

PM Dictionary

PM Dictionary is used by ONAP (SDC) to display the set of measurements supported by a particular NF.

- From SDC, ONAP Operator can:
  - select the desired measurements for PM Mapper performance events (future goal)
  - configure the NF to generate RTPM hvMeas events (future goal).

- For performance events, ONAP creates:
  - a PM Mapping File so the PM Mapper knows how to create the events. Format and content of PM Mapping File is TDB.
  - a YAML document for the PM Mapper events so the Analytics Application knows to which events to subscribe and the content and format of the event.

- PM Dictionary is versioned. For example, pmDefVsn="5G19_1906_002".
  - Allows ONAP components to associate the PM Mapper performance events, RTPM hvMeas events and Bulk PM XML Files with the appropriate PM Dictionary artifact.

PM Dictionary

Field	Description	Example	Nokia Internal Comments
pmDefVsn	Version of the PM Dictionary. Version is vendor defined.	5G19_1906_002	Generated by PM Dictionary tool.
nfType	NF type to whom this PM Dictionary applies. NF Type is vendor defined.	gnb	Approved 5G terms are gNB, gNB-CU, gNB-DU, gNB-CU-CP and gNB-CU-UP. Convert these to camel format for ONAP; gnb, gnbCu, gnbDu, gnbCuCp or gnbCuUp.
vendor	Vendor of the NF type to whom this PM Dictionary applies.	Nokia	Always set to Nokia.
swVersion	NF SW version that aligns with this version of the PM Dictionary.	5GBTS_19_3.0.62378	SW load build name delivered in the NF package with the PM Dictionary. Taken from swVersion Mapping Table.
measInfoId	Name for a group of related measurements, in 3GPP format where specified, else vendor defined name.	NR Intra Frequency PSCell Change	Taken from measInfoId Mapping Table.
measInfoIdNo	Vendor defined numeric identifier used in place of measInfoId string in hvMeas event.	55120	Taken from NIDD Measurement ID.
measInfoAbbrev	Abbreviation for the measInfoId string, in 3GPP format where specified, else vendor defined name.	NINFC	Taken from measInfoAbbrev Mapping Table.

PM Dictionary

Field	Description	Example	Nokia Internal Comments
measType	Measurement name used in PM file. Name is in 3GPP format. Vendor specific names are preceded with VS.	VS.NINFC.IntraFrPscelChFailTdcExp	Taken from measType Mapping Table.
measTypeAbbrev	Vendor defined abbreviation for the measType string.	M55120C00002	Taken from NIDD Counter ID.
measId	Vendor defined numeric identifier for the measType; used in GPB for efficiency. Must be combined with measInfoNo to identify a specific measurement.	2	Not unique on its own; must be combined with measInfoNo for uniqueness OPEN POINT
measDescription	Text description of the purpose of the measurement, what information does the measurement provide.	This measurement is the number of intra gNB intra frequency PSCell change failures due to TDCoverall timer expiry.	Taken from NIDD Description.
measCondition	Text description of the condition that causes the measurement to be updated.	This measurement is updated when the TDCoverall timer has elapsed before gNB receives the X2AP: SgNB Modification Confirm message.	Taken from NIDD Updated.
measResultType	Data type of the measurement result.	integer	Not present in NIDD OPEN POINT
measResultRange	Range for the measurement result.	0-2^32-1	Taken from NIDD Range. Note most counters not filled in. OPEN POINT
measResultUnits	Unit of measure for the result; e.g. milliseconds, bytes, kilobytes, packets, integer number.	integer number	Taken from NIDD Unit.

PM Dictionary

Field	Description	Example	Nokia Internal Comments
measObjClass	Measurement Object Class	PLMN/NRBTS/NRCELL	Add a column to NIDD. Derive from Measurement NW Aggregation Levels. Use lowest level as MOC.
measCollectionMethod	3GPP Collection Method for measurement; e.g. CC, SI, DER, Gauge.	CC	Taken from measCollectionMethod Mapping Table.
measLastChange	PM Dictionary version for the last time this measurement was changed, added or deleted. This is used to determine if Analytics Applications or performance event definitions need to be updated.	5G18A_1807_003	Generated by PM Dictionary tool.
measAggregationLevels	Vendor recommendation for the levels at which measurements are aggregated	NRBTS NRCELL	Taken from NIDD Measurement NW Aggregation Levels.

PM Dictionary

Mapping Tables are used to map Nokia names to 3GPP names in a flexible way.

- When new 3GPP specs are released, mapping tables are updated as appropriate.
- For ONAP, 5G and 4G BTS, CU and DU have to generate the PM XML File with 3GPP names, so if measurements switch from vendor specific to 3GPP specified, a SW change is needed.

Mapping Tables needed for PM to ONAP:

- Nokia Measurement Name to 3GPP Family (measInfoId).
  - E. g. LTE RRC to Radio Resource Control
- Nokia Measurement Abbreviation Name to 3GPP Family Abbreviation (measInfoAbbrev).
  - E. g. LTE_RRC to RRC
- Nokia NetAct Counter Name to 3GPP Measurement (measType)
  - E. g. INTRA_FR_PSCEL_CH_FAI_TDC_EXP to VS.NINFC.IntraFrPscelChFailTdcExp
- Nokia Logical Type & Trigger Type to 3GPP Collection Method (measCollectionMethod).
  - E. g. Sum+Event to Cumulative Counter (CC)

PM Dictionary

Some measurement names need to be mapped to numbers or abbreviations:

- Define a numeric measInfoIdNo that maps to each measInfoId for use in the RTPM GPB event.
  - Use the NIDD Measurement ID.
  - E.g. measInfoId *NR Intra Frequency PSCell Change* maps to measInfoIdNo 55120.
- Define a numeric measId that maps to measType for use in the RTPM GPB event.
  - Suggest to use the counter number part of the NIDD counter id.
  - E.g. measType *VS.NINFC.IntraFrPscelChFailTdcExp* maps to measId 2.
  - However, this is not unique and must be combined with measInfoIdNo to identify the specific measType; e.g. 55120 + 2 = *VS.NINFC.IntraFrPscelChFailTdcExp*
  - This is an open point. Suggest we use the measTypeAbbrev string as the measId instead of a number. A string is less efficient than a number but maybe not significantly so in this case.
- Define a measTypeAbbrev that maps to measType.
  - Suggest to use NIDD counter id.
  - E. g. measType *VS.NINFC.IntraFrPscelChFailTdcExp* maps to measTypeAbbrev M55120C00002.

PM Dictionary

There is not a 1-to-1 mapping from SW load to PM Dictionary version.

- SW Load is built every 2 weeks. PM Dictionary is built every PT (maybe once a month). There is a table maintained in the WFT page (where load builds are stored) to map which PM Dictionary version supports which SW loads.
- SW does not know the PM Dictionary version that aligns with itself and can not populate the pmDefVsn in the HvMeas or FileReady events. Suggest to populate the events with swVersion instead.
- When we deliver a particular PM Dictionary version in the NF package, we could include the SW load delivered in the NF package in the PM Dictionary swVersion field.
- ONAP must keep track of which PM Dictionary version is onboarded with (aligned with) a particular NF Type (NF SW load) so the correct PM Dictionary version is used (e.g. by SDC and Analytics Applications).

PM Dictionary

Meas Info ID	Meas Info ID No	Meas Info Aprev	Meas Type	Meas Type Abbrev	Meas Id	Meas Description	Meas Condition	Meas Result Type	Meas Result Range	Meas Result Units	Meas Obj Class	Meas Collection Method	Meas Last Change	Meas Aggregation Levels
NR Intra freq PSCell Change	55120	NI NF C	VS.NINFC.IntraFrPscelChFailTdcExp	M55120C00002	2	The number of intra gNB Intrafrequency PSCell Change failures	Measurement is updated when the TD Coverall timer has elapsed before gNB receives the X2AP	Integer	0-2^21-1	Integer number	PLMN/NRBTS/NRCell	CC	5G18	NRBTS NRCELL
NF Intra freq PSCell Change	55121	NI NF C	VS.NINFC.IntraFrPscelChFailTdcExp	M55120C00002	2	The number of intrafrequency PSCell change failures	Measurement is updated when the TD timer has elapsed before gNB receives X2AP	Integer	0-2^21-1	Integer number	PLMN/NRBTS/NRCell	CC	5G19	NRBTS NRCELL
NF Intra freq PSCell Change	55121	NI NF C	VS.NINFC.IntraFrPscelChFailTdcExp	M55120C00002	2	The number of intrafrequency PSCell change failures	Measurement is updated when the TD timer has elapsed before gNB receives X2AP	Integer	0-2^21-1	Integer number	PLMN/NRBTS/NRCell	CC	5G19	NRBTS NRCELL

FM Meta Data

DCAE Design Studio

Define Templates

User at SDC-DC Sees the Alarms from PNF Resource

R4: Limited Filtering

R5: Enhanced Filtering

User defines templates In SDC-DS GUI

R4 PM GUI Display at SDC-DS

FUTURE R5 DCAE-DS

Meas Info ID	Meas Info ID No	Meas Info Apprev	Meas Type	Meas Type Abbrev	Meas Id	Meas Description	Meas Condition	Meas Result Type	Meas Result Range	Meas Result Units	Meas Obj Class	Meas Collection Method	Meas Last Change	Meas Aggregation Levels
NR Intra freq PSCe Chan ge	55120	NI NF C	VS.NINF C.IntraF rPscelC hFailTdc Exp	M551 20C0 0002	2	The number of intra gNB Intrafrequency PSCell Change failures	Measurement is updated when the TD Coverall timer has elapsed before gNB receives the X2AP	Inte ger	0-2^21-1	Inte ger num ber	PLMN/ NRBTS/ NRCell	CC	5G18	NRBTS NRCEL L
NF Intra freq PSCe ll Chan ge	55121	NI NF C	VS.NINF C.IntraF rPscelC hFailTdc Exp	M551 20C0 0002	2	The number of intrafrequency PSCell change failures	Measurement is updated when the TD timer has elapsed before gNB receives X2AP	Inte ger	0-2^21-1	Inte ger num ber	PLMN/ NRBTS/ NRCell	CC	5G19	NRBTS NRCEL L
NF Intra freq PSCe ll Chan ge	55121	NI NF C	VS.NINF C.IntraF rPscelC hFailTdc Exp	M551 20C0 0002	2	The number of intrafrequency PSCell change failures	Measurement is updated when the TD timer has elapsed before gNB receives X2AP	Inte ger	0-2^21-1	Inte ger num ber	PLMN/ NRBTS/ NRCell	CC	5G19	NRBTS NRCEL L

Alarms info pulled from SDC Internal PNF CSAR

Select Counters
For Events for the PM Mapper in DCAE
Open the file, show the counters
Select browsability to select, and create a file as input for DCAE components
1 . Pick a file (GUI) – E// created a stand-alone GUI
2 . Selects a set of Counters (GUI) – E// created a stand-alone GUI.
3 . Generate a XML file as input to PM Mapper. String input.

Is it possible to reuse this S/W for the SDC development.
PoC (James Cuddy) REST call recves JSON of PM dictionary
JSON content describes the YAML file.