Configuration Persistence Service in R8+

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R8 DDF Presentation

TIME	AUG 17, 2020 CPS REQUIREMENTS SubComm AGENDA
10 min	**Context for CPS & Agenda** – Context for CPS & Basic problems to be addressed
10 min	**Overview of CPS** – Overview to CPS
15 min	**Model Driven CPS Proof of Concept (PoC) & Demo** – Overview of the Model-Driven CPS PoC for R7
5 min	**R8 & Beyond Roadmap** – Model Driven Proof of Concept (PoC) in R7, way forward in R8 Honolulu, New plan & roadmap
10 min	**Use Cases using CPS Database** – Overview of CPS Applications (State Mgmt)
5 min	**Questions & Answers** – Q&A
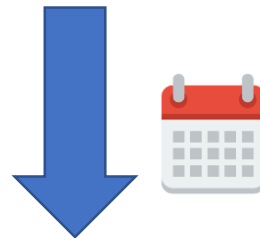
TIME	Q&A Session Post-Session
-	**Follow-up questions** – Follow-up meetings at CPS Team Call (Fridays)

Context for
Configuration Persistence Service (CPS)

Context
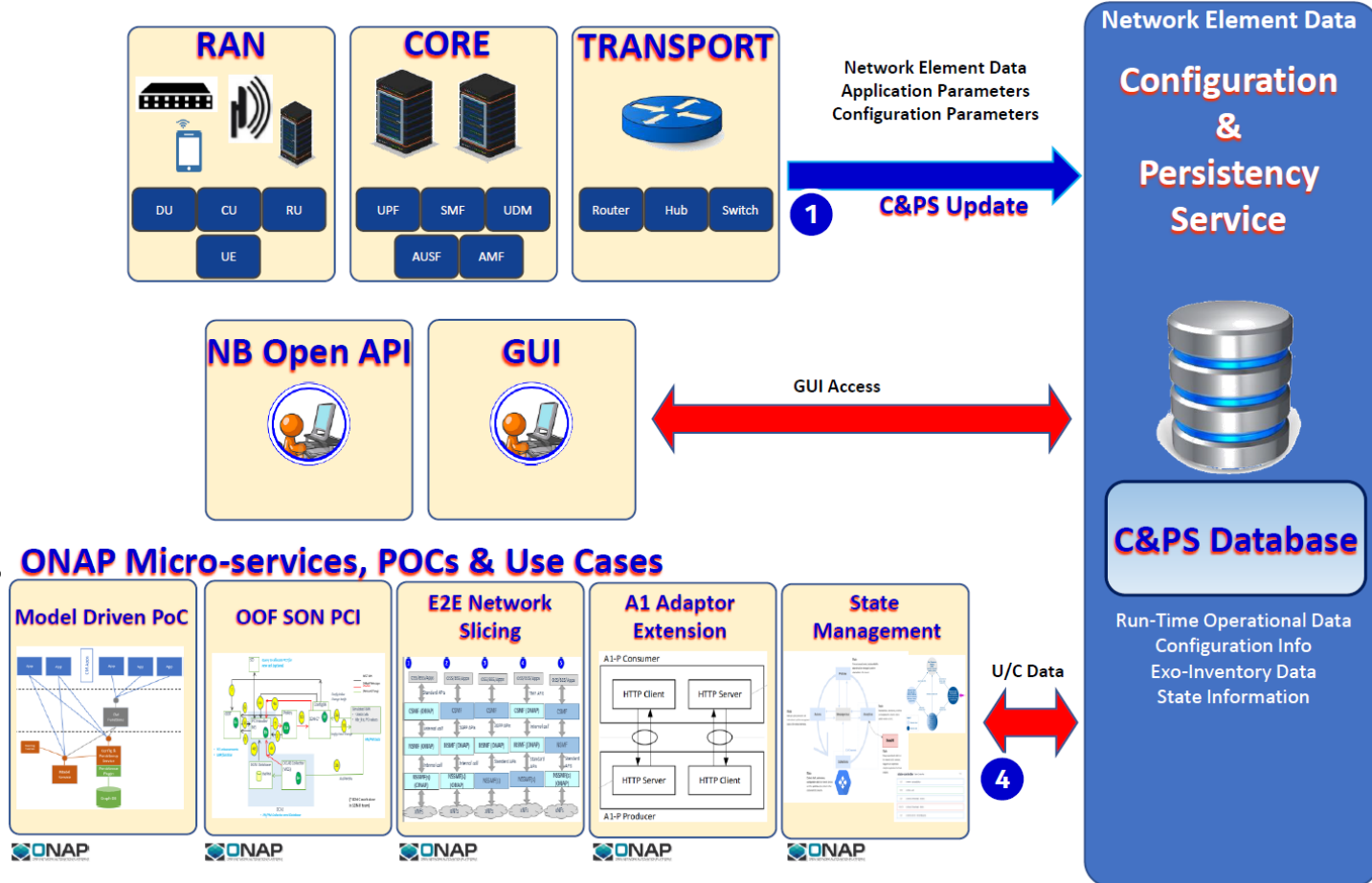
Configuration Persistence Service in R8

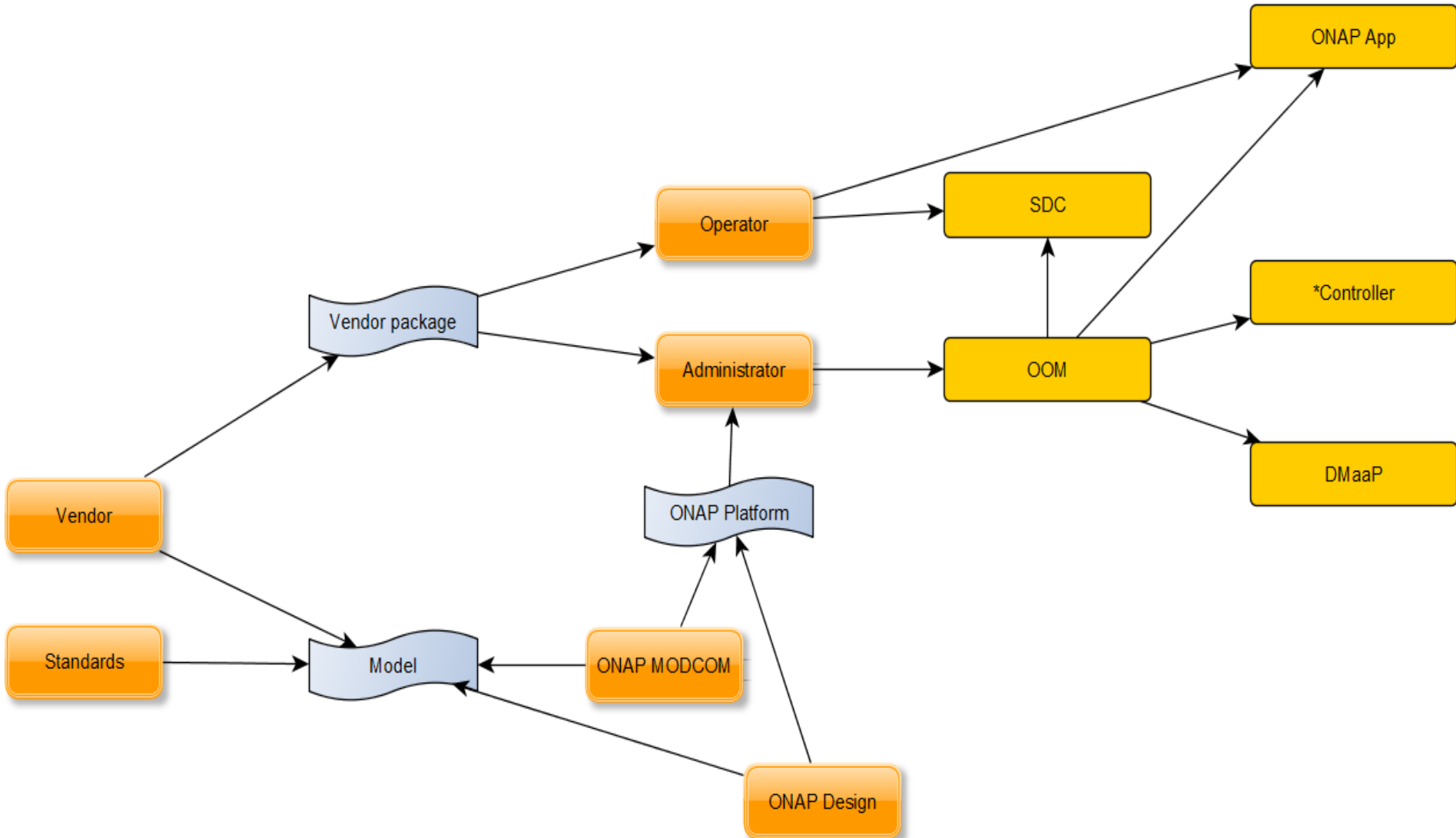| TOPIC	PROBLEM	SOLUTION
Heterogeneous Data Sources	Reconciling Multiple domains, multiple vendors, multiple functions and multiple versions	Model Driven Persistence
Shared Data Access	Expensive IO operations that should be shared rather than duplicated	Share Data access through model ownership
Model Handling	Because of the heterogeneous data sources need streamlined approach to support models without having platform life cycle events.	Model Driven Persistence

- Multiple vendors providing equipment / xNF
- Several telecom networks one ONAP platform
- Evolution of xNF and network standards
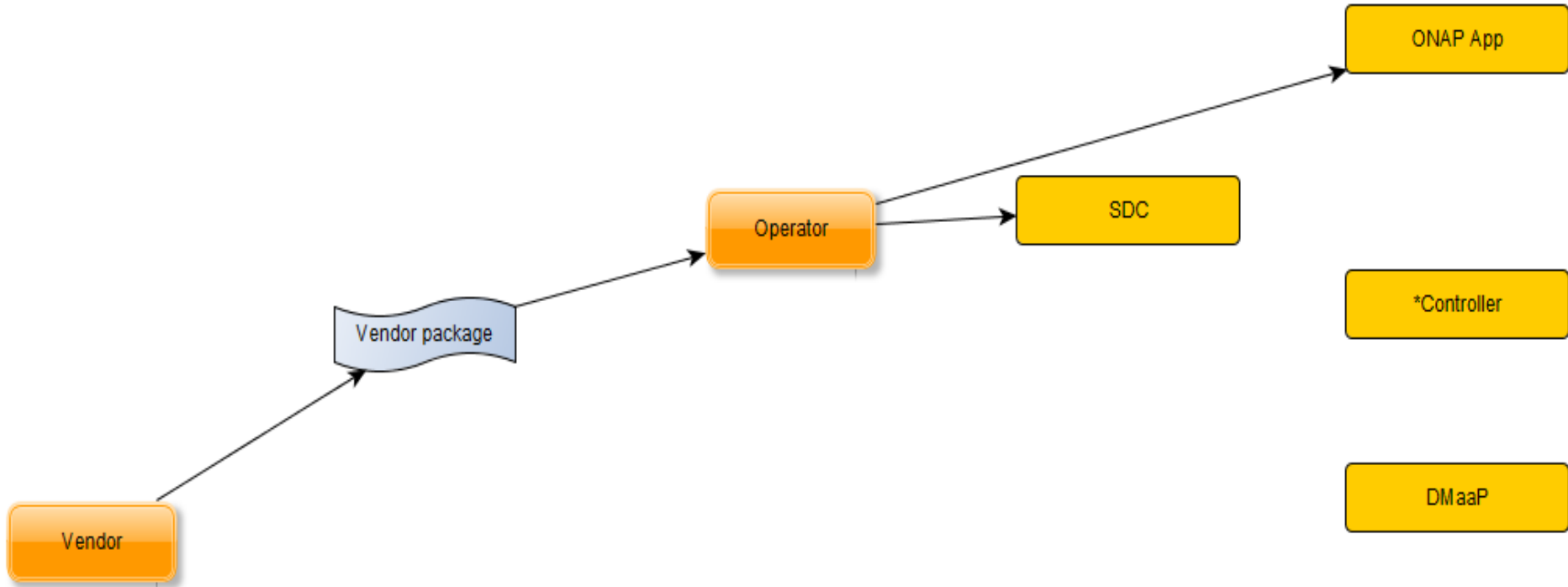- ONAP applications and use cases competing for access to the same CM data

RAN
DU | CU | RU
UE

CORE
UPF | SMF | UDM
AUSF | AMF

TRANSPORT
Router | Hub | Switch

Network Element Data
Application Parameters
Configuration Parameters

1 C&PS Update

NB Open API

GUI

GUI Access

ONAP Micro-services, POCs & Use Cases

Model Driven PoC

OOF SON PCI

E2E Network Slicing

A1 Adaptor Extension
A1-P Consumer
HTTP Client | HTTP Server
HTTP Server | HTTP Client
A1-P Producer

State Management

U/C Data

4

Network Element Data

Configuration & Persistency Service

C&PS Database

Run-Time Operational Data
Configuration Info
Exo-Inventory Data
State Information

Shared data analogy of a teacher sharing knowledge with students

Model ingestion during ONAP design & run time

Model ingestion with C&PS solution (Run-time)

Permission & Ownership of data
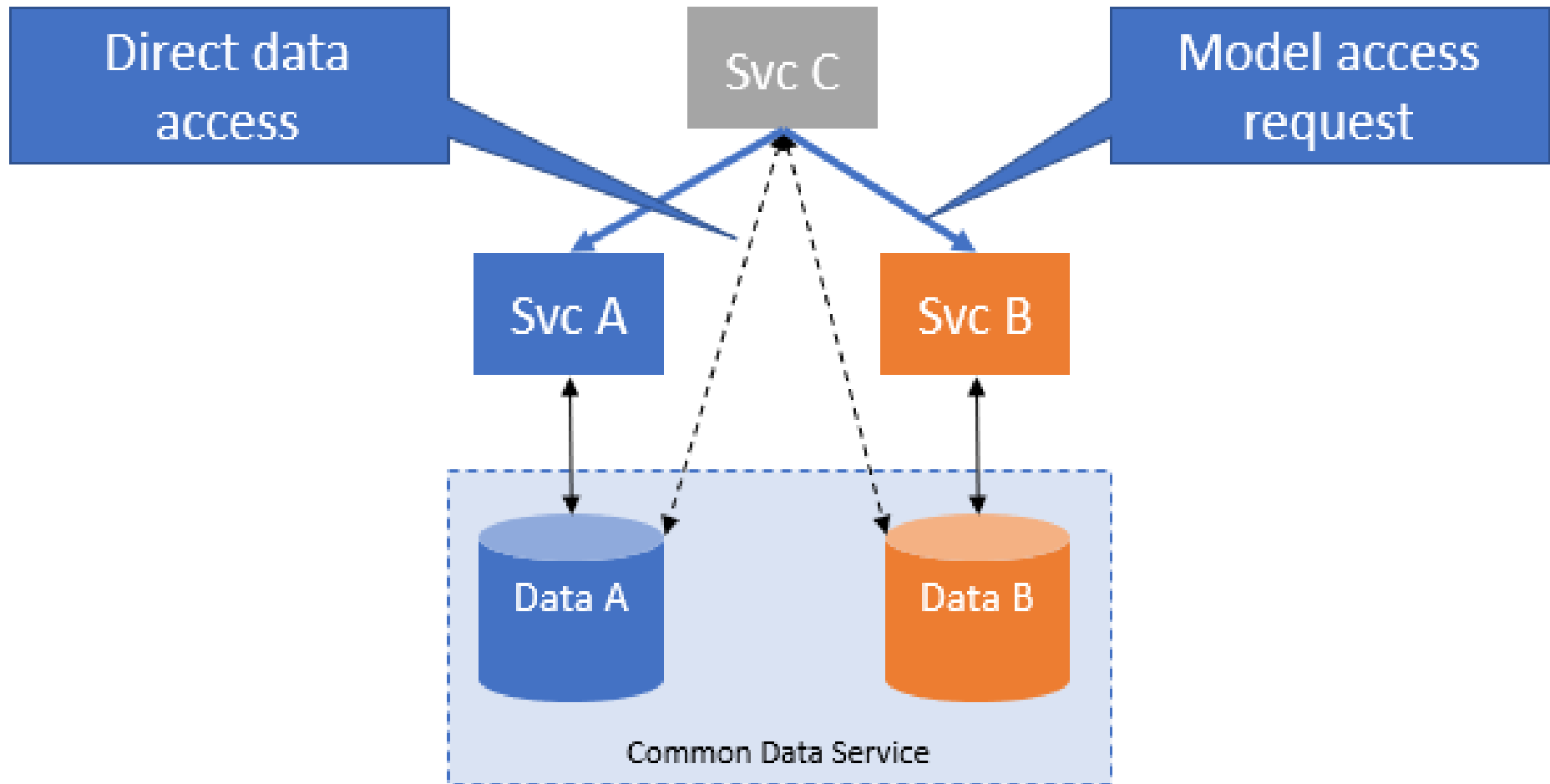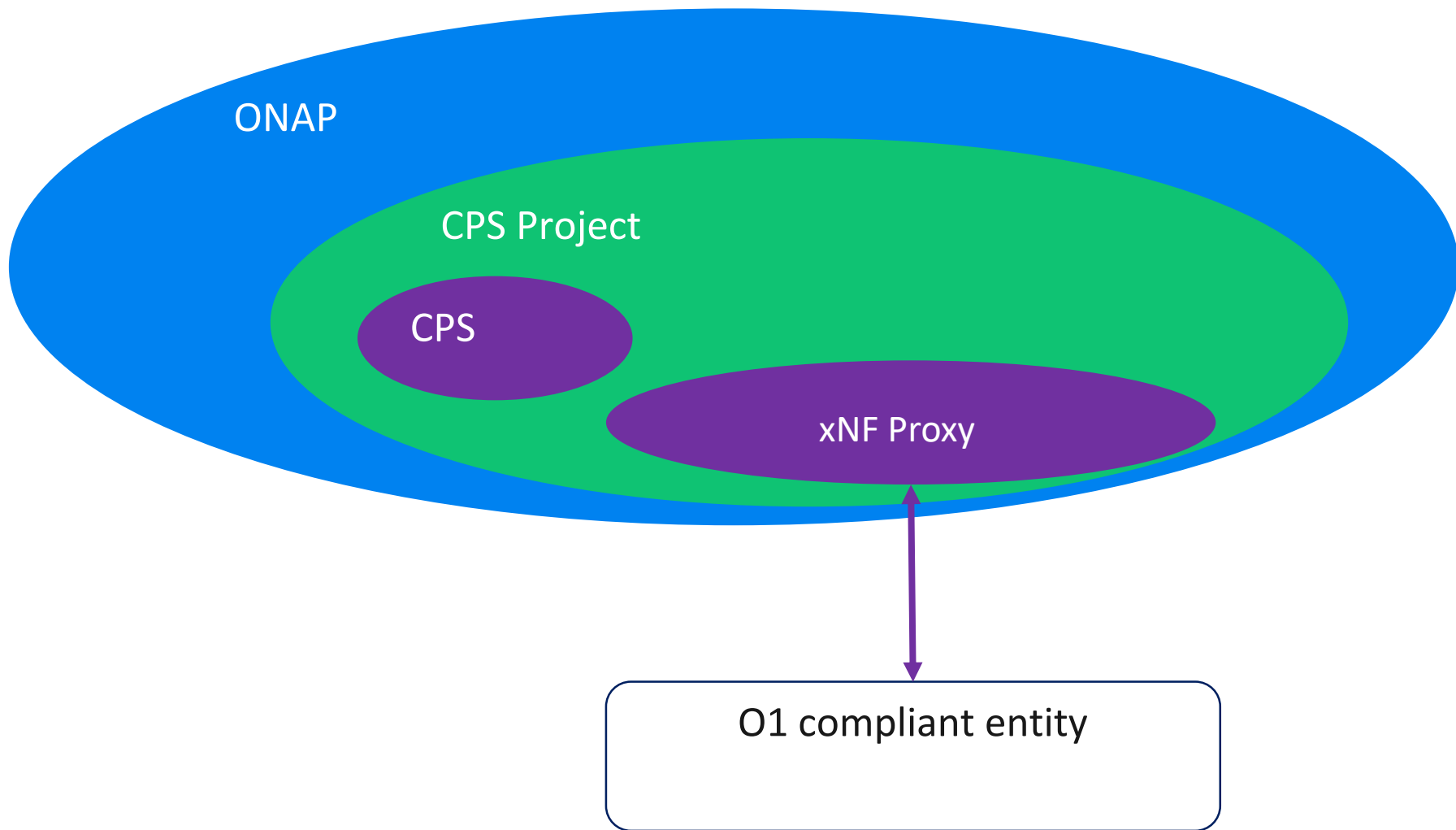
ONAP

CPS Project

CPS

xNF Proxy

O1 compliant entity

THE **LINUX** FOUNDATION

Configuration Persistence Service in R8

Executive Summary - The Configuration Persistence Service (CPS) is a *real-time service* that is designed to serve as a data repository for Run-time Network Element (configuration) data that needs to be persistent applicable to multiple domain (RAN, Transport, and Core). This was explored as a R7 PoC. *Focus on storing run-time DATA RELATED to NETWORK ELEMENT instances.* In R8, this is being proposed as a stand-alone project.

Business Impact - The ability for service operators to *visualize and manage network element data in a network (PNFs, VNFs, and logical constructs)* with ONAP is a critical business function because they are key Life Cycle Management (LCM) and OA&M operations. The project has business impacts to enhance the operation of data-handling within ONAP by providing efficient data layer services.

Business Markets - This project applies to any domain (wireless, transport, optical, and wireline) that ONAP may manage. It is not a market or geographical specific capability. It is expected that scaled ONAP installations such as Edge & Core ONAP deployments will also deploy the database across each installation.
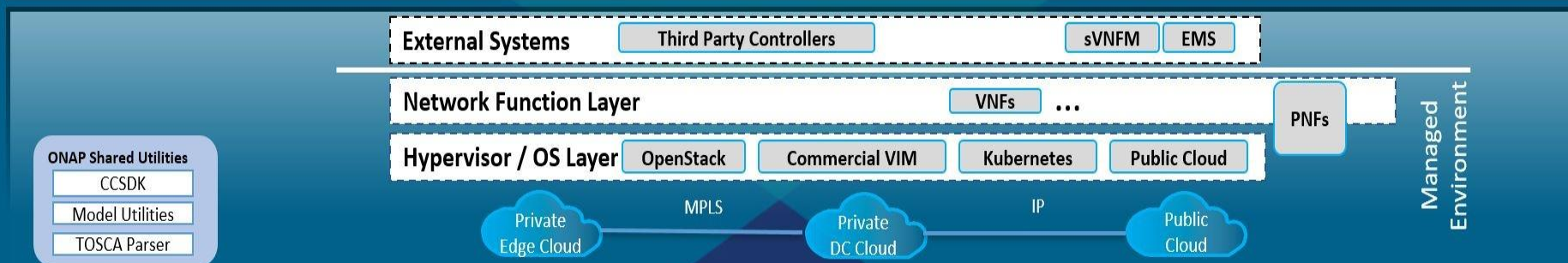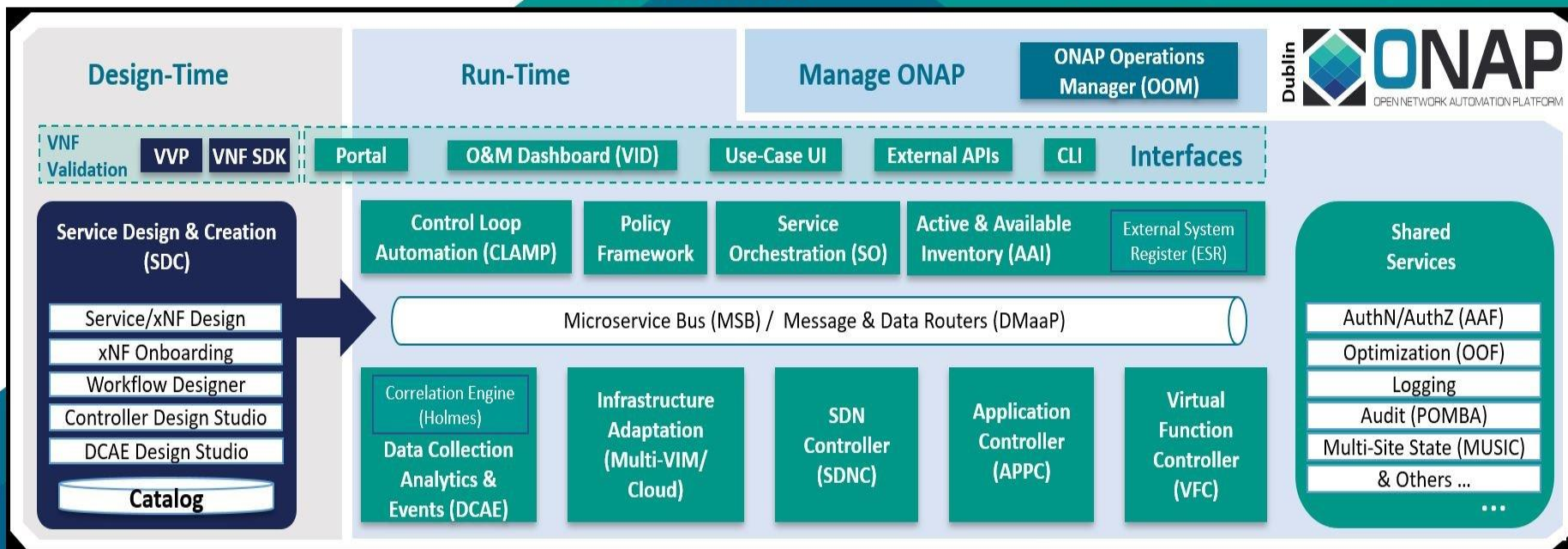
Funding/Financial Impacts - This project represents a large potential Operating Expense (OPEX) savings for operators because of the ability to configure networks saving time and expenses.

CPS in Architecture Context

Configuration Persistence Service (CPS)

Micro-Services & Use Cases — 1

Network Element Data

Read/Write

Configuration Information — 2

DU/PNF   CU/VNF

Standards Defined VES Event

CPS Update

Controller — 3

DU/PNF   CU/VNF

Read/Write

Active & Available Inventory (A&AI) — 4

A&AI Sync

Configuration Persistence Service

CPS Database

NETWORK ELEMENT DATA

Configuration Persistence Service (CPS)

Management Framework Data

ONAP RUN-TIME

Policy DB

DCAE Inventory

1 | DCAE VES Collector | **DCAE**

Network Element Data

Configuration Persistence Service

DMaaP

PNF VNF — **VES Event**

Standards Defined VES Event for Configuration

DU/PNF   CU/VNF

Configuration NameSpace topic 3GPP-Provisioning

CPS Update

2 | SO | **SO**
Service Orchestration

Read

PNF VNF — **Netconf O1**

CM Notification Change Config

DU/PNF   CU/VNF

Controller DB
Controller
SDN-C, VF-C, APP-C

Read/Write

CPS Database

3 | A&AI DB | **A&AI**
Real-Time Inventory

A&AI Sync

Run-Time Operational Data
Configuration Info
Exo-Inventory Data
State Information
(Yang modeled)

Network Element Data

4 | U/C DB | **Micro-Service**
PCI, E2ENS, A1P, MD PoC

Read/Write

Configuration Persistence Service (CPS)

RAN

DU	CU	RU
	UE	

CORE

UPF	SMF	UDM
	AUSF	AMF

TRANSPORT

Router	Hub	Switch

Network Element Data
Application Parameters
Configuration Parameters

1 → **CPS Update**

Network Element Data

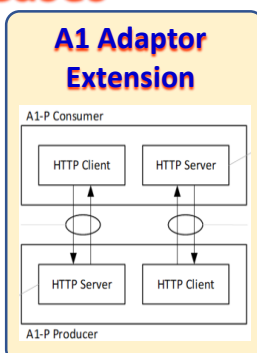## Configuration Persistence Service

NB Open API

GUI

GUI Access

CPS Database

Run-Time Operational Data
Configuration Info
Exo-Inventory Data
State Information

ONAP Micro-services, POCs & Use Cases

Model Driven PoC

OOF SON PCI

E2E Network Slicing

A1 Adaptor Extension

A1-P Consumer

HTTP Client	HTTP Server

HTTP Server	HTTP Client

A1-P Producer

State Management

U/C Data

4

ONAP — OPEN NETWORK AUTOMATION PLATFORM
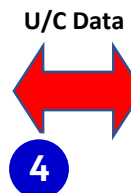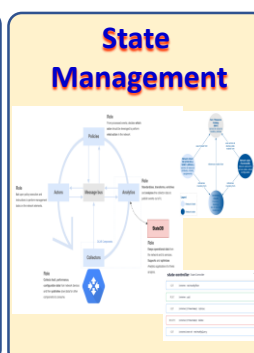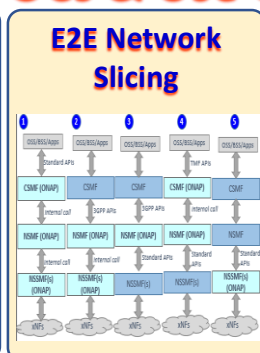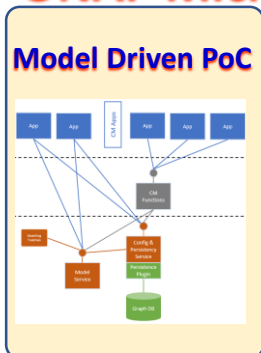
CPS READING: PNF Reports Configuration

WELCOME TO HONOLULU WELCOME TO

DU/PNF **CU/VNF**

ONAP RUN-TIME

PNF VNF

VES Event

Standards Defined VES Event for Configuration

DCAE VES Collector

DCAE Inventory

DCAE

Analytics

DMaaP

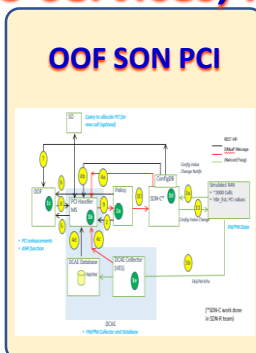## Configuration Persistence Service

Configuration NameSpace topic 3GPP-Provisioning

CPS Update

CPS Database

Run-Time Operational Data
Configuration Info
Exo-Inventory Data
RT Logical & Physical Connections

1
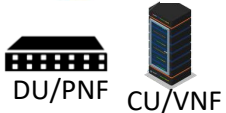
The PNF has a parameter update to report. The update originates from the PNF and is reported through a Standards Defined VES event with a configuration NameSpace (3GPP-Provisioning)

Standards Defined VES Event is received by the *DCAE VES Collector*. DCAE publishes the VES Event onto the DMaaP Bus.

In R8+: CPS as a stand-alone component, subscribes to the DMaaP Topic and gets the DMaaP event from the DMaaP bus to update the internal database. The VES event has a Configuration namespace topic, 3GPP-Provisioning
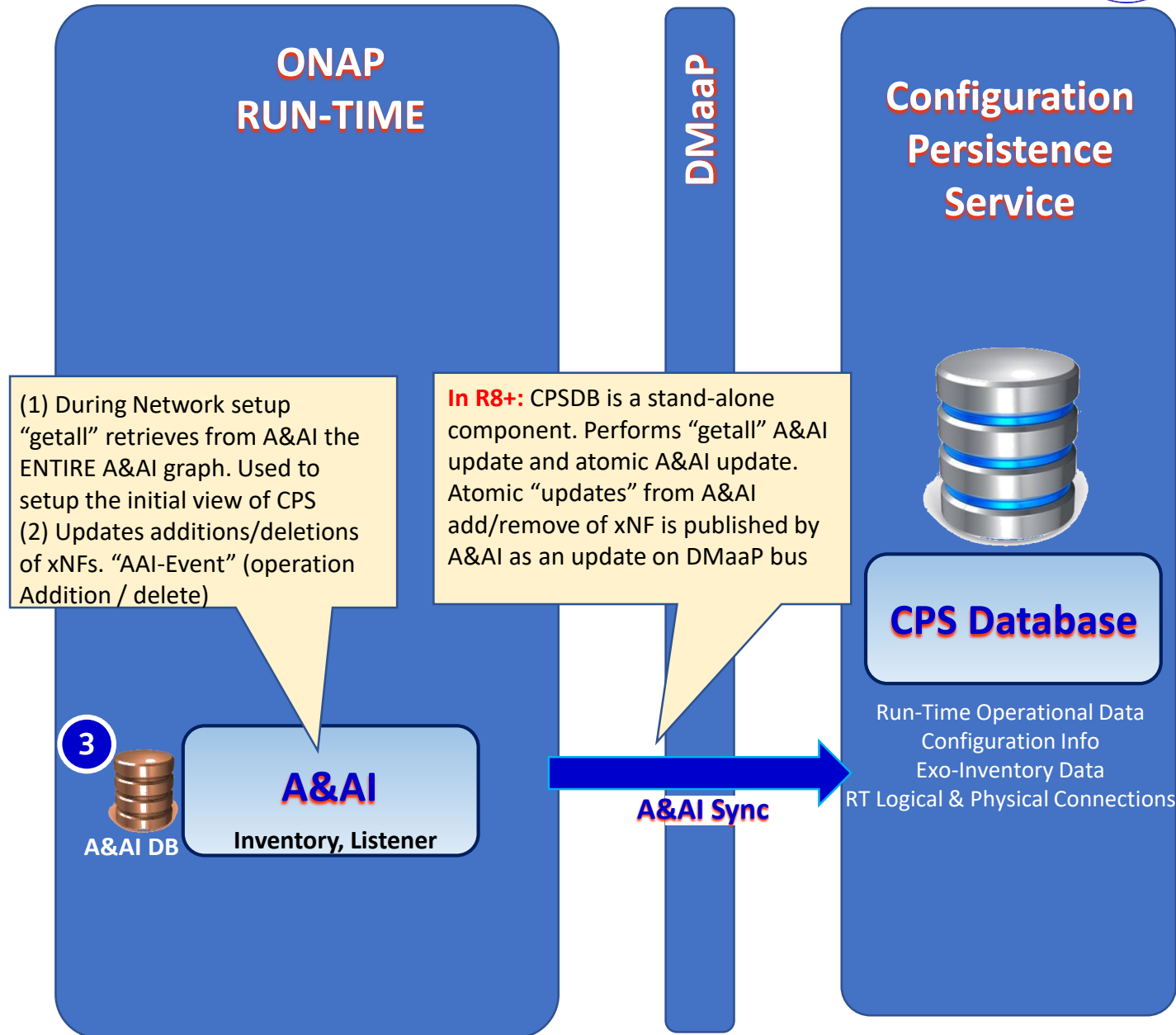
ONAP

A&AI Synchronization

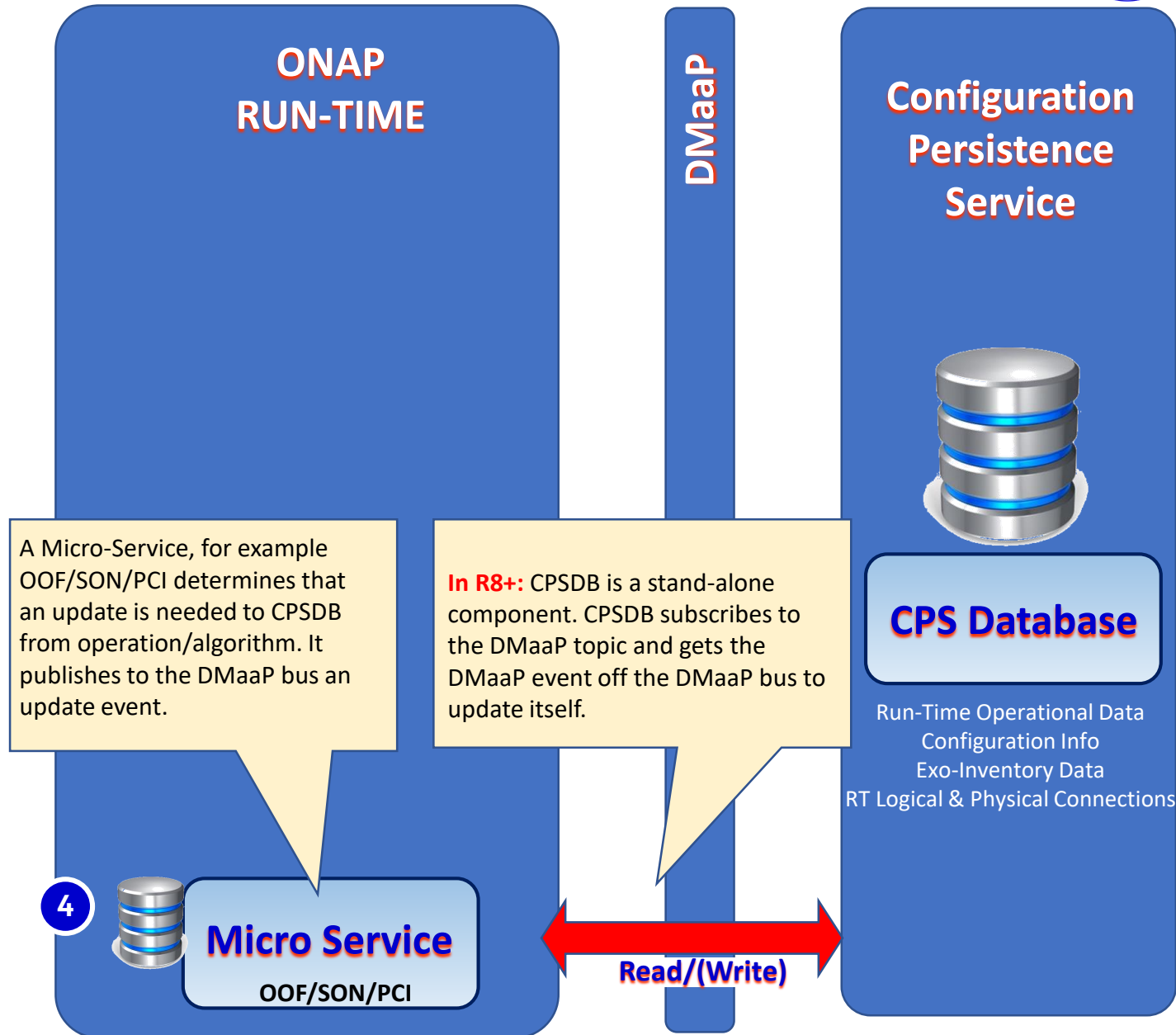**ONAP RUN-TIME**

DMaaP

Configuration Persistence Service

(1) During Network setup "getall" retrieves from A&AI the ENTIRE A&AI graph. Used to setup the initial view of CPS
(2) Updates additions/deletions of xNFs. "AAI-Event" (operation Addition / delete)

In R8+: CPSDB is a stand-alone component. Performs "getall" A&AI update and atomic A&AI update. Atomic "updates" from A&AI add/remove of xNF is published by A&AI as an update on DMaaP bus

CPS Database

3

A&AI DB

A&AI
Inventory, Listener

A&AI Sync

Run-Time Operational Data
Configuration Info
Exo-Inventory Data
RT Logical & Physical Connections

ONAP RUN-TIME

DMaaP

Configuration Persistence Service

WELCOME TO **HONOLULU** WELCOME TO

A Micro-Service, for example OOF/SON/PCI determines that an update is needed to CPSDB from operation/algorithm. It publishes to the DMaaP bus an update event.

In R8+: CPSDB is a stand-alone component. CPSDB subscribes to the DMaaP topic and gets the DMaaP event off the DMaaP bus to update itself.

CPS Database

Run-Time Operational Data
Configuration Info
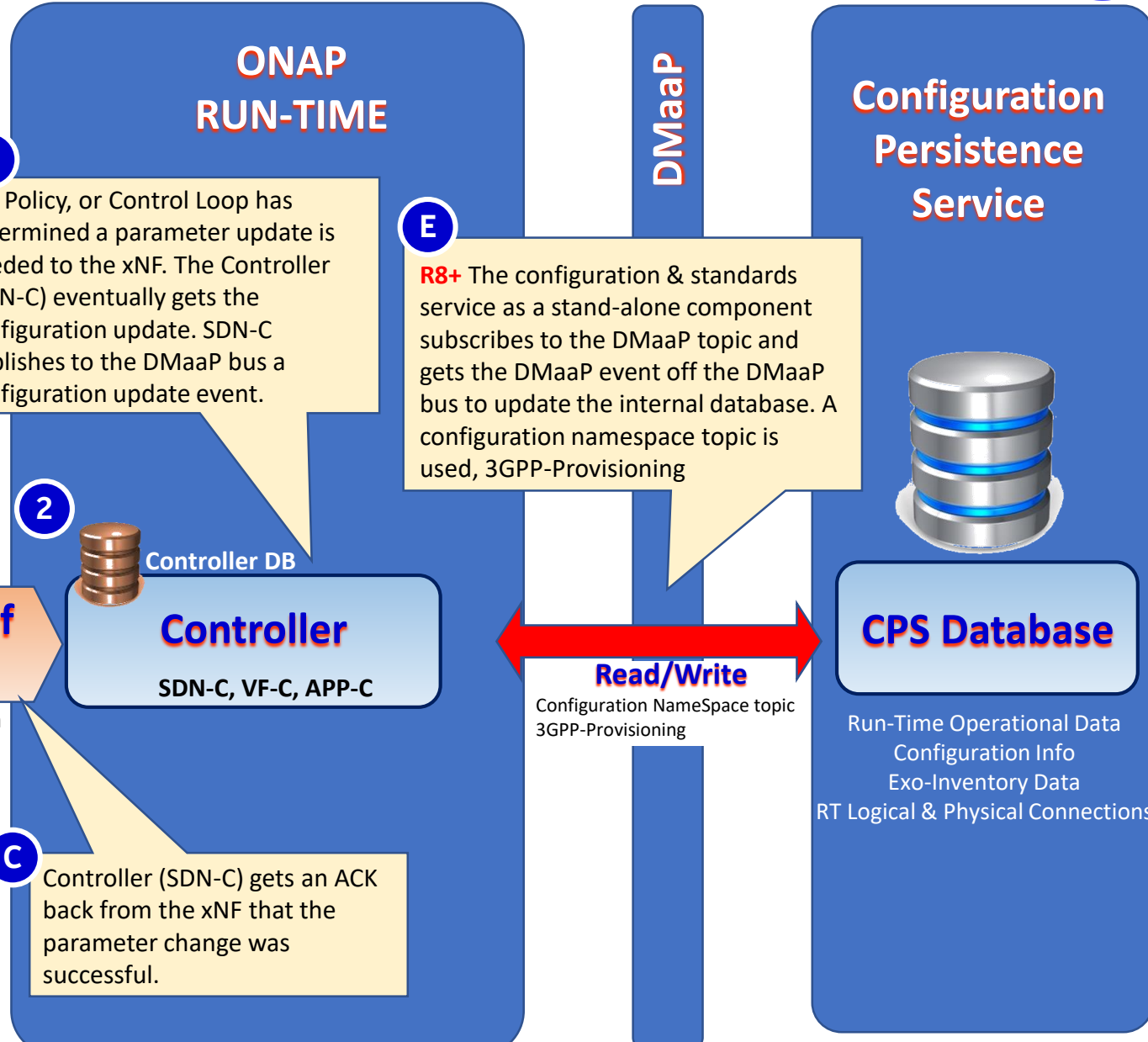Exo-Inventory Data
RT Logical & Physical Connections

4

Micro Service
OOF/SON/PCI

Read/(Write)

CPS WRITING: From Controller SDN-C

ONAP RUN-TIME

DMaaP

Configuration Persistence Service

A SO, Policy, or Control Loop has determined a parameter update is needed to the xNF. The Controller (SDN-C) eventually gets the configuration update. SDN-C publishes to the DMaaP bus a configuration update event.

The Controller (SDN-C) also sends a message to the xNF to update the parameter. This may be done via NetConf/O1/Ansible

E **R8+** The configuration & standards service as a stand-alone component subscribes to the DMaaP topic and gets the DMaaP event off the DMaaP bus to update the internal database. A configuration namespace topic is used, 3GPP-Provisioning

DU/PNF   CU/VNF

B

2   Controller DB

PNF VNF

Netconf O1

CM Notification Change Config

Controller
SDN-C, VF-C, APP-C

Read/Write
Configuration NameSpace topic
3GPP-Provisioning

CPS Database

Run-Time Operational Data
Configuration Info
Exo-Inventory Data
RT Logical & Physical Connections

D xNF would may send a Standards Defined VES unless xNF configured to suppress event on ONAP origination
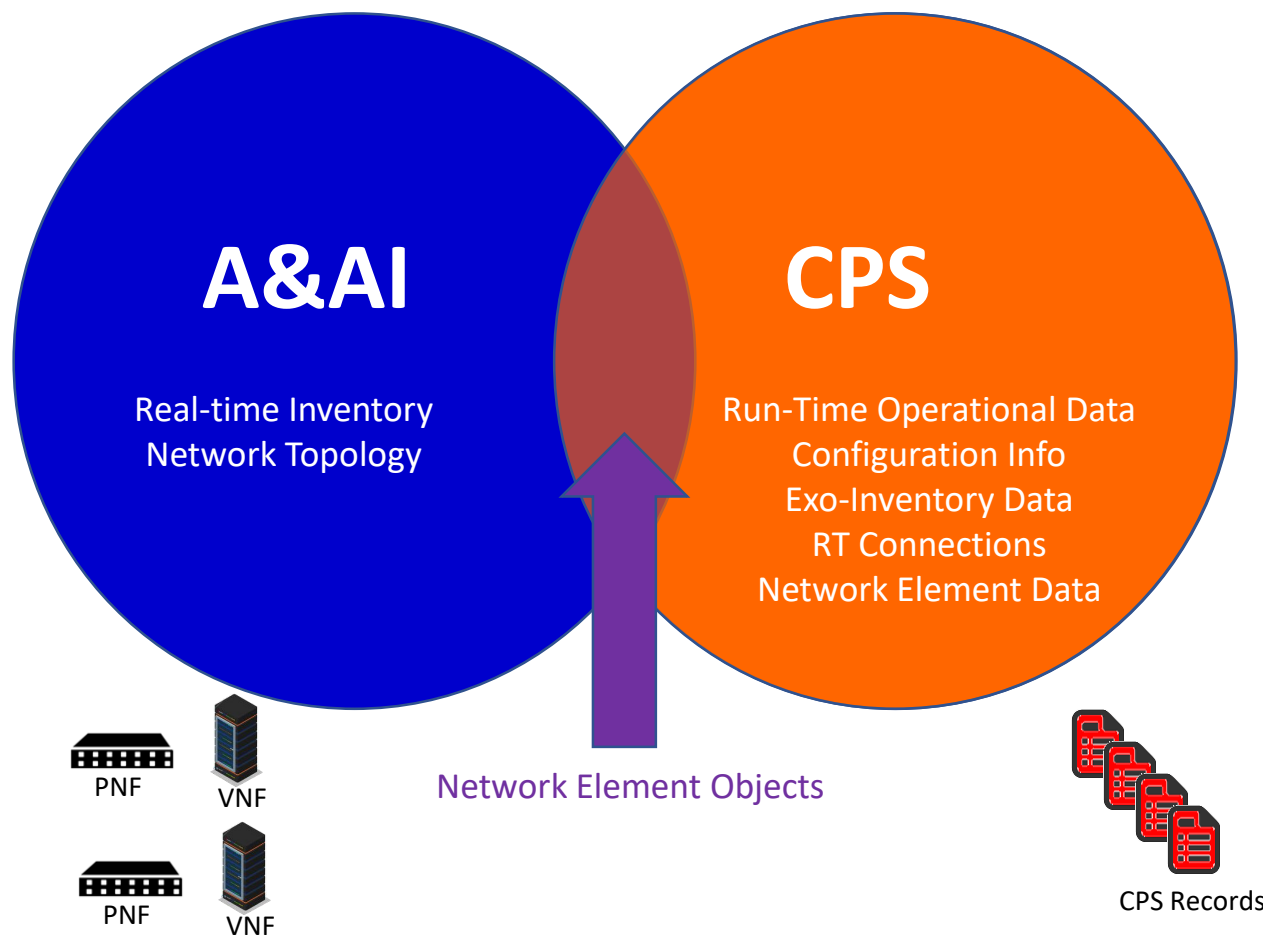
C Controller (SDN-C) gets an ACK back from the xNF that the parameter change was successful.

A&AI vs CPS

Concepts – A&AI conceptually stores Real-time inventory view of connected and "topology" of xNFs that ONAP sees. CPS stores Network Element Data. A&AI and CPS overlaps because they both need to know about Network Element objects so that can managed & orchestrated.
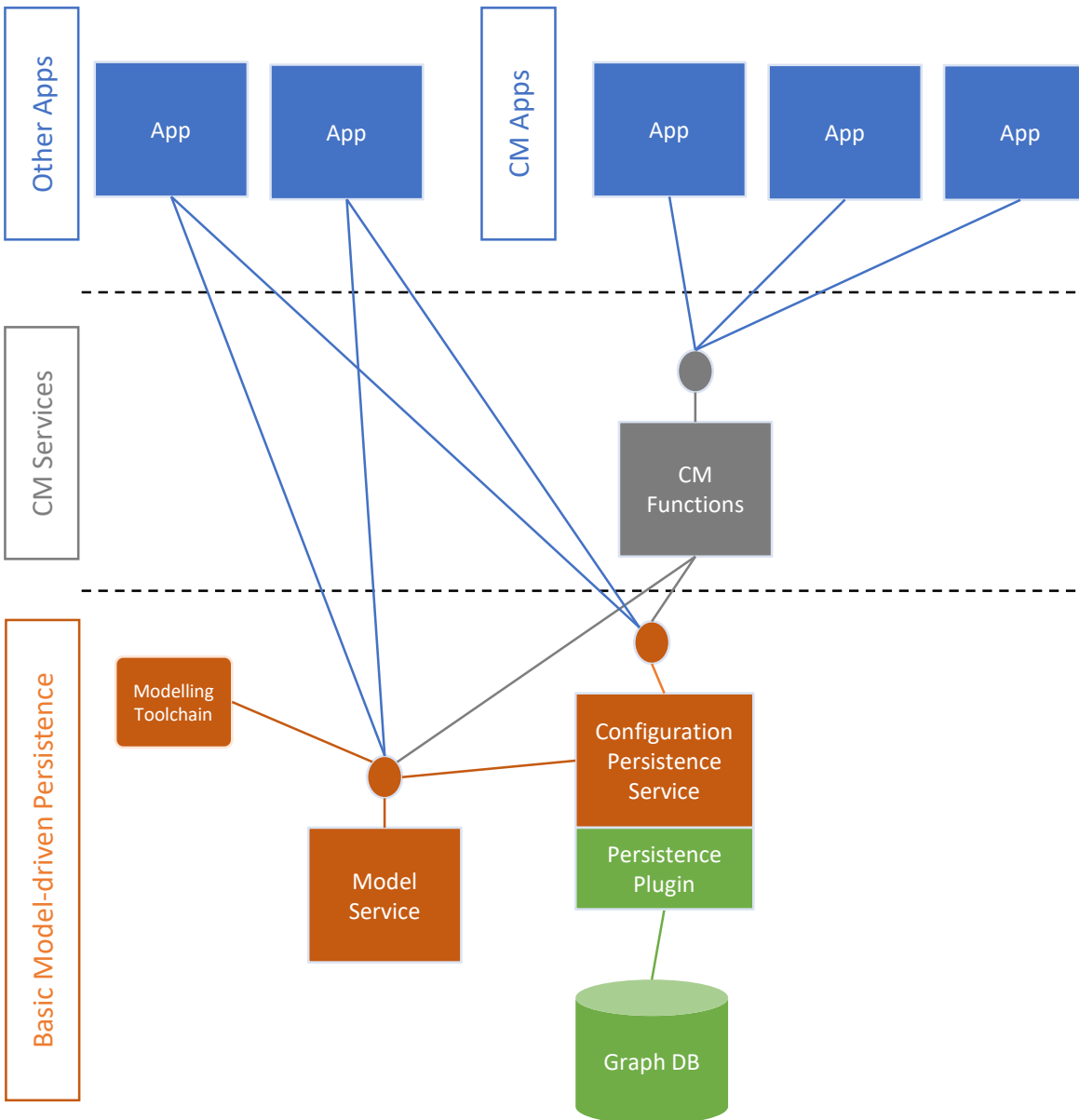

A&AI

Real-time Inventory
Network Topology

CPS

Run-Time Operational Data
Configuration Info
Exo-Inventory Data
RT Connections
Network Element Data

PNF   VNF

PNF   VNF

Network Element Objects

CPS Records

R7 Model Driven Proof of Concept for Configuration Persistence Service (CPS)

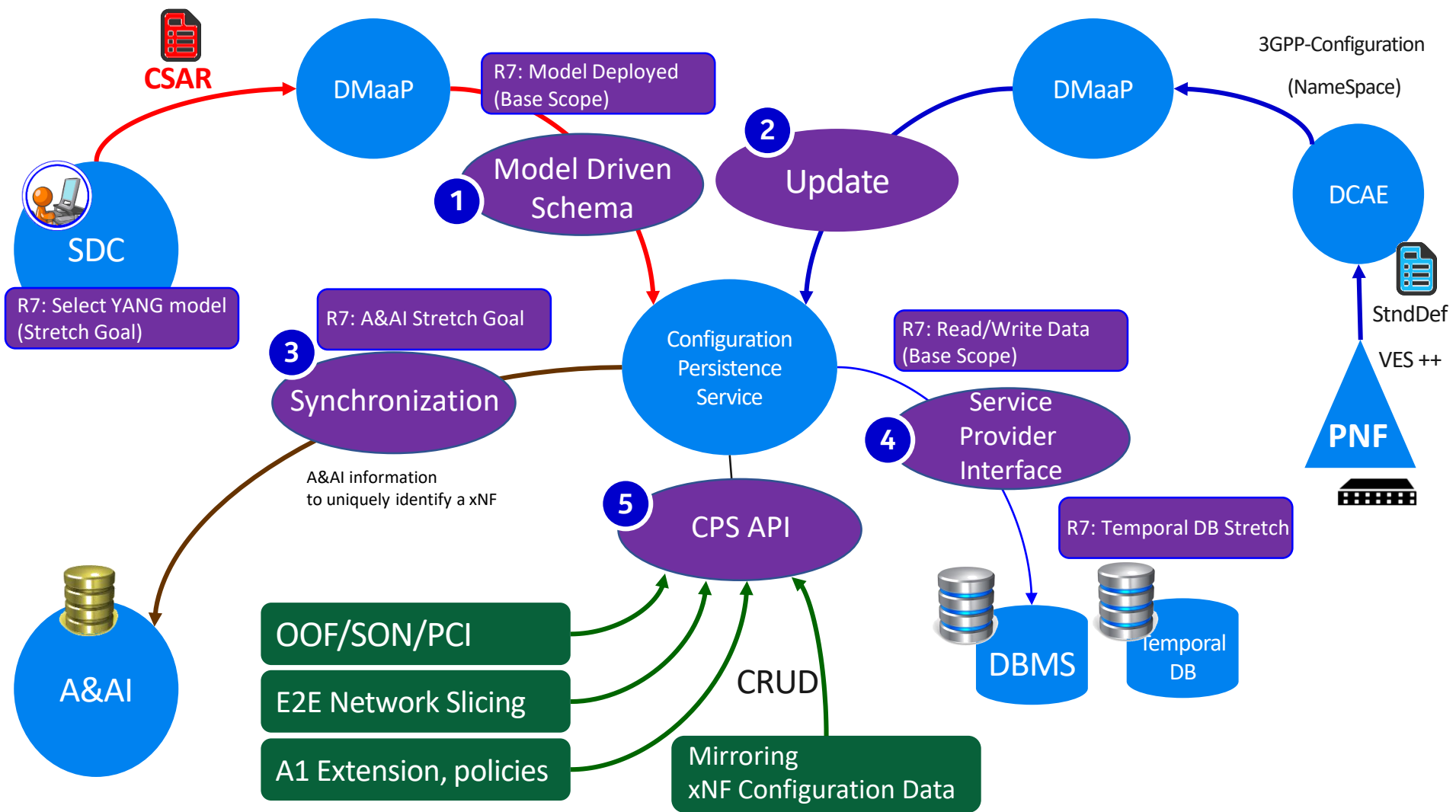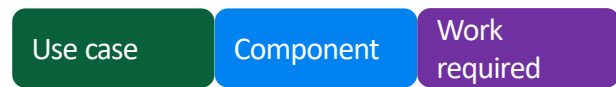**Proof of Concept**

- Provide schema-less model-driven (type safe) access to data which is owned by applications or indirectly by network functions
  - Applications own their own subset of the data according to cloud native principles ; in a separate logical or actual CPS instance
- Provide a model-driven specification for integrating external data sources
- Persisted data can be normalized or non-normalized
- Supports bulk, incremental and attribute value change reconciliation. It is best suited to data that is hierarchical and/or highly connected.
- New model versions can be introduced on-the-fly to the model repository to allow for evolution of the management platform to support network function versions without the need for a software change
- The Model Service is populated in multiple ways
  - Network function models are automatically injected by the Design and Onboarding component when the software packages are onboarded to it
  - Models are discovered from the network functions on instantiation
  - Application-specific models are injected by the App Manager when the app is deployed

R7 Model Driven CPS PoC

Use case | Component | Work required

CSAR

SDC

DMaaP

R7: Model Deployed (Base Scope)

1 Model Driven Schema

2 Update

DMaaP

3GPP-Configuration (NameSpace)

DCAE

StndDef

VES ++

PNF

R7: Select YANG model (Stretch Goal)

R7: A&AI Stretch Goal

3 Synchronization

A&AI information to uniquely identify a xNF

Configuration Persistence Service

R7: Read/Write Data (Base Scope)

4 Service Provider Interface

R7: Temporal DB Stretch

5 CPS API

OOF/SON/PCI

E2E Network Slicing

A1 Extension, policies

CRUD

Mirroring xNF Configuration Data

A&AI

DBMS

Temporal DB

ONAP

R7 Model Driven CPS PoC

TOPIC	PoC RESULTS
SEED CODE	Seed Code to serve as a basis for CPS has been developed
PROOF POINTS	1. Create/read CRUD operations using YANG fragments using a simple schema or schema-less repository 2. Deploy & upgrade YANG model fragments at run-time 3. Validate based on YANG Constraints 4. Provide architecture vision and roadmap for a target architecture.
ARCHITECTURE AGREEMENTS	Resolve key architectural Issues necessary for CPS as a stand-alone project
CPS CORE FUNCTIONALITY	Can soon demonstrate some key CPS operations
PERFORMANCE LIMITS	Ascertain a sense of Performance and Capacity boundaries

1. Demonstrate Create/read operations using YANG fragments against a CPS backed by very simple schema / schema-less repository

2. Demonstrate ability to deploy / upgrade YANG fragments at run-time

3. Demonstrate CPS behavior driven by YANG model

4. Provide architecture vision and roadmap for a target architecture, supported use cases, non-functional requirements towards an ONAP Project

R7 Model Driven CPS PoC

Weekly ONAP meeting hosted by Ben Cheung (Nokia)

PoC discussed with and approve by TSC

ONAP R8 Honolulu Project proposal ongoing, well on track for approval. Requested to present Oct 1

C&PS presentation in many fora, like this, LFN Design Developer Forum (DDF) etc.

Resourcing

    Ericsson 3 full time developers

    Bell Canada 2 part time developers

Jira backlog, team ceremonies like scrums etc. established

Architecture designed & implemented (proof point 4)

R7 Model Driven CPS PoC
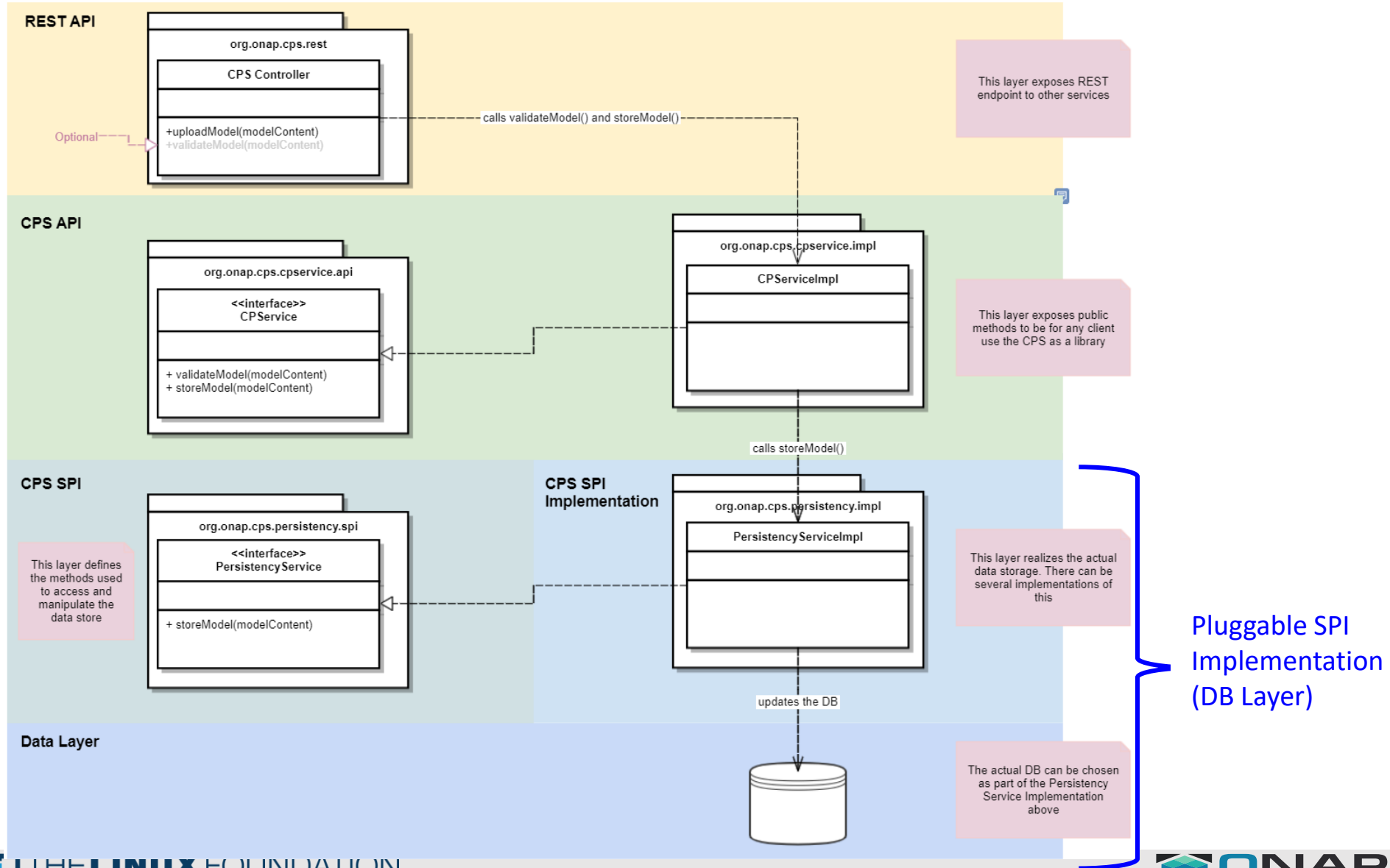
- PoC being developed on Nordix Branch to avoid impacts on production code

- Project structure set up completed
  - Following ONAP standards and conventions
  - Quality control build in (SonarQube & Checkstyle)

- ODL Yang Tools integrated
  - Parsing of Yang models
  - Parsing of Yang data, JSON or XML with validation for given Yang model

- First E2E iteration of 2 use cases completed
  - Upload & Validate Yang Model (part of proof point 2)
  - Upload JSON Data Object (part of proof point 1

- Base : N/A (new code)
  Main dependency : ODL Yang Tools 5.x (probably)
  https://javadoc.io/doc/org.opendaylight.yangtools

- Design and Architecture discussions ongoing
  https://wiki.onap.org/display/DW/Issues+decisions+and+assumptions

8	1	MEDIUM	Existing Yang Parser	Is there an existing Yang Parser in ONAP an/or OpenDayLight that can be used for C&PS	No	
9	N/A	AGREED	Location of PoC Code	Dan Timony suggested to use and existing CCSDK repo, he mentioned ccsdk/features. As long as the PoC remains completely independent and doesn't affect delivery of existing artifacts in the same repo.	--	ccsdk/features, see https://gerrit.onap.org/r/c/ccsdk/features/+/110385 (awaiting approval)
10	N/A	AGREED	Common information model, Data lake and Access control	How will the CPS help with managing coupling between ONAP components that make use of data lake and common information model	--	We will start with Architectural Approach A in the PoC with the aim of fully supporting Architectural Approach C. I.e. access to the data lake will be conditional on permission granted by the data owner. In the PoC we will not implement the permission granting mechanism
11	4,5	MEDIUM	Transactional behavior	It needs to be clear to users the level of atomic operations supported by the CPS	Yes	

CPS Roadmap & R6-R8 Plan

Configuration Persistence Service (CPS) Roadmap –

R6 Frankfurt → **R7 Guilin** → **R8 Honolulu** →

June 5, 2020 | *December, 2020* | *June 2021*

CPS 1.0
R6 CPS
- CC-SDK/SDN-C solution
- Evolution of "ConfigDB"

Supporting R6 Use Cases:
- SON/OOF/PCI U/C

CPS 1.1
R6 CPS Extensions
- Evolution of CC-SDK/SDN-C solution REQ322

Supporting R7 Use Cases:
- SON/OOF/PCI U/C
- 5G E2E Network Slicing
- A1 Policy extension (Ericsson)

Model-Driven PoC
- Write "base" CPS
- Write NE *Data*
- Read NE Data
- Access Control

State Management PoC
- State Management PoC (BellCA) self-contained

CPS 2.0
R8 CPS stand-alone project proposal
- Deprecate CPS 1.0 & 1.1
- Project proposals TSC/Architecture S/C
- Setup Project Repo

CPS FUNCTIONALITY:
- Data Recovery
- Model Adaption (Dynamic Schema)

CPS Roadmap & R8-R10 Plan

Configuration Persistence Service (CPS) Roadmap –

R8 Honolulu → **R9 Istanbul** → **R10 Kyoto** →

June 2021 | **December 2021** | **June 2021**

R8 Honolulu

CPS 2.0

R8 CPS stand-alone project proposal

- Deprecate CPS 1.0 & 1.1
- Project proposals TSC/Architecture S/C
- Setup Project Repo

CPS FUNCTIONALITY:

- Data Recovery
- Model Adaption (Dynamic Schema)

Legend:
RED text is CC-SDK/SDN-C solution
BLUE text is the PoC & stand-alone project

R9 Istanbul

Rx (future) development

CPS FUNCTIONALITY:

- Data Auditing Model driven
- Topology Traversal
- Data Syncing

R10 Kyoto

Rx (future) development

CPS FUNCTIONALITY:

- Data Auditing Rules Driven
- Data History
- Roll-Back
- Database Backup
- Performance Optimization (Scaling)

CPS Use Cases and Proof of Concepts in R8

5G USE CASE	DESCRIPTION
STATE MANAGEMENT POC	Bell Canada led PoC for State tracking and State management using CPS Integration with CPS (as a platform). Have the State management S/W now work with CPS using available swaggers/APIs
OOF - SON (5G)	Optimization and SON functions for 5G RAN. Self-optimization, Self-Healing, Self-configuration.
NETWORK SLICING (5G Use Case)	Network Slicing defines Slices for 5G RAN systems. Network Slicing is a long-lead (multi-release) development. (will be presented in its own lecture at the Virtual Face to Face)
MOBILITY STANDARDS HARMONIZATION/ A1 adapter	**A1 adapter:** Enhancing the A1 adapter/interface capabilities in ONAP to manage A1 Policies, support multiple A1 targets in the RAN and multi-version A1 interface for different A1 targets, introduce secure TLS communication.

Role

From processed events; decides **which actor** should be leveraged to perform **what action** in the network

Policies

Role

Act upon policy execution and instructions to perform management tasks on the network elements.

Actors

Message bus

Analytics

Role

Standardizes, **transforms**, **enriches** and **analyzes** the collector data to publish events out of it,

DCAE Components

StateDB

Role

Keeps operational data from the network and its services. **Supports** and **optimizes** Analytics applications for theirs analysis.

Collectors

Role

Collects fault, **performance**, **configuration data** from network devices and then **publishes** (raw) data for other components to consume.

state-controller State Controller ⌄

| GET | /states retrieveByFilter |

| POST | /states add |

| GET | /states/{timestamp} retrieve |

| DELETE | /states/{timestamp} delete |

| GET | /states/search retrieveByQuery |

ONAP
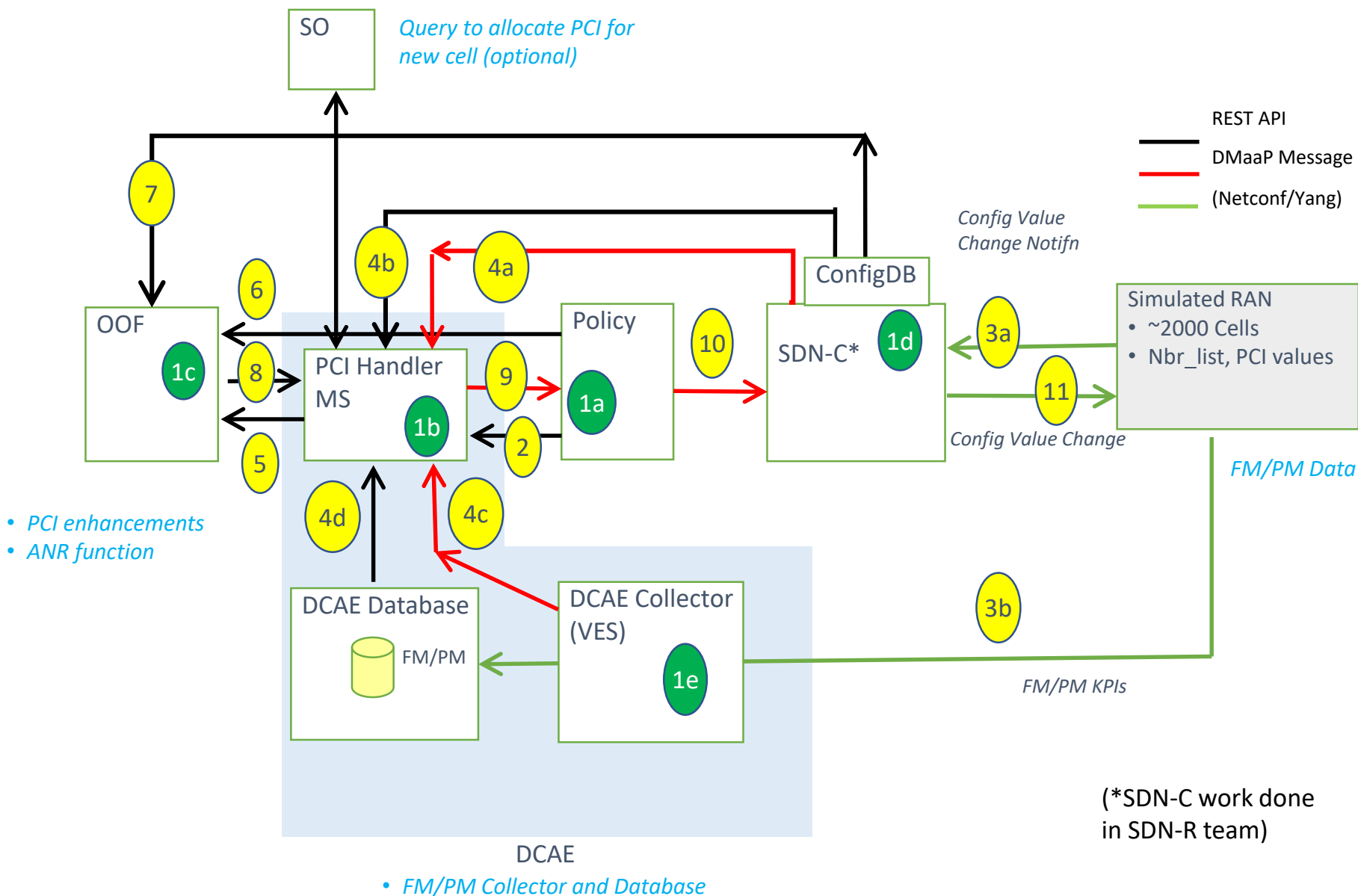
OOF / SON / PCI Use Case

- Config DB (MariaDB) used by PCI-H-MS (step 4b) and OOF (step 7)

- Query API (swagger JSON spec) exposed to other ONAP modules

- cellId needs to be globally unique (assumed eCGI) and align with ONAP YANG model, ORAN, 3GPP

- pnf-name indicates netconf server to be used for interactions regarding cells

- Pnf object (pnf-name, pnf-id) to be aligned with A&AI (A&AI/ConfigDB interaction to be finalized in Dublin release)

Cell (Object)

Attribute	Format
networkId	string
cellId	string
pciValue	uint64
nbrList	list of cellId
lastModifiedTS	timestamp
pnf-name	string

pnf (Object)

Attribute	Format
pnf-name	String
cells	List of cellID's
lastModifiedTS	timestamp

ConfigDB API

API	Input	Output
GET cellList	networkId, ts	List of cellIds
GET PCI	cellId, ts	PCI Value
GET nbrList	cellId, ts	List of cellIds and their PCI values
GET pnf-name	cellID, ts	pnf-name

End to End Network Slicing Use Case

1

OSS/BSS/Apps

↕ Standard APIs

CSMF (ONAP)

↕ *Internal call*

NSMF (ONAP)

↕ *Internal call*

NSSMF(s) (ONAP)

↕

xNFs

2

OSS/BSS/Apps

↕

CSMF

↕ 3GPP APIs

NSMF (ONAP)

↕ *Internal call*

NSSMF(s) (ONAP)

↕

xNFs

3

OSS/BSS/Apps

↕

CSMF

↕ 3GPP APIs

NSMF (ONAP)

↕ Standard APIs

NSSMF(s)

↕

xNFs

4

OSS/BSS/Apps

↕ TMF APIs

CSMF (ONAP)

↕ *Internal call*

NSMF (ONAP)

↕ Standard APIs

NSSMF(s)

↕

xNFs

5

OSS/BSS/Apps

↕

CSMF

↕

NSMF

↕ Standard APIs

NSSMF(s) (ONAP)

↕

xNFs
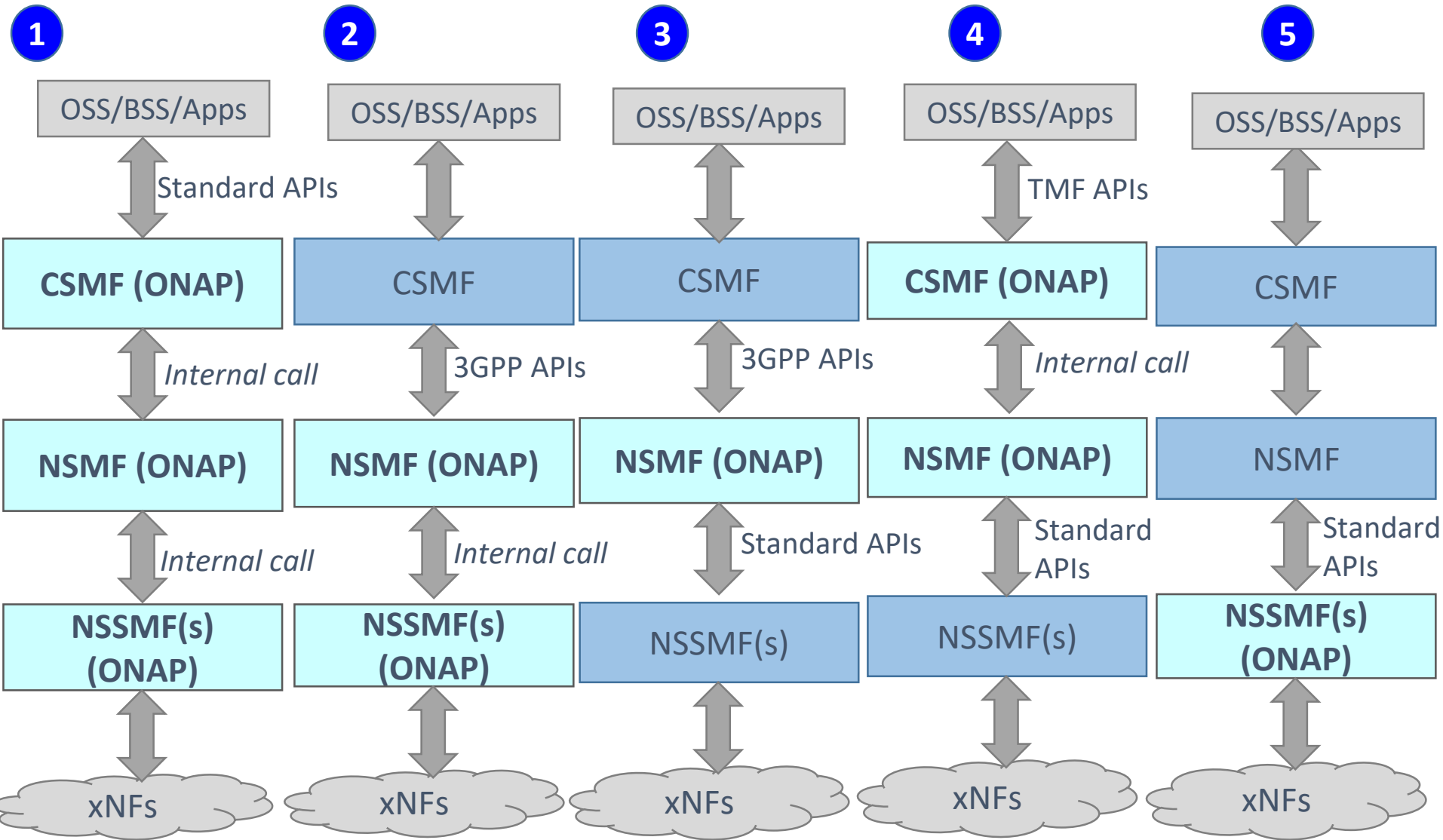
3rd party component

ONAP

End to End Network Slicing Use Case

NetworkSlice	Network Slice NRM	operationalState
NetworkSlice	Network Slice NRM	administrativeState
NetworkSlice	Network Slice NRM	serviceProfileList
NetworkSlice	Network Slice NRM	networkSliceSubnetRef
NetworkSliceSubnet	Network Slice NRM	operationalState
NetworkSliceSubnet	Network Slice NRM	administrativeState
NetworkSliceSubnet	Network Slice NRM	nsInfo
NetworkSliceSubnet	Network Slice NRM	sliceProfileList
NetworkSliceSubnet	Network Slice NRM	managedFunctionRef
NetworkSliceSubnet	Network Slice NRM	networkSliceSubnetRef
ServiceProfile	Network Slice NRM	serviceProfileId
ServiceProfile	Network Slice NRM	sNSSAIList
ServiceProfile	Network Slice NRM	pLMNIdList
ServiceProfile	Network Slice NRM	perfReq
ServiceProfile	Network Slice NRM	maxNumberofUEs
ServiceProfile	Network Slice NRM	coverageAreaTAList
ServiceProfile	Network Slice NRM	latency
ServiceProfile	Network Slice NRM	uEMobilityLevel
ServiceProfile	Network Slice NRM	resourceSharingLevel
ServiceProfile	Network Slice NRM	sST
ServiceProfile	Network Slice NRM	availability
SliceProfile	Network Slice NRM	sliceProfileId
SliceProfile	Network Slice NRM	sNSSAIList
SliceProfile	Network Slice NRM	pLMNIdList
SliceProfile	Network Slice NRM	perfReq
SliceProfile	Network Slice NRM	maxNumberofUEs
SliceProfile	Network Slice NRM	coverageAreaTAList
SliceProfile	Network Slice NRM	latency
SliceProfile	Network Slice NRM	uEMobilityLevel
SliceProfile	Network Slice NRM	resourceSharingLevel

Executive Summary - This requirement enhances the A1 adapter/interface capabilities provided in Rel 6 as part of 5G/ORAN & 3GPP Standards Harmonization requirement (REQ-38). O-RAN has defined A1 interface specification in the context of the management of 5G RAN elements to provide intent based policies for optimization of the RAN network performance. Planned enhancements for Rel 7 include additional support for managing A1 Policies, multiple A1 targets in the RAN, multi-version support for different A1 targets, and secure TLS communication.

A1-P Consumer

HTTP Client | HTTP Server

.../poli(

Create policy
Query policy
Update policy — Policy feed
Delete policy
Query policy types

HTTP Server | HTTP Client

.../policies

A1-P Producer

Appendix

Benjamin Cheung
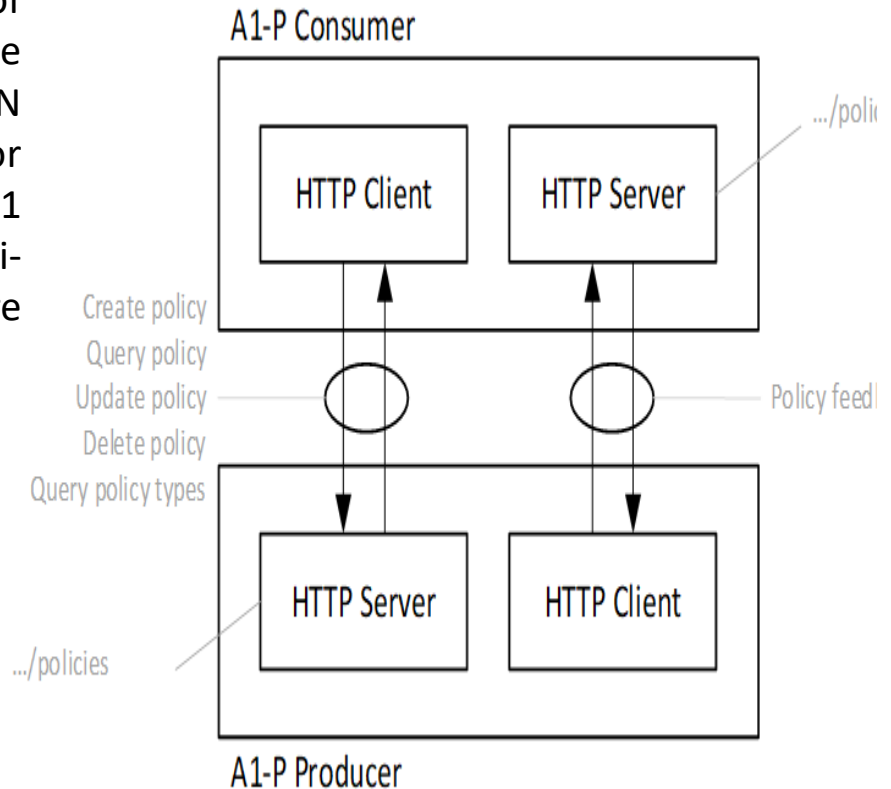
ACCESS TO CPS Database (READ/WRITE):

READ ONLY - Run-Time parameters can be READ by any ONAP platform component and any ONAP plug-in. Examples of ONAP platform components are A&AI, SDC, SDNC etc.

READ/WRITE - Parameters can be READ/WRITE from Controllers, DCAE (future), VES Collector/DMaaP, A&AI, Policy/CLAMP (future) and other components with permission settings.

DEFAULT - SO (future), DCAE, A&AI (indirectly), Controllers (CDS, APPC, SDNC) will have default read/write access to CPS Database

DEFINABLE - Other components will have default read-only access to Configuration Persistence Service but can be given Read/Write access on a per record basis.

SYNCING NEW xNF ADDED or DELETED (A&AI):

ELEMENT SYNC - Software keeps the A&AI elements with the elements in the RunTime Config DB in Sync. When the network first being established, a *GetAllPNFs* function from A&AI can be used on startup.

A&AI - A&AI is still the master of valid entities in the network and provides a dynamic view of the assets (xNFs) available to ONAP

CPS Database - The CPS Database is a master of the associate (exo-inventory) data associated with the entities.

DYNAMIC VIEW - When a xNF appears or is removed from the system, CPS Database records will be added/removed based on A&AI entries.

LOGIC - When a xNF appears is removed there is logic to determine how and when something is to be updated. There is some intelligence to know what elements of update.

INDEXING:

INDEXING - Data Records will be indexed by xNF (VNF, PNF, ANF). It would be an objective to have a similar indexing mechanism as A&AI. May also need an index to be a logical object ID.

RETRIEVAL - How are data records retrieved efficiently. This relates how the records are indexed.

Dependencies vs Scope

DEPENDENCIES – need to operate

SDC Yang Model (to load schema)
   ability to process & translate yang models into schemas
AAF (intra-ONAP security)
Database implementation for Data Persistence
          (for example MariaDB)
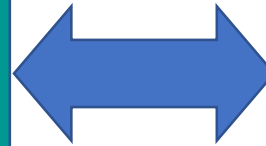
DEPENDENCIES – value added

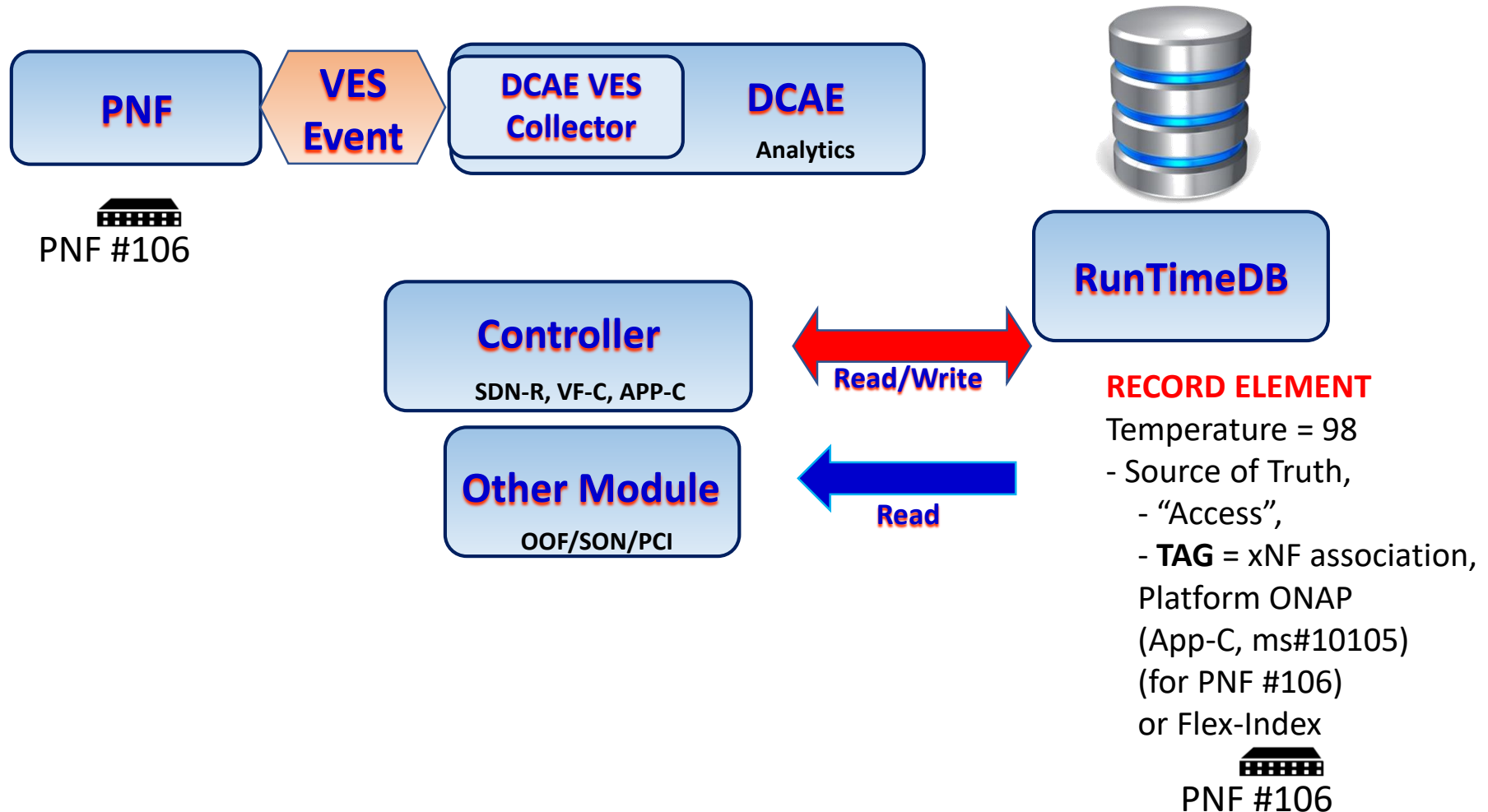DMaaP (some use cases to work / indirect dependency)
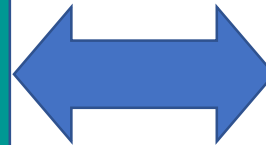
SCOPE

CPS
Database

RECEIVE INFORMATION
WRITE INFORMATION
PUBLISH CHANGES
REFERENTIAL INTEGRITY
INGEST PACKAGES
LOGICAL OBJECTS
ASSOCIATIONS
CARDINALITY RULES
LINKING RESTRICTIONS
SYNCHRONIZATION
DATA INTEGRITY & RECOVERY

Configuration Persistence Service (Run-Time)

PNF

VES Event

DCAE VES Collector **DCAE**
Analytics

PNF #106

RunTimeDB

Controller
SDN-R, VF-C, APP-C

Read/Write

Other Module
OOF/SON/PCI

Read

RECORD ELEMENT
Temperature = 98
- Source of Truth,
  - "Access",
  - **TAG** = xNF association,
  Platform ONAP
  (App-C, ms#10105)
  (for PNF #106)
  or Flex-Index

PNF #106

ONAP

PNF #101

PNF #102

PNF #103

PNF #104

A&AI

PNF #101

PNF #102

PNF #103

PNF #104

CPS DB

PNF #101
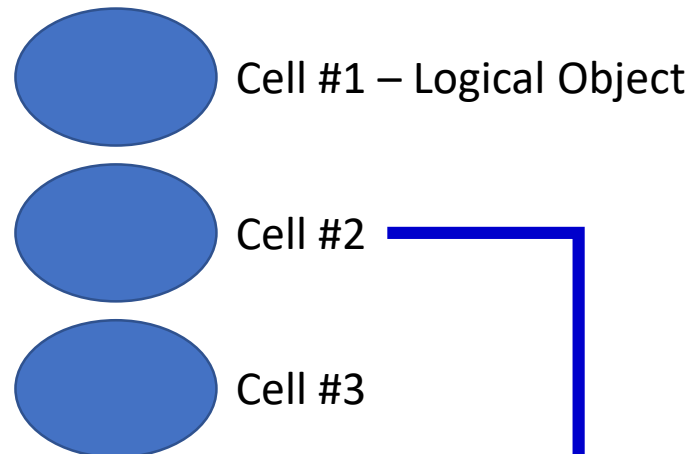
PNF #102

PNF #103

PNF #104

A&AI correlated/Index to RunTimeDB
Publish changes in A&AI, notification on DMaaP

Indices into Configuration Persistence Service may also use Flex-Index (such as CellID)

CPS Database (Run-Time View)

PNF #106

Cell #1 – Logical Object

Cell #2

Cell #3

RECORD ELEMENT
INDEX = PNF #106
Parameter #1
Parameter #2
Parameter #3
Logical object, Cell #1
    Cell Parameter #1
    Cell Parameter #2
    Cell Parameter #3

RECORD ELEMENT
INDEX = PNF #106
Parameter #1
Parameter #2
Parameter #3
State Info X.733
Associations
   { Logical Object #111 Cell #2 }
Cardinality Rules
Linking Restrictions

RECORD ELEMENT
INDEX = Logical Object #111
Parameter #1
Parameter #2
Parameter #3
State Info
Associations
  { PNF #106 }
Cardinality Rules
Linking Restrictions