Configuration & Persistency Service

• Design Developers Forum presentation
June 25, 2020 version 8
# DDF June 22-25, 2020 – C&PS Agenda

<table>
<thead>
<tr>
<th>TIME</th>
<th>JUNE 25, 2020 C&amp;PS DDF AGENDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 min</td>
<td>Overview of C&amp;PS &amp; Agenda – Introduction to C&amp;PS</td>
</tr>
<tr>
<td>20 min</td>
<td>Model Driven C&amp;PS Proof of Concept (PoC) – Overview of the Model-Driven C&amp;PS PoC for R7</td>
</tr>
<tr>
<td>3 min</td>
<td>R7 &amp; Beyond Roadmap – Model Driven Proof of Concept (PoC) in R7, way forward in R8 Honolulu, New plan &amp; roadmap</td>
</tr>
<tr>
<td>12 min</td>
<td>Use Cases using C&amp;PS Database – Overview of C&amp;PS Applications</td>
</tr>
<tr>
<td>5 min</td>
<td>Questions &amp; Answers – Q&amp;A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TIME</th>
<th>Q&amp;A Session Post-Session(</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1 hour)</td>
<td>Follow-up questions – Follow-up meetings at C&amp;PS Team Call (Fridays)</td>
</tr>
</tbody>
</table>
Overview of Configuration & Persistency Service

Business Case
Architecture S/C
Overview
Technical Flows
Executive Summary - The Configuration & Persistency Service is a real-time service that is designed to serve as a data repository for Run-time data that needs to be persistent. This will be explored as a PoC. R4/R5/R6 functionality from ConfigDB will be enhanced to continue to serve Use Cases. *Focus on storing run-time DATA RELATED to NETWORK ELEMENT instances.*

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.
Configuration & Persistency Service (C&PS)

1. **DCAE VES Collector**
   - Standards Defined VES Event for Configuration

2. **Service Orchestration (SO)**
   - SDN-C, VF-C, APP-C

3. **A&AI (Automation & AI)**
   - Real-Time Inventory

4. **Micro-Service**
   - PCI, E2ENS, A1P, MD PoC

Management Framework Data

- ONAP
- DCAE Inventory
- Policy DB

Run-TIME

- C&PS Update
- Read
- Read/Write

C&PS Database

- Configuration NameSpace topic 3GPP-Provisioning
- CM Notification Change Config

Network Element Data

- U/C DB
- Network Element Data

THE LINUX FOUNDATION
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 R6/R7: RTCDB is part of CC-SDK part of SDN-R. Thus, SDN-R receives the VES Event and writes to RTCDB.
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.
Data Persistency Service (Run-Time View)

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

In R6/R7: “getall” A&AI update, individual A&AI update

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

A&AI
Inventory, Listener

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

**In R6/R7:** RTCDB is in CC-SDK (part of SDN-R). Thus, SDN-R receives the VES Event and writes to RTCDB

**In R8+:** RTCDB is a stand-alone component. RTCDB subscribes to the DMaaP topic and gets the DMaaP event off the DMaaP bus to update itself.
The Controller (SDN-R) also sends a message to the xNF to update the parameter. This may be done via NetConf/O1/Ansible.

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

In R6/R7: RTCDB is in CC-SDK (part of SDN-R). Thus, SDN-R receives the VES Event and writes directly to RTCDB.

Controller (SDN-R) gets an ACK back from the xNF that the parameter change was successful.

xNF would may send a CMNotify unless xNF configured to suppress event on ONAP origination.
The Controller (SDN-C) also sends a message to the xNF to update the parameter. This may be done via NetConf/O1/Ansible.

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 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.

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

Controller (SDN-C) gets an ACK back from the xNF that the parameter change was successful.

xNF would maybe send a Standards Defined VES unless xNF configured to suppress event on ONAP origination.

Config & Persist Service

Netconf O1

PNF VNF

CM Notification Change Config

Controller DB

Controller

SDN-C, VF-C, APP-C

C&PS Database

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

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.
R7 – Model Driven Configuration & Persistency Service
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 C&PS PoC (Ericsson)

Use case Component Work required

DMaap → SDC → A&AI
1. Model Driven Schema
2. Update
3. Synchronization
4. Service Provider Interface
5. C&PS API

DMaap → DCAE

VES ++

VES → PNF

SDC

DMaap

A&AI

A&AI information to uniquely identify a xNF

OOF/SON/PCI

E2E Network Slicing

A1 Extension, policies

CRUD

Mirroring xNF Configuration Data

TSDB

DBMS

StandDef

PNF

THE LINUX FOUNDATION

E2E Network Slicing
A1 Extension, policies
CRUD
Mirroring xNF Configuration Data

VES ++
R7 Model Driven C&PS PoC

1. Model Driven Schema
2. Update
3. Synchronization
4. Service Provider Interface
5. C&PS API

Use case: Configuration & Persistency Service
Component: DMaaS
Work required: PNF

SDC
- CSAR
- SDC
- OOF/SON/PCI
- E2E Network Slicing
- A1 Extension, policies

DMaaS
- R7: A&AI Stretch Goal
- R7: Model Deployed (Base Scope)

Update
- R7: Read/Write Data (Base Scope)
- R7: TSDB Stretch Goal

Service Provider Interface
- DBMS
- TSDB

C&PS API
- CRUD
- Mirroring xNF Configuration Data

A&AI
- R7: Select YANG model (Stretch Goal)
- A&AI information to uniquely identify a xNF

DCAE
- StndDef
- VES ++

VES

PNF

THE LINUX FOUNDATION
C&PS Roadmap
C&PS Roadmap & R7-R8 Plan

Configuration & Persistency Service (CPS) Roadmap –

R7 Guilin

R8 Honolulu

Rx Future

R6 C&PS Extensions

Model-Driven PoC

- Establish key components for C&PS
- Write Real-Time NE Configuration Data
- Read (same) Data
- Access Control

Supporting R7 Use Cases:
- SON/OOF/PCI U/C,
- 5G E2E Network Slicing
- A1 Policy extension
- State Management
- Model Driven C&PS PoC

R8 C&PS project proposal

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

Rx (future) development

CPS FUNCTIONALITY:
- Data Auditing
- Topology Traversal
- Data History
- Roll-Back
- Database Backup
- Data Syncing
- Performance Optimization (Scaling)
C&PS Roadmap & R6-R8 Plan

Configuration & Persistency Service (CPS) Roadmap –

R6 Frankfurt

C&PS 1.0
R6 C&PS
- CC-SDK/SDN-C solution
- Evolution of “ConfigDB”

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

C&PS 1.1
R6 C&PS 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” C&PS
- Write NE Data
- Read NE Data
- Access Control

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

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

R7 Guilin

June 5, 2020

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

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

R8 Honolulu

December, 2020

June 2021
Use Cases & Proof of Concepts

Use Cases

Proof of Concept
## C&PS Use Cases and Proof of Concepts

<table>
<thead>
<tr>
<th>5G USE CASE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MODEL DRIVEN C&amp;PS POC</strong></td>
<td>Proof of Concept development to showcase model-driven Configuration &amp; Persistency Service operation. It schema-less model-driven (type safe) access to data which is owned by applications or indirectly by network functions</td>
</tr>
<tr>
<td><strong>NETWORK SLICING (5G Use Case)</strong></td>
<td>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)</td>
</tr>
<tr>
<td><strong>MOBILITY STANDARDS HARMONIZATION/ A1 adapter</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>STATE MANAGEMENT POC</strong></td>
<td>Bell Canada led PoC for State tracking and State management using C&amp;PS</td>
</tr>
</tbody>
</table>
Model Driven C&PS PoC (Ericsson)

- 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
OOF / SON / PCI Use Case

Query to allocate PCI for new cell (optional)

REST API
DMaaS Message
(Netconf/Yang)

Simulated RAN
• ~2000 Cells
• Nbr_list, PCI values

FM/PM Data

DCAE
• FM/PM Collector and Database

PCI Handler
MS

• PCI enhancements
• ANR function

ConfigDB Change Notifn

Config Value Change

FM/PM KPIs

1a

Policy

1b

PCI Handler
MS

1c

OOF

1d

SDN-C*

3a

REST API

3b

Simulated RAN

4a

Config Value Change Notifn

4b

ConfigDB

4c

4d

DCAE Collector (VES)

DCAE Database

FM/PM

3a

1e

DCAE Collector (VES)

FM/PM

FM/PM KPIs

(*SDN-C work done in SDN-R team)
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)

<table>
<thead>
<tr>
<th>Cell (Object)</th>
<th>pnf (Object)</th>
<th>ConfigDB API</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attribute</td>
<td>Attribute</td>
<td>API</td>
</tr>
<tr>
<td>networkId</td>
<td>pnf-name</td>
<td>GET cellList</td>
</tr>
<tr>
<td>cellId</td>
<td>cells</td>
<td>GET PCI</td>
</tr>
<tr>
<td>pciValue</td>
<td>lastModifiedTS</td>
<td>GET nbrList</td>
</tr>
<tr>
<td>nbrList</td>
<td>lastModifiedTS</td>
<td>GET pnf-name</td>
</tr>
<tr>
<td></td>
<td>pnf-name</td>
<td></td>
</tr>
</tbody>
</table>

- Format        
  - string
  - uint64
  - list of cellId
  - timestamp
  - String
End to End Network Slicing Use Case

1. OSS/BSS/Apps
   - Standard APIs
   - Internal call
   - NSMF (ONAP)
   - NSSMF(s) (ONAP)
   - xNFs

2. OSS/BSS/Apps
   - 3GPP APIs
   - Internal call
   - NSMF (ONAP)
   - NSSMF(s) (ONAP)
   - xNFs

3. OSS/BSS/Apps
   - 3GPP APIs
   - NSMF (ONAP)
   - NSSMF(s) (ONAP)
   - xNFs

4. OSS/BSS/Apps
   - TMF APIs
   - Internal call
   - NSMF (ONAP)
   - NSSMF(s) (ONAP)
   - xNFs

5. OSS/BSS/Apps
   - Standard APIs
   - NSMF
   - NSSMF(s)
   - xNFs

3rd party component
### End to End Network Slicing Use Case

<table>
<thead>
<tr>
<th>NetworkSlice</th>
<th>Network Slice NRM</th>
<th>operationalState</th>
</tr>
</thead>
<tbody>
<tr>
<td>NetworkSlice</td>
<td>Network Slice NRM</td>
<td>administrativeState</td>
</tr>
<tr>
<td>NetworkSlice</td>
<td>Network Slice NRM</td>
<td>serviceProfileList</td>
</tr>
<tr>
<td>NetworkSlice</td>
<td>Network Slice NRM</td>
<td>networkSliceSubnetRef</td>
</tr>
<tr>
<td>NetworkSliceSubnet</td>
<td>Network Slice NRM</td>
<td>operationalState</td>
</tr>
<tr>
<td>NetworkSliceSubnet</td>
<td>Network Slice NRM</td>
<td>administrativeState</td>
</tr>
<tr>
<td>NetworkSliceSubnet</td>
<td>Network Slice NRM</td>
<td>nsInfo</td>
</tr>
<tr>
<td>NetworkSliceSubnet</td>
<td>Network Slice NRM</td>
<td>sliceProfileList</td>
</tr>
<tr>
<td>NetworkSliceSubnet</td>
<td>Network Slice NRM</td>
<td>managedFunctionRef</td>
</tr>
<tr>
<td>NetworkSliceSubnet</td>
<td>Network Slice NRM</td>
<td>networkSliceSubnetRef</td>
</tr>
<tr>
<td>ServiceProfile</td>
<td>Network Slice NRM</td>
<td>serviceProfileId</td>
</tr>
<tr>
<td>ServiceProfile</td>
<td>Network Slice NRM</td>
<td>sNSSAIList</td>
</tr>
<tr>
<td>ServiceProfile</td>
<td>Network Slice NRM</td>
<td>pLMNIdList</td>
</tr>
<tr>
<td>ServiceProfile</td>
<td>Network Slice NRM</td>
<td>perfReq</td>
</tr>
<tr>
<td>ServiceProfile</td>
<td>Network Slice NRM</td>
<td>maxNumberOfUEs</td>
</tr>
<tr>
<td>ServiceProfile</td>
<td>Network Slice NRM</td>
<td>coverageAreaTAList</td>
</tr>
<tr>
<td>ServiceProfile</td>
<td>Network Slice NRM</td>
<td>latency</td>
</tr>
<tr>
<td>ServiceProfile</td>
<td>Network Slice NRM</td>
<td>uEMobilityLevel</td>
</tr>
<tr>
<td>ServiceProfile</td>
<td>Network Slice NRM</td>
<td>resourceSharingLevel</td>
</tr>
<tr>
<td>ServiceProfile</td>
<td>Network Slice NRM</td>
<td>sST</td>
</tr>
<tr>
<td>ServiceProfile</td>
<td>Network Slice NRM</td>
<td>availability</td>
</tr>
<tr>
<td>SliceProfile</td>
<td>Network Slice NRM</td>
<td>sliceProfileId</td>
</tr>
<tr>
<td>SliceProfile</td>
<td>Network Slice NRM</td>
<td>sNSSAIList</td>
</tr>
<tr>
<td>SliceProfile</td>
<td>Network Slice NRM</td>
<td>pLMNIdList</td>
</tr>
<tr>
<td>SliceProfile</td>
<td>Network Slice NRM</td>
<td>perfReq</td>
</tr>
<tr>
<td>SliceProfile</td>
<td>Network Slice NRM</td>
<td>maxNumberOfUEs</td>
</tr>
<tr>
<td>SliceProfile</td>
<td>Network Slice NRM</td>
<td>coverageAreaTAList</td>
</tr>
<tr>
<td>SliceProfile</td>
<td>Network Slice NRM</td>
<td>latency</td>
</tr>
<tr>
<td>SliceProfile</td>
<td>Network Slice NRM</td>
<td>uEMobilityLevel</td>
</tr>
<tr>
<td>SliceProfile</td>
<td>Network Slice NRM</td>
<td>resourceSharingLevel</td>
</tr>
</tbody>
</table>
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.
State Management PoC (Bell Canada)

- Svc / Resource Catalog (SDC)
  - service & resource models, policies

- Network intent DB (CDS DB or SDNC's MDSAL)
  - service & resource attributes, intents, assignments

- Inventory (A&AI)
  - inventory, topology, svc & resource instances

- Network state (RuntimeDB)
  - network element & service state, actual configuration

Legend:
- Network intent
- Network state
State Management PoC (Bell Canada)

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

**Actors**

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

**Message bus**

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

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

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

**Role**
DCAE Components
**state-controller**  State Controller

- **GET**  `/states`  retrieveByFilter
- **POST**  `/states`  add
- **GET**  `/states/{timestamp}`  retrieve
- **DELETE**  `/states/{timestamp}`  delete
- **GET**  `/states/search`  retrieveByQuery
APPENDIX

Benjamin Cheung
ACCESS TO C&PS 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 C&PS Database
DEFINABLE - Other components will have default read-only access to Config & Persist 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
C&PS Database - The C&PS 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, C&PS 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 Persistency
  - (for example MariaDB)

**DEPENDENCIES – value added**

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

---

**SCOPE**

- C&PS Database
- RECEIVE INFORMATION
- WRITE INFORMATION
- PUBLISH CHANGES
- REFERENTIAL INTEGRITY
- INGEST PACKAGES
- LOGICAL OBJECTS
- ASSOCIATIONS
- CARDINALITY RULES
- LINKING RESTRICTIONS
- SYNCHRONIZATION
- DATA INTEGRITY & RECOVERY
Config & Persist Service (Run-Time View)

- **PNF**
- **VES Event**
- **DCAE VES Collector**
- **DCAE Analytics**
- **Controller**
  - SDN-R, VF-C, APP-C
- **Other Module**
  - OOF/SON/PCI
- **RunTimeDB**
  - **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
A&AI correlated/Index to RunTimeDB
Publish changes in A&AI, notification on DMaaP

Indices into Config & Persist Service may also use Flex-Index (such as CellID)
C&PS Database (Run-Time View)

C&PS Database

PNF #106

Cell #1 – Logical Object
Cell #2
Cell #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
June 25 2020 Attendees

- Ben Cheung (Host, me)
- Bruno Sakoto
- Felix Katz
- Frank Kelly
- Joanne Liu Rudel
- Ken Kanishima
- Ramesh Parthasarathy
- Sai Seshu
- Takuya Kato
- Tony Finnerty
- Zhuangyang CHEN (China Mobile)
- Alessandro D’Alessandro