





# Integrating 3GPP 5G management framework with ONAP

2019 ONAP Joint Subcommittees Silicon Valley

Anatoly Andrianov, Nokia  
On behalf of 3GPP / SA5












# Objective / Expectation



-  Specify how to integrate 3GPP and ONAP for the Management and Orchestration of 3GPP 5G networks
-  ONAP and 3GPP shall:
  -  complement each other
  -  not overlap

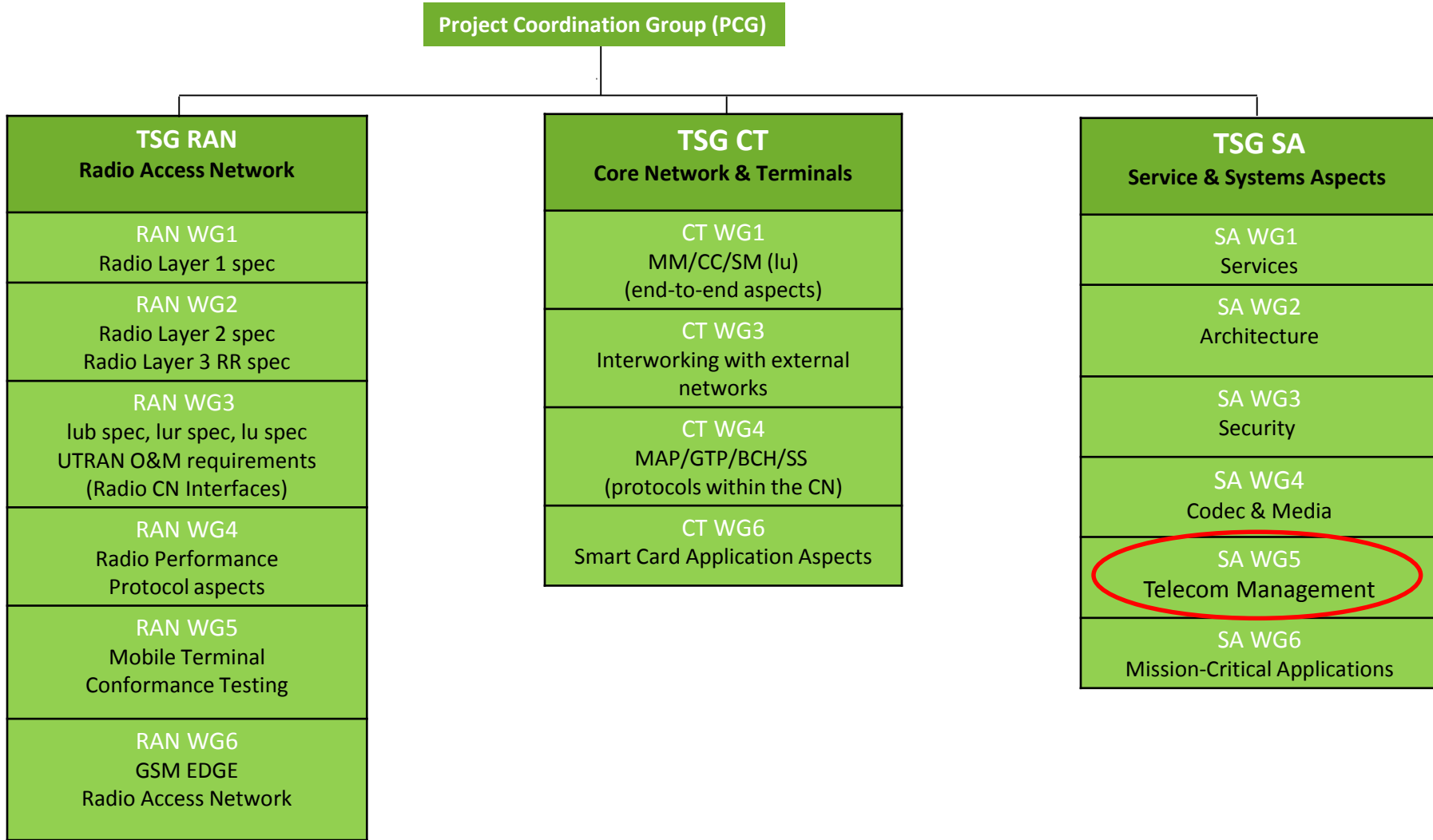
# Content



-  3GPP in a nutshell
-  3GPP Management Framework
-  Integrating 3GPP Management Framework with ONAP
  -  Positioning
  -  Fault & Performance Management
    -  General
    -  FM
    -  PM
  -  Provisioning (Config. Management)
  -  Misc.
-  Useful links

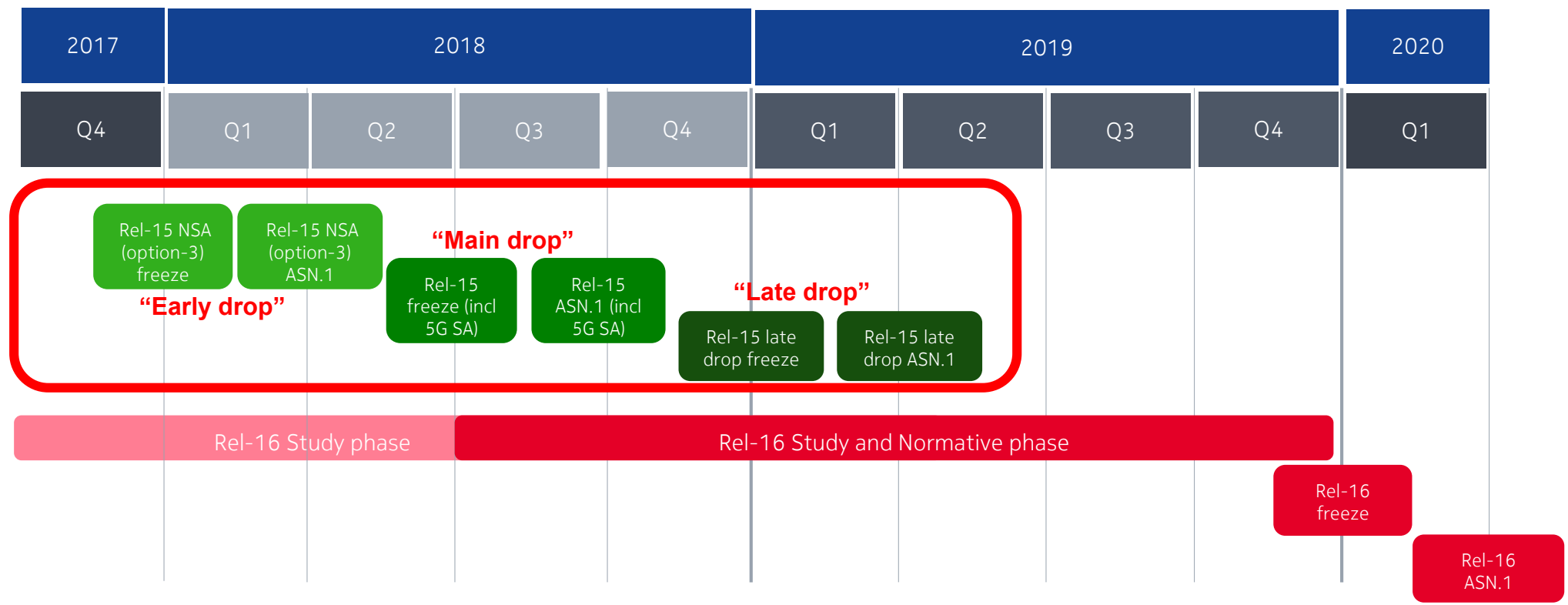


# 3GPP Structure





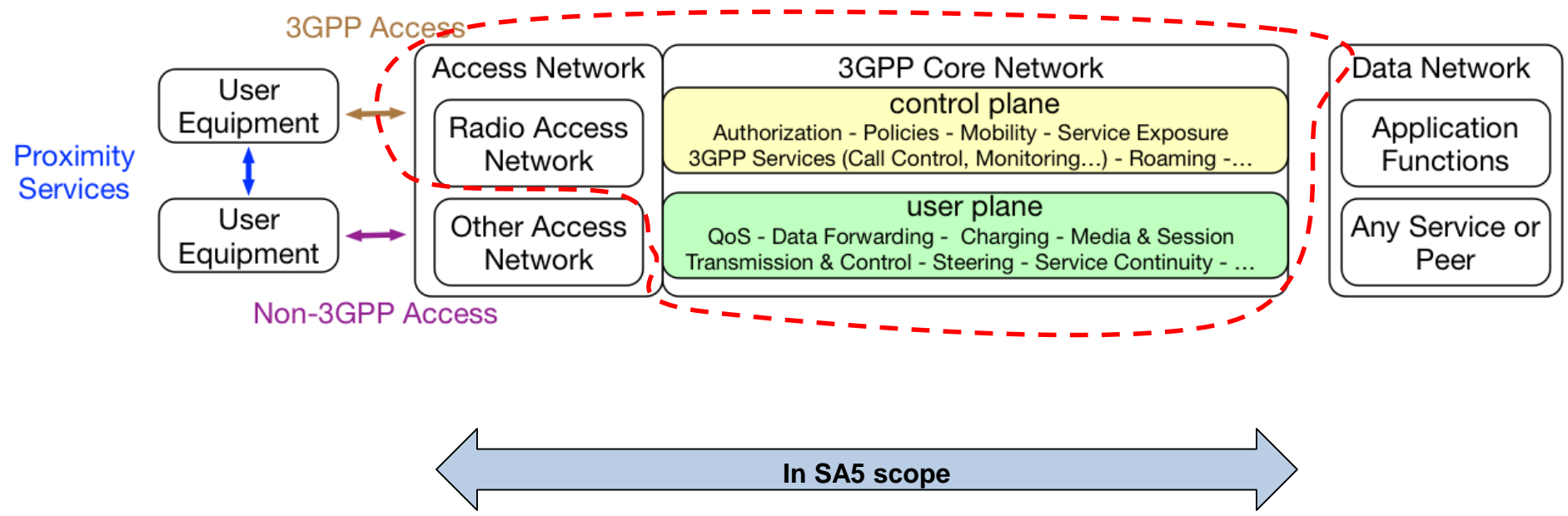
# 3GPP Releases



Not contractual. May change over time.



# 3GPP System

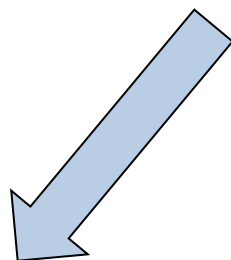


# 3GPP 5G Management Concepts

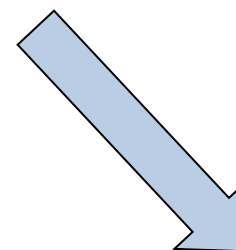


## Methodology to produce Technical Specifications

- 📶 Concepts, Use Cases, Requirements – Stage 1
- 📶 Protocol-neutral Information Model – Stage 2
- 📶 Protocol-specific Solution Set(s) (REST/JSON, YANG, etc.) – Stage 3



Managing what?








How?

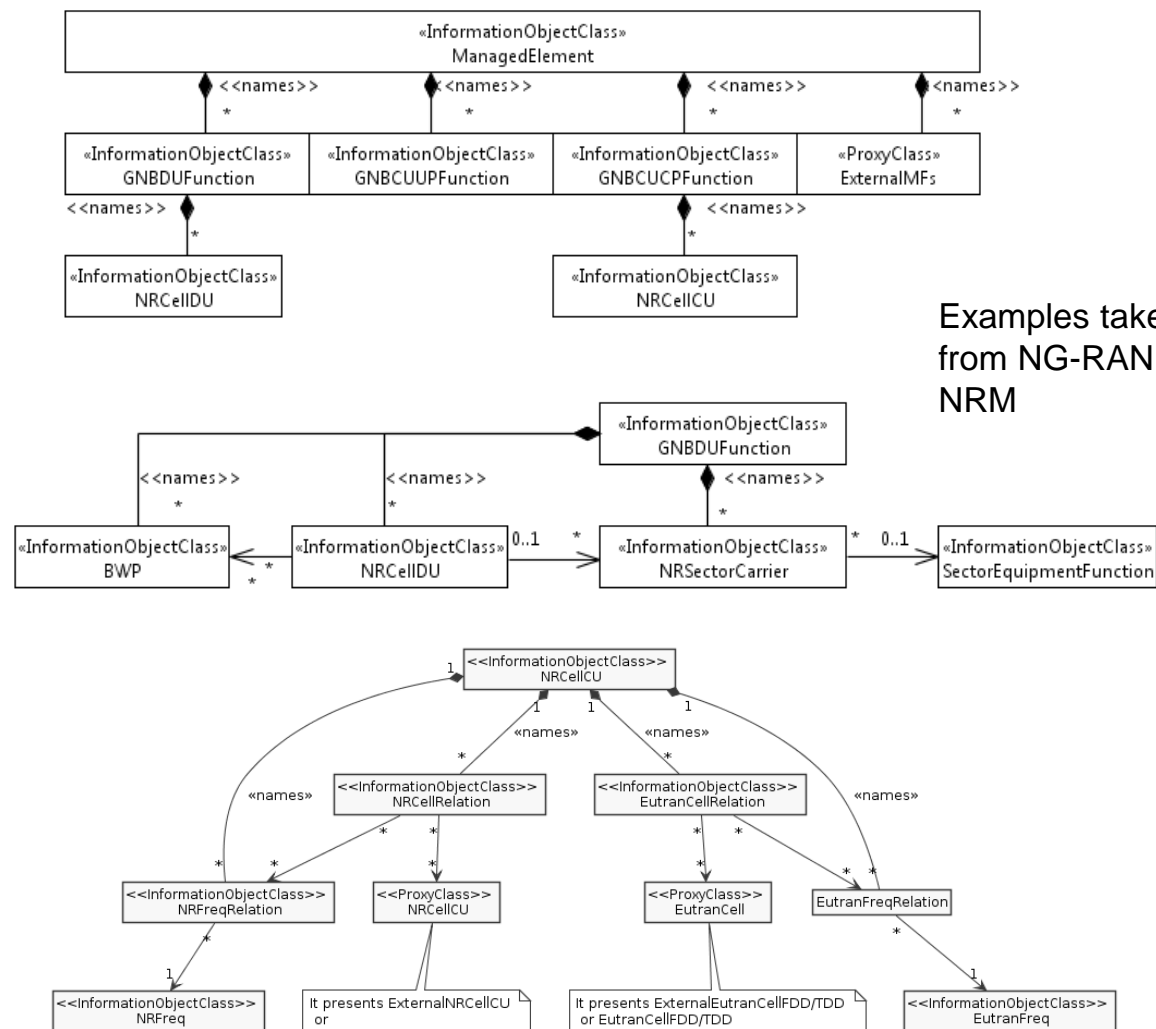
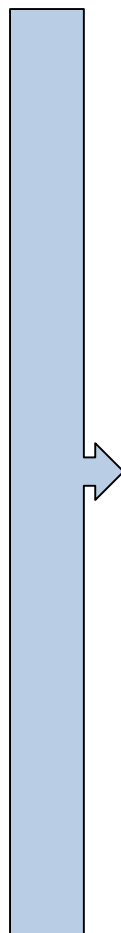
⇒ **Network Resource  
Model**

⇒ **Management  
Services**

# 5G Network Resource Model

5G network may comprise:

-  Stand Alone / Non-Stand Alone
-  Single / Dual Connectivity
-  NG-RAN Non Split / 2-Split / 3-Split options
-  5G Core Network Service-Based Architecture
-  Network Slicing





# 5G Management Services

From a Reference Point-Based management architecture to a Service-Based Management Framework

Management Services (MnSs)

Provisioning Services (CM)

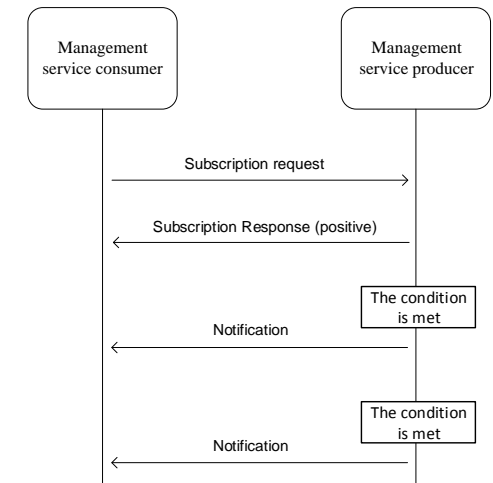
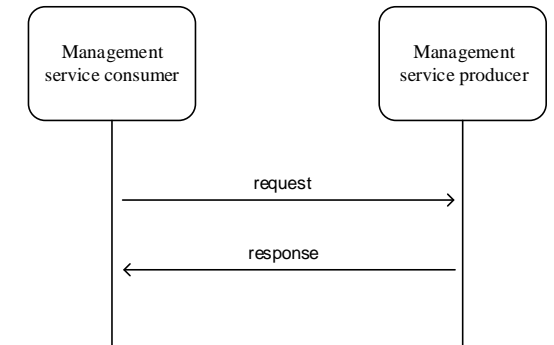
- Provisioning services
- Provisioning data report services

Fault Supervision MnSs

- Fault supervision control services
- Fault supervision data report services

Performance Assurance MnSs

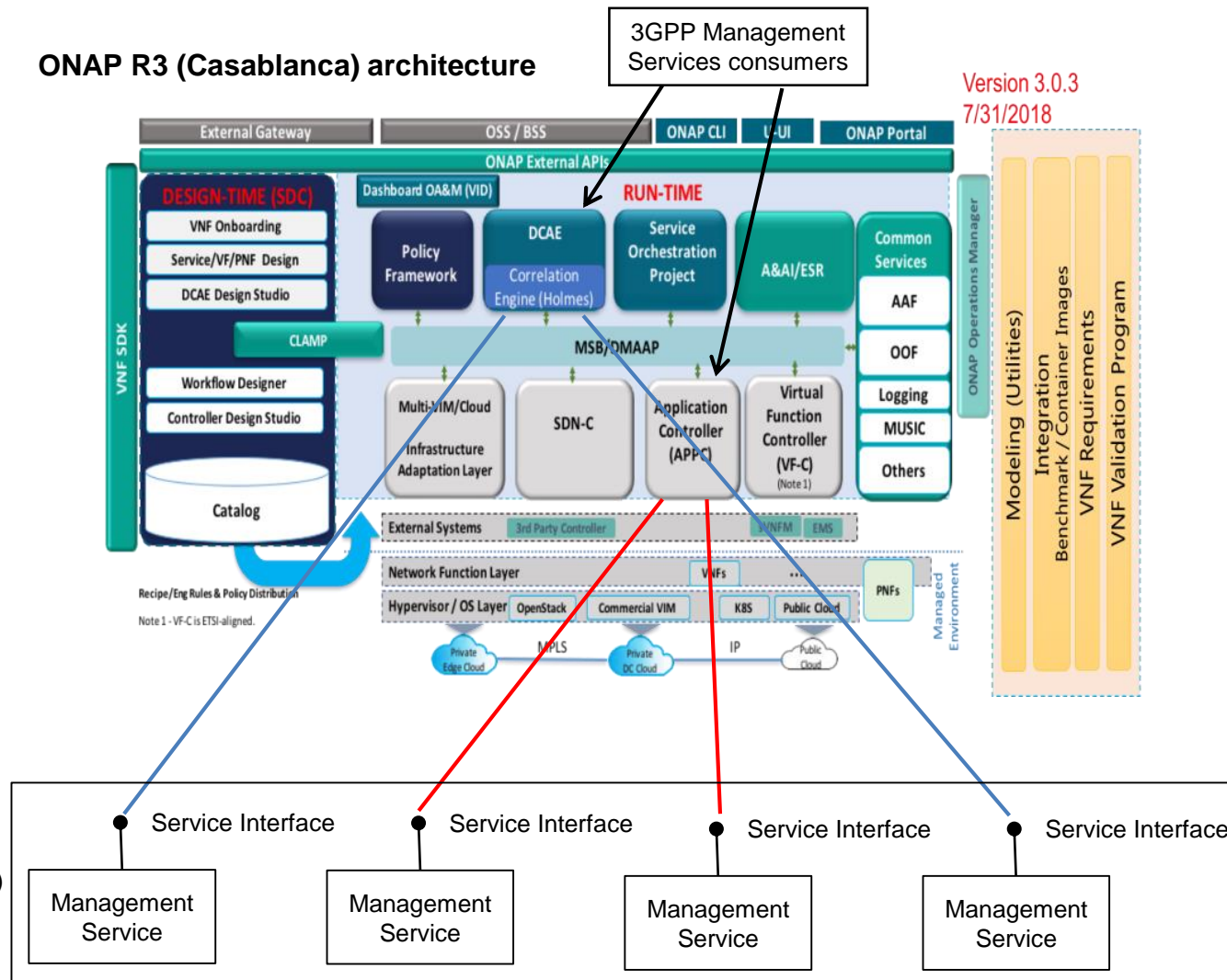
- Performance management job control services
- Performance data file reporting services
- Performance data streaming services





# Positioning ONAP wrt. 3GPP MnSs

ONAP R3 (Casablanca) architecture



# ONAP DCAE collection framework

- Aims at collecting all sorts of events from xNFs (but not only)
- In ONAP R1 and R2:
  - 📶 VES (VNF Event Stream) Collector, via REST / HTTPS / JSON API
  - 📶 SNMP Trap Collector, via SNMP
- In ONAP R3:
  - 📶 Data File Collector, to support 3GPP Bulk PM data file collection
  - 📶 VES-HV (High-Volume) Collector, to support Real-Time Performance Measurement (RTPM), using Google Protocol Buffer (GPB)

# How 3GPP will adapt to ONAP DCAE Collectors

3GPP Performance Assurance services	Candidate consumers in ONAP R3	Candidate 3GPP Rel-16 solution sets
Performance data file reporting services	VES JSON Collector (for FileReady notification)	Protocol: REST Payload: JSON
	Data File Collector (for PM file upload)	Protocol: FTP File content: XML
Performance data streaming services	VES JSON Collector for low-medium volume PM	Protocol: REST Payload: JSON
	HV Collector for real-time (less than 1 minute) high volume PM (TCP, GPB)	Protocol: TCP Payload: ASN.1 Binary

3GPP Fault Supervision services	Candidate consumers in ONAP R3	Candidate 3GPP Rel-16 solution sets
Fault supervision data report services	VES JSON Collector for alarm notifications under normal conditions	Protocol: REST Payload: JSON
	HV Collector for alarm notifications under alarm flooding conditions	Protocol: TCP Payload: ASN.1 Binary

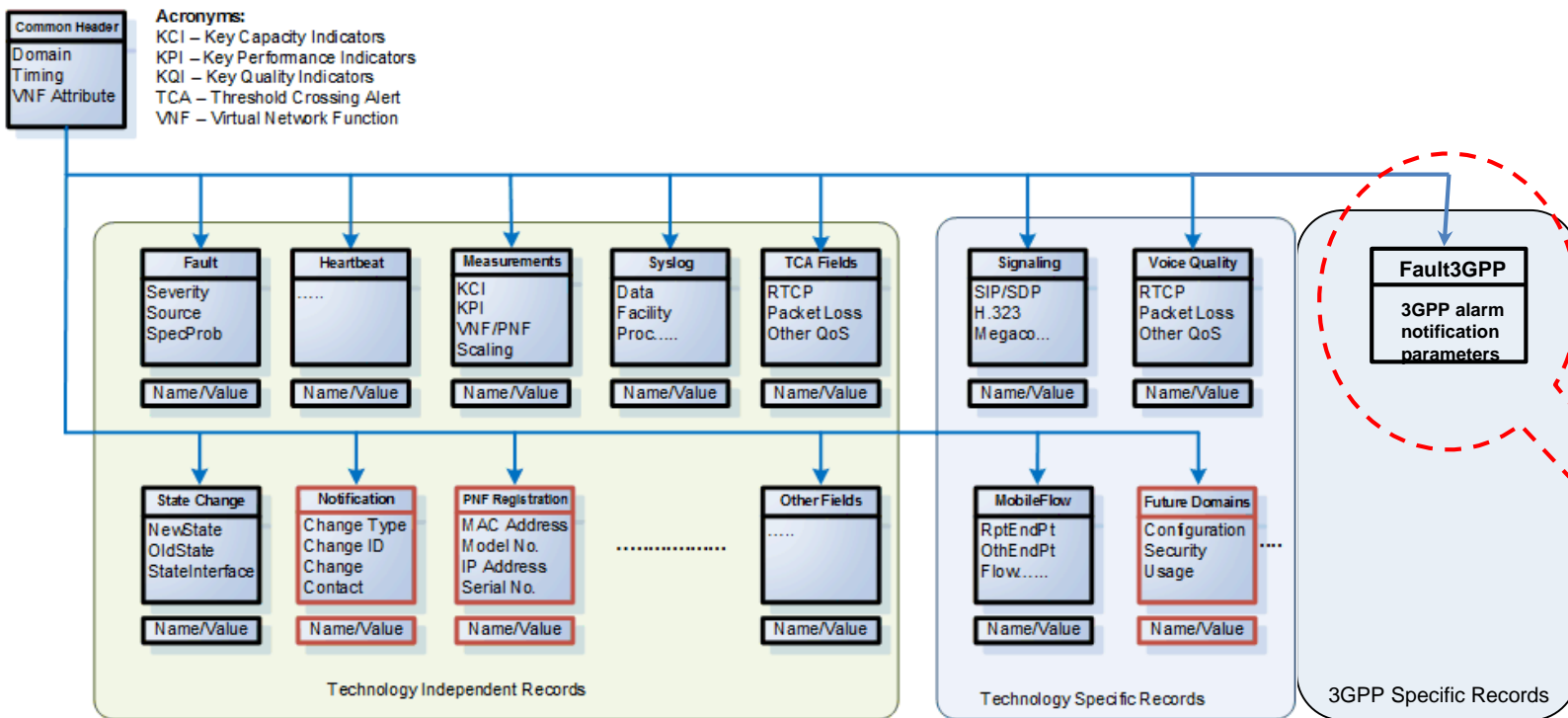
# Subscribe vs. No Subscribe to 3GPP events

ONAP	3GPP	Proposed action
<p>DCAE Collectors as recipients of any sorts of events from 5G xNFs.</p> <p>Address of DCAE Collectors configured at xNF instantiation time and/or later.</p>	<p>Based on Subscribe / Notify paradigm and filtering conditions.</p> <p>N-to-M relationship b/w notification emitters and recipients.</p>	<p><u>AI 3GPP</u>: Specify a solution to model the association between 5G NRM IOC instances and the address(es) of 'notification consumers', configurable via 'NF Provisioning Management Service'.</p>

Type of event	JSON VES Collectors' address list	HV VES Collectors' address list	Data File Collectors' address list
'fault'	{VES Coll#1 IP@}		
'measurement'	{VES Coll#1 IP@}	{HV Coll#1 IP@}	{DFC Coll#1 IP@}
'heartbeat'	{VES Coll#1 IP@}		
...			



# Introducing 'fault3GPP' as new type of Technology Specific Record



```

"$schema": "http://json-schema.org/draft-04/schema#",
"title": "VES Event Listener Common Event Format",
"type": "object",
"properties": {
  "event": {
    "$ref": "#/definitions/event"
  },
  "eventList": {
    "$ref": "#/definitions/eventList"
  }
},
"definitions": {
  "CommonEventHeader": {
    "description": "fields common to all events",
    "type": "object",
    "properties": {
      "domain": {
        "description": "the eventing domain associated with the event",
        "type": "string",
        "enum": [
          "fault",
          "heartbeat",
          "measurement",
          "mobileFlow",
          "notification",
          "other",
          "pnfRegistration",
          "sipSignaling",
          "stateChange",
          "syslog",
          "thresholdCrossingAlert",
          "voiceQuality",
          "fault3gpp"
        ]
      }
    }
  }
}

```

# Defining JSON schema for 'fault3GPP'

```
{
  "fault3gppFields": {
    "description": "3GPP alarm notifications format, based on 3GPP TS 28.532.",
    "type": "object",
    "properties": {
      "fault3gppFieldsversion": {
        "description": "The version of the Fault Supervision Management Service in TS 28.532 - Clause A.2",
        "type": "string"
      },
      "alarmNotification": {
        "oneOf": [
          {
            "$ref": "#/definitions/notifyNewAlarmType"
          },
          {
            "$ref": "#/definitions/notifyNewSecurityAlarmType"
          },
          {
            "$ref": "#/definitions/notifyClearedAlarmType"
          },
          {
            "$ref": "#/definitions/notifyAlarmListRebuiltType"
          }
        ]
      }
    }
  }
}
```

# Fault Management operations

	ONAP	3GPP	Proposed action
Retrieving missing alarms	Not addressed by ONAP	<b>getAlarmList ()</b> – used to deal with alarm loss. Two modes of operation: <ol style="list-style-type: none"> <li><u>Synchronous mode</u>: the list of missing alarms is returned synchronously with the operation</li> <li><u>Asynchronous mode</u>: the list of missing alarms is returned via alarm notifications. In this mode of operation, the only information returned synchronously is the status of the operation.</li> </ol>	<u>AI ONAP</u> : Introduce Use Case and operation getAlarmList to APPC API, where: <ul style="list-style-type: none"> <li>• APPC is consumer of 3GPP getAlarmList() operation</li> <li>• DCAE is consumer of 3GPP alarm notifications</li> <li>• Only asynchronous mode is supported</li> </ul>
Acknowledging Alarms	Not addressed by ONAP	<b>acknowledgeAlarms ()</b> – used to indicate that the activity to resolve the problem has started	<u>AI ONAP</u> : Introduce Use Case and operations to APPC API
Clearing Alarms	Not addressed by ONAP	<b>clearAlarms ()</b> – used for clearing alarms	
Setting comments	Not addressed by ONAP	<b>setComments ()</b> - used to set comments to alarms	



# OA&M Data Communication Management

	ONAP	3GPP	Proposed action
Heartbeat	Used by xNFs to communicate information about their health	No equivalent in 5G (Rel-15)  'Communication Surveillance' IRP (Integration Reference Point) applies to pre-5G technologies.	<u>AI 3GPP</u> : define a new Management Service (consumer would be VES Collector)

# Collecting 3GPP PM measurement data

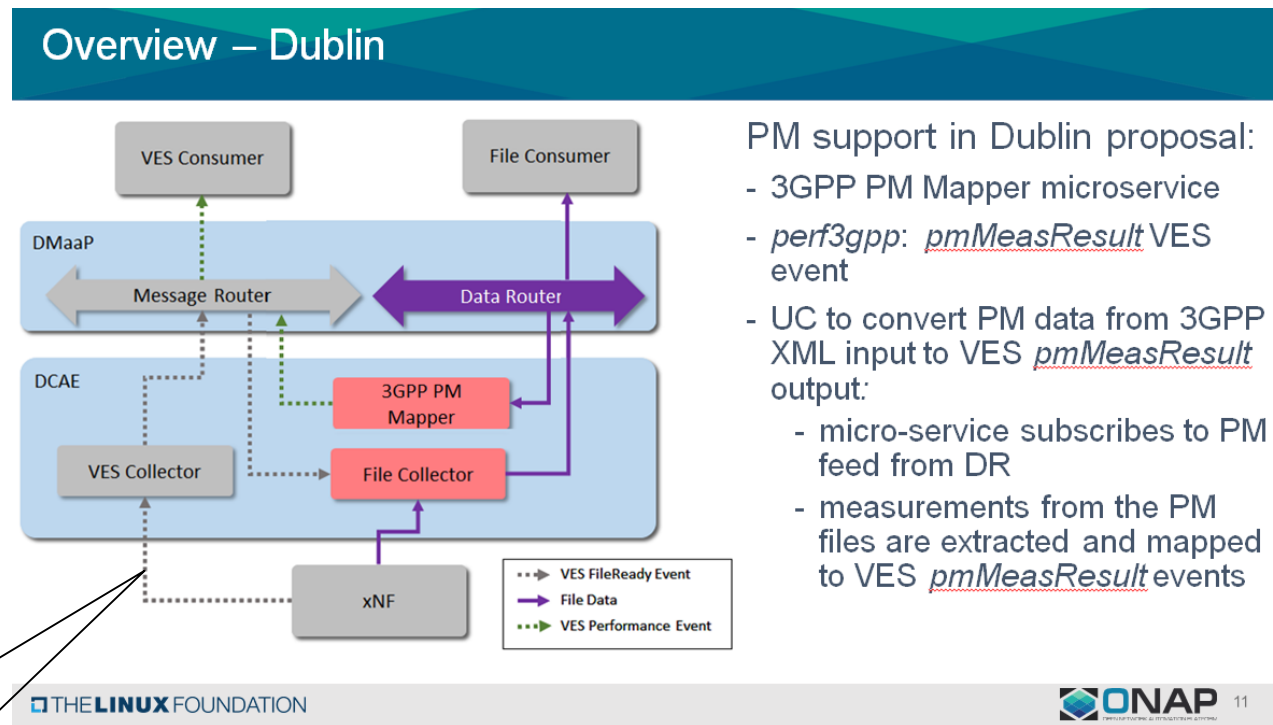
## Bulk PM data file

- VES Collector receives *FileReady* notification
- Data File Collector retrieves PM data file
- 3GPP and ONAP aligned already

## PM data streaming

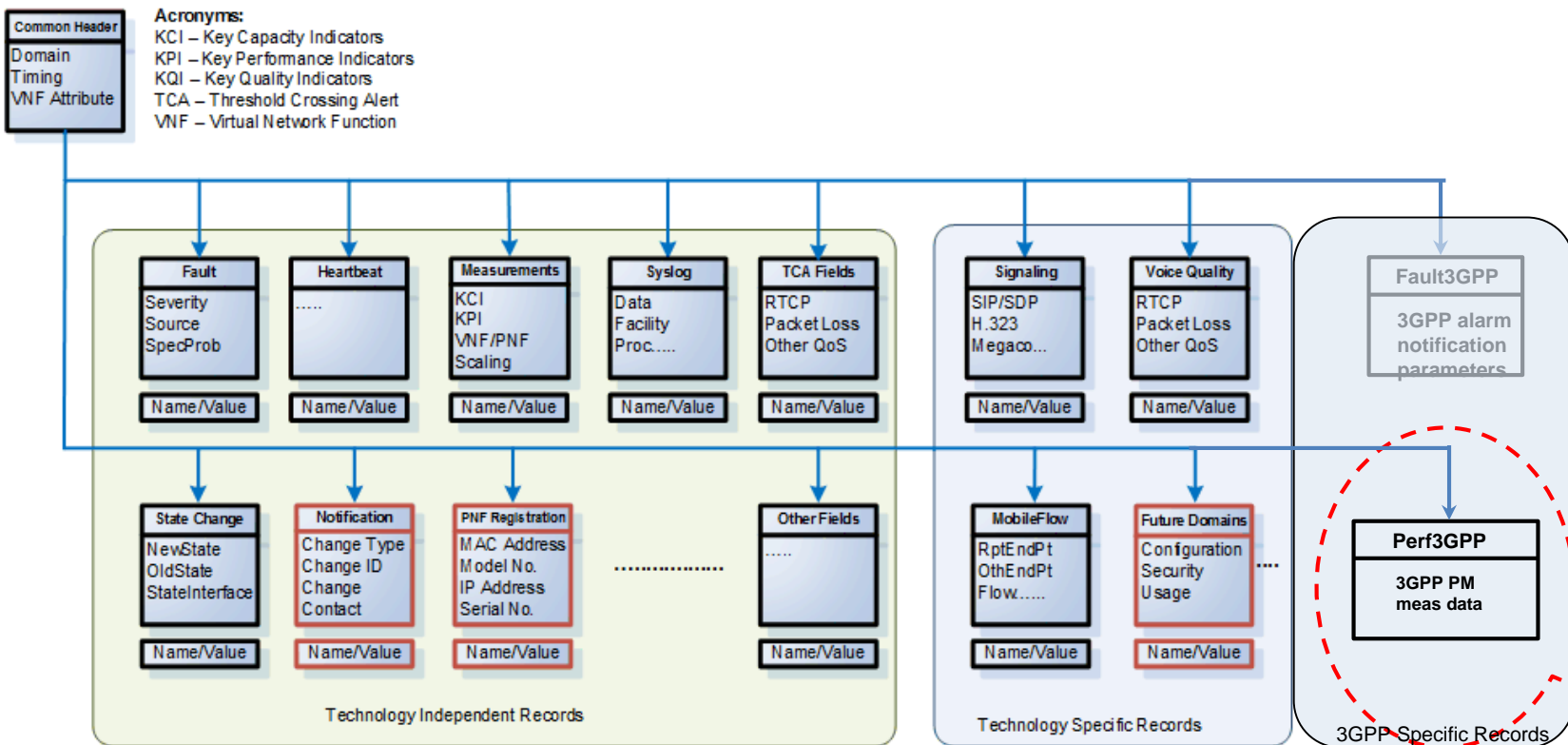
- VES Collector
  - JSON schema for PM records
- HV Collector
  - ASN.1

Re. REST/JSON PM data streaming, 3GPP will define a new Solution Set and may reuse ONAP Dublin VES *pmMeasResult* events schema.





# Defining new 'Perf3GPP' as new type of Technology Specific Record for 3GPP PM data streaming



```

"$schema": "http://json-schema.org/draft-04/schema#",
"title": "VES Event Listener Common Event Format",
"type": "object",
"properties": {
  "event": {
    "$ref": "#/definitions/event"
  },
  "eventList": {
    "$ref": "#/definitions/eventList"
  }
},
"definitions": {
  "commonEventHeader": {
    "description": "fields common to all events",
    "type": "object",
    "properties": {
      "domain": {
        "description": "the eventing domain associated with the event",
        "type": "string",
        "enum": [
          "fault",
          "heartbeat",
          "measurement",
          "mobileFlow",
          "notification",
          "other",
          "pnfRegistration",
          "sipSignaling",
          "stateChange",
          "syslog",
          "thresholdCrossingAlert",
          "voiceQuality",
          "perf3gpp"
        ]
      }
    }
  }
}
    
```



# Performance Management control

	ONAP	3GPP	Proposed action
Control of Performance Management (e.g. measurement start time, end time, Granularity Period, Reporting Period, measurements to be collected, etc.)	Parameters are provisioned (as other xNF configuration parameters) at instantiation time and/or later	Based on PM job (createMeasurementJob (), stopMeasurementJob (), ...)	<u>AI 3GPP</u> (Ongoing): Extend 5G Network Resource Model with PM control object classes / attributes.

# Provisioning Services

	ONAP	3GPP	Proposed action
CRUD operations	NETCONF / YANG as option	YANG NRM	<u>AI 3GPP</u> : Add NETCONF-based solution set for Provisioning Services.
CRUD notifications	Not supported in R3.	Supported (REST / JSON)	<p><u>AI ONAP</u>: Introduce 'Config3GPP' as new 3GPP Specific Record in VES API</p> <p><u>AI 3GPP</u>: Specify a new REST JSON Solution Set for:</p> <ul style="list-style-type: none"> <li>• objectCreationNotification ()</li> <li>• objectDeletionNotification ()</li> <li>• attributeValueChangeNotification ()</li> </ul> <p><u>Working assumption</u>: VES Collector would be the consumer of CRUD notifications.</p>



A GLOBAL INITIATIVE

# 3GPP SA5 OpenAPI Specifications



Contained in annex of the 3GPP Technical Specification which specifies the corresponding MnS



Also stored as separate physical files, accessible at <http://www.3gpp.org/ftp/Specs/2018-12/Rel-15/OpenAPI/>

- TS 28xxx series
- One .json file per Management Service
- Publicly available
- Still under discussion in 3GPP

Annex A (normative):  
OpenAPI specification

## A.0 Introduction

This clause describes the capabilities of the service in the structure of the OpenAPI Specification Version 3.0.1 [A9]. The OpenAPI document is represented in the JSON format option.

## A.1 Provisioning management service

```
{
  "openapi": "3.0.1",
  "info": {
    "title": "TS 28.532 Provisioning Management Service",
    "version": "15.1.0",
    "description": "OAS 3.0.1 specification of the Provisioning Management Service"
  },
  "servers": [
    {
      "url": "http://{DN_prefix_authority_part}/{DN_prefix_remainder}/ProvMnS/v1500",
      "variables": {
        "DN_prefix_authority_part": {
          "description": "See subclause 4.4 of TS 32.158",
          "default": "example.com"
        },
        "DN_prefix_remainder": {
          "description": "See subclause 4.4 of TS 32.158",
          "default": ""
        }
      }
    }
  ]
}
```

[www.3gpp.org - /ftp/Specs/2018-12/Rel-15/OpenAPI/](http://www.3gpp.org/ftp/Specs/2018-12/Rel-15/OpenAPI/)

[\[To Parent Directory\]](#)

1/25/2019 3:03 PM	15139	<a href="#">TS29122 AsSessionWithQoS.yaml</a>
1/25/2019 3:03 PM	13579	<a href="#">TS29122 ChargeableParty.yaml</a>
1/25/2019 10:45 AM	17682	<a href="#">TS29122 CommonData.yaml</a>
1/25/2019 3:03 PM	20984	<a href="#">TS29122 CpProvisioning.yaml</a>
1/25/2019 3:03 PM	15298	<a href="#">TS29122 DeviceTriggering.yaml</a>
1/25/2019 3:03 PM	5815	<a href="#">TS29122 ECRControl.yaml</a>
1/25/2019 3:03 PM	28128	<a href="#">TS29122 GMDviaMBMSbyMB2.yaml</a>
1/25/2019 3:03 PM	25968	<a href="#">TS29122 GMDviaMBMSbyMB.yaml</a>
1/29/2019 2:02 PM	26341	<a href="#">TS29122 MonitoringEvent.yaml</a>
1/25/2019 3:03 PM	2852	<a href="#">TS29122 MisdndLessMoSms.yaml</a>
1/25/2019 3:03 PM	30783	<a href="#">TS29122 NIDD.yaml</a>
1/25/2019 3:03 PM	15959	<a href="#">TS29122 NpConfiguration.yaml</a>
1/25/2019 3:03 PM	20469	<a href="#">TS29122 PfdManagement.yaml</a>
1/25/2019 3:03 PM	12501	<a href="#">TS29122 ReportingNetworkStatus.yaml</a>
1/25/2019 3:03 PM	10020	<a href="#">TS29122 ResourceManagementOfBdt.yaml</a>
1/27/2019 11:38 AM	4781	<a href="#">TS29222 APF Security API.yaml</a>
1/27/2019 11:38 AM	3905	<a href="#">TS29222 CABIF Access Control Policy API.yaml</a>
1/27/2019 11:38 AM	8215	<a href="#">TS29222 CABIF API Invoker Management API.yaml</a>
1/27/2019 11:38 AM	4800	<a href="#">TS29222 CABIF Auditing API.yaml</a>
1/27/2019 11:38 AM	4039	<a href="#">TS29222 CABIF Discover Service API.yaml</a>
1/27/2019 11:38 AM	8723	<a href="#">TS29222 CABIF Events API.yaml</a>
1/27/2019 11:38 AM	6051	<a href="#">TS29222 CABIF Logging API Invocation API.yaml</a>
1/27/2019 11:38 AM	17019	<a href="#">TS29222 CABIF Publish Service API.yaml</a>
1/27/2019 11:38 AM	16153	<a href="#">TS29222 CABIF Security API.yaml</a>
12/22/2018 1:25 AM	61289	<a href="#">TS29502 Nsmf PDUSession.yaml</a>
12/22/2018 1:14 AM	8805	<a href="#">TS29503 Nudm EE.yaml</a>
12/22/2018 1:14 AM	3571	<a href="#">TS29503 Nudm FF.yaml</a>
12/22/2018 1:07 AM	50747	<a href="#">TS29503 Nudm SEM.yaml</a>
12/22/2018 1:14 AM	8190	<a href="#">TS29503 Nudm NFAM.yaml</a>

# Some useful links



- 📶 TS 28.530 – Management and orchestration; Concepts, use cases and requirements ([http://www.3gpp.org/ftp//Specs/archive/28\\_series/28.530/](http://www.3gpp.org/ftp//Specs/archive/28_series/28.530/))
- 📶 TS 28.522 – Management and orchestration; Architecture framework ([http://www.3gpp.org/ftp//Specs/archive/28\\_series/28.533/](http://www.3gpp.org/ftp//Specs/archive/28_series/28.533/))
- 📶 TS 28.541 – Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3 ([http://www.3gpp.org/ftp//Specs/archive/28\\_series/28.541/](http://www.3gpp.org/ftp//Specs/archive/28_series/28.541/))
- 📶 TS 28.532 – Management and orchestration; Generic management services ([http://www.3gpp.org/ftp//Specs/archive/28\\_series/28.532/](http://www.3gpp.org/ftp//Specs/archive/28_series/28.532/))
- 📶 TS 28.545 - Management and orchestration; Fault Supervision (FS) ([http://www.3gpp.org/ftp//Specs/archive/28\\_series/28.545/](http://www.3gpp.org/ftp//Specs/archive/28_series/28.545/))
- 📶 TS 28.550 – Management and orchestration; Performance assurance ([http://www.3gpp.org/ftp//Specs/archive/28\\_series/28.550/](http://www.3gpp.org/ftp//Specs/archive/28_series/28.550/))
- 📶 TR 28.890\* - Management and orchestration; Study on integration of Open Network Automation Platform (ONAP) and 3GPP management for 5G networks ([http://www.3gpp.org/ftp//Specs/archive/28\\_series/28.890/](http://www.3gpp.org/ftp//Specs/archive/28_series/28.890/))

Thank you!