**3GPP TSG-SA5 Meeting #140-e *S5-216092***

**Online, , 15th Nov 2021 - 24th Nov 2021**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **28.632** | **CR** | **0005** | **rev** | **-** | **Current version:** | **16.0.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network | **X** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Update Inventory stage2 to support SBMA | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson Hungary Ltd | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NSA\_SBMA | | | | |  | ***Date:*** | | | 2021-11-04 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The inventory NRM is needed for both EUTRAN and 5G. As the document is fully IRP focused and does not mention SBMA it needs modifications to be usable with SBMA.  The IRP word in the title is kept because it is not allowed to change the title. As otherwise SBMA information can be added to the document it is not deemed a good idea, to create a complete new speciication, just to correct the title. (The title of the existing 28.622 also includes the word IRP today.)  As some user need inventory not just about HW, but also about HW, SW and Licenses alt.2 is also included. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add SBMA references to the document.  Redefine the 4 SupportIOCs as normal IOCs making them usable for SBMA systems. This does not affect the current stage 3 XML mapping.  Both XML and the proposed YANG mapping map IOCs and SUpportIOCs in the same way.  Added inheritance from TOP for the redefined IOCs.  Add SBMA common notifications. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Inventory not available for 5G SBMA systems | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | Introduction, 1, 2, 3.2, 4.2.1, 4.2.2, 4.3.1.2, 4.3.2.1, 4.3.2.2, 4.3.2.3, 4.3.2.4, 4.3.3.1, 4.3.3.2, 4.3.3.3, 4.3.3.4, 4.3.4.1, 4.3.4.2, 4.3.4.3, 4.3.4.4, 4.3.5.1, 4.3.5.2, 4.3.5.3, 4.3.5.4, 4.3.6.2, 4.3.7.2, 4.5.2, Annex A | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

***First change***

# Introduction

The present document is part of a TS-family covering the 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Telecommunication management; as identified below:

32.690 Inventory Management (IM): Requirements

28.631 Inventory Management (IM) Network Resource Model (NRM) Integration Reference Point (IRP); Requirements

**28.632 Inventory Management (IM) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)**

28.633 Inventory Management (IM) Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions

Inventory Management (IM), in general, provides the operator with the ability to assure correct and effective operation of the network as it evolves. IM actions have the objective to monitor the actual configuration on the Network Elements (NEs) and Network Resources (NRs), and they may be initiated by the operator or by functions in the Operations Systems (OSs) or NEs. The final goal of IM is the establishment of an accurate and timely model of the actual inventory in the NEs or NRs.

***Next change***

# 1 Scope

The present document specifies the Inventory Management (IM) Network Resource Model (NRM) that can be communicated between an IRPAgent and an IRPManager in deployment scenarios using the IRP framework as defined in TS 32.102 [2], or between an MnS consumer and MnS producer in deployment scenarios using the Service Based Management Architecture (SBMA) as defined in TS 28.533 [17], for telecommunication network management purposes, including management of converged networks.

The present document specifies the semantics and behaviour of information object class attributes and relations visible across the reference point in a protocol and technology neutral way. It does not define their syntax and encoding.

***Next change***

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TS 32.101: "Telecommunication management; Principles and high level requirements".

[2] 3GPP TS 32.102: "Telecommunication management; Architecture".

[3] 3GPP TS 32.302: "Telecommunication management; Configuration Management (CM); Notification Integration Reference Point (IRP): Information Service (IS)".

[4] 3GPP TS 32.600: "Telecommunication management; Configuration Management (CM); Concept and high-level requirements".

[5] 3GPP TS 28.662: "Generic Radio Access Network (RAN) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

[6] 3GPP TS 28.642: "Telecommunication management; Configuration Management (CM): UTRAN network resources Integration Reference Point (IRP): Network Resource Model (NRM)".

[7] 3GPP TS 32.300: "Telecommunication management; Configuration Management (CM); Name convention for Managed Objects".

[8] 3GPP TS 32.150: "Telecommunication management; Integration Reference Point (IRP) Concept and Definitions".

[9] Void

[10] 3GPP TS 28.622: " Generic Network Resource Model (NRM) Integration Reference Point (IRP);Information Service (IS)".

[11] 3GPP TS 32.690: "Telecommunication management; Inventory Management (IM): Requirements".

[12] 3GPP TS 25.466: "UTRAN Iuant interface: Application Part".

[13] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".

[14] 3GPP TS 28.530: "Management and orchestration; Concepts, use cases and requirements".

[15] 3GPP TS 28.531: "Management and orchestration; Provisioning".

[16] 3GPP TS 28.532: "Management and orchestration; Management services".

[17] 3GPP TS 28.533: " Management and orchestration; Architecture framework".

***Next change***

## 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

DN Distinguished Name (see 3GPP TS 32.300 [7])

IM Inventory Management

IOC Information Object Class

IRP Integration Reference Point

ITU-T International Telecommunication Union, Telecommunication Sector

MIM Management Information Model

MO Managed Object

MOC Managed Object Class

NE Network Element

NM Network Manager

NRM Network Resource Model

RDN Relative Distinguished Name (see 3GPP TS 32.300 [7])

TMN Telecommunications Management Network

UML Unified Modelling Language

UMTS Universal Mobile Telecommunications System

UTRAN UMTS Terrestrial Radio Access Network

SBMA Service Based Management Architecture

***Next change***

### 4.2.1 Relationships

This clause depicts the set of IOCs that encapsulate information relevant for this service. This clause provides the overview of all information object classes in UML. Subsequent clauses provide more detailed specification of various aspects of these information object classes.

The inventory NRM contains two alternatives for inventory data modeling. Alternative 1 is for NE structure and hardware inventory. Alternative 2 is an extended version for inventory information modeling consisting of NE structure, hardware, software and license data inventory.

Alternative 1, hardware inventory model

Diagram

Description automatically generated

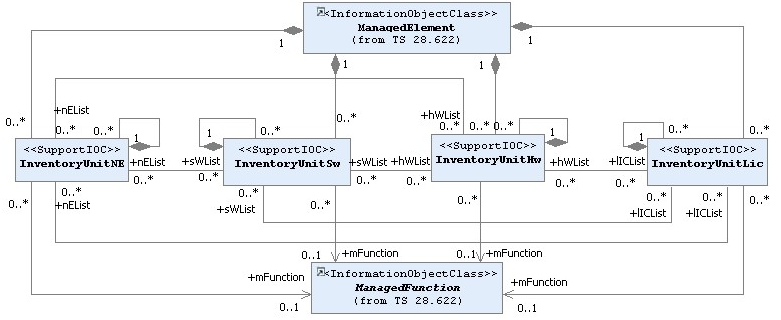
NOTE: The listed cardinality numbers represent transient as well as steady-state numbers, and reflect all managed object creation and deletion scenarios.

Figure 4.2.1-1: Alternative 1 - Inventory Management NRM Containment/Naming and Association diagram

Each IOC instance is identified with a Distinguished Name (DN) according to 3GPP TS 32.300 [7] that expresses its containment hierarchy. As an example, the DN of a IOC representing a InventoryUnit could have a format like:

SubNetwork=Sweden,meContext=MEC-Gbg-1,ManagedElement=RNC-Gbg-1,InventoryUnit=Inv-1.

Alternative 2, extended model for hardware, software and licence inventory:



<<IOC>>

<<IOC>>

<<IOC>>

<<IOC>>

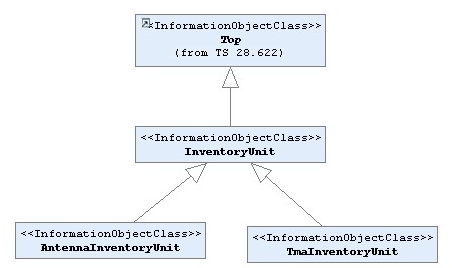
Figure 4.2.1-2: Alternative 2 - Inventory Management NRM Containment/Naming and Association diagram

NOTE: For IRP based systems inventory information upload in alternative 2 is done using the FT IRP and related FT IRP notification capabilities. For SBMA based systems provisioning operations defined in TS 28.532 [16] are also available.

4.2.2 Inheritance

This subclause depicts the inheritance relationships that exist between IOCs.

Figure 4.2.2.1 shows the inheritance hierarchy for the IM NRM for alternative 2

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**Figure 4.2.2-1: Inventory Management NRM Inheritance Hierarchy for alternative 1**

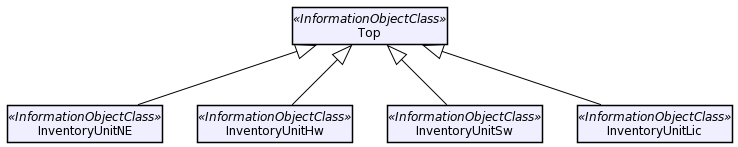


Figure 4.2.2.2 shows the inheritance hierarchy for the IM NRM for alternative 2.

**Figure 4.2.2-2: Inventory Management NRM Inheritance Hierarchy for alternative 2**

## 4.A Imported information entities and local labels

|  |  |
| --- | --- |
| Label reference | Local label |
| 3GPP TS 28.622 [10], IOC, *ManagedFunction \_* | *ManagedFunction \_* |
| 3GPP TS 28.620 [10], IOC, *ManagedElement\_* | *ManagedElement\_* |
| 3GPP TS 28.620 [10], IOC, *Top* | *Top* |

***Next change***

4.3 Class definitions

4.3.1 InventoryUnit

4.3.1.1 Definition

This IOC represents inventory information for an Inventory Unit.

4.3.1.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Support Qualifier** | **isReadable** | **isWritable** | **isInvariant** | **isNotifyable** |
| inventoryUnitType | M | T | F | F | T |
| vendorUnitFamilyType | CM | T | F | F | T |
| vendorUnitTypeNumber | CM | T | F | F | T |
| versionNumber | O | T | F | F | T |
| vendorName | M | T | F | F | T |
| serialNumber | CM | T | F | F | T |
| dateOfManufacture | O | T | F | F | T |
| dateOfLastService | O | T | F | F | T |
| unitPosition | O | T | F | F | T |
| manufacturerData | O | T | F | F | T |
| **Attribute related to role** |  |  |  |  |  |
| relatedFunction | O | T | F | F | T |

4.3.1.3 Attribute constraints

|  |  |
| --- | --- |
| **Name** | **Definition** |
| vendorUnitFamilyType CM Support Qualifier | The inventory is hardware. |
| vendorUnitTypeNumber CM Support Qualifier | The inventory is hardware. |
| serialNumber CM Support Qualifier | The inventory is hardware. |

4.3.1.4 Notifications

There is no notification defined.

4.3.2 InventoryUnitNE

4.3.2.1 Definition

This IOC represents the logical and physical structure of the NE.

4.3.2.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Support Qualifier** | **isReadable** | **isWritable** | **isInvariant** | **isNotifyable** |
| neId | M | T | F | F | T |
| customerIdentifier | O | T | F | F | T |
| productName | M | T | F | F | T |
| vendorName | M | T | F | F | T |
| productType | O | T | F | F | T |
| salesUniqueId | O | T | F | F | T |
| operatorUniqueName | O | T | T | F | T |
| siteId | O | T | F | F | T |
| additionalInformation | O | T | F | F | T |
| **Attribute related to role** |  |  |  |  |  |
| mFunction | O | T | F | F | T |
| lICList | O | T | F | F | T |
| hWList | O | T | F | F | T |
| sWList | O | T | F | F | T |

4.3.2.3 Attribute constraints

iSNotifiable is True for SBMA based systems, otherwise it is False for all attributes.

4.3.2.4 Notifications

For SBMA, the common notifications defined in subclause 4.5 are valid for this IOC, without exceptions or additions.

4.3.3 InventoryUnitHw

4.3.3.1 Definition

This IOC represents the hardware components.

4.3.3.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Support Qualifier** | **isReadable** | **isWritable** | **isInvariant** | **isNotifyable** |
| hwId | M | T | F | F | T |
| hwType | M | T | F | F | T |
| hwName | O | T | F | F | T |
| hwVersion | M | T | F | F | T |
| vendorName | O | T | F | F | T |
| salesUniqueId | O | T | F | F | T |
| hwUnitLocation | M | T | F | F | T |
| model | O | T | F | F | T |
| hwCapability | O | T | F | F | T |
| modificationDate | O | T | F | F | T |
| manualDataEntry | O | T | F | F | T |
| additionalInformation | O | T | F | F | T |
| **Attribute related to role** |  |  |  |  |  |
| mFunction | O | T | F | F | T |
| lICList | O | T | F | F | T |
| nEList | O | T | F | F | T |
| sWList | O | T | F | F | T |

4.3.3.3 Attribute constraints

iSNotifiable is True for SBMA based systems, otherwise it is False for all attributes.

4.3.3.4 Notifications

For SBMA, the common notifications defined in subclause 4.5 are valid for this IOC, without exceptions or additions.

4.3.4 InventoryUnitSw

4.3.4.1 Definition

This IOC represents the software components.

4.3.4.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Support Qualifier** | **isReadable** | **isWritable** | **isInvariant** | **isNotifyable** |
| swId | M | T | F | F | T |
| swName | O | T | F | F | T |
| swVersion | O | T | F | F | T |
| vendorName | O | T | F | F | T |
| salesUniqueId | O | T | F | F | T |
| classification | M | T | F | F | T |
| swStatus | O | T | F | F | T |
| swInstallationTime | O | T | F | F | T |
| swActivationTime | O | T | F | F | T |
| additionalInformation | O | T | F | F | T |
| **Attribute related to role** |  |  |  |  |  |
| mFunction | O | T | F | F | T |
| lICList | O | T | F | F | T |
| nEList | O | T | F | F | T |
| hWList | O | T | F | F | T |

4.3.4.3 Attribute constraints

iSNotifiable is True for SBMA based systems, otherwise it is False for all attributes.

4.3.4.4 Notifications

For SBMA, the common notifications defined in subclause 4.5 are valid for this IOC, without exceptions or additions.

4.3.5 InventoryUnitLic

4.3.5.1 Definition

This IOC represents the licence components.

4.3.5.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Support Qualifier** | **isReadable** | **isWritable** | **isInvariant** | **isNotifyable** |
| licId | M | T | F | F | T |
| licType | O | T | F | F | T |
| vendorName | O | T | F | F | T |
| validity | O | T | F | F | T |
| key | O | T | F | F | T |
| licStatus | O | T | F | F | T |
| licActivationTime | O | T | F | F | T |
| salesUniqueId | O | T | F | F | T |
| additionalInformation | O | T | F | F | T |
| **Attribute related to role** |  |  |  |  |  |
| mFunction | O | T | F | F | T |
| sWList | O | T | F | F | T |
| nEList | O | T | F | F | T |
| hWList | O | T | F | F | T |

4.3.5.3 Attribute constraints

iSNotifiable is True for SBMA based systems, otherwise it is False for all attributes.

4.3.5.4 Notifications

For SBMA, the common notifications defined in subclause 4.5 are valid for this IOC, without exceptions or additions.

4.3.6 TmaInventoryUnit

4.3.6.1 Definition

This IOC represents inventory information for a Tower Mounted Amplifier Unit.

4.3.6.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Support Qualifier** | **isReadable** | **isWritable** | **isInvariant** | **isNotifyable** |
| tmaNumberOfNon-LinearGainValues | CM | T | F | F | T |
| tmaNon-LinearGainValue | CM | M | O | F | T |
| tmaAdditionalDataFieldNumber | CO | M | O | F | T |
| tmaAntennaModelNumber | CO | M | O | F | T |
| tmaAntennaOperatingBands | CO | M | O | F | T |
| tmaBeamwidthForEachOpBandInBandOrder | CO | M | O | F | T |
| tmaGainForEachOpBandInBandOrder | CO | M | O | F | T |
| tmaInstallationDate | CO | M | O | F | T |
| tmaInstallersId | CO | M | O | F | T |
| tmaMaxSupportedGain | CO | M | O | F | T |
| tmaMinSupportedGain | CO | M | O | F | T |

4.3.6.3 Attribute constraints

|  |  |
| --- | --- |
| **Name** | **Definition** |
| tmaNumberOfNon-LinearGainValues CM Support Qualifier | It is supported over the Iuant interface. |
| tmaNon-LinearGainValue CM Support Qualifier | It is supported over the Iuant interface. |
| tmaAdditionalDataFieldNumber CO Support Qualifier | It is supported over the Iuant interface. |
| tmaAntennaModelNumber CO Support Qualifier | It is supported over the Iuant interface. |
| tmaAntennaOperatingBands CO Support Qualifier | It is supported over the Iuant interface. |
| tmaBeamwidthForEachOpBandInBandOrder CO Support Qualifier | It is supported over the Iuant interface. |
| tmaGainForEachOpBandInBandOrder CO Support Qualifier | It is supported over the Iuant interface. |
| tmaInstallationDate CO Support Qualifier | It is supported over the Iuant interface. |
| tmaInstallersId CO Support Qualifier | It is supported over the Iuant interface. |
| tmaMaxSupportedGain CO Support Qualifier | It is supported over the Iuant interface. |
| tmaMinSupportedGain CO Support Qualifier | It is supported over the Iuant interface. |

4.3.6.4 Notifications

There is no notification defined.

4.3.7 AntennaInventoryUnit

4.3.7.1 Definition

This IOC represents inventory information for an Antenna Unit.

4.3.7.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Support Qualifier** | **isReadable** | **isWritable** | **isInvariant** | **isNotifyable** |
| maxTiltValue | CO | M | O | F | T |
| minTiltValue | CO | M | O | F | T |
| mechanicalOffset | CO | M | O | F | T |
| baseElevation | CO | M | O | F | T |
| latitude | CO | M | O | F | T |
| longitude | CO | M | O | F | T |
| patternLabel | CO | M | O | F | T |

4.3.7.3 Attribute constraints

|  |  |
| --- | --- |
| **Name** | **Definition** |
| maxTiltValue CO Support Qualifier | It is supported over the Iuant interface. |
| minTiltValue CO Support Qualifier | It is supported over the Iuant interface. |
| mechanicalOffset CO Support Qualifier | It is supported over the Iuant interface. |
| baseElevation CO Support Qualifier | It is supported over the Iuant interface. |
| latitude CO Support Qualifier | It is supported over the Iuant interface. |
| longitude CO Support Qualifier | It is supported over the Iuant interface. |
| patternLabel CO Support Qualifier | It is supported over the Iuant interface. |

4.3.7.4 Notifications

There is no notification defined.

***Next change***

## 4.5 Common notifications

### 4.5.1 Alarm notifications

None.

### 4.5.2 Configuration notifications

This clause presents a list of notifications, defined in TS 28.532 [16], that an MnS consumer may receive. The notification header attribute objectClass/objectInstance shall capture the DN of an instance of a class defined in the present document.

| Name | Qualifier | Notes |
| --- | --- | --- |
| notifyMOICreation | O | -- |
| notifyMOIDeletion | O | -- |
| notifyMOIAttributeValueChanges | O | -- |
| notifyEvent | O | -- |
| notifyMOIChanges | O | -- |

***Next change***

# Annex A (informative): PlantUML source code

28-632 Figure 4-2-2-2 Inheritance alt-2 plantuml

@startuml

skinparam backgroundColor white

skinparam classBackgroundColor motivation

skinparam classBorderColor black

skinparam Shadowing false

skinparam noteBackgroundColor white

skinparam noteBorderColor white

skinparam arrowColor black

hide circle

hide members

Top <<InformationObjectClass>>

class InventoryUnitNE <<InformationObjectClass>>

class InventoryUnitHw <<InformationObjectClass>>

class InventoryUnitSw <<InformationObjectClass>>

class InventoryUnitLic <<InformationObjectClass>>

Top <|-- InventoryUnitNE

Top <|-- InventoryUnitHw

Top <|-- InventoryUnitSw

Top <|-- InventoryUnitLic

@enduml

***End of changes***