**3GPP TSG-SA5 Meeting #155 *S5-243099***

**Jeju, South Korea, 27 - 31 May 2024**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **28.104** | **CR** | **0098** | **rev** | **1** | **Current version:** | **18.3.0** |  |
|  | | | | | | | | |
| *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:*** | Rel-18 CR TS 28.104 updates on the terminology for ML entity | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, Nokia | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | AIML\_MGT | | | | |  | ***Date:*** | | | 2024-04-29 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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:*** | | * During 3GPP SA5#154 meeting, S5-241931 was agreed to change the term “ML entity” to ML Model. This contribution propose to align the terminology with it. * Stage3 related with MLmodel are missing | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Correct the ML entity to ML model. * Add stage3 code for mlModelRef and aIMLInferenceFunctionRef | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Inconsistent description | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.6, 9.1.2, 9.2.1, 9.3.1.1, 9.3.1.2, 9.3.1.3, 9.5.1, B.2.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | | Forge MR link: https://forge.3gpp.org/rep/sa5/MnS/-/merge\_requests/1144 | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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| **1st change** |

## 5.6 AI/ML support for MDA

The MDA process may utilize AI/ML technologies. An MDA Function may optionally be deployed as one or more AI/ML inference function(s) in which the relevant ML entities are used for inference per the corresponding MDA capability. Specifications for MDA ML model training to enable ML model deployments are given in TS 28.105 [24].

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| **Next change** |

### 9.1.2 Associated information entities and local labels

Table 9.1.2-1

|  |  |
| --- | --- |
| Label reference | Local label |
| TS 28.105 [24], IOC, AIMLInferenceFunction | AIMLInferenceFunction |
| TS 28.105 [24], IOC, MLModel | MLModel |

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| **Next change** |

### 9.2.1 Relationships

This clause provides the relationships of relevant classes in UML.



NOTE: When the MDAEntity represents the ManagedElement or ManagedFunction, it means the MDAFunction is located in the NE/NF that the ManagedElement or ManagedFunction represents, but it does not mean the MDA is the feature of the NE/NF.

Figure 9.2.1-1: NRM fragment for MDA request and MDA report

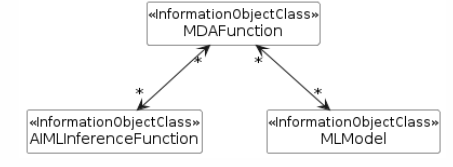


Figure 9.2.1-2: Relations for AI/ML supported MDA function

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| **Next change** |

### 9.3.1 MDAFunction

#### 9.3.1.1 Definition

The IOC MDAFunction represents the MDA function which supports one or more MDA capabilities. The MDA function may be supported by AI/ML. Attribute mLModelRefList indicates that AI/ML is supported for this function. Attribute AIMLInferenceFuntionRefList indicates that AI/ML Inference Function is supported for this function.

#### 9.3.1.2 Attributes

Table 9.3.1.2-1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | S | isReadable | isWritable | isInvariant | isNotifyable |
| supportedMDACapabilities | M | T | F | F | T |
| **Attribute related to role** |  | | | | |
| mLModelRefList | CM | T | F | F | T |
| aIMLInferenceFunctionRefList | CM | T | F | F | T |

#### 9.3.1.3 Attribute constraints

|  |  |
| --- | --- |
| Name | Definition |
| mLModelRefList CM S | The condition is "The MDA function is supported by ML Model". |
| aIMLInferenceFunctionRefList CM S | The condition is "The MDA function is supported by AI/ML inference function". |

#### 9.3.1.4 Notifications

The common notifications defined in clause 9.6 are valid for this IOC, without exceptions or additions.

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| **Next change** |

### 9.5.1 Attribute properties

Table 9.5.1-1

| Attribute Name | Documentation and Allowed Values | Properties |
| --- | --- | --- |
| mDAType | It indicates the type of MDA type (corresponding to the MDA capability).  AllowedValues: the value of MDA type defined for each MDA capability in clause 8. | type: String  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| requestedMDAOutputs | It indicates the requested analytics outputs for an MDA request. | type: MDAOutputPerMDAType  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| mDAOutputIEFilters | It provides the filters for the analytics output information elements of an MDA type for an MDA request. | type: MDAOutputIEFilter  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| mDAOutputIEName | It indicates the analytics output information element name.  AllowedValues: the analytics output information element names for each MDA type as specified in clause 8. | type: string  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| filterValue | It indicates the filter value for analytics output information element for an MDA request.  The MDA output information element is only requested and reported when its value equals to the value of this attribute.  allowedValues: depends on the definitions of the analytics output information element (see clause 8) indicated by mDAOutputIEName attribute. | The type for the corresponding mDAOutputIEName as defined in clause 8 |
| threshold | It indicates the threshold for analytics output information element for an MDA request. | type: ThresholdInfo  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| analyticsPeriod | It indicates a list of time durations, or a time-period related to a time schedule for analytics. | type: AnalyticsSchedule  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| timeOut | It indicates a time until which an MDA MnS consumer needs to obtain an MDA output. Beyond this time the MDA output is no longer needed by the MDA MnS consumer. | type: DateTime (see TS 32.156 [18])  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| reportingMethod | It indicates the reporting method of the analytics output selected by the MnS consumer.  allowedValues: File, Streaming, Notification. | type: Enum  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| reportingTarget | It indicates the reporting target of the MDA outputs.  Allowed values: URI. | type: String  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| analyticsScope | It indicates the scope of the analytics requested by the MnS consumer. | type: AnalyticsScopeType  multiplicity: 0..1  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: False |
| managedEntitiesScope | It indicates the scope of the analytics by the DNs of the managed entities.  It carries the DN(s) of SubNetwork MOI(s), ManagedElement MOI(s), and/or the MOI(s) of the derivative IOCs of ManagedFunction (see TS 28.622 [19]).  For each MOI provided by this attribute, the MOI itself and all of its subordinated MOIs are in the scope of analytics. | type: DN  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| areaScope | It indicates the scope of the analytics by the geographical area information. | type: GeoArea (see TS 28.622 [19])  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| startTime | It indicates the start time of the periodical analytics requested by the MnS consumer. | type: DateTime (see TS 32.156 [18])  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| stopTime | It indicates the stop time of the periodical analytics requested by the MnS consumer.  This attribute shall contain a NULL value in case the analytics is requested for an indefinite time period. | type: DateTime (see TS 32.156 [18])  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mDAReportID | It indicates the identifier for the MDAReport. | type: string  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mDAOutputList | It indicates a list of output results related to particular MDA type. | type: MDAOutputEntry  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| analyticsWindow | It indicates the time duration related to an MDA output. It can be in the past, when the analytics is statistics, or in the future for a prediction. | type: TimeWindow  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mDAOutputIEValue | It indicates the MDA output result that can be numeric or non-numeric. | The type for the corresponding mDAOutputIEName as defined in clause 8 |
| confidenceDegree | A probability range that contains the degree of accuracy of the analytics output statistics or prediction. | type: Real  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| supportedMDACapabilities | It indicates the MDA capabilities supported by the MDA function.  AllowedValues: the value of MDA types defined for the MDA capabilities in clause 8. | type: String  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| mDAOutputs | It indicates the analytics output results of one or more MDA types delivered to MDA consumer. | type: MDAOutputs  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| mDARequestRef | It indicates the DN of the MDARequest MOI for which the results are generated by the MDA producer. | type: DN  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| monitoredMDAOutputIE | It indicates the analytics output information element name monitored by a threshold.  AllowedValues: the analytics output information element names for each MDA type as specified in clause 8. | type: string  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| thresholdValue | It specifies the value against which the monitored MDA output information element is compared at a threshold level in case the hysteresis is zero.  allowedValues: float or integer | type: Union  multiplicity: 1  isOrdered: NA  isUnique: NA  defaultValue: None  isNullable: False |
| hysteresis | It specifies the hysteresis of a threshold. If this attribute is present the monitored MDA output information element value is not compared against the threshold value as specified by the thresholdValue attribute but against a high and low threshold value given by  highThresholdValue- = thresholdValue + hysteresis  lowThresholdValue = thresholdValue - hysteresis  When going up, the threshold is triggered when the MDA output information element value reaches or crosses the high threshold value. When going down, the threshold is triggered when the MDA output information element value reaches or crosses the low threshold value.  allowedValues: non-negative float or integer | type: Union  multiplicity: 0..1  isOrdered: NA  isUnique: NA  defaultValue: None  isNullable: False |
| thresholdDirection | It indicates the direction of a threshold indicating the direction for which a threshold crossing triggers a threshold.  When the threshold direction is configured to "UP", the associated treshold is triggered only when the subject MDA output information element value is going up upon reaching or crossing the threshold value. The treshold is not triggered, when the MDA output information element value is going down upon reaching or crossing the threshold value.  Vice versa, when the threshold direction is configured to "DOWN", the associated treshold is triggered only when the MDA output information element value is going down upon reaching or crossing the threshold value. The treshold is not triggered, when the MDA output information element value is going up upon reaching or crossing the threshold value.  When the threshold direction is set to "UP\_AND\_DOWN" the treshold is active in both direcions.  In case a threshold with hysteresis is configured, the threshold direction attribute shall be set to "UP\_AND\_DOWN".  allowedValues:  - UP  - DOWN  - UP\_AND\_DOWN | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mDAOutputStartTime | It indicates the analytics start time for an MDA output. | type: DateTime (see TS 32.156 [18])  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mDAOutputEndTime | It indicates the analytics end time for an MDA output. | type: DateTime (see TS 32.156 [18])  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| timeDurations | It indicates a list of time duration. | type: TimeWindow  multiplicity: \*  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: False |
| granularityPeriod | It indicates the granularity period (in unit of second) of the analytics for an MDA output. In case of PM prediction, this indicates the granularity period of the prediction of the PMs. | type: integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLModelRefList | This attribute holds a DN list of MLModel (See TS 28.105 [24]). | type: DN  multiplicity: 0..\*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| aIMLInferenceFuntionRefList | This attribute holds a DN list of AIMLInferenceFuntion (See TS 28.105 [24]) | type: DN  multiplicity: 0..\*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| recommendationFilter | It indicates the entities for which no recommendation should be generated for the specific MDAOutputPerMDAType. This could be provided either as managedEntitiesScope or as areaScope. | type: AnalyticsScopeType  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |

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| **Next change** |

### B.2.1 PlantUML code for Figure 9.2.1-2: Relations for AI/ML supported MDA function

@startuml

skinparam ClassStereotypeFontStyle normal

skinparam ClassBackgroundColor White

skinparam shadowing false

skinparam monochrome true

hide members

hide circle

'skinparam maxMessageSize 250

skinparam nodesep 60

class AIMLInferenceFunction <<InformationObjectClass>>

class MLModel <<InformationObjectClass>>

class MDAFunction <<InformationObjectClass>>

MDAFunction "\*" <--> "\*" AIMLInferenceFunction

MDAFunction "\*" <--> "\*" MLModel

@enduml

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| **Next change** |

Forge MR link: <https://forge.3gpp.org/rep/sa5/MnS/-/merge_requests/1144> at commit 5c086f3d0cfeb2aa4e8fbfef762be87af7ee4334

\*\*\* START OF CHANGE 1 \*\*\*

\*\*\* OpenAPI/TS28104\_MdaNrm.yaml \*\*\*

<CODE BEGINS>

openapi: 3.0.1

info:

title: MDA NRM

version: 18.3.0

description: >-

OAS 3.0.1 specification of the MDA NRM

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externalDocs:

description: 3GPP TS 28.104; MDA

url: http://www.3gpp.org/ftp/Specs/archive/28\_series/28.104/

paths: {}

components:

schemas:

#-------- Definition of types-----------------------------------------------------

MDATypes:

type: array

items:

type: string

MDAOutputs:

type: array

items:

$ref: '#/components/schemas/MDAOutputPerMDAType'

AnalyticsScopeType:

oneOf:

- type: object

properties:

managedEntitiesScope:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

- type: object

properties:

areaScope:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/GeoArea'

MDAOutputPerMDAType:

type: object

properties:

mDAType:

type: string

mDAOutputIEFilters:

type: array

items:

$ref: '#/components/schemas/MDAOutputIEFilter'

MDAOutputIEFilter:

type: object

properties:

mDAOutputIEName:

type: string

filterValue:

type: string

threshold:

$ref: '#/components/schemas/ThresholdInfo'

analyticsPeriod:

$ref: '#/components/schemas/AnalyticsSchedule'

timeOut:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DateTime'

ReportingMethod:

type: string

enum:

- FILE

- STREAMING

- NOTIFICATION

ReportingTarget:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Uri'

AnalyticsSchedule:

oneOf:

- type: object

properties:

timeDurations:

type: array

items:

$ref: 'TS28104\_MdaReport.yaml#/components/schemas/TimeWindow'

- type: object

properties:

granularityPeriod:

type: integer

ThresholdInfo:

type: object

properties:

monitoredMDAOutputIE:

type: string

thresholdDirection:

type: string

enum:

- UP

- DOWN

- UP\_AND\_DOWN

thresholdValue:

oneOf:

- type: integer

- $ref: 'TS28623\_ComDefs.yaml#/components/schemas/Float'

hysteresis:

oneOf:

- type: integer

minimum: 0

- type: number

format: float

minimum: 0

#-------- Definition of types for name-containments ------

SubNetwork-ncO-MdaNrm:

type: object

properties:

MDAFunction:

$ref: '#/components/schemas/MDAFunction-Multiple'

MDAReport:

$ref: '#/components/schemas/MDAReport-Multiple'

ManagedElement-ncO-MdaNrm:

type: object

properties:

MDAFunction:

$ref: '#/components/schemas/MDAFunction-Multiple'

#-------- Definition of abstract IOCs --------------------------------------------

#-------- Definition of concrete IOCs --------------------------------------------

MDAFunction-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/ManagedFunction-Attr'

- type: object

properties:

supportedMDACapabilities:

$ref: '#/components/schemas/MDATypes'

mlModelRefList:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

aIMLInferenceFunctionRefList:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/ManagedFunction-ncO'

- type: object

properties:

MDARequest:

$ref: '#/components/schemas/MDARequest-Multiple'

MDARequest-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- type: object

properties:

requestedMDAOutputs:

$ref: '#/components/schemas/MDAOutputs'

reportingMethod:

$ref: '#/components/schemas/ReportingMethod'

reportingTarget:

$ref: '#/components/schemas/ReportingTarget'

analyticsScope:

$ref: '#/components/schemas/AnalyticsScopeType'

startTime:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DateTime'

stopTime:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DateTime'

recommendationFilter:

$ref: '#/components/schemas/AnalyticsScopeType'

MDAReport-Single:

$ref: 'TS28104\_MdaReport.yaml#/components/schemas/MDAReport'

#-------- Definition of JSON arrays for name-contained IOCs ----------------------

MDAFunction-Multiple:

type: array

items:

$ref: '#/components/schemas/MDAFunction-Single'

MDARequest-Multiple:

type: array

items:

$ref: '#/components/schemas/MDARequest-Single'

MDAReport-Multiple:

type: array

items:

$ref: '#/components/schemas/MDAReport-Single'

#-------- Definitions in TS 28.104 for TS 28.532 ---------------------------------

resources-mdaNrm:

oneOf:

- $ref: '#/components/schemas/MDAFunction-Single'

- $ref: '#/components/schemas/MDARequest-Single'

- $ref: '#/components/schemas/MDAReport-Single'

<CODE ENDS>

\*\*\* END OF CHANGE 1 \*\*\*

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| **End of change** |