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Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

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Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, certain modal verbs have the following meanings:

- shall** indicates a mandatory requirement to do something
- shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

- should** indicates a recommendation to do something
- should not** indicates a recommendation not to do something
- may** indicates permission to do something
- need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

- can** indicates that something is possible
- cannot** indicates that something is impossible

The constructions "can" and "cannot" shall not to be used as substitutes for "may" and "need not".

- will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

1 Scope

The present document specifies use cases, requirements and procedures for management capabilities of 5G networks.

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 TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 28.532: "Management and orchestration; Generic management services".

3 Definitions of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

MnS	Management Service
-----	--------------------

4 Heartbeat

4.1 Overview

The communication between Management Service (MnS) producers and MnS consumers shall be monitored, and communication link breaks between them shall be discovered by MnS consumers as early as possible. The behaviour of the MnS consumers, after detection of communication failure, is outside the scope of the present document.

4.2 Specification level requirements

4.2.1 Use cases

4.2.1.1 Configuring heartbeat notification periodicity

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To configure the periodicity at which the management service producer shall emit heartbeat notifications to its authorized management service consumer.	
Actors and Roles	An authorized consumer of the management service.	
Telecom resources	The management service producer.	
Assumptions	N/A	
Pre-conditions	The periodicity requested by the management service consumer has a valid value.	
Begins when	The management service consumer sends a request to the management service producer to set the periodicity at which it shall emit heartbeat notifications.	
Step 1	The management service producer receives the request and sets its internal countdown timer to a value (which can be zero) equal to the periodicity requested by the management service consumer.	
Step 2	The management service producer sends a heartbeat notification to all authorized management service consumer(s), provided they previously subscribed to heartbeat notifications.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The notification periodicity has been configured according to the management service consumer request. A heartbeat notification is sent out to all authorized management service consumer(s).	
Traceability	REQ-HB-CTRL-FUN-2.	

4.2.1.2 Requesting immediate heartbeat notification

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To trigger the emission of an immediate heartbeat notification by the management service producer.	
Actors and Roles	An authorized consumer of the management service.	
Telecom resources	The management service producer.	
Assumptions	N/A	
Pre-conditions	N/A	
Begins when	The soliciting management service consumer sends a request to the management service producer to emit immediately a heartbeat notification.	
Step 1	The management service producer receives the request and sends immediately a heartbeat notification to all authorized management service consumer(s) who had previously subscribed to heartbeat notifications. The management service producer count down timer is not impacted.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The immediate heartbeat notification has been emitted according to the soliciting management service consumer request.	
Traceability	REQ-HB-CTRL-FUN-3, REQ-HB-NOTIF-FUN-2.	

4.2.1.3 Emitting periodic heartbeat notifications

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To send periodic heartbeat notifications at the periodicity requested by the management service consumer.	
Actors and Roles	An authorized producer of the management service.	
Telecom resources	The management service consumer.	
Assumptions	The heartbeat notification periodicity has been configured according to the management service consumer request.	Configuring heartbeat notification periodicity
Pre-conditions	N/A	
Begins when	The internal countdown timer managed by the management service producer has reached the value 0.	
Step 1	The management service producer sends a heartbeat notification to all authorized management service consumer(s), provided they previously subscribed to heartbeat notifications..	
Step 2	The management service producer resets its internal countdown timer to the value of the heartbeat notification periodicity.	Configuring heartbeat notification periodicity
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The periodic heartbeat notification has been emitted to all authorized management service consumer(s) at the requested periodicity.	
Traceability	REQ-HB-NOTIF-FUN-1.	

4.2.2 Requirements

4.2.2.1 Requirements for controlling heartbeat

REQ-HB-CTRL-FUN-1: The management service provider shall have the capability to allow its authorized consumer to read the heartbeat period.

REQ-HB-CTRL-FUN-2: The management service provider shall have the capability to allow its authorized consumer to set the heartbeat period.

REQ-HB-CTRL-FUN-3: The management service provider shall have the capability to allow its authorized consumer to request the emission of an immediate heartbeat notification.

4.2.2.2 Requirements for notifying heartbeat

REQ-HB-NOTIF-FUN-1: The management service provider shall have the capability to send periodic heartbeat notifications to its authorized consumer at the frequency specified by the management service consumer.

REQ-HB-NOTIF-FUN-2: The management service provider shall have the capability to send immediate heartbeat notifications to its authorized consumer, upon request from the management service consumer.

4.3 Procedures for heartbeat

4.3.1 Procedure for configuring heartbeat notification periodicity

Figure 4.3.1-1 illustrates the procedure for configuring the periodicity of heartbeat notifications using operations and notifications of the provisioning MnS (see clause 11.1.1 of [2]).

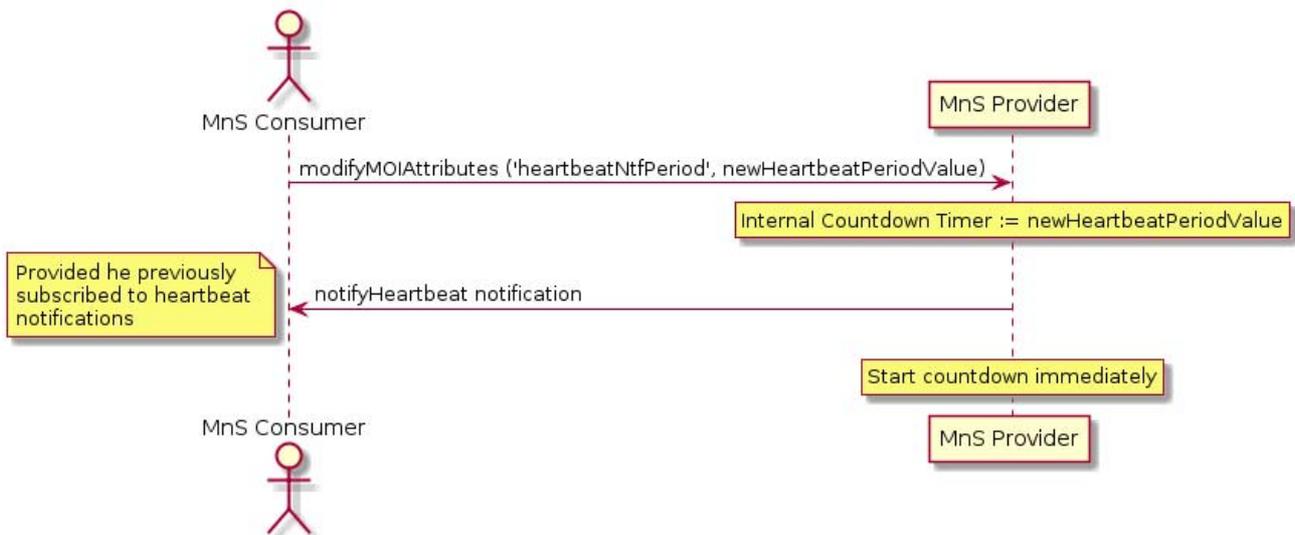


Figure 4.3.1-1: Procedure for configuring heartbeat notification periodicity

4.3.2 Procedure for requesting immediate heartbeat notification

Figure 4.3.2-1 illustrates the procedure for requesting immediate heartbeat notification using operations and notifications of the provisioning MnS (see clause 11.1.1 of [2]).

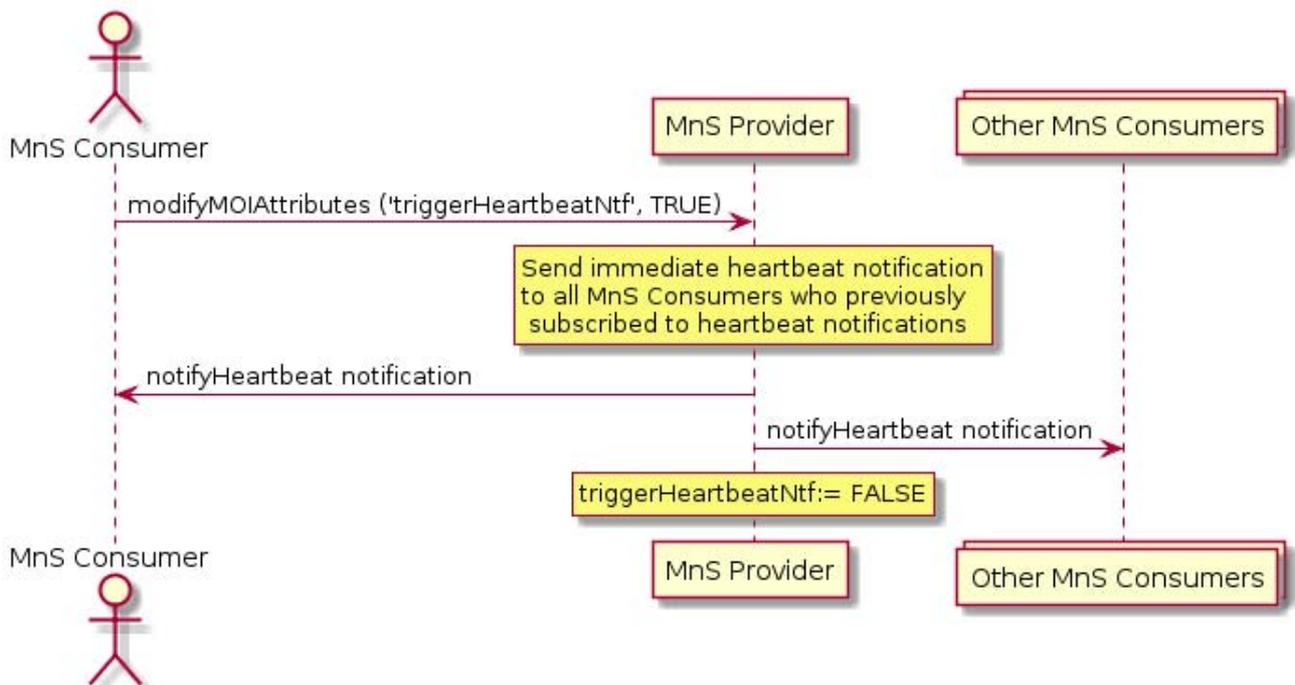


Figure 4.3.2-1: Procedure for requesting immediate heartbeat notification

4.3.3 Procedure for notifying periodic heartbeat notifications

Figure 4.3.3-1 illustrates the procedure for notifying periodic heartbeat notifications using operations and notifications of the provisioning MnS (see clause 11.1.1 of [2]).

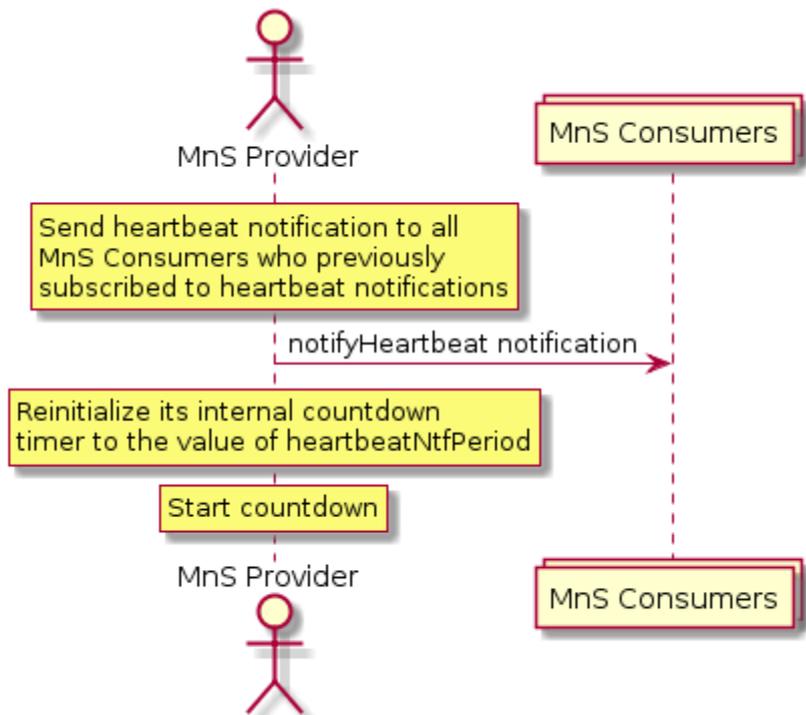


Figure 4.3.3-1: Procedure for notifying periodic heartbeat notifications

Annex A (informative): Heartbeat PlantUML source code

A.1 Procedure for configuring heartbeat notification periodicity

The following PlantUML source code is used to describe the procedure for configuring heartbeat notification periodicity, as depicted by Figure 4.3.1-1:

```
@startuml
title "Configuring heartbeat notification periodicity"
actor "MnS Consumer" as CONS
participant "MnS Provider" as PROV
CONS -> PROV: modifyMOIAttributes ('heartbeatNtfPeriod', newHeartbeatPeriodValue)

rnote over PROV
  Internal Countdown Timer := newHeartbeatPeriodValue
endrnote

PROV -> CONS: notifyHeartbeat notification
note left
  Provided he previously
  subscribed to heartbeat
  notifications
end note

rnote over PROV
  Start countdown immediately
endrnote

@enduml
```

A.2 Procedure for requesting immediate heartbeat notification

The following PlantUML source code is used to describe the procedure for requesting immediate heartbeat notification, as depicted by Figure 4.3.2-1:

```
@startuml
title "Requesting immediate heartbeat notification"
actor "MnS Consumer" as CONS
participant "MnS Provider" as PROV
collections "Other MnS Consumers" as OTHER
CONS -> PROV: modifyMOIAttributes ('triggerHeartbeatNtf', TRUE)

rnote over PROV
  Send immediate heartbeat notification
  to all MnS Consumers who previously
  subscribed to heartbeat notifications
endrnote
```

```
PROV -> CONS: notifyHeartbeat notification
PROV -> OTHER: notifyHeartbeat notification
```

```
rnote over PROV
  triggerHeartbeatNtf:= FALSE
endrnote
```

```
@enduml
```

A.3 Procedure for notifying periodic heartbeat notifications

The following PlantUML source code is used to describe the procedure for notifying periodic heartbeat notifications, as depicted by Figure 4.3.3-1:

```
@startuml
title "Notifying periodic heartbeat notifications"

actor "MnS Provider" as PROV
collections "MnS Consumers" as CONS

rnote over PROV
  Send heartbeat notification to all
  MnS Consumers who previously
  subscribed to heartbeat notifications
endrnote

PROV -> CONS: notifyHeartbeat notification

rnote over PROV
  Reinitialize its internal countdown
  timer to the value of heartbeatNtfPeriod
endrnote

rnote over PROV
  Start countdown
endrnote

@enduml
```

Annex B (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2020-02	SA5#129-e	S5-201108				First draft, including EditHelp comments	0.1.0
2020-03	SA#87-e	SP-200197				Presented for approval	1.0.0
2020-03	SA#87-e					Upgrade to changecontrol version	16.0.0

History

Document history		
V16.0.0	November 2020	Publication