# ETSI TS 132 532 V13.0.0 (2016-02)


**Universal Mobile Telecommunications System (UMTS);**
**LTE;**
**Telecommunication management;**
**Software management (SwM);**
**Integration Reference Point (IRP);**
**Information Service (IS)**
**(3GPP TS 32.532 version 13.0.0 Release 13)**


Reference
RTS/TSGS-0532532vd00

Keywords
LTE,UMTS

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# Contents

Intellectual Property Rights ..... 2
Foreword ..... 2
Modal verbs terminology ..... 2
Foreword ..... 7
Introduction ..... 7
1 Scope ..... 8
2 References ..... 8
3 Definitions and abbreviations ..... 8
3.1 Definitions ..... 8
3.2 Abbreviations ..... 8
4 Information Object Classes ..... 9
4.1 Imported information entities and local labels ..... 9
4.2 Class diagram ..... 9
4.2.1 Attributes and relationships ..... 9
4.2.2 Inheritance ..... 10
4.3 Information object class definitions ..... 11
4.3.1 GenManCapability ..... 11
4.3.1.1 Definition ..... 11
4.3.1.2 Attributes ..... 11
4.3.1.3 Notifications ..... 11
4.3.2 GenManProfile ..... 12
4.3.2.1 Definition ..... 12
4.3.2.2 Attributes ..... 12
4.3.2.3 Notifications ..... 12
4.3.3 GenManProcess ..... 13
4.3.3.1 Definition ..... 13
4.3.3.2 Attributes ..... 13
4.3.3.3 Notifications ..... 13
4.3.4 SwMCapability ..... 14
4.3.4.1 Definition ..... 14
4.3.4.2 Attributes ..... 14
4.3.4.3 Attribute constraints ..... 14
4.3.4.4 Notifications ..... 14
4.3.5 SwMProfile ..... 15
4.3.5.1 Definition ..... 15
4.3.5.2 Attributes ..... 15
4.3.5.3 Attribute constraints ..... 15
4.3.5.4 Notifications ..... 15
4.3.6 SwMProcess ..... 16
4.3.6.1 Definition ..... 16
4.3.6.2 Attributes ..... 16
4.3.6.3 Notifications ..... 16
4.3.7 SwMIRP ..... 17
4.3.7.1 Definition ..... 17
4.3.7.2 Attributes ..... 17
4.3.7.3 Notifications ..... 17
4.3.8 SwMManagedEntity ..... 17
4.3.8.1 Definition ..... 17
4.4 Information relationship definitions ..... 17
4.4.1 relation-swMIRP-swMCapability (M) ..... 17
4.4.1.1 Definition ..... 17
4.4.1.2 Roles ..... 17

4.4.1.3 Constraints ..... 17
4.4.2 relation-SwmIRP-swMProfile (M) ..... 18
4.4.2.1 Definition ..... 18
4.4.2.2 Roles ..... 18
4.4.2.3 Constraints ..... 18
4.4.3 relation-swMIRP-swMProcess (M) ..... 18
4.4.3.1 Definition ..... 18
4.4.3.2 Roles ..... 18
4.4.3.3 Constraints ..... 18
4.4.4 relation-swMCapabilites-swMProfile (M) ..... 19
4.4.4.1 Definition ..... 19
4.4.4.2 Roles ..... 19
4.4.4.3 Constraints ..... 19
4.4.5 relation swMProfile-swMProcess (M) ..... 19
4.4.5.1 Definition ..... 19
4.4.5.2 Roles ..... 19
4.4.5.3 Constraints ..... 19
4.5 Information attribute definitions ..... 20
4.5.1 Definition and legal values ..... 20
4.5.2 Constraints ..... 22

5 IRP descriptions: Interface Definitions ..... 23
5.1 Class diagram representing interfaces ..... 23
5.2 Generic rules ..... 25
5.3 SwMIRPOperations_1 Interface (M) ..... 26
5.3.1 Operation `listSwMCapabilities` (M) ..... 26
5.3.1.1 Definition ..... 26
5.3.1.2 Input parameters ..... 26
5.3.1.3 Output parameters ..... 26
5.3.1.4 Post-condition ..... 26
5.3.1.5 Exceptions ..... 26
5.3.1.5.1 operation_failed ..... 26
5.3.2 Operation `listSwMProfiles` (M) ..... 27
5.3.2.1 Definition ..... 27
5.3.2.2 Input parameters ..... 27
5.3.2.3 Output parameters ..... 27
5.3.3 Operation `createSwMProfile` (M) ..... 27
5.3.3.1 Definition ..... 27
5.3.3.2 Input parameters ..... 27
5.3.3.3 Output parameters ..... 28
5.3.4 Operation `deleteSwMProfile` (M) ..... 28
5.3.4.1 Definition ..... 28
5.3.4.2 Input parameters ..... 28
5.3.4.3 Output parameters ..... 28
5.3.5 Operation `listSwMProcesses` (M) ..... 29
5.3.5.1 Definition ..... 29
5.3.5.2 Input parameters ..... 29
5.3.5.3 Output parameters ..... 29
5.3.6 Operation `resumeSwMProcess` (M) ..... 29
5.3.6.1 Definition ..... 29
5.3.6.2 Input parameters ..... 29
5.3.6.3 Output parameters ..... 30
5.3.7 Operation `swFallback` (M) ..... 30
5.3.7.1 Definition ..... 30
5.3.7.2 Input parameters ..... 30
5.3.7.3 Output parameters ..... 30
5.3.8 Operation `terminateSwMProcess` (M) ..... 31
5.3.8.1 Definition ..... 31
5.3.8.2 Input parameters ..... 31
5.3.8.3 Output parameters ..... 31
5.4 SwMIRPOperations_2 Interface (O) ..... 32

5.4.1 Operation changeSwMProfile (O) ..... 32
5.4.1.1 Definition ..... 32
5.4.1.2 Input parameters ..... 32
5.4.1.3 Output parameters ..... 32
5.4.1.4 Constraints ..... 33
5.5 SwMIRPNotifications_1 Interface (M) ..... 34
5.5.1 Notification notifySwMProfileCreation (M) ..... 34
5.5.1.1 Definition ..... 34
5.5.1.2 Input parameters ..... 34
5.5.2 Notification notifySwMProfileDeletion (M) ..... 34
5.5.2.1 Definition ..... 34
5.5.2.2 Input parameters ..... 34
5.5.3 Notification notifySwMProcessCreation (M) ..... 35
5.5.3.1 Definition ..... 35
5.5.3.2 Input parameters ..... 35
5.5.4 Notification notifySwMProcessStage (M) ..... 35
5.5.4.1 Definition ..... 35
5.5.4.2 Input parameters ..... 35
5.5.5 Notification notifySwMProcessDeletion (M) ..... 36
5.5.5.1 Definition ..... 36
5.5.5.2 Input parameters ..... 36
5.5.6 Notification notifyNewSwAvailability (M) ..... 36
5.5.6.1 Definition ..... 36
5.5.6.2 Input parameters ..... 36
5.6 SwMIRPNotifications_2 Interface (O) ..... 37
5.6.1 Notification notifySwMProfileChange (C/O) ..... 37
5.6.1.1 Definition ..... 37
5.6.1.2 Input parameters ..... 37
5.7 SwMIRPOperations_3 Interface (M) ..... 37
5.7.1 Operation downloadNESw (M) ..... 37
5.7.1.1 Definition ..... 37
5.7.1.2 Input parameters ..... 38
5.7.1.3 Output parameters ..... 38
5.7.1.4 Pre condition ..... 39
5.7.1.5 Post-condition ..... 39
5.7.1.6 Exceptions ..... 39
5.7.2 Operation activateNESw (M) ..... 39
5.7.2.1 Definition ..... 39
5.7.2.2 Input parameters ..... 39
5.7.2.3 Output parameters ..... 40
5.7.2.4 Pre condition ..... 40
5.7.2.5 Post-condition ..... 40
5.7.2.6 Exceptions ..... 40
5.8 SwMIRPOperations_4 Interface (O) ..... 41
5.8.1 Operation installNESw (O) ..... 41
5.8.1.1 Definition ..... 41
5.8.1.2 Input parameters ..... 41
5.8.1.3 Output parameters ..... 41
5.8.1.4 Pre condition ..... 42
5.8.1.5 Post-condition ..... 42
5.8.1.6 Exceptions ..... 42
5.9 SwMIRPNotifications_3 Interface (M) ..... 43
5.9.1 Notification notifyDownloadNESwStatusChanged (M) ..... 43
5.9.1.1 Definition ..... 43
5.9.1.2 Input parameters ..... 43
5.9.1.3 Triggering Event ..... 44
5.9.1.3.1 From State ..... 44
5.9.1.3.2 To State ..... 44
5.9.1.4 Constraints ..... 44
5.9.2 Notification notifyActivateNESwStatusChanged (M) ..... 44
5.9.2.1 Definition ..... 44

5.9.2.2 Input parameters ..... 45
5.9.2.3 Triggering Event ..... 45
5.9.2.3.1 From State ..... 45
5.9.2.3.2 To State ..... 45
5.9.2.4 Constraints ..... 45
5.10 SwMIRPNotifications_4 Interface (O) ..... 46
5.10.1 Notification notifyInstallNESwStatusChanged (O) ..... 46
5.10.1.1 Definition ..... 46
5.10.1.2 Input parameters ..... 46
5.10.1.3 Triggering Event ..... 46
5.10.1.3.1 From State ..... 46
5.10.1.3.2 To State ..... 47
5.10.1.4 Constraints ..... 47
5.11 SwmOperations_5 Interface (CM) ..... 47
5.11.1 Operation `listNaswmProcesses` (M) ..... 47
5.11.1.1 Definition ..... 47
5.11.1.2 Input parameters ..... 47
5.11.1.3 Output parameters ..... 48
5.12 SwmOperations_6 Interface (CM) ..... 48
5.12.1 Operation `cancelNaswmProcesses` (M) ..... 48
5.12.1.1 Definition ..... 48
5.12.1.2 Input parameters ..... 48
5.12.1.3 Output parameters ..... 49
5.12.1.4 Pre condition ..... 49
5.12.1.5 Post-condition ..... 49
5.12.1.6 Exceptions ..... 49

**Annex A (informative): Change history ..... 50**

History ..... 51

# Foreword

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

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# 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:

32.531: Telecommunication management; Software management; Concepts and Integration Reference Point (IRP) Requirements

**32.532:** Telecommunication management; **Software management Integration Reference Point (IRP); Information Service (IS)**

32.536: Telecommunication management; Software management Integration Reference Point (IRP); Solution Set (SS) definitions

# 1 Scope

The present document contains the Software Management Interface IRP Information Services descriptions.

# 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 32.101: "Telecommunication management; Principles and high level requirements".

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

[4] Void.

[5] Void.

[6] 3GPP TS 32.531: "Telecommunication management; Software management; Concepts and Integration Reference Point (IRP) Requirements".

[7] 3GPP TS 32.622: "Telecommunication management; Generic network resources Integration Reference Point (IRP); Network Resource Model (NRM)".

[8] 3GPP TS 32.312: "Telecommunication management; Generic Integration Reference Point (IRP) management: Information Services".

[9] 3GPP TS 32.302: Telecommunication management; Configuration Management (CM); Notification Integration Reference Point (IRP); Information Service (IS).

# 3 Definitions and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TS 32.101 [2], TS 32.102 [3] and 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 TS 32.531 [6], TS 32.101 [2], TS 32.102 [3] and TS 21.905 [1], in that order.

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1], TS 32.531 [6] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1] and TS 32.531 [6].

# 4 Information Object Classes

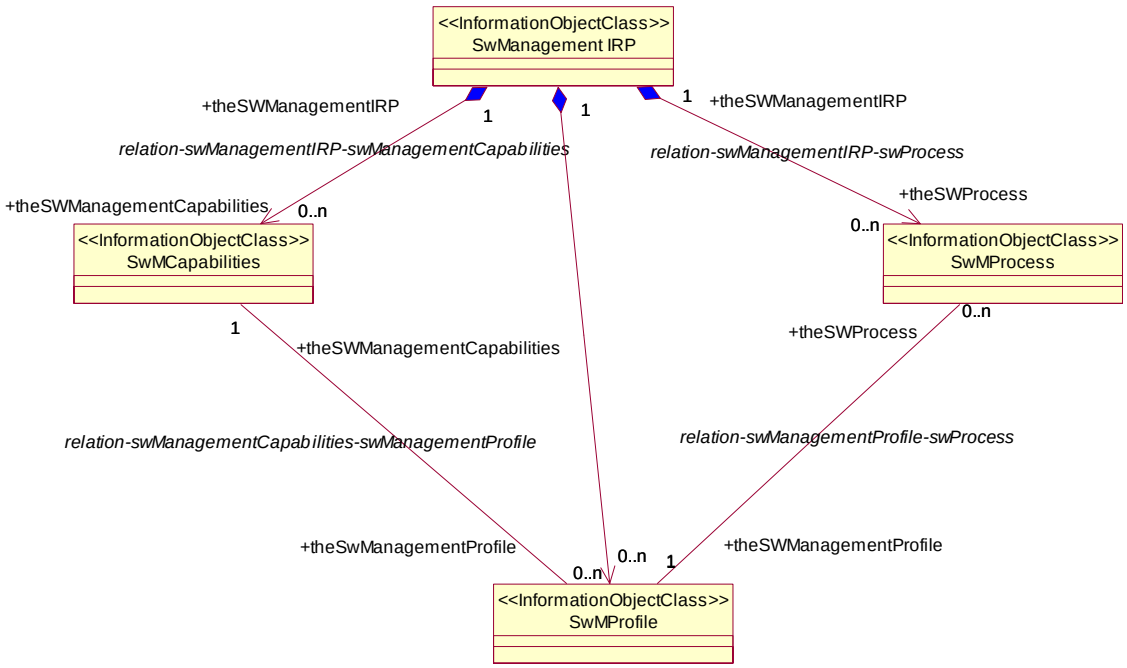
## 4.1 Imported information entities and local labels

| Label reference | Local label |
|---|---|
| 3GPP TS 32.622 [7], information object class, Top | top |
| 3GPP TS 32.312 [8], information object class, managedGenericIRP | managedGenericIRP |

## 4.2 Class diagram

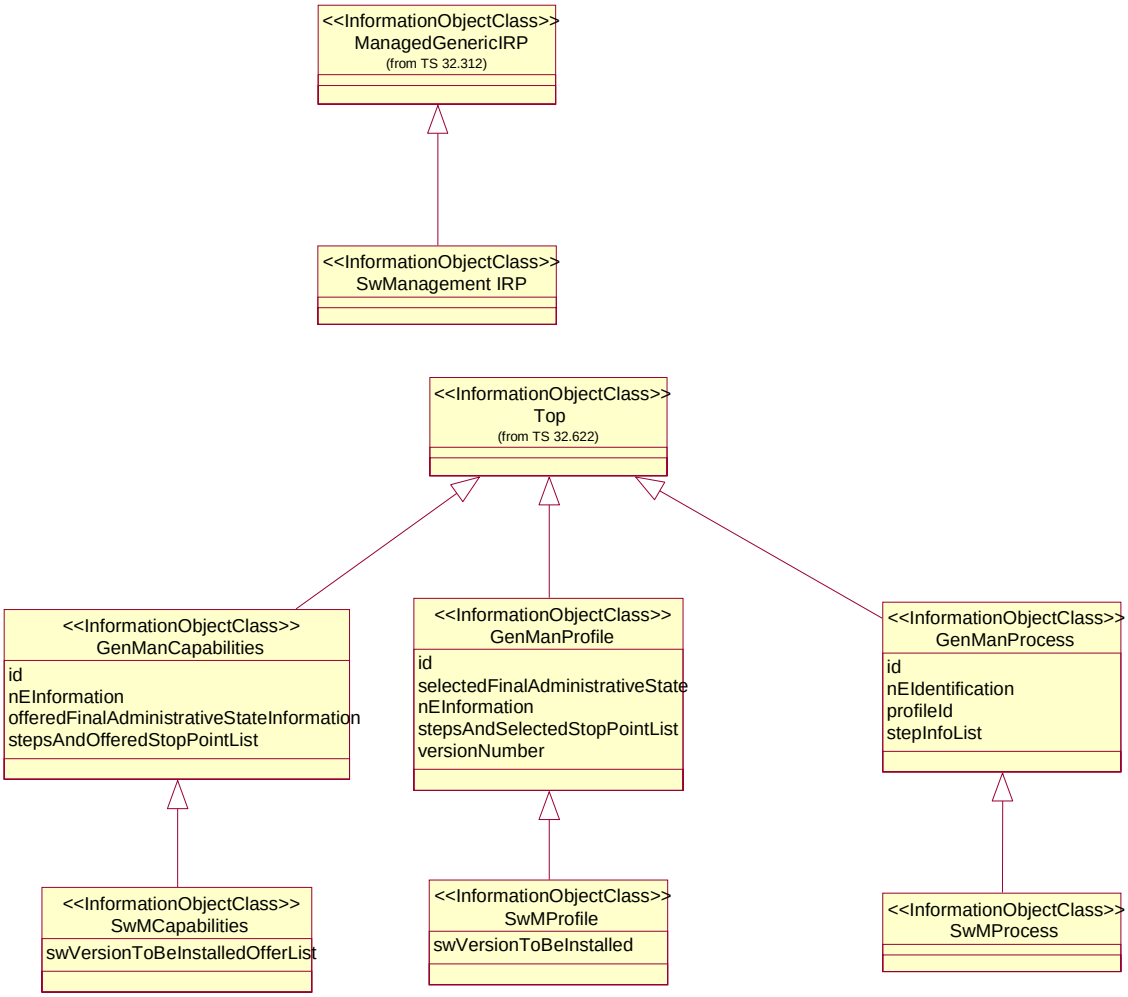
### 4.2.1 Attributes and relationships

The diagram reflects the definitions in the text of the following clauses. In case of conflict text takes precedence.



### 4.2.2 Inheritance

The diagram reflects the definitions in the text of the following clauses. In case of conflict text takes precedence.



# 4.3 Information object class definitions

## 4.3.1 GenManCapability

### 4.3.1.1 Definition

This object class is a support object class. Sub-classes of this IOC represent the IRPAgent"s capability in support of automated management.

It is created by the IRPAgent and cannot be modified by the IRPManager.
An instance of a sub-class of `genManCapability` object is valid for a certain NE type or a set of NE types.
Multiple `genManCapability` objects may be instantiated in the IRPAgent.

The object identifies:

a) the sequence of the self-configuration steps
and for each step

a.1) the possibility, whether before the step a stop point can be selected, such that the self-configuration step is suspended and waits for a request by the IRPManager to resume.

b) the final `administrativeState` (ITU-T X.731) of the NE after successful self-configuration.

### 4.3.1.2 Attributes

| Attribute name | Support Qualifier | Read Qualifier | Write Qualifier |
|---|---|---|---|
| `id` | M | M | - |
| `nEInformation` | M | M | - |
| `stepsAndOfferedStopPointList` | M | M | - |
| `offeredFinalAdministrativeStateInformation` | M | M | - |

### 4.3.1.3 Notifications

None.

## 4.3.2 GenManProfile

### 4.3.2.1 Definition

This object class is a support object class. Sub-classes of this IOC represent the IRPManager"s decision related to automated management.

An instance of a sub-class of `GenManProfile` is valid for a certain NE type or a set of NE types.
For an NE starting its self-configuration process (see genManProcess) there shall be no ambiguity which instance of a sub-class of `GenManProfile` is valid for a certain NE type or a set of NE types.
Multiple instances of sub-classes of `GenManProfile` objects may be instantiated in the IRPAgent.

By using an instance of a sub-class of this object the IRPManager decides which of the possible stop points offered in the related instance of a sub-class of `genManCapability` are used to suspend the automated management process of the specified NE type (or set of NE types) and which of the `offeredFinalAdministrativeStateInformation` is selected.

### 4.3.2.2 Attributes

| Attribute name | Support Qualifier | Read Qualifier | Write Qualifier |
|---|---|---|---|
| `id` | M | M | - |
| `versionNumber` | M | M | - |
| `nEInformation` | M | M | - |
| `stepsAndSelectedStopPointList` | M | M | - |
| `selectedFinalAdministrativeState` | M | M | - |

### 4.3.2.3 Notifications

None.

## 4.3.3 GenManProcess

### 4.3.3.1 Definition

This object class is a support object class. Sub-classes of this IOC describe the automated management process for an NE. They allow the IRPManager to be informed about the current progress of the process and where stop points are set. No intervention of the IRPManager is foreseen except resume after a stop point was reached or termination of the self-configuration.

When the automated management process for an NE starts, an instance of the sub-class of `genManProcess` is created automatically.

The steps in the `stepInfoList` shall conform to the content of the relevant sub-class of `genManProfile` instance. Example:
If the `stepsAndOfferedStopPointList` of a sub-class instance of `genManProfile` indicates `stopPointCanBeSetBeforeThisStep` for step X, then the entry for step X in the `stepInfoList` of the sub-class instance of `genManProcess` can only have the value `stopPointIsNotSet` .

When there is no relevant `genManProfile` at creation time of `genManProcess`, then the IRPAgent creates the `genManProcess` based on the relevant `genManCapability`. In this case preferably no stop point shall be set in the self configuration process.

When the last step of the self configuration process is completed successfully, the `genManProcess` instance is deleted automatically.

When self configuration process is terminated by the IRPManager, the `genManProcess` instance is deleted automatically.

### 4.3.3.2 Attributes

| Attribute name | Support Qualifier | Read Qualifier | Write Qualifier |
|---|---|---|---|
| `id` | M | M | - |
| `nEIdentification` | M | M | - |
| `profileId` | M | M | - |
| `stepInfoList` | M | M | - |

### 4.3.3.3 Notifications

None.

## 4.3.4 SwMCapability

### 4.3.4.1 Definition

This object class is a sub-class of `genManCapability` and represents the IRPAgent"s capability in support of SWM.

It is created by the IRPAgent and cannot be modified by the IRPManager.
A `SwMManagementCapability` object is valid for a certain NE type or a set of NE types with a certain SW version or set of versions. For an NE there shall be no ambiguity which `SwMManagementCapability` object is valid for the NE.
Multiple `SwMManagementCapability` objects may be instantiated in the IRPAgent.

The object identifies:

a) the sequence of the self-configuration steps

and for each step:

a.1) the possibility, whether before the step a stop point can be selected, such that the self-configuration step is suspended and waits for a request by the IRPManager to resume.

b) the final `administrativeState` of the NE after successful self-configuration.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_SWM_FUN_5 | |
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_1 | |

### 4.3.4.2 Attributes

All attributes inherited from IOC `GenManCapability.`

Additional attributes:

| Attribute name | Support Qualifier | Read Qualifier | Write Qualifier |
|---|---|---|---|
| `swVersionToBeInstalledOfferList` | CM *) | M | - |

*) Condition: `objectClass_is_swMCapability`

### 4.3.4.3 Attribute constraints

| Name | Definition |
|---|---|
| `objectClass_is_swMCapability` | `objectClass` is equal to `swMCapabilities` |

### 4.3.4.4 Notifications

| Name | Qualifier | Notes |
|---|---|---|
| `notifyNewSwAvailability` | M | |

## 4.3.5 SwMProfile

### 4.3.5.1 Definition

This object class is a sub-class of `genManProfile`. It allows the IRPManager to select from the stop points offered in the `swMCapabilites` object those which should be used to stop the SW management process for NEs, which fit to the `nEInformation` and `swVersionToBeInstalled,` and which of the `offeredFinalAdministrativeStateInformation` is selected.
For an NE starting its SWM process there shall be no ambiguity which `swMManagementProfile` is valid for the NE. Therefore the `nEInformation` of different `swMProfile` instances shall not intersect. Example for a not allowed intersection: profile 1 has `nEInformation=(`neType=eNB), profile 2 has `nEInformation=((`neType=eNB) and (Id=1)) ).

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_1 | |
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_2 | |
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_3 | |
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_4 | |
| 3GPP TS 32.531 [6] | REQ_SWM_FUN_7 | The part of the requirement to avoid service impact can be fulfilled by creating a swmProfile with `selectedFinalAdministrativeState` equal `locked` |

### 4.3.5.2 Attributes

All attributes inherited from IOC `GenManProfile.`

Additional attributes:

| Attribute name | Support Qualifier | Read Qualifier | Write Qualifier |
|---|---|---|---|
| `swVersionToBeInstalled` | CM | M | - |

Condition: `objectClass_is_swMProfile`

### 4.3.5.3 Attribute constraints

| Name | Definition |
|---|---|
| `objectClass_is_swMProfile` | `objectClass` is equal to `swMProfile` |

### 4.3.5.4 Notifications

| Name | Qualifier | Notes |
|---|---|---|
| notifySwMProfileCreation | M | |
| notifySwMProfileChange | CM | Condition: Present if operation `changeSwMProfile` is supported. |
| notifySwMProfileDeletion | M | |

## 4.3.6 SwMProcess

### 4.3.6.1 Definition

This object class is a sub-class of `genManProcess` . It describes the SW management process for an NE. It allows the IRPManager to be informed about the current progress of the SWM process and where stop points are set. No intervention of the IRPManager is foreseen except to provide indication to resume after a stop point was reached or to abort the self-configuration.

When the automated management process for an NE starts, an instance of the `swMProcess` is created automatically.

The `id` of the `swMProcess` shall be identical to the identifier of the NE and identify the `swMProcess` instance uniquely.

The steps in the `stepInfoList` shall conform to the content of the relevant `swMProfile` instance.
Example:
If the `stepsAndOfferedStopPointList` of `swMProfile` indicates `stopPointCanBeSetBeforeThisStep` for step X, then the entry for step X in the `stepInfoList` of `swMProcess` can only have the value `stopPointIsNotSet` .

When there is no relevant `swMProfile` at creation time of `swMProcess`, then the IRPAgent creates the `swMProcess` based on the relevant `swMCapability`. In this case preferably no stop point shall be set in the self configuration process.

When the last step of the self configuration process is completed successfully, the `swMProcess` instance is deleted automatically.

When self configuration process is terminated by the IRPManager, the `swMProcess` instance is deleted automatically.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_2 | |
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_3 | |
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_4 | |
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_5 | |
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_6 | |

### 4.3.6.2 Attributes

All attributes inherited from IOC `GenManProcess.`

Additional attributes: None.

### 4.3.6.3 Notifications

| Name | Qualifier | Notes |
|---|---|---|
| notifySwMProcessCreation | M | |
| notifySwMProcessStage | M | |
| notifySwMProcessDeletion | M | |

### 4.3.7 SwMIRP

#### 4.3.7.1 Definition

This information object represents a Software Management IRP. It inherits from IOC managedGenericIRP.

#### 4.3.7.2 Attributes

All attributes inherited from IOC managedGenericIRP.

Additional attributes: None.

#### 4.3.7.3 Notifications

All notifications inherited from IOC managedGenericIRP.

Additional notifications: None.

### 4.3.8 SwMManagedEntity

#### 4.3.8.1 Definition

The proxy IOC, SwMManagedEntity represents the role that can be played by an instance of a managed element. The objectClass and objectInstance identify a managed element instance.

## 4.4 Information relationship definitions

### 4.4.1 relation-swMIRP-swMCapability (M)

#### 4.4.1.1 Definition

This represents the relationship between SwMIRP and SwMCapability.

#### 4.4.1.2 Roles

| Name | Definition |
|---|---|
| theSwmIRP | It represents the SwmIRP. |
| theSwMCapability | It represents the SwMCapability |

#### 4.4.1.3 Constraints

There is no constraint for this relationship.

## 4.4.2 relation-SwmIRP-swMProfile (M)

### 4.4.2.1 Definition

This represents the relationship between `SwmIRP` and `SwMProfile`.

### 4.4.2.2 Roles

| Name | Definition |
|---|---|
| `theSwmIRP` | It represents the `SwmIRP.` |
| `theSwMProfile` | It represents the `SwMProfile.` |

### 4.4.2.3 Constraints

There is no constraint for this relationship.

## 4.4.3 relation-swMIRP-swMProcess (M)

### 4.4.3.1 Definition

This represents the relationship between `SwmIRP` and `SwMProcess`.

### 4.4.3.2 Roles

| Name | Definition |
|---|---|
| `theSwMIRP` | It represents the `SwMIRP.` |
| `theSwMProcess` | It represents the `SwMProcess.` |

### 4.4.3.3 Constraints

There is no constraint for this relationship.

## 4.4.4 relation-swMCapabilites-swMProfile (M)

### 4.4.4.1 Definition

This represents the relationship between `swMCapability` and `swMProfile`.

### 4.4.4.2 Roles

| Name | Definition |
|---|---|
| `theSwMCapability` | It represents the `swMCapability.` |
| `theSwMProfile` | It represents `the swMProfile.` |

### 4.4.4.3 Constraints

A relation can only exist between a `SwMProfile` and a `SwMCapability` when
a) all steps which are entries in the stepsAndSelectedStopPointList of SwMProfile have stopPointCanBeSetBeforeThisStep = Yes in the stepsAndOfferedStopPointList of the SwMCapability.b) nEInformation of SwMProfile is a subset of nEInformation of SwMCapability.

## 4.4.5 relation swMProfile-swMProcess (M)

### 4.4.5.1 Definition

This represents the relationship between `SwMProfile` and `SwMProcess`.

### 4.4.5.2 Roles

| Name | Definition |
|---|---|
| `theSwMProfile` | It represents the `theSwMProfile.` |
| `theSwMProcess` | It represents the `SwMProcess.` |

### 4.4.5.3 Constraints

A `SwMProcess` shall perform all self-configuration steps according to `stepsAndOfferedStopPointList` of `SwMProfile`.

A relation can only exist between a SwMProcess and a SwMProfile when nEIdentification of SwMProcess falls into nEInformation of SwMProfile.

# 4.5 Information attribute definitions

## 4.5.1 Definition and legal values

| Attribute Name | Definition | Legal Values |
|---|---|---|
| id | It identifies uniquely an instance of its object class. | |
| nEIdentification | This attribute identifies the NE for which the self management activity is done. | |
| nEInformation | This attribute defines the neType or NE instance/s - with optional software identification information - , for which this capability/profile instance is valid. | 'NE instance/s' only applies for instance/s already known to the IRPManager, e.g. in case of re-configuration or SW update. |
| startStepName | nameOfStep, this attribute defines the start step for resume operation. | The legal value of startStepName could be one of the step which defined in stepsAndOfferedStopPointList |
| swVersionToBeInstalled | This attribute describes which SW identification information shall be used at the end of self management in NEs for which this swMCapability/swMProfile applies. | |
| stepsAndOfferedStopPointList | Each entry in the list contains for each step the following information:<br>• nameOfStep:<br>This list shall be exhaustive; if a certain step is not visible or not supported in the SWM process, then it shall not be shown (listed) in the stepsAndOfferedStopPointList.<br>• sequenceNumberInProcess<br>• stopPointCanBeSetBeforeThisStep | nameOfStep:<br>nEHealthCheck,<br>swDownload,<br>swInstallation,<br>swActivation<br>More values for nameOfStep may be used by other IRPs.<br>All steps may be offered as stop points.<br><br>sequenceNumberInProcess:<br>Positive Integer<br><br>stopPointCanBeSetBeforeThisStep: Yes, No |
| stepsAndSelectedStopPointList | Each entry in the list contains for each step the following information:<br>• nameOfStep:<br>• sequenceNumberInProcess<br>• stopPointSetIndication | nameOfSwMStep,<br>sequenceNumberInProcess:<br>see stepsAndOfferedStopPointList<br><br>stopPointSetIndication:<br>stopPointIsSetBeforeThisStep, stopPointIsNotSet |

| | | |
|---|---|---|
| stepInfoList | This list attribute contains information about all steps and how far they have progressed. Each entry in the list contains:<br>• nameOfStep<br>• sequenceNumberInProcess<br>• stopPointSetIndication<br>• stepProgress | nameOfSwMStep,<br>sequenceNumberInProcess:<br>see stepsAndOfferedStopPointList<br><br>stopPointSetIndication:<br>see stepsAndSelectedStopPointList<br><br>stepProgress:<br>notYetStarted,<br>running,<br>completed,<br>awaitingResume,<br>failure,<br>terminated |
| swMprocessList | This attribute contains information about the instances of swMProcess . Each entry in the list contains (SET OF):<br>• id<br>• nEIdentification<br>• stepInfoList | See individual definitions of the list entry content. |
| offeredFinalAdministrativeStateInformation | It describes which selection is offered regarding the administrativeState of the NE after successful automated management: If it may have the value locked or unlocked or if the value of the administrativeState may be determined by the configuration data which is uploaded in the course of the automated management. | One or more of the following values:<br>locked,<br>unlocked,<br>determinedByConfigurationData<br>The value unlocked should always be present. |
| selectedFinalAdministrativeState | Determines which of the offers made regarding the administrativeState of the NE after successful self-configuration is taken. | One of the following values:<br>locked,<br>unlocked,<br>determinedByConfigurationData<br>Default value is value unlocked. |
| swVersionToBeInstalledOfferList | This list describes for which SW version/s the capability object is valid. The first element in the list indicates the default software version to be installed. | Minimum size of list: 1 entry |
| versionNumber | This number is the version number of a profile. Its value is 1 when a profile is created. It is incremented by 1 each time a profile is successfully changed. | Integer |
| profileId | This parameter records the identification of the profile used by the process. It consists of two data:<br>• id (of the profile)<br>• versionNumber | See versionNumber |
| matchingNEInformation | This parameter records the information of the NE which was matching with the nEInformation of the profile when determining which profile is to be used for the process. | See nEInformation |

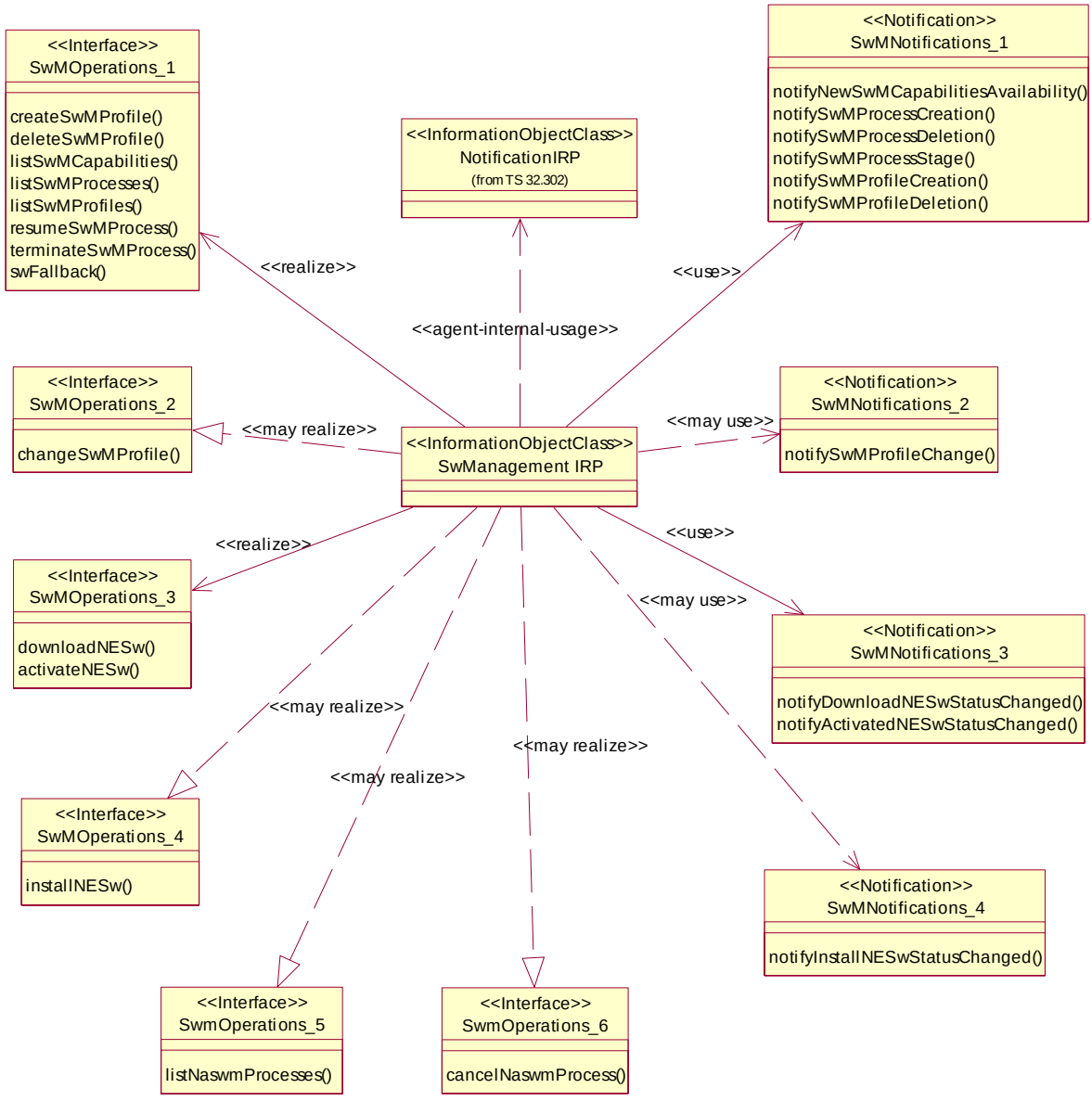
| | | |
|---|---|---|
| result | This parameter records the result of an operation. | success,<br>failure,<br>stepNameNotMatch: The current process step doesn"t match the startStepName in the operation.<br>nEInformationIntersection : There shall be no ambiguity which swMManagementProfile is valid for the NE. Therefore the nEInformation of different swMProfile instances shall not intersect. Example for a not allowed intersection: profile 1 has nEInformation=(neType=eNB), profile 2 has nEInformation=((neType=eNB) and (Id=1)). |

### 4.5.2 Constraints

None.

# 5 IRP descriptions: Interface Definitions

## 5.1 Class diagram representing interfaces




Additionally, the operations and notifications of this document are specified and grouped under Interfaces as shown in the following sections. To allow the flexible support of the necessary and sufficient operations and notifications for software management, the operations and notifications of this specification are packaged into two groups, one related to automatic software management (ASWM) and the other related to non-automated software management (NASWM).

Automatic Software Management requires the following operations and notifications:

1. SwMOperations_1 and SwMNotifications_1 shall be mandatory
2. SwMOperations_2 and SwMNotifications_2 shall be optional

Non Automatic Software Management requires the following operations and notifications:

1. SwMOperations_3 and SwMNotifications_3 shall be mandatory

2. SwMOperations_4 and SwMNotifications_4 shall be optional

3. SwMOperations_5 shall be conditional mandatory; the condition is: progress reporting for or cancellation of NASWM operations is supported.

4. SwMOperations_6 shall be conditional mandatory; the condition is: cancellation of NASWM operations is supported.

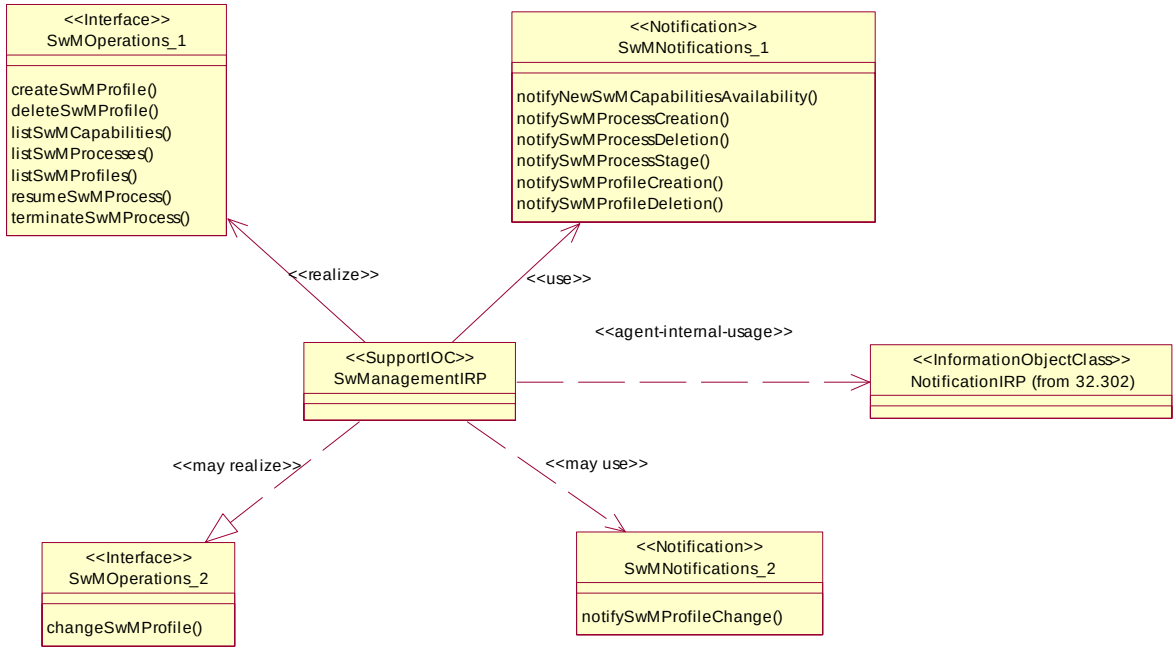



**Figure 5.1-2 Operations and Notifications for ASWM**

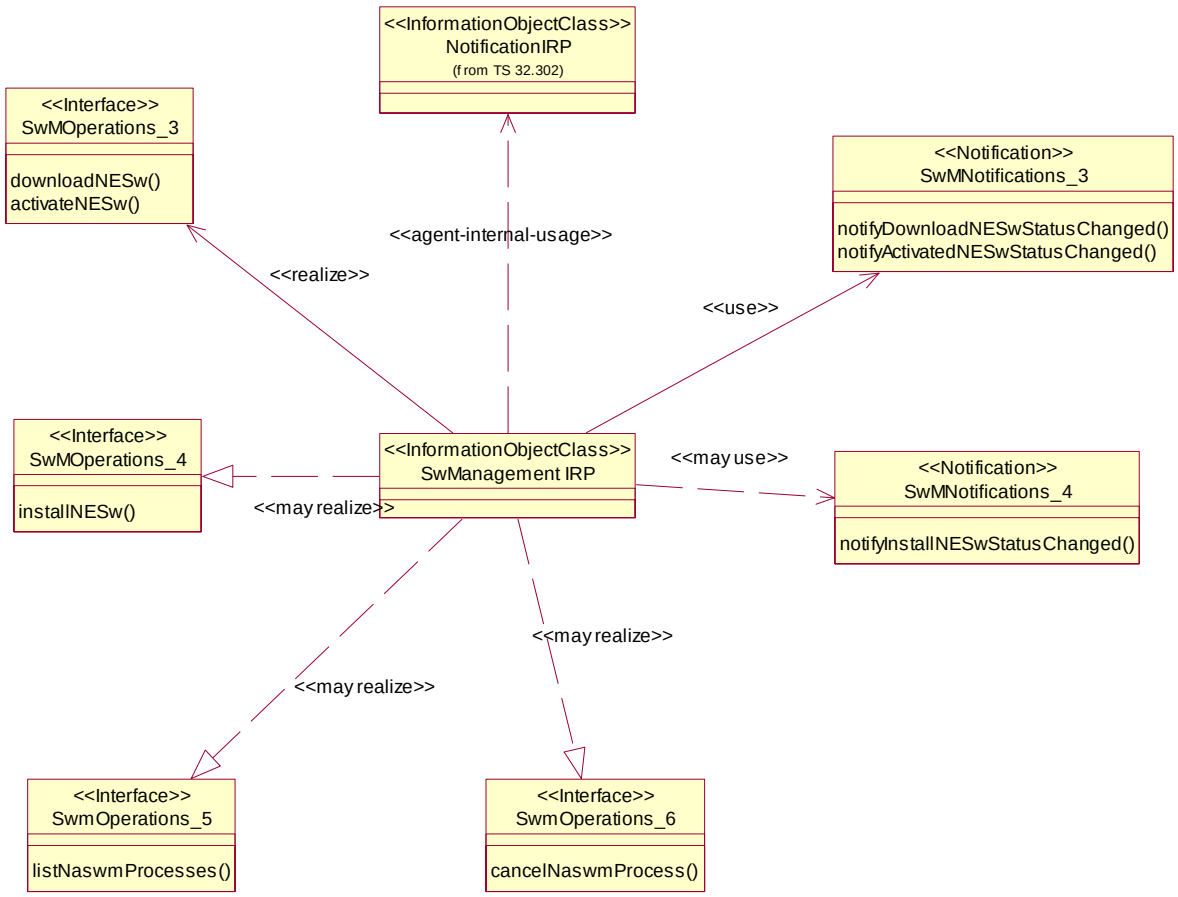



**Figure 5.1-3 Operations and Notifications for NASWM**

## 5.2 Generic rules

- **Rule 1:** each operation with at least one input parameter supports a pre-condition valid_input_parameter which indicates that all input parameters shall be valid with regards to their information type. Additionally, each such operation supports an exception operation_failed_invalid_input_parameter which is raised when pre-condition valid_input_parameter is false. The exception has the same entry and exit state.

- **Rule 2:** each operation with at least one optional input parameter supports a set of pre-conditions supported_optional_input_parameter_xxx where "xxx" is the name of the optional input parameter and the pre-condition indicates that the operation supports the named optional input parameter. Additionally, each such operation supports an exception operation_failed_unsupported_optional_input_parameter_xxx which is raised when (a) the pre-condition supported_optional_input_parameter_xxx is false and (b) the named optional input parameter is carrying information. The exception has the same entry and exit state.

- **Rule 3:** each operation shall support a generic exception operation_failed_internal_problem which is raised when an internal problem occurs and that the operation cannot be completed. The exception has the same entry and exit state.

NOTE: These rules are mapped at the solution set level. Pre-conditions and exceptions, generated by these rules, need not appear explicitly in the present document.

# 5.3 SwMIRPOperations_1 Interface (M)

## 5.3.1 Operation listSwMCapabilities (M)

### 5.3.1.1 Definition

This operation allows the IRPManager to determine on the Itf-N interface which steps in the SW management are performed in NEs of a certain type, what is done by the NE in case a step does not perform normally and before which steps a stop point can be set, such that the software download halts and waits for a continuation request by the IRPManager.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_1 | |

### 5.3.1.2 Input parameters

| Parameter Name | Qualifier | Information type | Comment |
|---|---|---|---|
| nEInformation | M | swM.nEInformation | If this input parameter contains no information, all (offered) SwMCapability instances are to be listed in the output. |

### 5.3.1.3 Output parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| capabilityList | M | swM.capabilityList | Each entry in the list contains:<br>• Id of SwMCapability<br>• nEInformation of SwMCapability<br>• swVersionToBeInstalledOfferList of SwMCapability<br>• stepsAndOfferedStopPointList of SwMCapability<br>• offeredFinalAdministrativeStateInformation of SwMCapability |
| result | M | swM.result | result=success and empty swMCapabilityList mean: No instance found. |

### 5.3.1.4 Post-condition

| Assertion Name | Definition |
|---|---|
| dataDelivered | The requested data is delivered. |

### 5.3.1.5 Exceptions

#### 5.3.1.5.1 operation_failed

| Exception Name | Definition |
|---|---|
| operation_failed | Condition: Pre-condition is false or post-condition is false.<br>Returned Information: The output parameter result.<br>Exit state: Entry state. |

## 5.3.2 Operation listSwMProfiles (M)

### 5.3.2.1 Definition

This operation allows the IRPManager to find out which instances of SwMProfile are valid NEs of a certain type.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_1 | |
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_2 | |

### 5.3.2.2 Input parameters

| Parameter Name | Qualifier | Information type | Comment |
|---|---|---|---|
| nEInformation | M | swM.nEInformation | If this input parameter contains no information, all profile instances are to be listed in the output. |

### 5.3.2.3 Output parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| swMProfileList | M | swM.swMProfileList | Each entry in the list contains:<br>• Id of profile<br>• versionNumber of swMprofile<br>• nEInformation of profile<br>• stepsAndSelectedStopPointList of profile<br>• selectedFinalAdministrativeState of profile<br>• conditionally swVersionToBeInstalled of swMprofile |
| result | M | swM.result | |

## 5.3.3 Operation createSwMProfile (M)

### 5.3.3.1 Definition

This operation allows the IRPManager to establish an instance of SwMProfile to be valid for NEs of a certain type.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_2 | |

### 5.3.3.2 Input parameters

| Parameter Name | Qualifier | Information type | Comment |
|---|---|---|---|
| id | O | swM.id | Identifier of swMprofile |
| nEInformation | M | swM.nEInformation | See 4.5 |
| swVersionToBeInstalled | M | swM.swVersionToBeInstalled | See 4.5 |
| stepsAndSelectedStopPointList | M | swM.stepsAndSelectedStopPointList | See 4.5 |
| selectedFinalAdministrativeState | M | swM.selectedFinalAdministrativeState | See 4.5 |

#### 5.3.3.3 Output parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| id | CM | SwMProfile.id | See the definition of the result field described below |
| result | M | ENUM<br>{<br>success,<br>failure,<br>nEInformationIntersection,<br>notAllowedBecauseOfOngoingSwmActivity<br>} | If result = success , then parameter id contains the id of the created swMProfile.<br>If result = failure , then parameter id is absent.<br>If result = nEInformationIntersection, then parameter id contains the id of a swMProfile whose nEInformation would intersect with the proposed nEInformation for the new swMProfile, which was not created in this case.<br>If result = notAllowedBecauseOfOngoingSwmOperation, then parameter id is absent. |

### 5.3.4 Operation deleteSwMProfile (M)

#### 5.3.4.1 Definition

This operation allows the IRPManager to delete an instance of swMProfile.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_2 | |

#### 5.3.4.2 Input parameters

| Parameter Name | Qualifier | Information type | Comment |
|---|---|---|---|
| id | M | swM.id | Identifier of swMprofile |

#### 5.3.4.3 Output parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| result | M | swM.result | |

## 5.3.5 Operation listSwMProcesses (M)

### 5.3.5.1 Definition

This operation allows the IRPManager to find out the status of one or several swMProcess instances

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_4 | |

### 5.3.5.2 Input parameters

| Parameter Name | Qualifier | Information type | Comment |
|---|---|---|---|
| nEIdentification | O | swM.nEIdentification | It describes for which NE the swMprocess is to be listed.<br><br>If this parameter is not present, all swMprocess instances are to be listed in the output. |

### 5.3.5.3 Output parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| swMprocessList | M | swM.swMprocessList | See 4.5 |
| result | M | swM.result | result=success and empty swMProcessList mean: No instance found |

## 5.3.6 Operation resumeSwMProcess (M)

### 5.3.6.1 Definition

This operation allows the IRPManager to resume a SW management process which currently has stopped at a stop point step.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_3 | |

### 5.3.6.2 Input parameters

| Parameter Name | Qualifier | Information type | Comment |
|---|---|---|---|
| id | M | swM.id | Identifier of swMprocess |
| startStepName | M | swM.NameOfStep | The start step for the resume operation.<br>If the current process step is equal to the startStepName value, the process will start from startStepName.<br>If the current process step does not match the startStepName value, then it will be indicated in the result of the operation. Not matching startStepName value can either be the case that the process has already started from the specified step (i.e. request is too late) or that the process has not yet reached the specified step (i.e request is too early). |

#### 5.3.6.3 Output parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| result | M | swM.result | |

### 5.3.7 Operation swFallback (M)

#### 5.3.7.1 Definition

This operation enables the IRPManager to initiate a SW fallback.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_SWM_FUN_6 | |

#### 5.3.7.2 Input parameters

| Parameter Name | Qualifier | Information type | Comment |
|---|---|---|---|
| filter | M | swM.filter | To describe properties of the NEs to be selected. |

#### 5.3.7.3 Output parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| nEList | M | swM.nEList | Each entry in the list contains:<br>nEIdentification<br>swFallbackStatus (values: fallbackSuccessful, fallbackUnsuccessful) |
| result | M | swM.result | • Success,<br>• Partly successful – swFallbackStatus is fallbackUnsuccessful for at least one NE and fallbackSuccessful for at least one other NE<br>• Failure<br><br>Empty NEList and Result=Success means: No NEs fulfilling filter were found. |

## 5.3.8 Operation `terminateSwMProcess` (M)

### 5.3.8.1 Definition

This operation allows the IRPManager to terminate a SW management process which is currently ongoing.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_6 | |

### 5.3.8.2 Input parameters

| Parameter Name | Qualifier | Information type | Comment |
|---|---|---|---|
| `id` | M | `swM.id` | Identifier of swMprocess . |

### 5.3.8.3 Output parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| `result` | M | `swM.result` | |

# 5.4 SwMIRPOperations_2 Interface (O)

## 5.4.1 Operation changeSwMProfile (O)

### 5.4.1.1 Definition

This operation allows the IRPManager to change an instance of SwMProfile.

A change in a profile which was already used at the start of an swMProcess does not affect that swMProcess (which is run to its completion according to the former version of the profile.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_2 | |

### 5.4.1.2 Input parameters

| Parameter Name | Qualifier | Information type | Comment |
|---|---|---|---|
| id | M | swM.id | Identifier of swMprofile |
| nEInformation | M | swM.nEInformation | See 4.5 |
| swVersionToBeInstalled | M | swM.swVersionToBeInstalled | See 4.5 |
| stepsAndSelectedStopPointList | M | swM.stepsAndSelectedStopPointList | See 4.5 |
| selectedFinalAdministrativeState | M | swM.selectedFinalAdministrativeState | See 4.5 |

### 5.4.1.3 Output parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| result | M | ENUM<br>{<br>success,<br>failure,<br>nEInformationIntersection,<br>notAllowedBecauseOfOngoingSwmActivity<br>} | If result = success or failure , then parameter id may be absent or contain the id of the changed swMprofile.<br>If result = nEInformationIntersection, then parameter conflictingProfileId contains the id of a SwMProfile 'A' whose nEInformation would intersect with the proposed nEInformation for the SwMProfile'B' = input parameter id. SwMProfile'B' will not be changed in this case.<br>If result = notAllowedBecauseOfOngoingSwmActivity, (which means that the operation is rejected because another SWM activity is ongoing for at least one NE covered by input parameter neInformation), then parameter conflictingProfileId is absent. |
| versionNumber | M | SwMProfile.versionNumber | See 4.5. This parameter has value 0 when result <> success. |
| conflictingProfileId | C *) | SwMProfile.id | See definition of result above. |

Editor Note: whether this parameter needs to be conditional or mandatory needs further discussion. The condition: result_is_nEInformationIntersection

#### 5.4.1.4 Constraints

| Name | Definition |
|---|---|
| result_is_nEInformationIntersection | result is equal to nEInformationIntersection |

# 5.5 SwMIRPNotifications_1 Interface (M)

## 5.5.1 Notification notifySwMProfileCreation (M)

### 5.5.1.1 Definition

This notification conveys information about the creation of an instance of IOC swMProfile.

### 5.5.1.2 Input parameters

| Parameter Name | Qualifiers | Matching Information | Comment |
|---|---|---|---|
| id | M,Y | swM.id | Identifier of swMprofile |
| versionNumber | M, Y | swM.versionNumber | See 4.5 |
| nEInformation | M,Y | swM.nEInformation | See 4.5 |
| swVersionToBeInstalled | M,Y | swM.swVersionToBeInstalled | See 4.5 |
| stepsAndSelectedStopPointList | M,N | swM.stepsAndSelectedStopPointList | See 4.5 |
| selectedFinalAdministrativeState | M,N | swM.selectedFinalAdministrativeState | See 4.5 |

## 5.5.2 Notification notifySwMProfileDeletion (M)

### 5.5.2.1 Definition

This notification conveys information about the deletion of an instance of IOC swMProfile.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_2 | |

### 5.5.2.2 Input parameters

| Parameter Name | Qualifiers | Matching Information | Comment |
|---|---|---|---|
| id | M,Y | swM.id | Identifier of swMprofile |

## 5.5.3 Notification notifySwMProcessCreation (M)

### 5.5.3.1 Definition

This notification conveys information about the creation of an instance of IOC `swMProcess`.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_2 | |

### 5.5.3.2 Input parameters

| Parameter Name | Qualifiers | Matching Information | Comment |
|---|---|---|---|
| `id` | M,Y | `swM.id` | Identifier of swMprocess |
| `nEIdentification` | M,Y | `swM.nEIdentification` | see 4.5 |
| `profileId` | M,N | `swM.profileId` | see 4.5 |
| `matchingNEInformation` | M,N | `swM.matchingNEInformation` | see 4.5 |
| `stepInfoList` | M,N | `swM.stepInfoList` | see 4.5 |

## 5.5.4 Notification `notifySwMProcessStage` (M)

### 5.5.4.1 Definition

This notification conveys information about the stage of an instance of IOC `swMProcess` that has been completed or at which that process has been stopped (based on pre-set stop points).

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_5 | |

### 5.5.4.2 Input parameters

| Parameter Name | Qualifiers | Matching Information | Comment |
|---|---|---|---|
| `id` | M,Y | `swM.id` | Identifier of swMprocess |
| `stepInfoList` | M,N | `swM.stepInfoList` | `see 4.5` |

## 5.5.5 Notification notifySwMProcessDeletion (M)

### 5.5.5.1 Definition

This notification conveys information about the deletion of an instance of IOC `swMProcess`

IRPAgent shall also send out this notification in case of a process termination caused by an exception, for example IRP Agent terminates the process because it had to wait too long after a suspend operation.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_2 | |

### 5.5.5.2 Input parameters

| Parameter Name | Qualifiers | Matching Information | Comment |
|---|---|---|---|
| `id` | M,Y | `swM.id` | Identifier of swMprocess |
| `triggerForDeletion` | M, Y | `swM.triggerForDeletion` | This parameter describes what triggered the deletion of the swMprocess instance:<br>`triggerForDeletion:`<br>irpAgentTermination,<br>irpManagerTermination,<br>automatedSWMSuccesfullyConcluded |
| `additionalInformation` | O, N | `swM.additionalInformation` | |

## 5.5.6 Notification `notifyNewSwAvailability` (M)

### 5.5.6.1 Definition

This notification conveys information about the availability of new SW.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_2 | |

### 5.5.6.2 Input parameters

| Parameter Name | Qualifiers | Matching Information | Comment |
|---|---|---|---|
| `nEandSWversion` | M,Y | `swM.NEandSWversion` | Informs about new available SW, SW version and NE / NE version (types) for which it is valid |

# 5.6 SwMIRPNotifications_2 Interface (O)

## 5.6.1 Notification notifySwMProfileChange (C/O)

### 5.6.1.1 Definition

This notification conveys information about a change of an instance of IOC swMProfile.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_ASWM_FUN_2 | |

### 5.6.1.2 Input parameters

| Parameter Name | Qualifiers | Matching Information | Comment |
|---|---|---|---|
| id | M,Y | swM.id | Identifier of swMprofile |
| versionNumber | M,Y | swM.versionNumber | See 4.5 |
| nEInformation | M,Y | swM.nEInformation | See 4.5 |
| swVersionToBeInstalled | M,N | swM.swVersionToBeInstalled | See 4.5 |
| stepsAndSelectedStopPointList | M,N | swM.stepsAndSelectedStopPointList | See 4.5 |
| selectedFinalAdministrativeState | M | swM.selectedFinalAdministrativeState | See 4.5 |

# 5.7 SwMIRPOperations_3 Interface (M)

## 5.7.1 Operation downloadNESw (M)

### 5.7.1.1 Definition

This operation allows IRPManager to request an IRPAgent to download network element software entities from a specified location. IRPManager provides a unique reference where IRPAgent can download NE software from.

NOTE: The file transfer may not happen over Itf-N and the details on how to transfer file from IRPAgent to NE(s) is vendor specific and outside the scope of this specification.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_NASWM_FUN_1 | |
| 3GPP TS 32.531 [6] | REQ_NASWM_FUN_2 | |

### 5.7.1.2 Input parameters

| Parameter Name | Qualifier | Information type | Comment |
|---|---|---|---|
| swToBeDownloaded | M | List of STRUCT <<br>swLocation,<br>swFileSize,<br>swFileCompression,<br>swFileFormat<br>> | These attributes represent information about the NE software which will be downloaded by IRPAgent.<br><br>*swLocation:* Denotes a unique location of software. This attribute includes the name of the software or a software version.<br><br>*swFileSize:* It identifies the size of the file. Its value is positive Integer (the unit is byte). It is optional to fill in this attribute value.<br><br>*swFileCompression:* It identifies the name of the compression algorithm used for the file. An empty fileCompression means that there is no compression on the file. Choice of compression algorithm is vendor-specific but is encouraged to use industrial standard algorithm such as GZIP. It is optional to fill in this attribute value.<br><br>*swFileFormat:* It identifies the encoding technique used by the file. It is optional to fill in this attribute value |
| neIdentifier | M | Distinguished Name (DN) | Identifies the destination where the software can be downloaded and can include network element, managed element or managed functionality etc. The information is represented using a full Distinguished Name according to 3GPP TS 32.300. |

### 5.7.1.3 Output parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| ownloadProcessId | M | Integer | An Identifier generated by IRPAgent upon receiving a non-automated software management request from IRPManager.<br>In this case, it identifies the NE software download operation request. |
| esult | M | ENUM<br>{<br>requestAccepted,<br>requestFailed,<br>notAllowedBecauseOfOngoingSwmActivity<br>} | Indicates whether SwMIRP has accepted or rejected the download request.<br><br>It can have any one of the three possible values:<br>– 'requestAccepted' which means that IRPAgent would perform the NE software download operatio<br>– 'requestFailed' which means that IRPAgent has failed to initiate the NE software download operation. Specific error condition can be captured in reason field<br>– notAllowedBecauseOfOngoingSwmActivity which means that the operation is rejected becaus another SWM activity is ongoing for the requested NE.. |
| eason | O | String | To capture detailed error reason. The field is empty when there is no error. |
| istOfStepNumbersAnd-urations | CM Note 1) | List of<br>{<br>Integer;<br>(Integer;Integer;Integer)<br>} | This identifies a list of steps of the non-automated software management process and for each step the estimated duration (hours, minutes, seconds) for its completion. |

Note 1:Condition: Progress reporting of NASWM operations is supported.

#### 5.7.1.4 Pre condition

| Assertion Name | Definition |
|---|---|
| swDownloadable | NE software is available which IRPAgent can download |

#### 5.7.1.5 Post-condition

| Assertion Name | Definition |
|---|---|
| swDownloadInProgress | The SwMIRP has accepted the download request to perform the requested operation. |
| swAvailable | This is the final state when downloadNESw operation is complete and notifyDownloadNESwStatusChanged has been generated. |

#### 5.7.1.6 Exceptions

| Exception Name | Definition |
|---|---|
| operationFailed | Condition: Pre-condition is false or post-condition is false.<br>Returned Information: The output parameter status.<br>Exit state: Entry state. |
| resourceLimitation | Condition: Operation not performed due to resource limitation.<br>Returned Information: The output parameter status.<br>Exit state: Entry state. |

### 5.7.2 Operation activateNESw (M)

#### 5.7.2.1 Definition

This operation allows IRPManager to activate network element software entity which has been previously downloaded or installed on the request of IRPManager. This operation may be service affecting.

NOTE: activateNESw can be triggered through automatic or manual ways.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_NASWM_FUN_5 | |
| 3GPP TS 32.531 [6] | REQ_NASWM_FUN_8 | |

#### 5.7.2.2 Input parameters

| Parameter Name | Qualifier | Information type | Comment |
|---|---|---|---|
| swVersionToBeActivated | M | swVersion | swVersion denotes the software version which would be activated. The details on how to activate a software version is vendor specific. |
| neIdentifier | M | Distinguished Name (DN) | Identifies the destination where software has to be activated. This is a full Distinguished Name according to 3GPP TS 32.300 |

### 5.7.2.3 Output parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| ctivateProcessId | M | Integer | An Identifier is generated by IRPAgent upon receiving non-automated software management request from IRPManager. In this case, it identifies the NE software activation operation request. This id is unique for activateNESw operations. |
| esult | M | ENUM<br>{<br>requestAccepted,<br>requestFailed,<br>notAllowedBecauseOfOngoingSwmActivity<br>} | Indicates whether SwMIRP has accepted or rejected the NE software activation request.<br><br>It can have any one of the three possible values:<br>– 'requestAccepted' which means that IRPAgent would perform the NE software activation operatio<br>– 'requestFailed' which means that IRPAgent has failed to initiate the NE software activation operation. Specific error condition can be captured in reason field<br>– notAllowedBecauseOfOngoingSwmActivity which means that the operation is rejected becaus another SWM activity is ongoing for the requested NE.. |
| eason | O | String | To capture specific error conditions. The field is empty when there is no error. |
| istOfStepNumbersAnd-urations | CM Note 1) | See 5.7.1.3 | See 5.7.1.3 |

Note 1:Condition: Progress reporting of NASWM operations is supported.

### 5.7.2.4 Pre condition

swAvailable or swInstalled

| Assertion Name | Definition |
|---|---|
| swAvailable | The NE software has been successfully downloaded |
| swInstalled | The NE software has been installed |

### 5.7.2.5 Post-condition

| Assertion Name | Definition |
|---|---|
| swActivationInProgress | The SwMIRP has accepted the request to perform the requested activation operation. |
| swActivated | This is the final state when activateNESw operation is complete and notifyActivateNESwStatusChanged has been generated |

### 5.7.2.6 Exceptions

| Exception Name | Definition |
|---|---|
| operationFailed | Condition: Pre-condition is false or post-condition is false.<br>Returned Information: The output parameter status.<br>Exit state: Entry state. |
| resourceLimitation | Condition: Operation not performed due to resource limitation.<br>Returned Information: The output parameter status.<br>Exit state: Entry state. |

# 5.8 SwMIRPOperations_4 Interface (O)

## 5.8.1 Operation `installNESw` (O)

### 5.8.1.1 Definition

This operation allows IRPManager to initiate installation of NE software entity which has been previously downloaded on the request of IRPManager. Installation may also be initiated from a remote location.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_NASWM_FUN_3 | |
| 3GPP TS 32.531 [6] | REQ_NASWM_FUN_4 | |

### 5.8.1.2 Input parameters

| Parameter Name | Qualifier | Information type | Comment |
|---|---|---|---|
| `swTobeInstalled` | M | swLocation | swLocation denotes a unique location (local or remote) of software which can be a directory path or a URL and includes 1) the name of software or 2) a software version |
| `neIdentifier` | M | Distinguished Name (DN) | Identifies the destination where the NE software needs to be installed. This is a full Distinguished Name according to 3GPP TS 32.300 |

### 5.8.1.3 Output parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| `nstallProcessId` | M | Integer | An Identifier generated by IRPAgent upon receiving a non-automated software management request from IRPManager. In this case, it identifies the NE softwar installation operation request. This id is unique for installNESw operations. |
| `esult` | M | ENUM<br>{<br>requestAccepted,<br>requestFailed,<br>`notAllowedBecauseOfOngoingSwmActivity`<br>} | Indicates whether SwMIRP has accepted or rejected the installation request.<br><br>It can have any one of the twhreeo possible values:<br>– 'requestAccepted' which means that IRPAgent ul perform the NE software installation operation<br>– 'requestFailed' which means that IRPAgent has failed to initiate the NE software installation operation. Specific error condition can be captured in reason field<br>– `notAllowedBecauseOfOngoingSwmActivit` which means that the operation is rejected because automatic SWM is ongoing for the requested NE.. |
| `eason` | O | String | To capture detailed error conditions. The field is emp when there is no error. |
| `istOfStepNumbersAnd-urations` | CM Note 1) | See 5.7.1.3 | See 5.7.1.3 |

Note 1: Condition: Progress reporting of NASWM operations is supported..

#### 5.8.1.4 Pre condition

| Assertion Name | Definition |
|---|---|
| swAvailable | NE software is available |

#### 5.8.1.5 Post-condition

| Assertion Name | Definition |
|---|---|
| swInstallationInProgress | The SwMIRP has successfully accepted the request to perform the requested installation operation |
| swInstalled | This is the final state when installNESw operation is complete and notifyInstallNESwStatusChanged has been generated |

#### 5.8.1.6 Exceptions

| Exception Name | Definition |
|---|---|
| operationFailed | Condition: Pre-condition is false or post-condition is false.<br>Returned Information: The output parameter status.<br>Exit state: Entry state. |
| resourceLimitation | Condition: Operation not performed due to resource limitation.<br>Returned Information: The output parameter status.<br>Exit state: Entry state. |
| swNotAvailable | Condition: NE software is not available.<br>Returned Information: The output parameter status.<br>Exit state: Entry state. |

# 5.9 SwMIRPNotifications_3 Interface (M)

## 5.9.1 Notification notifyDownloadNESwStatusChanged (M)

### 5.9.1.1 Definition

This notification, generated by IRPAgent conveys information about the status of the downloadNESw operation.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_NASWM_FUN_1 | |

### 5.9.1.2 Input parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| objectClass | M, Y | SwMManagedEntity.objectClass | Represents the network element object class generating this event. Also refer to Notification header [9]. |
| objectInstance | M,Y | SwMManagedEntity.objectInstance | Represents the network element instance generating the event. Also refer to Notification header [9]. |
| notificationId | O,N | -- | Refer to Notification header [9]. |
| eventTime | M,Y | -- | Refer to Notification header [9]. |
| systemDN | C,Y | -- | Refer to Notification header [9]. |
| notificationType | M,Y | 'notifyDownloadNESwStatusChanged' | |
| downloadProcessId | M, Y | Integer | To allow IRPManager correlate this notification with the downloadNESw operation request. Also refer to section 5.7.1 |
| downloadOperationStatus | M,Y | enum {<br>NE_SWDOWNLOAD_SUCCESSFUL,<br>NE_SWDOWNLOAD_FAILED,<br>NE_SWDOWNLOAD_PARTIALLY_SUCCESSFUL<br>} | Provides information on the status of downloadNESw operation for the network element involved. Note: When only one software entity has to be downloaded, downloadOperationStatus can be either NE_SWDOWNLOAD_SUCCESSFUL or NE_SWDOWNLOAD_FAILED. |
| downloadedNESwInfo | O,N | LIST<DownloadedNESw> | Information on where the software or version got downloaded on the NE |
| failedSwInfo | O,N | LIST<FailedSw, FailureReason> | Information on software not abled to be downloaded and the corresponding failure reason. |

#### 5.9.1.3 Triggering Event

##### 5.9.1.3.1 From State

neSwDownloadInProgress

| Assertion Name | Definition |
|---|---|
| neSwDownloadInProgress | IRPAgent has accepted the request to download software and downloadProcessId is available |

##### 5.9.1.3.2 To State

neSwDownloadSuccessful or neSwDownloadFailed or neSwDownloadPartiallySuccessful.

| Assertion Name | Definition |
|---|---|
| neSwDownloadSuccessful | Software has been successfully downloaded. When multiple software have to be downloaded, it means that all software entities have been downloaded successfully |
| neSwDownloadFailed | Software has not been downloaded. When multiple software have to be downloaded, it means that no software has been downloaded |
| neSwDownloadPartiallySuccessful | At least one of the software has not been downloaded (hence can be used only when multiple software need to be downloaded) |

#### 5.9.1.4 Constraints

None

### 5.9.2 Notification notifyActivateNESwStatusChanged (M)

#### 5.9.2.1 Definition

This notification, generated by IRPAgent conveys information about the status of the activateNESw operation.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_NASWM_FUN_5 | |

### 5.9.2.2 Input parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| objectClass | M, Y | SwMManagedEntity.objectClass | Represents the network element object class generating this event. Also refer to Notification header [9]. |
| objectInstance | M, Y | SwMManagedEntity.objectInstance | Represents the network element instance generating the event. Also refer to Notification header [9]. |
| notificationId | O,N | -- | Refer to Notification header [9]. |
| eventTime | M,Y | -- | Refer to Notification header [9]. |
| systemDN | C,Y | -- | Refer to Notification header [9]. |
| notificationType | M,Y | 'notifyActivateNESwStatusChanged' | |
| activateProcessId | M, Y | Integer | To allow IRPManager correlate this notification with the activateNESw operation request. Also Refer to section 5.7.2 |
| activateOperationStatus | M,Y | ENUM{<br>NE_SWACTIVATION_SUCCESSFUL,<br>NE_SWACTIVATION_FAILED,<br>NE_SWACTIVATION_PARTIALLY_SUCCESSFUL<br>} | Provides information on the status o activateNESw operation for the network element involved. When the activation could get completed to onl a certain extent, partial success may be used. |
| swVersion | M, Y | swVersion | The software version which the activateNESw operation has tried to activate, no matter the activateNESw operation is successful or failed or partially successful. |
| failureReason | CM,N | String | The error reason when the activateNESw operation is not successful.<br><br>Condition:<br>**activateOperationStatus <>** NE_SWACTIVATION_SUCCESSFU |

### 5.9.2.3 Triggering Event

#### 5.9.2.3.1 From State

neSwActivationInProgress

| Assertion Name | Definition |
|---|---|
| neSwActivationInProgress | IRPAgent has accepted the request to activate software and activateProcessId is available |

#### 5.9.2.3.2 To State

neSwActivationSuccessful or neSwActivationFailed or neSwActivationPartiallySuccessful.

| Assertion Name | Definition |
|---|---|
| neSwActivationSuccessful | Software has been successfully activated. |
| neSwActivationFailed | Software has not been activated. |
| neSwActivationPartiallySuccessful | When activation can be completed only to a certain extent, partial success may be used. |

### 5.9.2.4 Constraints

None.

# 5.10 SwMIRPNotifications_4 Interface (O)

## 5.10.1 Notification notifyInstallNESwStatusChanged (O)

### 5.10.1.1 Definition

This notification, generated by IRPAgent conveys information about the status of the installNESw operation.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_NASWM_FUN_3 | |

### 5.10.1.2 Input parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| objectClass | M, Y | SwMManagedEntity.objectClass | Represents the network element object class generating this event. Also refer to Notification header [9]. |
| objectInstance | M, Y | SwMManagedEntity.objectInstance | Represents the network element instance generating the event. Also refer to Notification header [9] |
| notificationId | O,N | -- | Refer to Notification header [9]. |
| eventTime | M,Y | -- | Refer to Notification header [9]. |
| systemDN | C,Y | -- | Refer to Notification header [9]. |
| notificationType | M,Y | 'notifyInstallNESwStatusChanged' | |
| installProcessId | M, Y | Integer | To allow IRPManager correlate this notification with the installNESw operation request. Also refer to section 5.8.1 |
| installOperationStatus | M,Y | ENUM {<br>NE_SWINSTALLATION_SUCCESSFUL,<br>NE_SWINSTALLATION_FAILED,<br>NE_SWINSTALLATION_PARTIALLY_SUCCESSFUL<br>} | Provides information on the status of installNESw operation for the network element involved. |
| installedNESwInfo | O,N | LIST<InstalledNESw> | Information on where the software or version got installed on the NE |
| failedSwInfo | O,N | LIST<FailedSw, FailureReason> | It provides information on the software which failed in installation |

### 5.10.1.3 Triggering Event

#### 5.10.1.3.1 From State

neSwInstallationInProgress

| Assertion Name | Definition |
|---|---|
| neSwInstallationInProgress | IRPAgent has accepted the request to install software and installProcessId is available |

#### 5.10.1.3.2 To State

`neSwInstallationSuccessful or neSwInstallationFailed or neSwInstallationPartiallySuccessful.`

| Assertion Name | Definition |
|---|---|
| neSwInstallationSuccessful | Software has been successfully installed |
| neSwInstallationFailed | Software has not been installed |
| neSwInstallationPartiallySuccessful | At least one of software has not been installed |

### 5.10.1.4 Constraints

None.

## 5.11 SwmOperations_5 Interface (CM)

### 5.11.1 Operation `listNaswmProcesses` (M)

#### 5.11.1.1 Definition

This operation allows the IRPManager to find out the status of one or several downloadNESw, installNESw or activateNESw operations which have not yet been completed.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_NASWM_FUN_7 | |

#### 5.11.1.2 Input parameters

| Parameter Name | Qualifier | Information type | Comment |
|---|---|---|---|
| `naswmProcessId` | `O` | `swM.naswmProcessId` | It identifies the ongoing `downloadProcessId` or `installProcessId` or `activateProcessId` of the operation about which information is to be listed in the output.<br><br>If this parameter is not present, all processes of the input `naswmOperationType` are to be listed in the output. |
| `naswmOperationType` | `M` | `swM.naswmOperationType` | It describes whether information is requested about an ongoing `downloadNESw`, `installNESw` or `activateNESw` operation. |

#### 5.11.1.3 Output parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| naswmProcessList | M | swM.naswmProcessList | Each entry of this list contains:<br>naswmProcessId (M) , see 5.11.1.2<br>neIdentification (M) , see 4.5.1<br>naswmOperationType (M) , see 5.11.1.2<br>estimatedRemainingCompletionTime (M) – indicating the estimated remaining time until completion of the operation in hours, minutes, seconds<br>listOfStepNumbersAndDurations (O) , see 5.7.1.3<br>numberOfCurrentProcessStep (O) - indicating which of the steps is currently performed<br>estimatedRemainingCompletionTimeForTheCurrentStep (O) – indicating the estimated remaining time until completion of the current process step in hours, minutes, seconds |
| result | M | swM.result | result=success and empty naswmProcessList mean: No ongoing NASWM process found |
| reason | O | String | To capture detailed error conditions. The field is empty when there is no error. |

## 5.12 SwmOperations_6 Interface (CM)

### 5.12.1 Operation cancelNaswmProcesses (M)

#### 5.12.1.1 Definition

This operation allows the IRPManager to request from the IRPAgent to cancel a downloadNESw or installNESw or activateNESw operation.

Information on Requirements Traceability:

| Referenced TS | Requirement label | Comment |
|---|---|---|
| 3GPP TS 32.531 [6] | REQ_NASWM_FUN_2,<br>REQ_NASWM_FUN_4,<br>REQ_NASWM_FUN_8 | |

#### 5.12.1.2 Input parameters

| Parameter Name | Qualifier | Information type | Comment |
|---|---|---|---|
| processId | M | Integer | It describes which download/activate/installNESw operation is to be cancelled, i.e. gives its download/install/activationProcessId as provided in the output parameters of download/activate/installNESw operation. |
| naswmOperationType | M | swM.naswmOperationType | It describes whether cancellation is requested of a ongoing downloadNESw, installNESw or activateNESw operation. |

#### 5.12.1.3 Output parameters

| Parameter Name | Qualifier | Matching Information | Comment |
|---|---|---|---|
| result | M | swM.result | success or operationIsAlreadyCompleted or noSuchProcess or failure |
| reason | O | String | To capture detailed error conditions. The field is empty when there is no error. |

#### 5.12.1.4 Pre condition

| Assertion Name | Definition |
|---|---|
| operationStoppable | The specified operation is ongoing and can be terminated |

#### 5.12.1.5 Post-condition

downloadedSWIsDeleted or swCanBeActivatedLater or swUninstalled

| Assertion Name | Definition |
|---|---|
| downloadedSWIsDeleted | This post-condition applies if the operation to be cancelled has naswmOperationType downloadNESw: If software has been downloaded before the download operation was cancelled, then it is deleted. |
| swCanBeActivatedLater | This post-condition applies if the operation to be cancelled has naswmOperationType activateNESw: The software which was not activated can been activated at another later time. |
| swUninstalled | This post-condition applies if the operation to be cancelled has naswmOperationType installNESw: The software which was not completely installed is completely uninstalled. |

#### 5.12.1.6 Exceptions

| Exception Name | Definition |
|---|---|
| operationFailed | Condition: Pre-condition is false or post-condition is false.<br>Returned Information: The output parameter status.<br>Exit state: Entry state. |
| resourceLimitation | Condition: Operation not performed due to resource limitation.<br>Returned Information: The output parameter status.<br>Exit state: Entry state. |

# Annex A (informative): Change history

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Date** | **TSG #** | **TSG Doc.** | **CR** | **Rev** | **Subject/Comment** | **Old** | **New** |
| 2008-12 | SP-42 | SP-080717 | | | Submitted to SA#42 for information and approval | 1.0.0 | 8.0.0 |
| 2009-06 | SP-44 | SP-090408 | 001 | -- | Correction of naming errors | 8.0.0 | 8.1.0 |
| 2009-06 | SP-44 | SP-090408 | 002 | -- | Add missing start step parameter for resume operation | 8.0.0 | 8.1.0 |
| 2009-06 | SP-44 | SP-090290 | 003 | -- | To add a Non-Automated Software Management operation, downloadNESw | 8.1.0 | 9.0.0 |
| 2009-06 | SP-44 | SP-090290 | 004 | -- | To add a Non-Automated Software Management operation, activateNESw | 8.1.0 | 9.0.0 |
| 2009-06 | SP-44 | SP-090290 | 005 | -- | To add a Non-Automated Software Management operation, installNESw | 8.1.0 | 9.0.0 |
| 2009-06 | SP-44 | SP-090290 | 006 | -- | Editorial cleanup and correction of various qualifiers for TS 32.532 | 8.1.0 | 9.0.0 |
| 2009-06 | SP-44 | SP-090290 | 007 | -- | To update SWM Class diagram to include Non-Automated Software Management interfaces | 8.1.0 | 9.0.0 |
| 2009-09 | SP-45 | SP-090627 | 008 | - | Adding missing Editor"s Notes on Automatic software management | 9.0.0 | 9.1.0 |
| 2009-09 | SP-45 | SP-090627 | 009 | - | Remove duplication of SWM functionalities | 9.0.0 | 9.1.0 |
| 2009-09 | SP-45 | SP-090627 | 010 | - | To rephrase the definitions of installNESw and activateNESw operations | 9.0.0 | 9.1.0 |
| 2009-09 | SP-45 | SP-090627 | 011 | - | Addition of a new NASWM notification notifyInstallNESwStatusChanged | 9.0.0 | 9.1.0 |
| 2009-09 | SP-45 | SP-090627 | 012 | - | Addition of a new NASWM notification notifyActivateNESwStatusChanged | 9.0.0 | 9.1.0 |
| 2009-09 | SP-45 | SP-090627 | 013 | - | Adding error reason | 9.0.0 | 9.1.0 |
| 2009-09 | SP-45 | SP-090627 | 014 | - | Addition of a new NASWM notification notifyDownloadNESwStatusChanged | 9.0.0 | 9.1.0 |
| 2009-09 | SP-45 | SP-090627 | 015 | - | To update Software Management Class Diagram to include NASWM notifications | 9.0.0 | 9.1.0 |
| 2009-12 | SP-46 | SP-090719 | 016 | -- | To move editor notes related to NASWM operations | 9.1.0 | 9.2.0 |
| 2009-12 | SP-46 | SP-090719 | 017 | -- | Extend requirements traceability table for IOC swmProfile | 9.1.0 | 9.2.0 |
| 2009-12 | SP-46 | SP-090719 | 018 | -- | To update SwManagement IRP Class Diagram | 9.1.0 | 9.2.0 |
| 2010-01 | -- | -- | -- | -- | Formatting changes (removal of bold for notAllowedBecauseOfOngoingSwmActivity) | 9.2.0 | 9.2.1 |
| 2010-03 | SP-47 | SP-100035 | 019 | -- | Remove editor notes | 9.2.1 | 9.3.0 |
| 2010-03 | SP-47 | SP-100035 | 020 | -- | Add clarification to parameter swVersionToBeInstalledOfferList | 9.2.1 | 9.3.0 |
| 2010-03 | SP-47 | SP-100035 | 021 | -- | Correct the input parameters of notifyActivateNESwStatusChanged | 9.2.1 | 9.3.0 |
| 2010-03 | SP-47 | SP-100035 | 022 | -- | Rapporteur"s cleanup | 9.2.1 | 9.3.0 |
| 2010-09 | SP-49 | SP-100489 | 023 | -- | Modify the Class diagram representing interfaces | 9.3.0 | 10.0.0 |
| 2010-12 | SP-50 | SP-100833 | 024 | 2 | Modify the input parameters of notifyActivateNESwStatusChanged | 10.0.0 | 10.1.0 |
| 2010-12 | SP-50 | SP-100833 | 027 | 1 | Add NE health check step in automatic software management - Align with NGMN | 10.0.0 | 10.1.0 |
| 2010-12 | SP-50 | SP-100831 | 030 | 1 | Correcting requirements traceability and presence qualifier of notifyNewSwAvailability | 10.0.0 | 10.1.0 |
| 2010-12 | SP-50 | SP-100833 | 026 | 1 | Correcting the traced requirement of NotifyNewSwAvailability - Align with 32.531 | 10.0.0 | 10.1.0 |
| 2012-09 | SP-57 | SP-120558 | 035 | -- | Correction on TS-family members in introduction | 10.1.0 | 10.2.0 |
| 2012-09 | SP-57 | SP-120645 | 037 | 1 | Addition of progress reporting and cancellation of Non-Automated Software Management operations | 10.2.0 | 11.0.0 |
| 2014-10 | - | - | - | - | Update to Rel-12 version (MCC) | 11.0.0 | **12.0.0** |
| 2016-01 | - | - | - | - | Update to Rel-13 version (MCC) | 12.0.0 | **13.0.0** |

# History

| Document history | | |
|---|---|---|
| V13.0.0 | February 2016 | Publication |
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