

I n t e r n a t i o n a l T e l e c o m m u n i c a t i o n U n i o n

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

H.248.75

(05/2011)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS
Infrastructure of audiovisual services – Communication
procedures

**Gateway control protocol: Package identifier
publishing and application package**

Recommendation ITU-T H.248.75



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Recommendation ITU-T H.248.75

Gateway control protocol: Package identifier publishing and application package

Summary

Recommendation ITU-T H.248.75 defines a new package that allows the media gateway controller (MGC) to determine the relationship between the base and extended packages as well as to determine or set which package ID (base or extended) will be used (published) in commands. It also allows the MGC to suppress the use of certain packages on the media gateway (MG).

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T H.248.75	2011-05-14	16

FOREWORD

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The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Recommendation ITU-T H.248.75

Gateway control protocol: Package identifier publishing and application package

1 Scope

One of the core functions provided by [ITU-T H.248.1] is the ability to define "H.248 Packages" which extend the capabilities of the protocol without modifying the protocol syntax. Properties, signals, events and statistics (known as ITU-T H.248 elements) may be defined via packages.

An ITU-T H.248 package template allows the definition of properties, signals, events and statistics in a stand-alone manner independent of other packages. Alternatively, it allows the package definition to inherit the properties, signals, events and statistics of another package and then add additional ITU-T H.248 elements or values to existing elements. ITU-T H.248's package extension mechanism allows for a nested inheritance, i.e., C can extend B which can extend A. However, in a package definition, the "extends" relationship is only between two packages: a base package and an extended package. Thus, whether a package is deemed a base or an extended package is determined from this perspective. The terms "base package" and "extended package" are defined in clause 3.2.

For efficient communication between a media gateway controller (MGC) and a media gateway (MG), the two entities should agree on a common set of packages and how they will be used. Currently, this agreement is achieved by the MGC learning the list of packages and package versions that the MG supports through an audit of the packages descriptor and/or the use of profiles. The MGC should then refrain from using any package that the MG does not support.

This mechanism, while simple and robust, suffers from several limitations:

- The MGC cannot ask the MG to stop using certain package IDs. Where the MGC/MG utilize extension packages, whilst the MGC may only support the use of extended package IDs, the MG may, however, reply with a base package ID. This may cause parsing errors. Likewise the MGC may only support the use of base package IDs for the base elements and extended package IDs for the extended elements; however, the MG may reply using only the extended package ID for both elements. The MGC has no way to prevent this.
- The packages descriptor does not expose the relationship between base packages and extended packages supported by the MG. As explained under clause 6.2.3 of [ITU-T H.248.1], some scenarios may cause an MG to encode package elements using a base package ID even when the MGC only implements the extended package, and vice versa.
- The MGC cannot ask the MG to stop using packages that the MGC does not support. The existence of such packages will not prevent the MG from correctly processing requests sent by the MGC. However, elements belonging to these packages may appear in replies generated by the MG (for example, in replies to an AuditValue.req of a complete descriptor). These extra elements will unnecessarily increase the size of the replies, thus contributing to the signalling overhead.

This Recommendation defines a new package that aims to resolve the above shortcomings. This package allows the MGC to determine the relationship between the base and extended packages as well as to determine/set which package ID (base and/or extended) will be used (published) in commands. It also allows the MGC to suppress the use of certain packages on the MG.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T H.248.1] Recommendation ITU-T H.248.1 (2005), *Gateway control protocol: Version 3*, up to and including Amendment 2 (12/2009).

3 Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 AuditCapabilities.req: ITU-T H.248.1 AuditCapabilities command request.

3.2.2 AuditValue.req: ITU-T H.248.1 AuditValue command request.

3.2.3 base package (adapted from [ITU-T H.248.1]): A package that is supported by the media gateway (MG) and that is extended by at least one other package supported by the MG.

3.2.4 extended package (adapted from [ITU-T H.248.1]): A package that is supported by the MG and that extends at least one other package supported by the MG.

NOTE – An extended package may also be a base package. If package C extends package B and package B extends package A, then B is both an extended and a base package.

3.2.5 Notify.req: ITU-T H.248.1 Notify command request.

3.2.6 package element: A property, signal, event or statistic defined in a package.

3.2.7 PackageID: An ITU-T H.248 Package Identifier. See clause 12.1 of [ITU-T H.248.1].

3.2.8 published package: A package that the MG includes in response to a packages descriptor audit.

NOTE – Often the text will use phrases like "the package is published" or "the MG publishes the package" to indicate that the package is a published package.

3.2.9 stand-alone package: A package that is supported by the MG and that neither extends nor is extended by any other package supported by the MG.

3.2.10 Subtract.req: ITU-T H.248.1 Subtract command request.

4 Abbreviations any acronyms

This Recommendation uses the following abbreviations and acronyms:

MG Media Gateway

MGC Media Gateway Controller

5 Conventions

None.

6 Package identifier publishing issues

This clause discusses different use cases concerning the use of base or extended package IDs.

6.1 Packages audit

When an MG implements an extended ITU-T H.248 package and its base, [ITU-T H.248.1] allows it to decide whether it will publish the base package ID in response to a packages audit from the MGC. This behaviour is described in clause 6.2.3 of [ITU-T H.248.1].

If the MG decides to only publish the extended package ID, then only this package ID would be used to reference all ITU-T H.248 package elements (properties, signal, events and statistics) of the base and extended package in both ITU-T H.248 command requests and replies. If the MG decides to publish both the base and extended package IDs, then the MGC and the MG can decide to use either the base or extended package IDs to reference the ITU-T H.248 package elements of the base package in command requests. How the MGC and MG decide is discussed in clause 6.2 herein. By using the "Package Extension Information" property from the "Package Identifier Publishing and Application Package", the MGC is able to determine the relationship between an extended package and its base without the need for the provisioning of this information in the MGC.

6.2 Full and wildcarded package IDs

Where an MGC has fully specified the package ID in a command request, the MG uses this in the command reply, and vice versa.

Where the MGC has wildcarded the package ID in a command request, by default the MG should reply with the package ID of the package where the ITU-T H.248 package element was originally defined, if the MG publishes both the related base package ID and extended package ID in response to a packages descriptor audit. Otherwise, the MG would use the extended package ID (in replacement of the base package ID for the base element) if it only publishes the extended package ID. For more information, see clause 6.2.3 of [ITU-T H.248.1].

There is no known case where an MG wildcarded the package ID in a command request (e.g., Notify.req).

The above behaviour of using both the base and extended package IDs may cause issues where an MGC has only been provisioned with the knowledge of the extended package IDs (for base and extended elements) and does not accept an MG using a base package ID (that it has no prior knowledge of) in the response. Likewise, this may cause issues where an MGC has only been provisioned with the knowledge of the base package IDs for the base elements and extended package IDs for the extended elements. In this case, the MGC does not accept an MG using only the extended package IDs.

The use of the "Base Package Publishing" (*pipa/bpp*) property from the "Package Identifier Publishing and Application Package" allows the MGC to control how packages will be published and used as the interface between the MGC and MG in terms of the ITU-T H.248 control association.

NOTE – Whilst a Subtract.req does not explicitly request an AuditValue.req with a wildcarded package ID, it is implicit in the command. Thus it is in scope of the above wildcarded package ID usage.

7 Package identifier publishing and application package

Package name: Package Identifier Publishing and Application
PackageID: pipa (0x0106)
Description: This package allows an MGC to determine information regarding the base and extended package usage (i.e., the "base-extension" relationship) and thus can be used to control how an MG publishes these packages. It also allows the MGC to control whether the functionality of a certain package will be used at all.
Version: 1
Extends: None

7.1 Properties

7.1.1 Base package publishing

Property name: Base Package Publishing
PropertyID: bpp (0x0001)
Description: This property is used to determine how package IDs should be used between the MGC and MG when referring to an extended package and its base package. This allows the MGC to indicate to the MG how package IDs should be published.

This property lists all the extended packages. Stand-alone packages are not supported by this property.

This property does not disable the use of the functionality of a package, rather it controls how the package elements (e.g., properties, signals, events and statistics) are used. In response to an audit, this property only returns information on the extended packages.

Type: Sub-list of String

Possible values: A list of BasePkgPub

Each element of the list being of value **BasePkgPub**.

```
BasePkgPub = ExtendedPkgName COLON PubAct
```

```
ExtendedPkgName = PackageName  
; The PackageName as per [ITU-T H.248.1] Annex B.  
; For binary encoding the hexadecimal representation of  
; the PackageID (e.g., 0x00AB) is used.
```

```
PubAct = "Both" / "Ext"  
; See clause 7.6.2.1 for a definition of these values
```

Default: Provisioned

Defined in: Termination State

Characteristics: Read/Write

7.1.2 Package extension information

Property name:	Package Extension Information
PropertyID:	pei (0x0002)
Description:	<p>This property represents all the extended packages supported by the MG and the version of each such package. It gives the relationship between the extended packages and their base packages and, optionally, base package version. Only extended packages and their base packages are specified in this property. Stand-alone packages are not included.</p> <p>This property is not affected by the setting of the "Base Package Publishing" (<i>pipa/bpp</i>) and/or the "Package Suppression" (<i>pipa/supp</i>) property. Thus, even if a package is suppressed, it is still reported by the "Package Extension Information" (<i>pipa/pei</i>) property.</p>
Type:	Sub-list of String
Possible values:	<p>A list of <code>PkgExtInf</code>, each element of the list being of value <code>PkgExtInf</code>.</p> <pre>PkgExtInf = ExtendedPkgName COLON BasePkgName ExtendedPkgName = PackageName ["-" Version] BasePkgName = PackageName ["-" Version] ; The PackageName as per [ITU-T H.248.1] Annex B. ; For binary encoding the hexadecimal representation of ; the PackageID (e.g., 0x00AB) is used. ; The default value of Version is "1".</pre>
Default:	Provisioned
Defined in:	Termination State
Characteristics:	Read Only

7.1.3 Package suppression

Property name:	Package Suppression
PropertyID:	supp (0x0003)
Description:	<p>This property indicates what packages the MG should suppress. Rather than simply suppressing the publishing of a package ID (and associated package element), this property indicates to the MG that the functionality associated with a package shall not be used.</p> <p>The MG shall not use the package IDs of suppressed packages in any request or response it sends to the MGC. The MG shall return error #501 (Not implemented) for any request that includes such package IDs.</p> <p>The MG shall not include the package IDs of suppressed packages in the response to the packages descriptor audit. This may affect how elements of packages extended by other packages are encoded in certain scenarios. See clause 6.2.3 of [ITU-T H.248.1].</p>
Type:	Sub-list of String

Possible values: A list of `SuppPkg`, each element of the list being of value `SuppPkg`.

```
SuppPkg = PackageName ["-" Version]
; The default value of Version is "1".
; The PackageName as per [ITU-T H.248.1] Annex B.
; For binary encoding the hexadecimal representation of
; the PackageID (e.g., 0x00AB) is used.
```

Default: An empty list (meaning no package is suppressed).

Defined in: Termination State

Characteristics: Read/Write

7.2 Events

None.

7.3 Signals

None.

7.4 Statistics

None.

7.5 Error codes

None.

7.6 Procedures

7.6.1 Package relationship determination

As per [ITU-T H.248.1], in order to determine which packages may be used in communications with the MG, the MGC may perform an `AuditValue.req` on the packages descriptor. The MG will return a list of its supported package IDs, which are the only ones that either the MGC or the MG can apply in the established control association as the interface between them. Using this method, the MGC must be provisioned with the relationship between base and extended packages.

Alternatively, the MGC may perform an `AuditValue.req` command on the "Package Extension Information" (*pipa/pei*) property. The use of the *pipa/pei* property prevents the need for provisioning on the MGC. This will return a list of extension packages showing the relationship between them and their base packages.

NOTE – The use of an `AuditCapabilities.req` command will also return the above information.

7.6.2 Package publishing

As per [ITU-T H.248.1], the publication (or lack thereof) of the base package IDs for extended packages (in response to a packages descriptor audit) can be used by either the MGC or the MG to determine (via inference) whether both the base and extended package IDs can be used to reference the same package elements.

7.6.2.1 Publishing behaviour

There are two behaviours that may be exhibited with regard to publishing package identities across an ITU-T H.248 control association:

- **Extended (Ext):** This indicates that the MG only publishes the extended package ID, thus the MGC and MG shall only use the extension package ID to refer to all ITU-T H.248 elements either defined or inherited by the extension package.
- **Both (Both):** This indicates that the MG publishes both the base and the extended package ID, thus the MGC and MG may use the base or the extended package ID to refer to inherited ITU-T H.248 elements/values, and shall use the extension package ID to refer to ITU-T H.248 elements/values defined by the extension package. If the MG uses the extended package ID to refer to inherited ITU-T H.248 elements/values in a command request, then the MGC shall use that package ID in the command reply, and vice versa.

7.6.2.2 Determining the MG's package publishing capability and status

A more deterministic approach for deciding whether or not base package identities can be used for inherited package elements is for the MGC to perform an AuditValue.req and/or AuditCapabilities.req command on the "Base Package Publishing" (*pipa/bpp*) property. It is assumed that, as part of the provisioning of an MG, the MG knows whether it supports the use of base package identities. In response to the request, the MG returns information for all the extended packages on the MG.

Therefore, an AuditValue.req will return the current publishing behaviour set for each of the extended packages on the MG. In response to an AuditValue.req command, the MG shall return one of the following values:

- Extended (Ext): If the MG returns "ext", then it will only support the "Extended" behaviour as defined in clause 7.6.2.1.
- Both (Both): If the MG returns "both", then it will only support the "Both" behaviour as defined in clause 7.6.2.1.

An AuditCapabilities.req will result in the MG returning the potential publishing behaviour ("Base" and/or "Extended") for each of the extended packages. Where the MG supports "base" and "extended" for a particular package, it shall return two instances of the package ID: one indicating "base" and another indicating "extended".

7.6.2.3 Setting the package publishing behaviour

Depending on the response to an audit of the *pipa/bpp* property, an MGC may choose to change the MG's behaviour. If the MGC wants to control the MG's package IDs publishing behaviour as described above, it shall set the *pipa/bpp* property on the MG. The MGC may control whether base packages are published on a package-by-package basis. It does so by providing an extended package ID and a publishing action. If the MG only supports "Extended" behaviour (i.e., the MG has responded with "extended" to an AuditCapabilities.req), then the MG cannot be changed to "both" and any attempt to do so will result in error code 449, "Unsupported or Unknown Parameter or Property Value".

The MGC may wildcard "ALL" the package IDs, which results in the referencing of all the extended packages. If wildcard "CHOOSE" is used, error code 472, "Required Information Missing", should be returned. If a base package ID is provided or if the MGC tries to set an unsupported publishing action, error code 449, "Unsupported or unknown parameter or property value", shall be returned. Extended package IDs not included in the *pipa/bpp* property maintain their provisioned default value.

As the *pipa/bpp* property represents all the extended packages on the MG, the MGC should include all the extended packages even if it needs to change a sub-set of package publishing status. Failure to do so will result in the unspecified packages defaulting to their provisioned value.

7.6.3 Package suppression

If the MGC wants to prevent the MG from using a package, it shall send the "Suppressed Packages" (*pipa/supp*) property including the package ID of that package.

As a consequence, the ITU-T H.248 elements of that package cannot be encoded by either the MG or the MGC, and thus are invalid. All signals of the suppressed package are stopped and removed from the signals descriptors.

The setting of the *pipa/supp* property shall have the following effect:

- If a base package is suppressed while another extended package that inherits it is not, then this shall have the effect of suppressing all the ITU-T H.248 elements/values associated with the base package. None of the ITU-T H.248 elements/values added by the extended package are suppressed.

For example, assume the base package has property A with values 1, 2, 3 and the extension package extends property A with values 4 and 5; then, if the base package is suppressed, the functionality associated with values 4 and 5 is supported and the functionality associated with values 1, 2, 3 is invalid.

- If an extended package is suppressed and its base package is kept, then any ITU-T H.248 element/value associated with the base package is valid whilst the ITU-T H.248 elements of the extended package are invalid.

For example, assume the base package has property A with values 1, 2, 3 and the extended package extends property A with values 4 and 5; then, upon suppression of the extended package, the functionality associated with values 1, 2, 3 is supported and the functionality associated with values 4 and 5 is invalid.

- If both the base and extended packages are suppressed, then all ITU-T H.248 elements/values associated with them are invalid.
- If a stand-alone package (i.e., a non-extended base package) is suppressed, then all ITU-T H.248 elements/values associated with it are invalid.

If a package and all packages extending it (if any) are suppressed, then the elements of that package cannot be encoded by either the MG or the MGC.

For the functions which are suppressed (invalid), the MG shall immediately apply the following actions to all existing terminations.

For ITU-T H.248 elements that are completely removed from both base and extended packages:

- All properties and statistics of the suppressed package are reset to their default value.
- All events of the suppressed package are removed from the Events and EventBuffer descriptors and from the event buffer itself.
- All signals of the suppressed package are stopped and removed from the Signals descriptors.

For ITU-T H.248 elements where only a subset of values remain, then only these values and any element required to support these values shall remain. The package ID associated with the package where the subset was defined is used to address those elements. For signals and events, if a single parameter (even with a subset of values) remains, then other parameters (even other parameter values of this parameter) are deemed to be valid. In this respect, an extra parameter will cause all parameters of the signal or event to be inherited.

For example, assume a base package A that defines a signal D with parameters E and F; both E and F need to be supported for the operation of the signal. Parameter E has values 1 and 2, and parameter F has values 3 and 4. It also defines a property Z. Package B that extends package A is then defined. Package A is then suppressed. The following would result:

- If extended Package B only added a new value 5 to signal D Parameter E, then signal D must be valid in order to support and signal this new value. Parameter F is also valid. Property Z is invalid.
- If extended Package B only added a new value to property Z, then only using property Z with this new value would be valid. Signal D would not be valid as no new signal element was defined.

8 Package application examples

8.1 MGC to MG direction

This clause provides examples on how to set the publishing behaviour. As indicated above, the MGC may perform an AuditValue.req on the *pipa/bpp* property to determine the current summary of whether the MG publishes the base package IDs for the extended packages. The MG shall then respond with an appropriate value corresponding to the fact:

- On receipt of "Both", the MGC can use either the base or extended package IDs to reference the package elements common to both base and extended packages. The extended package ID is only used to reference package elements of the extension package.
- On receipt of "Ext", the MGC can use only the extension package IDs to refer to all package elements of both base and extended packages.

The usage of the *pipa/bpp* property is illustrated in the two examples below.

Example 1:

An MG has implemented the Network (*nt*) and RTP (*rtp*) packages and publishes *rtp* with its base package *nt* to the MGC. The MG will respond the following to an AuditValue.req on the *pipa/bpp* property:

```
pipa/bpp=["rtp:both"]
```

Then, the MGC can use either *nt* or *rtp* to refer to those package elements of the *nt* package, and use only *rtp* to refer to the package elements of the *rtp* package.

Example 2:

An MG has implemented the Network (*nt*) and TDM circuit (*tdmc*) packages, but publishes only *tdmc* without its base package *nt* to the MGC. The MG will respond the following to an AuditValue.req on the *pipa/bpp* property:

```
pipa/bpp=["tdmc:ext"]
```

Then, the MGC can use only *tdmc* to refer to all package elements of both *nt* and *tdmc* packages.

8.2 MG to MGC direction

This clause provides example responses based on particular publishing behaviour. The behaviour of how an MG responds to a fully specified or wildcarded package ID is described in clause 6.2. The examples assume that the MG has implemented the Network (*nt*), RTP (*rtp*) and TDM circuit (*tdmc*) packages.

NOTE – An MG would typically not implement both the *rtp* and *tdmc* packages on a single termination. These packages are used here solely to illustrate the behaviour of multiple packages extending a single base package.

Example 3 shows the behaviour where the MG publishes both the base and extended package IDs for extended packages (i.e., `pipa/bpp=["rtp:both","tdmc:both"]`). The response contains a single instance for each package element with the package ID of the package where it was originally defined, i.e., "Report ITU-T H.248 elements with original package ID".

Example 4 shows the behaviour where the MG publishes only the extended package IDs for the extended packages (i.e., `pipa/bpp=["rtp:ext","tdmc:ext"]`). The response contains all instances for the base package elements with each extended package ID and a single instance for the extended package elements with the extended package ID itself.

Example 3:

An MGC issues the following request to an MG:

```
MEGACO/3 [192.168.1.1]
Transaction = 1003 {
  Context = 2 {
    AuditValue = Term1 {
      Audit {
        Statistics { /*/* }
      }
    }
  }
}
```

If the MG publishes the base package ID *nt* and the extended package IDs *rtp* and *tdmc*, then the MG would reply with:

```
MEGACO/3 [192.168.1.2]
Reply = 1003 {
  Context = 2 {
    AuditValue = Term1 {
      Statistics {
        nt/dur = v1,
        nt/os = v2,
        nt/or = v3,
        rtp/ps = v4,      ; rtp extension
        rtp/pr = v5,      ; rtp extension
        rtp/pl = v6,      ; rtp extension
        rtp/jit = v7,     ; rtp extension
        rtp/delay = v8    ; rtp extension
      }
    }
  }
}
```

This results in a minimal set of ITU-T H.248 package elements being returned. The statistics (*nt/dur*, *nt/os* and *nt/or*) from the base package are published once as they are common to both the *rtp* and *tdmc* packages. The *rtp* package statistics (*rtp/ps*, *rtp/pr*, *rtp/pl*, *rtp/jit* and *rtp/delay*) are published with an *rtp* package ID as they are unique to the RTP package. No *tdmc* statistics are published because no additional statistics are defined in that package.

Example 4:

Given the request of Example 3, if the MG only publishes the extended package IDs *rtp* and *tdmc*, then the MG would reply with:

```
MEGACO/3 [192.168.1.2]
Reply = 1003 {
  Context = 2 {
    AuditValue = Term1 {
      rtp/dur = v1,      ; nt as base package of rtp
      rtp/os = v2,      ; nt as base package of rtp
      rtp/or = v3,      ; nt as base package of rtp
      rtp/ps = v4,      ; rtp extension
      rtp/pr = v5,      ; rtp extension
      rtp/pl = v6,      ; rtp extension
      rtp/jit = v7,     ; rtp extension
      rtp/delay = v8,   ; rtp extension
      tdmc/dur = v1,    ; nt as base package of tdmc
      tdmc/os = v2,     ; nt as base package of tdmc
      tdmc/or = v3,     ; nt as base package of tdmc
    }
  }
}
```

This results in the duplication of package elements between the extended packages. In this example, "*dur*", "*os*" and "*or*" are duplicated leading to two instances of each.

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