International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

H.248.16

(03/2013)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Communication procedures

Gateway control protocol: Enhanced digit collection packages and procedures

Recommendation ITU-T H.248.16

ITU-T H-SERIES RECOMMENDATIONS

AUDIOVISUAL AND MULTIMEDIA SYSTEMS

CHARACTERISTICS OF VISUAL TELEPHONE SYSTEMS	H.100–H.199
INFRASTRUCTURE OF AUDIOVISUAL SERVICES	
General	H.200–H.219
Transmission multiplexing and synchronization	H.220–H.229
Systems aspects	H.230–H.239
Communication procedures	**H.240–H.259**
Coding of moving video	H.260–H.279
Related systems aspects	H.280–H.299
Systems and terminal equipment for audiovisual services	H.300–H.349
Directory services architecture for audiovisual and multimedia services	H.350–H.359
Quality of service architecture for audiovisual and multimedia services	H.360–H.369
Supplementary services for multimedia	H.450–H.499
MOBILITY AND COLLABORATION PROCEDURES	
Overview of Mobility and Collaboration, definitions, protocols and procedures	H.500–H.509
Mobility for H-Series multimedia systems and services	H.510–H.519
Mobile multimedia collaboration applications and services	H.520–H.529
Security for mobile multimedia systems and services	H.530–H.539
Security for mobile multimedia collaboration applications and services	H.540–H.549
Mobility interworking procedures	H.550–H.559
Mobile multimedia collaboration inter-working procedures	H.560–H.569
BROADBAND, TRIPLE-PLAY AND ADVANCED MULTIMEDIA SERVICES	
Broadband multimedia services over VDSL	H.610–H.619
Advanced multimedia services and applications	H.620–H.629
Ubiquitous sensor network applications and Internet of Things	H.640–H.649
IPTV MULTIMEDIA SERVICES AND APPLICATIONS FOR IPTV	
General aspects	H.700–H.719
IPTV terminal devices	H.720–H.729
IPTV middleware	H.730–H.739
IPTV application event handling	H.740–H.749
IPTV metadata	H.750–H.759
IPTV multimedia application frameworks	H.760–H.769
IPTV service discovery up to consumption	H.770–H.779
Digital Signage	H.780–H.789

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T H.248.16

Gateway control protocol: Enhanced digit collection packages and procedures

Summary

Recommendation ITU-T H.248.16 defines two packages that provide enhanced digit collection capabilities for Recommendation ITU-T H.248.1:

– extended DTMF digit map completion event, incorporating detailed reporting of timeouts, digit buffering control, and reporting and control of processing of extra events;

– enhanced DTMF digit map completion event, incorporating additional digit collection procedures for reporting a completion event.

This Revision incorporates a new Completion Event "Unsuccessful Match Reporting" parameter in the "Extended DTMF detection" and "Enhanced DTMF detection" packages.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T H.248.16	2002-11-29	16
1.1	ITU-T H.248.16 (2002) Cor. 1	2004-03-15	16
2.0	ITU-T H.248.16	2013-03-16	16

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

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.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

Table of Contents

Recommendation ITU-T H.248.16

Gateway control protocol: Enhanced digit collection packages and procedures

1 Scope

This Recommendation defines two packages that provide enhanced digit collection capabilities for [ITU-T H.248.1]. The support of these packages is optional.

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 v3 (2013), *Gateway control protocol: Version 3*.

3 Definitions

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

DTMF Dual Tone Multi Frequency

MG Media Gateway

MGC Media Gateway Controller

5 Extended DTMF detection package

Package name: Extended DTMF detection package

Package ID: xdd (0x0052)

Description: This package provides an extended DTMF digit map completion event, incorporating detailed reporting of timeouts, digit buffering control, and reporting and control of processing of extra events.

Version: 2

Extends: dd (0x0006) version 2

5.1 Properties

None.

5.2 Events

5.2.1 Extended DigitMap Completion Event

Event name: Extended DigitMap Completion Event

Event ID: xce (0x0005)

Description: Generated when a digit map completes as described in clause 7.1.14 of [ITU-T H.248.1], or in clause 5.5, Procedures, of this Recommendation, as appropriate.

5.2.1.1 EventsDescriptor parameters

5.2.1.1.1 Buffer Control

Parameter name: Buffer Control

Parameter ID: bc (0x0001)

Description: Maximum period for which digit buffering should occur following reporting of this event, in seconds.

Type: Integer

Optional: Yes

Possible values: 0 upwards.

Default: 0

5.2.1.1.2 Extra Digit Disposition

Parameter name: Extra Digit Disposition

Parameter ID: xdd (0x0002)

Description: If ON, an extra digit event triggering digit map completion by causing mismatch to all candidate patterns is discarded. If OFF, the extra digit event is processed as indicated by step 5 of the appropriate matching procedures.

Type: Boolean

Optional: Yes

Possible values: ON or OFF.

Default: OFF

5.2.1.1.3 Match Procedure

Parameter name: Match Procedure

Parameter ID: mp (0x0003)

Description: Indicates which matching procedures should be used for this digitmap.

Type: Enumeration

Optional: Yes

Possible values: base or enhanced.
"base" (0x0001) Use match procedures described in clause 7.1.14 of [ITU-T H.248.1].
"enhanced" (0x0002) Use match procedures described in clause 5.5.

Default: Base

5.2.1.1.4 Unsuccessful Match Reporting

Parameter name: Unsuccessful Match Reporting

Parameter ID: umr (0x0004)

Description: The MGC may use this parameter to control whether the DigitMap Completion Event is generated in the event of an unsuccessful DigitMap match (i.e., match with method "Partial match" or "Full Match").

Type: Boolean

Optional: Yes

Possible values:

On Generate DigitMap Completion Event on unsuccessful match.

Off Do not generate a DigitMap Completion Event on an unsuccessful match.

Default: *On*

5.2.1.2 ObservedEventsDescriptor parameters

5.2.1.2.1 DigitString

Parameter name: DigitString

Parameter ID: ds (0x0001)

Description: The portion of the current dial string as described in the appropriate match procedures which matched part or all of an alternative event sequence specified in the digit map.

Type: String

Optional: No

Possible values: A sequence (possibly empty) of the characters '0' through '9', 'A' through 'F', and the long duration modifier 'Z'. If the completion event was triggered by timer expiry, the character 'T', 'S', or 'L', shall be appended to the end of the dial string to indicate which timer expired (detailed timeout reporting).

Default: None

5.2.1.2.2 Termination Method

Parameter name: Termination Method

Parameter ID: meth (0x0002)

Description: Indicates the reason for generation of the event. See the appropriate match procedures.

Optional: No

Type: Enumeration

Possible values: "UM" (0x0001) Unambiguous match
"PM" (0x0002) Partial match, completion by timer expiry or nmatched event

"FM" (0x0003) Full match, completion by timer expiry or unmatched event

Default: None

5.2.1.2.3 Unmatched Event

Parameter name: Unmatched Event

Parameter ID: extra (0x0003)

Description: The observed digit event which triggered the completion event by failing to match any candidate pattern.

Type: String

Optional: Yes

Possible values: Not included if completion was not triggered by an unmatched event (extra digit). Otherwise, one of the characters '0' through '9' or 'A' through 'F', preceded by the 'Z' qualifier if relevant to the mismatch and descriptive of the observed event.

Default: None

5.3 Signals

None.

5.4 Statistics

None.

5.5 Procedures

5.5.1 Enhanced match procedures

These procedures outline the "shortest match" method of processing digitmaps. These procedures shall be used when the "enhanced" match procedures are specified in the completion event.

5.5.1.1 DigitMap definition, creation, modification and deletion

These procedures are identical to those in clause 7.1.14.1 of [ITU-T H.248.1].

5.5.1.2 DigitMap timers

The collection of digits according to a DigitMap may be protected by three inter-event timers, viz. a start timer (T), a short timer (S), and a long timer (L).

1) The start timer (T) is used prior to any digits being available for processing against the digit map.
2) The start timer (T) is used prior to any digits having been dialled.
3) If the Media Gateway can determine that at least one more digit is needed for a digit string to match any of the allowed patterns in the digit map, then the long interdigit timer (L) should be used (e.g., 16 seconds).
4) If the digit string has matched one of the patterns in a digit map, that match shall be reported immediately as a full match unless a timing specifier is indicated at the end of the digitstring. If a timing specifier is present, the MG must apply the timer indicated and wait for more digits.

In addition to these inter-event timers, a digit map may also require use of a timer on tone duration. This is used when the digit map contains the 'Z' duration modifier to discriminate between short- and long-duration digit events.

Default values of these timers should be provisioned on the MG, but can be overridden by values specified within the DigitMap.

5.5.1.3 DigitMap syntax

The digit map syntax shall be the same as that described in clause 7.1.14.3 of [ITU-T H.248.1], with the exception of the dot symbol. The matching rules outlined below will always result in matching zero repetitions of the final digit if a terminal dot symbol is used. Therefore, a digitstring should never be terminated by a dot symbol, but rather should always be terminated by an explicit event.

In the event that a terminal dot symbol is present, and the "enhanced" procedures are requested, the MG shall process the map as it is specified; that is to say, in the event that the pattern with the terminal dot symbol is the last remaining, the MG shall report a full match upon detection of the "dotted" event, as the dot is instantly matched to zero repetitions. The dot symbol is, effectively, ignored.

5.5.1.4 DigitMap completion event

These procedures are identical to those in clause 7.1.14.4 of [ITU-T H.248.1]. By default, DigitMaps are processed according to the procedures of clause 7.1.14, notification is sent to MCG when the DigitMap has completed (see clause 7.1.14.4 of [ITU-T H.248.1]), and any embedded signals and embedded events are triggered. However, if the Unsuccessful Match Reporting parameter is set to "*off*" and the DigitMap completion was triggered as a result of an unsuccessful match, then the DigitMap completion event is not notified to the MGC nor are embedded signals and/or embedded events triggered. However, the DigitMap will be de-activated.

5.5.1.5 DigitMap procedures

Pending completion, successive events shall be processed according to the following rules:

1) The "current dial string", an internal variable, is initially empty. The set of candidate alternative event sequences includes all of the alternatives specified in the digit map.

2) At each step, if buffered digits are available, the oldest one (with possible accompanying long digit (Z) qualifier) is removed from the buffer and processing moves to the next step as if the digit event had just been observed. Otherwise a timer is set to wait for the next event, based either on the default timing rules given in clause 7.1.14 of [ITU-T H.248.1] or on explicit timing specified in one or more alternative event sequences. If the timer expires and a member of the candidate set of alternatives is fully satisfied, a full match is reported. If the timer expires and part or none of any candidate alternative is satisfied, a partial match is reported.

3) If an event, including a timer (T, S or L) expiry, is detected, it is mapped to a digit string symbol and added to the end of the current dial string. The duration of the event (long or not long) is noted if and only if this is relevant in the current symbol position (because at least one of the candidate alternative event sequences includes the 'Z' modifier at this position in the sequence).

4) The current dial string is compared to the candidate alternative event sequences. If, and only if, a sequence expecting a long-duration event at this position is matched (i.e., the event had long duration and met the specification for this position), then any alternative event sequences not specifying a long duration event at this position are discarded, and the current dial string is modified by inserting a 'Z' in front of the symbol representing the latest event. Any sequence expecting a long-duration event at this position, but not matching the observed event, is discarded from the candidate set. If alternative event sequences not

specifying a long duration event in the given position remain in the candidate set after application of the above rules, the observed event duration is treated as irrelevant in assessing matches to them.

5) If a candidate remains and it has been fully matched, a completion event is generated indicating a full match and reporting the "current dial string" as the matched digitstring. If no candidates remain, a completion event is generated indicating a partial match and reporting the "current dial string" as the matched digitstring.

6) If no completion event is reported out of step 5, processing returns to step 2.

5.5.1.6 DigitMap activation

These procedures are identical to those in clause 7.1.14.6 of [ITU-T H.248.1].

5.5.1.7 Interaction of DigitMap and event processing

These procedures are identical to those in clause 7.1.14.7 of [ITU-T H.248.1].

5.5.1.8 Wildcards

These procedures are identical to those in clause 7.1.14.8 of [ITU-T H.248.1].

5.5.1.9 Example

As an example, consider the following dial plan:

0	Local operator
00	Long distance operator
911	Emergency Services Access
xxxx	Local extension number (starts with 1-7)
8xxxxxxx	Local number
#xxxxxxx	Off-site extension
*xx	Star services
91xxxxxxxxxx	Long distance number
9011 + up to 15 digits	International number

If the DTMF detection package described in clause E.6 of [ITU-T H.248.1] is used to collect the dialled digits, then the dialling plan shown above results in the digit map illustrated below. Please note that timeouts that should be detected at the end of a digitstring must be explicitly included. Also note that the shortest match method outlined in these procedures will always route 911 immediately, while correctly matching 91[0, 2-9] against the long distance dialling entry.

```
(0S|00|911|[1-7]xxx|8xxxxxxx|Fxxxxxxx|Exx|91xxxxxxxxxx|9011x.S)
```

6 Enhanced DTMF detection package

Package name: Enhanced DTMF detection

Package ID: edd (0x0066)

Description: This package provides an enhanced DTMF digit map completion event, incorporating additional digit collection procedures for reporting a completion event.

Version: 1

Extends: xdd (0x0052) version 2

6.1 Properties

None.

6.2 Events

6.2.1 Matched DigitMap Completion Event

Event name: Matched DigitMap Completion Event

Event ID: mce (0x0006)

Description: Generated when a digit map completes as described in clause 7.1.14 of [ITU-T H.248.1], or in clause 5.5, as appropriate.

6.2.1.1 EventsDescriptor parameters

6.2.1.1.1 Buffer Control

Property name: Buffer Control

Parameter ID: bc (0x0001)

Description: Maximum period for which digit buffering should occur following reporting of this event, in seconds.

Type: Integer

Optional: Yes

Possible values: 0 upwards.

Default: 0

6.2.1.1.2 Unsuccessful Match Reporting

Parameter name: Unsuccessful Match Reporting

Parameter ID: umr (0x0002)

Description: The MGC may use this parameter to control whether the DigitMap Completion Event is generated in the event of an unsuccessful DigitMap match (i.e., match with method "Partial match" or "Full Match").

Type: Boolean

Optional: Yes

Possible values:

- On — Generate DigitMap Completion Event on unsuccessful match.
- Off — Do not generate a DigitMap Completion Event on an unsuccessful match.

Default: On

6.2.1.2 ObservedEventsDescriptor parameters

6.2.1.2.1 DigitString

Property name: DigitString

Parameter ID: ds (0x0001)

Description: The portion of the current dial string as described in the appropriate match procedures which matched part or all of an alternative event sequence specified in the digit map.

Type: string

Optional: No

Possible values: A sequence (possibly empty) of the characters '0' through '9', 'A' through 'F', and the long duration modifier 'Z'. If the completion event was triggered by timer expiry, the character 'T', 'S', or 'L', shall be appended to the end of the dial string to indicate which timer expired (detailed timeout reporting).

Default: None

6.2.1.2.2 Termination Method

Property name: Termination Method

Parameter ID: meth (0x0002)

Description: Indicates the reason for generation of the event. See the appropriate match procedures in clause 6.5.1.

Type: Enumeration

Optional: No

Possible values: "ESM" (0x0004) Enhanced shortest match, completion by timer expiry or unmatched event or when using shortest match procedures and alternate sequence could be matched, or exactly one sequence is matched.

Default: None

6.3 Signals

None.

6.4 Statistics

None.

6.5 Procedures

6.5.1 Match procedures

These procedures outline the method of processing digitmaps which shall be used when using the matched completion event.

6.5.1.1 DigitMap definition, creation, modification and deletion

These procedures are identical to those in clause 7.1.14.1 of [ITU-T H.248.1].

6.5.1.2 DigitMap timers

The collection of digits according to a DigitMap may be protected by three timers, viz. a start timer (T), short timer (S), and long timer (L).

1) The start timer (T) is disabled for this package. That is, the start timer can be considered to be infinitely long when using this package.
2) If the Media Gateway can determine that at least one more digit is needed for a digit string to match any of the allowed patterns in the digit map, then the interdigit timer value should be set to a long (L) duration (e.g., 16 seconds).
3) If the digit string has matched one of the patterns in a digit map, that match shall be reported immediately as an unambiguous match unless a timing specifier is indicated at the end of the digitstring, or an alternate sequence could be matched. If a timing specifier is present, the MG must apply the timer indicated and wait for more digits.

Default values of these timers should be provisioned on the MG, but can be overridden by values specified within the DigitMap.

6.5.1.3 DigitMap syntax

The digit map syntax shall be the same as that described in clause 7.1.14.3 of [ITU-T H.248.1], with the exception of the dot symbol. The matching rules outlined below will always result in matching zero repetitions of the final digit if a terminal dot symbol is used. Therefore, a digitstring should never be terminated by a dot symbol, but rather should always be terminated by an explicit event.

In the event that a terminal dot symbol is present, the MG shall process the map as it is specified; that is to say, in the event that the pattern with the terminal dot symbol is the last remaining, the MG shall use the digit map procedures defined below upon detection of the "dotted" event, as the dot is instantly matched to zero repetitions. The dot symbol is, effectively, ignored.

6.5.1.4 DigitMap completion event

See clause 5.5.1.4.

6.5.1.5 DigitMap procedures

Pending completion, successive events shall be processed according to the following rules:

1) The "current dial string", an internal variable, is initially empty. The set of candidate alternative event sequences includes all of the alternatives specified in the digit map.

2) At each step, if buffered digits are available, the oldest one (with possible accompanying long digit (Z) qualifier) is removed from the buffer and processing moves to the next step as if the digit event had just been observed. Otherwise, a timer is set to wait for the next event, based either on the default timing rules given in clause 7.1.14 of [ITU-T H.248.1] or on explicit timing specified in one or more alternative event sequences. If the timer expires and a member of the candidate set of alternatives is fully satisfied, an enhanced shortest match is reported.

3) If an event, including a timer (S or L) expiry, is detected, it is mapped to a digit string symbol and added to the end of the current dial string. The duration of the event (long or not long) is noted if, and only if, this is relevant in the current symbol position (because at least one of the candidate alternative event sequences includes the 'Z' modifier at this position in the sequence).

4) The current dial string is compared to the candidate alternative event sequences. If, and only if, a sequence expecting a long-duration event at this position is matched (i.e., the event had long duration and met the specification for this position), then any alternative event sequences not specifying a long duration event at this position are discarded, and the current dial string is modified by inserting a 'Z' in front of the symbol representing the latest event. Any sequence expecting a long-duration event at this position, but not matching the observed event, is discarded from the candidate set. If alternative event sequences not specifying a long duration event in the given position remain in the candidate set after application of the above rules, the observed event duration is treated as irrelevant in assessing matches to them.

5) If a candidate remains, and it has been fully matched, a completion event is generated indicating an enhanced shortest match and reporting the "current dial string" as the matched digitstring.

6) Alternatively, one of the following conditions may be detected:

   a) an event has been detected such that a match to a complete alternative event sequence of the digit map will be impossible no matter what additional events are received, and no event sequence is matched; or

b) a timer has expired and no sequence is matched.

If these conditions occur, the contents of the current dial string should have the first event in its buffer removed, and the current digit map should be reapplied. These are considered to be reset conditions for the digit map. This process continues until either there is a match, or the request is terminated (as per steps 2 through 6).

7) If no completion event is reported out of step 5, processing returns to step 2.

6.5.1.6 DigitMap activation

These procedures are identical to those in clause 7.1.14.6 of [ITU-T H.248.1].

6.5.1.7 Interaction of DigitMap and event processing

These procedures are identical to those in clause 7.1.14.7 of [ITU-T H.248.1].

6.5.1.8 Wildcards

These procedures are identical to those in clause 7.1.14.8 of [ITU-T H.248.1].

6.5.1.9 Example

As an example, consider the following private digit collection request:

*12	Private access code
#	Re-origination request

If the enhanced DTMF detection package is used to collect the dialled digits, then the resulting digit map is illustrated below.

```
(*12|#)
```

Let's assume a user dials "145*6#", waiting 5 minutes between dialling the 4 and 5. The following processing would take place:

Current dial string	Action
1	Digit is removed from current dial string as per step 6a.
4	Digit is removed from current dial string as per step 6a.
Timeout occurs	Digit is removed from current dial string as per step 6b.
5	Digit is removed from current dial string as per step 6a.
*	Collection continues as per step 2.
*6	Digit is removed from current dial string as per step 6a.
6	Digitmap is reapplied after removing the digit. This digit is also removed from the current dial string as per step 6a.
#	Enhanced shortest match is reported as per step 5.

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	**Audiovisual and multimedia systems**
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	Telecommunication management, including TMN and network maintenance
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Terminals and subjective and objective assessment methods
Series Q	Switching and signalling
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks, open system communications and security
Series Y	Global information infrastructure, Internet protocol aspects and next-generation networks
Series Z	Languages and general software aspects for telecommunication systems

Printed in Switzerland
Geneva, 2013