INTERNATIONAL TELECOMMUNICATION UNION

ITU-T H.248.34

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(01/2005)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Communication procedures

Gateway control protocol: Stimulus Analogue Line Package

CAUTION !

PREPUBLISHED RECOMMENDATION

This prepublication is an unedited version of a recently approved Recommendation. It will be replaced by the published version after editing. Therefore, there will be differences between this prepublication and the published version.

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Recommendation H.248.34

Stimulus Analogue Line Package

Summary

H.248.34 describes a Stimulus Analogue Line package that defines new H.248 events, signals and parameters derived from the V5 PSTN protocol defined in ITU-T Recommendation G.964.

To assist both vendors and operators in migrating V5 Local Exchange and access network nodes to a Next Generation Network Media Gateway and Media Gateway Controller architecture, the package provides guidelines for mapping the V5 PSTN Protocol to the "Stimulus Analogue line" package, other H.248 packages and the H.248.1 protocol.

ITU-T Recommendation H.248.34

Gateway Control Protocol: Stimulus Analogue Line Package

1 Scope

The Stimulus Analogue Line package defines H.248 signals and events that are exchanged between a MG and a MGC for controlling analogue POTS lines which can, for example, be used to host telephones, analogue PBXs and turn-key systems. The signals and events defined in the package are stimulus in nature and enable the full set of POTS services that are delivered via a V5 LE and AN to be ubiquitously provided in a NGN MG and MGC architecture.

NOTE – The use of the Call Finished signal is a national option. It is included as part of joint text with ETSI. In normal circumstances, national specific functionality shall be included as a separate package. The use of Call Finished shall not compromise existing H.248 procedures.

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

2.1 Normative references

– ITU-T Recommendation G.964 (03/2001), V-interfaces at the digital local exchange (LE) – V5.1 interface (based on 2048 kbit/s) for the support of access network (AN)

– ITU-T Recommendation G.965 (03/2001), V-interfaces at the digital local exchange (LE) – V5.2 interface (based on 2048 kbit/s) for the support of access network (AN)

– ITU-T Recommendation H.248.1 (05/2002) Corrigendum 1 (03/2004), Gateway Control Protocol: Version 2

– ITU-T Recommendation H.248.8 (03/2002) Amendment 1 (03/2004), Gateway Control Protocol: Error Code and Service Change Reason definitions

– ITU-T Recommendation H.248.23 (11/2004), Gateway Control Protocol: Enhanced Alerting Packages

– ITU-T Recommendation H.248.26 (07/2003) Amendment 1 (11/2004), Gateway Control Protocol: Enhanced Analogue Lines Packages

2.2 Informative references

– SSPE/SPEC/001-1 V5 - UK PSTN Mapping Requirements Issue 2 (July 1998)

3 Definitions

This Recommendation uses the following terms and definitions:

3.1 V5: A general term for the family of V interfaces for connection of ANs to the LE, e.g. a V5.1 interface or a V5.2 interface.

3.2 **AN:** A system implemented between the local exchange (LE) and user, replacing part or the whole of the local line distribution network.

3.3 **LE:** An exchange on which user lines are terminated via an AN.

4 Abbreviations

This Recommendation uses the following abbreviations:

AN	Access Network
BCC	Bearer Channel Control
LE	Local Exchange
MG	Media Gateway
MGC	Media Gateway Controller
NGN	Next Generation Network
PBX	Private Branch Exchange
POTS	Plain Old Telephone Service
PSTN	Public Switched Telephony Network
TDM	Time Division Multiplex

5 Stimulus Lines Analogue Package

Package Name: Stimulus Analogue Package

PackageID: stimal (0x0093)

Description:

This package defines all the stimulus events and signals necessary for controlling an analogue line. This analogue line package is different from other H.248 analogue line packages, because the analogue signals and events that are exchanged between the MGC and the MG are stimulus rather than functional in nature. The stimulus approach enables the MG to be transparent to the underlying service being delivered by the MGC and also does not unduly restrict the types of services that may be delivered to an analogue line.

The H.248 signals and events have been derived from the V5 PSTN protocol signals defined in G.964. This approach enables the MGC to support the same type of services and capabilities as the existing PSTN network.

NOTE – Unlike an AN as defined in G.964/G.965, an H.248 MG has the capability to detect in-band (e.g. DTMF) signals, generate local tones and announcements and generate FSK tones for caller display purposes. Control of these capabilities is provided by other packages in the H.248 series of Recommendations.

The stimulus analogue line package is a superset package that defines the full repertoire of signals and events. A particular PSTN national authority may support a subset of the signals, events and parameters listed in the package.

Version: 1

Extends: None

5.1 Properties

None

5.2 Events

5.2.1 Steady Signal

Event Name: Steady Signal

Event ID: stedsig (0x0001)

Description: Activation of the "Steady Signal" event results in either all the steady signals that are supported by the MG being reported to the MGC, or a list of specified steady signals being reported by the MG to the MGC. The former functionality is achieved by excluding the Events Descriptor parameter "Signal to Detect" when the event descriptor is activated. The latter functionality is achieved by including the Events Descriptor parameter "Signal to Detect" when the Events Descriptor is activated. The actual steady signal that is reported to the MGC is identified by the ObservedEvents Descriptor parameter "Detected Signal".

The default recognition time of a particular steady signal may be modified via the Events Descriptor parameter "Recognition Time".

5.2.1.1 EventsDescriptor parameters:

5.2.1.1.1 Signal to Detect

Parameter Name: Signal to Detect

ParameterID: detectsig (0x0001)

Description:

This parameter indicates to the MG the type of steady signals that are to be recognised by the MG.

If this parameter is excluded, then all steady signals that are recognised by the MG are detected and subsequently reported via the ObservedEvents Descriptor.

If this parameter is included, then only the specified list of steady signals are detected and subsequently reported via the ObservedEvents Descriptor.

Type: Sub-list of Enumeration

Optional: Yes

Possible Values: See Table 1 below for a list of steady signal parameter names and values.

Default: All steady signals

Table 1/H.248.34 – Steady Signal Parameter Names and Values

Text Encoding	Binary Encoding
"normalPolarity"	(0x0000)
"reversePolarity"	(0x0001)
"batteryOnC-wire"	(0x0002)
"noBatteryOnC-wire"	(0x0003)
"offHook"	(0x0004)
"onHook"	(0x0005)
"batteryOnA-wire"	(0x0006)
"aWireonEarth"	(0x0007)

Text Encoding	Binary Encoding
“noBatteryOnA-wire”	(0x0008)
“noBatteryOnB-wire”	(0x0009)
“reducedBattery”	(0x000a)
“noBattery”	(0x000b)
“alternateReducedPower”	(0x000c)
“normalBattery”	(0x000d)
“stopRinging”	(0x000e)
“startPilotFrequency”	(0x000f)
“stopPilotFrequency”	(0x0010)
“lowImpedanceonB-wire”	(0x0011)
“b-wireConnectedtoearth”	(0x0012)
“b-wireDisconnectedfromearth”	(0x0013)
“batteryOnB-wire”	(0x0014)
“lowLoopImpedance”	(0x0015)
“highLoopImpedance”	(0x0016)
“anomalousLoopImpedance”	(0x0017)
“a-wireDisconnectedfromearth”	(0x0018)
“c-wireOnearth”	(0x0019)
“c-wireDisconnectedfromearth”	(0x001a)
“rampToReversePolarity”	(0x001d)
“rampToNormalPolarity”	(0x001e)

5.2.1.1.2 Recognition Time

Parameter Name: Recognition Time

ParameterID: rectime (0x0002)

Description:

This parameter is included if the default recognition time of a steady signal is to be modified.

Type: Integer

Optional: Yes

Possible values: Any positive value in milliseconds.

Default: Provisioned default for each steady signal

5.2.1.2 ObservedEventsDescriptor Parameters :

5.2.1.2.1 Detected Signal

Parameter Name: Detected Signal

ParameterID: sig (0x0001)

Description: This parameter returns the detected steady signal.

Type: Enumeration

Optional: No

Possible values: See Table 1 for a list of steady signal parameter names and values.

Default: None

5.2.2 Line Information

Event Name: Line Information

Event ID: lineinfo (0x0002)

Description:

The line information is used to transmit specific information on the subscriber line status to the MGC.

5.2.2.1 EventsDescriptor parameters :

None.

5.2.2.2 ObservedEventsDescriptor parameters :

5.2.2.2.1 Line Information

Parameter Name: Line Information

ParameterID: info (0x0001)

Description: This parameter indicates that the status of the subscriber line has changed.

Type: Enumeration

Optional: No

Possible Values: See Table 2 for a list of line information parameter names and values.

Default: None

Table 2/H.248.34 – Line Info Parameter Names and Values

Text Encoding	Binary Encoding
"impedanceMarkerReset"	(0x0000)
"impedanceMarkerSet"	(0x0001)
"lowLoopImpedance"	(0x0002)
"anomalousLoopImpedance"	(0x0003)
"anomalousLineCondition"	(0x0004)

5.2.3 Pulsed Signal

Event Name: Pulsed Signal

Event ID: pulsedsig (0x0003)

Description:

Activation of the "Pulsed Signal" event results in either all the pulsed signals that are supported by the MG being reported to the MGC, or a list of specified pulsed signals being reported by the MG to the MGC. The former functionality is achieved by excluding the event descriptor parameter "Signal to Detect" when the Events Descriptor is activated. The latter functionality is achieved by including the Events Descriptor parameter "Signal to Detect", when the Events Descriptor is activated. The actual pulsed signal that is reported to the MGC is identified by the ObservedEvents Descriptor parameter "Detected Signal".

The default recognition time of a particular pulsed signal may be modified via the Events Descriptor parameter "Recognition Time".

5.2.3.1 EventsDescriptor parameters :

5.2.3.1.1 Signal to Detect

Parameter Name: Signal to Detect

ParameterID: detectsig (0x0001)

Description:

This parameter indicates to the MG the type of pulsed signals that are to be recognised by the MG.

If this parameter is excluded, then all pulsed signals that are recognised by the MG are detected and subsequently reported via the ObservedEvents Descriptor.

If this parameter is included, then only the specified list of pulsed signals are detected and subsequently reported via the ObservedEvents Descriptor.

Type: Sub-list of Enumeration

Optional: Yes

Possible Values: See Table 3 for a list of pulsed signal parameter names and values.

Default: All pulsed signals.

Table 3/H.248.34 – Pulsed Signal Parameter Names and Values

Text Encoding	Binary Encoding
“pulsedNormalPolarity”	(0x007f)
“pulsedReversedPolarity”	(0x007e)
“pulsedBatteryonCwire”	(0x007d)
“pulsedOnHook”	(0x007c)
“pulsedReducedBattery”	(0x007b)
“pulsedNoBattery”	(0x007b)
“initialRing”	(0x0079)
“meterPulse”	(0x0078)
“50HzPulse”	(0x0077)
“registerrecall”	(0x0076)
“pulsedOffHook”	(0x0075)
“pulsedB-wireConnectedToEarth”	(0x0074)
“earthLoopPulse”	(0x0073)
“pulsedB-wireConnectedToBattery”	(0x0072)
“pulsedA-wireConnectedToEarth”	(0x0071)
“pulsedA-wireConnectedToBattery”	(0x0070)
“pulsedC-wireConnectedToEarth”	(0x006f)
“pulsedC-wireDisconnected”	(0x006e)
“pulsedNormalBattery”	(0x006d)
“pulsedA-wireDisconnected”	(0x006c)
“pulsedB-wireDisconnected”	(0x006b)

5.2.3.1.2 Recognition Time

Parameter Name: Recognition Time

ParameterID: rectime (0x0002)

Description: This parameter is included if the default recognition time of a pulsed signal is to be modified.

Type: Integer

Optional: Yes

Possible values: Any positive value in milliseconds.

Default: Provisioned per pulsed signal.

5.2.3.2 ObservedEventsDescriptor parameters :

5.2.3.2.1 Detected Signal

Parameter Name: Detected Signal

ParameterID: sig (0x0001)

Description: This parameter returns the detected steady signal.

Type: Enumeration

Optional: No

Possible Values: See Table 3 for a list of pulsed signal parameter names and values.

Default: None

5.2.4 Autonomous Signalling Sequence Response

Event Name: Autonomous Signalling Sequence Response

Event ID: autosigseqresp (0x0004)

Description:

The purpose of the "autonomous signalling sequence response" is to inform the MGC about the results of the application of the signal "autonomous signalling sequence". The sequence response type identifies a particular (pre-defined) response.

5.2.4.1 EventsDescriptor parameters :

None

5.2.4.2 ObservedEventsDescriptor parameters :

5.2.4.2.1 Sequence Response Type

Parameter Name: Sequence Response Type

ParameterID: seqresptype (0x0001)

Description:

The sequence response type specifies a particular response to the request to apply the autonomous signalling sequence.

Type: Integer

Optional: No

Possible values: Any non-negative value

Default: None

5.3 Signals

5.3.1 Pulsed Signal

Signal Name: Pulsed Signal

Signal ID: pulsedsig (0x0001)

Description: Used by the MGC to instruct the MG to apply a pulsed signal.

Signal Type: Brief

Duration: Provisioned

5.3.1.1 Additional parameters:

5.3.1.1.1 Signal

Parameter Name: Signal

ParameterID: sig (0x0001)

Description: This parameter indicates the type of pulsed signal to be sent.

Type: Enumeration

Optional: No

Possible Values: See Table 3 for a list of pulsed signal parameter names and values.

Default: None

5.3.1.1.2 Number of Pulses

Parameter Name: Number of Pulses

ParameterID: numofpulses (0x0002)

Description: This parameter indicates the number of pulses to be sent.

Type: Integer

Optional: Yes

Possible Values: A positive number of pulses

Default: 1

5.3.2 Steady Signal

Signal Name: Steady Signal

Signal ID: stedsig (0x0002)

Description: Used by the MGC to instruct the MG to apply a steady signal.

Signal Type: OnOff

Duration: Not applicable

5.3.2.1 Additional parameters:

Parameter Name: Signal

ParameterID: sig (0x0001)

Description: This indicates the steady signal to be sent.

Type: Enumeration

Optional: No

Possible values: See Table 1 for a list of steady signal parameter names and values.

Default: None

5.3.3 Digits

Signal Name: Digits

Signal ID: digits (0x0003)

Description: A signal to specify that loop digits are to be forwarded to the analogue line for onward routing of the call. The mapping of the digit values to the number of loop disconnect pulses sent is provisioned in the MG.

Signal Type: Brief

Duration: Provisioned

5.3.3.1 Additional parameters:

5.3.3.1.1 Digits

Parameter Name:	Digits
ParameterID:	digit (0x0001)
Description:	The string of digits to be generated.
Type:	String
Optional:	No
Possible values:	A sequence of the characters '0' through to '9', 'A' through 'F'.
Default:	None

5.3.4 Autonomous Signalling Sequence

Signal Name: Autonomous Signalling Sequence

Signal ID: autosigseq (0x0004)

Description: An indication to the MG to start a predefined signalling sequence as defined by the sequence type.

Signal Type: Brief

Duration: Duration varies depending on parameter values

5.3.4.1 Additional parameters:

5.3.4.1.1 Sequence Type

Parameter Name:	Sequence Type
ParameterID:	seqtype (0x0001)
Description:	The sequence type to apply.
Type:	Integer
Optional:	No
Possible values:	Any non-negative value
Default:	None

5.3.5 Call Finished

Signal Name: Call Finished

Signal ID: cfin(0x0005)

Description: This signal is sent by the MGC to indicate to the MG that it shall apply a voltage/current feed that corresponds to an Idle Feed condition. For example as is defined in the "V5 –UK Mapping requirements" (SSPE/SPEC/001-1).

Signal Type: Brief

Duration: Provisioned

5.3.5.1 Additional parameters:

None

5.4 Statistics

None

5.5 Procedures

5.5.1 Event – Steady Signal

The event "steady signal" is used by the MG to report to the MGC, the occurrence of a certain steady signal condition on the analogue line. The "signal" parameter identifies the type of steady signal detected. The default recognition time of a steady signal may be modified by including the Events Descriptor parameter "recognition time".

5.5.2 Event – line information

The event "line information" is used by the MG to report to the MGC the line status. This event is reported when the status of the line changes. The "info" parameter identifies the subscriber line status.

5.5.3 Event – Pulsed Signal

The event "pulsed signal" is used by the MG to report to the MGC, the occurrence of a certain pulsed signal condition on the analogue line. The "signal" parameter identifies the type of pulsed signal detected. The default recognition time of a pulsed signal may be modified by including the Events Descriptor parameter "recognition time".

5.5.4 Event – Autonomous Signalling Response

The event "autonomous signalling response" is used to notify the MGC about the result of the application of the signal "autonomous signalling sequence" that was requested by the MGC. The parameter "Sequence Response Type" in the ObservedEvents Descriptor identifies the result.

5.5.5 Signal – Pulsed Signal

The signal "pulsed signal" is used by the MGC to request the MG to apply the specified pulsed signal to the analogue line.

5.5.6 Signal – Steady Signal

The signal "steady signal" is used by the MGC to request the MG to apply the specified steady signal to the analogue line.

5.5.7 Signal – Digits

The signal "Digits" is sent by the MGC to request the MG to send loop disconnect digits to an analogue line.

5.5.8 Signal – Autonomous Signalling Sequence

The "autonomous signalling sequence" signal is used by the MGC to request the MG to apply a predefined signalling sequence.

5.5.9 Signal – Call Finished

This signal is sent to the MG to indicate that it shall apply a voltage/current feed that corresponds to an Idle Feed condition.

5.5.10 Guidelines for mapping of the V5 PSTN Protocol

This section provides guidelines on mapping the V5 PSTN protocol defined in G.964 to the H.248 protocol. These guidelines may assist both network operators and vendors in the migration of their existing V5 PSTN protocol implementations to an architecture based on the H.248 sub-series of recommendations.

Table 4 describes the mapping of V5 PSTN Protocol messages to H.248 commands. Table 5 describes the mapping of the V5 Bearer Channel Connection protocol to H.248 commands. Table 6 provides a mapping of V5 information elements to H.248 concepts.

Table 4/H.248.34 – Mapping of V5 PSTN Protocol messages

Message type	Reference (clause)	Mapping	Mapping Details
Path establishment messages			
ESTABLISH	13.3.1	H.248 (Transaction Request e.g. Notify, Modify)	This V5 message maps to a command in H.248 (e.g. Notify, Modify). V5 information elements can be mapped to appropriate H.248 Events and Signals Descriptors as defined in Table 6.
ESTABLISH ACK	13.3.2	H.248 (Transaction Reply), (Transaction Request e.g. Notify, Modify)	This V5 message maps to a H.248 "Transaction Reply". V5 allows detected steady and pulsed signals to be embedded in the Establish Ack. In the MG to MGC case, detected H.248 steady and pulsed signals must be carried in a separate transaction request and command (e.g. Notify) specifying an ObservedEvents Descriptor as defined in the Table 6. In the MGC to MG case, H.248 steady and pulsed signals must be carried in a separate transaction request and command (e.g. Modify) specifying a Signals Descriptor as defined in Table 6.
SIGNAL	13.3.3	H.248 (Transaction Request e.g. Notify, Modify)	This V5 message maps to a command in H.248 (e.g. Notify, Modify) and V5 information elements can be carried within an Events Descriptor and Signals Descriptor as defined in Table 6.
SIGNAL ACK	13.3.4	No mapping	This V5 message is specific to the V5 PSTN protocol and support is not required within H.248.

Message type	Reference (clause)	Mapping	Mapping Details
Path clearing messages			
DISCONNECT	13.3.7	H.248 (Transaction Request e.g. Subtract, Modify)	This V5 message is used by the LE to indicate that there is no call activity to the AN. The V5 "Disconnect" is mapped as follows: If the analogue termination is not in the Null context, then the V5 "Disconnect" is mapped to a H.248 Subtract command. The H.248 Subtract command will result in the descriptors (e.g. Signals and Events Descriptors) being reset to their default or provisioned values and the termination is placed in an idle state. If the analogue termination is in the Null context, then the V5 "Disconnect" is mapped to a H.248 Modify Command. If the optional "call finished" signal is supported, then the V5 "Disconnect" is mapped to the "call finished" signal.
DISCONNECT COMPLETE	13.3.8	H.248 (Transaction Reply)	This is an acknowledgement to the V5 Disconnect Message. In H.248 this maps to a "Transaction Reply".
Other messages			
STATUS ENQUIRY	13.3.6	H.248 (Transaction Request e.g. Audit Value, Modify or Move with an Audit Descriptor)	This V5 message is specific to the V5 PSTN protocol error handing and is used to request the V5 PSTN protocol state of the AN. The H.248 protocol has an Audit Value command and Audit Descriptor for auditing the MG.
STATUS	13.3.5	No mapping.	This V5 message is specific to the V5 PSTN protocol error handing and carries state and cause information elements and therefore no direct mapping is required. The H.248 protocol has it own mechanism for conveying protocol errors by using the Error Descriptor.
PROTOCOL PARAMETER	13.3.9	H.248 (Transaction Request e.g. Modify)	This V5 message is used to carry the recognition time, enable autonomous ack and disable autonomous ack V5 information elements. This message is mapped to a H.248 command (e.g. Modify) and the V5 information elements can be mapped to H.248 Events and Signals Descriptors as defined in Table 6.

Table 5/H.248.34 – Mapping of V5.2 Bearer Channel Connection (BCC) Protocol

V5.2 BCC Message	H.248 Mapping Details
Allocate	An "Allocate" maps to H.248 Add commands, which specify an association between physical and ephemeral terminations within the same context.
Deallocate	In the simplest case the "Deallocate" maps to H.248 "Subtract" commands that return physical terminations to the NULL context and destroys the ephemeral terminations.

Table 6/H.248.34 – Detailed mapping of V5 PSTN Protocol Information Elements

V5 PSTN Protocol Information Elements	H.248 Mapping Details
Pulse Notification	In V5 a pulse notification can be requested by the LE at the End of all the pulses, Start of the first pulse or at the End of each pulse. The corresponding mappings in H.248 are provided below: ▪ End of all the pulses – This is achieved in H.248.1 by setting the Notify Complete flag to "Time Out" and activating the signal completion event in the Generic Package (see section E.1/H.248.1). ▪ Start of the first pulse – Determined by the MGC upon receipt of a H.248 "Transaction Reply" containing a successful response to the command. ▪ End of each pulse NOTE – This may be achieved in H.248.1 by setting the Notify Complete flag to "onIteration" (this value of NotifyComplete will be available in H.248.1 version 3) and activating the signal completion event in the Generic Package (see section E.1/H.248.1).
Line Information	Mapped to "line information" event in this package.
Autonomous Signalling Sequence	The V5 information element is mapped to the "autonomous signalling sequence" signal in this package. The V5 "sequence type" parameter is directly mapped to the signal parameter "sequence type". V5 supports "sequence type" values in the range 0 to 15, while the sequence type parameter in this package is an Integer and provides enhanced capability.
Sequence Response	The V5 information element is mapped to the "autonomous signalling sequence response" event in this package. The V5 "sequence response type" parameter is directly mapped to the ObservedEvents Descriptor parameter "sequence response type". V5 supports "sequence response" values in the range 0 to 15, while the sequence response type parameter in this package is an Integer and provides enhanced capability.
Cadenced Ringing	This is supported by ring signal in the Enhanced Alerting package version 2 (ITU-T H.248.23). The V5 ring cadence type information element is mapped to the "pattern" parameter.

<table>
<tr><th>V5 PSTN Protocol Information Elements</th><th colspan="4">H.248 Mapping Details</th></tr>
<tr><td>Pulsed Signal</td><td colspan="4">In the MGC to MG direction, the V5 information element is mapped to the signal “pulsed signal” defined in this package with the V5 parameters mapped as follows:
▪ Pulse type – Directly mapped to the parameter “Signal” as specified below.</td></tr>
<tr><td></td><td colspan="2">V5</td><td colspan="2">H.248</td></tr>
<tr><td></td><td>Pulsed Signal</td><td>Value</td><td>Text Encoding</td><td>Binary Encoding</td></tr>
<tr><td></td><td>Pulsed normal polarity</td><td>127</td><td>“pulsedNormalPolarity”</td><td>(0x007F)</td></tr>
<tr><td></td><td>Pulsed reversed polarity</td><td>126</td><td>“pulsedReversedPolarity”</td><td>(0x007E)</td></tr>
<tr><td></td><td>Pulsed battery on c-wire</td><td>125</td><td>“pulsedBatteryonCwire”</td><td>(0x007D)</td></tr>
<tr><td></td><td>Pulsed on hook</td><td>124</td><td>“pulsedOnHook”</td><td>(0x007C)</td></tr>
<tr><td></td><td>Pulsed reduced battery</td><td>123</td><td>“pulsedReducedBattery”</td><td>(0x007B)</td></tr>
<tr><td></td><td>Pulsed no battery</td><td>122</td><td>“pulsedNoBattery”</td><td>(0x007A)</td></tr>
<tr><td></td><td>Initial Ring</td><td>121</td><td>“initialRing”</td><td>(0x0079)</td></tr>
<tr><td></td><td>Meter pulse</td><td>120</td><td>“meterpulse”</td><td>(0x0078)</td></tr>
<tr><td></td><td>50 Hz pulse</td><td>119</td><td>“50HzPulse”</td><td>(0x0077)</td></tr>
<tr><td></td><td>Register recall (timed loop open)</td><td>118</td><td>“registercall”</td><td>(0x0076)</td></tr>
<tr><td></td><td>Pulsed off hook (pulsed loop closed)</td><td>117</td><td>“pulsedOffHook”</td><td>(0x0075)</td></tr>
<tr><td></td><td>Pulsed b-wire connected to earth</td><td>116</td><td>“pulsedB-wireConnectedToEarth”</td><td>(0x0074)</td></tr>
<tr><td></td><td>Earth loop pulse</td><td>115</td><td>“earthLoopPulse”</td><td>(0x0073)</td></tr>
<tr><td></td><td>Pulsed b-wire connected to battery</td><td>114</td><td>“pulsedB-wireConnectedToBattery”</td><td>(0x0072)</td></tr>
<tr><td></td><td>Pulsed a-wire connected to earth</td><td>113</td><td>“pulsedA-wireConnectedToEarth”</td><td>(0x0071)</td></tr>
<tr><td></td><td>Pulsed a-wire connected to battery</td><td>112</td><td>“pulsedA-wireConnectedToBattery”</td><td>(0x0070)</td></tr>
<tr><td></td><td>Pulsed c-wire connected to earth</td><td>111</td><td>“pulsedC-wireConnectedToEarth”</td><td>(0x006F)</td></tr>
<tr><td></td><td>Pulsed c-wire disconnected</td><td>110</td><td>“pulsedC-wireDisconnected”</td><td>(0x006E)</td></tr>
<tr><td></td><td>Pulsed normal battery</td><td>109</td><td>“pulsedNormalBattery”</td><td>(0x006D)</td></tr>
<tr><td></td><td>Pulsed a-wire disconnected</td><td>108</td><td>“pulsedA-wireDisconnected”</td><td>(0x006C)</td></tr>
<tr><td></td><td>Pulsed b-wire disconnected</td><td>107</td><td>“pulsedB-wireDisconnected”</td><td>(0x006B)</td></tr>
</table>

<table>
<tr><th>V5 PSTN Protocol Information Elements</th><th>H.248 Mapping Details</th></tr>
<tr><td></td><td>

Number of pulses - Directly mapped to the “Number of Pulses” parameter.
Pulse Duration Type – The default duration is provisioned in the MG, but this can be overridden by specifying a signal duration parameter specified in H.248.1.
Suppression Indicator – Mapped to the H.248.1 KeepActive flag, which is associated with the detected event that should not halt the pulsed signal.
Ack Request Indicator – See text regarding V5 “pulse notification” information element.

In the MG to MGC direction, the V5 information element is mapped to the ObservedEvent “pulsed signal” defined in this package with the V5 parameters mapped as follows:

Pulse type – Directly mapped to the parameter “Detected Signal”.
Number of pulses – Not applicable in this direction
Pulse Duration Type – Not applicable in this direction
Suppression Indicator – Not applicable in this direction
Ack Request Indicator – Not applicable in this direction

</td></tr>
<tr><td>Steady Signal</td><td>
In the MGC to MG direction the V5 information element is mapped to the signal “steady signal” defined in this package with the V5 parameters mapped as follows:

Steady Signal type – Directly mapped to the parameter “Signal” as specified below.

<table>
<tr><th colspan="2">V5</th><th colspan="2">H.248</th></tr>
<tr><th>Steady Signal</th><th>Value</th><th>Text Encoding</th><th>Binary Encoding</th></tr>
<tr><td>Normal polarity</td><td>0</td><td>“normalPolarity”</td><td>(0x0000)</td></tr>
<tr><td>Reversed polarity</td><td>1</td><td>“reversedPolarity”</td><td>(0x0001)</td></tr>
<tr><td>Battery on c-wire</td><td>2</td><td>“batteryOnC-wire”</td><td>(0x0002)</td></tr>
<tr><td>No battery on c-wire</td><td>3</td><td>“noBatteryOnC-wire”</td><td>(0x0003)</td></tr>
<tr><td>Off hook (loop closed)</td><td>4</td><td>“offHook”</td><td>(0x0004)</td></tr>
<tr><td>On hook (loop open)</td><td>5</td><td>“onHook”</td><td>(0x0005)</td></tr>
<tr><td>Battery on a-wire</td><td>6</td><td>“batteryOnA-wire”</td><td>(0x0006)</td></tr>
<tr><td>A-wire on earth</td><td>7</td><td>“aWireonEarth”</td><td>(0x0007)</td></tr>
<tr><td>No battery on a-wire</td><td>8</td><td>“noBatteryOnA-wire”</td><td>(0x0008)</td></tr>
<tr><td>No battery on b-wire</td><td>9</td><td>“noBatteryOnB-wire”</td><td>(0x0009)</td></tr>
<tr><td>Reduced Battery</td><td>10</td><td>“reducedBattery”</td><td>(0x000a)</td></tr>
<tr><td>No battery</td><td>11</td><td>“noBattery”</td><td>(0x000b)</td></tr>
<tr><td>Alternate reduced power/no power</td><td>12</td><td>“alternateReducedPower”</td><td>(0x000c)</td></tr>
</table>
</td></tr>
</table>

V5 PSTN Protocol Information Elements	H.248 Mapping Details			
	Normal battery	13	"normalBattery"	(0x000d)
	Stop ringing	14	"stopRinging"	(0x000e)
	Start pilot frequency	15	"startPilotFrequency"	(0x000f)
	Stop pilot frequency	16	"stopPilotFrequency"	(0x0010)
	Low impedance on b-wire	17	"lowImpedanceonB-wire"	(0x0011)
	B-wire connected to earth	18	"b-wireConnectedtoearth"	(0x0012)
	B-wire disconnected from earth	19	"b-wireDisconnectedfromearth"	(0x0013)
	Battery on b-wire	20	"batteryOnB-wire"	(0x0014)
	Low loop impedance	21	"lowLoopImpedance"	(0x0015)
	High loop impedence	22	"highLoopImpedance"	(0x0016)
	Anomalous loop impedence	23	"anomalousLoopImpedence"	(0x0017)
	A-wire disconnected from earth	24	"a-wireDisconnectedfromearth"	(0x0018)
	C-wire on earth	25	"c-wireOnearth"	(0x0019)
	C-wire disconnected from earth	26	"c-wireDisconnectedfromearth"	(0x001a)
	Ramp to reverse polarity	29	"rampToReversePolarity"	(0x001d)
	Ramp to normal polarity	30	"rampToNormalPolarity"	(0x001e)
	In the MG to MGC direction, the V5 information element is mapped to the ObservedEvent "steady signal" defined in this package with the V5 parameters mapped as follows: ▪ Steady Signal type – Directly mapped to the parameter "Detected Signal".			
Digits Signal	In the MGC to MG direction, the V5 information element is mapped to the signal "digit" in this package, with the V5 parameters mapped as follows: ▪ Digit Information – Directly mapped to the "Digits" Parameter. Digit Ack Request Indicator – See text regarding the V5 "pulse notification" information element. In the direction of MG to MGC, the Loop Disconnect digits detected by the MG are reported as a "digit completion" event as part of H.248 digit map handling.			

V5 PSTN Protocol Information Elements	H.248 Mapping Details

Recognition Time	This is mapped to an Events Descriptor specifying the event "steady signal" or "pulsed signal" with Events Descriptor parameters specifying the "detect signal" and "recognition time".
	
	For example, to modify the steady signal "Off Hook" recognition time to "100"ms and to report all the other steady signals (i.e. NOT offHook), then the Events Descriptor would contain the following information:
	
	Events = requestid {
	stimal/stedsig {
	detectsig = offHook,
	rectime = 100
	},
	stimal/stedsig {
	detectsig # offHook
	}
	}

Enable Autonomous Acknowledge	To enable autonomous acknowledgement, an embedded Signals Descriptor is added to the event specifying the signal to be detected. The Signals Descriptor shall contain the signal that is to be autonomously sent in response to the detected event.
	
	For example, if "Normal Polarity" is to be sent autonomously in response to an "Off Hook" and to continue reporting all other steady signals (i.e. NOT offHook), then the Events Descriptor would contain the following information:
	
	Events = requestid {
	stimal/stedsig {
	detectsig = offHook,
	Embed {
	Signals {
	stimal/stedsig {
	signal = normalPolarity
	}
	}
	}
	},
	stimal/stedsig {
	detectsig # offHook,
	}
	}

Disable Autonomous Acknowledge	An autonomous acknowledgement in the MG can be disabled by replacing the events descriptor containing an embedded Signals Descriptor with an Events Descriptor, which does not contain embedding.
	
	For example, to request the MG to detect all steady signal events without generating an "Autonomous Ack", then the Events Descriptor would contain the following information:
	
	Events = requestid {
	stimal/stedsig
	}

V5 PSTN Protocol Information Elements	H.248 Mapping Details
Resource Unavailable	This is mapped to the H.248 .8 Error Code – 510, "Insufficient Resources".
Enable Metering	The mapping of the relevant V5 parameters is described below: ▪ Repetition Indicator – This is mapped to the enable metering signal defined in the Automatic Metering package (ITU-T H.248.26). Value "00" indicates that fixed rate metering is required and this is mapped to a non-zero "pulse count" parameter value. Value "11" indicates automatic metering and this is mapped to a zero "pulse count" parameter value. ▪ Pulse Type – The frequency of the metering pulse to be applied is configured in the MG. ▪ Rate Type – The rate type is mapped to an appropriate "Pulse Repetition Interval" associated with the enable metering signal in the Automatic Metering package (ITU-T H.248.26). ▪ Pulse duration type – This is a provisioned item in the MG. ▪ Suppression Indicator – This is mapped to the KeepActive flag which is associated with the detected event that should not suppress the automatic metering. ▪ Reporting pulse count – This is mapped to the Periodic Report event and its parameter "Report period" (ITU-T H.248.26).
Metering Report	The mapping of the relevant V5 parameters is described below: ▪ Pulse Count – Counts are returned via event "Periodic Report" and the statistics "Current Pulse Count" and "Pulse Count since Last Report" as defined in the Automatic Metering package (ITU-T H.248.26). ▪ Report Type – "Metering Continuing" can be assumed by the MGC if no Signal Completion event is received. "Metering ended" is determined by the MGC when the Signal Completion event is received. "Positive acknowledgement of new automatic metering instructions" is determined by the MGC when a successful Transaction reply is received in response to the instruction to apply an Enable Metering signal. "Failure of metering in the AN" can be assumed by the MGC on reception of a transaction reply with an appropriate error code. ▪ Failure Reason – This is handled by an appropriate H.248.8 error code and only included when the V5 "Report Type" specifies "Failure of metering in the AN"
Attenuation	This is mapped to the gain control property in the TDM Circuit Package (ITU-T H.248.1).

Appendix I – V5 to H.248 Mapping Overview

Table I.1 contains an overview of the mapping of V5 messages to H.248 commands based on Table 16/G.764. Table I.2 indicates which information elements are implemented as events and/or signals in the stimulus analogue line package and is based on Table 17/G.764.

Table I.1/H.248.34 – PSTN protocol message types

Message type	**Reference G.964 § (clause)**	**H.248 Mapping Direction LE → AN**	**H.248 Mapping Direction AN → LE**	**Description**
Path establishment messages				
ESTABLISH	13.3.1	ADD	NOTIFY	Initiation of PSTN path
ESTABLISH ACK	13.3.2	TRANSACTION REPLY (if required additionally TRANSACTION REQUEST)	TRANSACTION REPLY (if required additionally TRANSACTION REQUEST)	Positive response to PSTN path initiation.
SIGNAL	13.3.3	MODIFY	NOTIFY	An electrical line condition described in a message (e.g. pulsed signal "Meter pulse").
SIGNAL ACK	13.3.4	TRANSACTION REPLY	TRANSACTION REPLY	Acknowledgement of sent/received message
Path clearing messages				
DISCONNECT	13.3.7	SUBTRACT	Not Applicable	Initiation of clearing the PSTN path
DISCONNECT COMPLETE	13.3.8	Not Applicable	TRANSACTION REPLY	Positive response to a path clearing
Other messages				
STATUS ENQUIRY	13.3.6	H.248 Audit Value, Audit Descriptor	Not applicable	Request of status conditions in AN
STATUS	13.3.5	Not applicable	TRANSACTION REPLY	Report of status conditions in AN
PROTOCOL PARAMETER	13.3.9	MODIFY	Not applicable	Request to change a PSTN port parameters (e.g. timer values to detect hook flash)
NOTE – All other values of PSTN protocol message types are reserved.				

Table I.2/H.248.34 – Information element identifier coding

Name	Reference G.964 § (clause)	Implemented as an Event in Stimulus Analogue Lines Package	Implemented as a Signal in Stimulus Analogue Lines Package	Mapped	Not required
SINGLE OCTET					
Pulse-notification	13.4.6.1 1	X		X	
Line-information	13.4.6.2 1	X		X	
State	13.4.6.3 1				X
Autonomous-signalling-sequence	13.4.6.4 1		X	X	
Sequence-response	13.4.6.5 1	X		X	
VARIABLE LENGTH					
Sequence-number	13.4.7.1 3				X
Cadenced-ringing	13.4.7.2 3		X	X	
Pulsed-signal	13.4.7.3 3 to 5	X	X	X	
Steady-signal	13.4.7.4 3	X	X	X	
Digit-signal	13.4.7.5 3		X	X	
Recognition-time	13.4.7.6 4	X		X	
Enable-autonomous-acknowledge	13.4.7.7 4 to 6	X		X	
Disable-autonomous-acknowledge	13.4.7.8 3	X		X	
Cause	13.4.7.9 3 to 5		Covered by H.248 Error Codes.	X	
Resource-unavailable	13.4.7.10 3 to 8		Covered by H.248 Error Codes.	X	
Enable-metering	13.4.7.11 4 to 7	X	X	X	
Metering-report	13.4.7.12 4 to 5	X	X	X	
Attenuation	13.4.7.13 3		Covered by TDM Circuit Package	X	
NOTE – All other Information Element Name values are reserved.					