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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Communication procedures

Gateway control protocol: Facsimile, text conversation and call discrimination packages

Recommendation ITU-T H.248.2

ITU-T H-SERIES RECOMMENDATIONS

AUDIOVISUAL AND MULTIMEDIA SYSTEMS

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

Recommendation ITU-T H.248.2

Gateway control protocol: Facsimile, text conversation and call discrimination packages

Summary

Recommendation ITU-T H.248.2 defines packages that extend the applicability of the ITU-T H.248.1 Gateway Control Protocol Recommendation. Specifically, this Recommendation describes packages for fax, text telephone, call type discrimination and data call detection for use with the ITU-T H.248.1 Gateway Control Protocol. As defined in Recommendation ITU-T H.248.1, a "package" is an extension to ITU-T H.248.1 that supports specific behaviour.

The packages are intended for control over gateway functions for transport of facsimile or text conversation between different network environments. Extensions can be made for other kinds of data transport.

- **The Call Type Discrimination package** defines control and monitoring of a line for the signalling protocols used in the beginning of a session of data transmission for fax, text telephony or data. This package has been revised to enable the MG to autonomously determine the call type to be supported.
- **The Text Telephone package** defines control of a text telephone session in any of the modes supported by the automoding text telephone Recommendation, ITU-T V.18.
- **The Fax package** defines control of a fax transmission.
- **The Fax/Textphone/Modem Tones Detection package** defines control over a termination for detection of any signals from a fax, text telephone or data modem during a connection in voice mode.
- **The Text Conversation package** defines control over a real-time interactive text conversation session using a universal presentation format and transferred with a transport method from a multimedia protocol in any network environment.
- **The IP Fax package** defines control over facsimile transmission in a packet network.

All the packages have been editorially modified to align with the ITU-T H.248.1 packages template.

Amendment 1 (2007) to the 2005 revision provides an enhancement to the types of call that may be discriminated through in-band signalling. It groups existing call types into like types. It provides an explanation of when those types are used. Several new call types are added to the Discriminated Call Type event. The Call discrimination flows have been corrected with the correct events.

This 2013 revision incorporates a correction to the example call flow in Appendix I.

NOTE – This Recommendation has been renumbered. It was previously known as Recommendation ITU-T H.248, Annex F.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T H.248 Annex F	2000-11-17	16
1.0	ITU-T H.248.2	2000-11-17	16
2.0	ITU-T H.248.2	2005-01-08	16
2.1	ITU-T H.248.2 (2005) Amd. 1	2007-01-13	16
3.0	ITU-T H.248.2	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.

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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/.

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Recommendation ITU-T H.248.2

Gateway control protocol: Facsimile, text conversation and call discrimination packages

1 Scope

This Recommendation describes packages for the ITU-T H.248.1 gateway protocol related to data or telematic services. With terminations implementing these packages, a gateway is expected to handle initial modem negotiations, and the communication in voice, fax and text telephone call types. It contains:

– Package "ftmd" for general detection of signals on a fixed telephone line indicating a possible request to enter some data-related mode;

– Package "ctyp" for general call discrimination to sort out if a call should be handled as voice, fax, text telephone or modem data, and perform the initial negotiation;

– Package "txp" for communicating with text telephones in the telephone network;

– Package "fax" for communication with facsimile in the telephone network;

– Package "txc" for general text conversation in other environments;

– Package "ipfax" for fax transmission in IP networks.

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.224]	Recommendation ITU-T H.224 (2005), *A real time control protocol for simplex applications using the H.221 LSD/HSD/MLP channels*, plus Cor.1 (2007).
[ITU-T H.248.1]	Recommendation ITU-T H.248.1 (2013), *Gateway control protocol: Version 3*.
[ITU-T H.320]	Recommendation ITU-T H.320 (2004), *Narrow-band visual telephone systems and terminal equipment*.
[ITU-T H.323]	Recommendation ITU-T H.323 (2009), *Packet-based multimedia communications systems*.
[ITU-T H.324]	Recommendation ITU-T H.324 (2009), *Terminal for low bit-rate multimedia communication*.
[ITU-T T.30]	Recommendation ITU-T T.30 (2005), *Procedures for document facsimile transmission in the general switched telephone network*, plus Amd.1 (2007).
[ITU-T T.37]	Recommendation ITU-T T.37 (1998), *Procedures for the transfer of facsimile data via store-and-forward on the Internet*, plus Amendments 1 (1999), 2 (2001) and 3 (2002).
[ITU-T T.38]	Recommendation ITU-T T.38 (2010), *Procedures for real-time Group 3 facsimile communication over IP networks*, plus Erratum 1 (2013).

[ITU-T T.50]	Recommendation ITU-T T.50 (1992), *International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) – Information technology – 7-bit coded character set for information interchange.*
[ITU-T T.134]	Recommendation ITU-T T.134 (1998), *Text chat application entity.*
[ITU-T T.140]	Recommendation ITU-T T.140 (1998)/Add. 1 (2000), *Protocol for multimedia application text conversation.*
[ITU-T V.8]	Recommendation ITU-T V.8 (2000), *Procedures for starting sessions of data transmission over the public switched telephone network.*
[ITU-T V.8 *bis*]	Recommendation ITU-T V.8 *bis* (2000), *Procedures for the identification and selection of common modes of operation between data circuit-terminating equipments (DCEs) and between data terminal equipments (DTEs) over the public switched telephone network and on leased point-to-point telephone-type circuits.*
[ITU-T V.17]	Recommendation ITU-T V.17 (1991), *A 2-wire modem for facsimile applications with rates up to 14 400 bit/s*, plus Corrigendum 1 (1998).
[ITU-T V.18]	Recommendation ITU-T V.18 (2000), *Operational and interworking requirements for DCEs operating in the text telephone mode*, plus Amendment 1 (2002).
[ITU-T V.21]	Recommendation ITU-T V.21 (1988), *300 bits per second duplex modem standardized for use in the general switched telephone network.*
[ITU-T V.23]	Recommendation ITU-T V.23 (1988), *600/1200-baud modem standardized for use in the general switched telephone network.*
[ITU-T V.25]	Recommendation ITU-T V.25 (1996), *Automatic answering equipment and general procedures for automatic calling equipment on the general switched telephone network including procedures for disabling of echo control devices for both manually and automatically established calls*, plus Corrigendum 1 (2001).
[ITU-T V.27 *ter*]	Recommendation ITU-T V.27 *ter* (1988), *4800/2400 bits per second modem standardized for use in the general switched telephone network.*
[ITU-T V.34]	Recommendation ITU-T V.34 (1998), *A modem operating at signalling rates of up to 33 600 bit/s for use on the general switched telephone network and on leased point-to-point 2-wire telephone-type circuits.*
[ITU-T V.61]	Recommendation ITU-T V.61 (1996), *A simultaneous voice plus data modem, operating at a voice plus data signalling rate of 4800 bit/s, with optional automatic switching to data-only signalling rates of up to 14 400 bit/s, for use on the General Switched Telephone Network and on leased point-to-point 2-wire telephone type circuits.*
[ITU-T V.90]	Recommendation ITU-T V.90 (1998), *A digital modem and analogue modem pair for use on the Public Switched Telephone Network (PSTN) at data signalling rates of up to 56 000 bit/s downstream and up to 33 600 bit/s upstream.*
[IETF RFC 3550]	IETF RFC 3550 (2003), *RTP: A Transport Protocol for Real-Time Applications.*
[IETF RFC 4103]	IETF RFC 4103 (2005), *RTP Payload for Text Conversation.*

[ISO/IEC 10646-1]   ISO/IEC 10646-1:2000, *Information technology − Universal Multiple-Octet Coded Character Set (UCS) − Part 1: Architecture and Basic Multilingual Plane*.

3   Definitions

This Recommendation defines the following terms:

3.1   hexadecimal octet coding: Hexadecimal octet coding is a means for representing a string of octets as a string of hexadecimal digits, with two digits representing each octet.

Each octet is issued by the DTE or DCE in the same time sequence as transmitted on the GSTN line, with no intervening characters.

For each octet, the 8-bit sequence is encoded as two hexadecimal digits. Bit 0 is the first transmitted; bit 7 is the last.

Bits 7-4 are encoded as the first hexadecimal digit, with bit 7 as MSB and bit 4 as LSB. Bits 3-0 are encoded as the second hexadecimal digit, with bit 3 as MSB and bit 0 as LSB.

Examples:

Octet bit pattern (time order as specified in Recs ITU-T V.8 and ITU-T V.8 *bis*)	Hexadecimal coding	ITU-T T.50 codes
00011011	D8	4/4, 3/8
11100100	27	3/2, 3/7
10000011 10100010 11001000 00001001	C1451390	4/3, 3/1, 3/4, 3/5, 3/1, 3/3, 3/9, 3/0

3.2   hexadecimal octet sequence: A hexadecimal octet sequence is an even number of hexadecimal digits, terminated by a <CR> (ITU-T T.50 0/13) character.

4   Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CR   Carriage Return

DCE   Date Circuit-terminating Equipment

DTE   Data Terminal Equipment

DTMF   Dual Tone Multi Frequency

EDT   European Deaf Telephone

FAX   Facsimile

FCS   Frame Check Sequence

GSTN   General Switched Telephone Network

ID   Identity

IP   Internet Protocol

ISDN   Integrated Services Digital Network

LSB   Least Significant Bit

MG   Media Gateway

MGC   Media Gateway Controller

MIME   Multipurpose Internet Mail Extension

MSB   Most Significant Bit

PSTN   Public Switched Telephone Network

RTP   Real-time Transfer Protocol

SDP   Session Description Protocol

SIP   Session Initiation Protocol

TCP   Transmission Control Protocol

5   FAX/Textphone/Modem Tones Detection package

Package name:	FAX/Textphone/Modem Tones Detection package
Package ID:	ftmd (0x000E)
Description:	This package defines an event to detect the presence of data traffic (fax, textphone or modem) on a line. The main intention of this event may be used to effect the compression option on the line so that an audio codec capable of transmitting modem signals can be invoked to handle the connection when needed. This Package extends the possible values of tone id in the "start tone detected" event. Note that there is no discrimination between tones from this package. If discrimination is desired, the Call Type Discrimination package should be invoked.
Version:	1
Extends:	tonedet version 1

5.1   Properties

None.

5.2   Events

Events are defined as for the Tone Detection package (see [ITU-T H.248.1]).

5.2.1   Additional tone id value

Tone Id: dtfm (0x0039)

This tone id is generated when any of the following tones are detected.

"Tone"	Description	Applicable to
CNG	an ITU-T T.30 fax calling	Fax
V21flag	an ITU-T V.21 tone and flags	Fax
CIV18	an ITU-T V.8 CI with ITU-T V.18 call function	Textphone
XCI	an ITU-T V.18 XCI	Textphone
V18txp	an ITU-T V.18 "txp"	Textphone
Belltone	a Bell 103 carrier, either the high or the low frequency channel (as defined in [ITU-T V.18])	Textphone
Baudot	a Baudot initial tone and character (as defined in [ITU-T V.18])	Textphone
Edt	an EDT initial tone and character (as defined in [ITU-T V.18])	Textphone
Ctm	a CTM signal was detected (as defined in [b-3GPP TS 26.226])	Textphone

"Tone"	Description	Applicable to
CIdata	an ITU-T V.8 CI with any data call function	Data
CT	an ITU-T V.25 calling tone	Text and data
CIfax	an ITU-T V.8 CI with facsimile call function	Fax
V21tone	an ITU-T V.21 carrier, either the high or the low frequency channel	Text and data
V23tone	an ITU-T V.23 carrier, either the high or the low frequency channel	Text and data
V8 *bis*	an ITU-T V.8 *bis* modem handshaking signal	Fax, text and data
ANS	ITU-T V.25 ANS, equivalent to T.30 CED from answering terminal	Fax, text and data
ANSAM	ITU-T V.8 ANSam	Fax, text and data

5.3   Signals

None.

5.4   Statistics

None.

5.5   Procedures

None.

6   Text Conversation package

Package name: Text Conversation

Package ID: txc (0x000F)

Description: The Text Conversation package is intended for enabling real-time text conversation between terminals in different networks or multimedia environments. This package includes the mechanisms needed to transport ITU-T T.140 text conversation streams in multimedia environments. The transport mechanism will be different for each environment where the package is used.

Version: 1

Extends: None

6.1   Properties

6.1.1   Text Buffering Time

Property name: Text Buffering Time

Property ID: bufftime (0x0001)

Description: This property indicates the time in ms that ITU-T T.140 data shall be collected before transmission in order to minimize text overhead. In low bit rate IP networks, a value of 300 ms is recommended. In environments with low overhead or high bit rates, this property should have the value 0, enabling immediate transmission of entered characters.

Type: Integer

Possible values: 0-500

Default:	Provisioned
Defined in:	LocalControl
Characteristics:	Read/Write

6.1.2 Text Termination Connection State

Property name:	Text Termination Connection State
Property ID:	connstate (0x0002)
Description:	The connection state property is used to register text capability, request a text connection, and reflect details of the achieved text connection. For transport methods having separate channel control procedures, managed by the MGC, only a subset of the values is used:Idle, Prepare, Connected.
Type:	Enumeration

Possible values:

Idle	(0x0001)	For no connection efforts
Prepare	(0x0002)	For being known in the termination and ready to accept (the text capability is offered in session requests)
Initiate	(0x0003)	For taking the initiative to establish a text connection opening a text channel
Accept	(0x0004)	For accepting an incoming request for a text session
Deny	(0x0005)	For denying an incoming text connect request
Connected	(0x0006)	For established connection in text mode

Default:	Idle (0x0001)
Defined in:	TerminationState
Characteristics:	Read/Write

6.1.3 Text User Identity

Property name:	Text User Identity
Property ID:	txuserid (0x0003)
Description:	This parameter holds the optional remote User Identity parameter of an ITU-T T.140 text conversation session, retrieved from the session.
Type:	String
Possible values:	String of up to 64 characters in Unicode UTF-8
Default:	None
Defined in:	LocalControl
Characteristics:	Read/Write

6.1.4 Text Transport

Property name: Text Transport

Property ID: trpt (0x0004)

Description: The Transport parameter reflects the transport mechanism selected for the Text Conversation termination. When the media description has the full capability of describing sessions including the transport mechanism, this parameter is implied by the media descriptor.

Type: Enumeration

Possible values:

H224	(0x0001)	For ITU-T H.224 Client ID = 2 in [ITU-T H.320]
AL1	(0x0002)	For AL1 in [ITU-T H.324]
TCP	(0x0003)	For TCP as in Annex G of [ITU-T H.323]
RTP/T.140	(0x0004)	For RTP with ITU-T T.140 as in Annex G of [ITU-T H.323] or IETF SIP
RTP/RED/T.140	(0x0005)	For RTP with ITU-T T.140 and redundancy coding RED as in Annex G of [ITU-T H.323] or IETF SIP
T.134	(0x0006)	For ITU-T T.134 in the ITU-T T.120 environment
Unassigned	(0x0007)	When no transport protocol is assigned

Default: Unassigned (0x0007)

Defined in: LocalControl

Characteristics: Read/Write

6.1.5 Text Protocol Version

Property name: Text Protocol Version

Property ID: TextProto (0x0005)

Description: The version of the ITU-T T.140 protocol used in the connection.

Type: Integer

Possible values: Any integer corresponding to an ITU-T T.140 version number. (Currently 1)

Default: 1

Defined in: LocalControl

Characteristics: Read/Write

6.1.6 Redundancy Level

Property name: Redundancy Level

Property ID: red (0x0006)

Description:	The number of generations to use in RTP redundancy coding including the Primary.
Type:	Integer
Possible values:	0-6
	0 = use default or automatic decision on redundancy level
	1 = use no redundancy
	2-6 = use specified number of generations of data
Default:	0
Defined in:	LocalControl
Characteristics:	Read/Write

6.1.7   Txc Request Timer

Property name:	Txc Request Timer
Property ID:	txctim (0x0007)
Description:	The txctim property is a timer value in tenths of seconds for the requested operation. If the requested operation is not completed within this time, the state is returned to Idle and the result reported in the connchange event. An initial timer value of 0 indicates that no timer control is requested.
Type:	integer
Possible values:	0-6000
Default:	0
Defined in:	LocalControl
Characteristics:	Read/Write

6.2   Events

6.2.1   Connection State Change

Event name:	Connection State Change
Event ID:	connchange (0x0001)
Description:	This event will occur when the text connection state for the termination has changed. Its parameter is the new contents of the Connection State property. If a request timed out, the state is returned to Idle.

6.2.1.1   EventDescriptor parameters

None.

6.2.1.2   ObservedEventDescriptor parameters

6.2.1.2.1   Connection Change

Parameter name:	Connection Change
Parameter ID:	connchng (0x0001)
Description:	Indicates the current connection state

Type:	Enumeration
Optional:	No
Possible value:	As property txc/connstate
Default:	None

6.3 Signals

None.

6.4 Statistics

6.4.1 Characters Transferred

Statistic name:	Characters Transferred
Statistics ID:	chartrans (0x0001)
Description:	Number of bytes of ITU-T T.140 data transferred through the termination
Type:	Integer
Possible values:	0 and up
Level:	Termination

6.4.2 Packets Lost

Statistic name:	Packets Lost
Statistics ID:	packlost (0x0002)
Description:	Number of ITU-T T.140 packets lost as counted by the receiving ITU-T T.140 termination
Type:	integer
Possible values:	0 and up
Level:	Termination

6.5 Procedures

The following are standard transport mechanisms for text conversation in different environments.

–	In ITU-T H.320:	ITU-T H.224 with Client ID = 2;
–	In ITU-T H.324:	AL1 channel connected with ITU-T H.245 procedures;
–	In ITU-T T.120:	ITU-T T.134 transport in ITU-T T.125 communication channel environment;
–	In ITU-T H.323:	RTP/T.140 or TCP as selected with ITU-T H.245 messages;
–	In IETF SIP:	RTP/T.140 as initiated with SDP.

NOTE – ITU-T T.140 text media is also used together with ITU-T V.18 modems for text telephony; this is specified in a separate package: Text_Telephone (txp).

The Text Conversation package is intended to be added to a multimedia termination, handling appropriate multiplexing and control.

6.5.1 Function

A termination with Text Conversation adds capability declaration for a text conversation channel in the call set-up according to procedures defined for each environment. When matching capabilities exist, an ITU-T T.140 channel can be established according to the transport protocol used in the current environment. ITU-T T.140 text stream contents received from one termination are transferred for transmission to other ITU-T T.140 capable terminations in the context. The ITU-T T.140 contents may be buffered for a short moment for possible collection of more text in the same transmission according to the buffer time property.

6.5.2 Informative description

Real-time text conversation allows telecom users to carry out a written conversation. The presentation and coding aspects of standardized text conversation are defined in [ITU-T T.140]. Text is transmitted character by character (or in small blocks) so that the users experience a close interaction. The text and basic editing control is ISO/IEC 10646-1, UTF-8 coded. Figure 1 gives an example of how a text conversation can be displayed to the user.

ANNE	EVE
Hi, this is Anne.	Oh, hello Anne, I am glad you are calling! It's been long since we met!
Yes, have you heard that I will come to Paris in November?	No, that's new to me. What brings you here?

Figure 1 – Possible display of a one-to-one text conversation

For each transport environment, a suitable transport protocol must be selected to carry the text. Currently defined and recommended transport environments for ITU-T T.140 text media streams that can be supported by this package are:

1) packet networks, where the procedures described in Annex G of [ITU-T H.323] can be used for setting up and conducting text conversation sessions, using TCP or RTP/T.140 for the transport of ITU-T T.140;

2) packet networks, where the IETF Session Initiation Protocol (SIP) can be used for setting up and conducting text conversation sessions using RTP/T.140 for the transport of ITU-T T.140;

3) the ITU-T H.324 multimedia environment in PSTN, ISDN and Mobile networks, where an AL1 channel connected by ITU-T H.245 procedures is used for ITU-T T.140;

4) the ITU-T H.320 multimedia environment, where an ITU-T H.224 channel with Client ID = 2 is specified for transport of ITU-T T.140;

5) the ITU-T T.120 data conferencing environment, that can be used alone, or in conjunction with any of the environments above, where ITU-T T.134 specifies the application entity and ITU-T T.125 the data channel for ITU-T T.140.

A separate Text Telephone package (txp) supports text telephony in the PSTN using the ITU-T V.18 modem in native and legacy modes, and ITU-T T.140 for communication with terminations using this package.

Interworking between these forms of Text Conversation can be achieved through the use of gateways with packages defined here.

6.5.3 Total Conversation

Most text conversation transport environments are part of multimedia communication systems. With the introduction of text, they enable conversation in video, text and voice simultaneously, called Total Conversation. The total set of communication modes that people tend to use locally can be offered on a distance through Total Conversation. Since the text part is built on the unified presentation level T.140, the task to arrange interoperability of Total Conversation in different network environments through a gateway is simplified.

Video is optional in the multimedia systems. Therefore, compatible text-and-voice conversation can also be established within the same framework.

6.5.4 Descriptor to use for text conversation

One descriptor value is of specific interest for the Text Conversation and Text Telephone packages. That is the text conversation media stream. It is described here for information.

Text conversation stream

This descriptor is used for the text conversation stream, according to [ITU-T T.140]. [ITU-T T.140] gives a general presentation level description for a termination supporting real-time text conversation. The text and basic editing control is UTF-8 coded. For each transport environment, a suitable transport protocol must be selected to carry the text.

T.140 is a registered MIME text stream name, which can be specified to be used as it is or in RTP embedding of [IETF RFC 4103].

7 Text Telephone package

Package name:	Text Telephone package
Package ID:	txp (0x0010)
Description:	The Text Telephone package is used on a line termination in a Media Gateway, to handle text telephone calls. It includes ITU-T V.18 text telephone modem functionality that adapts to different legacy text telephone systems in the PSTN as well as it provides communication with ITU-T V.18-equipped text telephones. The text media stream is UTF-8 coded with a few editing functions as specified in [ITU-T T.140]. The Text Telephone package is intended to be operated together with the Call Type Discrimination package (ctyp) to perform ITU-T V.18 automoding functions.
Version:	1
Extends:	None

Text telephony

Text telephony offers a real-time conversation in text between two parties. It may be combined with voice conversation. Text telephony in PSTN existed in at least six incompatible legacy modes before the automoding modem Recommendation for text telephony ITU-T V.18 was introduced by [ITU-T V.18]. It is suitable for use in PSTN text telephones, as well as in gateways for connection to the PSTN text telephones. When connected, it can operate in one of its native ITU-T V.18 modes, or in any of the six legacy modes described in [ITU-T V.18] annexes. The legacy modes are Baudot, EDT, DTMF, V.21, Minitel and Bell 103. The mode detection and adjustment of the transmission to the selected mode is automatic.

The native modes use [ITU-T T.140] for the text coding and control and [ITU-T V.21] or optionally [ITU-T V.61] for the modulation. The legacy modes use different character coding schemes, but

when used in a gateway, the text stream to and from the textphone termination is ITU-T T.140 coded for all modes. The text telephone package described here includes character conversion, filtering and other adaptation needed for conversation with the legacy mode text telephones.

Carrier modes and carrierless modes

Three of the legacy textphone modes are carrierless. This means that they do not send any signal at all when there are no characters to transmit. Three legacy modes and the native ITU-T V.18 modes use a carrier tone transmitted as long as the connection is maintained. If the carrier stops, it is detected but the line is not disconnected because this is normal behaviour when transferring call or when alternating between voice and text usage.

Text Telephone package considerations above the ITU-T V.18 modem level

[ITU-T V.18] only specifies an automoding modem and the requirement to use ITU-T T.140 when ITU-T V.18 native mode is achieved in a connection. When used in a gateway, there are some general issues that must be handled above the ITU-T V.18 level.

Character set

The legacy modes have limited character sets. For all legacy modes, appropriate character conversion, filtering and control interception are included in the package functionality, so that the communication with other ITU-T T.140 text terminations in the context is equalized to an ITU-T T.140 text stream.

Embedded termination functionality

There is no need to open all details of the use of ITU-T V.18 and ITU-T T.140 to be accessible from the MGC in a gateway. ITU-T V.18, ITU-T T.140, character conversion methods and other automated methods are therefore combined in the Text Telephone package that can be added to suitable terminations of a gateway. Figure 2 describes the Text Telephone package components.
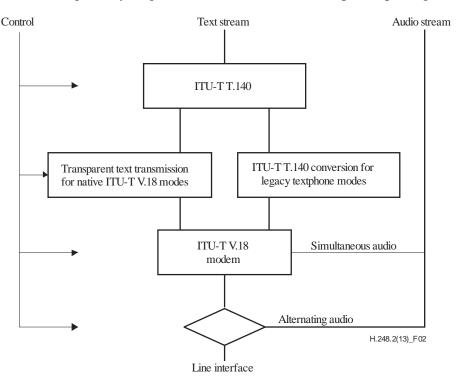

Figure 2 – Text Telephone package functional view

7.1 Properties

7.1.1 Conversation mode

Property name:	Conversation mode
Property ID:	convmode (0x0001)
Description:	The behaviour of the termination is influenced by this property. By setting the property to a selection of the possible values, the number of ways that the conversation can be conducted can be defined. After connection the property contains the actual conversation mode used in the call.
	The basic text-only mode shall always be supported.
	The alternating text and voice mode is most often used to enable one user to speak and read and the other to listen and type. It is used because there was no technology support for simultaneous voice and text when text telephony was introduced. It is only supported for compatibility with the legacy mode text telephone habits.
	The simultaneous text and voice mode enables the users to communicate in any combination and order of the two media. No legacy mode terminals operate in this mode. ITU-T V.18-equipped terminals with ITU-T V.61 modulation can operate in this mode.
Type:	Sub-list of Enumeration
Possible values:	Text-only (0x0001) Basic text-only mode, not possible to combine with voice
	Alternating (0x0002) Text and voice may be alternating
	Simultaneous (0x0003) Simultaneous text and voice mode
Default:	Provisioned
Defined in:	Termination state
Characteristics:	Read/Write

7.1.2 Communication Mode

Property name:	Communication Mode
Property ID:	commode (0x0002)
Description:	This property indicates what modulation and mode the ITU-T V.18 modem is operating in, reflecting what type of text telephone it is in connection with. For an explanation of the different modes, see [ITU-T V.18].
	If a specific mode of operation is wanted, this property is set before the text connection is made.
	Normally it is set with the outcome of the ITU-T V.18 automoding procedure performed with the Call Type Discrimination package.
	When a legacy mode textphone signal is detected by the Call Type Discrimination package, the connection result is only reported, but ITU-T V.18 does not transmit any signal until ordered to do so by setting this property or when probing is invoked.
Type:	Enumeration
Possible values:	V18-V21Hi (0x0001) Native ITU-T V.18 mode transmitting on the high channel for text only or text

		and voice alternatively
V18-V21Lo	(0x0002)	Native ITU-T V.18 mode transmitting on the low channel for text only or text and voice alternatively
V18-V61C	(0x0003)	Native ITU-T V.18 mode for text and voice simultaneously, transmitting in the caller's channel
V18-V61A	(0x0004)	Native ITU-T V.18 mode for text and voice simultaneously, transmitting in the answering part's channel
V21Hi	(0x0005)	Legacy ITU-T V.21 mode transmitting on the high channel
V21Lo	(0x0006)	Legacy ITU-T V.21 mode transmitting on the low channel
DTMF	(0x0007)	DTMF text telephone mode
EDT	(0x0008)	EDT ("European Deaf Telephone")
Baudot 45	(0x0009)	Baudot 45.45 bit/s
Baudot 47	(0x000A)	Baudot undetermined bit rate
Baudot 50	(0x000B)	Baudot 50 bit/s
V23Hi	(0x000C)	ITU-T V.23 modulation and Minitel coding transmitting on the high channel
V23Lo	(0x000D)	ITU-T V.23 modulation and Minitel coding, transmitting on the low channel
BellHi	(0x000E)	Bell 103, transmitting on the high channel
BellLo	(0x000F)	Bell 103, transmitting on the low channel
None	(0x0010)	No mode achieved

Default: "None" (0x0010)

Defined in: LocalControl

Characteristics: Read/Write

7.1.3   Connection Mode

Property name: Connection Mode

Property ID: connmode (0x0003)

Description: This property indicates in what connection phase and mode the ITU-T V.18 modem is operating. A connection effort is initiated by setting this property to connecting, with the desired mode in the Communication Mode property.

An ITU-T V.18 modem can be controlled to operate in one of a set of modes for seeking contact with a counterpart. The modes available are listed as values of this property. Determination of the mode is made by the ctyp package, possibly combined with the probing action of that package.

Once connected, the termination operates in the selected mode until the text connection is lost or it is ordered to disconnect. If text

connection is lost for a certain time, the automoding procedure can be restarted through the ctyp package, or the modem can stay in the achieved mode trying to reconnect.

The ctyp package may be used on a connected voice line to detect if the remote user wants to enter text mode. It must be noted that for some of the legacy modes (EDT, DTMF and Baudot), the user has to push some keys on the textphone to make the connection when ITU-T V.18 is set in the automode monitor mode. This is slightly unusual for a textphone user, who normally waits for the answering side to start the conversation. Therefore, the explicit automoding modes should be used when possible, probing as answering and sending ITU-T V.18 signals as calling.

If a connection request fails, the property returns to Idle state. If the connection request succeeds, the property changes value to Connected.

Type:	Enumeration		
Possible values:	Idle	(0x0001)	No connection established and no efforts to connect
	Connecting	(0x0002)	For request of the native or legacy mode indicated in the Communication Mode property
	Connected	(0x0003)	Connection established in one of the communication modes

Default:	Idle (0x0001)
Defined in:	Termination State
Characteristics:	Read/Write

7.1.4   Action at Loss of Connection

Property name:	Action at Loss of Connection
Property ID:	lossconnection (0x0006)
Description:	This property tells how the ITU-T V.18 modem handles loss of text connection. When "Keep" is selected, the conversation is optimized for the alternating text-voice mode. When "Return" is selected, the communication is optimized for call forwarding between different types of text telephones. For that case, ctyp must be invoked for reconnection.

Type:	Enumeration		
Possible values:	Keep	(0x0001)	Keep selected communication mode
	Return	(0x0002)	Return to automoding

Default:	Provisioned
Defined in:	Termination State
Characteristics:	Read/Write

7.1.5   V18 Options

Property name:	V18 Options

Property ID:	v18opt (0x0007)
Description:	This property indicates what optional capabilities the ITU-T V.18 modem implementation has and is allowed to use.
Type:	Sub-list of Enumeration
Possible values:	V.61 capability (0x0001) Indicates the ability to use V.61 modulation
Default:	None
Defined in:	Termination state
Characteristics:	Read/Write

7.1.6 Character Set

Property name:	Character Set
Property ID:	characterset (0x0008)
Description:	The legacy modes have limited character sets. For all legacy modes, appropriate character conversion, filtering and control interception is included in the package functionality, so that the communication with other ITU-T T.140 text terminations in the context is equalized to an ITU-T T.140 text stream. For a user-friendly conversion of received national characters in the limited character sets to ISO/IEC 10646-1 used in ITU-T T.140, there is a need to specify what national translation table to use. This is valid for EDT, DTMF, ITU-T V.21 and Baudot modes. The character set parameter is the registered ISO code for the national variant of the ITU-T T.50 character set used. Default is:

– German for EDT;

– Danish for DTMF (suitable also for the Netherlands);

– Swedish/Finnish for ITU-T V.21 (suitable also for the United Kingdom);

– International Reference Version for Baudot.

Example: In Norway, the letter "Æ" (A and E together) is used in the same location of the 7-bit character table as used for letter "Ä" (A with umlaut) in Finland and Sweden. The international reference version has the character "[" (left bracket) in the same position. In ITU-T T.140, these characters have unique positions.

Type:	String
Possible values:	ISO registered name for a character set
Default:	Provisioned
Defined in:	Termination State
Characteristics:	Read/Write

7.2 Events

7.2.1 Connection Mode Changed

Event name:	Connection Mode Changed

| **Event ID:** | connchng (0x0001) |
| **Description:** | This event reports the change of communication mode, as a result of a connection effort, or a disconnection. |

7.2.1.1   EventDescriptor parameters

None.

7.2.1.2   ObservedEventDescriptor parameters

Same as the property txp/commode.

7.3   Signals

None.

7.4   Statistics

7.4.1   Number of Characters Transferred

Statistic name:	Number of Characters Transferred
Statistics ID:	chartrans (0x0001)
Description:	Number of bytes of ITU-T T.140 data transferred (sent and received)
Type:	Integer
Possible values:	0 or more characters
Level:	Termination

7.4.2   Number of Alternating Turns

Statistic name:	Number of Alternating Turns
Statistics ID:	altturns (0x0002)
Description:	Number of alternating turns when using alternating conversation mode
Type:	Integer
Possible values:	0 or more turns
Level:	Termination

7.5   Procedures

7.5.1   Basic operation

After line connection, the termination where the Text Telephone package is implemented should be requested to try a text telephone connection using the functionality of the Call Type Discrimination package for the modem signalling according to [ITU-T V.18] in a selected mode. Once the connection is established, the Text Telephone package is used for the text communication in the established mode.

After connection in text mode, the result is a gateway context with one textphone termination and one voice line termination connected to the same line. In the same context, the normal case is to have other terminations with audio and text conversation media.

In the simplest text-only case, the audio streams are not used and may be released.

Text received through the ITU-T V.18 modem is converted if necessary to ITU-T T.140. It is embedded in the RTP/T.140 format according to the rules in [ITU-T T.140] and [IETF RFC 4103], specifying RTP/T.140. Text received from other text conversation terminations is transmitted through the text telephone termination after extraction from the RTP packets. This process continues until any end disconnects.

7.5.2 Informative description

Two descriptor values are of specific interest for the Text Telephone package. These are: the text conversation media stream, and the ITU-T V.18 modem. The text conversation media stream is described in the Text Conversation package. The ITU-T V.18 modem descriptor is described in clause 7.5.3 for information.

7.5.3 ITU-T V.18 modem

The ITU-T V.18 modem type is intended for communication with text telephones in the PSTN. Its operational modes are implemented in the textphone package. The logic for setting and detecting the mode according to [ITU-T V.18] is handled by the ctyp package. Some properties of the Text Telephone package and the Call Type Discrimination package directly reflect parameters for control of the ITU-T V.18 modem. ITU-T V.18 modem implementations may have different capabilities reflected in the property values.

An ITU-T V.18 modem may be operated in automode monitor mode, when it listens on a voice line for text telephone signals. This mode can be used to detect that the user wishes to transit from voice to text during a voice call. That is done entirely with the ctyp package.

Alternatively, an ITU-T V.18 modem may be operated in modes where it actively tries to establish a text telephone connection. The procedure includes transmission of text telephone-specific signals on the line. For calling modems, it is done by the CI signal in the ctyp package. For an answering modem, it is done with the ctyp package combined with probing from the textphone package by setting the commode property to the probing mode.

When the mode is discriminated, the commode property should be set to request communication in that mode.

After successful connection in a text telephone mode, the text session is conducted in the specific mode as controlled with the commode property, and the text stream is made available in ITU-T T.140 format for other text terminations in the context.

The Text Telephone package only contains the text connection and text media aspects of the termination. It is supposed to be combined with appropriate call control packages, line interface packages and voice channel packages.

7.5.4 Operation with alternating text and voice mode

If the involved gateways have the alternating text and voice capability, the following procedure can be applied to give the users a possibility to go back and forth between using text and voice. Between the terminals in the context, two streams are members of the context during the call, the text stream and the audio stream. The procedure is slightly dependent on the terminal type as described in the following clause.

7.5.5 Alternating text and voice mode with legacy, carrierless textphones

For the carrierless types Baudot, DTMF and EDT the following way to operate should be used: When ITU-T V.18 detects text, the textphone termination stops feeding the audio stream into the audio stream of the context, and instead inserts the detected and ITU-T T.140 converted characters into the text stream. This mode is continued as long as characters keep coming from the PSTN textphone.

When no more characters arrive, and no textphone signal is received within one second, the audio channel is again fed to the Audio-stream channel. If new text comes from the ITU-T V.18 side, the process is repeated.

It is important that the implementation of ITU-T V.18 can retrieve characters from the first detected text telephone signals after each mode shift. The leading tones before the characters can be as short as 150 ms.

If text is received from the context through the Text stream when ITU-T V.18 is not actively receiving text, the voice path is muted, and the characters are sent to the ITU-T V.18 modem for transmission. When all text is transmitted and no more is received for two seconds, the audio channels are enabled again.

Since the carrierless systems are one-way alternate transmission systems, transmission of characters is possible only in one direction at a time. Once started, reception is given priority.

In the Context, two-way simultaneous transmission is possible. Therefore, characters received from the context while ITU-T V.18 is busy receiving should be buffered (up to a reasonable limit).

After the initial connections, all these actions are automatic and are handled within the textphone termination.

7.5.6 Alternating voice and text conversation in carrier mode

After a carrier mode text connection is established, loss of carrier can be taken as the indication that the audio stream shall be connected with audio interface of the line. When the remote end is an ITU-T V.21, Bell or ITU-T V.18 device, the text communication can be full duplex, so the gateway can just let the text streams flow between the terminations.

When carrier reappears, or text is received through the text system, the audio stream shall be muted, and text transmission noted.

Minitel does not support any voice interworking mode.

7.5.7 Simultaneous voice and text mode

In case the simultaneous voice and text method is enabled, the handling of the voice and text channels is trivial. Once connected, the text stream can stay connected with the remote text stream all the time to serve a two-way simultaneous text conversation, and the audio channel can be connected with the remote audio stream to support a two-way simultaneous audio channel. This mode can be supported by ITU-T V.18 with ITU-T V.61 modulation.

8 Call Type Discrimination package

Package name:	Call Type Discrimination Package
Package ID:	ctyp (0x0011)
Description:	This package monitors the termination for signals indicating presence of an ITU-T T.30 telefax terminal, an ITU-T V.18 or legacy mode text telephone or data modem. In cooperation with the MGC and the remote MG or endpoint, it can perform exchange of signals until the call type is determined and an appropriate mode for the call can be established.
	The package contains modem negotiation functions of Recommendations [ITU-T V.25], [ITU-T V.8], [ITU-T V.8 *bis*], [ITU-T V.18] and [ITU-T T.30].
Version:	3

Extends: None

8.1 Properties

8.1.1 Call Types

Property name: Call Types

Property ID: calltyp (0x0001)

Description: The Call Types property selects the types of calls for which the termination is monitored. Note that the connection is, by default, regarded to be capable of handling audio and therefore no specific value is included for that.

Type: Sub-list of Enumeration

Possible values: FAX   (0x0001)

    TEXT   (0x0002)

    DATA (0x0003)

Default: None

Defined in: Termination State

Characteristics: Read/Write

8.1.2 Text Call Types

Property name: Text Call Types

Property ID: ttyp (0x0002)

Description: This parameter indicates for what text telephone modes the termination is monitored, used in TEXT mode.

Type: Sub-list of Enumeration

Possible values: V21   (0x0001)

    DTMF   (0x0002)

    Baudot45 (0x0003)

    Baudot50 (0x0004)

    Bell   (0x0005)

    EDT   (0x0006)

    Minitel   (0x0007)

    V18   (0x0008)

    CTM   (0x0009)

Default: None

Defined in: Termination State

Characteristics: Read/Write

8.1.3 V8bis Support

Property name: V8bis Support

Property ID: v8bsup (0x0003)

Description: Support of the ITU-T V.8 *bis* modem negotiating procedure is

optional. The V8bis support property indicates if ITU-T V.8 *bis* is supported. It can be used in TEXT, FAX and DATA modes.

Type:	Boolean
Possible values:	True ITU-T V.8 *bis* is supported by the package
	False ITU-T V.8 *bis* is not supported by the package
Default:	Provisioned
Defined in:	Termination State
Characteristics:	Read

8.1.4   Probe Message

Property name:	Probe Message
Property ID:	probemsg (0x0004)
Description:	This property holds a short string that the termination transmits as a stimulating probe message for the carrierless communication modes in the answering modes. The far end user will see this message when it is transmitted in the mode matching the counterpart's textphone, and type a response back, enabling the ITU-T V.18 modem to detect the type of carrierless text telephone in the connection.
	When issued, it is automatically followed by "GA" in Baudot probing, and with "+" in EDT and DTMF probing to reflect the turntaking signal habit in the different user communities. The string could be customized to briefly inform the called user about what service that is reached.
	Note that the string is not issued in the carrier modes.
Type:	String
Possible values:	Any string, not more than 20 characters long
Default:	Empty String ("")
Defined in:	Termination State
Characteristics:	Read/Write

8.1.5   Probe Order

Property name:	Probe Order
Property ID:	probeorder (0x0005)
Description:	This property holds an indication on what modes to probe for, and the order the probes will be transmitted. Probing is a time-consuming procedure and it is important that the most likely modes are probed first. The order to select depends on whether or not any legacy mode textphones are on the market in the area where the gateway is installed. An optimized order can be composed by enumerating the desired specific type indicators. Note that leaving out a type from probing may cause connection problems for connection with textphones of that type.
Type:	Sub-List of Enumeration

Possible values: (For recommended orders, see [ITU-T V.18].)

Any combination of one to six of the type indicators:

- V21 (0x0001)
- DTMF (0x0002)
- Baudot (0x0003)
- EDT (0x0004)
- MINITEL (0x0005)
- BELL (0x0006)

in any desired order

Default: Provisioned

Defined in: Termination state

Characteristics: Read/Write

8.1.6   Phase Reversal Detect

Property name: Phase Reversal Detect

Property ID: phrevdet (0x0006)

Description: This property indicates support of detection of the phase reversals within ANS or ANSam signals. If this property has the value "False", ANS with phase reversals (ANSBAR) will be reported as ANS and ANSam with phase reversals (ANSAMBAR) will be reported as ANSam in the dtone event.

Type: Boolean

Possible values: True   Phase reversal detection is supported by the termination.

False   Phase reversal detection is not supported by the termination.

Default: Provisioned

Defined in: Termination State

Characteristics: Read

8.1.7   MG Responsible for Call Discrimination Signalling

Propery name: MG Responsible for Call Discrimination Signalling

Property ID: MGCallSig (0x0007)

Description: This property indicates whether the MGC or MG is responsible for initiating the Call Discrimination Signalling.

Type: Boolean

Possible values: True   Indicates that the MG is responsible for Call Discrimination Signalling, i.e., ANS, ANSam. The signals defined in clause 7.3 are not sent from the MGC to order messages, the MG autonomously determines when to send the appropriate messages.

False   Indicates that the MGC is responsible for initiating Messages for Call Discrimination. The signals defined in clause 7.3 apply.

Default:	Provisioned
Defined in:	Termination State
Characteristics:	Read/Write

8.2 Events

8.2.1 Discriminating Tone Detected

Event name:	Discriminating Tone Detected
Event ID:	dtone (0x0001)
Description:	This event indicates that a signal valid for detection and discrimination of mode was detected. The signal name is given as a parameter. Further logic is needed in some cases to discriminate the call type from this information. The ITU-T V.8 *bis* related parameters are returned only when ITU-T V.8 *bis* is supported. Xxx Note that some textphones operate with DTMF tones. This package decodes initial DTMF signals according to the specification for text telephones in ITU-T V.18. DTMF detection may be indicated also from the "dd" package if that is active.

8.2.1.1 EventsDescriptor parameters

None.

8.2.1.2 ObservedEventDescriptor parameters

8.2.1.2.1 Discriminating Tone Type

Parameter name:	Discriminating Tone Type
Parameter ID:	dtt (0x0001)
Description:	Indicates the call type associated with the discriminating tone.
Type:	Enumeration
Optional:	No
Possible values:	*For FAX*

	CNG	(0x0001)	A T.30 fax calling tone
	V21flag	(0x0002)	V21 tone and flags for fax answering
	For TEXT		
	XCI	(0x0003)	An ITU-T V.18 XCI
	V18txp1	(0x0004)	An ITU-T V.18 txp signal in channel V.21(1)
	V18txp2	(0x0005)	An ITU-T V.18 txp signal in channel V.21(2)
	BellHi	(0x0006)	A Bell 103 carrier on the high channel
	BellLo	(0x0007)	A Bell 103 low channel
	Baudot45	(0x0008)	A Baudot45 initial carrier and characters
	Baudot50	(0x0009)	A Baudot50 initial carrier and characters

Edt	(0x000A)	An EDT initial tone and characters
DTMF	(0x000B)	DTMF signals
CTM	(0x001C)	CTM signals

For DATA

Sig	(0x000C)	Modulation signal from a mode only used for data, i.e., not ITU-T V.21, ITU-T V.23 nor Bell 103

Common to TEXT and DATA

CT	(0x000D)	An ITU-T V.25 calling tone
V21hi	(0x000E)	An ITU-T V.21 carrier on the higher frequency channel
V21lo	(0x000F)	An ITU-T V.21 carrier on the low frequency channel
V23hi	(0x0010)	An ITU-T V.23 high carrier
V23lo	(0x0011)	An ITU-T V.23 low carrier
CI	(0x0012)	An ITU-T V.8 CI with contents in "dtvalue"

Common to FAX, TEXT and DATA

ANS	(0x0013)	ITU-T V.25 ANS, equivalent to T.30 CED from answering terminal
ANSbar	(0x0014)	ITU-T V.25 ANS with phase reversals
ANSAM	(0x0015)	ITU-T V.8 ANSam
ANSAMbar	(0x0016)	ITU-T V.8 ANSam with phase reversals
CM	(0x0017)	ITU-T V.8 CM with contents in "dtvalue"
CJ	(0x0018)	ITU-T V.8 CJ
JM	(0x0019)	ITU-T V.8 JM with contents in "dtvalue"
ENDOFSIG	(0x001A)	End of reported signal detected reported for continuous or repeated signals
V8BIS	(0x001B)	ITU-T V.8 bis signal, with signal type in parameter V8bistype and value in "dtvalue"

Default: None

8.2.1.2.2 Discriminating Tone Value

Parameter name:	Discriminating Tone Value
Parameter ID:	dtvalue (0x0002)
Description:	Indicates the data (if any) associated with the discriminating call tone.
Type:	String
Optional:	Yes
Possible values:	When used for ITU-T V.8 and ITU-T V.8 *bis* related messages, the following coding rules apply:

If an ITU-T V.8 *bis* message is detected without a preceding ITU-T V.8 *bis* signal, the preamble is reported as a 0 <signal> value.

The contents of valid ITU-T V.8 *bis* message(s), if detected, are reported using hexadecimal octet coded string(s) (see clause 3.1). Flag detection and consumption, flag transparency 0-bit deletion and FCS checking are performed by the MG. The MG shall not report invalid messages (e.g., bad FCS). If two consecutive messages are detected but the first is invalid, the MG shall indicate this with a comma in front of the second message (e.g., <2nd message>). Two concatenated V.8 *bis* messages are reported with two consecutive <message> indications.

Default: None

8.2.1.2.3 V.8bis Type

Parameter name:	V8bis Type
Parameter ID:	v8bist (0x0004)
Description:	A detected ITU-T V.8 *bis* signal. ITU-T V.8 *bis* can be used for all modes.
Type:	Enumeration
Optional:	Yes
Possible values:	

ESi	(0x0001)	ITU-T V.8 *bis* signal ESi
ESr	(0x0002)	ITU-T V.8 *bis* signal ESr
MRe	(0x0003)	ITU-T V.8 *bis* signal MRe
MRdi	(0x0004)	ITU-T V.8 *bis* signal MRd from initiator
MRdr	(0x0005)	ITU-T V.8 *bis* signal MRd from responder
CRe	(0x0006)	ITU-T V.8 *bis* signal CRe
CRdi	(0x0007)	ITU-T V.8 *bis* signal CRd from initiator
CRdr	(0x0008)	ITU-T V.8 *bis* signal CRd from responder
MS	(0x0009)	ITU-T V.8 *bis* message MS with contents in "dtvalue"
CL	(0x000A)	ITU-T V.8 *bis* message CL with contents in "dtvalue"
CLR	(0x000B)	ITU-T V.8 *bis* message CLR with contents in "dtvalue"
ACK	(0x000C)	ITU-T V.8 *bis* message ACK with contents in "dtvalue"
NAK	(0x000D)	ITU-T V.8 *bis* message NAK with contents in "dtvalue"

Default: None

8.2.2 Call Type Discrimination Result

Event name:	Call Type Discrimination Result
Event ID:	calldisres (0x0002)

<table>
<tr><td>**Description:**</td><td colspan="4">This event indicates that the MG has completed the Call Type discrimination process and has determined that a particular call type is supported.</td></tr>
</table>

8.2.2.1 EventsDescriptor parameters

None.

8.2.2.2 ObservedEventDescriptor parameters

8.2.2.2.1 Discriminated Call Type

<table>
<tr><td>**Parameter name:**</td><td colspan="3">Discriminated Call Type</td></tr>
<tr><td>**Parameter ID:**</td><td colspan="3">dct (0x0001)</td></tr>
<tr><td>**Type:**</td><td colspan="3">Enumeration</td></tr>
<tr><td>**Optional:**</td><td colspan="3">No</td></tr>
<tr><td>**Possible values:**</td><td>Audio</td><td>(0x0000)</td><td>Default Audio negotiated</td></tr>
<tr><td></td><td colspan="3">*For FAX*</td></tr>
<tr><td></td><td>T30</td><td>(0x0001)</td><td>An ITU-T T.30 PSTN FAX call without ECM</td></tr>
<tr><td></td><td>T30ECM</td><td>(0x0002)</td><td>An ITU-T T.30 PSTN FAX call with ECM (non-V.34)</td></tr>
<tr><td></td><td>T30V34</td><td>(0x0003)</td><td>An ITU-T T.30 PSTN FAX call with ITU-T V.34 (half-duplex)</td></tr>
<tr><td></td><td>T38UDPTL</td><td>(0x0004)</td><td>An ITU-T T.38 FAX call using UDPTL</td></tr>
<tr><td></td><td>T38TCP</td><td>(0x0005)</td><td>An ITU-T T.38 FAX call using TCP</td></tr>
<tr><td></td><td>T37</td><td>(0x0006)</td><td>An ITU-T T.37 FAX call</td></tr>
<tr><td></td><td>FAXAUDIO</td><td>(0x0007)</td><td>For audio codec (e.g., ITU-T G.711 over RTP)

This value is only used when the MG can determine that FAX is being used over the audio codec.</td></tr>
<tr><td></td><td colspan="3">*For TEXT*</td></tr>
<tr><td></td><td>V18txp1</td><td>(0x0008)</td><td>An ITU-T V.18 TEXT call carried in channel V.21(1)</td></tr>
<tr><td></td><td>V18txp2</td><td>(0x0009)</td><td>An ITU-T V.18 TEXT call carried in channel V.21(2)</td></tr>
<tr><td></td><td>Baudot45</td><td>(0x000C)</td><td>A Baudot45 TEXT call</td></tr>
<tr><td></td><td>Baudot50</td><td>(0x000D)</td><td>A Baudot50 TEXT call</td></tr>
<tr><td></td><td>Edt</td><td>(0x000E)</td><td>An EDT TEXT call</td></tr>
<tr><td></td><td>DTMF</td><td>(0x000F)</td><td>DTMF TEXT call</td></tr>
<tr><td></td><td>CTM</td><td>(0x0014)</td><td>A CTM TEXT call</td></tr>
<tr><td></td><td>TEXTAUDIO</td><td>(0x0021)</td><td>For audio codec (e.g., G.711 over</td></tr>
</table>

RTP)

This value is only used when the MG can determine that TEXT is being used over the audio codec.

| | Minitel | (0x0024) | A Minitel TEXT call |
| | | | This value is only used when the MG can determine that TEXT is being used over ITU-T V.23. |

For Modem

BellHi	(0x000A)	A Bell 103 MODEM call on the high channel
BellLo	(0x000B)	A Bell 103 MODEM call on the low channel
V8	(0x0015)	An ITU-T V.8 MODEM call
V8bis	(0x0016)	An ITU-T V.8 *bis* MODEM call
		NOTE – V8/V8 *bis* is used to negotiate the modem type. Implementers are encouraged to use the actual modem types: ITU-T V.34, ITU-T V.61, ITU-T V.90, ITU-T V.91 and ITU-T V.92 where possible.
V21hi	(0x0010)	An ITU-T V.21 Modem call on the higher channel
V21lo	(0x0011)	An ITU-T V.21 Modem call on the low channel
V23hi	(0x0012)	An ITU-T V.23 Modem call on the high carrier
V23lo	(0x0013)	An ITU-T V.23 Modem call on the low carrier
MODEMAUDIO	(0x0022)	For audio codec (e.g., ITU-T G.711 over RTP)
		This value is only used when the MG can determine that MODEM is being used over the audio codec.
V150MODEM	(0x0023)	For ITU-T V.150 modem relay

Default: Audio (0x0000)

8.3   Signals

8.3.1   V8 Signal

Signal name: V8 Signal

Signal ID: v8sig (0x0001)

Description: Indicates to the MG the type of V8 Signal to send.

| **Signal type:** | TO |
| **Duration:** | Default provisioned in MG. The MGC may override this default by providing a duration. |

8.3.1.1 Additional parameters

8.3.1.1.1 V.8 Signal Type

Parameter name:	V.8 Signal Type
Parameter ID:	v8styp (0x0001)
Description:	The type of ITU-T V.8 signal to send.
Type:	Enumeration
Optional:	Yes
Possible values:	CM (0x0001)
	CJ (0x0002)
	JM (0x0003)
	CI (0x0004)
	v8nosig (0x0005) Not used (reserved)
	NOTE – The normal ITU-T H.248 signal replacement procedures are used to turn off a signal and shall be used.
Default:	Provisioned

8.3.1.1.2 V.8 Signal Contents

Parameter name:	V8Sig Cont
Parameter ID:	v8scont (0x0002)
Description:	The ITU-T V.8 signals carry data for call type and modulation modes. These parameters can be supplied through the v8cont parameter. [ITU-T V.8] can be used for FAX, TEXT and DATA modes.
Type:	String
Optional:	Yes
Possible values:	Allowed contents of the signals, coded as hexadecimal octet coded string
Default:	Empty String ("")

8.3.1.1.3 V.18 XCI Enable

Parameter name:	V18 XCI Enable
Parameter ID:	v18xcien (0x0003)
Description:	XCI can be sent intermixed with CI transmission as specified in [ITU-T V.18] to stimulate plain Minitel terminals to respond as text telephones. Used in TEXT mode.
Type:	Boolean
Optional:	Yes

Possible values:	True	XCI transmission enabled during ITU-T V.18 CI transmission
	False	XCI transmission disabled
Default:	True	

8.3.2 Answer Signal

Signal name:	Answer Signal
Signal ID:	ans (0x0002)
Description:	The MGC uses this signal to order the MG to provide an answer signal.
Signal type:	TO
Duration:	Default provisioned in MG. The MGC may override this default by providing a duration.

8.3.2.1 Additional parameters

8.3.2.1.1 Answer Type

Parameter name:	ANS Type
Parameter ID:	AnsType (0x0001)
Description:	The type of answer signal to be sent.
Type:	Enumeration
Optional:	Yes

Possible values:

ANS	(0x0001)	ITU-T V.25 ANS (equivalent to ITU-T T.30 CED) for all modes
ANSBAR	(0x0002)	ITU-T V.25 ANS with phase reversals for all modes
ANSAM	(0x0003)	ITU-T V.8 ANSam for all modes
ANSAMBAR	(0x0004)	ITU-T V.8 ANSam with phase reversals for all modes
V18txp1	(0x0005)	An ITU-T V.18 txp signal played in ITU-T V.21 channel (1) for TEXT
V18txp2	(0x0006)	An ITU-T V.18 txp signal played in ITU-T V.21 channel (2) for TEXT
ansnosig	(0x0007)	Not used (Reserved)

NOTE – The normal ITU-T H.248 signal replacement procedures are used to turn off a signal and shall be used.

Default:	Provisioned

8.3.3 Calling Signal

Signal name:	Calling Signal
Signal ID:	callsig (0x0003)
Description:	The MGC uses this signal to order the MG to provide a calling signal.

| **Signal Type:** | TO |
| **Duration:** | Default provisioned in MG. The MGC may override this default by providing a duration. |

8.3.3.1 Additional parameters

8.3.3.1.1 Call Signal Name

Parameter name:	Call Signal Name
Parameter ID:	csn (0x0001)
Description:	Indicates the type of calling tone to be sent.
Type:	Enumeration
Optional:	Yes
Possible values:	CT (0x0001) ITU-T V.25 calling tone used for TEXT and DATA
	CNG (0x0002) ITU-T T.30 calling tone used for FAX with defined cadence
	callnosig (0x0003) Not Used (Reserved)
	NOTE – The normal ITU-T H.248 signal replacement procedures are used to turn off a signal and shall be used.
Default:	Provisioned

8.3.4 V8bisSignal

Signal name:	V8bis Signal
Signal ID:	v8bs (0x0004)
Description:	The MGC uses this signal to order the MG to provide an ITU-T V.8 *bis* signal.
Signal type:	BR
Duration:	Default provisioned in MG. The MGC may override this default by providing a duration.

8.3.4.1 Additional parameters

8.3.4.1.1 V.8bis signal name

Parameter name:	V8bisSigname
Parameter ID:	V8bsn (0x0001)
Description:	ITU-T V.8 *bis* signals can be used in all modes. Some ITU-T V.8 *bis* signals contain data messages, supplied in V8bisSigContents.
Type:	Enumeration
Optional:	Yes
Possible values:	ESi (0x0001) ITU-T V.8 *bis* signal ESi
	ESr (0x0002) ITU-T V.8 *bis* signal ESr
	MRe (0x0003) ITU-T V.8 *bis* signal MRe
	MRdi (0x0004) ITU-T V.8 *bis* signal MRd from initiator

MRdrh	(0x0005)	ITU-T V.8 *bis* signal MRd from responder on high power
CRel	(0x0006)	ITU-T V.8 *bis* signal CRe on low power
CRdi	(0x0007)	ITU-T V.8 *bis* signal CRd from initiator
CRdr	(0x0008)	ITU-T V.8 *bis* signal CRd from responder
MS	(0x0009)	ITU-T V.8 *bis* message MS with contents in signalvalue
CL	(0x000A)	ITU-T V.8 *bis* message CL with contents in signalvalue
CLR	(0x000B)	ITU-T V.8 *bis* message CLR with contents in signalvalue
ACK	(0x000C)	ITU-T V.8 *bis* message ACK with contents in signalvalue
NAK	(0x000D)	ITU-T V.8 *bis* message NAK with contents in signalvalue
MRdrl	(0x000E)	ITU-T V.8 *bis* signal MRd from responder on low power
CReh	(0x000F)	ITU-T V.8 *bis* signal CRe on high power

Default: Provisioned

8.3.4.1.2 V.8bis Signal Contents

Parameter name: V8bis Signal Contents

Parameter ID: V8bscont (0x0002)

Description: Some of the ITU-T V.8 *bis* signals are messages. Their contents can be defined with theV8biscont parameter.

ITU-T V.8 *bis* can be used in TEXT, FAX and DATA modes.

The transmitted ITU-T V.8 *bis* message frame(s) is specified as hexadecimal octet coded string (see clause 3.1). Additional messages are delimited by comma characters. Flag generation, flag transparency 0-bit insertion and FCS generation are performed by the MG. If no data is provided by the MGC, no ITU-T V.21 carrier is generated beyond that used in segment 2. For two concatenated messages, the MG shall insert the required preamble between the first and second messages.

Type: String

Optional: Yes

Possible values: Valid contents for the ITU-T V.8 *bis* signals

Default: Empty string ("")

8.3.5 V18 Probe

Signal name: V18 Probe

Signal ID: v18prob (0x0005)

Description:	This signal transmits the v18 probes in order to stimulate possible text telephones to transmit connect establishing signals. The probes are sent according to the specification in [ITU-T V.18]. For carrierless probes, the string in the "probemsg" property is transmitted. The probes are sent in the order specified in the property "probeorder".
Signal type:	BR
Duration:	Default provisioned in MG. The MGC may override this default by providing a duration.

8.3.5.1 Additional parameters

None.

8.4 Statistics

None.

8.5 Procedures

The Call Type Discrimination package is invoked for cases when the network connection is established and the call may enter one of the types of voice, fax, text telephone and modem. The package contains functionality to support the decision and connection processes. Once discriminated and the modem handshaking completed, an appropriate specific call type package should be invoked to complete the connection establishment on the modulation level and perform the session.

When used for active modem negotiation, by means of commands from the MGC, the termination shall be made to operate according to the Recommendations for modem negotiation: [ITU-T V.25], [ITU-T V.8], [ITU-T V.8 *bis*], [ITU-T V.18] and [ITU-T T.30]. For probing according to [ITU-T V.18] during the negotiating process, the probing mechanism may be applied as defined in this package by turning the signal V18prob ON.

The package may also be used for monitoring and reporting on data activity on the termination.

8.5.1 Informative description

If the desired call type is known from the beginning, the Call Type Discrimination package should be invoked in order to actively try to establish a connection by sending out stimulating signals. By contrast, this package is also used to monitor the line to detect signals which are to be relayed to the Media Gateway Controller as input to a discrimination decision. Either the MGC or the MG may be assigned to perform the bearer level call discrimination signalling. In principle, when tones are reported to the MGC as events by an MG, the MG should avoid passing these tones via the media stream where possible, to reduce the possibility of unwanted duplicate tones (the MGC may subsequently order the MG to send these tones). Since the Call Type Discrimination package can be invoked to initially only monitor the line, it can be invoked on lines where voice calls are the most common mode of operation. There may be situations where this passive way of working results in less efficient or less reliable connection in fax/text/data mode.

8.5.2 Operation

The package is activated on a termination of a line in an outgoing or incoming call where fax, text or data mode may be wanted. The properties are set to the enabled call types.

8.5.3   Operation for incoming calls

The call is answered, the destination is evaluated, and the remote call initiated using packages and gateway functions outside the scope of this package.

The MGC may order stimulating signals defined in this package to be sent on the line.

The line is monitored for signals for the selected modes as defined in the "dtone" event descriptor.

The MGC is expected to evaluate call type indications of all types; registered type of the destination, offered capabilities of the endpoint, invoked connection efforts of specific types from the endpoint. It can then use these call level indications to request the MG to further evaluate the call types. The MGC can then use the bearer level discriminating events from the MG to determine which call type should be used.

As soon as the modem handshaking is complete, and a condition is reached that is valid for only one call type, a package for handling that call type should be invoked by the MGC, thus placing the MG into the desired mode of operation.

The package contains components for conducting a negotiation procedure according to the different connection procedures defined in [ITU-T V.25], [ITU-T V.8], [ITU-T V.8 *bis*], [ITU-T T.30], [ITU-T T.38] and [ITU-T V.18]. (ITU-T V.8 *bis* support is optional and its availability can be interrogated through the property V8bissupport.)

8.5.4   Operation for transit calls, coming from and going to the switched network

If no fax/text/data indication is present in the incoming call, the outgoing call is placed in voice mode, with the Call Type Discrimination package active.

If the MGC is responsible for call discrimination signalling and if a valid tone is detected, it is reported to the MGC as an event. By actions of the MGC, it can then request the MG to signal to play the tone at the other end. The process continues according to the rules of the connection procedures until the call type can be determined and the mode of operation can be established.

If the MG is responsible for call discrimination signalling then it shall perform the call type discrimination signalling itself and report the discriminated call type to the MGC via a notified event.

8.5.5   Operation for calls having one endpoint in the packet network

If no fax/text/data indication is present in the incoming call, the outgoing call in the packet network is placed in voice mode.

If a request to open a text channel, a fax channel or a data channel is made from the packet endpoint, the corresponding call type is tried on the switched network connection.

If a signal indicating presence of a fax, textphone or a modem is received from the circuit switched network, and the call type can be evaluated, a corresponding channel is requested to the remote packet endpoint. If that request is acknowledged, the connection in the fax/text/data mode is completed on the switched side.

If the call type cannot be evaluated, further signal exchange is performed on the switched interface until the call type is determined, and then the channel establishment continues on the packet side.

8.5.6   Cases when the call type cannot be determined from the signals

For cases when the call type cannot be determined by the signal exchange, a decision must be taken by other means, or a transparent transport can be selected.

The other means to make the decision may be a number analysis and comparison to registered user preferences or network defaults.

Cases when the decision is not possible by signal analysis but need to be taken by external means:

ITU-T V.21: Used both for text telephony and for credit card transactions. The decision is recommended to be based on regional preferences and registering preference for data per destination number in regions where the default preference is for text telephony.

ITU-T V.23: Used both for Minitel-based text telephones and for the Minitel information retrieval system. The conflict is only when an answering endpoint transmits the v23hi signal. A transparent data transport is recommended for this case.

8.5.7 Scenarios and call flows

Signal sequence scenarios can be derived from the different connection protocols, with ITU-T T.38 being the main protocol for fax, ITU-T V.18 for text telephony and V.8/V.25 for data.

The typical fax scenario is discriminated when CNG is detected from the calling end and a corresponding CED (ANS) and/or V.21flags are detected at the answering end. For instances when either a CNG or ANS is not reported to the MGC, V.21flags detection is sufficient for fax discrimination. Alternatively, an ITU-T V.8 CM or JM signal with a fax call type may be detected at either end.

The text telephone scenario is discriminated when a text telephone call type is detected in ITU-T V.8, a text telephone function is negotiated in ITU-T V.8 *bis*, or a signal valid for text-only is detected.

The data scenario is discriminated when a data call type is detected in V.8, a data function is negotiated in V.8 *bis*, or a data mode (not text) is entered by any part.

In all cases, the handshaking protocol should be completed using the Call Type Discrimination package, before entering the selected data mode.

Appendix I shows an example call establishment and discrimination flow for the MGC controlled case and the MG controlled case.

8.5.8 Initial characters

For carrierless text telephones of the Baudot, EDT and DTMF types, the text transmission itself is needed for mode determination, and therefore the characters received during determination shall be stored. They shall be made available by local actions in the MG to be used by the txp package as initially received text for a seamless takeover of a connection.

8.5.9 Time-critical handling

The default way of handling connection requests should be to propagate the connection request to the remote endpoint, and verify capabilities before positively responding to an incoming connection request for fax, text or data mode. It can, however, be very time-consuming to verify the endpoint capabilities and connect appropriate channels. The caller may time out between detection of off-hook and receiving a positive signal. Similar time-critical steps exist in the ITU-T V.8, ITU-T V.8 *bis*, ITU-T V.18, ITU-T T.30 and ITU-T V.25 procedures. The MGC must take action to compromise between the risk of one party timing out because of long waiting for a signal, and the risk of connecting a fax/text/data call before the capabilities of the endpoints are verified and the appropriate channels connected. One possible way to handle this risk is to define default actions to take before any party in the call times out. The ctyp package gives the MGC all necessary control to handle the connection process including such actions.

For time-critical applications, the MGC may indicate to the MG through the *ctyp/MGCallSig* property that the MG shall be responsible for the Call Discrimination signalling. The result of the discrimination process is communicated to the MGC through the *ctype/calldisres* event. This method saves multiple MGC/MG signalling round-trip times during the MGC control of the modem tones.

9   Fax package

Package name: Fax

Package ID: fax (0x0012)

Description: The fax package is intended for enabling fax communication between terminals/applications in different networks or messaging environments. This package includes the mechanisms needed to identify ITU-T T.30 fax sessions (signals and data).

Version: 1

Extends: None

9.1   Properties

9.1.1   Fax Connection State

Property name: Fax Connection State

Property ID: faxstate (0x0001)

Description: After successful Phase A connection with the ctyp package, the connection state property is used to request a fax connection. When placing a termination into a fax mode, the initial state shall be set to "Negotiating".

When this property is interrogated, it shall reflect the state of the achieved fax connection. A connection effort can be cancelled by setting the faxstate property to Idle.

Type: Enumeration

Possible values:

Idle	(0x0001)	No connection efforts
Prepare	(0x0002)	Known in the termination and ready to accept connections
Negotiating	(0x0003)	Taking the initiative to establish a fax connection
TrainR	(0x0004)	Fax Phase B or later training as Receiver
TrainT	(0x0005)	Fax Phase B or later training as Transmitting
Connected	(0x0006)	Completed connection
EOP	(0x0007)	Procedures Complete
ProcInterrupt	(0x0008)	Procedure Interrupt Processing
Disconnect	(0x0009)	Premature Disconnect

Default: Idle (0x0001)

Characteristics: Read/Write

Defined in: Termination State

9.1.2   Transmission Speed

Property name: Transmission Speed

Property ID: trspd (0x0002)

Description: The Transport parameter reflects the transmission speed seen at the analogue interface for the fax relay or the transmission speed used by the FAX termination (ITU-T T.30 PSTN).

Type: Integer

Possible values: 1200-33600

Default: Provisioned

Defined in: Termination State

Characteristics: Read/Write

9.1.3   PSTN Interface

Property name: PSTN Interface

Property ID: pstnif (0x0003)

Description: The PSTN Interface parameter reflects the interface used to connect to a physical FAX machine.

Type: Enumeration

Possible values:

NA	(0x0001)	Not applicable
V17	(0x0002)	
V27TER	(0x0003)	
V29	(0x0004)	
V21	(0x0005)	
V34	(0x0006)	

Default: Provisioned

Defined in: Termination State

Characteristics: Read/Write

9.1.4   Fax Transport

Property name: Fax Transport

Property ID: ftrpt (0x0004)

Description: The Transport parameter reflects the transport mechanism selected for the fax termination.

Type: Enumeration

Possible values:

T30	(0x0001)	For ITU-T T.30 PSTN sessions without ECM
T30ECM	(0x0002)	For ITU-T T.30 PSTN sessions with ECM (non-V.34)
T30V34	(0x0003)	For ITU-T T.30 PSTN sessions with V.34 (half-duplex)

Default: Provisioned

Characteristics: Read/Write

Defined in: Termination State

9.2   Events

9.2.1   Fax Connection State Change

Event name: Fax Connection State Change

Event ID: faxconnchange (0x0001)

Description: This event will occur when the fax connection state for the termination has changed. Its parameter is the new Fax Connection State. A connection effort that timed out returns the termination to the Idle state.

9.2.1.1   EventDescriptor parameters

None.

9.2.1.2   ObservedEventDescriptor parameters

9.2.1.2.1   Fax Connection Change

Parameter name: Fax Connection Change

Parameter ID: faxconnchng (0x0001)

Type: Enumeration

Optional: No

Possible values:

Idle	(0x0001)	No connection efforts
Prepare	(0x0002)	Known in the termination and ready to accept connections
Negotiating	(0x0003)	Taking the initiative to establish a fax connection
TrainR	(0x0004)	Fax Phase B or later training as Receiver
TrainT	(0x0005)	Fax Phase B or later training as Transmitting
Connected	(0x0006)	Completed connection
EOP	(0x0007)	Procedures Complete
ProcInterrupt	(0x0008)	Procedure Interrupt Processing
EOF	(0x0009)	End of fax session, call terminating
PI	(0x000A)	Priority Interrupt; Switch to Voice
Disconnect	(0x000B)	Premature Disconnect

Default: Idle (0x0001)

9.3   Signals

None.

9.4   Statistics

9.4.1   Number of Pages Transferred

Signal name: Number of Pages Transferred

Statistics ID: pagestrans (0x0001)

Description: Number of pages of fax image data transferred through the termination.

Type: Integer

Possible values: 0 or more pages

Level: Termination

9.4.2   Train Downs

Statistic name: Train Downs

Statistics ID: traindowns (0x0002)

Description: Number of times FAX trained down during transmission.

Type: Integer

Possible values: 0 or more train downs

Level: Termination

9.5   Procedures

The following are standard transport mechanisms for fax in different environments.

−   In ITU-T T.30: Use ITU-T T.30 procedures with and without ECM.

−   In ITU-T T.30 Annexes C and F: Use ITU-T T.30 procedures selected via [ITU-T V.8] (used for ITU-T V.34 fax).

9.5.1   Function

A termination with Fax provides a method for transfer of fax pages preceded by negotiations in the call set-up according to procedures defined for each environment. When matching capabilities exist, the appropriate sessions can be established in order to transfer pages of image or binary data.

Real-time fax allows telecom users to transfer fax pages in real-time. The procedural aspects of GSTN fax are defined in [ITU-T T.30]. The compression methods used in transporting fax images are defined in [ITU-T T.4], [ITU-T T.6], [ITU-T T.81], [ITU-T T.82], [ITU-T T.85] and [ITU-T T.44]. In traditional ITU-T T.30 without error correction, images are transferred in a stream one page at a time. In ITU- T.30 with error correction, images are transferred in blocks that are also known as partial pages. Numerous examples of fax sessions are contained in Appendix IV of [ITU-T T.30].

•   For each transport environment, a suitable transport protocol must be selected to carry the image. Currently defined and recommended transport environments for ITU-T T.30 media streams that can be supported by this package are GSTN networks, where the procedures are defined in [ITU-T T.30], [ITU-T T.30] Annex A (for error correction), [ITU-T T.30] Annex C (duplex protocol) and [ITU-T T.30] Annex F (half duplex ITU-T V.34 protocol).

9.5.2   Process of adding Fax-capable terminations

The MGs are responsible for detecting fax tones and relaying the related events to the MGC. The MGC should conduct Call Discrimination as defined within the Call Type Discrimination package in order to determine whether a fax or other mode is applicable. The MGC may choose to skip this if the MG is not capable of the Call Type Discrimination package. Once the MGC evaluates the tones and determines that the incoming call is fax, the MGC shall execute appropriate Modify commands to place the termination into a "Negotiating" state.

9.5.3   Process of ending a fax call

The MGs are responsible for detecting events that would cause the interruption of a fax call. The MGC is responsible for making the determination if this switch can be made and instruct the MGs to switch. It is also responsible for switching it back to fax.

The MGC should receive indication that the fax call ends from the MG before receiving typical call termination indications.

10   IP Fax package

Package name:	IPFax
Package ID:	ipfax (0x0013)
Description:	The Fax package is intended for enabling real-time or store-and-forward fax communication between terminals/applications in different networks or messaging environments. This package includes the mechanisms needed to transport ITU-T T.30 fax sessions (signals and data) in a real-time IP environment. The transport mechanism will be different for each environment where the package is used.
Version:	2
Extends:	None

10.1   Properties

10.1.1   Fax Connection State

Property name:	Fax Connection State
Property ID:	faxstate (0x0001)
Description:	After successful Phase A connection with the ctyp package, the connection state property is used to request a fax connection. When placing a termination into a fax mode, the initial state shall be set to "Negotiating". When this property is interrogated, it shall reflect the state of the achieved fax connection.
Type:	Enumeration

Possible values:

Idle	(0x0001)	No connection efforts
Prepare	(0x0002)	Known in the termination and ready to accept connections
Negotiating	(0x0003)	Taking the initiative to establish a fax connection
TrainR	(0x0004)	Fax Phase B or later training as Receiver
TrainT	(0x0005)	Fax Phase B or later training as Transmitter
Connected	(0x0006)	For completed connection
EOP	(0x0007)	Procedures Complete
ProcInterrupt	(0x0008)	Procedure Interrupt Processing
Disconnect	(0x0009)	Premature Disconnect

Default:	Idle (0x0001)
Characteristics:	Read/Write
Defined in:	Termination State

10.1.2 Transmission Speed

Property name:	Transmission Speed
Property ID:	trspd (0x0002)
Description:	The Transport property reflects the transmission speed seen at the IP interface for the fax relay. A value of zero (0) indicates that there is no speed set.
Type:	Integer
Possible values:	0-33600
Default:	0
Characteristics:	Read/Write
Defined in:	Termination State

10.1.3 T.38 Capabilities

Property name:	T.38 Capabilities
Property ID:	T38Capabilities (0x0003)
Description:	These capabilities describe the ITU-T T.38 fax termination. They are defined in Annex B of [ITU-T T.38]. Their SDP equivalents are defined in Annex D of [ITU-T T.38].
Type:	Sub-list of Enumeration

Possible values:	FaxFillBitRemoval	(0x0001)	Indication of fill bit removal
	FaxTranscodingMMR	(0x0002)	For MMR transcoding availability
	FaxTranscodingJBIG	(0x0003)	For JBIG transcoding availability
	UDPFEC	(0x0004)	UDP Forward Error Correction
	UDPRedundancy	(0x0005)	UDP Redundancy Error Correction

Default:	Provisioned
Characteristics:	Read/Write
Defined in:	Termination State

10.1.4 T.38 Maximum Buffer Size

Property name:	T.38 Maximum Buffer Size
Property ID:	T38MaxBufferSize (0x0004)
Description:	This capability describes the ITU-T T.38 fax termination. They are defined in Annex B of [ITU-T T.38]. Their SDP equivalents are defined in Annex D of [ITU-T T.38].
Type:	Integer

Possible values:	0-32765
Default:	Provisioned
Characteristics:	Read/Write
Defined in:	Termination State

10.1.5 T.38 Maximum Datagram Size

Property name:	T.38 Maximum Datagram Size
Property ID:	T38MaxDatagramSize (0x0005)
Description:	This capability describes the T.38 fax termination. They are defined in Annex B of [ITU-T T.38]. Their SDP equivalents are defined in Annex D of [ITU-T T.38].
Type:	Integer
Possible values:	0-32765
Default:	Provisioned
Characteristics:	Read/Write
Defined in:	Termination State

10.1.6 T.38 Version

Property name:	T.38 Version
Property ID:	T38Version (0x0006)
Description:	This is the ITU-T T.38 version number.
Type:	Integer
Possible values:	0-32765
Default:	Provisioned
Characteristics:	Read/Write
Defined in:	Termination State

10.1.7 IP Fax Transport

Property name:	IP Fax Transport
Property ID:	ipftrpt (0x0007)
Description:	The IP Fax Transport parameter reflects the transport mechanism selected for the fax termination.
Type:	Enumeration
Possible values:	T38UDPTL (0x0001) For ITU-T T.38 using UDPTL
	T38TCP (0x0002) For ITU-T T.38 using TCP
	T37 (0x0003) For ITU-T T.37
	AUDIO (0x0004) For audio codec (e.g., ITU-T G.711 over RTP)
Default:	Provisioned
Characteristics:	Read/Write

Defined in: Termination State

10.2 Events

10.2.1 Fax Connection State Change

Event name: Fax Connection State Change

Event ID: faxconnchange (0x0001)

Description: This event will occur when the fax connection state for the termination has changed. Its parameter reflects the new state. If a connection effort times out, it is reported in this event, with the faxconnchng parameter set to Idle.

10.2.1.1 EventDescriptor parameters

None.

10.2.1.2 ObservedEventDescriptor parameters

10.2.1.2.1 Fax Connection Change

Parameter name: Fax Connection Change

Parameter ID: faxconnchng (0x0001)

Description: Indicates the state of the fax connection

Type: Enumeration

Optional: No

Possible values:

Idle	(0x0001)	No connection efforts
Prepare	(0x0002)	Known in the termination and ready to accept connections
Negotiating	(0x0003)	Taking the initiative to establish a fax connection
TrainR	(0x0004)	Fax Phase B or later training as Receiver
TrainT	(0x0005)	Fax Phase B or later training as Transmitter
Connected	(0x0006)	For completed connection
EOP	(0x0007)	Procedures Complete
ProcInterrupt	(0x0008)	Procedure Interrupt Processing
EOF	(0x0009)	end of fax session, call terminating
PI	(0x000A)	Priority Interrupt; Switch to Voice
Disconnect	(0x000B)	Premature Disconnect

Default: Idle (0x0001)

10.3 Signals

None.

10.4 Statistics

10.4.1 Pages Transferred

Statistic name: Pages Transferred

Statistics ID: pagestrans (0x0001)

Description: Number of pages of fax image data transferred through the termination

Type: Integer

Possible values: 0 or more pages

Level: Termination

10.4.2 Train Downs

Statistic name: Train Downs

Statistics ID: traindowns (0x0002)

Description: Number of times FAX trained down during transmission

Type: Integer

Possible values: 0 or more train downs

Level: Termination

10.5 Procedures

The following are standard transport mechanisms for fax in different environments.

− In Annex B of [ITU-T T.38]: UDPTL or TCP in ITU-T T.38 fax-only communication channel environment.

− In Annex D of [ITU-T H.323]: UDPTL or TCP as selected with H.245 messages.

− In Annex D of [ITU-T T.38] (SIP): UDPTL or TCP as initiated with SDP.

− In Annex E of [ITU-T T.38]: UDPTL or TCP as initiated with ITU-T H.248.

− In [ITU-T T.37]: SMTP (MIME)/TCP.

10.5.1 Function

A termination with Fax provides a method for transfer of fax pages preceded by negotiations in the call set-up according to procedures defined for each environment. When matching capabilities exist, the appropriate sessions can be established in order to transfer pages of image or binary data.

Real-time fax allows telecom users to transfer fax pages in real-time. For each transport environment, a suitable transport protocol must be selected to carry the image. Currently defined and recommended transport environments for ITU-T T.30 media streams that can be supported by this package are:

1) packet networks, where the procedures described in Annex B of [ITU-T T.38] can be used for setting up and conducting fax sessions, using TCP or UDPTL for the transport of ITU-T T.30 signals and data;

2) packet networks, where the procedures described in Annex D of [ITU-T H.323] can be used for setting up and conducting fax and voice sessions, using TCP or UDPTL as negotiated via ITU-T H.245;

3) packet networks, where the IETF Session Initiation Protocol (SIP) can be used for setting up and conducting fax sessions as defined in Annex D of [ITU-T T.38] using UDPTL or TCP for the transport of T.30 signals and data;

4) packet networks, where ITU-T H.248 can be used for setting up and conducting fax sessions as defined in Annex E of [ITU-T T.38] using UDPTL or TCP for the transport of ITU-T T.30 signals and data;

5) packet networks, where the packets of ITU-T G.711 coded data (with ITU-T T.30 signals and data embedded) can be transported via RTP.

The Extended Simple Mail Transport Protocol messaging environment over packet, that can be used alone or in conjunction with any of the environments above, where [ITU-T T.37] specifies the methods for transporting image/tiff files using the same compression methods as specified for use in [ITU-T T.30]. For information it can be noted that [b-IETF RFC 2301], [b-IETF RFC 3302], [b-IETF RFC 3191], [b-IETF RFC 3192] and [b-IETF RFC 2305] and [b-IETF RFC 2530], [b-IETF RFC 2879] and [b-IETF RFC 2532] specify these transport mechanisms.

Interworking between these forms of fax can be achieved through the use of gateways with packages defined here.

10.5.2 Process of adding IP fax-capable terminations

The MGs are responsible for detecting fax tones and relaying the related events to the MGC. The MGC should conduct Call Discrimination as defined within the Call Type Discrimination package in order to determine whether a fax or other mode is applicable. The MGC may choose to skip this if the MG is not capable of the Call Type Discrimination package. Once the MGC evaluates the tones and determines that the incoming call is fax, the MGC shall execute appropriate Modify commands to place the IP fax-capable termination into a "Negotiating" state.

10.5.3 Process of ending a fax call

The MGs are responsible for detecting events that would cause the interruption of a fax call. The MGC is responsible for making the determination if this switch can be made, and instruct the MGs to switch. It is also responsible for switching it back to fax.

The MGC should receive indication that the fax call ends from the MG before receiving typical call termination indications.

10.5.4 Informative example

One possible instruction from an MGC to an MG to modify an existing context to an ITU-T T.38 media stream:

```
MGC to MG:
MEGACO/1.0 [123.123.123.4]:55555
Transaction = 14 {
 Context = 2000 {
  Modify = RTP/1 {
   Media {
    Stream = 1 {
     Local {
v=0
c=IN IP4 124.124.124.222
m=image 1111 udptl t38
a=T38FaxRateManagement:transferredTCF
a=T38UdpEC:t38UDPFEC
     }
    }
   }
  }
 }
}
```

Appendix I

Call discrimination flows

(This appendix does not form an integral part of this Recommendation.)

This appendix details example call flows in Figures I.1 and I.2 for Call Establishment and discrimination. It details call controlling signalling, ITU-T H.248 and bearer and in-band signalling interactions.
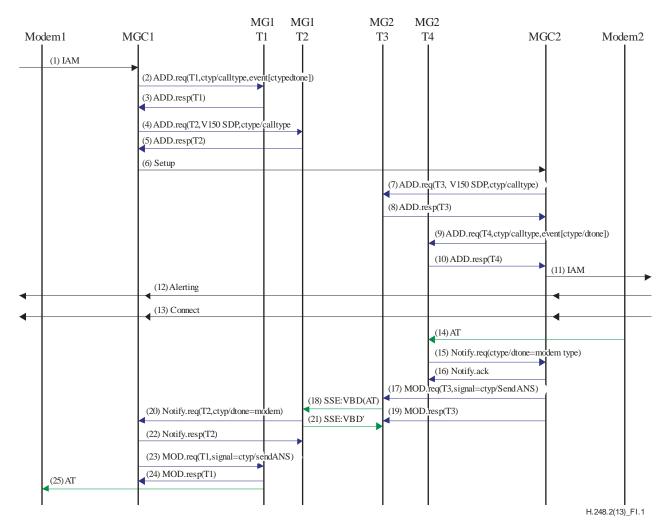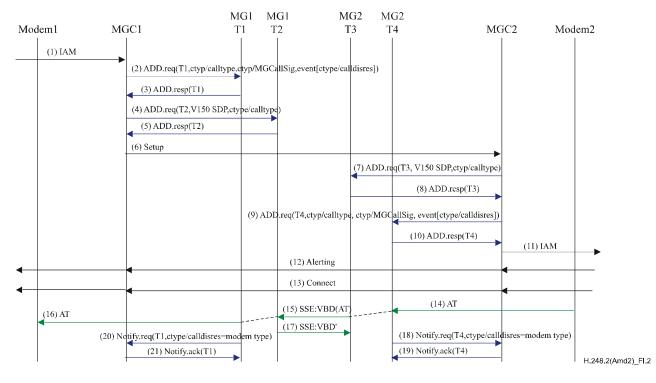

Figure I.1 − MGC controlled call discrimination

Figure I.2 – MG controlled call discrimination

Bibliography

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[b-IETF RFC 2305]   IETF RFC 2305 (1998), *A Simple Mode of Facsimile Using Internet Mail.*

[b-IETF RFC 2530]   IETF RFC 2530 (1999), *Indicating Supported Media Features Using Extensions to DSN and MDN.*

[b-IETF RFC 2532]   IETF RFC 2532 (1999), *Extended Facsimile Using Internet Mail.*

[b-IETF RFC 2879]   IETF RFC 2879 (2000), *Content Feature Schema for Internet Fax (V2).*

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[b-IETF RFC 3302]   IETF RFC 3302 (2002), *Tag Image File Format (TIFF) – Image/tiff MIME Sub-type Registration.*

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