International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

T.38

Amendment 1

(10/2014)

SERIES T: TERMINALS FOR TELEMATIC SERVICES

Facsimile – Group 3 protocols

Procedures for real-time Group 3 facsimile communication over IP networks

Amendment 1: New Appendix VI, clarifications and corrections

Recommendation ITU-T T.38 (2010) – Amendment 1

ITU-T T-SERIES RECOMMENDATIONS

TERMINALS FOR TELEMATIC SERVICES

Facsimile – Framework	T.0–T.19
Still-image compression – Test charts	T.20–T.29
Facsimile – Group 3 protocols	**T.30–T.39**
Colour representation	T.40–T.49
Character coding	T.50–T.59
Facsimile – Group 4 protocols	T.60–T.69
Telematic services – Framework	T.70–T.79
Still-image compression – JPEG-1, Bi-level and JBIG	T.80–T.89
Telematic services – ISDN Terminals and protocols	T.90–T.99
Videotext – Framework	T.100–T.109
Data protocols for multimedia conferencing	T.120–T.149
Telewriting	T.150–T.159
Multimedia and hypermedia framework	T.170–T.189
Cooperative document handling	T.190–T.199
Telematic services – Interworking	T.300–T.399
Open document architecture	T.400–T.429
Document transfer and manipulation	T.430–T.449
Document application profile	T.500–T.509
Communication application profile	T.510–T.559
Telematic services – Equipment characteristics	T.560–T.649
Still-image compression – JPEG 2000	T.800–T.829
Still-image compression | JPEG XR	T.830–T.849
Still-image compression – JPEG-1 extensions	T.850–T.899

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

Recommendation ITU-T T.38

Procedures for real-time Group 3 facsimile communication over IP networks

Amendment 1

New Appendix VI, clarifications and corrections

Summary

Recommendation ITU-T T.38 defines the procedures to be applied to allow Group 3 facsimile transmission between terminals where, in addition to the public switched telephone network (PSTN) or integrated services digital network (ISDN), a portion of the transmission path used between terminals includes an IP network, e.g., the Internet.

This revision of this Recommendation clarifies Recommendation ITU-T H.323, Recommendation ITU-T H.248.1, session initiation protocol (SIP) and session description protocol (SDP) call establishment and improves the compatibility between ITU-T T.38 gateways and Group 3 facsimile.

Amendment 1 to Recommendation ITU-T T.38 (2010/09) introduces additions and corrections to the Recommendation and adds clause 11, "Security considerations" and Appendix VI, "Security considerations from a historical perspective". Furthermore, Amendment 1 captures items from the 'Implementers Guide' (05/2012) and from Erratum 1 (04/2013) to Recommendation ITU-T T.38 (09/2010).

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T T.38	1998-06-18	8	11.1002/1000/4393
1.1	ITU-T T.38 (1998) Amd. 1	1999-04-01	8	11.1002/1000/4601
1.2	ITU-T T.38 (1998) Amd. 2	2000-02-10	8	11.1002/1000/4841
1.3	ITU-T T.38 (1998) Cor. 1	2000-03-30	8	11.1002/1000/5144
1.4	ITU-T T.38 (1998) Amd. 3	2000-11-17	16	11.1002/1000/5166
1.5	ITU-T T.38 (1998) Amd. 4	2001-07-29	16	11.1002/1000/5527
2.0	ITU-T T.38	2002-03-29	16	11.1002/1000/5689
2.1	ITU-T T.38 (2002) Cor. 1	2003-07-14	16	11.1002/1000/6479
2.2	ITU-T T.38 (2002) Amd. 1	2003-07-29	16	11.1002/1000/6507
2.3	ITU-T T.38 (2002) Amd. 3	2004-01-30	16	11.1002/1000/7244
2.4	ITU-T T.38 (2002) Amd. 2	2004-04-22	16	11.1002/1000/7239
3.0	ITU-T T.38	2004-04-22	16	11.1002/1000/7313
3.1	ITU-T T.38 (2004) Amd. 1	2005-01-08	16	11.1002/1000/7456
4.0	ITU-T T.38	2005-09-13	16	11.1002/1000/8559
5.0	ITU-T T.38	2007-04-06	16	11.1002/1000/9044
6.0	ITU-T T.38	2010-09-13	16	11.1002/1000/10995
6.1	ITU-T T.38 (2010) Amd. 1	2014-10-14	16	11.1002/1000/12293

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

FOREWORD

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

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

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

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

NOTE

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

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

INTELLECTUAL PROPERTY RIGHTS

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

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

Table of Contents

Recommendation ITU-T T.38

Procedures for real-time Group 3 facsimile communication over IP networks

Amendment 1

New Appendix VI, clarifications and corrections

Modifications introduced by this amendment/corrigendum are shown in revision marks. Unchanged text is replaced by ellipsis (…). Some parts of unchanged text (clause numbers, etc.) may be kept to indicate the correct insertion points.

• • •

2 Normative 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.245] Recommendation ITU-T H.245 (2009), *Control protocol for multimedia communication*.

[ITU-T H.248.1] Recommendation ITU-T H.248.1 (20~~05~~13), *Gateway control protocol, Version 3*.

[ITU-T H.248.2] Recommendation ITU-T H.248.2 (20~~05~~13), *Gateway control protocol: Facsimile, text conversation and call discrimination packages*.

[ITU-T H.323] Recommendation ITU-T H.323 (2003), *Packet-based multimedia communications systems*.

• • •

[IETF RFC 5939] IETF RFC 5939 (2010), Session Description Protocol (SDP) Capability Negotiation.

[IETF RFC 6466] IETF RFC 6466 (2011), *IANA Registration of the 'image' Media Type for the Session Description Protocol (SDP).*

• • •

3 Definitions

• • •

3.5 ITU-T T.38/ITU-T V.34G3: In this Recommendation, ITU-T T.38/ITU-T V.34G3 refers to an ITU-T T.38 endpoint that supports G3FE and includes the ITU-T T.30/V.34 half-duplex procedures.

3.6 ITU-T T.38 transport mode: The actual *protocol stack* below the ITU-T T.38 protocol layer. There are three main T.38 transport modes, labelled as "UDPTL/UDP", "RTP/UDP" and "TPKT/TCP".

NOTE – There might be variations of an ITU-T T.38 transport mode. E.g., in case of security enhanced T.38 transport modes: "UDPTL/DTLS/UDP", "SRTP/UDP" and "TPKT/TLS/TCP".

• • •

5.1 Conventions

5.1.1 SDP offer/answer protocol variants

This Recommendation provides example signalling syntax. There are two models for the session description protocol (SDP) concerning the indication and negotiation of media and transport capabilities:

– the name "*legacy* SDP Offer/Answer" indicates SDP Offer/Answer, according to [IETF RFC 3264];

– the name "*revised* SDP Offer/Answer" indicates SDP Offer/Answer, according to [IETF RFC 5939] and [b-IETF ~~Draft MediaCapNeg~~RFC 6871].

• • •

11 Security considerations

See Appendix VI for security considerations from a historical perspective.

• • •

Annex D

SIP/SDP call establishment procedures

(This annex forms an integral part of this Recommendation.)

D.1 Introduction

This annex describes system level requirements and procedures for Internet-aware facsimile implementations and Internet-aware facsimile gateways conforming to ITU-T T.38 to establish calls with other ITU-T T.38 implementations using the procedures defined in [IETF RFC 3261] (SIP) and [IETF RFC 2327] (SDP)~~.~~ and the 'image' media type as defined in [IETF RFC 6466]. SIP [IETF

RFC 3261] uses the embedded SDP Offer/Answer protocol (see clause D.2.3.0) for indication and negotiation of media configurations (for example, a specific ITU-T T.38 configuration).

• • •

D.2.1.3.1 SDP parameter definitions

The SDP parameters shown in Table D.1 are defined by this Recommendation.

Table D.1 – ITU-T T.38 SDP parameter definitions

No.	Parameter name	Definition
1	T38FaxVersion	This is the version number of ITU-T T.38. New versions shall be compatible with previous versions. Absence of this parameter indicates version 0. The version is expressed as an integer value.
2	T38MaxBitRate	Indicates the maximum fax transmission rate supported by the endpoint and shall not be used to negotiate actual transmission speeds. (~~Note~~NOTE 1)
3	T38FaxFillBitRemoval	Indicates the capability to remove and insert fill bits in Phase C (refer to [ITU-T T.30]), non-ECM data to reduce bandwidth. This is a boolean parameter (inclusion = true, exclusion = false). (NOTE 2)
4	T38FaxTranscodingMMR	Indicates the ability to convert to/from MMR from/to the line format for increasing the compression of the data and reducing the bandwidth in the packet network. This is a boolean parameter (inclusion = true, exclusion = false). (NOTE 2)
5	T38FaxTranscodingJBIG	Indicates the ability to convert to/from JBIG to reduce bandwidth. This is a boolean parameter (inclusion = true, exclusion = false). (NOTE 2)
6	T38FaxRateManagement	Indicates the fax rate management model as defined in [ITU-T T.38]. Values may be "localTCF" or "transferredTCF".
7	T38FaxMaxBuffer	Indicates the maximum number of octets that can be stored on the remote device before an overflow condition occurs. It is the responsibility of the transmitting application to limit the transfer rate to prevent an overflow. The negotiated data rate should be used to determine the rate at which data is being removed from the buffer. Value is an integer.
8	T38FaxMaxDatagram	~~Indicates the~~The maximum size of the payload ~~within an RTP packet~~ that can be accepted by the remote device. This is an integer value.
9	T38FaxMaxIFP	This parameter signals the maximum IFP frame size the offering endpoint is capable of accepting.
10	T38FaxUdpEC	Indicates any desired error correction scheme, either FEC or redundancy or none. Valid options are "t38UDPFEC", "t38UDPRedundancy" and "t38UDPNoEC". This parameter shall only be present when using UDPTL as the transport for [ITU-T T.38].
11	T38FaxUdpECDepth	If the parameter is specified, then the 'minred' value indicates that the offering endpoint wishes to receive at least that many redundancy frames per UDPTL datagram (when the answering endpoint chooses to use t38UDPRedundancy as the error correction mode), or that the offering endpoint wishes to receive at least that many FEC frames per

Table D.1 – ITU-T T.38 SDP parameter definitions

No.	Parameter name	Definition
		UDPTL datagram (when the answering endpoint chooses to use t38UDPFEC as the error correction mode). Additionally, if 'maxred' is specified, it indicates that the offering endpoint wishes to receive no more than that many redundancy frames or FEC frames per UDPTL datagram.
12	T38FaxUdpFECMaxSpan	Indicates that offering endpoint may not be able to properly process FEC frames that span more than the specified number of IFP frames.
13	T38VendorInfo	Indicates the manufacturer of the endpoint.
14	T38ModemType	Indicates modem capability supported by the ITU-T T.38 endpoint. Valid options are: "t38G3FaxOnly" (0) and "t38G3AndV34G3" (1). Note: if not provided, the implied value of this parameter is "t38G3FaxOnly".
NOTE 1 – See also the informative note in clause H.4 on how the parameter T38MaxBitRate has been interpreted in existing implementations. NOTE 2 – If omitted in signalling then default value (= 'false').		

Only parameter "**T38FaxRateManagement"** is mandatory, all other parameters are optional. See also clause D.2.3.5 with respect to parameter usage in SDP Offer/Answer, and summary in Annex H.

D.2.2 Basic call setup

D.2.2.1 Choosing call setup mechanism

Annex B indicates that ITU-T H.323 FastCall Setup is the basic mechanism for establishing an ITU-T T.38 call. The method described in this annex is intended for use in conjunction with this mechanism in a decomposed gateway model. In addition, this annex may also be used if the emitting gateway is aware that the destination gateway supports the call establishment mechanism of this annex.

• • •

D.2.3.5 SDP parameter usage in SIP/SDP Offer/Answer negotiations

This clause (see also summary in Annex H) describes the use of ITU-T T.38 SDP parameters when utilized with the SIP/SDP offer/answer model.

T38MaxBitRate is declarative and the answer is independent of the offer. The parameter simply indicates the maximum transmission bit rate supported by the endpoint.

T38FaxFillBitRemoval is negotiated. If the answering entity does not support this capability or if the capability was not in the offer, this parameter shall not be present in the answer.

NOTE – Then default behaviour according to the semantic 'false' applies.

T38FaxTranscodingMMR is negotiated. If the answering entity does not support this capability or if the capability was not in the offer, this parameter shall not be present in the answer.

NOTE – Then default behaviour according to the semantic 'false' applies.

T38FaxTranscodingJBIG is negotiated. If the answering entity does not support this capability or if the capability was not in the offer, this parameter shall not be present in the answer.

NOTE – Then default behaviour according to the semantic 'false' applies.

T38FaxRateManagement is declarative and the answer must contain the same value.

• • •

D.2.8 Interoperability

Both SIP and Annex B require a well-known port to initiate call signalling. As described in SIP, its well-known port is 5060. Endpoints in this annex shall use the SIP well-known port by default.

D.2.8.1 Fall-back procedure

In case of an unsuccessful negotiation of an ITU-T T.38 session between gateways, it is recommended, in order to maximize the success rate of facsimile calls in GSTN, that gateways should fall back to ITU-T V.152 with ITU-T G.711 as VBD codec. If ITU-T V.152 is not an available mode, then non-ITU-T V.152 audio with ITU-T G.711 codec is a possible alternative. One example of achieving this is described in D.2.4.2.4.

Annex E

ITU-T H.248.1 call establishment procedures

(This annex forms an integral part of this Recommendation.)

• • •

E.2.1.3 Media channels

ITU-T T.38 facsimile packets are sent on a separate TCP/UDP port from ITU-T H.248 message transport. A minimal implementation of this annex requires a TCP, UDP or SCTP port for call signalling (ITU-T H.248 message) transport and either a UDP port or a TCP port for ITU-T T.38 facsimile information.

• • •

E.2.2.1.2 Voice and facsimile connection

Digits are collected by the media gateway (MG) and sent to the calling agent to invite the called party to a voice connection as defined in [ITU-T H.248.1]. A voice connection is set up.

Upon detection of CNG by the emitting media gateway (MG), the calling agent is informed (via [ITU-T H.248.1]) of this event and instructs the destination MG to play CNG. If the destination MG then notifies the MGC of a CED (or ITU-T V.21 flags) event and is capable of ITU-T T.38, the MGC requests that each MG open an ITU-T T.38 connection. Details for discrimination of the call as facsimile is described in clause 8 of [ITU-T H.248.2]. The MGC may also request that a new MG handle the facsimile connection. The ITU-T T.38 protocol proceeds with an ITU-T T.38 ITU-T V.21 flags indicator packet.

Note that if ITU-T T.38 is not supported by one of the MGs, the MGC may ~~decide~~choose to abort a fax relay connection and attempt ~~the facsimile call~~to make a connection over ~~ITU-T G.711 (~~a conditioned audio channel, using ~~ITU-T G.711~~procedures and methods as defined in ~~this case~~ITU-T V.152. Note also that it is ~~beyond the scope of this annex).~~ possible that legacy systems may use a pass-through service with non-ITU-T V.152/G.711 codec configurations.

Full flexibility of switching between MGs (e.g., voice+facsimile, voice-only or facsimile-only) and deciding on options will not be possible if the MGC is not notified of the facsimile events (and the MG alone detects facsimile and switches blindly to ITU-T T.38). Upon completion of the facsimile call (ITU-T T.38 completion) by the off-ramp media gateway (MG), the calling agent is informed (via [ITU-T H.248.1]) of this event and may request that the connection be reverted to voice.

• • •

Annex H

Signalled and provisioned ITU-T T.38 protocol parameters

(This annex forms an integral part of this Recommendation.)

• • •

H.2.2 Overview of transport-dependent ITU-T T.38 parameters

H.2.2.1 Transport mode "UDPTL/UDP"

Table H.2 provides a summary of all the defined ITU-T T.38 parameters. It may be concluded that **all** parameters may be principally optional, and may thus be omitted in control plane signalling protocols. In the case of absent parameters in signalling messages, the local ITU-T T.38 endpoint will apply the default parameter values. The default parameter values may be further refined in an "ITU-T T.38 profile" definition (which may be, for example, a subset of a SIP or ITU-T H.248 interface profile), if not already implicitly given by ITU-T T.38 itself.

Table H.2 – ITU-T T.38 SDP parameter (Semantics according to SDP IETF RFC 3264 capability negotiation protocol) – (1) Negotiated IP transport = UDPTL/UDP

No.	Name	Syntax (SDP)	Semantic (SIP/SDP) Ref.: Clause D.2.3.5	Mandatory/ Optional?	Type and unit	(Provisioned) Default value
1	Version	**T38FaxVersion**	Parameter is negotiated. The entity answering the offer *shall return* the same or a lower version number.	Recommended (Note 8). If omitted then default value.	INTEGER (0..255), [-]	0
2	Maximum Bitrate	**T38MaxBitRate**	Parameter is declarative and the answer is independent of the offer. The parameter simply indicates the maximum transmission bit rate supported by the endpoint.	Recommended (Note 9). If omitted then default value.	INTEGER (0..2^{16}–1), [bit/s] (Note 6)	14 400 (Note 1)
3	Fill Bit Removal	**T38FaxFillBitRemoval**	Parameter is negotiated. If the answering entity does not support this capability or if the capability was not in the offer, this parameter shall not be present in the answer.	Optional. If omitted then default value.	BOOLEAN, [-]	FALSE
4	MMR Transcoding	**T38FaxTranscodingMMR**	Parameter is negotiated. If the answering entity does not support this capability or if the capability was not in the offer, this parameter shall not be present in the answer.	Optional. If omitted then default value.	BOOLEAN, [-]	FALSE
5	JBIG Transcoding	**T38FaxTranscodingJBIG**	Parameter is negotiated. If the answering entity does not support this capability or if the capability was not in the offer, this parameter shall not be present in the answer.	Optional. If omitted then default value.	BOOLEAN, [-]	FALSE
6	Data Rate Management Method	**T38FaxRateManagement**	Parameter is declarative and the answer must contain the same value.	Mandatory. If omitted then default value.	ENUMERATION, [-]	'transferredTCF' (Note 4)
7	Maximum Buffer Size	**T38FaxMaxBuffer**	Parameter is declarative and the answer is independent of the offer. This parameter simply signals the buffer space available on the offering endpoint and the answering endpoint. The answering endpoint may have more or less buffer space than the offering endpoint. Each endpoint	Optional. If omitted then default value.	INTEGER (0..2^{16}–1), [bytes]	1800 (Note 2)

No.	Name	Syntax (SDP)	Semantic (SIP/SDP) Ref.: Clause D.2.3.5	Mandatory/ Optional?	Type and unit	(Provisioned) Default value
			should be considerate of the available buffer space on the opposite endpoint.			
8	Maximum Datagram Size	**T38FaxMaxDatagram**	Parameter is declarative and the answer is independent of the offer. This parameter signals the largest acceptable datagram for the offering endpoint and the answering endpoint (i.e., the maximum size of the xyz payload). The answering endpoint may accept a larger or smaller datagram than the offering endpoint. Each endpoint should be considerate of the maximum datagram size of the opposite endpoint.	Optional. If omitted then default value.	INTEGER ($0..2^{16}–1$), [bytes]	150 (Note 3)
9	Maximum IFP Size	**T38FaxMaxIFP**	Parameter is declarative and the answer is independent of the offer. This parameter signals the maximum IFP frame size the offering endpoint is capable of accepting.	Optional. If omitted then default value. . If T38FaxMaxIFP is included in an offer, then inclusion of this parameter is Mandatory in that offer.	INTEGER ($0..2^{16}–1$), [bytes]	40 (Note 3) (Note 7)
10	Error Correction	**T38FaxUdpEC**	Parameter is negotiated only when using UDPTL as the transport. If the answering endpoint supports the offered error correction mode, then it shall return the same value in the answer; otherwise, the T38FaxUdpEC parameter shall not be present in the answer.	Optional. If omitted then default value.	ENUMERATION, [-]	't38UDPRedundancy' (Note 5)

No.	Name	Syntax (SDP)	Semantic (SIP/SDP) Ref.: Clause D.2.3.5	Mandatory/ Optional?	Type and unit	(Provisioned) Default value
11	Error Correction Depth	**T38FaxUdpECDepth**	Parameter is declarative and the answer is independent of the offer, and is relevant only when using UDPTL as the transport. If the parameter is specified, then the 'minred' value indicates that the offering endpoint wishes to receive **at least** that many redundancy frames per UDPTL datagram (when the answering endpoint chooses to use t38UDPRedundancy as the error correction mode), or that the offering endpoint wishes to receive **at least** that many FEC frames per UDPTL datagram (when the answering endpoint chooses to use t38UDPFEC as the error correction mode). Additionally, if 'maxred' is specified, it indicates that the offering endpoint wishes to receive **no more** than that many redundancy frames or FEC frames per UDPTL datagram.	Optional. If omitted then default value.	INTEGER (0..2^{16}–1), [frames]	1 for 'minred', none for 'maxred' (Note 3)
12	Error Correction Span	**T38FaxUdpFECMaxSpan**	Parameter is declarative and the answer is independent of the offer, and is relevant only when using UDPTL as the transport. If the parameter is specified, it indicates that offering endpoint may not be able to properly process FEC frames that span more than the specified number of IFP frames.	Optional. If omitted then default value.	INTEGER (0..2^{16}–1), [frames]	3
13	Vendor Information	**T38VendorInfo**	Parameter is declarative and the answer is independent of the offer. The parameter merely indicates the manufacturer of the endpoint.	Optional. ~~If sent then ignore.~~	Space separated List of three INTEGERs (Note 10)	No default value configured

No.	Name	Syntax (SDP)	Semantic (SIP/SDP) Ref.: Clause D.2.3.5	Mandatory/ Optional?	Type and unit	(Provisioned) Default value
14	Supported Modem	**T38ModemType**	Parameter is declarative and indicates the modem capability supported by the gateway.	Optional. If omitted then default value (0)	Enumeration	t38G3FaxOnly

NOTE 1 – The bitrate of the ITU-T V.17 modem is used as default value due to the majority of deployed G3FE devices, which are supporting ITU-T V.17 modem speed.

NOTE 2 – The proposed default maximum buffer size relates to a conservative estimate of ITU-T V.17 modem data for one second (= 1800 bytes due to 14400 bit/s times one second).

NOTE 3 – The maximum datagram size (which is the maximum size of the UDPTL PDU) is a result of the packetization time, the maximum bitrate (modem speed) and the redundancy level (and~~/or~~ FEC~~???~~). The proposed default value of 150 bytes represents a conservative estimate under the conditions of fastest modem speed, a maximum redundancy level of '3', and packetization time of 20 ms. Dependency between T38FaxMaxDatagram, T38FaxMaxIFP and T38FaxUdpECDepth can be defined as:

T38FaxMaxDatagram ≥ UDPTL header+ T38FaxMaxIFP + T38FaxUdpECDepth* (number of bytes per FEC or number of bytes per redundant frame) + additional bytes for error recovery due to ASN.1 structure.

NOTE 4 – Because data rate management method 2 is mandatory for UDP (see clause 8.2).

NOTE 5 – Because the packet redundancy method is simpler and more widely deployed as forward error correction methods.

NOTE 6 – The interpretation of the unit value of **T38MaxBitRate** parameter is specific to a given protocol.

NOTE 7 – The default value was calculated similarly to that of T38FaxMaxDatagram (in Note 3 of this table).

NOTE 8 – The main ITU-T T.38 capability set are related to a particular ITU-T T.38 version. It is therefore recommended to signal this parameter.

NOTE 9 – This parameter is recommended to be signalled in order to avoid potential interoperability problems (see clause B.3.7 which mandates this parameter for ITU-T H.323-controlled ITU-T T.38 endpoints).

NOTE 10 – See clauses D.2.3.1 and D.2.3.2.

…

Appendix V

ITU-T T.38 implementation guidelines

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

…

V.3.3 Incorrect use of the colon (":") in several ITU-T T.38 attributes in Annex D

Some equipment vendors have incorrectly implemented the ABNF as defined in Annex D for several parameters: ~~T38FaxFillBit Removal~~T38FaxFillBitRemoval, T38FaxTranscodingMMR, and T38FaxTranscodingJBIG. ~~These~~Several implementers incorrectly assumed that these attributes have ~~made incorrect use of the~~ a value (an "att-value" in SDP) following a colon ~~(":").~~(e.g., "a=T38FaxTranscodingJBIG:0"), but they do not. Implementers should ~~avoid this mistake, and make their implementations robust by interpreting ":1" as support for the~~ treat the presence of the attribute~~,~~ as "true" and ~~":0"~~absence as ~~not supporting the~~"false" regardless of any attribute~~.~~ value that might be present. Furthermore, implementers shall not construct SDP attribute lines for these Boolean attributes that include a colon and attribute value. A proper attribute line for T38FaxTranscodingJBIG, for example, is "a=T38FaxTranscodingJBIG".

The correct behaviour of these parameters is defined in clauses D.2.3.1 and D.2.3.2.

…

Appendix VI

Security considerations from a historical perspective

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

VI.1 Historical origin and use of Recommendation ITU-T T.38

Recommendation ITU-T T.38 itself does not define any explicit means for security support. The rationale behind it can be found in the historical usage and evolution of packet-switched networks with real-time transport of facsimile data.

Figure VI.1 simplifies the history by dividing the past two decades into four significant phases. The predecessor technology of ITU-T T.38 is ITU-T X.38 (see [b-ITU-T X.38]). ITU-T T.38 shares many capabilities from ITU-T X.38. ITU-T X.38 itself (phase 1) did not provide any security support, primarily because:

– ITU-T X.38 was only used between two gateways (the emitting and receiving gateway);

– network access via PSTN only, and PSTN is per se a trusted domain (as circuit-switched network); and

– packet data network (PDN) is an overlay on top of a circuit-/frame-switched network, again a network technology highly robust against potential security attacks.

ITU-T T.38 was initially (and still is) deployed in PSTN emulation systems (PES; phase 2). IP transport was/is limited on the network core level, typically a managed (and trusted) IP network.

Recommendation ITU-T T.38 (1998 to 2010) primarily gave scope to such types of service deployments (phase 2), thus, there were not any explicit security requirements received for support by ITU-T T.38. This assumption could be confirmed by the stage 1/2 specification for ITU-T T.38: the service definition for Internet facsimile F.185 [ITU-T F.185] does not define any security requirements.

NOTE – [b- Nagireddi] mentions using the ITU-T T.38 FEC capability for security support:

> *"Forward error correction is used in many digital communication systems. It is also useful in T.38 … based fax calls as given in … A FEC technique also helps to encrypt the transmitted bits that help in sending secured VoIP voice and fax. Some FEC - based techniques are reported as patented for VoIP as a part of a secured VoIP communication"*

Almost all new wireline and wireless access technologies provide IP support; this means that ITU-T T.38 PSTN-IP gateways (phase 3) may no longer be required. The ITU-T T.38 endpoint is located in the IP-based end user equipment itself, the so called IAF terminal. The IP-based access network becomes the focal point of security discussions (e.g., trusted or untrusted network segment).

The last evolution step would be an all IP network (phase 4). ITU-T T.38 might then be replaced by better-suited IP transport technologies, but typically still be dependent on legal requirements for electronic documents.

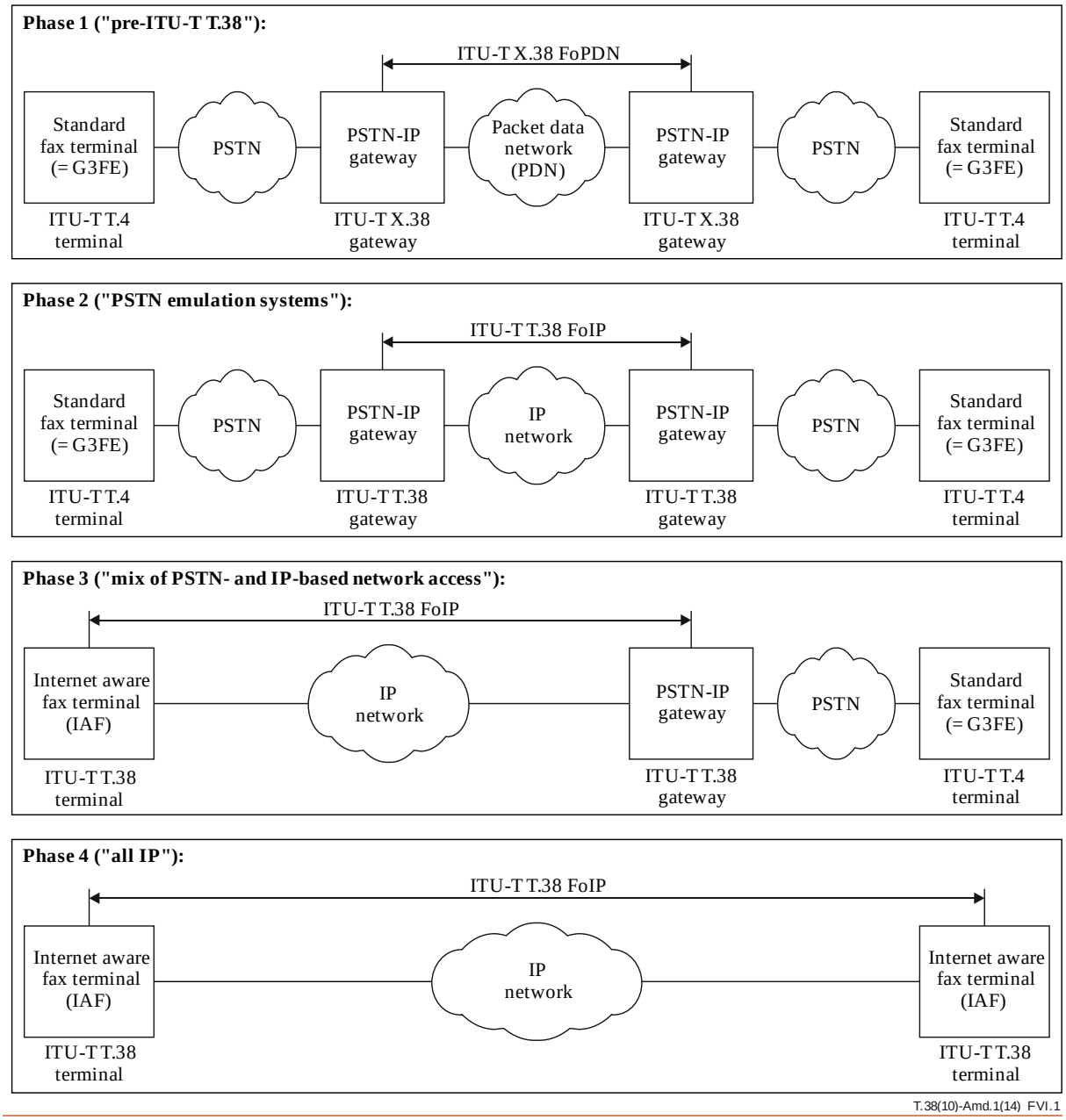

Figure VI.1 – Real-time facsimile over packet networks – Simplified network evolution over the past two decades

VI.2 Application vs network/transport level security

ITU-T T.38 usage in deployments with IP-based network access (phase 3) appears to be the most critical scenario from a security perspective. Security could in principle be supported at multiple protocol layers; see Figure VI.2.

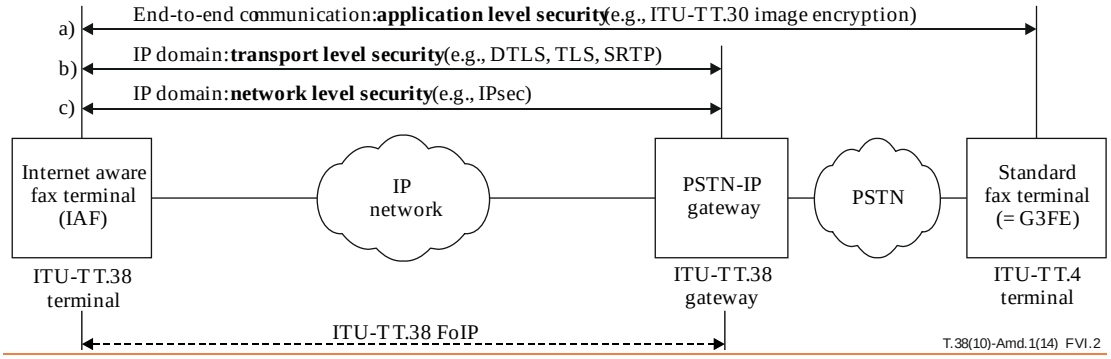

Figure VI.2 – Application vs network/transport level security

The scope of network and transport level security is limited to the IP network. There are multiple options for transport level security, which are dependent on the ITU-T T.38 transport mode (see clause 3.6).

Application level security would be related to the encoding of the facsimile document (also known as image) itself. [ITU-T T.30] defines two optional security support functions (see Annexes G and H in [ITU-T T.30]), in order to provide document confidentiality and document integrity.

Bibliography

[b-IETF RFC 2833] IETF RFC 2833 (2000), *RTP Payload for DTMF Digits, Telephony Tones and Telephony Signals*.

[b-IETF RFC 4566] IETF RFC 4566 (2006), *SDP: Session Description Protocol*.

[b-IETF RFC 4734] IETF RFC 4734 (2006), *Definition of Events for Modem, Fax, and Text Telephony Signals*.

[b-IETF ~~Draft MediaCapNeg~~RFC 6871] IETF ~~draft-ietf-mmusic-sdp-media-capabilities,~~RFC 6871 (2013), *SDP M~~m~~edia C~~c~~apabilities Negotiation.* ~~http://datatracker.ietf.org/doc/draft-ietf-mmusic-sdp-media-capabilities.~~

[b-ITU-T X.38] Recommendation ITU-T X.38 (1996), *G3 facsimile equipment/DCE interface for G3 facsimile equipment accessing the Facsimile Packet Assembly/Disassembly facility (FPAD) in a public data network situated in the same country*.

[b-Nagireddi] Nagireddi, S. (2008), *VoIP Voice and Fax Signal Processing*. Wiley, ISBN 978-0-470-22736-7.

SERIES OF ITU-T RECOMMENDATIONS

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

Printed in Switzerland
Geneva, 2015