i3 forum

# *Fax over IP: achieving an industry solution*

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international ip interconnection

i3 forum

# The problem

**In PSTN fax is widely used and works reliable but when there is an IP segment in connection chain:**

***„It takes weeks or even months to „tune" the networks before fax works."***

What happens

- Fax connections cannot be setup
- Signalling is OK. connection setup – no data transfer
- Connections disconnected before transmission is completed
- Many redials or retransmissions
- Image errors

# i3 forum FoIP activity objectives

## Issue the guidelines for carriers to run reliable fax over IP without „tuning”

### The necessity:

*„Fax should die in IP networks”* however:

- Most regulation authorities  consider fax as Universal Service.
- Fax is still used by customers.
- Fax is considered as legal document.

### The activities:

- September 2009 i3 forum started FoIP activity.
- January 2010 i3 forum started working with SIP Forum FoIP Task Group.

# What happens in IP segment

**In PSTN voice call is setup, then modem uses acoustic frequency to transmit image data (always G.711) :**

- ✓T.30 for signalling
- ✓T.4 or T.6 for image transmission

**In IP segment initially always voice call is setup, then after fax discrimination switchover is necessary:**

Digitalization of modem signal

Detection of fax signals, relay protocol use

**Fax passthrough (VBD)**
**G.711 no VAD/DTX**

- ►Bandwidth requirements
- ►Packet loss,
- ►Jitter,
- ►Echo cancellation

**Fax relay**
**ITU-T T.38**

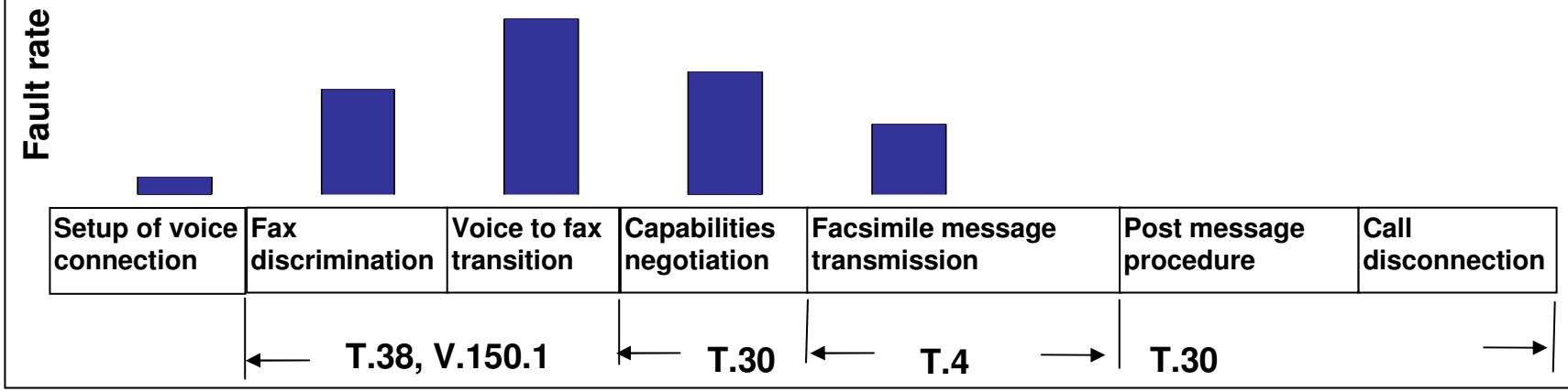
- ►Ambiguous standard,
- ►Call parameters,
- ►Protocol interaction
- ►Delays - protocol timers

# Surveys and their results # 1

## Faults per connection chain section

- Between gateways, between gateway and terminal
- Incoming from SP VoIP networks

## Faults in subsequent fax call phases – interaction of protocols




## Most often mentioned problems:

- Disconnection on wrong SIP error codes when T.38 not supported.
- Call setup, T.38 ports opened, „no signal”
- Lack of VBD support
- Lack of V.34 support

# Standardization situation ITU-T.38

| | | |
|---|---|---|
| **June 1998** | 32 p. | 4 Amendments<br>1. H.323 setup. 2 SIP/SDP H.248 setup 3. IAF, TPKT 4. Improvements |
| **March 2002** | 78 p. | 3 Amendments<br>**1. Half duplex V.34**, V.150.1 Internetworking Annex F, **Autonomous switchover** 2. RTP encapsulation 3. Implementation guidelines |
| **April 2004** | 122 p. | Consolidation<br>1 Amendment,<br>Addition of Vendor ID in SIP/SDP call setup |
| **Sept. 2005** | 125 p. | Revision, precise specification |
| **April 2007** | 129 p. | Revision, precise specification |
| **July 2010** | 153 p. | Revised SIP/SDP O/A [SDPCapNeg and MediaCapNeg], New parameter: T38ModemType, Signalled and provisioned T.38 protocol parameters (Annex H) |

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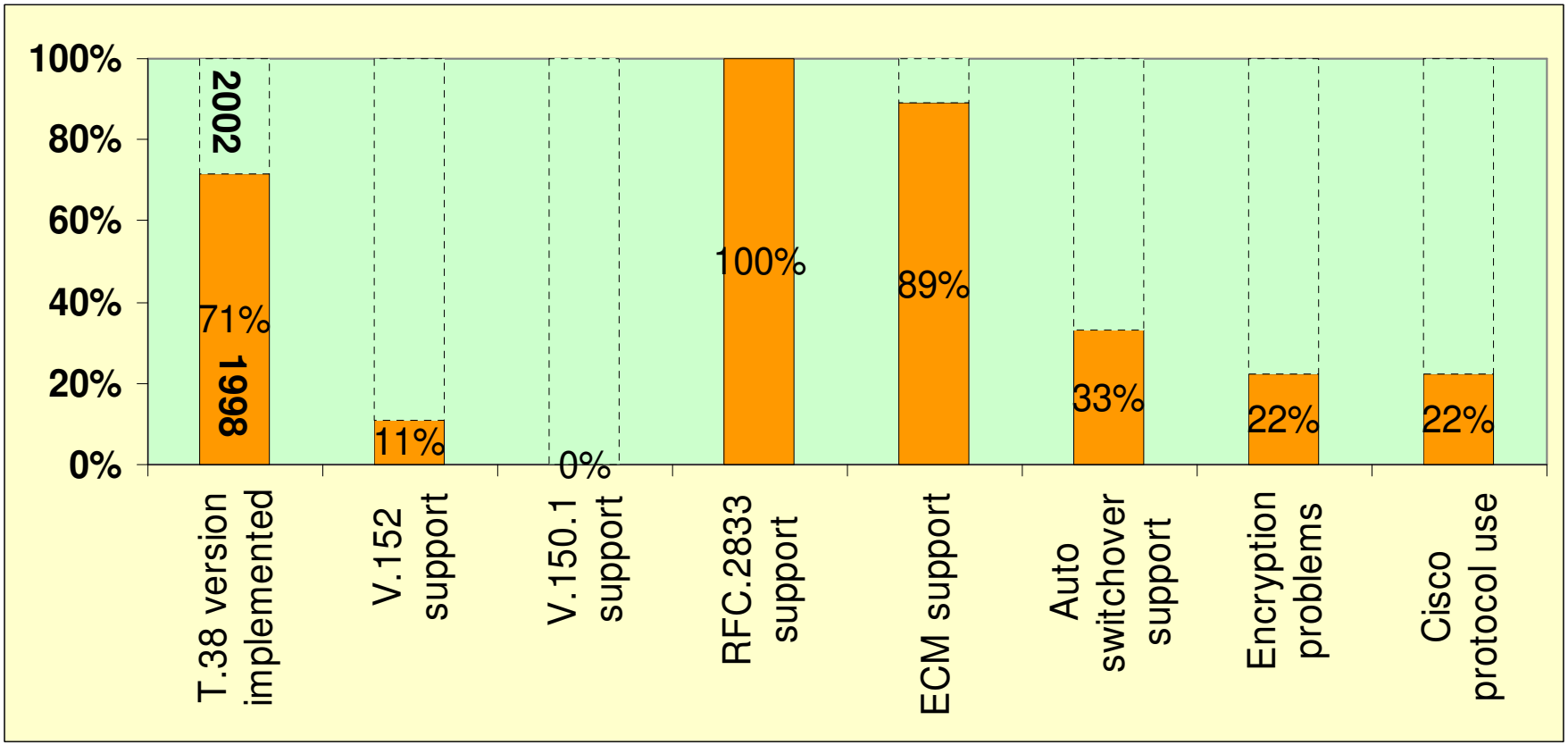
# Surveys and their results # 2




**What can be neglected in this phase**

- Cisco protocol and switchover
- Encryption – so far rarely used

**What is not possible**

- Modem relay – V.150.1 not implemented.
- SSE switchover – no Annex F T.38

# Conclusions - i3 forum guidelines

General prerequisites

**Bandwidth calculation, VBD definition, redundancy use, QoS parameters, packet loss, jitter, delay, COS marking, gateway resources configuration, echo control, transport stack recommendation**

Technical guidelines for existing networks

Testing recommendations

## Only T.38 version 1998 can be used

**How to improve interoperability in existing networks?**

- **Always use RFC 2833 payload for fax tones**
- **Automatic speedup on fax tones – no V.152**
- **Implement G.711 without VAD/DTX**
- **SG3 to G3 fallback procedure**
- **ECM to be negotiated by terminals**

Target technical guidelines

Testing recommendations

**New versions of standards:**

**T.38, revised SDP…**

# Next planned activities

## Main activity streams:

- Target guidelines based on new standard versions (ITU, IETF)
- Testing in real environment with SIP Forum
- Gathering information about FoIP problems

## Why testing in real network?

### Protocol interaction problems (examples)

- Delay between the off-ramp/receiving gateway's 200OK to initial INVITE and the subsequent re-INVITE to T.38.
- Delayed audio channel suppression during T.38 switchover

- Delays can change and the faults may appear or not – identification problem
- Some faults may appear as a result of several different causes

# Next activities details

## Target Guidelines with new standard version.

- T.38 version July/2010
- draft-ietf-mmusic-sdp-capability-negotiation-13.txt
- draft-ietf-mmusic-sdp-media-capabilities-09.txt
- ITU-T V.152 Amendment
  - Annex B – Use of data signal detection and silence insertion in voiceband data,
  - Annex C - Use of V.21 preamble for echo canceller control in a V.152 gateway". 03/2009
- draft-ietf-avt-dtls-srtp-07.txt.

## Verification tests list

- Tests to be performed before running new IP interconnection link
- Equipment and network tests (also call flows, SIP O/A)

## Testing with SIP Forum. .

- Identification of interoperability problems and solution verification.
- Investigation of time dependencies problems – protocol interactions etc.
- Delay distribution measurement in tandem networks.
- Determination of an impact of different parameters on successful fax connection rate

## FoIP problems repository

- „Knowledge database" gathering the description of known problems and solutions

# Thank you

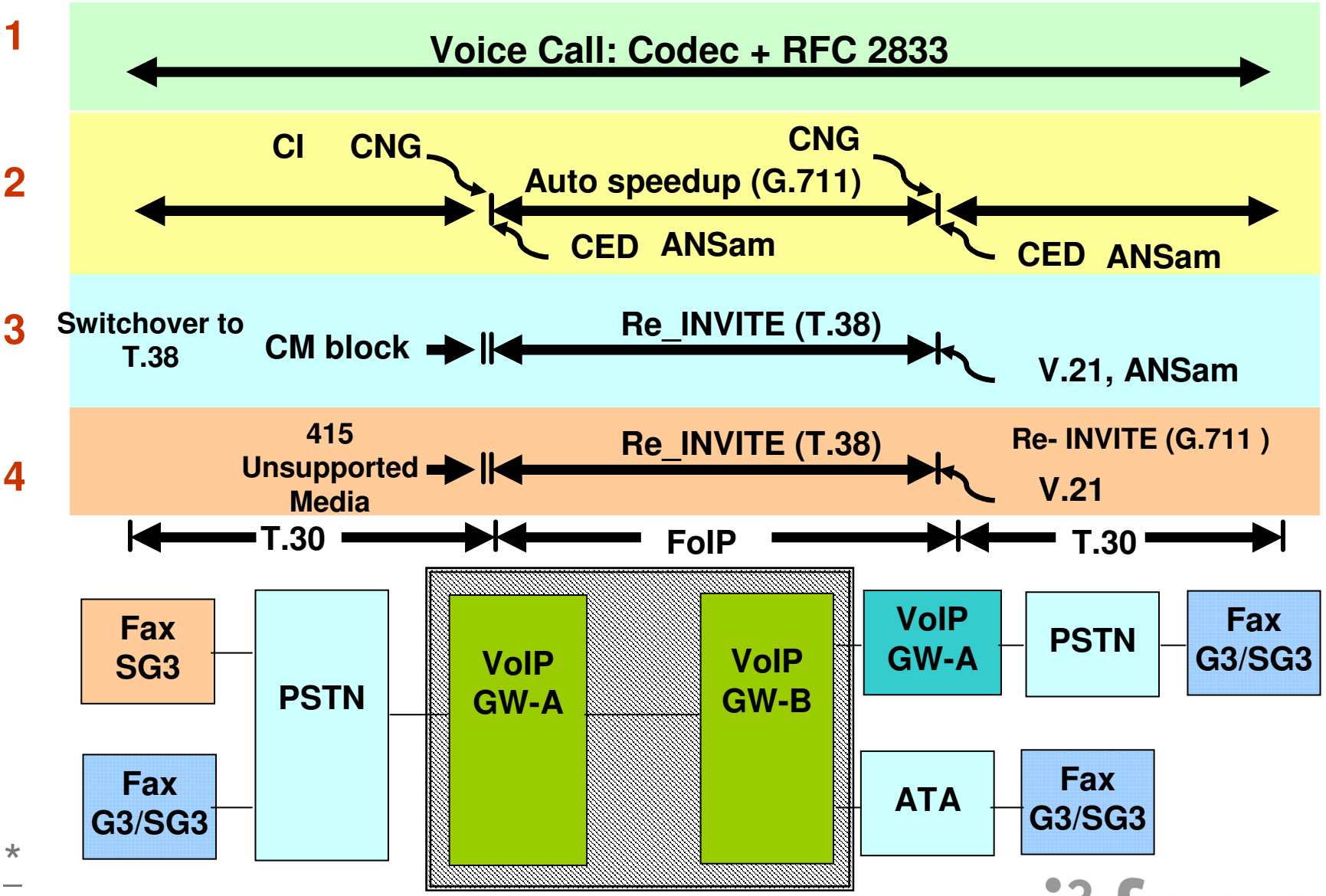
# BACK-UP

# T.38 version number

**Amendment 1 (2003) + IETF draft**

| Version Number | Version Dependent Content Summary | Original Documentation |
|---|---|---|
| 0 | 1998 ASN.1 Syntax | Initial Publication (1998), Amendment 1 (1999), Amendment 2 (02/00) |
| 1 | 1998 ASN.1 Syntax, TPKT, IAF support | Amendment 3 (11/00)<br>Note: Some early implementations supporting TPKT indicate version 0. |
| 2 | 2002 ASN.1 Syntax | Updated Recommendation (2002) |
| 3 | V.34, V.33 support, 2002 Syntax extended | |
| 4 | Defined Defaults for negotiated parameters in Annex D. | Draft |

# Guidelines to improve interoperability

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