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Foreword

This ETSI Technical Report (ETR) has been produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

ETRs are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or the application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or an I-ETS.

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1 Scope

This ETR:

- identifies the various technical proposals which have been proposed to date within TC-TE and ITU-T Study Group 8 (SG8);
- identifies the common points and differences between the proposals;
- finds possible ways to harmonize the various approaches;
- if possible, opens the way to a future European Telecommunication Standard (ETS).

2 References

This ETR incorporates by dated and undated reference, provisions from other publications. These references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETR only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ETS 300 242: "Terminal Equipment (TE); Group 3 facsimile equipment".

[2] ETS 300 001: "Attachments to the Public Switched Telephone Network (PSTN); General technical requirements for equipment connected to an analogue subscriber interface in the PSTN".

[3] ITU-T Recommendation T.4 (1994): "Standardization of group 3 facsimile apparatus for document transmission".

[4] ITU-T Recommendation T.30 (1994): "Procedures for document facsimile transmission in the general switched telephone network".

[5] ITU-T Recommendation V.8 (1994): "Procedures for starting sessions of data transmission over the general switched telephone network".

3 Definitions

For the purposes of this ETR, the definitions given in ITU-T Recommendations T.4 [3] and T.30 [4] apply.

4 Abbreviations

For the purposes of this ETR, the abbreviations given in ITU-T Recommendations T.4 [3] and T.30 [4] apply.

5 Definition of a fax-switch

A "fax-switch" is a technical feature which handles a call received over the Public Switched Telephone Network (PSTN) to automatically direct it either to a Group 3 facsimile application or to another application depending on the call received.

6 Fax-switch technical descriptions submitted to date

Some fax-switch technical descriptions have already been made through various contributions within ITU-T SG 8 and ETSI STC TE2. The ITU-T description (given in annex D of ITU-T Recommendation T.30 [4]) was approved in March 1993.

The various technical descriptions within ETSI and the ITU-T cover more or less extensive areas. The technical description may:

- cover only the technical principle of fax-switch;

- be complemented by precise timers;

- specify the performances of the fax-switch;

- deal with specific issues related to implementation matters.

All of these aspects are treated in this ETR.

7 Technical principle

7.1 CNG detection

All the technical descriptions submitted to date rely on the following principle.

An incoming call is identified by the fax-switch as a "facsimile call" if the signal "CNG" is detected. CNG (calling tone) is defined in ITU-T Recommendation T.30 [4]. This signal is always sent by a Group 3 facsimile equipment (see ETS 300 242 [1]) operating in the automatic calling mode and was originally specified to notify a human answerer that a machine is calling.

CNG emission was not mandatory when calling in manual mode. Yet, fax-switch operation can, generally, be performed by other means but takes more time (e.g. by silence/speech discrimination, see further). CNG being mandatory in manual mode (with the remark that "however, manual calling units conforming to the 1993 and previous versions of ITU-T/CCITT Recommendation T.30 may not transmit this signal") was adopted by ITU-T SG 8 in its meeting of June 1994 for Resolution n° 1 procedure.

7.2 Alternative ringing cadences - network based solution

Another type of solution has been proposed within ETSI STC TE 2. The selection would be achieved by the use of a supplementary service of the PSTN indicating at the called side which of several applications on the same line (facsimile, phone, data modem, ...) is required. This kind of supplementary service already exists in certain countries: different ringing tones/cadences are used depending on the application to be reached. Modulation of the ringing signal or a superimposition of an additional signal may also be conceived. It is felt this solution would be highly preferable because of its reliability and flexibility. This selective ringing alternative is not widely offered at present and network operators are encouraged to introduce it at the earliest opportunity. All the post-connection selection methods described in this ETR have the disadvantage of connecting calls that are intended for a service which may not be currently available, i.e.:

- voice calls may be answered although no person is present or no voice recording medium is available;

- facsimile calls may be answered although no facsimile facility is available.

In both cases, the result is reduced quality of service.

The rest of this ETR considers only the CNG detection based solution.

8 Behaviour of a calling facsimile machine

8.1 Emission of CNG - event stopping CNG emission

ITU-T Recommendation T.30 [4], subclauses 3.1.3 ("Operation method 3") and 3.1.4 ("Operation method 4"), describes the automatic operation at the calling station.

It is stated that the CNG signal is transmitted by the calling facsimile machine after dialling is completed and until a "**signal is detected**". It is not specified what this signal is exactly, but one can assume it is the signal sent by a called facsimile equipment when answering the call, namely:

- Called station identification (CED) followed by (NSF)-(CSI)-DIS, in case of automatic answering facsimile apparatus;

- only (NSF)-(CSI)-DIS for some manual answering facsimile apparatus (in ITU-T Recommendation T.30 [4], CED emission is not mandatory for manual answering though often implemented).

The behaviour of a calling facsimile machine when receiving signals other than CED, or (NSF)-(CSI)-DIS (for example voice), is assumed to be:

- CNG emission continuation;

- and not entering the facsimile protocol (looking for (NSF)-(CSI)-DIS).

Certain machines can also enter the facsimile protocol and thus **stop CNG emission** upon reception of a signal only identified as V.21 upper channel modulated (the modulation of (NSF)-(CSI)-DIS). The reason for this is that the stopping of the CNG emission permits a better reception of the rest of the (NSF)-(CSI)-DIS). In this case, fax-switch cannot work because CNG is no longer emitted.

Besides, it has been reported that some calling machines exist which stop CNG emission upon the reception of any signal (e.g. voice). It happens that some of these machines re-start the CNG emission as soon as a silence is placed on the line (end of the announcement of the fax-switch or pause). The CNG detection is more difficult when such a machine is calling. It is believed that such machines are few in number.

For the remainder of this ETR, the generic term "**answer signal**" is defined as the signal received from the called side which makes the calling side entering in the facsimile protocol (phase B).

8.2 Emission of CNG for the manual facsimile calls

Some facsimile machines do not send CNG during manual calls.

Within a fax-switch operation, facsimile application is the **default** application. It follows that if no application has been explicitly selected (by the calling or called user) during handling a manual call, the facsimile application is nevertheless connected. However, this "default connection" has a drawback: it introduces a **delay**. This delay translates into higher toll charges and, possibly, in the unsuccessful handling of some facsimile calls.

It has been proposed, in some contributions, that CNG should be emitted by new facsimile apparatus even for manual calls. ETSI TC-TE consider this to be a sensible proposal. It was adopted by ITU-T SG 8 at its meeting of June 1994 for Resolution n° 1 procedure with the remark that "however, manual calling units conforming to the 1993 and previous versions of ITU-T/CCITT Recommendation T.30 may not transmit this signal".

If the facsimile machine sends CNG in manual mode, it should be sent immediately following the decision to invoke the facsimile mode.

8.3 Post-dialling delay - delay to receive the answer signal

ITU-T Recommendation T.30 [4], subclauses 3.1.3 and 3.1.4 does not specify the time the **automatic** calling facsimile machine expects to receive the answer signal from the called side once the dialling is completed.

For the rest of this ETR, this timer is stated as "**Tx**".

At present, this timer is free to other standardization bodies (e.g. ETSI with ETS 300 001 [2], Chapter 5, subclause 5.6.5), but since April 1993, ITU-T SG 8 has been trying to standardize it. A possible standardized value is also under consideration in ETSI TC-TE.

Timer Tx has a crucial importance on the reliability of the connection of facsimile machines. If it is too short, Tx may expire before the facsimile procedure has been started by the called machine.

The various delays to be considered are:

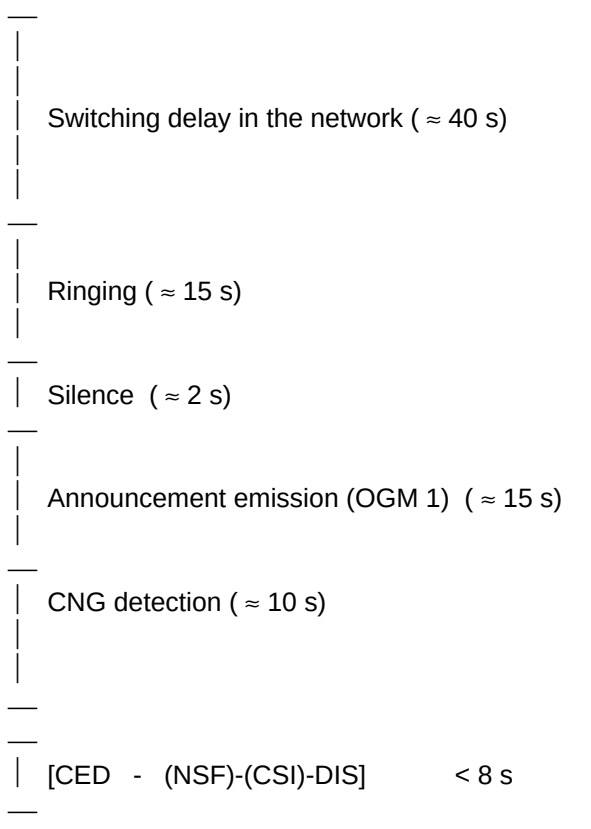
- switching delay through the networks, especially in the case of international calls;

- delay in answering the call at the called side (ringing time), this time is generally around 15 s, but in some countries a time of up to 50 s may be allowed. In others countries, there is a trend to allow this time beyond 15 s to accommodate simple phone-fax machines without fax-switch (the user has more time to take the call before the automatic answering reacts);

- time to detect CNG by the fax-switch;

- detection of initial identification sequence.

The calculation which has been made by TC-TE leads to a value of **90 s** for reliability in the case of long delays:



The total of the timers makes a duration of 90 s. The 8 s timer takes into account (with a margin) machines which enter phase B of ITU-T Recommendation T.30 [4] only upon reception of part of (NSF)-(CSI)-DIS].

NOTE 1: Some fax-switches can detect CNG more quickly than as presented above, but some others fax-switches may take more time.

NOTE 2: The calculation above does not take into account of the case of an additional fax-switch step which may be present if, for example, a private network device also implementing a fax-switch is placed between the public line and the fax-switch.

NOTE 3: ITU-T SG 8 is considering this overall figure of 90 s.

NOTE 4: ITU-T SG 2 informed SG 8 that the "Post dialling delay" (interpreted here as "switching delay in the network") is under 30 s for most countries but it is not clear in the liaison statement from SG 2 to SG 8 what is the exact definition of the "Post dialling delay" and if PABX and other possible causes of additional delays are considered in the survey results provided by SG 2.

8.4 T1 timer at the emitting side

Once the calling facsimile machine has entered the facsimile protocol upon detection of the "answer signal", the time during which the calling facsimile machine tries to receive the (NSF)-(CSI)-DIS sequence is clearly defined in ITU-T Recommendation T.30 [4] as the **T1 timer (35 ± 5 s)**.

However, the point in the emitting procedure where T1 is started is not clearly defined in ITU-T Recommendation T.30 [4]. It should begin as soon as the calling terminal recognizes the fax capability of the destination. This may require recognition of the initial identification sequence.

For **manual** calling, it can be assumed that timer T1 begins to run as soon as the user has switched their facsimile machine to line (generally by pushing a "Start" button), but the text of ITU-T Recommendation T.30 [4] is no clearer on this matter.

9 Announcement emitted by the called side

9.1 Necessity of an announcement

When the fax-switch function is provided at the called side, sending an announcement is considered necessary so that a manual caller is not left in silence after the connection. This announcement is called "OGM 1".

Generally, this announcement is described as a "voice" announcement, but other announcement types can be used (tones, music, bips, ...), provided they do not suggest that the call has not been answered yet and they do not simulate the CED.

9.2 Announcement emission along with CNG detection

Various possibilities exist as to the emission of the announcement at the called side:

- before the CNG detection;
- during the CNG detection;
- after the CNG detection;
- any combination of the three possibilities given above.

The fax-switch descriptions submitted so far differ somewhat on that point. Clause 10 is intended to clarify the differences.

10 Precise descriptions of the fax-switch operation

Table 1 lists the various sequences proposed to date for fax-switch operation. The sequences mainly specify how the CNG detection process and the announcement emissions are chronologically arranged. The different steps are described in further detail.

NOTE 1: Table 1 describes the whole operation when CNG is not detected, until the facsimile application is connected as default application (emission of CED, (NSF)-(CSI)-DIS).

NOTE 2: Timer T1 (T1 = 35 s ± 5 s) is that specified in ITU-T Recommendation T.30 [4].

NOTE 3: "OGM 1", "OGM 2" and "OGM 3" are announcements.

NOTE 4: "Choose appropriate function":

- this indicates the action of the terminal when selecting either voice operation or facsimile operation. Voice operation may differ according to whether the user is present or absent;

- the distinction between "user is absent" and "user is present" is described further in subclause **Error! Bookmark not defined.**

NOTE 5: Some descriptions specify that OGM 3 may be a continuation of OGM 2 which may be itself a continuation of OGM 1.

NOTE 6: 8,05 seconds correspond to two bursts of CNG plus 15 % of tolerance.

NOTE 7: Description n° 1 corresponds to the one that was standardized by ITU-T SG 8 in January 1993 as annex D to ITU-T Recommendation T.30 [4].

NOTE 8: Descriptions n° 2, 3, 4 and 5 are proposals within ESTI STC TE 2 and ITU-T SG 8 to improve description n° 1.

Table 1

	Description 1	**Description 2**	**Description 3**	**Description 4**	**Description 5**
Answering call	Yes	Yes	Yes	Yes	Yes
CNG detection Duration Tb	1,8 s < Tb < 2,5s No signal emitted	1,8 s < Tb < 2,5s No signal emitted	1,8 s < Tb < 2,5s No signal emitted	Tb < 3 s No signal emitted	Tb < 6,4 s Short signal issued
OGM 1 emission	Duration not specified but limited by 8,05 ≤ Ta < T1 - OGM 1 - OGM 3 Optional CNG detection process	3 s < OGM 1 <4,5 s or = 5 s Optional CNG detection process	OGM 1 = 15 s Optional CNG detection process	> 6 s Mandatory CNG detection process	Duration determinated by operator or manufacturer Optional CNG detection process
Third step Duration: Ta Choose appropriate function	8,05 < Ta < [T1- OGM 1 - OGM 3] Mandatory CNG detection process OGM 2 (in case of user present) optional	8,05 < Ta < [T1- OGM 1 - OGM 3] Mandatory CNG detection process OGM 2 (in case of user present) optional	8,05 < Ta < [T1- OGM 1 - OGM 3] Mandatory CNG detection process OGM 2 (in case of user present) optional	[OGM 3 + Ta] < 30 s Optional CNG detection process OGM 2 (in case of user present) optional	Duration determinated by operator or manufacturer Mandatory CNG detection process
OGM 3 Optional	limited by 8,05 < Ta < [T1- OGM 1 - OGM 3]	limited by 8,05 < Ta < [T1- OGM 1 - OGM 3]	limited by 8,05 < Ta < [T1- OGM 1 - OGM 3]	[OGM 3 + Ta] < 30 s	called "OGM 2 " in this description
CED, (NSF)-(CSI)-DIS (if none other application selected)	Yes	Yes	Yes	Yes	Yes

11 Identification of the main differences between the different sequences

Table 2 sums up the main differences between the various descriptions. The differences are detailed further is this clause.

Table 2

	Description 1	**Description 2**	**Description 3**	**Description 4**	**Description 5**
Time before OGM 1	Close together				6,4 s
Duration of OGM 1	Limitation related to timer T1	3 s to 5 s	15 s	> 6 s	Duration determined by operator or manufacturer
Delay to detect CNG	Limitation related to timer T1	Limitation related to timer T1	Limitation related to timer T1	< 9 s	CNG assumed to be detected within the 6,4 s before OGM 1
Detection of CNG before, after, during OGM 1	Before: mandatory During: optional After: mandatory (Detection mainly after)			During	Before: mandatory During: optional After mandatory (Detection mainly before)
Maximum time the calling user is left in silence throughout the operation	Limited to Ta	Limited to Ta	Limited to Ta	5,5 s	Limited to Ta
Time to connect facsimile application as default mode	Limitation of: Ta, OGM 1, OGM 3	Limitation of: Ta, OGM 1, OGM 3	Limitation of: Ta, OGM 1, OGM 3	Not defined	Not defined
Performances of CNG detection in terms of level	Level not specifed	Level not specifed	Level not specifed	Level: - 30 dBm	Level: assumed to be that specified in ITU-T Rec. on T.4 [3] (- 43 dBm)

11.1 Time before OGM 1

Limitation of this time is required to avoid the situation where the calling user is left in a lengthy period of silence.

Descriptions n° 1, 2, 3 and 4 are close together concerning this time.

This time is longer for description n° 5 (6,4 seconds before OGM 1) but, in this description, an ad hoc tone needs to be emitted to advise the calling user that the call has been answered and is being handled. This tone is a "**short signal**" (say 1,2 s) emitted at a certain point of time within the 6,4 s duration (but not before 1,8 s after answering the call). The spectrum of this signal needs to be fitted to facilitate the CNG detection in parallel.

Discussion within ITU-T SG 8 might lead to the following solution (for description n° 5):

- the short signal is a V.21 upper channel signal (1 650 Hz - 1 850 Hz);

- it is coded as the signal "AI" of ITU-T Recommendation V.8 [5] which defines a new start-up sequence for modems.

This solution may be not applicable because some machines may enter the facsimile protocol and stop CNG emission upon reception of such a signal which is modulated exactly as the T.30 signal (NSF)-(CSI)-DIS, see subclause **Error! Bookmark not defined.** Further study is necessary on this matter. Certainly the solution needs to take into account the installed base of facsimile equipment.

For the rest of this ETR, this short signal, emitted to advise the calling user that the call has been answered, is called "**short signal**".

11.2 Duration of OGM 1

Descriptions n° 2 and 3 specify the duration of OGM 1. Description n° 1 does not (apart from the inequality [8,05 ≤ Ta < T1 - 0GM 1 - OGM 3]).

Descriptions n° 2 and 3 specify the duration of OGM 1 mainly because the CNG detection process is performed to a large extent at the end of the OGM 1 emission. The **timer Tx** runs until the "answer signal" (CED or (NSF)-(CSI)-DIS) is received from the called side.

Limiting OGM 1 duration in descriptions n° 2 and 3 permits Tx to be saved. This is important, because, if Tx expires, the automatic calling machine hangs up the line. As Tx is a national or regional matter, it may not be long enough.

Tx can be partly consumed by the switching delay in the network in case of long international routings, see subclause **Error! Bookmark not defined.**

Descriptions n° 4 and 5 do not specify the duration of OGM 1, because the CNG detection process is performed in parallel for description n° 4 and before OGM 1 for description n° 5.

11.3 Delay to detect CNG

The delay to detect CNG is very important to be sure that timer Tx will not be consumed excessively.

Descriptions n° 1, 2 and 3 specify the timer Ta and the duration of OGM 1 and OGM 3 so that:

$$T1 > Ta + OGM\ 1 + OGM\ 3$$

This does not explicitly define the time in which CNG should be detected. For this constraint, Tx is more relevant that T1.

In description n° 3, because of the rather long OGM 1 and because the CNG detection is mainly performed after OGM 1, the process takes more time. The time to detect CNG may be about 21 s from the point the call is answered (2 s Tb + 15 s OGM 1 + 4 s CNG detection).

Description n° 4 specifies the delay to detect CNG as being 9 s.

Description n° 5 does not specify the delay to detect CNG, but in this solution it is assumed that CNG is detected before OGM 1, then within 6,4 s.

11.4 Detection of CNG before, after or/and during OGM 1

Descriptions n° 1, 2 and 3 require CNG detection **before and after** OGM 1 with optional detection during OGM 1. Actually, these three proposals rely mainly on the detection of the CNG **after** OGM 1 because the time left before OGM 1 is very short with regard to the CNG sequence (repetition of [0,5 s, 1 100 Hz, 3 s silence]).

Description n° 4 requires CNG detection **during** OGM 1 with optional detection before and after OGM 1.

Description n° 5 requires CNG detection **before** OGM 1 with optional detection during OGM 1 and mandatory detection after OGM 1. In this solution, it is assumed that CNG is detected before OGM 1, then within 6,4 s.

11.5 Maximum time the calling user is left in silence throughout the operation

Descriptions n° 1, 2 and 3 do not specify a maximum time a manual caller is left in silence. Because OGM 2 is optional during the third step (duration Ta, see table 1), the caller may be left in silence during this time, especially in the case of "fax-switch when the user is present" where the called user is rung at this stage. Yet, this time Ta is indirectly limited by: (T1 - OGM 1 - OGM 3).

In the case of "fax-switch when the user is present", it is better that an OGM 2 is emitted. OGM 2 may be, for example, an announcement (e.g. "please wait, called user being called") or music or a sequence of bips or tones. It is better that OGM 2 does not simulate the network tones, but, if OGM 1 has already clearly alerted the caller the call has been answered, it is not harmful to simulate the ringback tone at this stage.

Description n° 4 specifies the maximum time the calling user is left in silence as the value 5,5 s.

Description n° 5 does not specify the maximum time the calling user is left in silence. However, a silence only takes place during third step (duration Ta). Ta is determined by the operator or manufacturer.

11.6 Time to connect facsimile application as default mode

Descriptions n° 1, 2 and 3, by limiting Ta, OGM 1 and OGM 3 (Ta + OGM 1 + OGM 3 < T1) limit the time to connect facsimile application as default mode.

The calculation which is made (involving T1 of ITU-T Recommendation T.30 [4]) ensures that, if the calling machine is switched on by the user (in manual mode) at the **beginning** of OGM 1, the facsimile connection nevertheless succeeds.

However, the calculation which is made does not take into account CED-(NSF)-(CSI)-DIS detection. This early switching by the user can speed up facsimile connection for machines emitting CNG in manual mode if the CNG can be detected in parallel with OGM 1, but for machines not emitting CNG in manual mode, it brings no advantage with regard to the manual switching at the **end** of OGM 1.

Descriptions n° 4 and 5 do not specify the time to connect facsimile application as default mode. Limitation of Ta and OGM 3 would be sufficient if we can assume that the user will switch the facsimile machine at the end of OGM 1. In that case the limitation would be:

For description n° 4: [Ta + OGM 3 + time to detect CED-(NSF)-(CSI)-DIS)] < T1.

For description n° 5: [Ta + OGM 2 + time to detect CED-(NSF)-(CSI)-DIS)] < T1.

11.7 Performances of the CNG detection

The level of CNG detection is not specified in descriptions n° 1, 2 and 3, but one can assume that the detection level specified in ITU-T Recommendation T.4 [3] (paragraph 7) for all the T.30 signals applies (i.e. the range of 0 dBm to - 43 dBm).

In description n° 4, the level range of detection is from 0 dBm to - 30 dBm because low detection levels are difficult to achieve **with OGM 1 in parallel**. Nevertheless, the same range as defined in ITU-T Recommendation T.4 [3] is advised to cope with possible international link attenuation problems.

Frequency range and non detection threshold are also defined.

In description n° 5 the level range of detection is assumed to be the same as defined in ITU-T Recommendation T.4 [3]: 0 dBm to - 43 dBm. Indeed the short signal has a spectrum different from that of CNG which facilitates the CNG detection during the short signal emission.

The detection level is closely related to the time to detect:

a) If the time to detect CNG is to be kept short, that means that CNG detection is performed:

   - either mainly in **parallel** with OGM 1, then, the performance is close to that of description n° 4 (0 dBm to - 30 dBm);

   - or **before** OGM 1, then, the performance is that of description n° 5: the level defined in ITU-T Recommendation T.4 [3] (0 dBm to - 43 dBm).

b) If CNG detection is mainly performed **after** OGM 1, the level defined in ITU-T Recommendation T.4 [3] also applies (0 dBm to - 43 dBm), but the time to detect CNG is increased.

CNG detection over at least 8,05 s may permit to avoid misdetection by confirming the first burst of 1 100 Hz by a second one (2 * 3,5 s + 15 % = 8,05 s) and to avoid misoperation in the presence of an 1 111 Hz answer signal provided by some networks.

It has been proposed within TC-TE that descriptions n° 1, 2, 3, 4 and 5 could be improved as follows:

in case of CNG partially detected but not confirmed, OGM 1 is delayed by 4,6 s from the point of this partial detection in order to confirm the detection by a second burst of CNG.

12 Synthesis of main differences between descriptions, possible harmonization

12.1 Synthesis of main differences

Two types of solution corresponding to two different user profiles can be identified:

- **Profile X corresponding to descriptions n° 3 and 4:**

Equipments with Profile X are more dedicated for **voice** with occasional facsimile use.

OGM 1 is longer than for Profile Y: 15 s. This fully accommodates a voice caller rather than only requesting him to wait while CNG detection is being processed.

The CNG detection can be processed in parallel with OGM 1 emission (description n° 4) but also after OGM 1 (description n° 3).

With this profile, CNG detection may be less reliable:

- if the CNG detection is processed in parallel, the level of CNG required for detection is higher which might raise some problems in case of attenuated international calls;

- if the CNG detection is processed mainly after OGM 1, a risk exists that timer Tx expires.

- **Profile Y corresponding to descriptions n° 2 and 5:**

Equipments with Profile Y are more dedicated for a use with a significant portion of **facsimile** calls (domestic and international ones).

OGM 1 is rather short (up to 5 s in description n° 2) or a silence is placed just after the connection with a short signal emitted (description n° 5).

The CNG detection is not aimed to be in parallel with OGM 1 emission but before or after OGM 1.

Reliable CNG detection for international calls can be expected.

Descriptions n° 2 and n° 3 come from description n° 1 in specifying OGM 1 duration. Then, there is no need to consider description n° 1 in the harmonization.

Selection of the OGM 1 duration with the type of fax-switch by the customer himself as appropriate to his needs can be a good solution. The customer can choose:

- either a long announcement (fax-switch Profile X);

- or a short announcement (fax-switch Profile Y) or the solution of the short signal during 6,4 s silence followed by the announcement (description n° 5).

The performances would correspond to the profile selected.

12.2 Possible harmonization within profiles

As two different user profiles are identified, it seems unreasonable to try to harmonize all the descriptions. However, it seems achievable to harmonize the different proposals within the same "family" (corresponding to the same profile).

12.2.1 Harmonization of descriptions n° 3 and 4

Descriptions n° 3 and 4 seem easy to harmonize.

A principle can be pointed out in relation to these two descriptions:

- if the delay to connect facsimile application is short (9 s), the level of detection is higher (e.g. - 30 dBm), because of the need for parallel detection;

- if the level of detection is lower (- 43 dBm), the time to connect facsimile is longer (>(1,8 s + 15 s + 3,5 s)). [1,8 s + 15 s + 3,5 s] corresponds to [Tb + OGM 1 + 1 burst of CNG].

Table 3 illustrates this principle.

Table 3

	Description 3	**Description 4**
Delay to connect facsimile	> 1,8 s + 15 s + 3,5 s	9 s
Level of detection	- 43 dBm	- 30 dBm

Harmonization of descriptions n° 3 and 4 may lead to the consideration of **both** of the approaches gathered in table 3. Intermediate approaches could be also considered.

12.2.2 Harmonization of descriptions n° 2 and 5

Description n° 5 differs mainly from description n° 2 because of the detection of CNG prior to OGM 1 (6,4 s of silence plus the "short signal").

As description n° 5 brings speedy and reliable CNG detection, harmonization between descriptions n° 2 and n° 5 should lead to the exclusion of description n° 2 and the retaining of description n° 5. Recent work within ITU-T SG 8 seems to follows this direction.

12.3 Fax-switch when the user is present - fax-switch when the user is absent

Descriptions generally distinguish between:

- fax-switch for selection between facsimile and telephone ("the user is present");
- fax-switch for selection between facsimile and voice recording ("the user is absent").

In both cases the operation is the same but:

- for selection between facsimile and telephone, the called user is rung during Ta (see table 1) or during OGM 1 emission (description n° 5);
- while for selection between facsimile and voice recording, a speech detection is carried out after OGM 1 to identify a human caller.

Profiles X and Y defined above can be combined with these two types of selection.

Table 4

	User absent	**User present**
Profile X (long announcement) (Descriptions n° 3 and 4)	More dedicated to **voice use.** Permits an immediate welcome to the calling user and explains, in detail, the operation in case of an answering machine. Drawback: - for a facsimile call, the connection to the facsimile application is rather slow (≥ 9 s).	More dedicated to **voice use**. Permits a welcome to the calling user and explains, in detail, the operation. Drawbacks: - for a facsimile call, the connection to the facsimile application is rather slow (≥ 9 s); - for a phone call, the answer by the called user is also delayed by the long announcement.
Profile Y (short announcement or short signal) (Descriptions n° 2 and 5)	More dedicated to **facsimile use**. Permits a quick connection to the facsimile. Drawback: the short announcement is less informative for the calling user. However, in the case of the short signal solution (description n° 5) more explanation may be given to the user after CNG detection phase.	More dedicated to **fax use** Permits a quick sorting of the facsimile calls from the telephone calls and does not delay the telephone calls. Drawback: the short announcement (or short signal) is less informative for the calling user during the CNG detection process.

13 Aspects related to the source of announcement

The material implementation is not described within fax-switch technical descriptions. However, the source of the announcement may have some influence on the fax-switch performance as pointed out in some of the contributions.

13.1 Source of announcement

The source of the OGM 1 announcement may be:

- internal to the fax-switch equipment;

- external to the fax-switch equipment.

If the first case is the more common one, it seems undesirable to exclude the second one. From a market point of view, it could be of some interest for low range facsimile machines to provide fax-switch without voice answering-recording included but furnished by an external device connected to the same line.

13.2 Case of external announcement source

Generally, on an external device source, the user can record himself OGM 1. Then, it is not easy to guarantee that a silence is placed at the right place to allow CNG detection and to limit the announcement duration. Because of this flexibility, there can be intermediate situations where fax-switch cannot be definitely qualified as pertaining to profile X (long announcement) or profile Y (short announcement). The solution of the short signal with CNG detection during 6,4 s silence prior to OGM 1 (description n° 5) seems difficult to accommodate with an external announcement source.

13.3 Line power consumption in case of external source announcement

When an external device is used for emitting the announcement, the problem of specifying the maximum PSTN line power consumption arises. As a matter of fact, two devices are simultaneously connected on the line for a certain period of time: the external device announcement source and the fax-switch itself. Then, the fax-switch needs to listen to the line for the CNG with a high impedance. It may be desirable to specify the consumption and the impedance drop introduced by the fax-switch.

14 Aspects related to the telephone service

Apart from the facsimile application, fax-switch can direct the call to the telephone. Then, it could be considered necessary to specify the behaviour of the fax-switch operation regarding the telephone service.

14.1 Ability to connect the telephone application

In all the descriptions, the user is able to directly enter the telephone application at any time except when the facsimile application has been entered.

15 Extensions

A fax-switch description should not exclude the detection of signals other than CNG, for example the recognition of:

- various data modem calling tones;

- DTMF sequences.

Some contributions proposing such an extension have been proposed within ETSI TC TE.

"V.8" is a new ITU-T Recommendation [5] developed by SG 14 to define a new start-up sequence for modems. Before adopting ITU-T Recommendation V.8 [5] for use in G3 facsimile, the compatibility with the installed base of fax-switches had to be carefully considered so that an existing fax-switch could work even when a machine implementing ITU-T Recommendation V.8 [5] is calling.

16 Conclusion

This ETR has focused on the solution relying on the CNG signal detection, because an alternative solution, based on a supplementary service of the PSTN, indicating at the called side which of several applications on the same line (facsimile, phone, data modem, ...) is required is not widely offered at present on the networks. However, this solution would be highly preferable because of its reliability and flexibility.

For the CNG detection based solution, this ETR analyses the various technical proposals which have been proposed so far within ETSI TC-TE and ITU-T SG 8 and finds possible ways to harmonize the various approaches.

Two profiles of fax-switches have been identified corresponding to two different user profiles:

- profile more dedicated for voice with an occasional facsimile use;

- profile more dedicated for a user receiving a significant portion of facsimile calls.

For each profile, harmonization of the different solutions is achievable.

History

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