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Speech Processing, Transmission and Quality aspects (STQ);
Transfer of performance parameters
of connections on a per call basis;
End-to-end speech transmission performance
Additional Network Feature (ANF);
Service Description

ETSI

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Foreword

This ETSI Standard (ES) has been produced by ETSI Speech processing, Transmission and Quality aspects (STQ), and is now submitted for the ETSI standards Membership Approval Procedure.

1 Scope

The present document specifies the Additional Network Feature (ANF) which enables the transfer of performance parameters between networks (private or public) on a per call basis in order to activate or deactivate specific network elements or to influence the routing of a particular call. This ANF is applicable to any call between any type of circuit or packet switching digital network like ISDN, PISN or digital mobile network as well as to multimedia, B-ISDN and Internet.

Due to the fact of increasing numbers of consecutive interconnected networks, the aim of the present document is to help to ensure end-to-end performance of a call. In a first step the scope of the present document is limited to end-to-end speech transmission performance, only.

The present document only covers the stage 1 description of the ANF-PERF according to ITU-T Recommendation I.130 [6].

Any user related actions and any network control decisions based on the values of the parameters exchanged are outside the scope of the present document. However, the present document may form the basis for further Supplementary Services (SS).

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1]   ITU-T Recommendation E.438: "Performance parameters and measurement methods to assess N-ISDN 64 kbit/s circuit switched bearer service UDI in operation".

[2]   ITU-T Recommendation G.109: "Definition of categories of speech transmission quality".

[3]   ITU-T Recommendation G.113: "Transmission impairments".

[4]   ITU-T Recommendation H.323: "Packet-based multimedia communications systems".

[5]   ITU-T Recommendation H.245: "Control protocol for multimedia communication".

[6]   ITU-T Recommendation I.130: "Method for the Characterization of Telecommunication Services supported by an ISDN and Network Capabilities of an ISDN".

[7]   ITU-T Recommendation I.350: "General Aspects of Quality of Service and Network Performance in Digital Networks, including ISDNs".

[8]   ITU-T Recommendation I.352: "Network performance objectives for connection processing delays in an ISDN".

[9]   ITU-T Recommendation I.380: "Internet protocol data communication service - IP packet transfer and availability performance parameters".

[10]   ITU-T Recommendation I.570: "Public/Private ISDN Interworking".

[11]   ITU-T Recommendation Q.115: "Logic for the control of echo control devices".

[12]   ITU-T Recommendation Q.762: "Signalling System No. 7 - ISDN user part general functions of messages and signals".

[13]   ITU-T Recommendation Q.763: "Signalling System No. 7 – ISDN user part formats and codes".

[14]   ITU-T Recommendation Q.2965.2: "Digital Subscriber Signalling System No. 2 – Signalling of individual Quality of Service parameters".

[15]   ETSI EG 201 050: "Speech processing, Transmission and Quality Aspects (STQ); Overall Transmission Plan Aspects for Telephony in a Private Network".

[16]   ETSI EG 201 474: "Speech Processing, Transmission and Quality Aspect (STQ); Future approaches to speech transmission quality across multiple interconnected networks".

[17]   ETSI EN 300 171: "Private Integrated Services Network (PISN); Specification, functional models and information flows; Control aspects of circuit-mode basic services [ISO/IEC 11574 (1994) modified]".

[18]   ETSI ETR 250: "Transmission and Multiplexing (TM); Speech communication quality from mouth to ear for 3,1 kHz handset telephony across networks".

[19]   ETSI TS 101 108: "Digital cellular telecommunications system (Phase 2+);Tandem Free Operation (TFO); Service Description; Stage 1 (GSM 02.53 version 7.0.1 Release 1998)".

[20]   ISO/IEC 11579-1: "Information technology - Telecommunications and information exchange between systems - Private integrated services network - Part 1: Reference configuration for PISN Exchanges (PINX)".

[21]   ETSI TS 101 329-3: "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); End to End Quality of Service in TIPHON Systems; A signalling mechanism for achieving TIPHON Quality of Service (QoS) levels".

NOTE: For the ETSI Standards Membership Approval Procedure (MV 20000818), the document is not yet publicly available.

[22]   ETSI ETR 076: "Integrated Services Digital Network (ISDN); Standards guide".

[23]   ETSI ETS 300 415: "Private Integrated Services Network (PISN); Terms and definitions".

3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the following terms and definitions apply:

Additional Network Feature (ANF) (see ETR 076 [22]): additional Network Feature (ANF) is a capability, over and above that of a basic service, provided by an ISDN, but not directly to an ISDN user.

ANF_PERF: ANF that enables the exchange of performance parameters between networks.

Intervening Network (IVN) (see ISO/IEC 11579-1 [20]): generic term for any real type of network which is employed for the provision of inter-PINX connections.

Public Network: (see ITU-T Recommendation I.570 [10]): network which provides services to the general public. A more detailed definition may be found in EG 201 050 [15].

Private Network (see ITU-T Recommendation I.570 [10]): network which provides services to a specific set of users only. A more detailed definition may be found in EG 201 050 [15].

Supplementary Services (SS): supplementary services are any services provided by a network in addition to its basic service or services.

Terminal Equipment (TE) (see ETS 300 415 [23]): item of equipment attached to a telecommunication network to provide access for a user to one or more services.

3.2   Abbreviations

For the purposes of the present document, the following abbreviations apply:

ECD	Echo Control Device
PISN	Private Integrated Services Network, see EN 300 171 [17]
PINX	Private Integrated Services network eXchange, see EN 300 171 [17]
VAD	Voice Activation Detection

4 Specification of the ANF

4.1 Description of the ANF

4.1.1 General

ANF-PERF is an additional network feature which enables the exchange and the update of performance parameters of consecutive connection parts of the specific call.

k

TE A
network 1
(see 4.4.1)

network k
exchange of performance parameters

network n
TE B
(see 4.4.1)
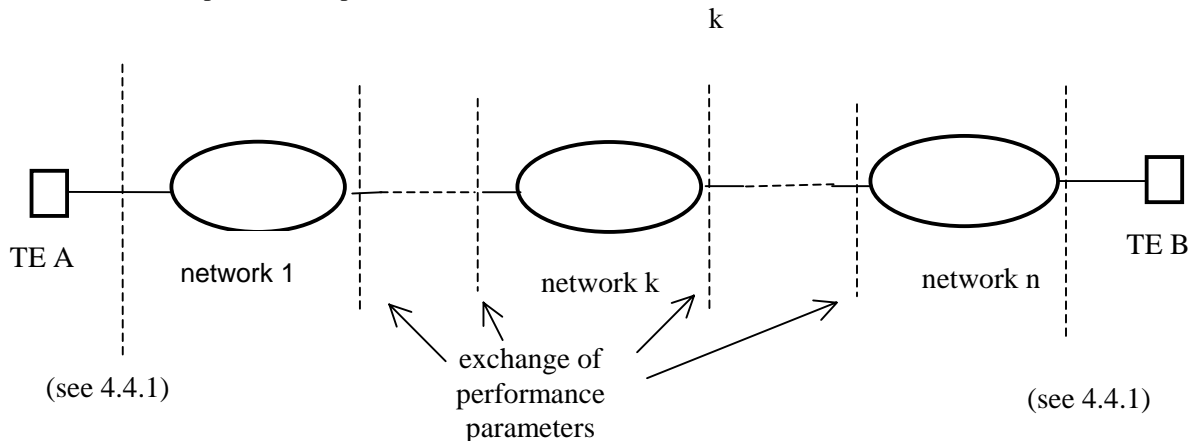
Figure 1: General Configuration

The performance parameter values are set to an initial value by the call originating network (private or public) that initiates the call (network 1 in Figure 1). It takes into account the values of TE A.

The destination network (network n in Figure 1) takes into account the values of TE B.

The values are updated upon each network boundary crossed depending on the transmission facilities used for that connection. Both directions (forward and backward) are considered simultaneously at call setup.

4.1.2 Applicability

This ANF is focussed on all connections that are used for voice communication which usually is used in a conversational (two way) mode.

Other applications may need only one way communication in which some parameters may be less relevant (e.g. delay). As networks are not aware of the detailed mode, all voice calls are treated in the same manner.

A call should be identifiable by each interconnecting network as a voice call.

The applicability to other type of calls (e.g. data or multimedia) is for further study.

4.2 Parameters

All parameters which are relevant for the user information transfer function (see ITU-T Recommendation I.350 [7]) should be considered.

As a first step the following performance parameters are exchanged (as indicated in EG 201 474 [16]).

Accumulated one-way transmission time at the interface k in the forward direction Daccf(k). This parameter is used in ITU-T Recommendation Q.762 [12] as propagation delay counter. It is also used in ITU-T Draft Recommendation E.ISDN-PERF [1] as OWPD (mean One Way Propagation Delay).

Accumulated one-way transmission time at the interface k in the backward direction Daccb(k).

This parameter is also accumulated in the forward direction.

NOTE 1: It is for further study that the assumption could be made that the one way transmission time in both directions is equal.

NOTE 2: With the parameters above the network k may calculate the Tail delay in the backward direction:
Dtailb(k) = Daccf(k)+Daccb(k).

Total one-way transmission time in the forward direction Daccf(tot). This parameter will be used by the originating network for the estimation of the ear-to-ear quality. This parameter corresponds to the "Call history information" field of SS#7 (see ITU-T Recommendation Q.763 [13]).

NOTE 3: With the parameters above the network k may calculate the Tail delay in the forward direction:
Dtailf(k) = Daccf(tot)-Daccf(k)+Daccb(k).

Echo control device indicator (ECDI) (as defined in ITU-T Recommendation Q.115 [11]).

Incoming half echo control device request indicator (as defined in ITU-T Recommendation Q.115 [11]).

Incoming half echo control device response indicator (as defined in ITU-T Recommendation Q.115 [11]).

Outgoing half echo control device request indicator (as defined in ITU-T Recommendation Q.115 [11]).

Outgoing half echo control device response indicator (as defined in ITU-T Recommendation Q.115 [11]).

Equipment Impairment factor (as defined in ITU-T Recommendation G.113 [3], Appendix.I and ETSI ETR 250 [18]).

Voice activity detectors (VAD).

Codec type (useful for tandem free operation, see ETSI TS 101 108 [19]).

Possible parameters for further applications:

- Charge information;

- QoS, categories of speech transmission quality (ITU-T Recommendation G.109 [2]);

- Comfort noise level;

- Expectation factor.

4.3   Parameter Values

The values of the exchanged parameters are assumed as mean values.

The networks involved in a call are responsible for the validity of the calculation, measurement or estimation of the updated values of performance parameters.

There may be configurations where the signalling data use a different path than the user data. In this case it is assumed that the instance responsible for the selection of the path for the user data is aware of the performance of that path.

The values may be time-dependent, e.g. different in the busy hours.

If appropriate, the mean values may be added, i.e. the parameters may be assumed as statistically independent.

The value of the parameters may be different for both directions of the connection.

4.4   Procedures

4.4.1   General

The ANF is always activated and used with every call setup.

The impairments of the transmission line between two networks are taken into account by the originating network.

The updated values are stored at least for the duration of a call.

In addition they may be kept for any post processing by separate feature request. This action will be done by management e.g. for statistics or required by a regulation. It is out of the scope of the present document.

The recipient network during call establishment shall accept the incoming call and handle it in a best effort way.

The attempt to provide guaranteed transmission quality levels is for further study.

In such a case, detailed negotiation procedures would be required. Calls might even have to be released when the required quality values can not be achieved. In addition, charging information depending on the resulting level would also be very desirable.

Changes of the parameter values during the call are not considered as a first step. Enhancements to consider changes during established calls e.g. call rerouting could be investigated later.

This service may also be offered to the terminal equipment. This may be realized on a subscription basis and could be considered as a supplementary service.

4.4.2   Procedures

The procedures depend on the parameters:

- Propagation delay counter: Accumulation of the received value. In addition the routing may be dependent on the received value, e.g. by choosing preferred paths with low delay if the received value is relatively high.

- VAD: The value of this parameter is binary. It is set if VAD is used.

- Type of codecs: This parameter is used to support Tandem Free Operation (TFO). It shall be used in a compatible way to H.323 [4] respectively H.245 [5].

- Parameters for Echo control: The logic is based on ITU-T Recommendation Q.115 [11]. Examples of the signalling procedures see ISUP99. In addition the tail delay shall be taken into account as described in EG 201 474 [16].

4.5   Interaction with other Supplementary Services and ANFs

Only the supplementary services or ANFs with interactions are indicated, in particular where a new destination network is involved:

4.5.1   Call diversion services (SS-CFU, SS-CFB, SS-CFNR)

If a call is forwarded to another destination, the values are updated according to the new transmission path.

4.5.2   Call Transfer (SS-CT)

The values are recalculated according to the new transmission path.

4.5.3   Path Replacement (ANF-PR)

The values may need to be recalculated according to the new transmission path. Further study is required.

4.6   Interworking considerations

4.6.1   Intervening Network

A part of a connection may be an intervening network.

The intervening network may be a leased line, a satellite link, a part of an ATM network with a PVC, an IP based network as examples.

The network that is responsible for the routing of a call to an intervening network should have knowledge of the performance values for that part of a connection. This will enable the network to update the performance values and to send them to the next network that handles the signalling.

> NOTE: The performance parameters of an IP based network are summarized in ITU-T Recommendation I.380 [9]. These parameters form the basis for the overall performance through the internet, i.e. between the instances that transform the continuous voice signals in a stream of packets and vice versa (e.g. gateways).

4.6.2   Interworking with network domains as described by TIPHON

TIPHON divides the networks up into a transport domain and a service domain. Between these two domains a signalling mechanism was introduced which among other things may be used to exchange performance parameters. Scenarios based on this architecture are covered in TS 101 329-3 [21]. The basic configuration is shown in Figure 2.
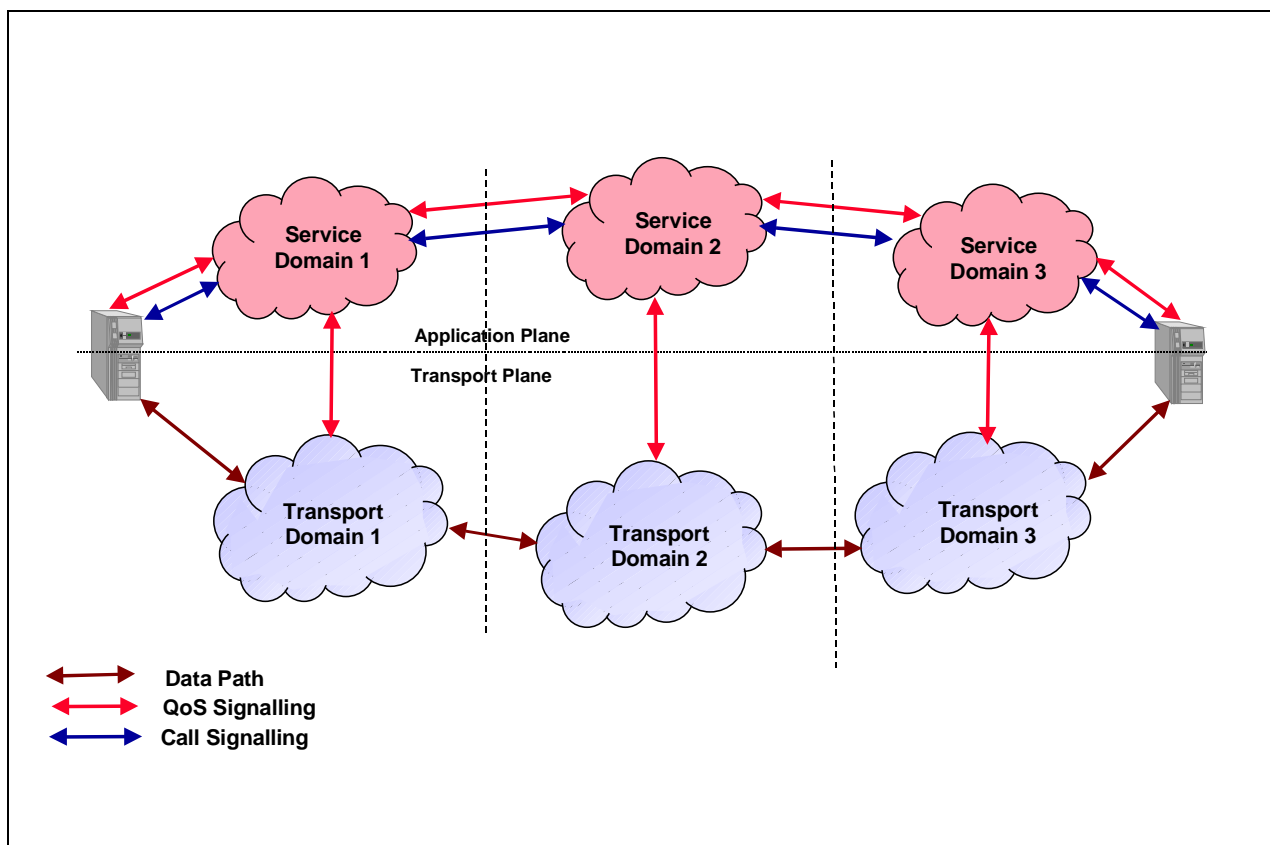
Figure 2: Generalized TIPHON Architecture II

In this case the signalling instance in the service domain takes into account the performance values received from the transport domain and updates the performance values sent to the signalling instance in the next service domain accordingly.

4.6.3 Interworking with an analogue network

An indication shall be inserted, that no end-to-end digital path for user information is available.

4.6.4 Interworking with a digital network, that does not support this ANF

An indication shall be inserted, that the ANF is not supported all the way.

4.6.5 Interworking with a mobile network

No special requirement.

The mobile network should indicate that an echo control device is included (see ITU-T Recommendation Q.115 [11]), and should insert impairment factors according to the codec type used.

4.6.6 Interworking with a B-ISDN

An approach for the signalling of individual QoS parameters in a B-ISDN is done in ITU-T Recommendation I.352 [8], Annex D, and ITU-T Recommendation Q.2965.2 [14].

4.7 Overall SDL diagram

Figure 3 shows an overall SDL diagram of ANF-PERF. Input/output symbols represent stimuli from/to basic call control.
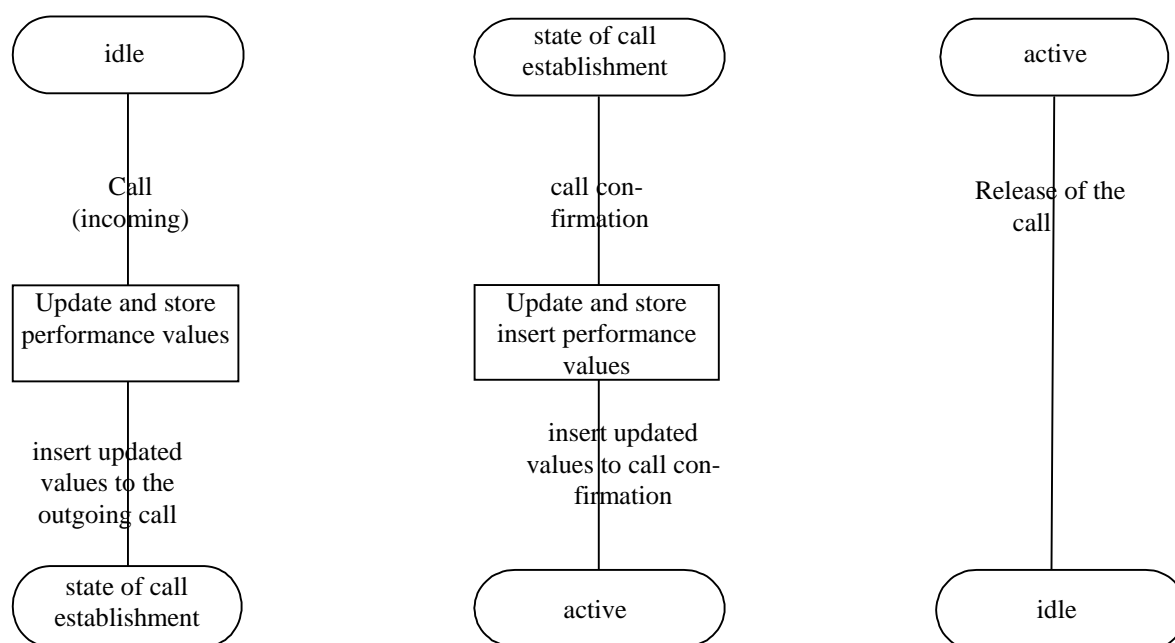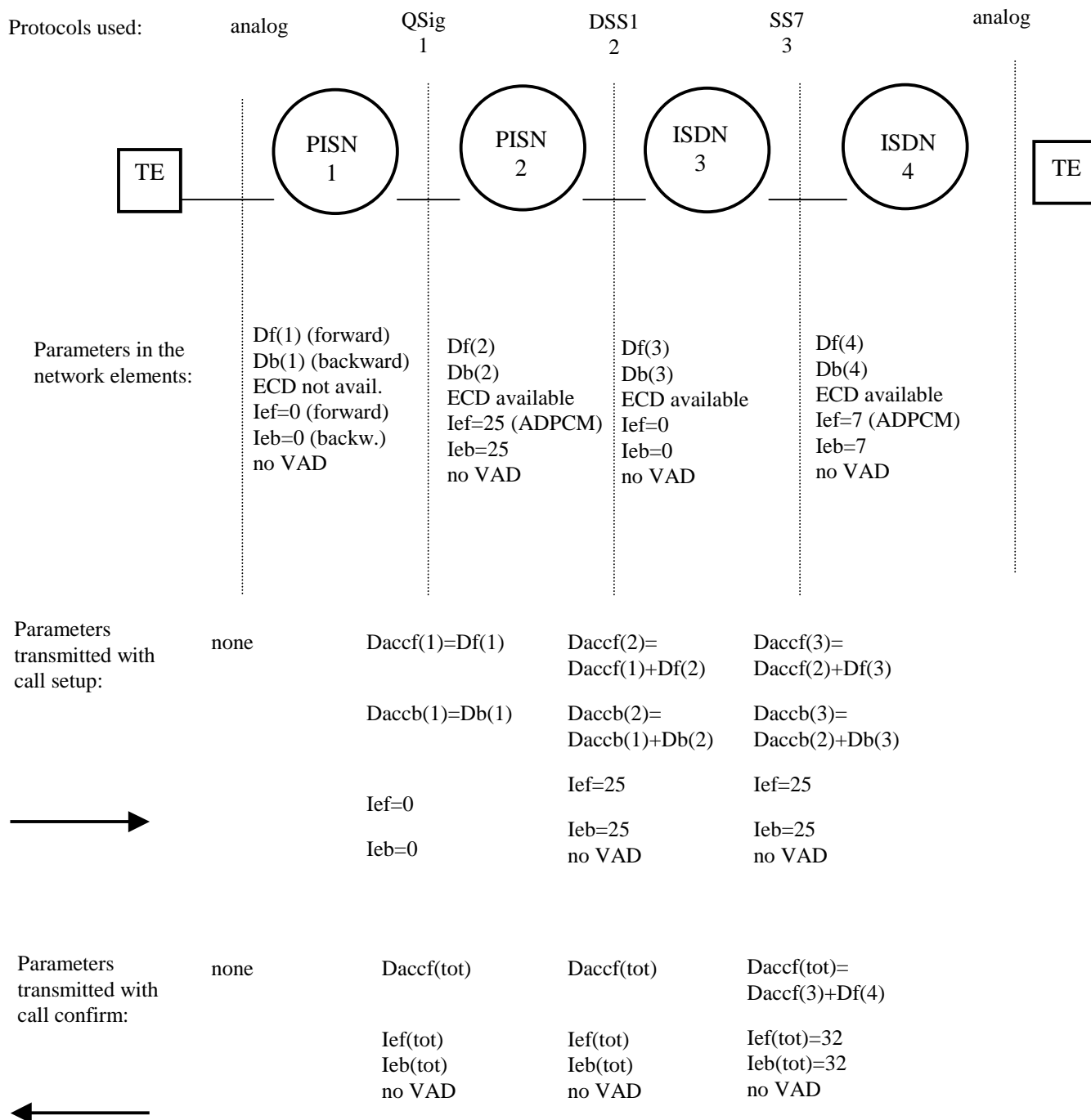

Figure 3: SDL diagram of ANF-PERF

Annex A (informative):
Annex to the stage 1 description:

Example to clarify the transfer of performance parameters. Messages to control ECDs are not yet included.

Protocols used:

	analog	QSig 1	DSS1 2	SS7 3	analog

TE — PISN 1 — PISN 2 — ISDN 3 — ISDN 4 — TE

Parameters in the network elements:

	Df(1) (forward) Db(1) (backward) ECD not avail. Ief=0 (forward) Ieb=0 (backw.) no VAD	Df(2) Db(2) ECD available Ief=25 (ADPCM) Ieb=25 no VAD	Df(3) Db(3) ECD available Ief=0 Ieb=0 no VAD	Df(4) Db(4) ECD available Ief=7 (ADPCM) Ieb=7 no VAD

Parameters transmitted with call setup:

none	Daccf(1)=Df(1)	Daccf(2)= Daccf(1)+Df(2)	Daccf(3)= Daccf(2)+Df(3)
	Daccb(1)=Db(1)	Daccb(2)= Daccb(1)+Db(2)	Daccb(3)= Daccb(2)+Db(3)
	Ief=0	Ief=25	Ief=25
	Ieb=0	Ieb=25 no VAD	Ieb=25 no VAD

→

Parameters transmitted with call confirm:

none	Daccf(tot)	Daccf(tot)	Daccf(tot)= Daccf(3)+Df(4)
	Ief(tot) Ieb(tot) no VAD	Ief(tot) Ieb(tot) no VAD	Ief(tot)=32 Ieb(tot)=32 no VAD

←

History

Document history			
V1.1.1	June 2000	Membership Approval Procedure	MV 20000825: 2000-06-27 to 2000-08-25