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Integrated Services Digital Network (ISDN); Signalling System No.7 (SS7); ISDN User Part (ISUP); Signalling aspects of charging

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Integrated Services Digital
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ETSI Standard

**Integrated Services Digital Network (ISDN);
Signalling System No.7 (SS7);
ISDN User Part (ISUP);
Signalling aspects of charging**

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Foreword

This ETSI Standard (ES) has been produced by ETSI Technical Committee Services and Protocols for Advanced Networks (SPAN).

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1 Scope

The present document specifies the stage three of the transfer of charging related information between a charge determination point and a charge registration or charge generation point by means of the Signalling System No.7 protocol. Additionally a connection control point may be located between determination point and a charge registration or charge generation point. Stage three identifies the protocol procedures and switching functions needed to support a feature.

The present document is applicable to an environment where different operators are working together. It is also applicable to a single network operator environment.

Whether the present document is applicable to a national environment and/or can be used for inter-network purposes depends on regulatory demands and/or bilateral agreements. It should be noted that there are network requirements and signalling limitations that are not covered because they are outside the scope of the present document. Examples of these are as follows:

- which currency is used;
- capabilities that require a translation function of currencies or for the translation of currencies into metering pulses;
- with an analogue access with pulse metering, no distinction can be made between pulses resulting from charges imposed by different operators;
- the on-line provided advice of charge information may not accurately reflect the correct charging rate due to discount rates, special charging arrangements, etc.;
- in association with these charging procedures, changes of the ISDN AoC supplementary services may be required for the identification of the network operator;
- new services like B-ISDN and new IN call concepts are not fully considered in the present document; especially the relay of charging information within configurations with more than one 'B' subscriber at the same time (e.g. conference calls) is not supported;
- no interworking is covered with existing implementations making use of implicit information elements pointing to locally available charging data;
- complaint handling between network operators in case of incorrect advice of charge information;
- explicit encryption or special security mechanisms.

This application makes use of the Application Transport Mechanism (APM) described in [2]. The present document specifies the respective user, i.e. the APM-user, to support the transfer of charging related information.

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 and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

- [1] ETSI EN 300 356-1 (V3.2.2): "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 3 for the international interface; Part 1: Basic services [ITU-T Recommendations Q.761 to Q.764 (1997), modified]".
- [2] ETSI EN 301 069-1: "Integrated Services Digital Network (ISDN); Signalling System No.7 (SS7); ISDN User Part (ISUP); Application transport mechanism; Part 1: Protocol specification [ITU-T Recommendation Q.765, modified]".
- [3] ITU-T Recommendation X.680: "Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation".
- [4] ITU-T Recommendation X.681: "Information technology - Abstract Syntax Notation One (ASN.1): Information object specification".
- [5] ITU-T Recommendation X.682: "Information technology - Abstract Syntax Notation One (ASN.1): Constraint specification".
- [6] ITU-T Recommendation X.683: "Information technology - Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications".
- [7] ITU-T Recommendation Q.1400: "Architecture framework for the development of signalling and OA&M protocols using OSI concepts".
- [8] ITU-T Recommendation X.690: "Information technology - ASN.1 encoding rules: Specification of basic encoding Rules (BER), Canonical encoding rules (CER) and Distinguished encoding rules (DER)".

3 Definitions and abbreviations

3.1 Definitions

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

absolute time: time of the day representing GMT

add-on charge: single additional charge which does not change the current tariff

charge: number of charge units (for the usage of a chargeable event (telecommunication service))

charge determination point: point is a point (exchange or IN-SCP/Service provider) that determines which tariff/add-on charge should be applied

charge generation point: exchange where online charging is performed (i.e. conversion of tariff per time to cost), e.g. the originating local exchange for advice of charge purposes

charge registration point: exchange that collects the information to be used for the actual charging of the call or service (either on meter-pulse counters or in call data records)

charge unit: base element for the charging process, expressed as meter-pulse units or as currency value

charging: calculation of the number of charge units, based on the chargeable event and its corresponding add-on charge/tariff

connection control point: connection control point is an exchange (e.g. IN-SSP) which controls calls which consist of multiple connection configurations (e.g. calls with introducing announcements, re-routing, follow-on, conferences)

start of charge: point in time where the condition to start charging are fulfilled, e.g. the connection between two subscribers is established

NOTE: Within the most networks **charging is started** directly with receipt of the Answer message. Each network operator - or in case of application of the charging messages over network boundaries each of the involved network operators - has to define the conditions for starting charging individually. However all the definitions base on the receipt of some kind of "connected" information.

stop of charge: point in time where the condition to stop charging is fulfilled, e.g. the connection between two subscribers is cleared

NOTE: Within the most networks **charging is stopped** directly on receipt of the Release message.

subtariff: within a tariff sequence, a charge unit per time unit

NOTE: Each subtariff has an individual duration and an individual charge unit.

tariff: set of parameters used for charging purposes to calculate the numbering charge units for the telecommunication service or a group of telecommunication services used

NOTE: A tariff consists of a tariff sequence.

tariff determination instance: particular charging-related process with a corresponding communication between a charge determination point and a charge registration/charge generation point

tariff sequence: list of up to 4 consecutive subtariffs which has to be applied for the charging of the communication event

NOTE: The subtariffs are applied at the start of the communication event and are applied consecutively according to the list of the subtariffs. The last subtariff may have an unlimited duration.

3.2 Abbreviations

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

AE	Application Entity
AEI	Application Entity Instance
ALS	Application Layer Structure
AOC-E	Advice Of Charge at the End of the call
AOCRG	Add-On ChaRGing information
AP	Application Process
APM	Application transport Mechanism
ASE	Application Service Element
ATII	Application Transport Instruction Indicators
BER	Basic Encoding Rules
CCP	Connection Control Point
CDP	Charge Determination Point
CDR	Call Data Record
CGP	Charge Generation Point
CRGA	ChaRGing Acknowledgement information
CRGT	ChaRGing Tariff information
CRI	Charging Reference Identifier
CRP	Charge Registration Point

GMT	Greenwich Mean Time
ID	IDentification
ISUP	ISDN User Part
MTP	Message Transfer Part
NI	Network Interface
OLE	Originating Line Exchange
OSI	Open System Interconnection
SACF	Single Association Control Function

4 Specification structure

The description of the ISDN User Part procedures in the present document is structured according to figure C.1 in annex C. The present document uses OSI ALS specification techniques described in [7].

The description is thus divided into two main parts:

- protocol functions;
- non-protocol functions, i.e. exchange nodal functions; this is referred to as the "Application Process".

The present document describes only the part of the total Application Process and protocol functions in the exchange that relates to the transfer of charging related information between a charge determination point and a charge registration or charge generation point.

The protocol functions are subdivided into three parts: Charging ASE, Application Transport Mechanism (APM ASE) and ISUP Basic Call (ISUP ASE). These are co-ordinated by the Single Association Control Function (SACF).

The ISUP ASE is defined in [1]. It is not the intention of the present document to re-define ISUP [1] in ALS format.

The Application Transport Mechanism is specified in [2].

The Charging ASE is a user of the services offered by the APM ASE. It is responsible for preparing the charging information in a form that can be transported by the Application Transport Mechanism.

This separation of the procedural description provides a logical and convenient document structure but does not imply that the ISUP protocol itself is separated: e.g. in the context of the present document, the Initial Address message always signifies the simultaneous set-up of a bearer and an associated call.

The service primitive technique, used to define the ASEs and the SACF specific to the application's signalling needs, is a way of describing how the services offered by an ASE, or SACF - the provider of (a set) of service(s) - can be accessed by the user of the service(s) - the SACF or the Application Process, respectively.

The service primitive interface is a conceptual one and is not a testable or accessible interface. It is a descriptive tool. The use of service primitives at an interface does not imply any particular implementation of that interface, nor does it imply that an implementation shall conform to that particular service primitive interface to provide the stated service. All conformance to the ISUP specifications is based on the external behaviour at a node, i.e. on the generation of the correct message structure (as specified in [1]), operation structure (as specified in the present document) and in the proper sequence (as specified in [1] and the present document).

The interfaces between SACF and APM ASE, to ISUP basic call signalling ASE, between SACF and NI, and to MTP-3 are described in [2].

5 Description

5.1 General description

The present document specifies the procedures for the transfer of charging related information between a charge determination point, a connection control point and a charge registration or charge generation point (see also annex B).

A charge determination, connection control, charge registration and charge generation point of the call may be located within the network of one operator (single network operator environment) or may be located in different networks of different operators (multi-operator environment).

The configuration of several charge determination points for one call is possible. It is assumed that there is only one CGP for the call. Moreover, it is assumed for the present document that there is either one CRP for each CDP or one CRP for all CDPs.

The transferred tariff information represents direct tariff or add-on charge (no pointers to charging data), either in meter-pulse format or in currency format. The interworking with the conversion into chargeband numbers or meter-pulse units is not supported.

The following functionality is provided:

- i) apply a call attempt charge for unsuccessful calls;
- ii) apply a call setup charge (once) at start of charging;
- iii) apply an initial communication tariff at start of charging and an (optional) next tariff at an absolute time during the call;
- iv) change immediately the current tariff;
- v) change the next tariff at an absolute time during the call;
- vi) change immediately the current tariff and change the next tariff at an absolute time during the call;
- vii) delete the next tariff and the corresponding absolute switchover time;
- viii) apply immediately an add-on charge (either a number of pulses or an amount of currency) during the call. This add-on charge is additive and does not change the tariff in force;
- ix) acknowledge the received charging information;
- x) differentiation as to whether the charging information is to be used for advice of charge purposes only, or for subscriber charging purposes (which would also allow it to be used for advice of charge purposes);
- xi) perform validation (e.g. check range of parameters, check whether a request from a certain network operator can be accepted);
- xii) apply a "one time charge" (i.e. non-periodic charge/flat rate) as a minimum communication charge at start of charging;
- xiii) stop charge generation/registration for a Tariff that belongs to an operator at the end of a connection configuration without clearing the complete call, that means connection A-party to CCP shall be kept;
- xiv) invoke and start charge generation/registration for a Tariff that belongs to an operator for a connection configuration independent of the existing ISUP messages (e.g. Address complete, Answer).

The charging information is encapsulated in the Application Transport parameter with the application context identifier "Charging ASE".

5.2 Network provider option

Table 1 summarizes the network provider options.

Table 1: Network provider option

Option	Reference	Value
Behaviour in unsuccessful cases	Clauses 6.1.7, 6.2.7, 6.4	Value 1: Release call Value 2: Continue call
Behaviour when communication charge sequence is not re-applied	Clause 6.3.1.4 c)	Value 1: Call continues "free of charge" Value 2: Call is released

6 Application Process functions

6.1 Procedures at a Charge Determination Point

a) Sending of next tariff information

A determination point shall not send next tariff information with a switch-over time that is more than 23 hours and 45 minutes after the current time.

b) Several Charge Determination Points

The configuration of several charge determination points for one call is possible.

Up to six network operators may send charging related information for one call. They are identified up to "network" in NetworkIdentification.

NOTE: This limitation of six network operators is set because of operational reasons.

If a charge determination point receives an Application Transport parameter with the application context identifier set to "Charging", the application process shall decide as to whether the information is passed on unchanged or modified.

The application process in a charge determination point may modify information received from a subsequent charge determination point in the following cases:

- the information is received from another network operator and bilateral agreements exist; or
- if the information comes from the same network.

In all other cases, the received information shall be passed on unchanged.

If the received information is modified, this charge determination point shall acknowledge the request from the subsequent charge determination point and shall insert its own originationIdentification in the request towards the charge registration point/charge generation point.

c) Format of the Charging Information

All information issued for the same call has to be in the same format, i.e. currency or pulse. This needs bilateral agreements between the network operators concerned.

If pulses are used, the corresponding currency value of a pulse needs bilateral agreements between the network operators concerned.