Final draft ETSI ES 201 296 V1.3.1 (2003-02)

ETSI Standard

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

Reference

RES/SPAN-130315

Keywords

ISDN, SS7, ISUP, charging

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00   Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:
http://www.etsi.org

The present document may be made available in more than one electronic version or in print. In any case of existing or
perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF).
In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive
within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status.
Information on the current status of this and other ETSI documents is available at
http://portal.etsi.org/tb/status/status.asp

If you find errors in the present document, send your comment to:
editor@etsi.org

Copyright Notification

ETSI

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://webapp.etsi.org/IPR/home.asp).

All published ETSI deliverables shall include information which directs the reader to the above source of information.

Foreword

This ETSI Standard (ES) has been produced by ETSI Technical Committee Services and Protocols for Advanced Networks (SPAN), and is now submitted for the ETSI standards Membership Approval Procedure.

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; 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 a 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 a 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.

6.1.1   Procedures during call set-up

6.1.1.1   CRGT request primitive

When a charge determination point has determined that:

- the tariff which has to be activated immediately at start of charging; and/or

- the next tariff which has to be activated at an absolute switch-over time; and/or

- the absolute switch-over time (GMT),

has to be transmitted to the charge registration or charge generation point, the application process shall issue the CRGT request primitive.

A CRGT request primitive may be re-issued during call set-up phase (i.e. at any time up to the Answer message), replacing previously issued information.

If the tariff is time dependent, then the next tariff and the absolute time at which the current tariff has to be replaced by this next tariff shall be sent. It can be sent together with the current tariff in the initial CRGT request primitive. The next tariff and the tariff switch-over time shall always be sent together.

The current tariff and the next tariff have the same tariff parameter structure, i.e. a Call Attempt charge, a Call Setup charge and a Communication charge (up to a maximum of 4 communication subtariffs).

The tariff parameters have either the meter-pulse format or the currency format. The tariff format used for the call is indicated by the first CRGT request primitive and shall not be changed during the call.

Clauses 6.1.1.2 to 6.1.1.4 specify the procedures for some specific cases.

6.1.1.2   Call attempt charge

The Call Attempt charge is a direct charge, to be charged only for unsuccessful calls.

If a call attempt charge is relevant to the call, the Call Attempt charge information shall be included in the CRGT request primitive.

To cover the scenario in the charge registration or generation point where the received absolute switch-over time has already been reached at the receipt of the CRGT indication primitive or just before start of charging, the Call Attempt charge shall also be sent in the first Next Tariff parameter.

In case of currency-format, the charge amount is indicated by a currency factor multiplied by a currency scale.

In case of meter-pulse-format, the charge amount is indicated by a number of meter-pulse units.

6.1.1.3   Call set-up charge

The Call Setup charge is a direct charge, to be charged once at start of charging.

If Call Setup charge is relevant to the call, the Call Setup charge information shall be included in the first CRGT request primitive.

To cover the scenario in the charge registration or generation point where the received absolute switch-over time has already been reached at the receipt of the CRGT indication primitive or just before start of charging, the Call Setup charge shall also be sent in the first Next Tariff parameter.

In the case of currency-format, the charge amount is indicated by a currency factor multiplied with a currency scale.

In the case of meter-pulse-format the charge amount is indicated by a number of meter-pulse units.

6.1.1.4 Communication charge

The Communication charge is a direct charge, to be applied at start of charging.

If Communication charge is relevant, this information shall be included in the first CRGT request primitive and before start of charging.

a) Meter-pulse-format

In case of meter-pulse-format, the charge amount is indicated by a number of meter-pulse units to be applied per time unit. The Communication charge is free when its value is zero.

b) Currency-format

In case of currency-format, the charge amount per time unit is indicated by a currency factor multiplied by a currency scale. The communication charging is free of charge when the product is zero.

NOTE: With the currency-format only one fixed time unit is used. This time unit has to be agreed between all co-operating networks, e.g. one second. Being fixed, the time unit is not transferred.

c) Communication charge sequence

The communication charge may be a sequence of up to 4 communication subtariffs. Except for the last subtariff, each subtariff shall be limited by its tariff duration. The last (or single) subtariff of the sequence may be either unlimited (tariff duration = 0) or limited.

At expiry of the tariff duration timer of the last (single) communication subtariff of the communication charge sequence, the following options are possible:

- the communication charge sequence is re-applied; or

- the communication charge sequence is not re-applied.

The chosen option is indicated in the tariffControlIndicators.

If a communication charge sequence is relevant to the call, the complete sequence shall be provided.

d) Absolute switch-over time

The absolute switch-over time is the time at which the current tariff has to be replaced by the next tariff.

The next tariff and the tariff switch-over time shall always be provided together.

e) Minimum Communication Charge at Start of Charging

To apply a minimum communication charge in case of pulse format, the first subtariff of the sequence is defined with N pulses, a duration which corresponds to the required duration and a time interval equal to zero.

To apply a minimum communication charge in case of currency format, the first subtariff is defined with N currency units and a duration which corresponds to the required duration. A flag in CommunicationChargeCurrency (subTariffControl) indicates whether the tariff is a "one time charge" for the minimum communication charge or not.

6.1.2 Procedures after start of charging

Clauses 6.1.2.1 to 6.1.2.4 and clause 6.1.3 specify the procedures for some specific cases.

6.1.2.1 Change current tariff

The current tariff can be changed by issuing a CRGT request primitive with the new current tariff.

6.1.2.2 Provide or change the next tariff and the tariff switch-over time

If during the call a tariff switch-over is performed at an indicated absolute switch-over time and a next tariff switch-over is defined, then this subsequent next tariff has to be available at least before the next tariff switch. This is performed by issuing a CRGT request primitive with the new next tariff and the next tariff switch-over time at least 12 minutes before the next switch-over time.

The same procedure is used to change/replace the stored next tariff and tariff switch-over time.

6.1.2.3 Delete the previously issued next tariff and tariff switch-over time

By issuing a CRGT request primitive with current tariff information only, the application process in a charge determination point indicates that a stored next tariff and its corresponding tariff switch-over time has to be deleted.

6.1.2.4 Add-on charging information

If a charge determination point determines that a certain amount of charge has to be added, the application process issue an AOCRG request primitive. The current tariff is not changed.

An AOCRG request primitive is allowed after start of charging only.

The charge is either in meter-pulse format or in currency format.

The add-on charge in meter-pulse-format is a number of meter-pulse units. The add-on charge in currency format is indicated by the currency factor multiplied by the currency scale.

6.1.3 Subsequent CRGT request primitives

In addition to the first CRGT request primitive, the application process in a determination point issues subsequent CRGT request primitives during the call in the following cases:

a) The current tariff is changed. A CRGT request primitive with the new current tariff together with the next tariff and its switch-over time has to be issued immediately.

b) The next tariff is changed. A CRGT request primitive with the new next tariff and the corresponding switch-over time has to be issued at least before the corresponding switch-over time.

c) The next tariff switch-over is modified. This is performed via the replacement by the first subsequent tariff switch-over. I.e. a CRGT request primitive with the new switch-over time and the corresponding next tariff will be issued at least 12 minutes before the next switch-over time in the registration point.

   If however there is no more next tariff switch-over, or the next tariff switch time is more than 23 hours and 45 minutes ahead, the tariff switch-over shall be deleted by issuing a CRGT request primitive with only the current tariff.

d) The next tariff and its tariff switch-over time was not issued at call setup. This exceptional case occurs when the switch-over time was more than 23 hours and 45 minutes after the moment the call is set-up. A CRGT request primitive with the next tariff and the corresponding switchover time has to be issued at least before the switchover time.

6.1.4 Acknowledgement and timer Tcrga

On issuing of a CRGT request primitive or AOCRG request primitive, the application process in a charge determination exchange shall start the timer Tcrga awaiting the CRGT confirmation or AOCRG confirmation primitive, respectively, representing the acknowledgement. On receipt of the acknowledgement, i.e. the CRGT confirmation or AOCRG confirmation primitive, the timer Tcrga shall be cancelled.

If Tcrga is still running, awaiting the acknowledgement to a previous CRGT request primitive or AOCRG request primitive, a new CRGT request primitive or AOCRG request primitive shall not be issued until an acknowledgement has been received or Tcrga expires.

NOTE: In the exchange of a charge determination point, there may be a need to delay the sending of the Initial Address message until the acknowledgement to a CRGT request primitive on the incoming leg of the call has been received.

6.1.5 Advice of charge/subscriber charging

The "Charging Control Indicator" information has to be included in the CRGT or AOCRG request primitive. Value "advice of charge" is provided if the charging information shall be used for advice of charge purposes only. Value "subscriber charging" is provided if the charging information shall be used for subscriber charging purposes and may also be used for advice of charge purposes.

6.1.6 Application Transport Instruction Indicators

According to [2], the Application Transport Instruction Indicators (ATII) have to be provided. They shall be included in the CRGT/AOCRG request primitive issued to the SACF/Charging ASE and be set according to the needs of the application, i.e. "do not release call/release call" and "do not send notification/send notification". If the requested functionality is essential to the call, then the ATII shall be set to "release call". If actions are required to be performed to gracefully handle the case that the communication with the charge registration or generation point is not successful but the call is to continue, then a notification shall be requested. If there is no real need to indicate an unsuccessful communication with the charge registration or generation point, then no actions need to be requested in the ATII.

6.1.7 Exceptional procedures

- On expiry of timer Tcrga; or

- on receipt of a CRGT confirmation or AOCRG confirmation primitive with the indication "not accepted"; or

- on receipt of the Charging_Error primitive,

a charge determination exchange shall either release the call or continue the call (network provider option).

In case of expiry of timer Tcrga or in case of the receipt of the Charging_Error primitive, the exchange shall inform the maintenance system about the event and shall provide the calling party number, the called party number, date and time, charging reference identifier and, if available, the global call reference.

6.2 Procedures at the Connection Control Point

a) Multiple connection configurations

While keeping the connection between charge registration or generation point and connection control point different connection(s) to charge determination point(s) can be established.

These connections can be established subsequently.

Different to usual calls ("basic calls") the procedures for "start charging", "stop charging" and "apply call attempt charges" at the Charge Registration or Generation Point can not be assigned to the existing ISUP messages (e.g. Address complete, Answer, Release).

b) Several Charge Determination Points

The configuration of several charge determination points for one connection established by the connection control point is possible.

Up to six network operators which are sending charging related information for one established connection are allowed. They are identified up to "network" in NetworkIdentification. The procedures in the connection control point are applied independently of the received value of "network" in NetworkIdentification.

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

6.2.1   Procedures during call Set-up

6.2.1.1   CRGT indication primitive

A CRGT indication primitive may be received more than one time during call set-up phase (i.e. at any time up to the Answer message).

The Connection Control Point shall pass on unchanged the received information except the value of delayUntilStart in ChargeControlIndicators which is always set to "delay start of tariffing up to the receipt of the "start" signal".

The NetworkIdentification in the parameter originationIdentification has to be stored. It will be used for further provision within START or STOP request primitives (see clauses 6.2.2 and 6.2.4).

No validation is performed (e.g. check of range of parameters, check of network identification).

6.2.2   Procedure at start of charge

Charging for all tariffs received from destination Charge Determination Points has to be started at the Charge Registration or Charge Generation Point.

In case that the Answer message can not be forwarded to the charge Registration or Charge Generation Point a START request primitive containing the list of NetworkIdentifications has to be issued by the application process.

6.2.3   Procedure after start of charge

6.2.3.1   Add-on charging information

An AOCRG indication primitive is allowed after start of charging only.

The information is passed on unchanged.

6.2.3.2   CRGT indication primitive

A CRGT indication primitive may be received more than one time during after receipt of the Answer message.

The Connection Control Point shall pass on unchanged the received information.

The NetworkIdentification in the parameter originationIdentification has to be stored in case the received value of delayUntilStart in ChargeControlIndicators is "delay start of tariffing up to the receipt of the "start" signal".

   NOTE: This is necessary to handle the configuration of more than one CCP.

No validation is performed (e.g. check of range of parameters, check of network identification).

6.2.4   Procedure at stop of charge

Charging for all tariffs received from destination Charge Determination Points has to be stopped at the Charge Registration or Charge Generation Point.

In case the connection with the Charge Registration or Charge Generation Point is to be cleared, the Release message will be issued. No STOP request primitive shall be sent.

In case, the connection with the Charge Registration or Charge Generation Point shall be kept a STOP request primitive containing the list of NetworkIdentifications has to be issued by the application process.

The indication callAttemptChargesApplicable within parameter stopIndicators has to be set to value "stop tariffing, call attempt charges are applicable", if the network specific conditions for call attempt charge are met.

6.2.5   Acknowledgement and timer Tcrga

a)   On issuing of a START request primitive or STOP request primitive, the application process in a connection control point shall start the timer Tcrga awaiting the START confirmation or STOP confirmation primitive, respectively, representing the acknowledgement. On receipt of the acknowledgement, i.e. the START confirmation or STOP confirmation primitive, the timer Tcrga shall be cancelled.

b)   In case of error detection (see clause 6.2.7, a) on receipt of a CRGT indication primitive, a CRGT response primitive shall be issued.
In case of error detection (see clause 6.2.7, b) on receipt of an AOCRG indication primitive, an AOCRG response primitive shall be issued.
The CRGT and AOCRG response primitive respectively, shall contain the acceptance indication "not accepted".

6.2.6   Application Transport Instruction Indicators

According to [2], the Application Transport Instruction Indicators (ATII) have to be provided. They shall be included in the START/STOP request primitive issued to the SACF/Charging ASE and be set according to the needs of the application, i.e. "do not release call/release call" and "do not send notification/send notification". If the requested functionality is essential for the call, then the ATII shall be set to "release call". If actions are required to be performed to gracefully handle the case that the communication with the charge registration or generation point is not successful but the call is to continue, then a notification shall be requested. If there is no real need to indicate an unsuccessful communication with the charge registration or generation point, then no actions need to be requested in the ATII.

6.2.7   Exceptional procedures

a)   A CRGT indication primitive shall be negatively acknowledged by issuing a CRGT response primitive with "not accepted" in the following cases:

-    violation of the ASN.1 coding; or

-    the maximum number (six) of allowed network operators which may send charging-related information (identified by NetworkIdentification up to "network") is exceeded.

b)   An AOCRG indication primitive shall be negatively acknowledged by issuing a AOCRG response primitive with "not accepted" in the following cases:

-    violation of the ASN.1 coding; or

-    the AOCRG indication primitive is received before start of charging.

c)   A Connection Control Point either releases the call or continues the call (network provider option) in following cases:

-    on expiry of timer Tcrga; or

-    on receipt of a START confirmation or STOP confirmation primitive with the indication "not accepted"; or

-    on receipt of the Charging_Error primitive.

In case of expiry of timer Tcrga or in case of the receipt of the Charging_Error primitive, the exchange shall inform the maintenance system about the event and shall provide the calling party number, the called party number, date and time, charging reference identifier and, if available, the global call reference.

6.3 Procedures at the charge registration or charge generation point

a) Several Charge Determination Points

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

Up to six network operators which are sending charging related information for one call are allowed. They are identified up to "network" in NetworkIdentification. The procedures in the charge generation point/charge registration point are applied independently of the received value of "network" in NetworkIdentification.

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

b) Received Information

The following general rule applies: Currently stored information related to one network operator is replaced by information related to this operator received subsequently (see clauses 6.3.1 and 6.3.2).

c) Interworking with the Charge indicator of the Backward Call Indicators Parameter

Exchanges which behave according to the present document shall not use the Charge indicator of the Backward Call Indicators parameter. The Charge indicator of the Backward Call Indicators parameter shall be set to "charge". If a call or service has to be free of charge, the mechanisms specified in the present document are to be used.

However, if a network allows the interworking with the Charge indicator (e.g. for a certain transition period), the information "no charge" in the Charge indicator overrules all possibly provided charging information.

d) Charge generation point, charge registration point and charge determination point are in different nodes

In case of the configuration "charge generation point - charge registration point - charge determination point" (i.e. these points are in different nodes), there are two separate instances: one between charge generation point and charge registration point and another between charge registration point and charge determination point. After registration is performed, the charge registration point shall pass on unchanged the received information except the value of subscriberCharge in ChargeControlIndicators which shall always be set to "advice of charge".

e) Charge Generation or Registration Point, Connection Control Point and Charge Determination Point are in different nodes

In case of the configuration "charge generation or registration point - connection control point - charge determination point" (i.e. these points are in different nodes), there are two separate instances: one between charge generation or registration point and charge determination point and another between charge generation or registration point and connection control point.

The charge generation or registration point detects the existence of a connection control point by receipt of a CRGT Indication Primitive with value delayUntilStart within ChargingControlIndicators or a STOP Indication Primitive.

In this case, the same procedures are applicable as described below.

6.3.1 Procedures during call set-up

6.3.1.1 CRGT indication primitive

The receipt of the CRGT indication primitive indicates:

- the tariff which has to be activated immediately at start of charging; or

- the next tariff which has to be activated at an absolute switch-over time; or

- the absolute switch-over time.

A CRGT indication primitive may be received more than once during call set-up phase (i.e. at any time up to the Answer message), replacing previously received information.

If the tariff is time dependent, then the next tariff and the absolute time at which the current tariff has to be replaced by this next tariff will be received. They can be received together with the current tariff in the initial CRGT indication primitive.

The current tariff and the next tariff have the same tariff parameter structure, i.e. a Call Attempt charge, a Call Setup charge and a Communication charge (up to a maximum of 4 communication subtariffs).

The tariff parameters have either the meter-pulse format or the currency format. The tariff-format used for the call is indicated by the first CRGT indication primitive and shall not be changed during the call.

Validation shall be performed (e.g. check of range of parameters, check of network identification).

Clauses 6.3.1.2 to 6.3.1.4 specify the procedures for some specific cases.

6.3.1.2 Call attempt charge

The Call Attempt charge is a direct charge, to be charged only for unsuccessful calls.

If a call attempt charge is relevant to the call, the Call Attempt charge information shall be included in the CRGT indication primitive.

In the case of currency-format, the charge amount is indicated by a currency factor multiplied by a currency scale. The call attempt charging shall not be performed if the product is zero or the parameter is not present.

In the case of meter-pulse-format, the charge amount is indicated by a number of meter-pulse units. The call attempt charging shall not be performed if the value is zero or the parameter is not present.

6.3.1.3 Call setup charge

The Call Setup charge is a direct charge, to be charged once at start of charging.

If a call setup charge is relevant to the call, the Call Setup charge information is included in the first CRGT indication primitive.

In the case of currency-format, the charge amount is indicated by a currency factor multiplied with a currency scale. The Call Setup charging shall not be performed when the product is zero or the parameter is not present.

In the case of meter-pulse-format the charge amount is indicated by a number of meter-pulse units. The Call Setup charge shall not be performed when the number is zero or the parameter is not present.

6.3.1.4 Communication charge

The Communication charge is a direct charge, to be applied at start of charging.

As part of the Current Tariff, the Communication Tariff is applied immediately at start of charging.

As part of the Next Tariff, the Communication Tariff is applied at the absolute time indicated by the absolute switch-over time parameter. The switch procedure is a network matter.

If the absolute switch-over time given in the CRGT indication primitive is already passed, then the communication charge of the next tariff instead of the current tariff shall immediately be applied (see also clause 6.1 a).

a) Meter-pulse-format

In case of meter-pulse-format, the charge amount is indicated by a number of meter-pulse units to be applied per time unit. The communication is free of charge when its value is zero.

b) Currency-format

In case of currency-format, the charge amount per time unit is indicated by a currency factor multiplied by a currency scale. The communication is free of charge when the product is zero.

NOTE: With the currency-format only one fixed time unit is used. This time unit has to be agreed between all co-operating networks, e.g. one second. Being fixed, the time unit is not transferred.

c)   Communication charge sequence

The communication charge may be a sequence of up to 4 communication subtariffs. Except for the last subtariff, each subtariff shall be limited by its tariff duration. The last (or single) subtariff of the sent sequence may be either unlimited (tariff duration = 0) or limited.

Initially, charging shall use the first subtariff. At expiry of the tariff duration timer, the subsequent subtariff shall be applied.

At expiry of the tariff duration timer of the last (single) communication subtariff of the communication charge sequence, the following options are possible:

-    the communication charge sequence is re-applied; or

-    the communication charge sequence is not re-applied.

The option to be applied is indicated in the tariffControlIndicators.

If a communication charge sequence is relevant to the call, the complete sequence shall be provided.

When the communication charge sequence is not re-applied, the following network provider option exists: either the call continues "free of charge" or the call is released.

d)   Absolute switch-over time

The absolute switch-over time is the time at which the current tariff has to be replaced by the next tariff. In a multi-operator environment, the procedures of how the subtariffs of the next tariff are applied are subject of bilateral or multilateral agreements.

e)   Minimum communication charge at start of charging

To apply a minimum communication charge in case of pulse format, the first subtariff of the sequence shall defined with N pulses, a duration which corresponds to the required duration and a time interval equal to zero.

To apply a minimum communication charge in case of currency format, the first subtariff shall be defined with N currency units and a duration which corresponds to the required duration. A flag in CommunicationChargeCurrency (subTariffControl) indicates whether the tariff is a "one time charge" for the minimum communication charge or not.

6.3.2   Procedures after start of charge

If the Call Setup charge is applied, all following received Call Attempts and Call Setup charges shall be ignored.

Clauses 6.3.2.1 to 6.3.2.4 and clause 6.3.3 specify the procedures for some specific cases.

6.3.2.1   Change current tariff

a)   On receipt of the CRGT indication primitive with the new tariff, the current tariff shall be changed

After successful validation (e.g. check of range of parameters, check of network identification), the new current tariff shall immediately be applied to the call according to the following two tariff change procedures:

-    tariff change without restart of the charging process (see b));

-    tariff change with restart of the charging process (see c)).

Which immediate tariff change procedure shall be used is indicated in the ChargingContolIndicators by "immediateChangeOfActuallyAppliedTariff": value 1 means "with restart", value 0 means "without restart".

b)   Tariff Change without restart of the charging process

The charging process for the actual call shall be continued with the new current tariff. I.e. the tariff change procedure is the same as the one which is performed at a tariff switchover from the current to the next tariff. This means that:

-      at the change of a tariff sequence, the new applied subtariff of the new tariff sequence is retrieved via the elapsed call duration;

-      at the change of a non-periodic tariff, the new non-periodic tariff is not applied (no double counting);

-      the new call attempt and call setup charge are not applied.

Figure 1 illustrates the tariff change without restart:

Immediate Tariff Change

Actual Current Tariff	Communication Subtariff TA1	Communication Subtariff TA2	

New Current Tariff	Communication Subtariff TN1	Communication Subtariff TN2	

Applied Tariff	TA1	TA2	TN2
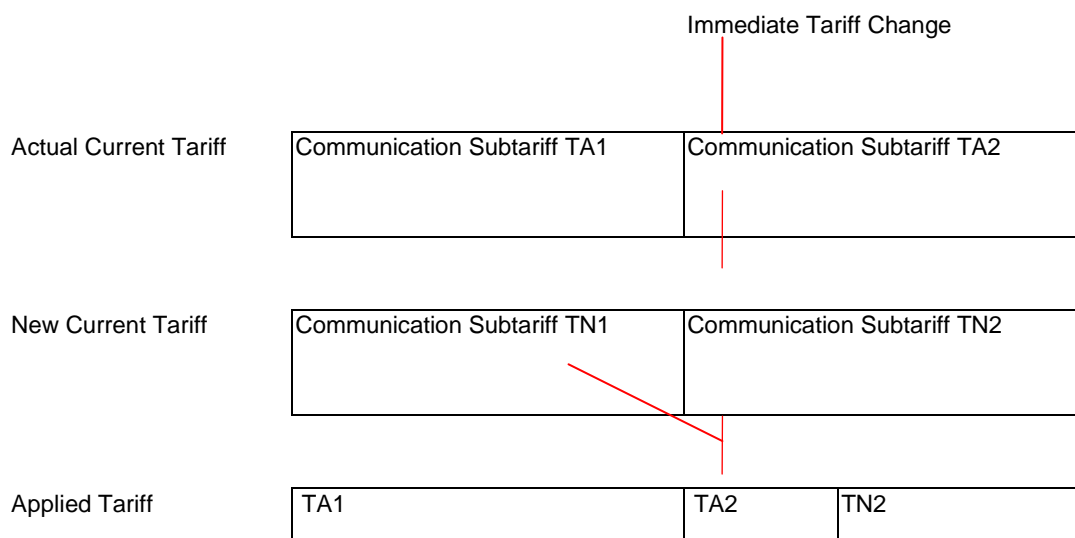
Figure 1: Tariff change without restart

c)   Tariff Change with restart of the charging process

The charging process with the actual current tariff shall be closed and restarted with the new current tariff. This means that:

-      at the change of a tariff sequence, the charging process restarts with the first communication subtariff of the new tariff sequence;

-      at the change of a non-periodic tariff, the new non-periodic tariff is applied;

-      the new call attempt and call setup charge are not applied.

Figure 2 illustrates the tariff change with restart:

Figure 2: Tariff change with restart

    d)   In a multi-operator environment, the procedures of how the subtariffs of the next tariff are applied are subject of bilateral or multilateral agreements.

6.3.2.2 Provide or change the next tariff and the tariff switch-over time

If during the call a tariff switch-over is performed at an indicated absolute switch-over time and a next tariff switch-over is defined, then this subsequent next tariff has to be available at least before the next tariff switch. On receipt of the CRGT indication primitive with the new n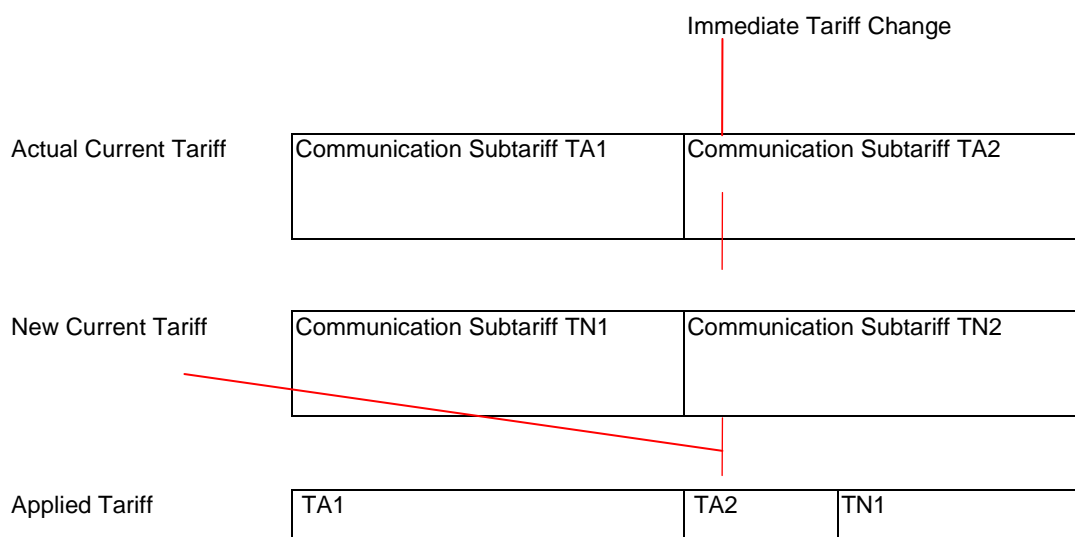ext tariff and the next tariff switch-over time, validation shall take place and the stored next tariff and the stored switch-over time immediately replaced without restart of the charging process, i.e. the ChargingControlIndicators shall not be used.

The same procedure is used to change/replace the stored next tariff and tariff switch-over time.

6.3.2.3 Delete the previously received next tariff and tariff switch-over time

On receipt of the CRGT indication primitive with current tariff information only, the stored next tariff and its corresponding tariff switch-over time has to be deleted.

6.3.2.4 Add-on charging information

On receipt of the AOCRG indication primitive, the given amount of charge has to be added. The current tariff shall not be changed.

An AOCRG indication primitive is allowed after start of charging only.

The charge is either in meter-pulse format or in currency format.

The add-on charge in meter-pulse-format is a number of meter-pulse units. The add-on charge in currency format is indicated by the currency factor multiplied by the currency scale.

6.3.3 Subsequent CRGT indication primitives

In addition to the first CRGT indication primitive, subsequent CRGT indication primitives during the call may be received in the following cases:

    a)   The current tariff has to be changed. A CRGT indication primitive with the new current tariff together with the next tariff and its switch-over time will be received.

b)   The next tariff has to be changed. A CRGT indication primitive with the new next tariff and the corresponding switch-over time will be received before the corresponding switch-over time.

c)   The next tariff switch-over has to be modified. This is performed via the replacement by the first subsequent tariff switch-over. I.e. a CRGT indication primitive with the new switch-over time and the corresponding next tariff will be received at least 12 minutes before the next switch-over time in the registration point.

If however there is no further next tariff switch-over, or the next tariff switch time is more than 23 hours and 45 minutes ahead, the tariff switch-over is deleted by receiving a CRGT indication primitive with only the current tariff.

d)   The next tariff and its tariff switch-over time was not received at call setup. A CRGT indication primitive with the next tariff and the corresponding switchover time will be received before the switchover time.

6.3.4   Procedure at start of charge

On receipt of the Answer message charging is started for the tariff(s) which is not indicated as "delayed until start".

On receipt of the START indication primitive charging shall be started for all network operators which are indicated within network Operators. If applicable, call set-up charges shall be taken (see clause 6.3.1.3).

6.3.5   STOP indication primitive

On receipt of the STOP indication primitive charging shall be stopped for all network operators which are indicated within network Operators finally. If applicable, call attempt charges shall be taken (see clause 6.3.1.2).

6.3.6   Acknowledgement

On receipt of a CRGT indication primitive, a CRGT response primitive shall be issued.

On receipt of an AOCRG indication primitive, an AOCRG response primitive shall be issued.

On receipt of a START indication primitive, a START response primitive shall be issued.

On receipt of a STOP indication primitive, an STOP response primitive shall be issued.

The CRGT, AOCRG, START or STOP response primitive, respectively, shall contain the acceptance indication "accepted" or "not accepted".

6.3.7   Advice of charge/subscriber charging

The "Charging Control Indicator" information is included in the CRGT or AOCRG indication primitive. Value "advice of charge" is provided if the charging information is to be used for advice of charge purposes only. Value "subscriber charging" is provided if the charging information is to be used for subscriber charging purposes and may also be used for advice of charge purposes.

6.3.8   Activation of next tariff at start of charge

It is possible that the start of charge for a call is received just after the switch-over time that is specified in the initial CRGT indication primitive (e.g. switch-over between receipt of the CRGT indication primitive and answer). To ensure that the switch-over is applied correctly, the charge generation or charge registration point always activates a next tariff of a switch-over time that corresponds to the appropriate 15 minute interval at receipt of the start of charge.

NOTE: E.g. indicated switch-over time is 9:00, receipt of Answer message at 9:15, take tariff which is applicable from 9:00 to 9:15.

6.3.9 Exceptional procedures

a) A CRGT indication primitive shall be negatively acknowledged by issuing a CRGT response primitive with "tariff not accepted" in the following cases:

- the "charging control indicator" is not present; or

- only the "charging control indicator" is present; or

- a current tariff parameter is not present in the first CRGT indication primitive; or

- a next tariff parameter is present and the tariff switchover time parameter is not present; or

- a tariff switchover time parameter is present and the next tariff is not present; or

- a CRGT indication primitive is received with tariff format (pulse or currency) other than the one received initially (either in an initial CRGT indication or in an initial AOCRG indication primitive); or

- the received tariff parameter value is unrecognized; or

- the maximum number (six) of allowed network operators which may send charging-related information (identified by NetworkIdentification up to "network") is exceeded; or

- the destinationIdentification is not allocated; or

- the pair of identifiers (originationIdentification/destinationIdentification) is incorrect; or

- on receipt of an unrecognized value of "network" (in NetworkIdentification); or

- on receipt of a recognized value of "network" (in NetworkIdentification) but there is no bilateral agreement.

b) An AOCRG indication primitive shall be negatively acknowledged by issuing a AOCRG response primitive with "add-on charge not accepted" in the following cases:

- the parameter charge control indicator is not present; or

- the parameter add-on charge is not present; or

- an AOCRG indication primitive is received with another tariff format (pulse or currency) than the one received initially (either in an initial CRGT indication or in an initial AOCRG indication primitive); or

- the received add-on charge parameter value is unrecognized; or

- the AOCRG indication primitive is received before start of charging; or

- the maximum number (six) of allowed network operators (identified by NetworkIdentification up to "network") is exceeded; or

- the destinationIdentification is not allocated; or

- the pair of identifiers (originationIdentification/destinationIdentification) is incorrect; or

- on receipt of an unrecognized value of "network" (in NetworkIdentification); or

- on receipt of a recognized value of "network" (in NetworkIdentification) but there is no bilateral agreement.

c) A START indication primitive shall be negatively acknowledged by issuing a AOCRG response primitive with "not accepted" in the following cases:

- ASN.1 coding errors; or

- the Answer messages is still not received; or

- on receipt of an unrecognized value of "network" (in NetworkIdentification); or

-       on receipt of a recognized value of "network" (in NetworkIdentification) but there is no bilateral agreement.

d)   A STOP indication primitive shall be negatively acknowledged by issuing a AOCRG response primitive with "not accepted" in the following cases:

-       ASN.1 coding errors; or

-       on receipt of an unrecognized value of "network" (in NetworkIdentification); or

-       on receipt of a recognized value of "network" (in NetworkIdentification) but there is no bilateral agreement.

6.3.10   Error indication primitive

On receipt of a Charging_Error indication primitive, the call shall be released or the call shall be continued (network provider option). The exchange shall inform the maintenance system about the event and shall provide the calling party number, the called party number, date and time, charging reference identifier and, if available, the global call reference.

6.4   Handling of identifiers

6.4.1   CRGT and AOCRG primitives

6.4.1.1   Identifiers in CRGT and AOCRG primitives

The initial request primitive, i.e. either a CRGT request or AOCRG request primitive, issued by the application process in a charge determination point shall contain the originationIdentification A.

The initial acknowledgement (i.e. the first CRGT/AOCRG response primitive) to this initial (CRGT/AOCRG) indication primitive (with originationIdentification and without destinationIdentification) issued by the application process in the charge registration or generation point shall contain the originationIdentification B and the destinationIdentification A in order to allow mapping between the sending and receiving direction.

The destinationIdentification A equals the originationIdentification A, and the destinationIdentification B equals the originationIdentification B.

All subsequent CRGT and AOCRG request primitives associated with the same tariff determination instance contain the originationIdentification A and destinationIdentification B. All subsequent CRGT and AOCRG response primitives associated with the same tariff determination instance shall contain the originationIdentification B and destinationIdentification A.

6.4.1.2   Assignment and use of identifiers

The Exchange Application Process manages the Charging Reference Identifiers (CRI).

The CRIs (network identification plus reference ID) are independently assigned by each of two exchanges concerned. If a CRI is released, the reference ID should not immediately be re-used.

The identifiers (CRI) associated with a specific tariff determination instance remain constant for the life of the call.

Different tariff determination instances for the same call are associated with different identifiers each of which also remains constant for the life of the call.

These identifiers are used to:

-       uniquely identify the tariff determination instance;

-       associate the charging information with this particular tariff determination instance.

The originationIdentification A shall be assigned by the application process in exchange A (charge determination point) when it issues the first CRGT or AOCRG request primitive; it is used to identify the point A at the charge registration or generation point (exchange B) (by means of originatingIdentification A in the first CRGT or AOCRG indication primitive) and to identify the charging reference at A (by means of destinationIdentification A in CRGT/AOCRG confirmation primitive).

The originationIdentification B shall be assigned by exchange B (charge registration or generation point) when it receives the first CRGT or AOCRG indication primitive of a signalling association; it is used to identify the charging reference at exchange B (by means of destinationIdentification B in subsequent CRGT/AOCRG indication primitives)and to identify point B at a charge determination point (by means of originatingIdentification B in the first CRGT or AOCRG confirmation primitive).

6.4.2   START and STOP primitives

6.4.2.1   Identifiers in START and STOP primitives

All request primitive, i.e. either a START request or STOP request primitive, issued by the application process in a connection control point shall contain the originationIdentification A.

The acknowledgement (i.e. the START/STOP response primitive) to this (START/STOP) indication primitive (with originationIdentification and without destinationIdentification) issued by the application process in the charge registration or generation point shall contain the originationIdentification B and the destinationIdentification A in order to allow mapping between the sending and receiving direction.

The destinationIdentification A equals the originationIdentification A, and the destinationIdentification B equals the originationIdentification B.

6.4.2.2   Assignment and use of identifiers

The Exchange Application Process manages the Charging Reference Identifiers (CRI).

The CRIs (network identification plus reference ID) are independently assigned by each of two exchanges concerned. If a CRI is released, the reference ID should not immediately be re-used.

These identifiers are used to:

- uniquely identify the connection control instance;

- associate the charging information with this particular connection control instance.

The originationIdentification A is assigned by the application process in exchange A (connection control point) when it is issuing the START or STOP request primitive; it is used to identify the point A at the charge registration or generation point (exchange B) (by means of originatingIdentification A in the START or STOP indication primitive).

The originationIdentification B is assigned by exchange B (charge registration or generation point) when it is receiving the START or STOP indication primitive.

6.5   Primitive interface

The Charging functions in the Application Process use the services provided by the SACF primitive interface. These are listed in table 2. Some primitives on this interface correspond with tariffing-data types specified in clause 9, this is also indicated in table 2.

Table 2: Primitives between AP and SACF (interface a in figure C.1)

Primitive name	Types	Tariffing-data types
AOCRG	Request/Indication	AddOnChargingInformation
	Response/Confirmation	ChargingAcknowledgementInformation
CRGT	Request/Indication	ChargingTariffInformation
	Response/Confirmation	ChargingAcknowledgementInformation
START	Request/Indication	StartCharging
	Response/Confirmation	ChargingAcknowledgementInformation
STOP	Request/Indication	StopCharging
	Response/Confirmation	ChargingAcknowledgementInformation
Charging_Error	Indication	-

6.6   ISUP basic call compatibility instruction indicators

The instruction indicators in the Message Compatibility Information and Parameter Compatibility Information parameter (see [1]) should be set in line with the ATII.

7   Single association control function

7.1   Introduction

The main objective of the SACF is to receive and deliver primitives from and to the appropriate entity and to perform a distribution function where appropriate for the ISUP AEI. The SACF described here only defines the mapping and functions related to the support of charging information transfer aspect of the model.

7.2   Outgoing messages

On receipt of a primitive (request or response) from the Application Process, the SACF issues appropriate primitives to the ASEs. The SACF also performs a distribution of the primitives received from the ASEs prior to sending the resulting primitive to NI.

The primitives on the interface between SACF and AP are defined in clause 6.5.

The primitives on the interface between SACF and Charging ASE are defined in clause 8.2.

The primitives on the interface between SACF and Unidentified Context Handling (UCH) ASE can be found in [2] and are therefore beyond the scope of the present document.

The primitives on the interface between SACF and APM ASE can be found in [2] and are therefore beyond the scope of the present document.

The primitives on the interface between SACF and ISUP ASE can be found in [2] and are therefore out of the scope of the present document.

The primitives on the interface between SACF and NI can be found in [2] and are therefore the scope of the present document.

Table 3: Mapping of primitives from AP towards charging ASE

From AP (interface a in figure C.1)	To charging ASE (interface b in figure C.1)
AOCRG	AOCRG
CRGT	CRGT
START	START
STOP	STOP

Table 4: Mapping of primitives from charging ASE towards APM ASE

From charging ASE (interface b in figure C.1)	To APM ASE (interface c in figure C.1)
APM_U_Data	APM_Data

7.3   Incoming messages

These procedures are described in [2] where the APM-user ASE corresponds with the charging ASE.

Table 5: Mapping of primitives from APM ASE towards charging ASE

From APM ASE (interface c in figure C.1)	To charging ASE (interface b in figure C.1)
APM_Data	APM_U_Data
APM_Error	APM_U_Error

Table 6: Mapping of primitives from charging ASE towards AP

From charging ASE (interface b in figure C.1)	To AP (interface a in figure C.1)
AOCRG	AOCRG
CRGT	CRGT
START	START
STOP	STOP
Charging_Error	Charging_Error

8   Charging ASE

8.1   Introduction

The Charging ASE is responsible for the signalling aspects for the charging application and for preparing the information in the appropriate form that can be passed to the APM for transportation.

8.2   Primitive interface

The SACF uses the services provided by the Charging ASE primitive interface. Table 7 lists the primitives used to access the services of the APM.

Table 7: Primitives between SACF and Charging ASE (interface b in figure C.1)

Primitive name	Types
APM_U_Data	Request/Indication
APM_U_Error	Indication
AOCRG	Request/Indication/Response/Confirmation
CRGT	Request/Indication/Response/Confirmation
START	Request/Indication/Response/Confirmation
STOP	Request/Indication/Response/Confirmation
Charging_Error	Indication

8.3   Signalling procedures

8.3.1   Outgoing direction

The data received in the AOCRG/CRGT/START/STOP request and response primitives have to be passed in the appropriate format (see clause 9) as "encapsulated application information" in the APM_U_Data primitive.

The Application Context Identifier shall be set to "Charging ASE".

With regard to an AOCRG/CRGT/START/STOP request primitive, the ATII are set as provided by the Application Process. As far as a AOCRG/CRGT/START/STOP response primitive is concerned, no actions need to be requested in the ATII.

On receipt of an APM_U_Error primitive, the contents should be passed unchanged in the Charging_Error primitive.

8.3.2   Incoming direction

It shall be verified that the data received as "encapsulated application information" in the APM_U_Data primitive are received in the appropriate format (see clause 9). These data shall be passed as appropriate parameters in the AOCRG/CRGT/START/STOP indication or confirmation primitive.

The Application Context Identifier and the ATII values are ignored.

8.3.3   Primitive contents

   a)   The APM_U_Data indication or request primitive contains the following information:

    -    Application Context Identifier;

    -    Application Transport Instruction Indicators;

    -    Application Data ("encapsulated application information", see clause 9).

   b)   The APM_U_Error indication primitive contains the relevant notification.

   NOTE: The contents of the AOCRG, CRGT, START and STOP primitives is defined in clause 6.6 (primitive interface defined at the AP/SACF interface).

9   Formats and codes of application data

Using ASN.1 as defined in [3] to [6], the following specifies the formats and codes for the support of transfer of charging information as an APM - user. The information is passed as application data in the APM_U_Data primitive to and from the Charging ASE.

These application data are transported as "encapsulated application information" in the Application Transport parameter with application context identifier "charging ASE" (value 3).

The Basic Encoding Rules (BER) according ITU-T Recommendation X.690 [8] are used.

```
Tariffing-Data-Types {itu-t(0) identified-organization(4) etsi (0) 1296 version3(4)}

DEFINITIONS IMPLICIT TAGS ::= BEGIN

-- This module contains the common data type definitions for the charging information used in the
-- new ISUP APM application "Charging ASE" and in the INAP charging operations.
--
--


EXPORTS

-- Charging Common Data Types

ChargingAcknowledgementInformation  ,
AddOnChargingInformation     ,
ChargingTariffInformation    ,
StartCharging                ,
StopCharging                 ,
ChargingMessageType ;

-- ChargingMessageType Type

ChargingMessageType ::= CHOICE {
    crgt   [00] ChargingTariffInformation  ,
    aocrg  [01] AddOnChargingInformation   ,
    crga   [02] ChargingAcknowledgementInformation ,
    start  [03] StartCharging  ,
    stop   [04] StopCharging   }

-- ChargeUnitTimeInterval Type
```

```
ChargeUnitTimeInterval ::= OCTET STRING (SIZE(2))

-- The ChargeUnitTimeInterval is binary coded and has the value range from 0 to 35997. It begins
with 200 milliseconds and
-- then in steps of 50 milliseconds.
-- the LSBit is the least significant bit of the first octet
-- the MSBit is the most significant bit of the last octet
-- the coding of the ChargeUnitTimeInterval is the following:
-- 0 : no periodic metering
-- 1 : 200 msec
-- 2 : 250 msec
-- ..
-- 35997 : 30 minutes
-- All other values are spare.


-- ChargingAcknowledgementInformation Type

ChargingAcknowledgementInformation ::= SEQUENCE {
    acknowledgementIndicators   [00] BIT STRING {
        accepted (0)    }
        (SIZE(minAcknowledgementIndicatorsLen..maxAcknowledgementIndicatorsLen)),   extensions [01]
SEQUENCE SIZE(1..numOfExtensions) OF ExtensionField OPTIONAL,
    originationIdentification   [02] ChargingReferenceIdentification,
    destinationIdentification   [03] ChargingReferenceIdentification
    }

-- Coding of "accepted":
--  0: not accepted.
--  1: accepted.
-- The "extensions" is a SEQUENCE for possible extensions.


-- ChargingControlIndicators Type

ChargingControlIndicators ::= BIT STRING {
        subscriberCharge (0),
        immediateChangeOfActuallyAppliedTariff (1),
        delayUntilStart (2)    }
    (SIZE(minChargingControlIndicatorsLen..maxChargingControlIndicatorsLen))

-- Coding of "subscriberCharge":
--  0 - advice-of-charge: charging information only to be used by the advice of charge service.
--  1 - subscriber-charge: charging information to be used by the subscriber charging program.
-- Coding of "immediateChangeOfActuallyAppliedTariff":
--  0 - immediate tariff change without restart
--  1 - immediate tariff change with restart
--  It is only used to change the actually applied tariff.
-- Coding of 'delayUntilStart':
--  0 - start tariffing, if it is not already started, without waiting for the 'start' signal
--  1 - delay start of tariffing up to the receipt of the 'start' signal


-- AddOnChargingInformation Type

AddOnChargingInformation ::= SEQUENCE {
    chargingControlIndicators   [00] ChargingControlIndicators  ,
    addOncharge                 [01] CHOICE {
        addOnChargeCurrency     [00] CurrencyFactorScale    ,
        addOnChargePulse        [01] PulseUnits
    },
    extensions [02] SEQUENCE SIZE(1..numOfExtensions) OF ExtensionField OPTIONAL,
    originationIdentification   [03] ChargingReferenceIdentification,
    destinationIdentification   [04] ChargingReferenceIdentification    OPTIONAL,
    currency                    [05] Currency
    }

-- This message is used to add an amount of charge for the call and does not alter the current
tariff.
-- The destinationIdentification is not available in an initial AddOnChargingInformation, in all
subsequent ones it is included, see
-- "Handling of Identifiers".

-- In the message the
-- add-on charge has either the pulse or currency format.


-- ChargingTariffInformation Type

ChargingTariffInformation ::= SEQUENCE {
    chargingControlIndicators   [00] ChargingControlIndicators,
```

```
    chargingTariff [01] CHOICE {
        tariffCurrency [00] TariffCurrency,
        tariffPulse [01] TariffPulse
    },
    extensions [02] SEQUENCE SIZE(1..numOfExtensions) OF ExtensionField OPTIONAL,
    originationIdentification   [03] ChargingReferenceIdentification,
    destinationIdentification   [04] ChargingReferenceIdentification    OPTIONAL,
    currency    [05] Currency
    }
--This message is used
-- to transfer explicit tariff data to the originating subscriber exchange and the charge
registration exchange during call
-- set-up and also in the active phase of a call.
-- The destinationIdentification is not available in an initial ChargingTariffInformation, in all
subsequent ones it is included, see
-- "Handling of Identifiers".


Code ::= CHOICE
{
    local   INTEGER,
    global  OBJECT IDENTIFIER
}


-- CommunicationChargeCurrency Type

CommunicationChargeCurrency ::= SEQUENCE {
    currencyFactorScale [00] CurrencyFactorScale    ,
    tariffDuration [01] TariffDuration ,
    subTariffControl    [02] SubTariffControl    }



-- CommunicationChargePulse Type

CommunicationChargePulse ::= SEQUENCE {
    pulseUnits [00] PulseUnits ,
    chargeUnitTimeInterval [01] ChargeUnitTimeInterval ,
    tariffDuration [02] TariffDuration }


-- Criticality Type

CriticalityType ::= ENUMERATED {
    ignore(0),
    abort(1)    }


-- Currency Type

Currency ::= ENUMERATED {
    noIndication    (0),
    australianDollar    (1),
    austrianSchilling   (2),
    belgianFranc    (3),
    britishPound    (4),
    czechKoruna (5),
    danishKrone (6),
    dutchGuilder    (7),
    euro    (8),
    finnishMarkka   (9),
    frenchFranc (10),
    germanMark  (11),
    greekDrachma    (12),
    hungarianForint (13),
    irishPunt   (14),
    italianLira (15),
    japaneseYen (16),
    luxembourgian-Franc (17),
    norwegianKrone  (18),
    polishZloty (19),
    portugeseEscudo (20),
    russianRouble   (21),
    slovakKoruna    (22),
    spanishPeseta   (23),
    swedishKrone    (24),
```

```
    swissFranc (25),
    turkishLira (26),
    uSDollar   (27),
    ...}


-- CurrencyFactor Type

CurrencyFactor ::= INTEGER (0..999999)

-- Value 0 indicates "no charge".


-- CurrencyFactorScale Type

CurrencyFactorScale ::= SEQUENCE {
    currencyFactor [00] CurrencyFactor DEFAULT noCharge    ,
    currencyScale  [01] CurrencyScale DEFAULT noScale   }
-- The charge amount is indicated by the currency factor multiplied with the currency scale.
-- "no charge" indicates CurrencyFactorScale has the value 0.



-- CurrencyScale Type

CurrencyScale ::= INTEGER (-7..3)
-- The actual value for currency scale is given by 10^x, where x is the value of the CurrencyScale.
--
-- the coding of CurrencyScale is as follows, all other values are spare:
-- -7 (249): 0,0000001
-- -6 (250): 0,000001
-- -5 (251): 0,00001
-- -4 (252): 0,0001
-- -3 (253): 0,001
-- -2 (254): 0,01
-- -1 (255): 0,1
-- 0 : 1
-- 1 : 10
-- 2 : 100
-- 3 : 1000


-- Definition of the extension class
EXTENSION ::= CLASS {
    &ExtensionType,
    &criticality    CriticalityType DEFAULT ignore,
    &id Code
    }
WITH SYNTAX {
    EXTENSION-SYNTAX    &ExtensionType
    CRITICALITY &criticality
    IDENTIFIED BY   &id
    }
-- Example of addition of an extension named 'Some Network Specific Indicator' of type
-- BOOLEAN, with criticality 'abort' and to be identified as extension number 1
-- Example of definition using the above information object class:
--
-- SomeNetworkSpecificIndicator EXTENSION ::= {
-- EXTENSION-SYNTAX BOOLEAN
-- CRITICALITY abort
-- IDENTIFIED BY local : 1
-- }
-- Example of transfer syntax, using the ExtensionField datatype as specified in section 4.1.
-- Assuming the value of the extension is set to TRUE, the extensions parameter
-- becomes a Sequence of type INTEGER ::= 1, criticality ENUMERATED ::= 1 and value [1]
-- EXPLICIT BOOLEAN ::= TRUE.
--
-- Use of Q.1400 defined Extension is ffs
-- In addition the extension mechanism marker is used to identify the future minor additions to
INAP.
firstExtension EXTENSION ::= {
    EXTENSION-SYNTAX    NULL
    CRITICALITY ignore
    IDENTIFIED BY   local:1
    }
-- firstExtension is just an example.
SupportedExtensions EXTENSION ::= {firstExtension , ...
-- full set of network operator extensions --}
```

```
-- SupportedExtension is the full set of the network operator extensions.

-- ExtensionField Type

ExtensionField ::= SEQUENCE {
    type    EXTENSION.&id ({SupportedExtensions}),
        -- shall identify the value of an EXTENSION type
    criticality CriticalityType DEFAULT ignore,
    value   [1] EXTENSION.&ExtensionType
        ({SupportedExtensions}{@type})
    }

-- This parameter indicates an extension of an argument data type. Its contents is network operator
specific.



-- PulseUnits Type

PulseUnits ::= OCTET STRING (SIZE(1))


-- the PulseUnits is binary coded and has the value range from 0 to 255

-- StartCharging Type

StartCharging ::= SEQUENCE {
    networkOperators            [00] SEQUENCE SIZE (1..maxNetworkOperators) OF NetworkIdentification
OPTIONAL,
    extensions                  [01] SEQUENCE SIZE(1..numOfExtensions) OF ExtensionField OPTIONAL,
    originationIdentification   [02] ChargingReferenceIdentification
    }

--This message is used
-- to start charge generation/registration for one that belongs to one network operator or
-- to start charge generation/registration for more tariffs that belong to several network
-- operators.
-- The corresponding network operator(s) are listed within sub-parameter 'networkOperators'.
-- The sub-parameter 'networkOperators' is mandatory in configurations of multiple charge
-- determination points.
-- If sub-parameter 'networkOperators' is not present in a configuration with only one charge
-- determination point, the corresponding tariff is started.
-- The 'extensions' is a SEQUENCE for possible extensions.



-- StopCharging Type

StopCharging ::= SEQUENCE {
    stopIndicators              [00] BIT STRING {
        callAttemptChargesApplicable (0) }
            (SIZE(minStopIndicatorsLen.. maxStopIndicatorsLen)),
    networkOperators            [01] SEQUENCE SIZE (1..maxNetworkOperators) OF NetworkIdentification
            OPTIONAL,
    extensions                  [02] SEQUENCE SIZE(1..numOfExtensions) OF ExtensionField OPTIONAL,
    originationIdentification   [03] ChargingReferenceIdentification
    }

--This message is used to stop charge generation/registration
-- for one that belongs to one network operator or
-- to stop charge generation/registration for more tariffs that belong to several network operators.
-- The corresponding network operator(s) are listed within sub-parameter 'networkOperators'.
-- The sub-parameter 'networkOperators' is mandatory in configurations of multiple charge
-- determination points.
-- If sub-parameter 'networkOperators' is not present in a configuration with only one charge
-- determination point, the corresponding tariff is stopped.
-- Coding of 'callAttemptChargesApplicable':
--  0 - stop tariffing, call attempt charges are not applicable
--  1 - stop tariffing, call attempt charges are applicable
-- The 'extensions' is a SEQUENCE for possible extensions.



-- SubTariffControl Type

SubTariffControl ::= BIT STRING {oneTimeCharge (0)}
 (SIZE(minSubTariffControlLen..maxSubTariffControlLen))


-- The coding of the oneTimeCharge is as follows:
```

```
-- 0 - Periodic charge
-- 1 - One time charge

minSubTariffControlLen  INTEGER ::= 1
maxSubTariffControlLen  INTEGER ::= 8


-- TariffCurrency Type

TariffCurrency ::= SEQUENCE {
    currentTariffCurrency  [00] TariffCurrencyFormat OPTIONAL  ,
    tariffSwitchCurrency   [01] TariffSwitchCurrency OPTIONAL
    }

-- TariffSwitchCurrency Type

TariffSwitchCurrency ::= SEQUENCE {
    nextTariffCurrency  [00] TariffCurrencyFormat   ,
    tariffSwitchoverTime   [01] TariffSwitchoverTime
    }



-- TariffCurrencyFormat Type

TariffCurrencyFormat ::= SEQUENCE {
    communicationChargeSequenceCurrency
        [00] SEQUENCE
         SIZE(minCommunicationTariffNum..maxCommunicationTariffNum)
         OF CommunicationChargeCurrency OPTIONAL    ,
    tariffControlIndicators [01] BIT STRING {
        non-cyclicTariff (0)    }
        (SIZE(minTariffIndicatorsLen..maxTariffIndicatorsLen))  ,
    callAttemptChargeCurrency   [02] CurrencyFactorScale OPTIONAL   ,
    callSetupChargeCurrency [03] CurrencyFactorScale OPTIONAL    }
```

-- The communication charge sequence currency is a direct charge in currency per time unit. Only one fixed time unit is used.
-- This time unit has
-- to be agreed between all cooperating networks, e.g. one second. Being fixed, the time unit is not transferred over
-- ISUP/INAP.
-- The call attempt charge is a direct charge, to be charged only for unsuccessful calls.
-- The call set-up charge is a direct charge, to be charged once at start of charging.
--
-- The coding of the non-cyclicTariff is as follows:
-- 0 - Cyclic tariff (at expiration of the tariff duration of the last communication tariff of the communication charge sequence,
-- the communication charge sequence is re-applied.
-- 1 - Non-cyclic tariff (at expiration of the tariff duration of the last communication tariff of the communication charge
-- sequence, do not re-apply the communication charge sequence)

-- TariffDuration Type

```
TariffDuration ::= INTEGER (0..36000)
```

-- TariffDuration identifies with 0 unlimited duration and else in seconds unit.
-- 0 = unlimited
-- 1 = 1 second
-- 2 = 2 seconds
-- ...
-- 36000 = 10 hours
--
-- The duration indicates for how long time the communication charge component is valid. Expiration of the tariff duration
-- timer leads to the activation of the next communication charge (if present).
-- In the case where there is no next communication charge in the communication charge sequence, the action to be performed
-- is indicated by the tariffControlIndicators.

-- TariffPulse Type

```
TariffPulse ::= SEQUENCE {
    currentTariffPulse  [00] TariffPulseFormat OPTIONAL ,
    tariffSwitchPulse   [01] TariffSwitchPulse OPTIONAL }
```

```
-- TariffSwitchPulse Type

TariffSwitchPulse ::= SEQUENCE {
    nextTariffPulse [00] TariffPulseFormat   ,
    tariffSwitchoverTime    [01] TariffSwitchoverTime   }


-- TariffPulseFormat Type

TariffPulseFormat ::= SEQUENCE {
    communicationChargeSequencePulse    [00] SEQUENCE
        SIZE(minCommunicationTariffNum.. maxCommunicationTariffNum)
        OF CommunicationChargePulse OPTIONAL    ,
    tariffControlIndicators [01] BIT STRING {
        non-cyclicTariff (0)    }
        (SIZE(minTariffIndicatorsLen..maxTariffIndicatorsLen))   ,
    callAttemptChargePulse  [02] PulseUnits OPTIONAL    ,
    callSetupChargePulse    [03] PulseUnits OPTIONAL    }

-- The communication charges are meter-pulse units, which are to be applied per charge unit time
interval.
-- The call attempt pulse units are to be charged only for unsuccessful calls.
-- The call set-up pulse units are to be charged once at start of charging.

-- TariffSwitchoverTime Type

TariffSwitchoverTime ::= OCTET STRING (SIZE(1))

-- This time is the absolute time at which the next tariff has to become active. It is represented
in steps of 15 minutes.
-- The coding is the following:
-- 0 : spare
-- 1 : 0 hour   15 minutes
-- 2 : 0 hour   30 minutes
-- 3 : 0 hour   45 minutes
-- 4 : 1 hour    0 minutes
-- ..
-- 96 : 24 hours     0 minutes
-- 97-255 : spare

minAcknowledgementIndicatorsLen           INTEGER ::=    1
maxAcknowledgementIndicatorsLen           INTEGER ::=    8

minChargingControlIndicatorsLen           INTEGER ::=    1
maxChargingControlIndicatorsLen           INTEGER ::=    8

maxNetworkOperators                       INTEGER ::=    6

minStopIndicatorsLen                      INTEGER ::=    1
maxStopIndicatorsLen                      INTEGER ::=    8

minTariffIndicatorsLen                    INTEGER ::=    1
maxTariffIndicatorsLen                    INTEGER ::=    8

minCommunicationTariffNum                 INTEGER ::=    1
maxCommunicationTariffNum                 INTEGER ::=    4


noCharge                                  INTEGER ::=    0
noScale                                   INTEGER ::=    0

numOfExtensions                           INTEGER ::= 1    --network specific


-- ChargingReferenceIdentification Type

ChargingReferenceIdentification ::= SEQUENCE {
    networkIdentification   [00] NetworkIdentification,
    referenceID [01] ReferenceID}


-- NetworkIdentification Type

NetworkIdentification ::= OBJECT IDENTIFIER

-- Following structure of the networkIdentification value shall be used:
```

```
-- {itu-t (0) administration (2) <national regulation authority> (x) network (y) node identification
(z)}
-- The value for x is the value of the national regulation authority, the value for y is under the
control of the national
-- regulation authority concerned, the value for z is under the control of the network concerned.

-- ReferenceID Type

ReferenceID ::= INTEGER (0..4294967295)
```

-- maximum value $2^{32} - 1$

```
END
-- of Tariffing-Data Types
```

10   Timers

Timer Tcrga: 6 s to 15 s, see clauses 6.1.4 and 6.1.7.

Annex A (informative):
Signalling interworking with DSS1

There is no direct signalling interworking with DSS1. Any charging specific information given to the user has to be considered within the scope of the Advice of Charge supplementary service.

Annex B (informative):
Examples

B.1   Introduction

- The present document specifies the procedures for the **transfer of charging related information** between a charge determination point and a charge registration or generation point.

- This **transfer** refers to a tariff determination instance, i.e. to a particular charging-related process with a corresponding communication between a charge determination point and a charge registration/charge generation point.

- The information sent by the CDP represents either an **add-on charge or a tariff**.

- An **add-on charge** is a single additional charge which does not change the current tariff.

- A **tariff** is a set of parameters used for charging purposes to calculate the charge units for the used telecommunication service or a group of telecommunication services. A tariff consists of a **tariff sequence**. A **tariff sequence** is a list of up to 4 consecutive **subtariffs** which has to be applied for the charging of the communication event. 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. Within a tariff sequence, a **subtariff** defines a **charge unit** per time unit. Each subtariff has an individual duration and an individual charge unit.

- A **charge unit** is the base element for the charging process. A unit can be expressed as meter-pulse unit or as currency value.

- The **charge** is determined by the **number of charge units**.

- The calculation of the charge is called **charging**.

A charge determination, registration and 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 concept is illustrated by the following example.
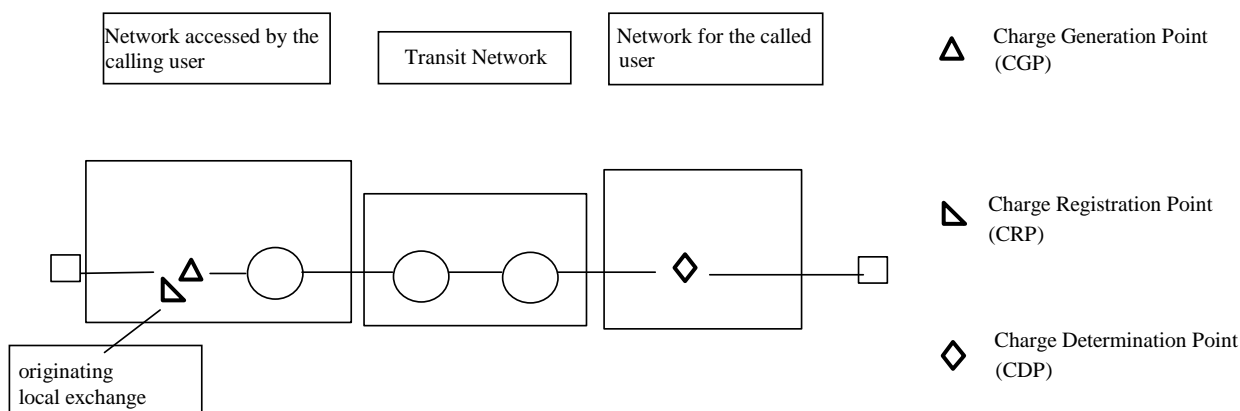
In this example, the CGP and CRP are located in the originating local exchange and the CDP is located in network serving the called user. An additional service to the charged (calling) user is provided. Information to the CRP is transferred from the CDP. The ISUP message may pass one or more transit networks between the end points. The transit networks transfer the information without being responsible for the content. The transferred charging information represents direct tariffs or add-on charges.

B.2   Examples

The following examples do not consider Advice Of Charge at the End of the call (AOC-E).

Configuration 1:
This example focuses on the relation between the location of the Charge Registration Point (CRP) or point
where the charging data are registered with e.g. a Call Data Record (CDR) and the purpose of the CRGT
primitive. The purpose of the primitive is given by the ChargingControlIndicator.
In this example, the CRP and the Charge Generation Point (CGP) are located in the Originating Line
Exchange (OLE). The ChargingControlIndicator indicates "subscriber charging".
The call is released before the tariff switchover time.
**ISUP/DSS1 message flow (focused on the charging relevant messages):**
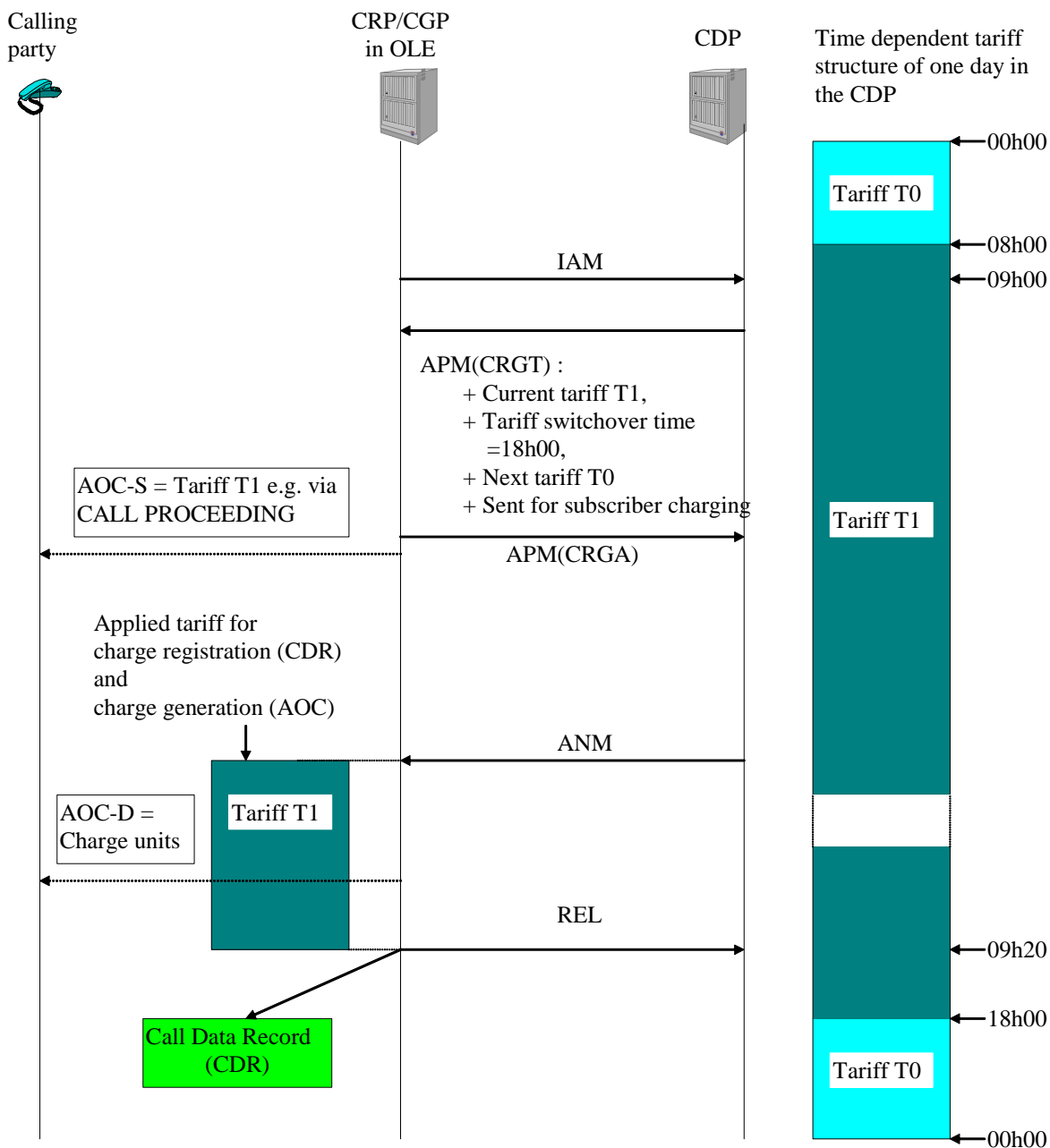
Configuration 2:

This example focuses on the relation between the location of the Charge Registration Point (CRP) or point where the charging data are registered with, e.g. a Call Data Record (CDR) and the purpose of the CRGT primitive. The purpose of the primitive is given by the ChargingControlIndicator.

In this example, Charge Determination Point (CDP) and CRP are located outside the OLE. The tariff is sent to the OLE only for AOC purposes (the ChargingControlIndicator indicates "AOC only").

The call is released before the tariff switchover time.

ISUP/DSS1 message flow (focused on the charging relevant messages):
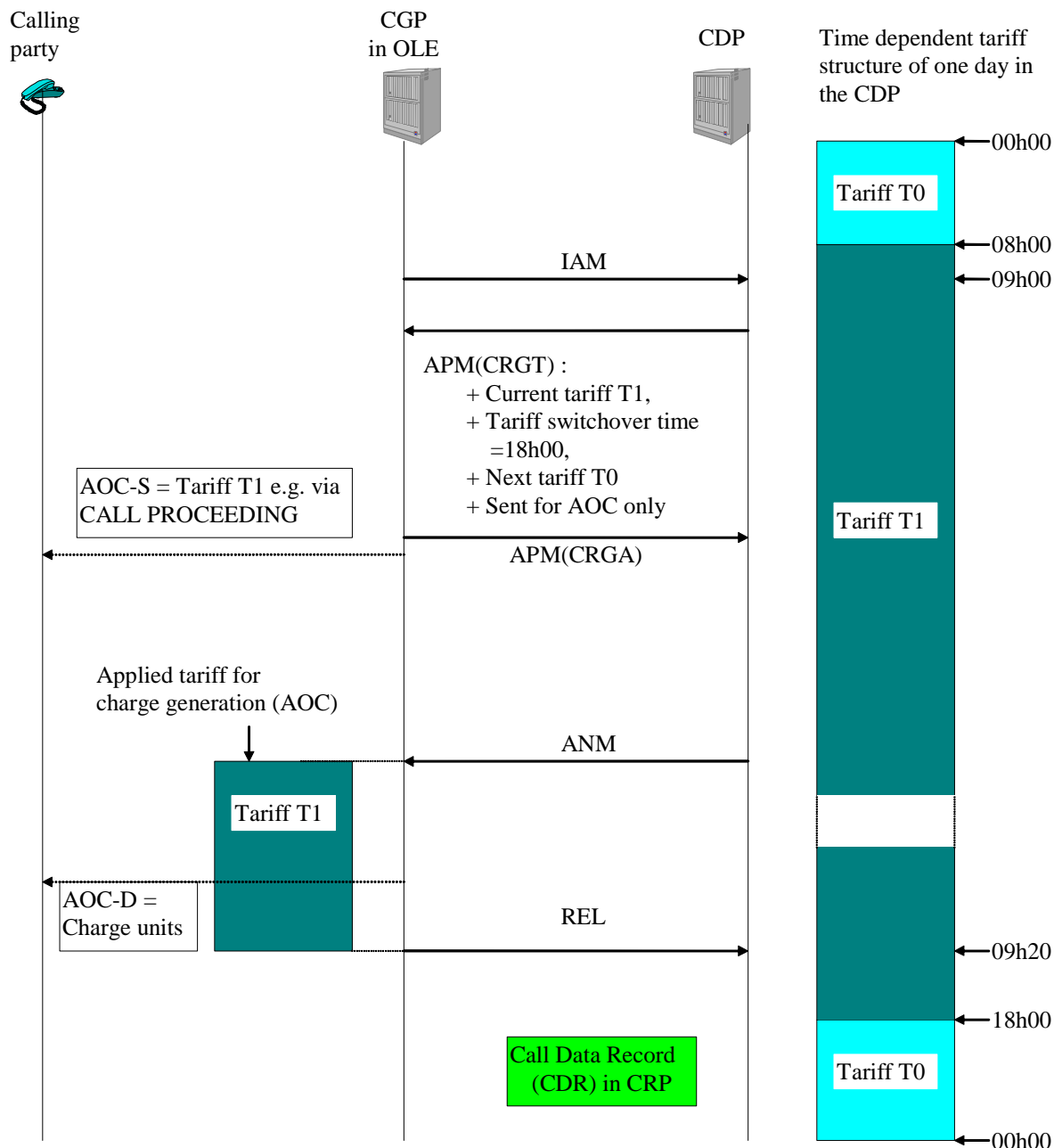
Configuration 3: A long duration call that crosses two tariff switchover times.
Charge Registration Point (Call Data Record CDR) and Charge Generation Point are located in the Originating Line Exchange (OLE).
The call charging starts with the first tariff T0. At the first tariff switchover time (17h00) the next tariff T1 is applied. This tariff T1 has been sent in the first CRGT primitive of the APM message.
At 18h50 (i.e. at least before the next tariff switchover time) , the new next tariff T2 and his corresponding switchover time 19h00 is sent with the second CRGT primitive. At 19h00 a tariff switch from T1 into T2 is performed.
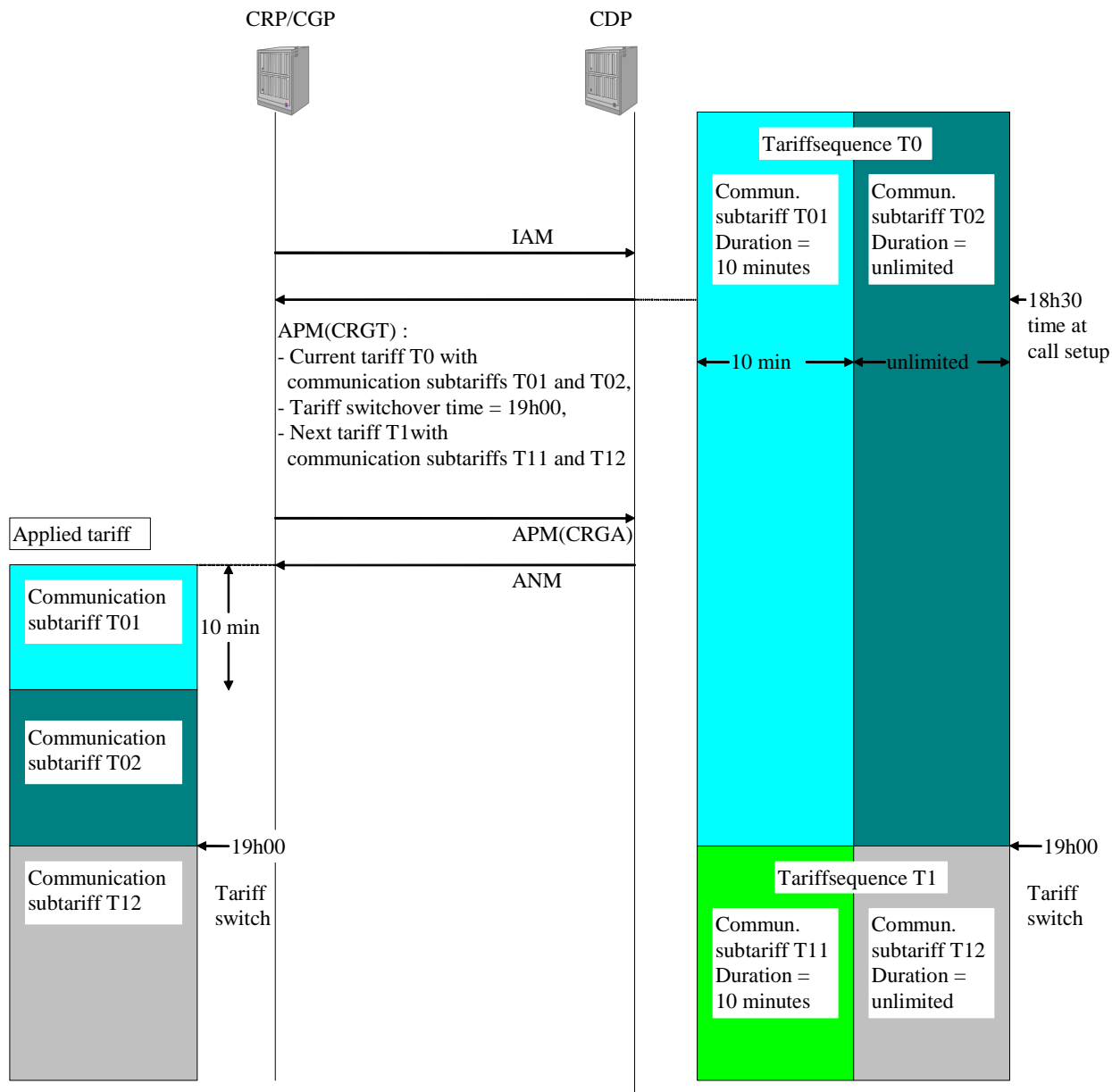**ISUP/DSS1 message flow (focused on the charging relevant messages):**
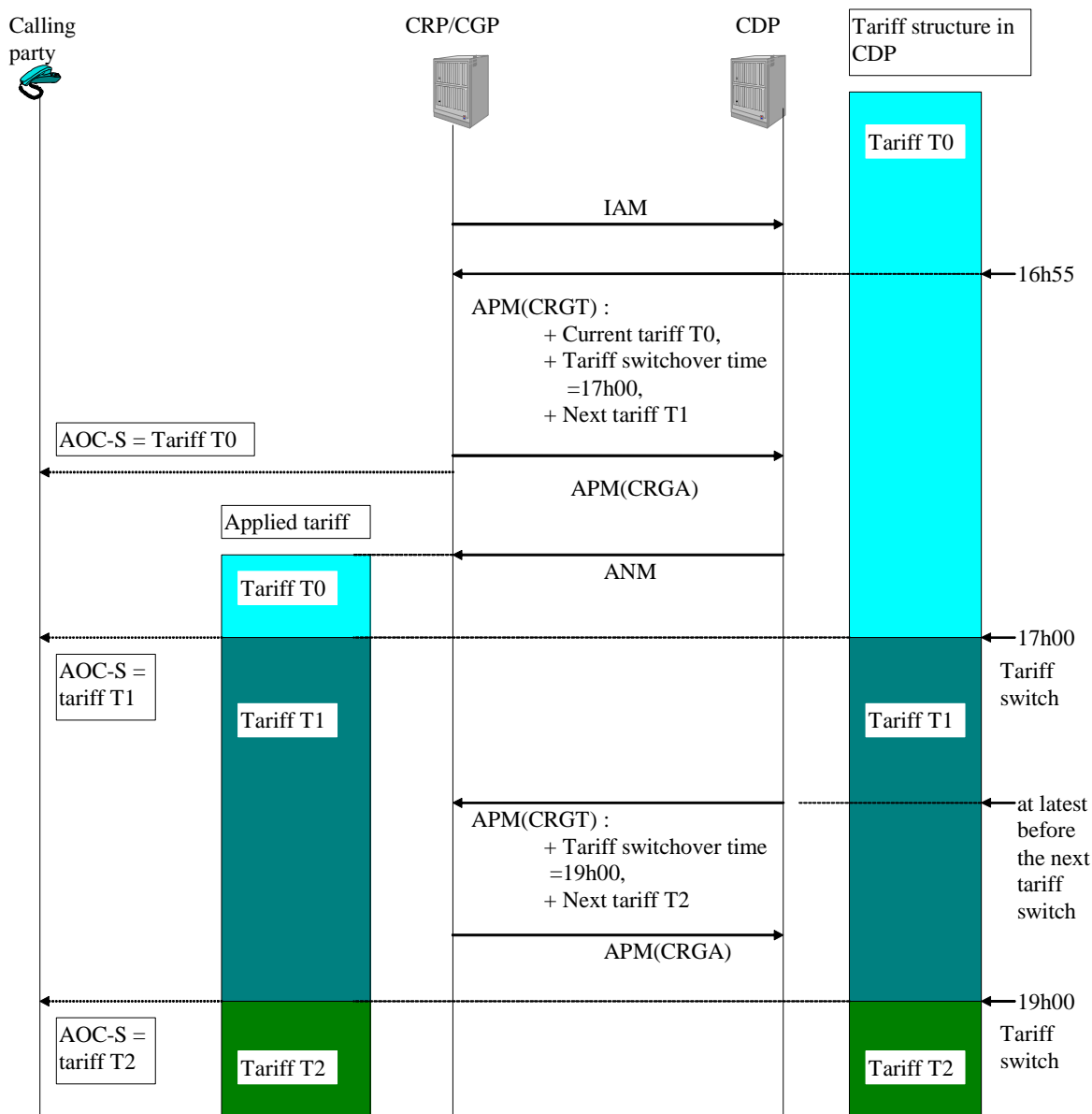
Configuration 4: Tariff switch for a tariff sequence
Tariff structure in CDP: Communication tariff sequence T0 with 2 communication subtariffs T01 and T02.
Call proceeding: Subtariff T01 is applied at start charging , subtariff T02 is applied after 10 minutes.
 The tariff switch occurs during the applience of this second subtariff T02. Consequently after the switch, the charging continues with the corresponding second subtariff T12 of the new tariff
ISUP/DSS1 message flow (focused on the charging relevant messages):

CRP/CGP   CDP

IAM

APM(CRGT) :
- Current tariff T0 with
  communication subtariffs T01 and T02,
- Tariff switchover time = 19h00,
- Next tariff T1 with
  communication subtariffs T11 and T12

Applied tariff

APM(CRGA)

ANM

Communication
subtariff T01   10 min

Communication
subtariff T02

19h00

Communication
subtariff T12   Tariff
switch

Tariffsequence T0

Commun.   Commun.
subtariff T01   subtariff T02
Duration =   Duration =
10 minutes   unlimited

18h30
time at
call setup

10 min   unlimited

19h00

Tariffsequence T1

Commun.   Commun.
subtariff T11   subtariff T12
Duration =   Duration =
10 minutes   unlimited

Tariff
switch

Configuration 5: Immediate tariff change without restart of the charging instance
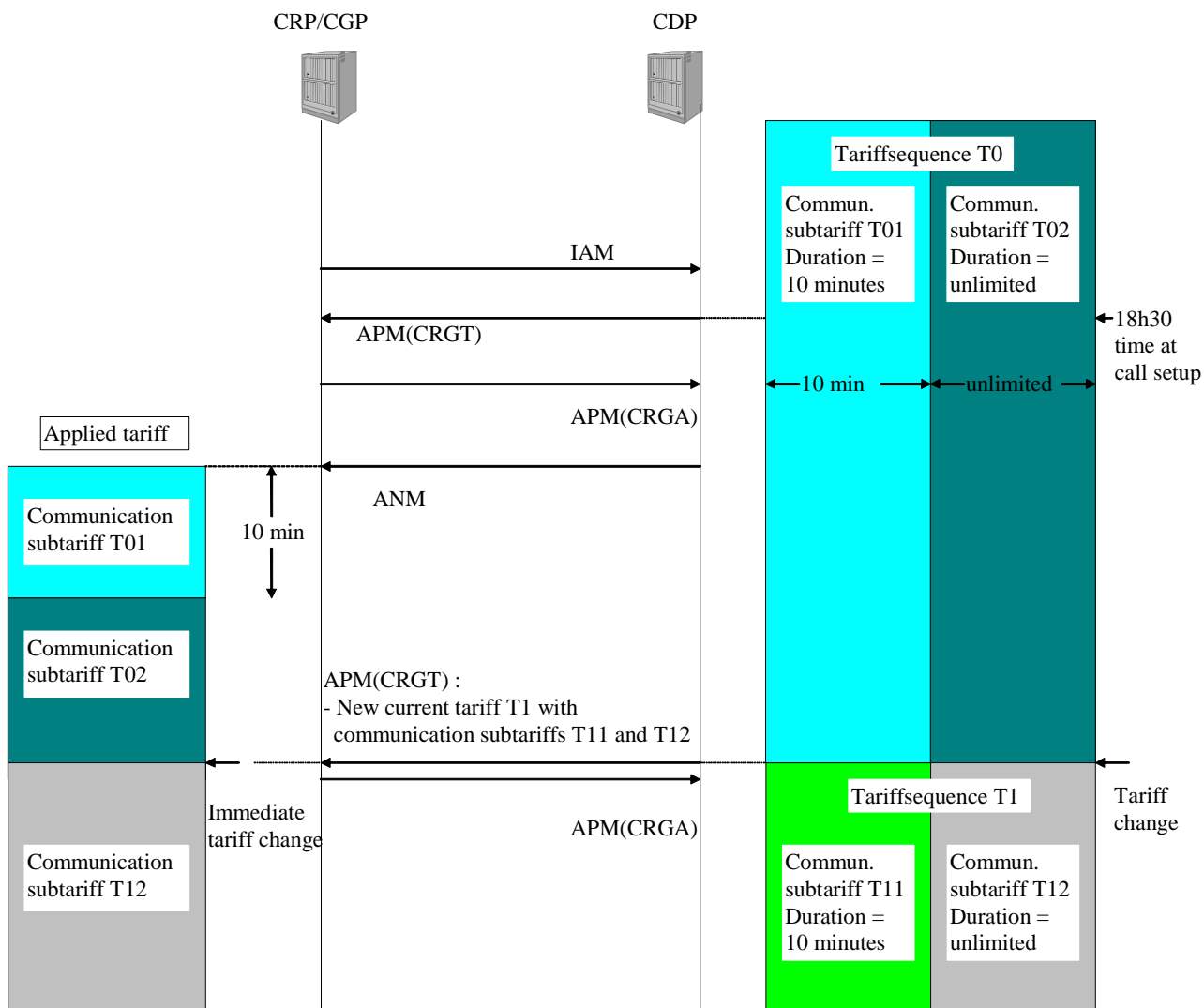EXAMPLE: due to a time correction a new tariff for the same connection has to be applied.

Tariff structure in CDP:
Communication tariff sequence T0 with 2 communication subtariffs T01 and T02.

Call proceeding and charging: subtariff T01 is applied at start charging. After 10 minutes the subtariff T02 is applied. The immediate tariff change occurs during the applience of this second subtariff T02. Consequently the charging continues with the corresponding second subtariff T12 of the new tariff (i.e. the charging is not restarted with the first subtariff T11 of the new tariff).

ISUP/DSS1 message flow (focused on the charging relevant messages):

Configuration 6: Immediate tariff change with restart of the charging instance
Example during one "Off hook/On hook session", a new tariff has to be applied due to an IN "follow on" call or an IN call with user interactive dialog.
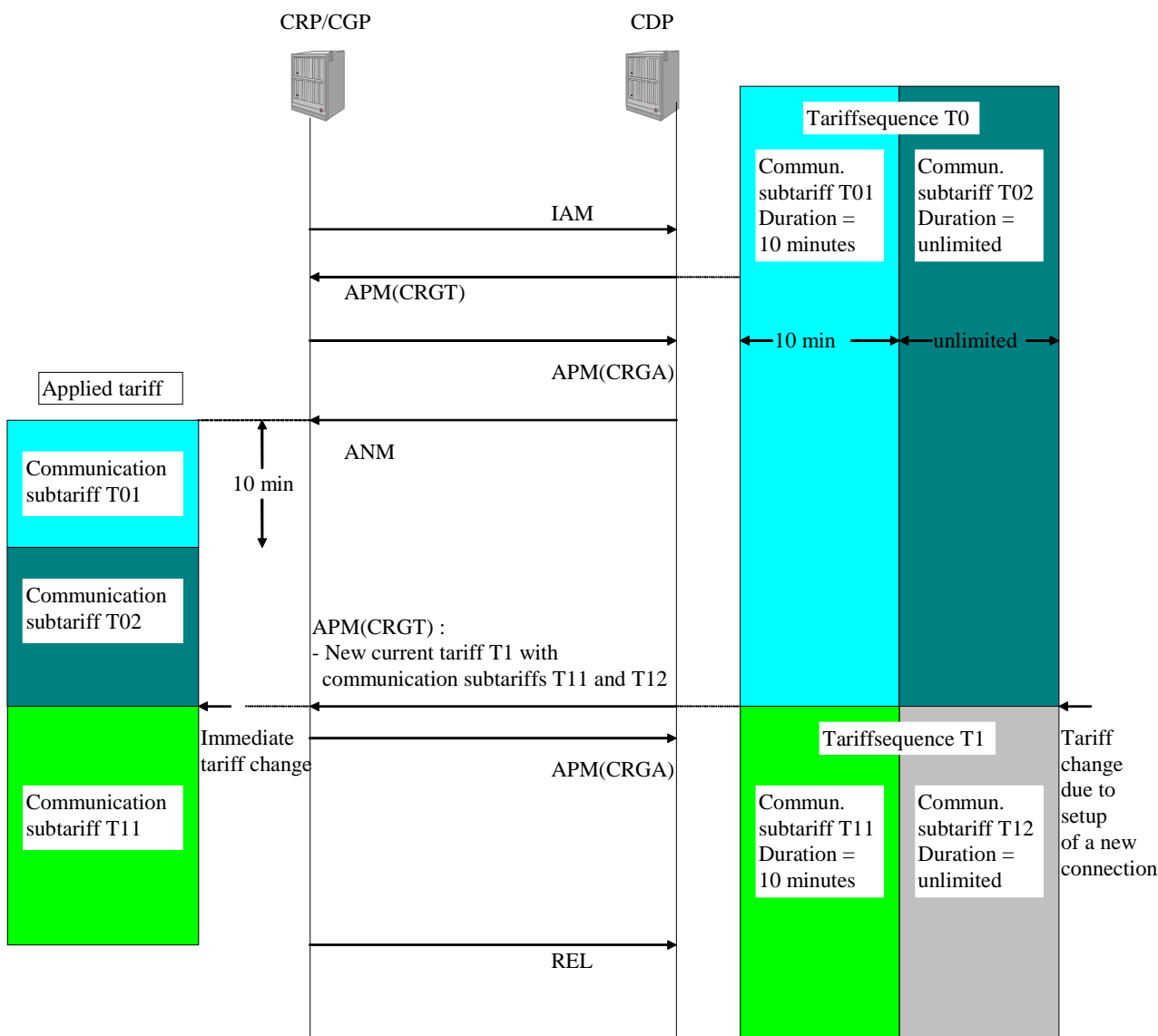
Tariff structure in CDP:
Communication tariff sequence T0 with 2 communication subtariffs T01 and T02.

Call proceeding and charging: Subtariff T01 is applied at start charging. After 10 minutes the subtariff T02 is applied.
After 5 minutes a new connection is setup (e.g. a follow on call).
At the immediate tariff change, the charging is stopped with the actual tariff and is restarted with the first subtariff T11 of the new tariff.

ISUP/DSS1 message flow (focused on the charging relevant messages):

CRP/CGP   CDP

Tariffsequence T0

Commun. subtariff T01   Commun. subtariff T02
Duration = 10 minutes   Duration = unlimited

IAM

APM(CRGT)

←10 min→ ←unlimited→

APM(CRGA)

Applied tariff

ANM

Communication subtariff T01

10 min

Communication subtariff T02

APM(CRGT) :
- New current tariff T1 with
  communication subtariffs T11 and T12

Immediate tariff change

APM(CRGA)

Communication subtariff T11

Tariffsequence T1

Commun. subtariff T11   Commun. subtariff T12
Duration = 10 minutes   Duration = unlimited

Tariff change due to setup of a new connection

REL

Annex C (informative):
Specification Structure

Figure C.1 illustrates diagrammatically the structure of the specification of the present document.
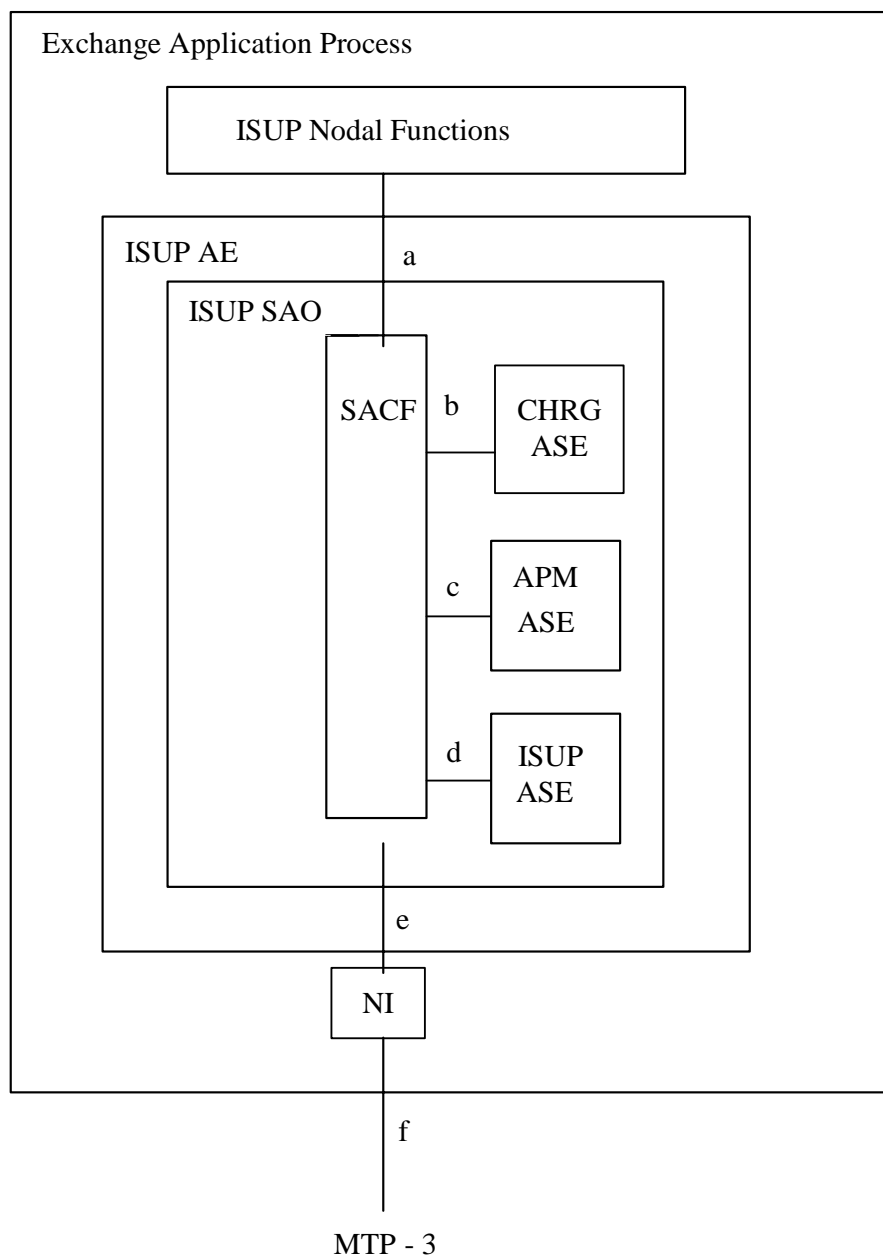
Figure C.1: Specification structure

History

Document history		
V1.1.2	September 1998	Publication
V1.2.2	February 2000	Publication
V1.3.1	February 2003	Membership Approval Procedure MV 20030418: 2003-02-18 to 2003-04-18