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3GPP

Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

3GPP

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Foreword

This Technical Specification (TS) was been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN) and originally published as ETSI TS 183 058 [7]. It was transferred to the 3rd Generation Partnership Project (3GPP) in January 2008.

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x   the first digit:

1   presented to TSG for information;

2   presented to TSG for approval;

3   or greater indicates TSG approved document under change control.

y   the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z   the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the Stage 3 of the real-time transfer of Tariff Information between a Charge Determination Point (CDP) and a Charge Generation Point (CGP) by means of the Session Initiation Protocol (SIP).

It identifies the protocol procedures and switching functions needed to support the transfer of tariff information related to IP multimedia services. The information needed to support the ISDN User part (ISUP) signalling aspects of charging (ES 201 296 [6]) for Advice of Charge information purposes is also specified, however, it can be used for other purposes as well where applicable.

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:

- the on-line provided advice of charge information may not accurately reflect the correct charging rate due to discount rates, special charging arrangements, etc. It is out of scope to ensure alignment of this information;

- complaint handling between network operators in case of incorrect advice of charge information;

- explicit encryption or special security mechanisms;

- usage of the transferred tariff information for charging purposes;

- interaction between UE and CGP for possible confirmation of provided tariffs;

- any function behind the CGP towards the UE.

2 References

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

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

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

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] 3GPP TS 22.173: "IP Multimedia Core Network Subsystem (IMS) Multimedia Telephony Service and supplementary services; Stage 1".

[2] IETF RFC 2976: "The SIP INFO Method".

[3] IETF RFC 4006: "Diameter Credit-Control Application".

[4] 3GPP TS 24.229: "Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".

[5] ISO 4217: "International Organization for Standardization; Type Currency Code List".

[6]   ETSI ES 201 296 (V1.3.1): "Integrated Services Digital Network (ISDN); Signalling System No.7 (SS7); ISDN User Part (ISUP); Signalling aspects of charging".

[7]   ETSI TS 183 058 V2.0.0: "Telecommunications and Internet Converged Services and Protocols for Advanced Networking (TISPAN); SIP Transfer of IP Multimedia Service Tariff Information; Protocol specification".

[8]   RFC 3261 (June 2002): "SIP: Session Initiation Protocol".

[9]   RFC 3023 (January 2001): "XML Media Types".

[10]   RFC 4288 (December 2005): "Media Type Specifications and Registration Procedures".

3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TS 22.173 [1] and the following apply:

absolute time: time of the day representing GMT

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

> NOTE: An add-on charge can either be metered in non-monetary units (e.g. meter-pulse) or in monetary-units (e.g. currency).

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

Charge Determination Point (CDP): determines which tariff/add-on charge should be applied, and inserts the tariff/add-on charge information to the appropriate SIP requests or responses

> NOTE: Example of a CDP is a SIP AS at the visited IMS network providing the premium rate service.

Charge Generation Point (CGP): receives the tariff/add-on charge information that was added by a CDP and transferred in the appropriate SIP requests or responses

> NOTE: Example of a CGP is an originating SIP AS at the home IMS network for advice of charge purposes.

charge unit: base element for the charging process, expressed in non-monetary or monetary units

charging: function within the telecommunications network and the associated OCS/BD components whereby information related to a chargeable event is collected, formatted, transferred and evaluated in order to make it possible to determine usage for which the charged party may be billed (offline charging) or the subscriber's account balance may be debited (online charging).

real-time: time, typically in number of seconds, to perform the on-line mechanism used for fraud control and cost control

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 defining the network utilization charges for the use of a particular bearer / session / service

> NOTE 1:   A tariff can either be metered in non-monetary units (e.g. meter-pulse) or in monetary units (e.g. currency).

> NOTE 2:   Relationship between tariff and charge units (charging) should be clarified.

> NOTE 3:   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 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:

AOC   Advice Of Charge
AOCRG   Add-On ChaRGe information
ASE   Application Service Element
CDP   Charge Determination Point
CGP   Charge Generation Point
CRGT   ChaRGe Tariff information
GMT   Greenwich Mean Time
ID   IDentification
IMS   IP Multimedia Subsystem
IP   Internet Protocol
ISDN   Integrated Service Data Network
ISUP   ISDN User Part
NGN   Next Generation Network
PSTN   Public Switch Telephone Network
SIP   Session Initiation Protocol
UE   User Equipment

4   SIP Transfer of Charging Information

4.1   Description

4.1.1   General description

The present document specifies the procedures for the realtime transfer of charging information in SIP between a Charge Determination Point (CDP) and a Charge Generation Point (CGP). CDP is a network function that determines which tariff/add-on charge should be applied and inserts the charging information to the appropriate SIP requests or responses, whereas the CGP is a network function that receives the tariff/add-on charge information that was added by a CDP.

Example of CDP is a SIP AS at the visited IMS network providing the premium rate service. Example of the CGP is the originating SIP AS at the home IMS network for advice of charge purposes.

The functionality is needed to support the tariff/add-on charge information of value added services that are charged by the operator of the originating end user, the home IMS operator, in case the operator of the originating end user has no knowledge about the tariff/add-on charge information related to these value-added services.

A charge determination and charge generation point of the communication 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 communication is possible. It is assumed that there is only one CGP for the communication.

The transferred tariff/add-on charge information represents direct Tariff Information (no pointers to charge data), either in monetary (e.g. currency) units or non-monetary (e.g. meter-pulse) units.

The following functionality is provided:

    i)   apply a communication attempt charge for unsuccessful communications;

    ii)   apply a communication 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 communication;

    iv)   change immediately the current tariff;

    v)   apply immediately an add-on charge (either a number of non-monetary units or an amount of monetary units) during the communication. This add-on charge is additive and does not change the tariff in force;

    vi)   differentiation as to whether the tariff/add-on charge 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);

    vii)   perform validation (e.g. check range of parameters, check whether a request from a certain network operator can be accepted);

    viii)   apply a "one time charge" (i.e. non-periodic charge/flat rate) as a minimum communication charge at start of charging;

4.1.2 Network provider option

Not applicable.

4.2 Coding requirements

CDP and CGP shall support the INFO method according to RFC 2976 [2] in support of SIP Transfer of Tariff Information.

CDP and CGP shall support multipart MIME content.

The SIP Transfer of Tariff Information XML schema, version 1.0, is defined in annex C. The Tariff Information XML schema shall be transported as a SIP MIME body. The MIME type for the Tariff Information is "application/vnd.etsi.sci+xml" (in accordance with subclause 5.1). Any SIP message that transports a body with Tariff Information shall identify the payload as MIME type "application/vnd.etsi.sci+xml" (in accordance with subclause 5.1).

4.3 Functional requirements

4.3.1 Overall requirements

    a) CGP receives tariff information and shall not send it further, however, the received tariff information can be used for the AoC info provision to the UE.

    b) There is only one CGP per service usage and the CGP is always located within the home network of the served subscriber.

    c) CDP determines the tariff to be applied or an add on charge, and provides for transfer to the CGP.

    d) There can be one or more CDP per service usage. CDP may be located in the originating or in the terminating network.

    e) Sending of next Tariff Information.

        A determination point shall not send next Tariff Information with a switch-over time that is more than 23 h and 45 min after the current time.

f) Format of the Tariff Information.

All information issued for the same communication has to be in the same format, i.e. monetary or non-monetary. This needs bilateral agreements between the network operators concerned.

If non-monetary formats are used, the corresponding monetary value of a non-monetary unit needs bilateral agreements between the network operators concerned.

A CDP has to encode the Tariff Information in a format that can be validated by the receiving CGP.

4.3.2 Procedures at a Charge Determination Point

4.3.2.0 General

The CDP shall assume that the UE supports version 1.0 of the MIME type associated with Tariff Information (see subclause 5.1), if support for the MIME type associated with Tariff Information in the Accept header is not indicated. If both the "sv" and "schemaversion" parameters are present, then the CDP shall ignore the value of the "schemaversion" parameter.

If the CDP includes the SIP Transfer of Tariff Information XML body (see subclause 5.1), it shall set the Content-Type header field to MIME type associated with Tariff Information (see subclause 5.1) and shall include in its "sv" or "schemaversion" parameter's value the versions of SIP Transfer of Tariff Information XML schema that can be used to validate the SIP Transfer of Tariff Information XML body.

4.3.2.1 Procedures during communication set-up

4.3.2.1.1 Tariff indication

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 generation point, the application process shall issue the Tariff indication.

A Tariff indication may be re-issued during communication set-up phase (i.e. at any time up to the dialog confirmation), 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 Tariff indication. 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 Communication Attempt charge, a Communication Setup charge and a Communication charge (up to a maximum of 4 communication subtariffs).

The tariff format used for the communication is indicated by the first Tariff indication and shall not be changed during the communication.

The following clauses specify the procedures for some specific cases.

4.3.2.1.2 Communication attempt charge

The communication attempt charge is a direct charge, to be charged only for unsuccessful communications.

If a communication attempt charge is relevant to the communication, the communication attempt Tariff Information shall be included in the Tariff indication.

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

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

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

4.3.2.1.3 Communication set-up charge

The communication setup charge is a direct charge, to be charged once at start of charging.

If communication setup charge is relevant to the communication, the communication setup Tariff Information shall be included in the first Tariff indication.

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

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

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

4.3.2.1.4 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 Tariff indication and before start of charging.

a) Non-monetary-format.

In case of non-monetary-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) Monetary-format.

In case of monetary-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 fixed time unit is one second, according to RFC 4006 [3].

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 communication, 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 non-monetary 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 monetary 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.

4.3.2.2 Procedures after start of charging

The following clauses and clause 4.3.2.3 specify the procedures for some specific cases.

4.3.2.2.1 Change current tariff

The current tariff can be changed by issuing a Tariff indication with the new current tariff.

4.3.2.2.2 Add-on charge

If a charge determination point determines that a certain amount of charge has to be added, the application process issues an Add-on-charge indication. The current tariff is not changed.

An Add-on-charge indication is allowed after start of charging only.

The charge is either in non-monetary format or in monetary format.

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

4.3.2.3 Subsequent Tariff indications

In addition to the first Tariff indication, the application process in a determination point issues subsequent Tariff indication during the communication in the following cases:

a) The current tariff is changed. A Tariff indication with the new current tariff t has to be issued immediately.

b) The next tariff and its tariff switch-over time were not issued at communication setup. This exceptional case occurs when the switch-over time was more than 23 h and 45 min after the moment the communication is set-up. A Tariff indication with the next tariff and the corresponding switchover time has to be issued at least before the switchover time.

4.3.3 Procedures at the charge generation point

The following general rule applies: Currently stored information related to one network operator is replaced by information related to this operator received subsequently.

4.3.3.0 General

The CGP shall include the Accept header field with

- "application/vnd.etsi.sci+xml", the MIME type associated with Tariff Information (see subclause 5.1), and indicate the versions of the XML Schema for SIP Transfer of Tariff Information it supports; and

- any other MIME type the CGP is willing and capable of accepting.

4.3.3.1 Procedures during communication set-up

4.3.3.1.1 Tariff indication

The receipt of the Tariff indication 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 Tariff indication may be received more than once during communication set-up phase (i.e. at any time up to the dialog confirmation), 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 Tariff indication.

The current tariff and the next tariff have the same tariff parameter structure, i.e. a communication attempt charge, a communication setup charge and a communication charge (up to a maximum of 4 communication subtariffs). The tariff parameters have either the non-monetary format or the monetary format. The tariff-format used for the communication is indicated by the first Tariff indication and shall not be changed during the communication.

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

The following clauses specify the procedures for some specific cases.

4.3.3.1.2 Communication attempt charge

The communication attempt charge is a direct charge, to be charged only for unsuccessful communications.

If a communication attempt charge is relevant to the communication, the communication attempt charge information shall be included in the Tariff indication.

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

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

4.3.3.1.3 Communication setup charge

The communication setup charge is a direct charge, to be charged once at start of charging.

If a communication setup charge is relevant to the communication, the communication setup charge information is included in the first Tariff indication.

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

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

4.3.3.1.4 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 Tariff indication is already passed, then the communication charge of the next tariff instead of the current tariff shall immediately be applied (see also clause 4.3.1 b).

a) Non-monetary-format.

In case of non-monetary-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) Monetary-format.

In case of monetary-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 fixed time unit is one second, according to RFC 4006 [3].

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 communication, the complete sequence shall be provided.

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

4.3.3.2   Procedures after start of charge

If the communication setup charge is applied, all following received communication attempts and communication setup charges shall be ignored.

The following clauses and clause 4.3.2.4 specify the procedures for some specific cases.

4.3.3.2.1   Change current tariff

a) On receipt of the Tariff indication 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 communication 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 communication 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 communication duration;

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

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

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 communication attempt and communication setup charge are not applied.

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.

4.3.3.2.2 Add-on Charge

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

An Add-on-charge indication is allowed after start of charging only.

The charge is either in non-monetary format or in monetary format.

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

4.3.3.3 Subsequent Tariff indications

In addition to the first Tariff indication, subsequent Tariff indications during the communication may be received in the following cases:

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

b) The next tariff and its tariff switch-over time were not received at communication setup. A Tariff indication with the next tariff and the corresponding switchover time will be received before the switchover time.

4.3.4 Handling of identifiers

The initial indication, i.e. either a Tariff indication or an Add-on-charge indication, issued by the application process in a charge determination point shall contain the originationIdentification A.

The initial acknowledgement (i.e. the first Tariff/Add-on-charge response) to this initial (Tariff/Add-on-charge) indication (with originationIdentification and without destinationIdentification) issued by the application process in the 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 Tariff and Add-on-charge indications associated with the same tariff determination instance contain the originationIdentification A and destinationIdentification B. All subsequent Tariff and Add-on-charge responses associated with the same tariff determination instance shall contain the originationIdentification B and destinationIdentification A.

4.4 Signalling requirements

4.4.1 General

When sending Tariff Information, the CDP shall encode this information according to the XML-schema defined in annex C and send it to the CGP. In addition, for this MIME body the AS:

- shall set the Content-Type header to "application/vnd.etsi.sci+xml" and set the Content-Disposition to "render" with the "handling" parameter set to "optional".

In the case the Tariff Information is transported in a message that is forwarded by CDP that contains already a content body, CDP shall generate a multipart/mixed MIME body containing two sub-parts:

- one with the Tariff Information; the Content-Type and Content-Disposition of this sub-part should be coded as specified for non-multipart bodies;

- one with the received body; headers describing the content of the received SIP message (e.g. Content-type) should be moved into the headers of the this subpart.

4.4.2 Procedures during communication set-up

4.4.2.1 Procedures at the CDP

When an INVITE request is received, the CDP operates as a routing B2B UA as specified in clause 5.7.5 of 3GPP TS 24.229 [4] and includes the tariff information in the content body of a reliable 1xx provisional response, or in the content body of a 200 OK.

4.4.3 Procedures after start of charging

4.4.3.1 Procedures at the CDP

The CDP operates as a routing B2B UA as specified in clause 5.7.5 of 3GPP TS 24.229 [4] and may send tariff information at any moment during the active phase of the communication. When sending the tariff information, the CDP shall include the tariff information in the content body of a mid-dialog request, a mid-dialog response or in the content body of a 200 OK response forwarded by the CDP or of an INFO request generated by the CDP.

4.5 Interaction with other services

Not applicable.

4.6 Interactions with other networks

4.6.1 Interaction with PSTN/ISDN

In case of interaction with networks which do not provide tariff information in the signalling system, the tariff information shall be discarded and the communication shall continue according to the basic call procedures.

The elements and types of the SIP Transfer of Tariff Information XML schema, version 1.0 (defined in annex C), shall be mapped to/from the regarding elements and types of the Tariff Charging ASE defined in clause 8 of ES 201 296 [6], as described in table 1. When the MGCF is able to interwork the ISUP charging ASE to a XML instance, the MGCF shall send to the ISDN network an ISUP charging acknowledgment "accepted". Was the interworking not successful, the MGCF acts as described in clause 6.3.6 of ES 201 296 [6] or no acknowledgement is sent.

Table 1: Mapping of Tariff elements

SIP Transfer of Tariff Information XML schema	ISUP Signalling aspects of Tariff Charging ASE

- messageType
  - crgt
  - aocrg
	- chargingMessageType
	  - crgt
	  - aocrg

ChargingTariffInformationType
- chargingControlIndicators
- chargingTariff
  - tariffCurrency
  - tariffPulse
- originationIdentification
- destinationIdentification
  currency
	ChargingTariffInformation
	- chargingControlIndicators
	- chargingTariff
	  - tariffCurrency
	  - tariffPulse
	- originationIdentification
	- destinationIdentification
	- currency

AddOnChargeInformationType
- chargingControlIndicators
- addOnCharge
  - addOnChargeCurrency
  - addOnChargePulse
- originationIdentification
- destinationIdentification
  currency
	AddOnChargeInformation
	- chargingControlIndicators
	- addOnCharge
	  - addOnChargeCurrency
	  - addOnChargePulse
	- originationIdentification
	- destinationIdentification
	  currency

TariffSwitchPulseType
- nextTariffPulse
  tarffSwitchOverTimer
	TariffSwitchPulse
	- nextTariffPulse
	  tarffSwitchOverTimer

CommunicationChargePulseType
- pulseUnits
- chargeUnitTimeInterval
  TariffDuration
	CommunicationChargePulse
	- pulseUnits
	- chargeUnitTimeInterval
	  TariffDuration

TariffPulseFormatType
- communicationChargeSequencePulse
- tariffControlIndicators
- callAttemptChargePulse
  callSetupChargePulse
	TariffPulseFormat
	- communicationChargeSequencePulse
	- tariffControlIndicators
	- callAttemptChargePulse
	  callSetupChargePulse

CommunicationChargeCurrencyType
- currencyFactorScale
- tariffDuration
  subTariffControl
	CommunicationChargeCurrency
	- currencyFactorScale
	- tariffDuration
	  subTariffControl

TariffSwitchCurrencyType
- nextTariffCurrency
  tariffSwitchOverTimer
	TariffSwitchCurrency
	- nextTariffCurrency
	  tariffSwitchOverTimer

TariffCurrencyFormatType
- communicationChargeSequence Currency
- tariffControlIndicators
- callAttemptChargeCurrency
  callSetupChargeCurrency
	TariffCurrencyFormat
	- communicationChargeSequence Currency
	- tariffControlIndicators
	- callAttemptChargeCurrency
	  callSetupChargeCurrency

CurrencyFactorScaleType
- currencyFactor
  currencyScale
	CurrencyFactorScale
	- currencyFactor
	  currencyScale

TariffPulseType
- currentTariffPulse
  tariffSwitchPulse
	TariffPulse
	- currentTariffPulse
	  tariffSwitchPulse

TariffCurrencyType
- currentTariffCurrency
  tariffSwitchCurrency
	TariffCurrency
	- currentTariffCurrency
	  tariffSwitchCurrency

ChargingControlIndicatorsType
- immediateChangeOfActuallyApplied Tariff
  delayUntilStart
	ChargingControlIndicators
	- immediateChangeOfActuallyApplied Tariff
	  delayUntilStart

ChargingReferenceIdentificationType
- networkIdentification
  referenceID
	ChargingReferenceIdentification
	- networkIdentification
	  referenceID

bitType	STRING
eightBitType	OCTET STRING (size (1))
sixteenBitType	OCTET STRING (size (2))
NetworkIdentificationType	NetworkIdentification

SIP Transfer of Tariff Information XML schema	ISUP Signalling aspects of Tariff Charging ASE

CurrencyType
     EUR
     USD
     CNY
     …
	Currency
	     Euro
	     uSDollar
	     chineseYuan
	     …

CurrencyFactorType	CurrencyFactor
CurrencyScaleType	CurrencyScale
TariffDurationType	TariffDuration

4.6.2 Interaction with PSTN/ISDN Emulation

For Further Study.

4.6.3 Interaction with external IP networks

The procedures of 3GPP TS 24.229 [4] shall apply.

5 Extensions within the present document

5.1 SIP Transfer of Tariff Information XML body

5.1.1 General

This subclause contains the SIP Transfer of Tariff Information XML body in XML format. The SIP Transfer of Tariff Information XML shall be valid against the SIP Transfer of Tariff Information XML schema defined in Annex C.

See subclause 5.1.2 for the associated MIME type definition.

5.1.2 MIME type definition

5.1.2.1 Introduction

This subclause defines the MIME type for "application/vnd.etsi.sci+xml". A SIP Transfer of Tariff Information XML Document can be identified with this media type.

5.1.2.2 Syntax

The following optional parameters are defined:

- "charset": the parameter has identical semantics to the charset parameter of the "application/xml" media type as specified in RFC 3023 [9].

- "sv" or "schemaversion": the syntax for the "sv" or "schemaversion" parameter is specified in table 2:

Table 2: Syntax of the "sv" or "schemaversion" parameter

```
m-parameter  /= ("sv" / "schemaversion") EQUAL LDQUOT [ sv-value-list ] RDQUOT
sv-value-list = sv-value-range *( "," sv-value )
sv-value-range = sv-value [ "-" sv-value ]
sv-value     = number / token
number       = 1*DIGIT [ "." 1*DIGIT ]
```

The BNF for m-parameter is taken from IETF RFC 3261 [8] and modified accordingly.

5.1.2.3 Operation

The encoding considerations for "application/vnd.etsi.sci+xml" are identical to those of "application/xml" as described in RFC 3023 [9].

The "sv" or "schemaversion" parameter's value is used to indicate:

- the versions of SIP Transfer of Tariff Information XML schema that can be used to validate the SIP Transfer of Tariff Information XML body (if the MIME type and parameter are present in the Content-Type header) or

- the accepted versions of the SIP Transfer of Tariff Information XML body (if the MIME type and parameter are present in the Accept header).

If the "sv" and "schemaversion" parameter are absent, it shall be assumed that version 1.0 of the XML Schema for the SIP Transfer of Tariff Information XML body is supported.

Annex A (informative):
Signalling flows

NOTE: The UNI AOC messages (to the left of the CGP) are out of scope of the present document and are shown for explanation reasons.
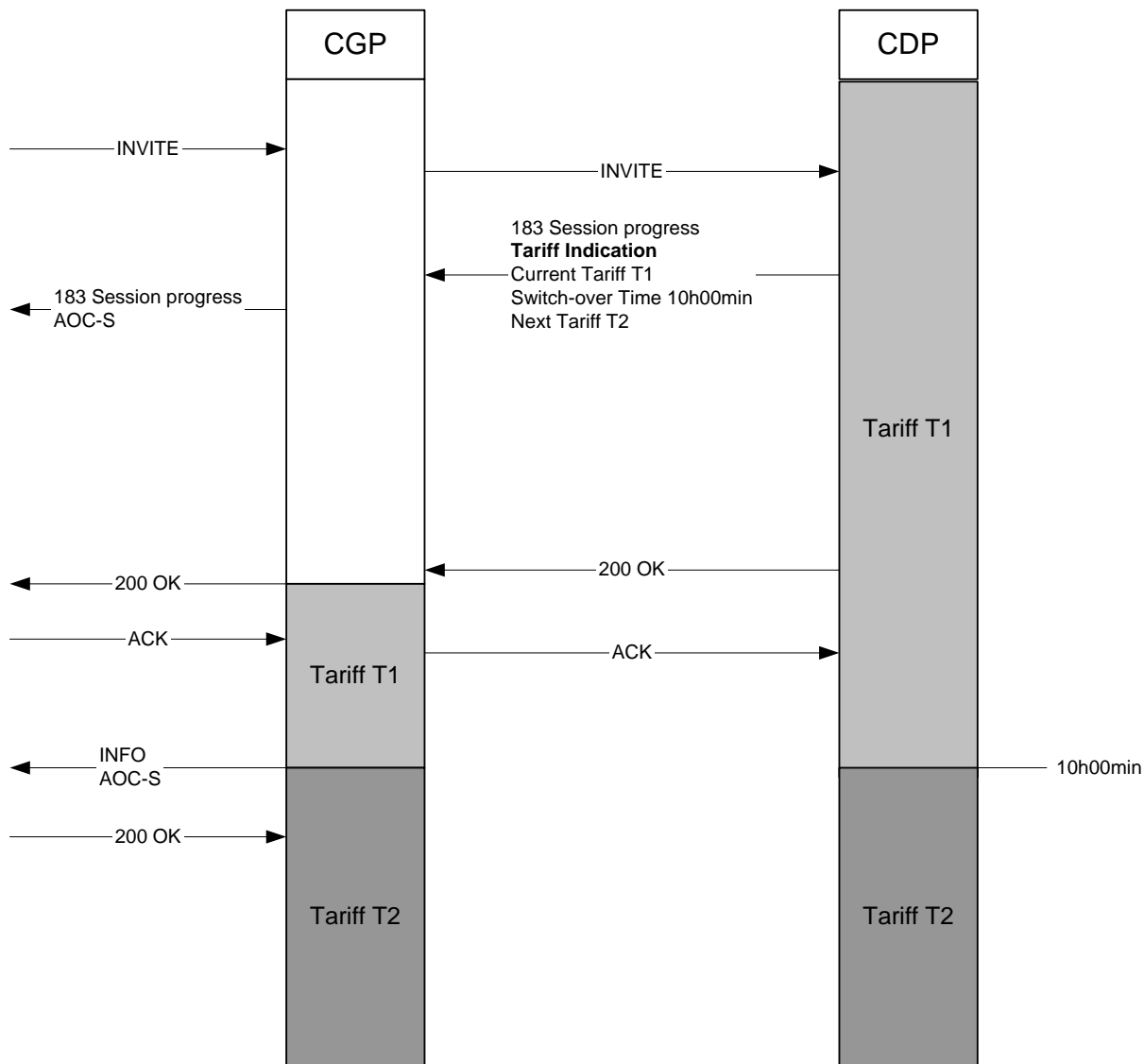
Figure 1: Transfer of Tariff Information during communication set-up

Figure 1 gives an example for transfer of Tariff Information during the communication set-up phase. When an INVITE request is received, the CDP includes the Tariff Information in the content body of a reliable 1xx provisional response, in this example the 183 Session progress response. The Tariff Information includes the current tariff T1, the next tariff T2, and the absolute switch-over time 10 h and 00 min.

The CGP applies T1 when the dialog is confirmed after the reception of the 200 OK. At 10 h and 00 min the CGP switches to T2.
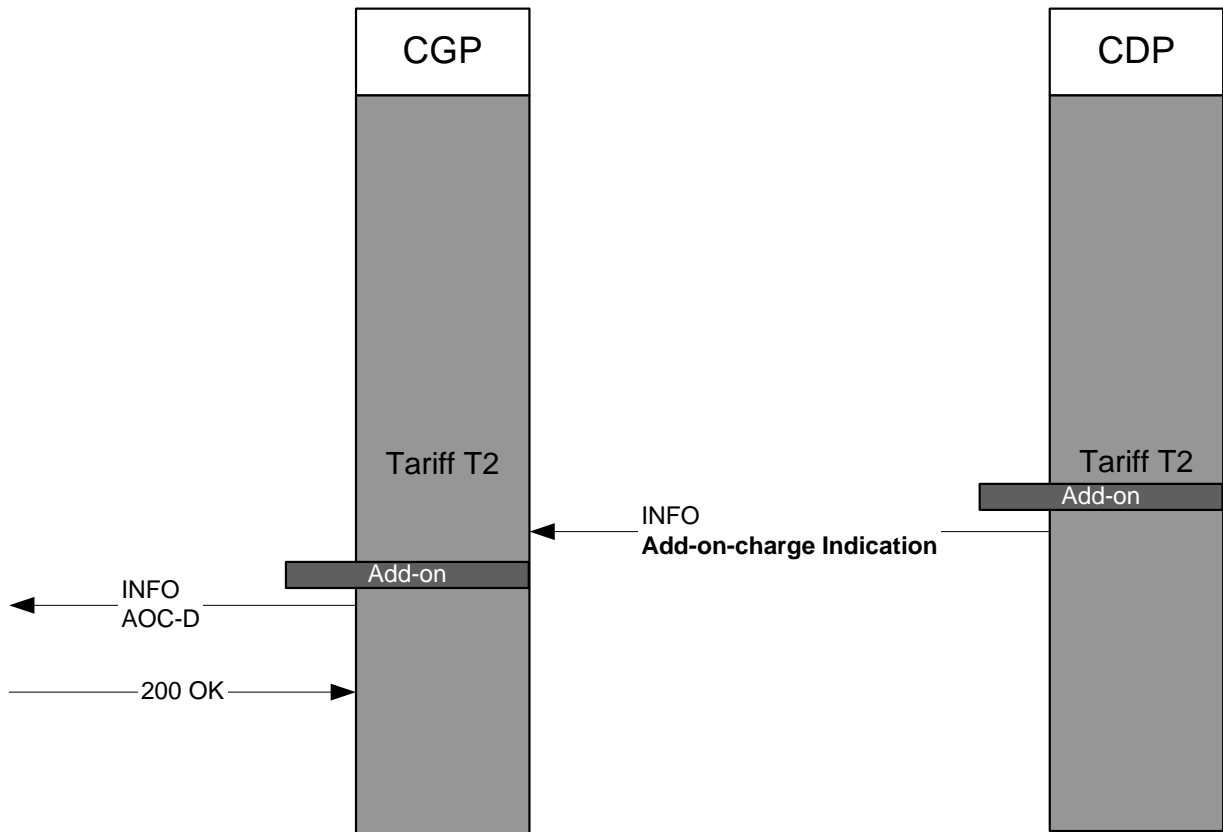
Figure 2: Transfer of Add-on-charge

Figure 2 gives an example for transfer of Add-on-charge after start of charging. The CDP includes the Tariff Information in the content body of an INFO request.

After the reception of the INFO request the CGP applies the Add-on charge.
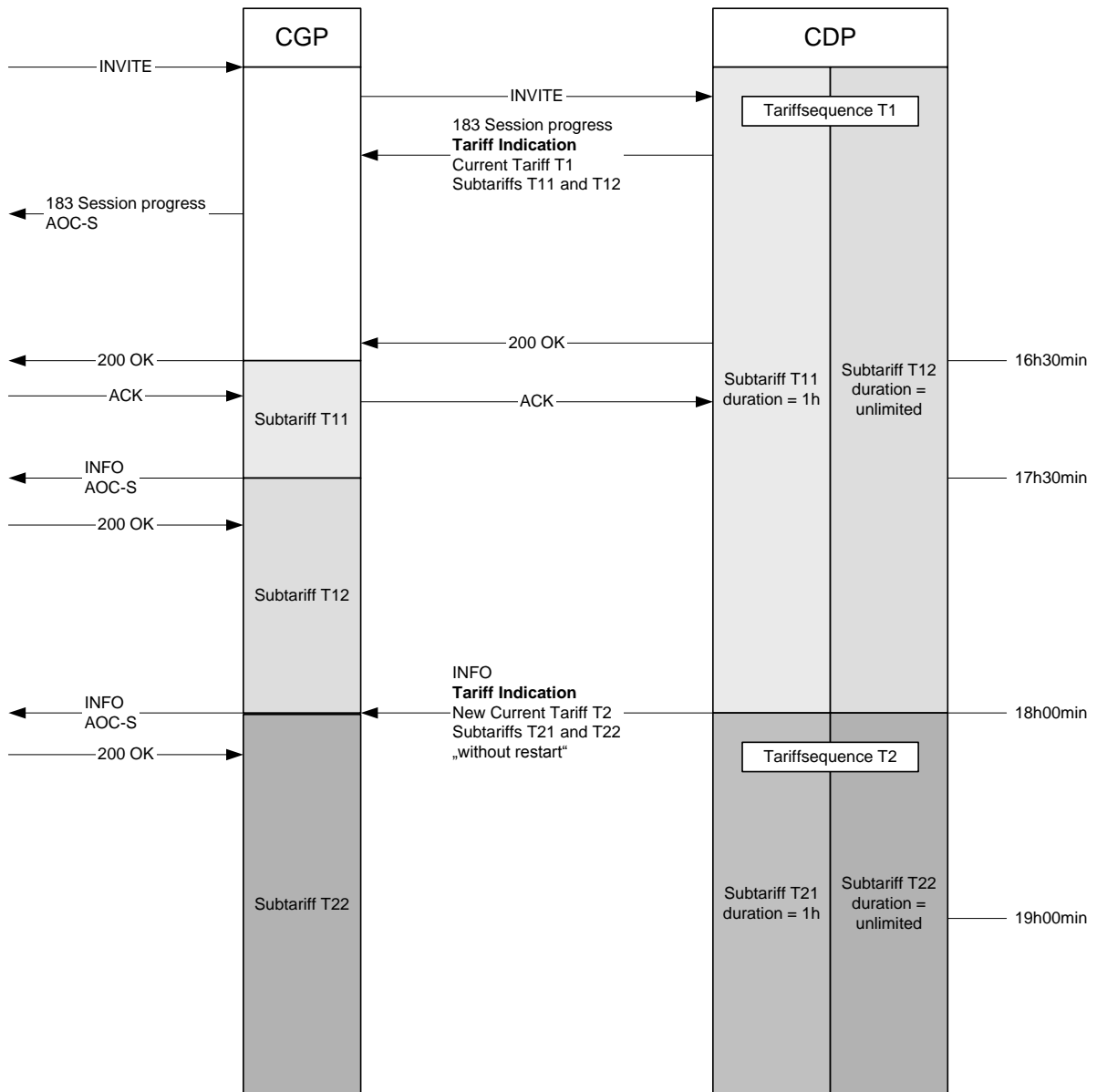
Figure 3: Immediate tariff change without restart of the charging instance

Figure 3 gives an example for an immediate tariff change without a restart of the charging instance. After start of charging, the CDP includes the Tariff Information in the content body of an INFO request. The Tariff Information includes the new current tariff T2, which is a tariff sequence with the sub-tariffs T21 (duration 1 h) and T22 (duration unlimited), and the indication that no restart shall be applied.

After the reception of the INFO request the CGP applies T22, because T22 is valid 1 h and 30 min after communication start.
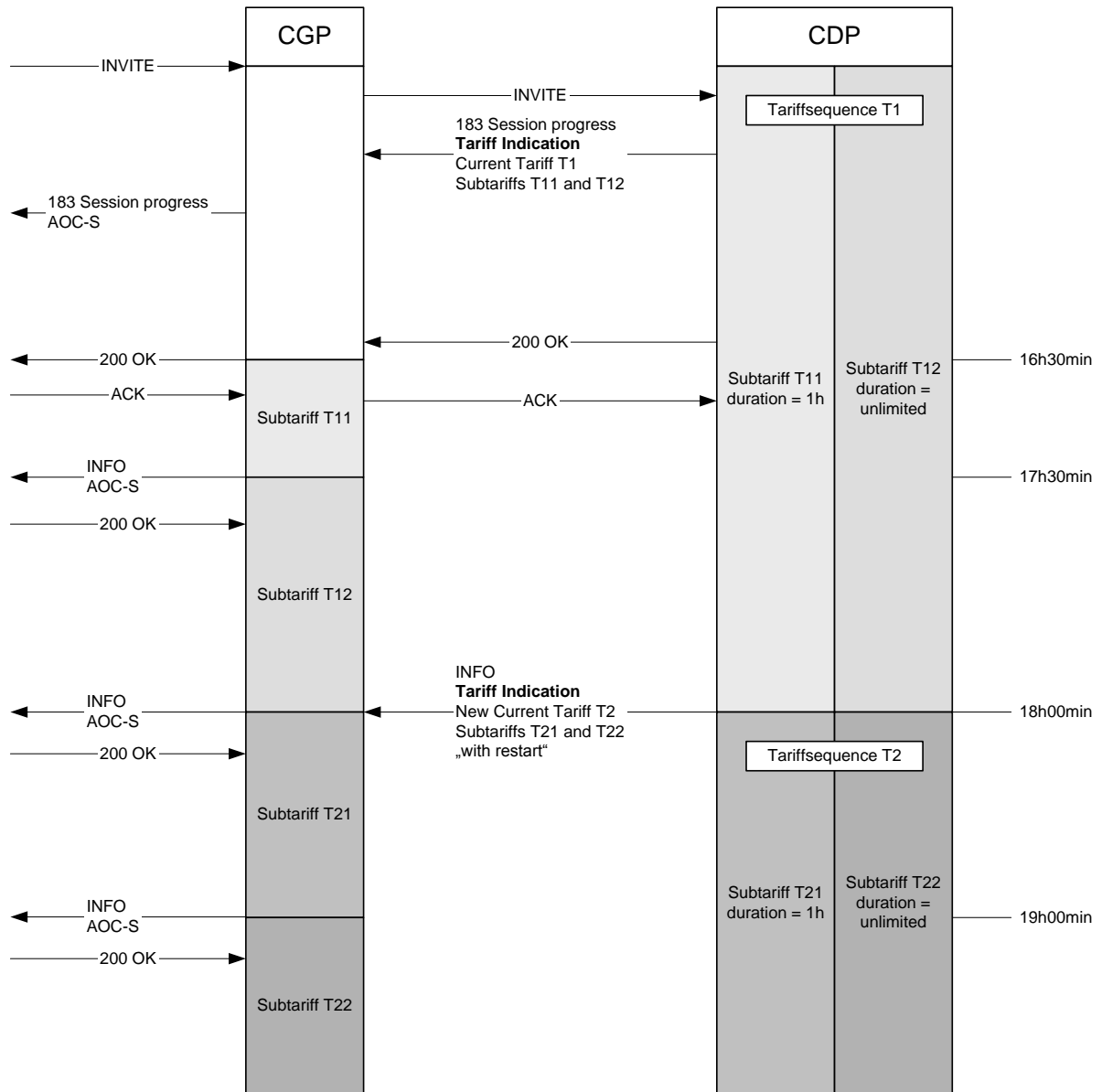
Figure 4: Immediate tariff change with restart of the charging instance

Figure 4 gives an example for an immediate tariff change with a restart of the charging instance. After start of charging, the CDP includes the Tariff Information in the content body of an INFO request. The Tariff Information includes the new current tariff T2, which is a tariff sequence with the sub-tariffs T21 (duration 1 h) and T22 (duration unlimited), and the indication that a restart shall be applied.

After the reception of the INFO request the CGP restarts the charging instance and applies T21 for 1 h, and then switches to T22.

Annex B (informative):
SIP Transfer of Tariff Information parameters

B.1 General

This annex describes the parameters needed to transport SIP NNI information.

B.2 NNI Information

B.2.0 General

For SIP Transfer of Tariff Information the regarding SIP messages shall be able to transport the following basic information:

- Charging Message Type, see clause B.2.1.

- Add On Charge Information, see clause B.2.2.

- Charge Tariff Information, see clause B.2.3.

B.2.1 Charge Message Type

The following Charge Message Types shall be applicable:

crgt   Charge Tariff Information.

aocrg   Add On Charge Information.

B.2.2 Add On Charge Information

B.2.2.0 General

Add On Charge Information is used to add an amount of charge for the communication and does not alter the current tariff. The Destination Identification is not available in an initial AddOnCharge Information message, in all subsequent ones it is included. In the message the add-on charge has either the pulse or currency format.

Add On Charge Information shall contain the following elements:

- Charging Control Indicators (optional), see clause B.3.2.1; and

- Add On Charge, see clause B.2.2.1; and

- Origination Identification, see clause B.3.1.1; and

- Destination Identification (optional), see clause B.3.1.2; and

- Currency (optional), see clause B.3.2.2.

B.2.2.1 Add On Charge

B.2.2.1.0 General

Add On Charge shall contain the following elements:

- Add On Charge Currency, see clause B.2.2.1.1; or

- Add On Charge Pulse, see clause B.2.2.1.2.

B.2.2.1.1 Add On Charge Currency

The Add On Charge Currency element shall be coded as Currency Factor Scale type, see clause B.3.2.3.

B.2.2.1.2 Add On Charge Pulse

The Add On Charge Pulse element shall be coded as Pulse Units type, see clause B.3.2.4.

B.2.3 Tariff Information

B.2.3.0 General

This information is used to transfer explicit tariff data to the originating subscriber's network and the charge registration AS during communication set-up and also in the active phase of a communication. The Destination Identification is not available in an initial Tariff Information, in all subsequent ones it is included.

Tariff Information shall contain the following elements:

- Control Indicators, see clause B.3.2.1; and

- Tariff, see clause B.2.3.1; and

- Origination Identification, see clause B.3.1.1; and

- Destination Identification (optional), see clause B.3.2; and

- Currency, see clause B.3.2.2.

B.2.3.1 Tariff

B.2.3.1.0 General

The Tariff shall contain the following elements

- Tariff Currency, see clause B.2.3.1.1; or

- Tariff Pulse, see clause B.2.3.1.2.

B.2.3.1.1 Tariff Currency

B.2.3.1.1.0 General

The Tariff Currency shall contain the following elements:

- Current Tariff Currency (optional), see clause B.2.3.1.1.1; and

- Tariff Switch Currency (optional), see clause B.2.3.1.1.2.

B.2.3.1.1.1 Current Tariff Currency

The Current Tariff Currency shall be coded as communication charge currency type, see clause B.3.2.5.

B.2.3.1.1.2 Tariff Switch Currency

B.2.3.1.1.2.0 General

The Tariff Switch Currency shall be coded as Tariff Switch Currency type, see clause B.2.3.1.1.2.1.

B.2.3.1.1.2.1 Tariff Switch Currency

B.2.3.1.1.2.1.0 General

Tariff Switch Currency shall contain the following elements:

- Next Tariff Currency, see clause B.2.3.1.1.2.1.1; and

- Tariff Switchover Time, see clause B.2.3.1.1.2.1.2.

B.2.3.1.1.2.1.1 Next Tariff Currency

B.2.3.1.1.2.1.1.0 General

Next Tariff Currency shall be coded as Tariff Currency Format type, see clause B.2.3.1.1.2.1.1.1.

B.2.3.1.1.2.1.1.1 Tariff Currency Format type

B.2.3.1.1.2.1.1.1.0 General

The Tariff Currency Format type shall contain the following elements:

- Communication Charge Sequence Currency (optional), see clause B.3.2.5; and

- Tariff Control Indicators, see clause B.3.2.6; and

- Call Attempt Charge Currency (optional), see clause B.3.2.7; and,

- Call Setup Charge Currency (optional), see clause B.3.2.8.

B.2.3.1.1.2.1.1.1.1 Communication Charge Sequence Currency

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.

The Communication Charge Sequence Currency shall contain a sequence with 1 up to 4 elements coded as Communication Charge Currency, see clause B.3.2.5.

B.2.3.1.1.2.1.2 Tariff Switchover Time

Tariff Switchover Time shall be coded as Tariff Switchover Time type, see clause B.3.2.6.

B.2.3.1.2 Tariff Pulse

The Tariff Pulse shall contain the following elements:

- Current Tariff Pulse (optional), see clause B.2.3.1.2.1; and

- Tariff Switch Pulse (optional), see clause B.2.3.1.2.2.

B.2.3.1.2.1 Current Tariff Pulse

Current Tariff Pulse shall be coded as Tariff Pulse Format type, see clause B.3.2.11.

B.2.3.1.2.2 Tariff Switch Pulse

Tariff Switch Pulse shall be coded as Tariff Switch Pulse type, see clause B.2.3.1.2.2.1.

B.2.3.1.2.2.1 Tariff Switch Pulse Type

The Tariff Switch Pulse type shall contain the following elements:

- Next Tariff Pulse, see clause B.2.3.1.2.2.1.1; and

- Tariff Switchover Time, see clause B.2.3.1.2.2.1.2.

B.2.3.1.2.2.1.1 Next Tariff Pulse

Next Tariff Pulse shall be coded as Tariff Pulse Format type, see clause B.3.2.11.

B.2.3.1.2.2.1.2 Tariff Switchover Time

Tariff Switchover Time shall be coded as Tariff Switchover Time type, see clause B.3.2.9.

B.3 Common information elements/types

B.3.1 Identification

B.3.1.1 Origination identification

The Origination identification shall be expressed as charging reference identification, see clause B.3.1.3.

B.3.1.2 Destination identification

The destination identification shall be expressed as charging reference identification, see clause B.3.1.3.

B.3.1.3 Charge reference identification

Charge reference identification shall contain the following elements:

- Network identification, see clause B.3.1.4; and

- Reference ID, see clause B.3.1.5.

B.3.1.4 Network identification

For the network identification the following structure of the network identification values may be used:

{itu-t (0) administration (2) <data country code> (x) network (y) element identification (z)}

Where the value for x is the value of the national regulation authority, the value for y is under the control of the Data Country Codes (DCCs) as defined in ITU-T Rec. X.121 concerned, and the value for z is under the control of the network concerned.

Any other valid object identifier value according to ITU-T X.660 may also be used. The last component of the object identifier value will usually identify the node creating the charging reference.

B.3.1.5 Reference ID

The reference ID element shall have INTEGER values from 0..4 294 967 295 (maximum value 2^{32} - 1).

B.3.1.6   Network operators

Network operators shall be coded as network identification, see clause B.3.1.4.

B.3.2   Charge

B.3.2.1   Charge control indicators

B.3.2.1.0   General

The charge control indicators shall contain 1 up to 8 bit-strings with the following elements:

- Immediate change of actually applied tariff, see clause B.3.2.1.1; and

- Delay until start, see clause B.3.2.1.2.

B.3.2.1.1   Immediate change of actually applied tariff

The immediate change of actually applied tariff element shall be coded as follows:

    0 - immediate tariff change without restart.

    1 - immediate tariff change with restart.

It is only used to change the actually applied tariff.

B.3.2.1.2   Delay until start

The delay until start element shall be coded as follows:

    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.

B.3.2.2   Currency

The currency element   (optional)shall be coded according to ISO 4217 [5]. The absence of this element shall be interpreted as 'no indication'.

B.3.2.3   Currency factor scale

The charge amount is indicated by the currency factor multiplied with the currency scale. "no charge" indicates currency factor scale has the value 0.

Currency factor scale shall contain the following elements:

- Currency factor, see clause B.3.2.3.1; and

- Currency scale, see clause B.3.2.3.2.

B.3.2.3.1   Currency factor

The currency factor shall have INTEGER values from 0 to 999 999. Value 0 indicates "no charge" and is the default-value.

B.3.2.3.2   Currency scale

The currency scale shall have INTEGER values from -7 to 3. The actual value for currency scale is given by 10^x, where x is the value of the currency scale. The default value is 'no Scale'.

The coding of currency scale 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 : 1 000

B.3.2.4 Pulse units type

Pulse units is binary coded and has the value range from 0 to 255.

B.3.2.5 Communication charge currency type

Communication charge currency shall contain the following elements:

- Currency factor scale, see clause B.3.2.3; and

- Tariff duration, see clause B.3.2.5.1; and

- Sub tariff control, see clause B.3.2.5.2.

B.3.2.5.1 Tariff duration

Tariff duration shall be coded as tariff duration type, see clause B.3.2.12.

B.3.2.5.2 Sub tariff control

Sub tariff control shall be coded as sub tariff control type, see clause B.3.2.13.

B.3.2.6 Tariff control iIndicators

The tariff control indicators shall contain a bit-string of 1 up to 8 non-cyclic tariff elements.

The coding of the non-cyclic Ttariff 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).

B.3.2.7 Call attempt charge currency

The call attempt charge is a direct charge, to be charged only for unsuccessful calls.

The call attempt charge currency shall be coded as Currency Factor Scale, see clause B.3.2.3.

B.3.2.8   Call setup charge currency

The call set-up charge is a direct charge, to be charged once at start of charging.

The call setup charge currency shall be coded as Currency Factor Scale, see clause B.3.2.3.

B.3.2.9   Tariff switchover time type

This time is the absolute time at which the next tariff has to become active. It is represented in steps of 15 min.

The tariff switchover time shall be coded as:

0 : spare.

1 : 0 h 15 min.

2 : 0 h 30 min.

3 : 0 h 45 min.

4 : 1 h   0 min.

..

96 : 24 h   0 min.

97-255 : spare.

B.3.2.10 Communication charge pulse type

Communication charge pulse shall contain the following elements:

- Pulse Units, see clause B.3.2.10.1; and

- Charge Unit Time Interval, see clause B.3.2.10.2; and

- Tariff Duration, see clause B.3.2.10.3.

B.3.2.10.1 Pulse units

Pulse units shall be coded as pulse units type, see clause B.3.2.4.

B.3.2.10.2 Charge unit time interval

Charge unit time interval shall be coded as charge unit time interval type, see clause B.3.2.14.

B.3.2.10.3   Tariff duration

Tariff duration shall be coded as tariff duration type, see clause B.3.2.12.

B.3.2.11 Tariff pulse format type

Tariff pulse format shall contain the following elements:

- Communication charge sequence pulse (optional), see clause B.3.2.11.1; and

- Tariff control indicators, see clause B.3.2.6; and

- Call attempt charge pulse (optional), see clause B.3.2.11.2; and

- Call setup charge pulse (optional), see clause B.3.2.11.3.

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.

B.3.2.11.1 Communication charge sequence pulse

The communication charge sequence pulse shall contain a sequence of 1 up to 4 elements coded as communication charge pulse, see clause B.3.2.10.

B.3.2.11.2 Call attempt charge pulse

Call attempt charge pulse shall be coded as pulse units, see clause B.3.2.4.

B.3.2.11.3 Call setup charge pulse

Call setup charge pulse shall be coded as pulse units, see clause B.3.2.4.

B.3.2.12 Tariff duration type

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 tariff control indicators.

Tariff duration shall have a INTEGER values form 0 to 36 000.

Tariff duration identifies with 0 unlimited duration and else in seconds unit.

> 0 = unlimited
>
> 1 = 1 s
>
> 2 = 2 s
>
> ...
>
> 36 000 = 10 h

B.3.2.13 Sub tariff control type

Sub tariff control shall contain 1 up to 8 one time charge elements. The coding of the one time charge element is as follows:

> 0 - Periodic charge.
>
> 1 - One time charge.

B.3.2.14 Charge unit time interval type

The charge unit time interval is binary coded and has the value range from 0 to 35 997. It begins with 200 msec and then in steps of 50 msec.

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

..

35 997 : 30 min

All other values are spare.

Annex C (normative):
SIP Transfer of Tariff   Information XML schema:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns="http://uri.etsi.org/ngn/params/xml/simservs/sci"
targetNamespace="http://uri.etsi.org/ngn/params/xml/simservs/sci" elementFormDefault="qualified"
version="1.0">
    <xs:annotation>
        <xs:documentation>XML Schema Definition for the AOC information</xs:documentation>
    </xs:annotation>
    <!--Definition of simple types-->
    <xs:simpleType name="bitType">
        <xs:restriction base="xs:boolean">
        <!-- The boolean datatype value "true" maps to bit value "1" and the value "false" to bit
value "0" -->
        </xs:restriction>
    </xs:simpleType>
    <xs:simpleType name="EightBitType">
        <xs:restriction base="xs:hexBinary">
            <xs:length value="1"/>
        </xs:restriction>
    </xs:simpleType>
    <xs:simpleType name="SixteenBitType">
        <xs:restriction base="xs:hexBinary">
            <xs:length value="2"/>
        </xs:restriction>
    </xs:simpleType>
<!-- Following structure of the networkIdentification value may 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. -->
    <xs:simpleType name="NetworkIdentificationType">
        <xs:restriction base="xs:string">
            <xs:pattern value="02[0-9A-F]+"/>
        </xs:restriction>
    </xs:simpleType>
    <!-- E.g. the value '028207023FFF' could be a valid example of the NetworkIdentificationType. --
>
    <xs:simpleType name="CurrencyType">
        <xs:restriction base="xs:string">
            <xs:length value="3" fixed="true" />
            <!--The currency shall be coded according to ISO 4217-->
        </xs:restriction>
    </xs:simpleType>
    <xs:simpleType name="CurrencyFactorType">
        <xs:restriction base="xs:integer">
            <xs:minInclusive value="0"/>
            <xs:maxInclusive value="999999"/>
        </xs:restriction>
    </xs:simpleType>
    <xs:simpleType name="CurrencyScaleType">
        <xs:restriction base="xs:integer">
            <xs:minInclusive value="-7"/>
            <xs:maxInclusive value="3"/>
        </xs:restriction>
    </xs:simpleType>
    <xs:simpleType name="TariffDurationType">
        <xs:restriction base="xs:integer">
            <xs:minInclusive value="0"/>
            <xs:maxInclusive value="36000"/>
        </xs:restriction>
    </xs:simpleType>
    <!--Definition of complex types-->
    <xs:complexType name="TariffSwitchPulseType">
        <xs:sequence>
            <xs:element name="nextTariffPulse" type="TariffPulseFormatType"/>
            <xs:element name="tariffSwitchOverTime" type="EightBitType"/>
        </xs:sequence>
    </xs:complexType>
    <xs:complexType name="CommunicationChargePulseType">
```

```
        <xs:sequence>
            <xs:element name="pulseUnits" type="EightBitType"/>
            <xs:element name="chargeUnitTimeInterval" type="SixteenBitType"/>
            <xs:element name="tariffDuration" type="TariffDurationType"/>
        </xs:sequence>
    </xs:complexType>
    <xs:complexType name="TariffPulseFormatType">
        <xs:sequence>
            <xs:element name="communicationChargeSequencePulse" type="CommunicationChargePulseType"
minOccurs="0" maxOccurs="4"/>
            <xs:element name="tariffControlIndicators" type="bitType"/>
            <xs:element name="callAttemptChargePulse" type="EightBitType" minOccurs="0"/>
            <xs:element name="callSetupChargePulse" type="EightBitType" minOccurs="0"/>
        </xs:sequence>
    </xs:complexType>
    <xs:complexType name="CommunicationChargeCurrencyType">
        <xs:sequence>
            <xs:element name="currencyFactorScale" type="CurrencyFactorScaleType"/>
            <xs:element name="tariffDuration" type="TariffDurationType"/>
            <xs:element name="subTariffControl" type="bitType"/>
        </xs:sequence>
    </xs:complexType>
    <xs:complexType name="TariffSwitchCurrencyType">
        <xs:sequence>
            <xs:element name="nextTariffCurrency" type="TariffCurrencyFormatType"/>
            <xs:element name="tariffSwitchOverTime" type="EightBitType"/>
        </xs:sequence>
    </xs:complexType>
    <xs:complexType name="TariffCurrencyFormatType">
        <xs:sequence>
            <xs:element name="communicationChargeSequenceCurrency"
type="CommunicationChargeCurrencyType" minOccurs="0" maxOccurs="4"/>
            <xs:element name="tariffControlIndicators" type="bitType"/>
            <xs:element name="callAttemptChargeCurrency" type="CurrencyFactorScaleType"
minOccurs="0"/>
            <xs:element name="callSetupChargeCurrency" type="CurrencyFactorScaleType"
minOccurs="0"/>
        </xs:sequence>
    </xs:complexType>
    <xs:complexType name="CurrencyFactorScaleType">
        <xs:sequence>
            <xs:element name="currencyFactor" type="CurrencyFactorType"/>
            <xs:element name="currencyScale" type="CurrencyScaleType"/>
    </xs:sequence>
    </xs:complexType>
    <xs:complexType name="TariffPulseType">
        <xs:sequence>
            <xs:element name="currentTariffPulse" type="TariffPulseFormatType" minOccurs="0"/>
            <xs:element name="tariffSwitchPulse" type="TariffSwitchPulseType" minOccurs="0"/>
        </xs:sequence>
    </xs:complexType>
    <xs:complexType name="TariffCurrencyType">
        <xs:sequence>
            <xs:element name="currentTariffCurrency" type="TariffCurrencyFormatType" minOccurs="0"/>
            <xs:element name="tariffSwitchCurrency" type="TariffSwitchCurrencyType" minOccurs="0"/>
        </xs:sequence>
    </xs:complexType>
    <xs:complexType name="ChargingControlIndicatorsType">
        <xs:sequence>
            <xs:element name="immediateChangeOfActuallyAppliedTariff" type="bitType" minOccurs="0"/>
            <xs:element name="delayUntilStart" type="bitType" minOccurs="0"/>
        </xs:sequence>
    </xs:complexType>
    <xs:complexType name="ChargingReferenceIdentificationType">
        <xs:sequence>
            <xs:element name="networkIdentification" type="NetworkIdentificationType"/>
            <xs:element name="referenceID" type="xs:nonNegativeInteger"/>
        </xs:sequence>
    </xs:complexType>
    <xs:complexType name="ChargingTariffInformationType">
        <xs:sequence>
            <xs:element name="chargingControlIndicators" type="ChargingControlIndicatorsType"/>
            <xs:element name="chargingTariff">
                <xs:complexType>
                    <xs:choice>
                        <xs:element name="tariffCurrency" type="TariffCurrencyType"/>
                        <xs:element name="tariffPulse" type="TariffPulseType"/>
                    </xs:choice>
```

```
                </xs:complexType>
            </xs:element>
            <xs:element name="originationIdentification"
type="ChargingReferenceIdentificationType"/>
            <xs:element name="destinationIdentification" type="ChargingReferenceIdentificationType"
minOccurs="0"/>
            <xs:element name="currency" type="CurrencyType" minOccurs="0"/>
        </xs:sequence>
    </xs:complexType>
    <xs:complexType name="AddOnChargingInformationType">
        <xs:sequence>
            <xs:element name="chargingControlIndicators" type="ChargingControlIndicatorsType"/>
            <xs:element name="addOnCharge">
                <xs:complexType>
                    <xs:choice>
                        <xs:element name="addOnChargeCurrency" type="CurrencyFactorScaleType"/>
                        <xs:element name="addOnChargePulse" type="EightBitType"/>
                    </xs:choice>
                </xs:complexType>
            </xs:element>
            <xs:element name="originationIdentification"
type="ChargingReferenceIdentificationType"/>
            <xs:element name="destinationIdentification" type="ChargingReferenceIdentificationType"
minOccurs="0"/>
            <xs:element name="currency" type="CurrencyType" minOccurs="0"/>
        </xs:sequence>
    </xs:complexType>
    <!--Definition of document structure-->
    <xs:element name="messageType">
        <xs:complexType>
            <xs:choice>
                <xs:element name="crgt" type="ChargingTariffInformationType"/>
                <xs:element name="aocrg" type="AddOnChargingInformationType"/>
            </xs:choice>
        </xs:complexType>
    </xs:element>
</xs:schema>
```

Annex D (informative): IANA registration templates

D.1 IANA registry for Application Media Types

D.1.1 IANA Registration template for application/vnd.etsi.sci+xml

NOTE 1: The information in the present Clause is for registration at IANA. RFC 4288 [10], section 9, describes the process that applies in case of changes to the registry of media types. Any future changes to the XML schema in Annex C or to the present Annex D.1.1 would require that this procedure is invoked.

NOTE 2: The MIME type "application/vnd.etsi.sci+xml" has originally been registered at IANA based on ETSI TS 183 058 v2.0.0. The maintenance responsibility for this specification has been transfered to 3GPP. Some corrections to the syntax of the XML schema are only included in the present specification, The original IANA registration is therefore outdated.

MIME media type name:

application

MIME subtype name:

vnd.etsi.sci+xml

Required parameters:

None

Optional parameters:

"charset" the parameter has identical semantics to the charset parameter of the "application/xml" media type as specified in RFC 3023 [9].

"sv" or "schemaversion" the parameter's value is used to indicate:

- the versions of the SIP Transfer of Tariff Information XML schema that can be used to validate the SIP Transfer of Tariff Information XML body (if the MIME type and parameter are present in the Content-Type header field) or

- the accepted versions of the SIP Transfer of Tariff Information XML body (if the MIME type and parameter are present in the Accept header field).

If the "sv" and "schemaversion" parameter are absent, it shall be assumed that version 1.0 of the SIP Transfer of Tariff Information XML body is supported.

Encoding considerations:

Same as encoding considerations of application/xml as specified in RFC 3023 [9]

Security considerations:

Same as general security considerations for application/xml as specified in section 10 of RFC 3023 [9].

In addition, this content type provides a format for exchanging information in SIP, so the security considerations from RFC 3261 [8] apply.

Interoperability considerations:

Same as Interoperability considerations as specified in section 3.1 of RFC 3023 [9].

If both "sv" and "schemaversion" are specified, then the value of "schemaversion" is ignored.

Published specification:

3GPP TS 29.658, version 8.4.0: "SIP Transfer of IP Multimedia Service Tariff Information; Protocol specification"

Available via <http://www.3gpp.org/specs/numbering.htm>.

Applications which use this media:

Applications that use the 3GPP IP multimedia (IM) Core Network (CN) subsystem as defined by 3GPP.

Intended usage:

COMMON

Additional information :

1. **Magic number(s)** : none

2. **File extension(s)** : none

3. **Macintosh file type code** : none

4. **Object Identifiers**: none

Annex E (informative):
Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2008-01					Publication as ETSI TS 183 058		2.0.0
2008-01					Conversion to 3GPP TS 29.458		2.0.1
2008-01					Technically identical copy as 3GPP TS 24.658 as basis for further development.		2.0.2
2008-05					General corrections [C3-080721 at C3-48]	2.0.2	2.1.0
2008-11					Registration of MIME type with IANA [C3-081666 at C3-49]	2.1.0	2.2.0
2008-11					Correction in add on charging information [C3-081635 at C3-49]	2.2.0	2.3.0
2008-11					Network identification format for SIP Transfer of Charging Information parameters [C3-081636 at C3-49]	2.2.0	2.3.0
2008-12	TSG#42				v 8.0.0 was produced by MCC	2.3.0	8.0.0
2009-03	TSG#43	CP-090089	001	3	Charging terminology	8.0.0	8.1.0
2009-03	TSG#43	CP-090062	002		Correction of scope	8.0.0	8.1.0
2009-05	TSG#44	CP-090343	003		Invalid XML schema bug fix	8.1.0	8.2.0
2009-09	TSG#45	CP-090631	005	003	Aligning IANA registration of MIME type "application/vnd.etsi.sci+xml"	8.2.0	8.3.0
2009-12	TSG#46	CP-090846	004	1	RTTI Schema corrections	8.3.0	8.4.0
2009-12	TSG#46	CP-090846	006	2	IANA Registration template for application/vnd.etsi.sci+xml	8.3.0	8.4.0
2009-12	TSG#46				Automatic upgrade from previous Release	8.4.0	9.0.0
2011-03	TSG#51				Automatic upgrade from previous Release version 9.0.0	9.0.0	10.0.0
2012-06	TSG#56	CP-120333	015	1	SIP Transfer of tariff XML correction	10.0.0	10.1.0
2012-09	TSG#57				Automatic upgrade from previous Release version 10.1.0	10.1.0	11.0.0