ETSI TS 124 390 V11.6.0 (2015-10)

TECHNICAL SPECIFICATION

Universal Mobile Telecommunications System (UMTS);
LTE;
Unstructured Supplementary Service Data (USSD)
using IP Multimedia (IM) Core Network (CN) subsystem IMS;
Stage 3
(3GPP TS 24.390 version 11.6.0 Release 11)

Reference

RTS/TSGC-0124390vb60

Keywords

LTE,UMTS

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
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Contents

Foreword

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1 Scope

The present document describes the procedures for using Unstructured Supplementary Service Data (USSD) operations for mobile initiated MMI mode over IP Multimedia Core Network Subsystem (IMS). MMI mode is for the transparent transport of MMI strings entered by the user to the Application Servers (AS) and for the transparent transport of text strings back to the User Equipment (UE) to be displayed for user information. Support of USSD service is optional and only applicable for an operator's Public Land Mobile Network (PLMN).

The present document is applicable to UE and AS which are intended to support USSD operations over IP Multimedia Core Network Subsystem (IMS) in mobile initiated MMI mode.

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*.

[1]   3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2]   IETF RFC 6086 (January 2011): "Session Initiation Protocol (SIP) INFO Method and Package Framework".

[3]   3GPP TS 24.090: " Unstructured Supplementary Service Data (USSD); Stage 3".

[4]   3GPP2 X.S0065-0 v1.0 (April 2012): "Unstructured Supplementary Service Data (USSD) Support".

[5]   3GPP TS 24.080: "Mobile radio interface layer 3 supplementary services specification; Formats and coding".

[6]   3GPP TS 24.229: "IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".

[7]   IETF RFC 4967 (July 2007): "Dial String Parameter for the Session Initiation Protocol Uniform Resource Identifier".

[8]   3GPP TS 24.238: "Session Initiation Protocol (SIP) based user configuration; Stage 3".

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

[10]   IETF RFC 3023: "XML Media Types".

[11]   IETF RFC 3261: "SIP: Session Initiation Protocol".

[12]   IETF RFC 5646 (September 2009): "Tags for Identifying Languages".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

AS	Application Server
IMS	IP Multimedia core network Subsystem
UE	User Equipment
USSD	Unstructured Supplementary Service Data
USSI	Unstructured Supplementary Service Data over IM CN subsystem

4 USSD using IMS

4.1 Introduction

This service provides the support for UE initiated MMI-mode USSD operations, which enables the transparent transport of MMI strings entered by the user to the IM core network and enables the transparent transport of text strings from the IM core network which are displayed by the UE for user information.

4.2 Description

There is no service description.

4.3 Operational requirements

There are no operational requirements.

4.4 Coding requirements

There are no coding requirements over and above those specified in 3GPP°TS°24.229°[6].

4.5 Signalling requirements

4.5.1 General

In the IM CN subsystem USSD messages can be transported in SIP INFO requests, SIP INVITE requests and SIP BYE requests, using a application/vnd.3gpp.ussd+xml MIME body.

Figure 4.1 and figure 4.2 give an overview of the supported USSD operations:

UE   USSI AS

                                      INVITE

\--->

language, ussd-String

BYE

<---

language, ussd-String

BYE

<- -
- - - - - -

Error
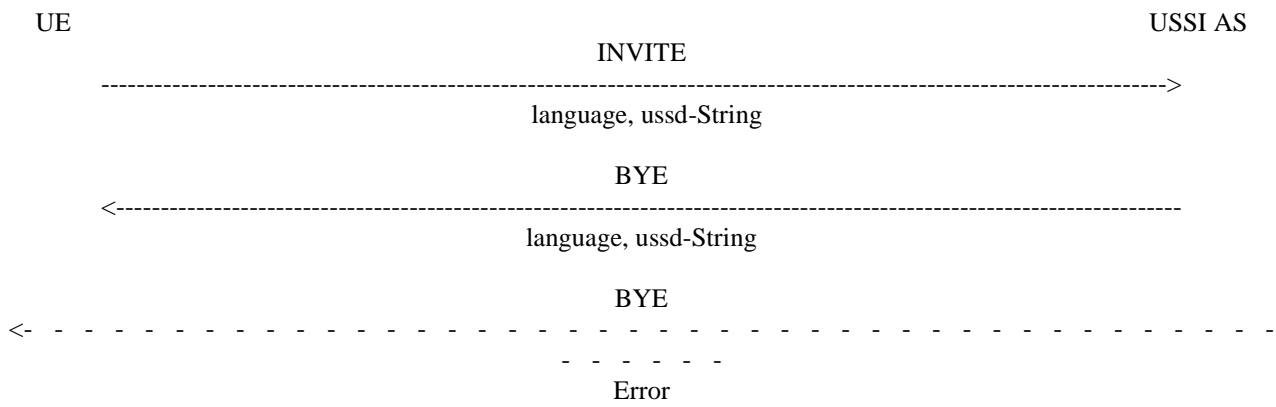
Figure 4.1: UE initiated USSD operation, network does not request further information

UE   USSI AS

                                      INVITE

\--->

language, ussd-String

INFO

<---

language, ussd-String

INFO

\--->

language, ussd-String

INFO

- -
- - - ->

Error

.

.

.

BYE

<---

language, ussd-String

BYE

<- -
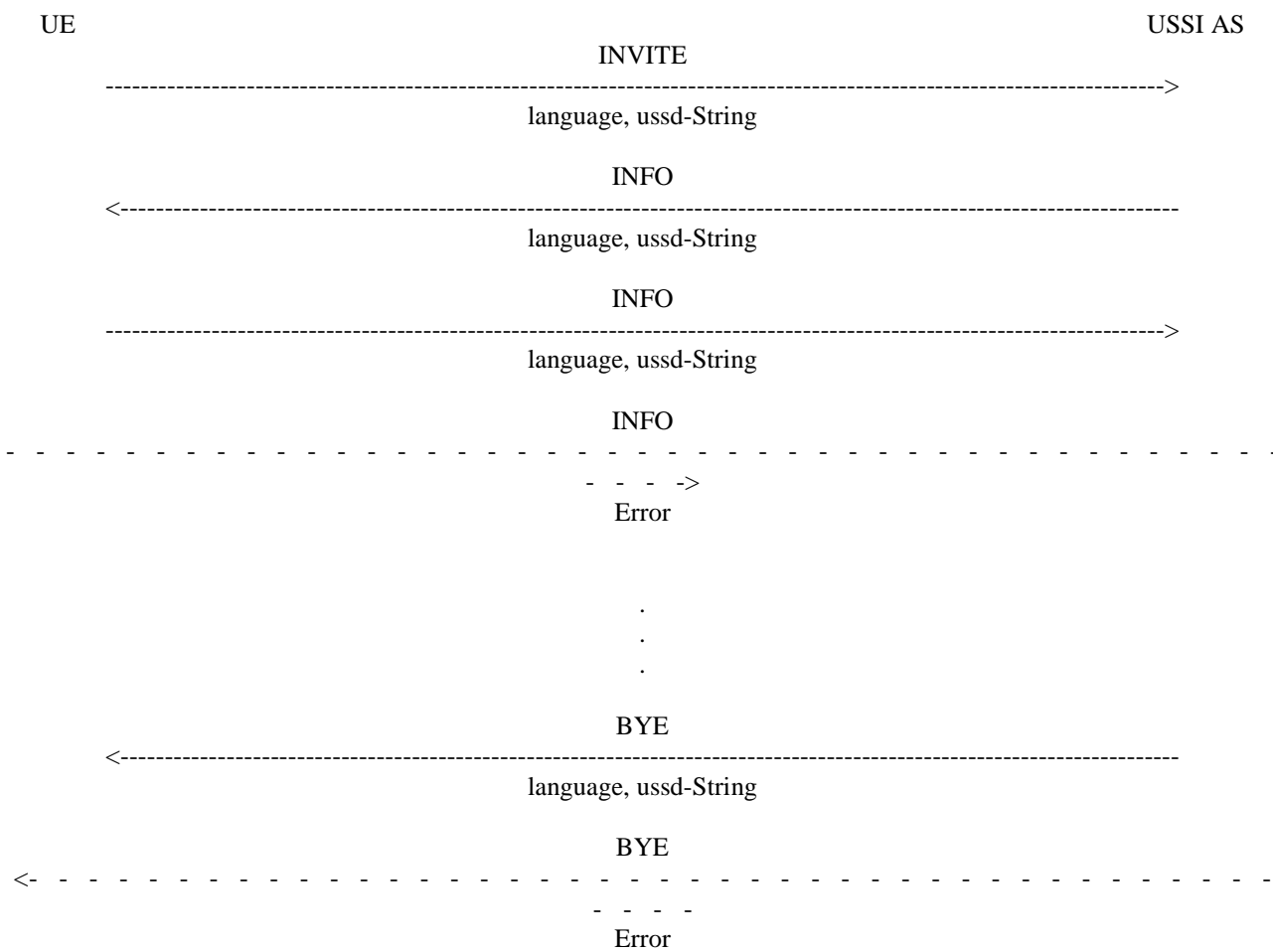- - - -

Error

Figure 4.2: UE initiated USSD operation, network requests further information

4.5.2 SDP Offer/Answer

When a UE sends an initial INVITE request, in order to establish a USSD session, it shall include an SDP offer with one media description, according to subclause 6.1.2 of 3GPP TS 24.229 [6]. The UE shall add a zero port number value to the media descriptions of the SDP offer, in order to inform network entities that media resources are not requested for the session.

When the USSI AS sends an SDP answer, it shall also add a zero port number value to any media description received in the associated SDP offer.

4.5.3 Activation/deactivation

4.5.4 Invocation and operation

4.5.4.1 Actions at the originating UA

NOTE 1: The Content-Language SIP header field is not used to determine the language of the USSD string. Only the <language> XML element is used.

In order to send the initial USSD message, the UE shall send an initial INVITE request, according to 3GPP TS 24.229 [6]. The UE shall populate the request as follows:

1) Request-URI set to a SIP URI with user part including the USSD string and and phone-context parameter set according to TS 24.229 [6], a host part set to the home netwok domain name used in REGISTER request as defined in TS 24.229 [6] a "user" URI parameter set to value "dialstring" as specified in RFC 4967 [7];

2) Recv-Info header field containing the g.3gpp.ussd info-package name;

3) Accept header field containing the application/vnd.3gpp.ussd+xml, application/sdp and multipart/mixed MIME types;

4) the Content-Type header, which shall contain "multipart/mixed";

5) SDP offer as described in subclause 4.5.2; and

6) application/vnd.3gpp.ussd+xml MIME body as described in subclause 5.1.3 with a Content-Disposition header field set to "render" and with "handling" header field parameter set to "optional". The XML document shall contain a single <ussd-string> element and may contain a <language> element.

When receiving an INFO request with Info-Package header field containing the g.3gpp.ussd info-package and containing application/vnd.3gpp.ussd+xml MIME body associated with the info package according to IETF RFC 6086 [2], the UE shall, in addition to the procedures specified in 3GPP TS 24.229 [6]:

1) if the UE is able to process the received information, send an INFO request within the dialog, according to 3GPP TS 24.229 [6]. The UE shall populate the INFO request as follows:

   a) Info-Package header field containing the g.3gpp.ussd info-package name; and

   b) application/vnd.3gpp.ussd+xml MIME body as described in subclause 5.1.3, associated with the info package according to IETF RFC 6086 [2] containing the user's response in a <ussd-string> element and optionally a <language> element; and

2) if the UE is not able to process the received information or rejects the received information, send an INFO request within the dialog, according to 3GPP TS 24.229 [6]. The UE shall populate the INFO request as follows:

   a) Info-Package header field containing the g.3gpp.ussd info-package name; and

   b) application/vnd.3gpp.ussd+xml MIME body as described in subclause 5.1.3, associated with the info package according to IETF RFC 6086 [2] containing an <error-code> element.

When receiving a BYE request containing application/vnd.3gpp.ussd+xml MIME body, the UE shall, in addition to the procedures specified in 3GPP TS 24.229 [6] handle the application/vnd.3gpp.ussd+xml MIME body.

NOTE 2: According to 3GPP TS 24.229 [6], the UE can receive a BYE request without the application/vnd.3gpp.ussd+xml MIME body and in this case the dialog is terminated immediately.

4.5.4.2   Actions at the AS

In addition to the procedures specified in this subclause, the USSI AS shall support the procedures specified in 3GPP TS 24.229 [6] for an AS.

NOTE 1: The Content-Language SIP header field is not used to determine the language of the USSD string. Only the <language> XML element is used.

Upon receiving an initial INVITE request with Request-URI containing the SIP URI including the USSD string and a "user" URI parameter set to value "dialstring" as specified in RFC 4967 [7], if the application/vnd.3gpp.ussd+xml MIME body contained in the request is accepted by the USSI AS, the USSI AS shall:

1) pass the USSD data received in the body of the SIP INVITE request to the USSD application handling and wait for the response of the application;

NOTE 2: How the USSD data are processed at the USSI AS is outside the scope of this specification. The USSI AS can handle the USSD dialogs or forward the USSD requests and responses to/from a legacy USSD server.

NOTE 3: The USSD string in the request-URI is not passed to the USSD application handling. In case of discrepancy between this string and the <ussd-string> element contained in the MIME body, the behaviour of the AS is determined by the <ussd-string> in the MIME body.

2) send 200 (OK) response to the request following the procedures specified for AS acting as a terminating UA in 3GPP TS 24.229 [6]. The USSI AS shall populate the 200 (OK) response to the request as follows:

   a) Recv-Info header field containing the g.3gpp.ussd info-package name;

   b) Accept header field containing the application/vnd.3gpp.ussd+xml, application/sdp and multipart/mixed MIME types; and

   c) SDP answer as described in subclause 4.5.2.

Upon receiving an ACK request associated with the INVITE request, the USSI AS shall:

1) if the network requests further information in order to perform the USSD operation, send an INFO request within the dialog created by the INVITE request. The USSI AS shall populate the INFO request as follows:

   a) Info-Package header field containing the g.3gpp.ussd info-package name; and

   b) application/vnd.3gpp.ussd+xml MIME body as described in subclause 5.1.3, associated with the info package according to IETF RFC 6086 [2] including a <ussd-string> element and a <language> element;

2) if the network successfully performed the USSD information and does not need any further information, send a BYE request in order to terminate the dialog. The USSI AS shall populate the BYE request with application/vnd.3gpp.ussd+xml MIME body, as described in subclause 5.1.3 including a <ussd-string> element and a <language> element; and

3) if the network informs the UE that the network is unable to process the USSD request or the network informs the UE that the network rejects the USSD request, send a BYE request in order to terminate the dialog. The USSI AS shall populate the BYE request with application/vnd.3gpp.ussd+xml MIME body, as described in subclause 5.1.3, including, a <error-code> element.

Upon receiving a SIP INFO request with Info-Package header field containing the g.3gpp.ussd info-package and a application/vnd.3gpp.ussd+xml MIME body associated with the info package according to IETF RFC 6086 [2], the USSI AS shall handle the SIP INFO request following the procedures specified for AS acting as a terminating UA in 3GPP TS 24.229 [6] and generate a SIP response as described in 3GPP TS 24.229 [6]. If the SIP response is a 2xx response, the USSI AS shall:

1) pass the USSD data received in the body of the SIP INFO request to the USSD application handling and wait for the response of the application;

NOTE 4: How the USSD data are processed at the USSI AS is outside the scope of this specification. The USSI AS can handle the USSD dialogs or forward the USSD requests and responses to/from a legacy USSD server.

2) if the network requests further information in order to perform the USSD operation, send an INFO request within the dialog. The USSI AS shall populate the INFO request as follows:

a) Info-Package header field containing the g.3gpp.ussd info-package name; and

b) application/vnd.3gpp.ussd+xml MIME body as described in subclause 5.1.3, associated with the info package according to IETF RFC 6086 [2] including a <ussd-string> element and a <language> element;

3) if the network successfully performed the USSD information and does not need any further information, send a BYE request in order to terminate the dialog. The USSI AS shall populate the BYE request with application/vnd.3gpp.ussd+xml MIME body, as described in subclause 5.1.3 including a <ussd-string> element and a <language> element; and

4) if the network informs the UE that the network is unable to process the USSD request, or the network informs the UE that the network rejects the USSD request, send a BYE request in order to terminate the dialog. The USSI AS shall populate the BYE request with application/vnd.3gpp.ussd+xml MIME body, as described in subclause 5.1.3, including, a <error-code> element.

4.6 Interaction with other services

4.6.1 Originating Identification Presentation (OIP)

There are no interaction requirements with OIP.

4.6.2 Originating Identification Restriction (OIR)

There are no interaction requirements with OIR.

4.6.3 Terminating Identification Presentation (TIP)

There are no interaction requirements with TIP.

4.6.4 Terminating Identification Restriction (TIR)

There are no interaction requirements with TIR.

4.6.5 Communication Diversion (CDIV)

There are no interaction requirements with CDIV. CDIV is not applicable for USSI.

4.6.6 Communication Hold (HOLD)

There are no interaction requirements with HOLD.

4.6.7 Communication Barring (CB)

There are no interaction requirements with CB. CB is not applicable for USSI.

4.6.8 Message Waiting Indication (MWI)

There are no interaction requirements with MWI.

4.6.9   Conference (CONF)

There are no interaction requirements with CONF.

4.6.10   Explicit Communication Transfer (ECT)

There are no interaction requirements with ECT.

4.6.11   Advice Of Charge (AOC)

There are no interaction requirements with AOC.

4.6.12   Closed User Groups (CUG)

There are no interaction requirements with CUG.

4.6.13   Three-Party (3PTY)

There are no interaction requirements with CUG.

4.6.14   Flexible Alerting (FA)

There are no interaction requirements with FA.

4.6.15   Communication Waiting (CW)

There are no interaction requirements with CW.

4.6.16   Completion of Communications to Busy Subscriber (CCBS)

There are no interaction requirements with CCBS.

4.6.17   Completion of Communications by No Reply (CCNR)

There are no interaction requirements with CCNR.

4.6.18   Customized Alerting Tones (CAT)

There are no interaction requirements with CAT.

4.6.19   Customized Ringing Signal (CRS)

There are no interaction requirements with CRS.

4.6.20   Personal Network Management (PNM)

There are no interaction requirements with PNM.

4.6.21   Malicious Communication Identification (MCID)

There are no interaction requirements with MCID.

4.6.22   SIP based user configuration

Based on filter criteria, an initial INVITE request including a dialstring and an optional XML body as described in subclause 4.5.1 can be forwarded either to an AS supporting SIP based user configuration as specified in 3GPP TS 24.238 [8] or to an AS supporting USSI as specified in this specification.

An AS supporting USSI and SIP based user configuration as specified in 3GPP TS 24.238 [8], shall handle an initial INVITE request as described in subclause 4.5.1 according to this specification.

NOTE: If an AS supports only SIP based user configuration as specified in 3GPP TS 24.238 [8], an initial INVITE request as described in subclause 4.5.1 is handled according to 3GPP TS 24.238 [8].

4.7   Service configuration

User self configuration is not applicable to USSD using IMS.

5   Extensions within the present document

5.1   INFO Package for transport of USSD information

5.1.1   Scope

This subclause contains the information required for the IANA registration of info package g.3gpp.ussd in accordance with IETF RFC 6086 [2].

Editor's note: MCC needs to register this info package with IANA when 24.390 is published.

5.1.2   g.3gpp.ussd info package

5.1.2.1   Overall description

3GPP TS 24.390 describes the procedures for using Unstructured Supplementary Service Data (USSD) (3GPP TS 24.090 [3] and 3GPP2 X. S0065 [4]) operations in the IP Multimedia Core Network Subsystem (IMS). SIP INFO requests are used to carry information associated with USSD, using the g.3gpp.ussd info package.

Every SIP INFO request associated with the g.3gpp.ussd info package carries a single application/vnd.3gpp.ussd+xml MIME body associated with the info package according to IETF RFC 6086 [2].

NOTE: According to the procedures in IETF RFC 6086 [2], the SIP INFO response will not contain a MIME body. A message associated with a USSD operation is always sent in SIP INFO request.

In a given dialog, when a UA sends an INFO request associated with the g.3gpp.ussd info package, then until receiving an INFO request associated with the g.3gpp.ussd info package, the UA does not send another INFO request associated with the g.3gpp.ussd info package.

5.1.2.2   Applicability

A number of solutions were discussed for the transportation of USSD information between the UE and the USSD AS. The solutions were:

1) use of subscription to the USSD event package as specified in IETF RFC 4575;

2) use of the session related methods (e.g. SIP 200 (OK) response to the SIP INVITE request);

3) use of the SIP MESSAGE method;

4) use of media plane mechanisms; and

5) use of the SIP INFO method as described in IETF RFC 6086, by defining a new info package.

Furthermore, each of the solutions 1), 2), 3), 4) and 5) were evaluated.

The use of a USSD event package was discounted as the usage of subscribe/notify mechanism for two-way communication is not appropriate since subscribe/notify mechanism is to provide one-way communication consisting of notifications from notifier to subscriber indicating that certain events in notifier have occurred.

The use of session related methods for USSD messages other than the initial USSD message and last USSD message was discounted as it was concluded that usage of UPDATE method for transport of USSD message would have side effect of impacting dialog configuration (e.g. possibly changing the remote contact URI).

Use of the SIP MESSAGE method was discounted since USSD is dialog based and all information exchange has to be part of the related session.

Use of the media plane mechanisms was discounted because the amount of USSD messages in a dialog is normally very small (normally only 2) and overhead caused by user plane setup (e.g. if MSRP is used as transport) would be disproportionately big in comparion to the actual USSD message size.

Based on the above analyses, the SIP INFO method was chosen to transport the USSD information between the UE and the USSD AS.

5.1.2.3 Info package name

g.3gpp.ussd

5.1.2.4 Info package parameters

None defined.

5.1.2.5 SIP options tags

None defined.

5.1.2.6 INFO message body parts

The MIME type of the message body carrying the information associated with USSD is application/vnd.3gpp.ussd+xml. application/vnd.3gpp.ussd+xml MIME type is defined in 3GPP TS 24.390.

When associated with the g.3gpp.ussd info package, the Content-Disposition value of the message body carrying the information associated with USSD is "info-package".

5.1.2.7 Info package usage restrictions

None defined.

5.1.2.8 Rate of INFO Requests

No maximum rate or minimum rate is defined for sending INFO requests associated with the g.3gpp.ussd info package.

For most USSD usages, normally zero, one, or a few, SIP INFO requests are generated in the SIP session by each participating user agent.

5.1.2.9 Info package security considerations

The security is based on the generic security mechanism provided for the underlying SIP signalling. No additional security mechanism is defined.

5.1.2.10 Implementation details and examples

UAC generation of INFO requests: See 3GPP TS 24.390:" Unstructured Supplementary Service Data (USSD) using IP Multimedia (IM) Core Network (CN) subsystem IMS; Stage 3"

Examples: See 3GPP TS 24.390: " Unstructured Supplementary Service Data (USSD) using IP Multimedia (IM) Core Network (CN) subsystem IMS; Stage 3"

5.1.3 application/vnd.3gpp.ussd+xml MIME type

5.1.3.1 Scope

This subclause contains the information required for the IANA registration of the application/vnd.3gpp.ussd+xml MIME type in accordance with IANA registration procedures.

> Editor's note: MCC needs to register the application/vnd.3gpp.ussd+xml MIME type with IANA when 24.390 is published.

5.1.3.2 application/vnd.3gpp.ussd+xml

The MIME type is used to carry USSD related information between the UE and the network. It is coded as an XML document and contains one or more of the following information:

- USSD language

- USSD string

- USSD error code as defined in subclause 5.1.3.3 of this specification

NOTE: The information elements cannot be present twice in the XML body.

An instance of the XML document is shown below:

```
<?xml version="1.0" encoding="UTF-8"?>
<ussd-data>
    <language>en</language>
    <ussd-string>*135#</ussd-string>
</ussd-data>
```

5.1.3.3 Data semantics

`<language>` is coded as defined in IETF RFC 5646 [12] and shall contain exactly one subtag.

`<ussd-string>` is coded as a string.

`<error-code>` is an integer. The following values are defined. If the received value is not listed below, it must be treated as 1.

- 1 error - unspecified

- 2 language/alphabet not supported

- 3 unexpected data value

`<anyExt>` contains optional elements defined by future version of this document.

Entity receiving the XML body ignores any unknown XML element and any unknown XML attribute.

NOTE: "unexpected data value" is used in case of interworking with the MAP protocol (i.e. in case such an error is received from the MAP interface). It is not used for the case where the string sent by the UE in response to a query from the network does not match any expected response. Procedures covering such cases are part of the USSD application handling. The application will usually send back another USSD string to the UE asking for a new input from the user or indicating that the transaction cannot be completed.

5.1.3.4 XML schema

Implementations in compliance with the present document shall implement the XML schema defined below.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
        elementFormDefault="qualified"
        attributeFormDefault="unqualified">
    <xs:element name="ussd-data">
        <xs:annotation>
            <xs:documentation>
                Unstructured Supplementary Services Data
            </xs:documentation>
        </xs:annotation>
        <xs:complexType>
            <xs:sequence>
                <xs:element name="language" type="xs:string" minOccurs="0"
maxOccurs="1"/>
                <xs:element name="ussd-string" type="xs:string" minOccurs="0"
maxOccurs="1"/>
                <xs:element name="error-code" type="xs:int" minOccurs="0"
maxOccurs="1"/>
                <xs:element name="anyExt" type="anyExtType" minOccurs="0"/>
                <xs:any namespace="##other" processContents="lax" minOccurs="0"
maxOccurs="unbounded"/>
            </xs:sequence>
            <xs:anyAttribute namespace="##any" processContents="lax"/>
        </xs:complexType>
    </xs:element>

    <xs:complexType name="anyExtType">
        <xs:sequence>
            <xs:any namespace="##any" processContents="lax" minOccurs="0"
maxOccurs="unbounded"/>
        </xs:sequence>
    </xs:complexType>

</xs:schema>
```

NOTE: The AS can take the information received in the MIME body, formulate a MAP USSD message and route the message over SS7 to the USSD server via the HSS. Alternatively, the AS can extract the USSD information from the received MIME body, and communicate with USSD server using other protocol.

5.1.3.5 IANA registration

NOTE: RFC 4288 [9], subclause 9, states the process that applies in case of changes to the registry of media types. Any changes to the format or to subclause 5.1.3.5 after the registration with IANA would invoke this procedure.

5.1.3.5.1 Name

Frederic Firmin

5.1.3.5.2 Email

frederic.firmin@etsi.org

5.1.3.5.3 MIME media type name

Application

5.1.3.5.4 MIME subtype name

Vendor Tree – vnd.3gpp.ussd+xml

5.1.3.5.5 Required parameters

None

5.1.3.5.6 Optional parameters

None

5.1.3.5.7 Encoding considerations

Binary.

5.1.3.5.8 Security considerations

Same as general security considerations for application/xml as specified in section 10 of IETF RFC 3023 [10]. In addition, this content type provides a format for exchanging information in SIP, so the security considerations from IETF RFC 3261 [11] apply.

The information transported in this MIME media type does not include active or executable content.

Mechanisms for privacy and intregrity protection of protocol parameters exist. Those mechanisms as well as authentication and further security mechanisms are described in 3GPP TS 24.229 [6].

5.1.3.5.9 Interoperability considerations

The MIME type allows interoperability of USSD information between mobile networks and other systems.

5.1.3.5.10 Published specification

3GPP TS 24.390

(http://www.3gpp.org/ftp/Specs/html-info/24390.htm)

5.1.3.5.11 Applications which use this media

n/a

5.1.3.5.12 Applications that manipulate MIME typed objects (messaging, download etc.)

n/a

5.1.3.5.13 Additional information

1. Magic number(s): n/a

2. File extension(s): n/a

3. Macintosh file type code: n/a

4. Object Identifiers: n/a

5.1.3.5.14 Intended usage

Common.

The USSD is a very common service available on most mobile networks. The registration of the associated MIME type allows the USSD service to be incorporated in messages from other messaging systems.

5.1.3.5.15 Other information/general comment

n/a

5.1.3.5.16 Person to contact for further information

1. Name: Frederic Firmin

2. Email: frederic.firmin@etsi.org

3. Author/Change controller: Frederic Firmin

Annex <A> (informative): Signalling flows

A.1 UE sending USSD request, no further information required

In the example flow at the figure A.1-1, UE 1 sends a USSD request. The USSD application does not require further information, the USSD operation is successful and the AS hosting the USSD application indicates sends a USSD response towards UE 1.
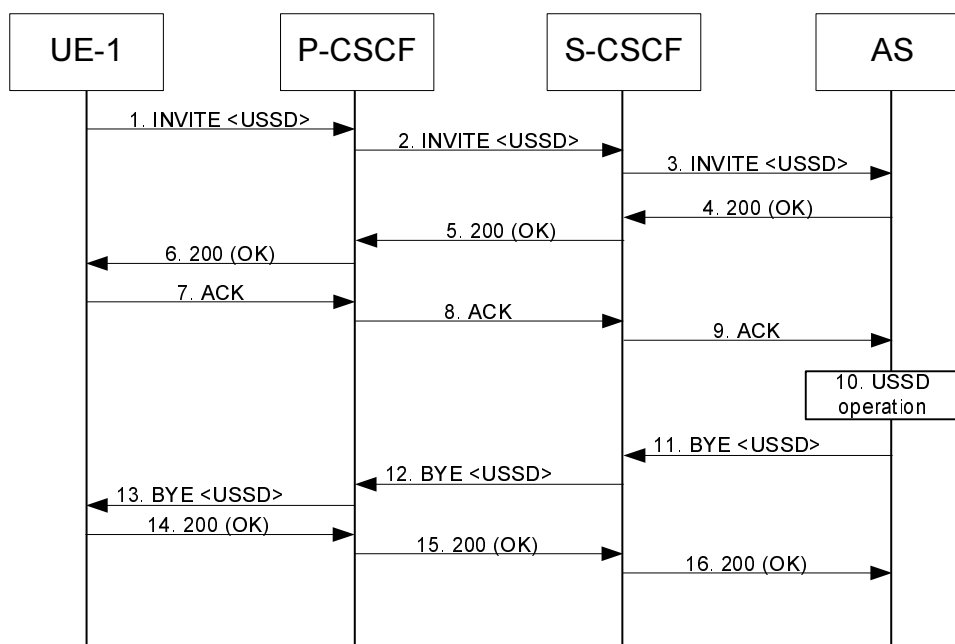
Figure A.1-1: UE sends USSD request

NOTE: For clarity, the SIP 100 (Trying) responses are not shown in the signaling flow.

1. UE A sends INVITE request containing the USSD request

UE sends the INVITE request.

By including the Recv-Info header field, the UE indicates its support for the g.3gpp.ussd info package.

Table A.1-1: INVITE request (UE-1 to P-CSCF)

```
INVITE sip:*135%23;phone-context=home1.net@home1.net;user=dialstring SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]:1357;branch=z9hG4bKnashds7
Max-Forwards: 70
Route: <sip:pcscf1.visited1.net:7531;lr>, <sip:scscf1.home1.net;lr>
Accept-Contact: *;+g.3gpp.icsi-ref="urn%3Aurn-7%3gpp-service.ims.icsi.mmtel"
P-Preferred-Identity: "John Doe" <sip:user1_public1@home1.net>
P-Access-Network-Info: 3GPP-UTRAN-TDD; utran-cell-id-3gpp=234151D0FCE11
Privacy: none
From: <sip:user1_public1@home1.net>;tag=171828
To: <sip:*135%23;phone-context=home1.net;user=dialstring>
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
```

```
Require: sec-agree
Supported: precondition, 100rel, gruu
Proxy-Require: sec-agree
Security-Verify: ipsec-3gpp; q=0.1; alg=hmac-sha-1-96; ealg=aes-cbc; spi-c=98765432; spi-
   s=87654321; port-c=8642; port-s=7531
Contact: <sip:user1_public1@home1.net;gr=hdg7777ad7aflzig8sf7>; +g.3gpp.icsi-
   ref="urn%3Aurn-7%3gpp-service.ims.icsi.mmtel"
Allow: INVITE, ACK, CANCEL, BYE, PRACK, UPDATE, REFER, MESSAGE, INFO
Accept: application/sdp; application/3gpp-ims+xml; application/vnd.3gpp.ussd+xml
Recv-Info: g.3gpp.ussd
Content-Type: multipart/mixed; boundary=outer
Content-Length: (…)

--outer
Content-Type: application/sdp

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=0 0
m=audio 0 RTP/AVP 97 96
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 telephone-event
--outer
Content-Type: application/vnd.3gpp.ussd+xml

<?xml version="1.0" encoding="UTF-8"?>
<ussd-data>
    <language>en</language>
    <ussd-string>*135#</ussd-string>
</ussd-data>

--outer—
```

Request-URI: in this example, the USSD message is *135#, and is represented as a dialstring.

Application/vnd.3gpp.ussd+xml MIME body: USSD message. The content of the <ussd-string> element included in the INVITE message must be equal to the dialstring inserted in the Request-URI.

2. INVITE request (P-CSCF to S-CSCF)

The P-CSCF forwards the INVITE request based on the Route header field.

3. INVITE request (S-CSCF to AS)

The S-CSCF forwards the INVITE request containing the USSD message based on iFC to the AS.

4. 200 (OK) response (AS to S-CSCF)

The AS sends a 200 (OK) confirming the receipt of the INVITE and to establish the dialog. The SIP 200 (OK) will contain a Recv-Info header field set to g.3gpp.ussd.

5. 200 (OK) response (S-CSCF to P-CSCF)

The S-CSCF forwards the 200 (OK) along the Via header field.

6. 200 (OK) response (P-CSCF to UE)

The P-CSCF forwards the 200 (OK) along the Via header field to the UE.

7. ACK request (UE to P-CSCF)

The UE responds to the 200 (OK) response with an ACK request sent to the P-CSCF.

8. ACK request (P-CSCF to S-CSCF)

The P-CSCF forwards the ACK request to the S-CSCF.

9. ACK request (S-CSCF to AS)

The S-CSCF forwards the ACK request to the AS.

10. USSD operation

The AS performs the requested USSD operation. Details of USSD processing are outside the scope of this specification.

In this example the USSD operation is successful and a response indicating success will be sent to the UE.

11. BYE request (AS to S-CSCF) — see example in table A.1-2

Table A1-2: BYE request (AS to S-CSCF)

```
BYE sip:user1_public1@home1.net;gr=hdg7777ad7aflzig8sf7 SIP/2.0
Via SIP/2.0/UDP sip:as1.home1.net;branch=z9hG4bK332b23.1
Max-Forwards: 70
Route: <sip:scscf1.home1.net;lr>, <sip:pcscf1.visited1.net:7531;lr>
From: <tel: +1-237-555-3333>;tag=314159
To: <tel:+1-237-555-1111>;tag=171828
Call-ID: cb03a0s09a2sdfglkj490334
Cseq: 129 BYE

Content-Type: application/vnd.3gpp.ussd+xml
Content-Length:

<?xml version="1.0" encoding="UTF-8"?>
<ussd-data>
    <language>en</language>
    <ussd-string>
        Hello, your credit is $175.50. Thanks for your query.
        We are happy to assist. Your operator
    </ussd-string>
</ussd-data>
```

Application/vnd.3gpp.ussd+xml MIME body: USSD message.

12. BYE request (S-CSCF to P-CSCF)

The S-CSCF forwards the BYE request to the P-CSCF.

13. BYE request (P-CSCF to UE)

The P-CSCF forwards the BYE request to the UE. The UE recognizes the application/vnd.3gpp.ussd+xml and displays the string.

14. 200 (OK) response (UE to P-CSCF)

The UE sends a 200 (OK) confirming the BYE request.

15. 200 (OK) response (P-CSCF to S-CSCF)

The P-CSCF forwards the 200 (OK) to the S-CSCF.

16. 200 (OK) response (S-CSCF to AS)

The S-CSCF forwards the 200 (OK) to AS.

A.2 UE sending USSD request, further information required from network

In the example flow at the figure A.2-1, UE 1 sends a USSD request. The USSD application requires further information, and UE 1 sends further information in a USSD request. After the USSD operation is successful, the AS hosting the USSD application sends a USSD response towards UE 1.
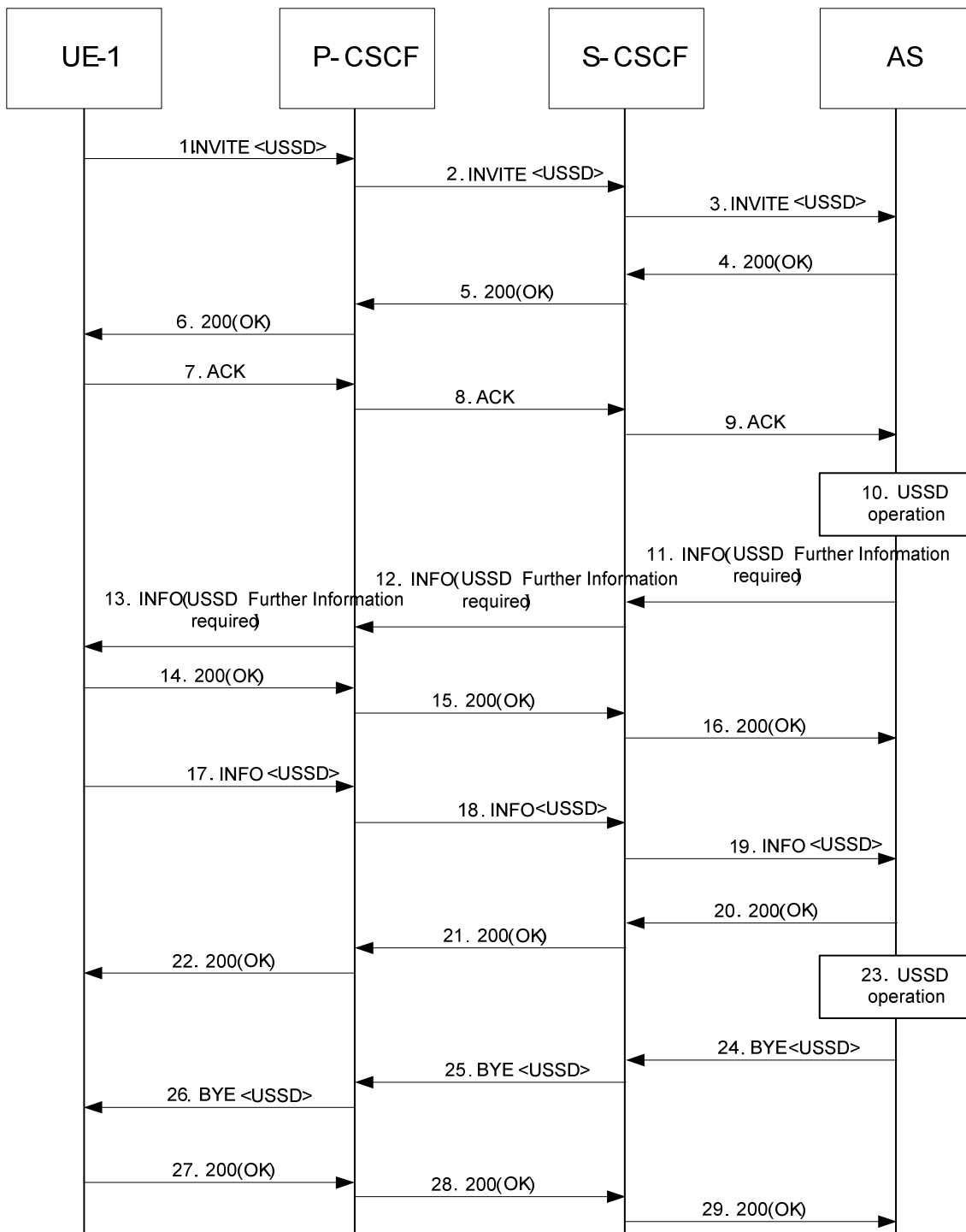
Figure A2-1: UE sends USSD request

NOTE: For clarity, the SIP 100 (Trying) responses are not shown in the 22ignaling flow.

1. UE A sends INVITE request containing the USSD request

UE sends the INVITE request.

By including the Recv-Info header field, the UE indicates its support for the g.3gpp.ussd info package.

Table A.2-1: INVITE request (UE-1 to P-CSCF)

```
INVITE sip:*135%23;phone-context=home1.net@home1.net;user=dialstring SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]:1357;branch=z9hG4bKnashds7
Max-Forwards: 70
```

```
Route: <sip:pcscf1.visited1.net:7531;lr>, <sip:scscf1.home1.net;lr>
Accept-Contact: *;+g.3gpp.icsi-ref="urn%3Aurn-7%3gpp-service.ims.icsi.mmtel"
P-Preferred-Identity: "John Doe" <sip:user1_public1@home1.net>
P-Access-Network-Info: 3GPP-UTRAN-TDD; utran-cell-id-3gpp=234151D0FCE11
Privacy: none
From: <sip:user1_public1@home1.net>;tag=171828
To: <sip:*135%23;phone-context=home1.net;user=dialstring>
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Require: sec-agree
Supported: precondition, 100rel, gruu
Proxy-Require: sec-agree
Security-Verify: ipsec-3gpp; q=0.1; alg=hmac-sha-1-96; ealg=aes-cbc; spi-c=98765432; spi-
    s=87654321; port-c=8642; port-s=7531
Contact: <sip:user1_public1@home1.net;gr=hdg7777ad7aflzig8sf7>; +g.3gpp.icsi-
    ref="urn%3Aurn-7%3gpp-service.ims.icsi.mmtel"
Allow: INVITE, ACK, CANCEL, BYE, PRACK, UPDATE, REFER, MESSAGE, INFO
Accept: application/sdp; application/3gpp-ims+xml; application/vnd.3gpp.ussd+xml
Recv-Info: g.3gpp.ussd
Content-Type: multipart/mixed; boundary=outer
Content-Length: (…)

--outer
Content-Type: application/sdp
v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=0 0
m=audio 0 RTP/AVP 97 96
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 telephone-event
--outer
Content-Type: application/vnd.3gpp.ussd+xml

<?xml version="1.0" encoding="UTF-8"?>
<ussd-data>
    <language>en</language>
    <ussd-string>*135#</ussd-string>
</ussd-data>
--outer—
```

Request-URI: in this example, the USSD message is *135#, and is represented as a dialstring.

Application/vnd.3gpp.ussd+xml MIME body: USSD message. The content of the <ussd-string> element in the INVITE message must be equal to the dialstring inserted in the Request-URI.

2. INVITE request (P-CSCF to S-CSCF)

The P-CSCF forwards the INVITE request based on the Route header field.

3. INVITE request (S-CSCF to AS)

The S-CSCF forwards the INVITE request containing the USSD message based on iFC to the AS.

4. 200 (OK) response (AS to S-CSCF)

The AS sends a 200 (OK) confirming the receipt of the INVITE and to establish the dialog. The SIP 200 (OK) will contain a Recv-Info header field set to g.3gpp.ussd.

5. 200 (OK) response (S-CSCF to P-CSCF)

The S-CSCF forwards the 200 (OK) along the Via header field.

6. 200 (OK) response (P-CSCF to UE)

The P-CSCF forwards the 200 (OK) along the Via header field to the UE.

7. ACK request (UE to P-CSCF)

The UE responds to the 200 (OK) response with an ACK request sent to the P-CSCF.

8. ACK request (P-CSCF to S-CSCF)

The P-CSCF forwards the ACK request to the S-CSCF.

9. ACK request (S-CSCF to AS)

The S-CSCF forwards the ACK request to the AS.

10. USSD operation

The AS performs the requested USSD operation. Details of USSD processing are outside the scope of this specification.

In this example, the AS requires further information from the UE.

11-13. INFO request (AS to UE) - see example in table A.2-11

Table A.2-11: INFO request (AS to S-CSCF)

```
INFO sip:user1_public1@home1.net;gr=hdg7777ad7aflzig8sf7 SIP/2.0
Via: SIP/2.0/UDP ussias.home1.net:6677;branch=z9hG4bKnashds75454
Max-Forwards: 70
Route: <sip:scscf1.home1.net:46545;lr>, <sip:pcscf1.visited1.net:7531;lr>
From: <sip:*135%23;phone-context=home1.net;user=dialstring>;tag=t45543543
To: <sip:user1_public1@home1.net>;tag=171828
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 4665 INFO
Info-Package: g.3gpp.ussd
Content-Length: (…)
Content-Type: application/vnd.3gpp.ussd+xml
Content-Disposition: Info-Package

<?xml version="1.0" encoding="UTF-8"?>
<ussd-data>
    <language>en</language>
    <ussd-string>
        Enter password:
    </ussd-string>
</ussd-data>
```

14-16. 200 (OK) response (UE to AS)

The UE sends a SIP 200 (OK) to the AS confirming the SIP INFO request.

17-19. INFO request (UE to AS) - see example in table A.2-17

The UE sends the SIP INFO request containing the further USSD information required.

Table A.2-17: INFO request (UE to P-CSCF)

```
INFO sip:ussias.home1.net:12456 SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]:1357;branch=z9hG4bKnashds76565465
Max-Forwards: 70
Route: <sip:pcscf1.visited1.net:7531;lr>, <sip:scscf1.home1.net;lr>,
    <ussias.home1.net:6677;lr>
From: <sip:user1_public1@home1.net>;tag=171828
To: <sip:*135%23;phone-context=home1.net;user=dialstring>;tag=t45543543
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 128 INFO
Info-Package: g.3gpp.ussd
Content-Length: (…)
Content-Type: application/vnd.3gpp.ussd+xml
Content-Disposition: Info-Package

<?xml version="1.0" encoding="UTF-8"?>
<ussd-data>
    <language>en</language>
    <ussd-string>
        zAyEx1973
    </ussd-string>
</ussd-data>
```

20-21. 200 (OK) response (AS to UE)

The AS sends a SIP 200 (OK) to the UE confirming the SIP INFO request.

23. USSD operation

The AS performs the requested USSD operation. Details of USSD processing are outside the scope of this specification.

In this example, the USSD operation is successful and AS sends a response indicating success will be sent to the UE.

24-26 BYE request (AS-UE)

The AS sends a SIP BYE request towards UE containing a USSD response.

Table A.2-2: BYE request (AS to S-CSCF)

```
BYE sip:user1_public1@home1.net;gr=hdg7777ad7aflzig8sf7 SIP/2.0
Via SIP/2.0/UDP sip:as1.home1.net;branch=z9hG4bK332b23.1
Max-Forwards: 70
Route: <sip:scscf1.home1.net;lr>, <sip:pcscf1.visited1.net:7531;lr>
From: <tel: +1-237-555-3333>;tag=314159
To: <tel:+1-237-555-1111>;tag=171828
Call-ID: cb03a0s09a2sdfglkj490334
Cseq: 129 BYE
Content-Type: application/vnd.3gpp.ussd+xml
Content-Length:

<?xml version="1.0" encoding="UTF-8"?>
<ussd-data>
    <language>en</language>
    <ussd-string>
        Hello, your credit is $175.50. Thanks for your query.
        We are happy to assist. Your operator
    </ussd-string>
</ussd-data>
```

Application/vnd.3gpp.ussd+xml MIME body: USSD message.

27-29. 200 (OK) response (UE to AS)

The UE sends a 200 (OK) to AS confirming the BYE request.

Annex <B> (informative): Change history

<table>
<tr><th colspan="9">Change history</th></tr>
<tr><th>Date</th><th>TSG #</th><th>TSG Doc.</th><th>CR</th><th>Rev</th><th>Subject/Comment</th><th>Old</th><th>New</th></tr>
<tr><td>2011-04</td><td></td><td></td><td></td><td></td><td>Version 0.0.0 TS Skeleton</td><td>0.0.0</td><td></td></tr>
<tr><td>*2011-05*</td><td></td><td></td><td></td><td></td><td>*Contains agreed P-CRs from CT1#71: C1-112245, C1-112246*</td><td>*0.0.0*</td><td>*0.1.0*</td></tr>
<tr><td>*2011-07*</td><td></td><td></td><td></td><td></td><td>*Contains agreed P-CRs from CT1#72: C1-112934, C1-112935, C1-112956*</td><td>*0.1.0*</td><td>*0.2.0*</td></tr>
<tr><td>*2011-09*</td><td></td><td></td><td></td><td></td><td>*Contains agreed P-CRs from CT1#73:C1-113450, C1-113451, C1-113590,*</td><td>*0.2.0*</td><td>*0.3.0*</td></tr>
<tr><td>*2011-10*</td><td></td><td></td><td></td><td></td><td>*Contains agreed P-CRs from CT1#74: C1-114351, C1-114411*</td><td>*0.3.0*</td><td>*0.4.0*</td></tr>
<tr><td>*2012-01*</td><td></td><td></td><td></td><td></td><td>*Changes the structure of the TS in order to allow for collection of alternative proposals: existing material in main part and Annex A (signalling flows) are shifted to new Annex B.*

Contains agreed P-CRs from CT1#75: C1-115144, C1-115145, C1-115146, C1-115147, C1-115148, C1-115230.</td><td>*0.4.0*</td><td>*0.5.0*</td></tr>
<tr><td>*2012-01*</td><td></td><td></td><td></td><td></td><td>*Editorial correction*</td><td>*0.5.0*</td><td>*0.5.1*</td></tr>
<tr><td>*2012-02*</td><td></td><td></td><td></td><td></td><td>*Contains agreed P-CRs from CT1#76: C1-120685, C1-120688, C1-120693, C1-120694, C1-120884*</td><td>*0.5.1*</td><td>*0.6.0*</td></tr>
<tr><td>*2012-05*</td><td></td><td></td><td></td><td></td><td>*Contains agreed P-CR from CT1#77: C1-121624*</td><td>*0.6.0*</td><td>*0.7.0*</td></tr>
<tr><td>*2012-06*</td><td></td><td></td><td></td><td></td><td>*Contains agreed P-CRs from CT1#78:C1-121884, C1-122234, C1-122236, C1-122236, C1-122237*</td><td>*0.7.0*</td><td>*0.8.0*</td></tr>
<tr><td>2012-06</td><td>CT-56</td><td>CP-120281</td><td></td><td></td><td>Version 1.0.0 created by MCC for presentation to CT-56 for information</td><td>0.8.0</td><td>1.0.0</td></tr>
<tr><td>*2012-08*</td><td></td><td></td><td></td><td></td><td>*Contains agreed P-CRs from CT1#79:C1-122529, C1-123260, C1-123261, C1-123267, C1-123353, C1-123420*</td><td>*1.0.0*</td><td>*1.1.0*</td></tr>
<tr><td>*2012-08*</td><td></td><td></td><td></td><td></td><td>*Editorial cleanup*</td><td>*1.1.0*</td><td>*1.1.1*</td></tr>
<tr><td>2012-09</td><td>CT-57</td><td>CP-120608</td><td></td><td></td><td>Version 2.0.0 created by MCC for presentation to CT-57 for approval</td><td>1.1.1</td><td>2.0.0</td></tr>
<tr><td>2012-09</td><td>CT-57</td><td></td><td></td><td></td><td>Version 11.0.0 created by MCC after approval at CT-57</td><td>2.0.0</td><td>11.0.0</td></tr>
<tr><td>2012-12</td><td>CT-58</td><td>CP-120800</td><td>0002</td><td>3</td><td>USSI Cleanup of Alternatives</td><td>11.0.0</td><td>11.1.0</td></tr>
<tr><td>2012-12</td><td>CT-58</td><td>CP-120800</td><td>0003</td><td>2</td><td>USSI interaction with SIP user configuration</td><td>11.0.0</td><td>11.1.0</td></tr>
<tr><td>2012-12</td><td>CT-58</td><td>CP-120800</td><td>0013</td><td>1</td><td>Clean up of encoding USSD information as an XML document</td><td>11.0.0</td><td>11.1.0</td></tr>
<tr><td>2013-03</td><td>CT-59</td><td>CP-130105</td><td>0014</td><td>2</td><td>Clarifications and Corrections to USSI</td><td>11.1.0</td><td>11.2.0</td></tr>
<tr><td>2013-03</td><td>CT-59</td><td>CP-130105</td><td>0015</td><td>4</td><td>USSD Procedures clarifications and corrections</td><td>11.1.0</td><td>11.2.0</td></tr>
<tr><td>2013-06</td><td>CT-60</td><td>CP-130241</td><td>0016</td><td>1</td><td>IANA registration and corrections to USSI</td><td>11.2.0</td><td>11.3.0</td></tr>
<tr><td>2013-06</td><td>CT-60</td><td>CP-130241</td><td>0017</td><td>1</td><td>IANA security considerations correction</td><td>11.2.0</td><td>11.3.0</td></tr>
<tr><td>2013-09</td><td>CT-61</td><td>CP-130496</td><td>0018</td><td>2</td><td>Ambiguous reference to encoding of the language value in XML body</td><td>11.3.0</td><td>11.4.0</td></tr>
<tr><td>2014-06</td><td>CT-64</td><td>CP-140313</td><td>0021</td><td>1</td><td>Updating of reference to 3GPP2 USSD specification</td><td>11.4.0</td><td>11.5.0</td></tr>
<tr><td>2015-09</td><td>CT-69</td><td>CP-150582</td><td>0037</td><td>2</td><td>Addressing IANA Expert Review comments on "g.3gpp.ussd" INFO package</td><td>11.5.0</td><td>11.6.0</td></tr>
</table>

History

Document history		
V11.0.0	October 2012	Publication
V11.1.0	January 2013	Publication
V11.2.0	April 2013	Publication
V11.3.0	July 2013	Publication
V11.4.0	October 2013	Publication
V11.5.0	July 2014	Publication
V11.6.0	October 2015	Publication