USSD Plateform

(Applications)

with real-time charging by CAMEL

Version 1.5

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1	13/10/2004	GB	Initial text	V1.1
2	10/02/2005	JMB	Charging with CAMEL	V1.2
3	11/03/2005	AD	E-mail applications	V1.3
4	20/05/2005	BM	USSD call back	V1.4
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6	01/09/2006	BM	EMAIL by USSD, Horoscope ...	V1.5

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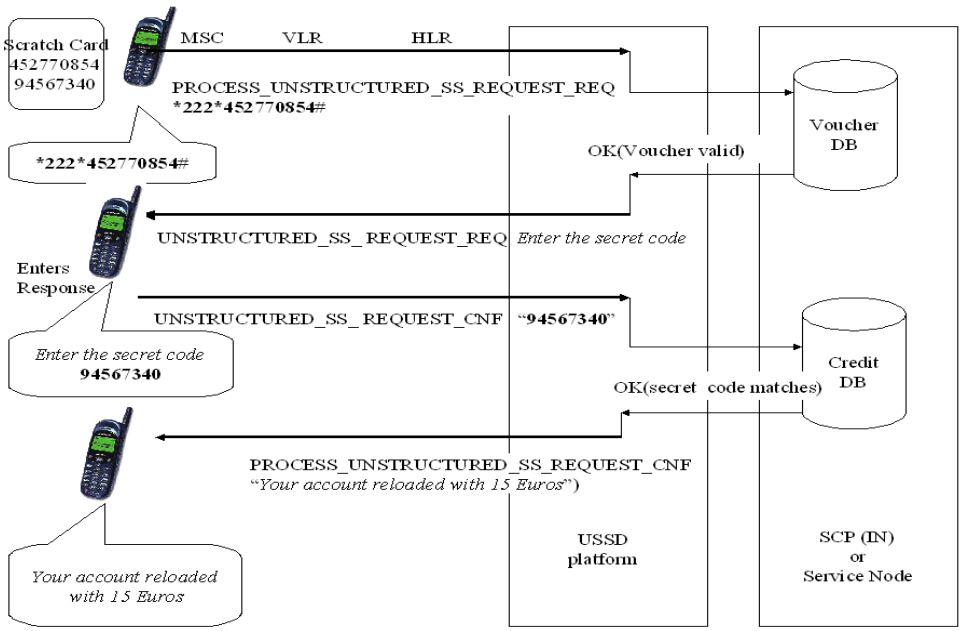
USSD from HALYS is a market-proven portal platform designed to make the most of the USSD and SMS bearers. It provides mobile operators with an unparalleled environment in which to launch successful interactive services and generate additional revenues from existing infrastructures and all legacy phones 2G and 2.5G , combining USSD, SMS, MMS to enrich the end-users' experience.

1 USSD: a modern proven offer for interactive services to any including legacy phone

Unstructured Supplementary Service Data (USSD) is unique to GSM. It corresponds to a capability built into the GSM standard as a support for transmitting information over the signaling channels of the GSM network: the mobile station user and an operator-defined application communicate in a manner that is transparent to the mobile station and to intermediate network entities.
USSD provides bi-directional session-based communications, allowing development of operator-specific supplementary services and providing a variety of applications compatible with nearly all legacy handsets.

Such a dialogue is illustrated in the diagram below of a voucher recharging application. The session opens with a message *222*452770854# where 222 is the number of the recharging application and 452770854 is the scratch card code of a 15 Euros voucher.
It is fast, inexpensive (no call charged even when the subscriber is roaming) and much simpler to customize that an IVR for the same recharging application.



In comparison with the other GSM bearers (USSD, CSD, GPRS, voice), USSD provides a unique set of characteristics to build interactive services:

- USSD is similar to SMS as it uses the network's signaling path to exchange short strings of 182 characters (160 for SMS).
- USSD is similar to circuit switched data since it is session oriented (whereas SMS is "store & forward"). When a USSD session is established, the radio connection remains open until the user, application, or time out releases it.
- USSD is similar to packet switched data since the USSD messages are handled in the NSS by MAP messages on the existing signaling network.
- USSD is similar to voice calls as the user simply dials a short code directly from the handset keypad to send a USSD command and open a USSD session (e.g. #100#). Users do not need to access any particular phone menu to access services through USSD.

AND more importantly, USSD **is not charged** by the roaming partners while used in roaming!
You can use your own charging model without incurring any charge from the other operators. Also it provides fast interative services *without GPRS or 3G from any legacy phone.*

2 Open developement architecture using WEB tools and SMPP

To ease any development by 3rd parties or your own IT team, HALYS has a clear separation between

- The USSD Gateway with SS7 connectivity (which is an integral part of the standard HALYS SMSCincludind fully redundant secured configurations)
- The Application server executes the interactive applications and communicates with the USSD Gateway using the well known SMPP protocol (with a Port defined by HALYS as the "USSD Port")

This architecture makes it easy for teams used to develop SMS applications to apply their knowledges to USSD applications immediately. Also they can use the JAVA toolkits which are provided to create menus, etc...in their own environment: LINUX, Windows, etc...
The HALYS ready-to-use applications follow this architecture. HALYS makes in-house development a full possibility.

Advanced content-based billing: CAMEL interface in the HALYS "USSD Gateway"

HALYS real-time rating engine supports content-based billing, whatever the bearer is (USSD, SMS, MMS,...). HALYS handles both post-paid customers, generating CDR, and prepaid customers, with real-time balance check and session cut-off.

For pre-paid customers, it uses a direct dialogue with the SS7 CAMEL protocol to charge directly on the IN machine with so called "Initial DP" primitives with values corresponding to the charging of a particular content as decided by the operator.

3 Fully packaged USSD applications

3.1 Customer-care services

Customer-care services supported by voice calls - either to IVR or customer-care representatives - generate huge costs in **unbilled minutes** and **human workload**. Replacing current voice services with USSD Browsing services brings:

- huge savings in network resources, IVR(Interactive Voice Response) operation and call-center load
- better customer satisfaction, because response time is very short , written information is easier to understand and errors less likely compared to DTMF,
- permanent contact with customers providing them with up-to-date and relevant information regarding your new services and offers.

Selfcare USSD services may include:

- balance inquiry for prepaid or postpaid customers
- credit recharge (Top-up) from scratch card or voucher, credit card or bank transfer, even when roaming
- switch of tariff plan, subscription to value-added services
- commercial information about special offers, new services, contact numbers,…

3.2 Credit recharging from e-account

In countries such as Tunisia where the Ministry of Telecommunications has implemented the "e-dinar" for any payment (theatres, games, etc...) it would be possible to entirely suppress the voucher pre-paid recharging system. It would save enormously the logistics and distribution costs.

Pre-paid customers would reload their "e-dinar" acount by any mean they want without the GSM operators involvment.

A simple menu driven USSD application provides the transfer of some money to the telephone pre-paid account. HALYS and the Dassault-Multimedia companies offer all the security to handle securedly money transfer applications with the necessary key and account number protections.

The result is a much simplified credit reloading logistics and huge savings.

3.3 SMS by USSD in particular “Call me Back”

Customers which do not have the Call or SMS-MO opened while they are roaming, can use USSD to send any SMS, in particular a "Call me Back" message:

SEND	*113*destination_number#
RECEIVE Prompt	ENTER YOUR SMS
SEND	Hello I am in Paris, but no credit left
RECEIVE Confirmation	SMS sent to 'destination number'

3.4 Address book of subscribers

The operators can set up a chargeable access to their own subscriber directory (LDAP) where any of their susbcribers will be able to query the name of a subscriber and USSD browse to fing the desired number. In addition to the direct revenue of these queries (which can be real-time charged with CAMEL), this promotes additional call traffic and increased ARPU.

HALYS team includes LDAP specialists which can create the directory and the administration so that the service is permanently available.

3.5 SMS/MMS menu

Create a user-friendly pathway to all existing value-added services from a single short code. Users can send requests from clear, easy-to-understand USSD menus and get the content delivered by SMS, MMS or WAP. No need to remember lists of short codes and complex commands, or to use the phone menu, which can be an obstacle for some users.
User case result: the introduction of a SMS menu has increased the SMS premium traffic by 50%.

3.6 Email

A full email client, enabling both private and business users to keep in contact with their e-mail anywhere and at any time

HALYS e-mail solution - based on POP account - is fully manageable by the user and allows him to see in just one click if e-mails have arrived. The application manages multiple e-mail accounts and gives the user the ability to reply to and forward the messages. When composing a mail, the user has also the option of using pre-defined texts. Thanks to USSD Browsing ubiquity, e-mail is available seamlessly and at ultra-low cost in the home country and abroad without the need of GPRS/3G networks.

SEND	*180#
RECEIVE Prompt	ENTER THE EMAIL ADDRESS
SEND	halys@gmail.com
RECEIVE Prompt	ENTER THE MESSAGE
SEND	Hello, I am in Paris, but no credit left
RECEIVE Confirmation	EMAIL sent to halys@gmail.com

3.7 Breaking News

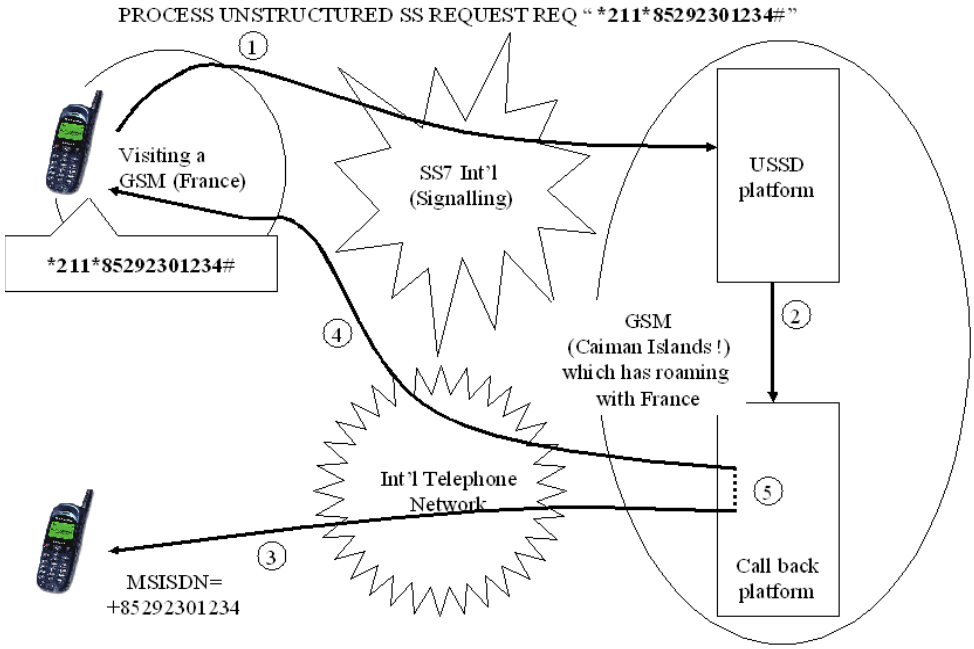
Receiving real-time news by links from Internet is one of the features HALYS can offer with the USSD Browsing solution.

Sport, weather, breaking news or specific domain articles; any Internet content can be made available in real-time to the mobile users. Thanks to the advanced charging features of HALYS USSD, all this content can be charged with any model required by operators. Easing maintenance and update of the value-added-services portal, this RSS News application allows direct integration of the RSS feeds into your USSD application.

3.8 Mobile marketing

The combination of USSD's low operating costs and great interactivity opens infinite opportunities for **push or pull** mobile advertisement and infotainment applications, such as voting, quizzes, interactive mass-marketing campaigns, promotional games...USSD service codes can be advertised on any medium: classifieds, corporate gifts, business cards, product packaging, billboards, etc.

3.9 Mobile marketing



USSD call back system for prepaid subscribers" may be implemented to offer a cheaper package for roaming subcribers who can save on the cost of their outgoing calls while roaming.

In 1) the roaming subscriber wants to call a Hong-Kong number. My be he cannot make a voice call because he is roaming in another country, and he is barred from making calls and also sending SMS-MO (because we assume there is no CAMEL setup). But he is able to establish a USSD session with his USSD platform, passing the service code "Call Back"=211 and the number that he wants to call (he just types 211*85292301234#, the cellphone recognizes from * and # that this is not a voice call but a USSD session). The USSD platform passes it to a call back system (a switch) 2) which calls the destination 3), then if the call is answered, calls back 4) the originating roaming mobile subscriber, and 5) connects the two legs of the call together.
Then the call back system will charge the call.
It is much cheaper because the call 4) is made at the operator's optimized ougoing call tarif, instead of incurring an expensive IOT charge from the roaming visited partner.

3.10 Value added services while roaming

For outbound roamers:
Provide your outbound roamers with a true Virtual Home Environment (VHE) wherever they roam, attracting high profile subscribers to your network. Requiring no additional work, USSD based interactive services are available on any network. USSD makes value added services a reality while roaming: travel information, location-based weather, news, etc. Subscribers can even access their emails (send and receive) from anywhere in the world!

For inbound roamers:
The GSM standard defines a specific range of USSD service codes for VPLMN applications. You can offer exclusive services (tourist guide, local news, useful numbers…) to inbound roamers and draw them to your network.

3.11 Advantages for mobile operators

- Offer fully interactive mobile services to nearly all your mobile users, right now.
- Leverage your existing 2G network investments.
- Generate revenues with highly cost-effective and profitable services
- Save on your current IVR application operating costs with network efficient services
- Increase ARPU with innovative data services
- Boost traffic on SMS / MMS services
- Educate your customers and anticipate a smooth shift to next generation mobile services.

4 Using the USSD platform to execute interactive text services

4.1 In-built test USSD services

There is 3 simple services that you can try as soon as you have connected the USSD platform and opened the 3 short codes as USSD codes in your HLR:

- Service *113*MSISDN# : "SMS by USSD".
- Service *180# : "EMAIL by USSD".
- Service *140# : "HOROSCOPE by USSD".

4.2 Creating your own USSD service with your external VAS platform

Even if you use only the USSD platform it is quite useful that you have read what precedes for the SMSC and in particular how to configure a SMPP connection.
Because a VAS platform which uses the HALYS USSD platform will execute all the USSD services with SMPP throught its SMPP client. The HALYS USSD platform is really a "Gateway USSD" because it is much simpler to make the applications with an external dedicated IT server.

Here is an example of an interactive "Mobile Initiated" service using HALYS as the "Gateway USSD" which maps SMPP application messages to SS7.and explains the principle

The VAS platform is basically an Internet server and the USSD applications may be written in Java, Perl, Php, etc.. The only thing needed in addition is a SMPP client which can be called by the application to perform the 2 basic SMMP operations:

1 submit_sm (send a message)
2 deliver_sm (receive a message)

However you will set the SMPP "Destination port address" to **9280**.
This is the special "HALYS USSD port". Instead of sending SMS by a "submit_sm", you send a USSD message. There is abolutely no difference with all the standard SMPP fields.

Taking the example, let us implement it together with your VAS platform

4.2.1 Parameters in the submit_sm and the deliver_sm

When the handphone makes a "USSD call" the VAS application receives a "deliver_deliver" . The number of the cellphone is contained in the

1 source_addr_ton
2 source_addr_npi
3 source_addr

4.2.2 List of the 3 possible command types that you can receive

The "data coding" is as usual in SMPP and corresponds to what has been recived in the USSD:

- PROCESS_UNSTRUCTURED_SS_REQUEST_REQ which opens the session

Your application will receive a short_message field like:

80 Transaction ID short_code*123456#

- UNSTRUCTURED_SS_REQUEST_CNF which is a deliver_sm. It is the answer of the submit_sm UNSTRUCTURED_SS_NOTIFY_REQ. There is in the response differents error which allow the application to send again a request or not.

Your application will receive a short_message field like:

74 Transaction ID user_err prov_err deliv_err netwk_err coding TEXT

- UNSTRUCTURED_SS_NOTIFY_CNF which is a deliver_sm. It is the answer of the submit_sm UNSTRUCTURED_SS_REQUEST_REQ.

Your application will receive a short_message field like:

78 Transaction ID user_err prov_err deliv_err netwk_err

4.2.3 List of the 3 possible command types that you can send

- UNSTRUCTURED_SS_REQUEST_REQ which ask a question, so you have to expect an answer, that is why you have to choice a *time-out value,* enough high to let the customer write its answer.

Your application will send a short_message field like:

72 Transaction ID *Time-out* coding TEXT

- UNSTRUCTURED_SS_NOTIFY_REQ which send a message. There is no answer from the customer, it is only an acknowledgement, that is why you have not to put a time-out value.

Your application will send a short_message field like:

76 Transaction ID coding TEXT

- PROCESS_UNSTRUCTURED_SS_REQUEST_RSP which send the last text or answer to the customer and close the session.

Your application will send a short_message field like:

81 Transaction ID coding TEXT

4.2.4 Parameters of messages

4.2.4.1 Transaction ID

USSD works with *sessions*. The session is opened on the SMSC side by the PROCESS_UNSTRUCTURED_SS_REQUEST_IND send by the HLR to the USSD plateform. All USSD sessions MUST be CLOSE by the application. The application *have to send* an PROCESS_UNSTRUCTURED_SS_REQUEST_RSP to close the session.

4.2.4.2 Time-out

The time-out is used to inform the application that the customer have not answer on the request, and in that case send again another request. You have to choice a right value, if you ask the customer to enter a message or a number. It is not the same time.
The time-out on a request *doesn't close the USSD session.*

4.2.4.3 Error codes : "time-out" = No response from customer to a UNSTRUCTURED_SS_REQUEST_REQ (a question sent by your application)

This error codes allow the application to know the reason of the problem. For example, if the customer doesn't answer to a request, after the *time-out that you have specified* it is a *time-out error*:
user_err = 0, prov_err = 8, deliver_err = 0 and netwk_err = 0
So, you can send one more time the question.

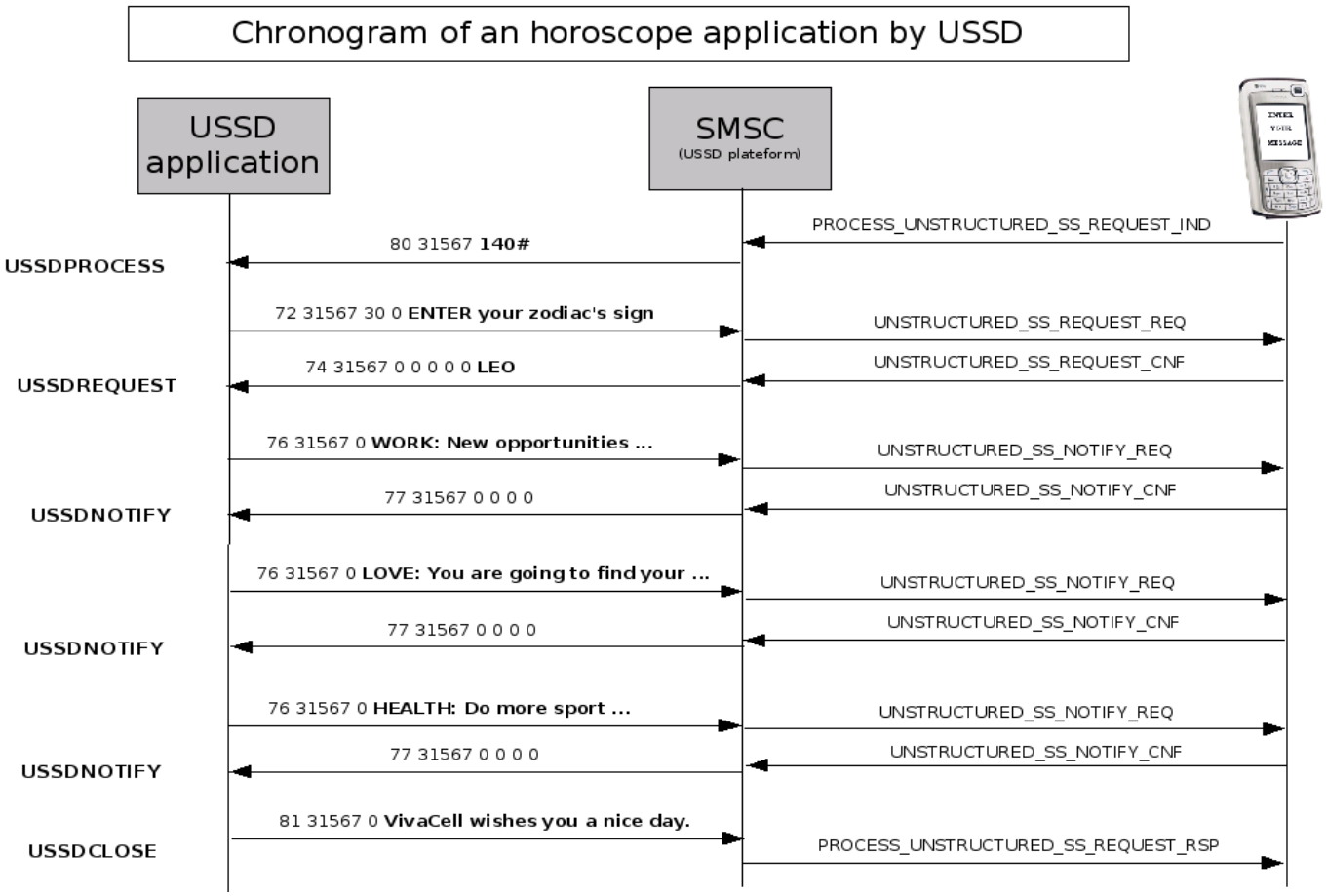
4.2.4.4 Coding and Text

You have to precise the coding of the text, if it is Latin or Unicode.

4.3 Example 1: An Horoscope application by USSD

The USSD code for this built-in application is *140#. **Try it !**

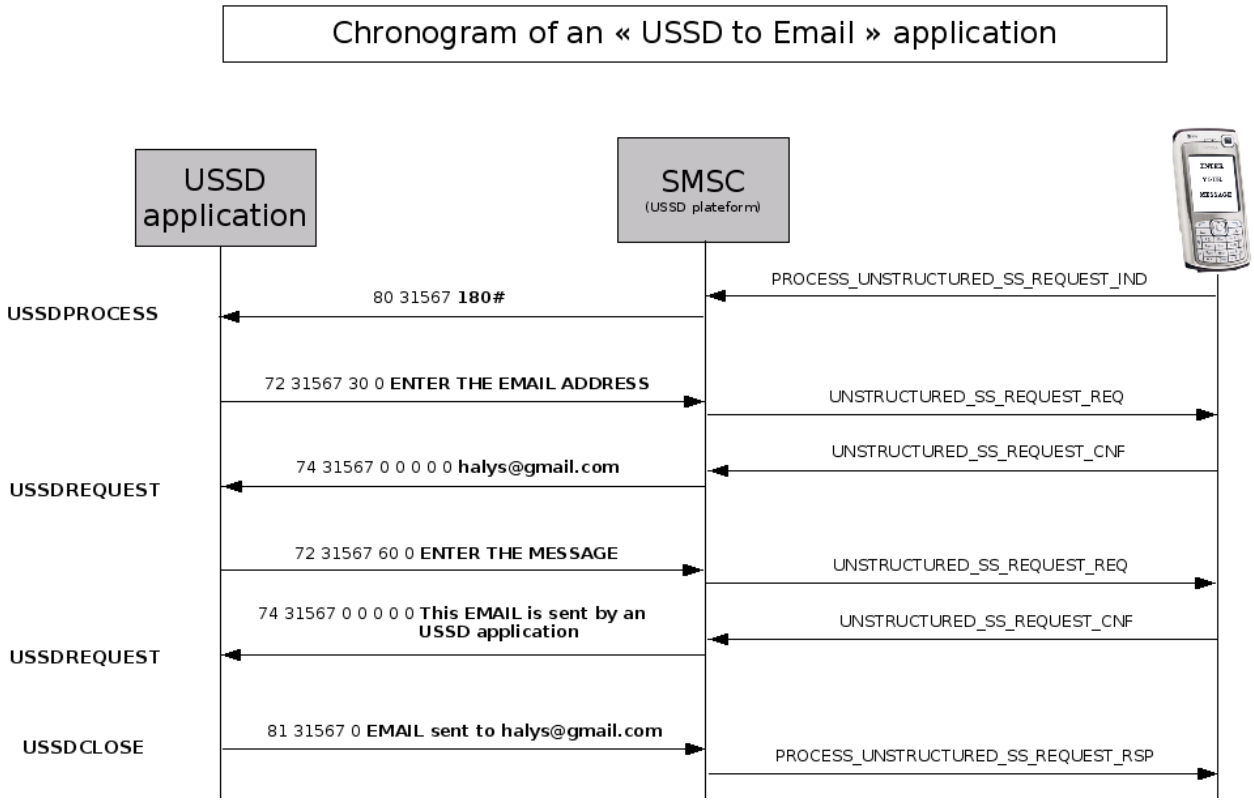
This application show the real utility of use “NOTIFY” command instead of “REQUEST” commands.



In order to send to the user a very long text such as an e-mail, you could also integrate the sending of a notification SMS whenever a new mail arrives on the mailbox of the user. He could connect to a USSD service to get the mail.

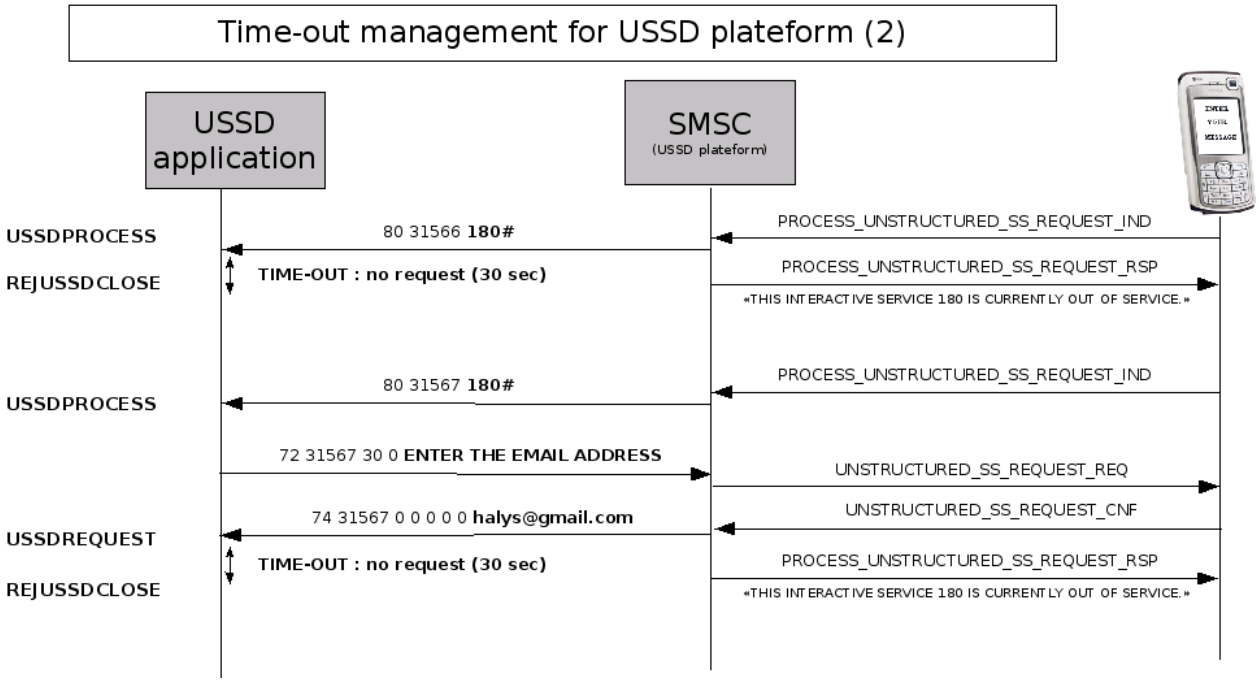
4.4 Example 2: An USSD to EMAIL application

The USSD code for this built-in application is *180#. **Try it !**



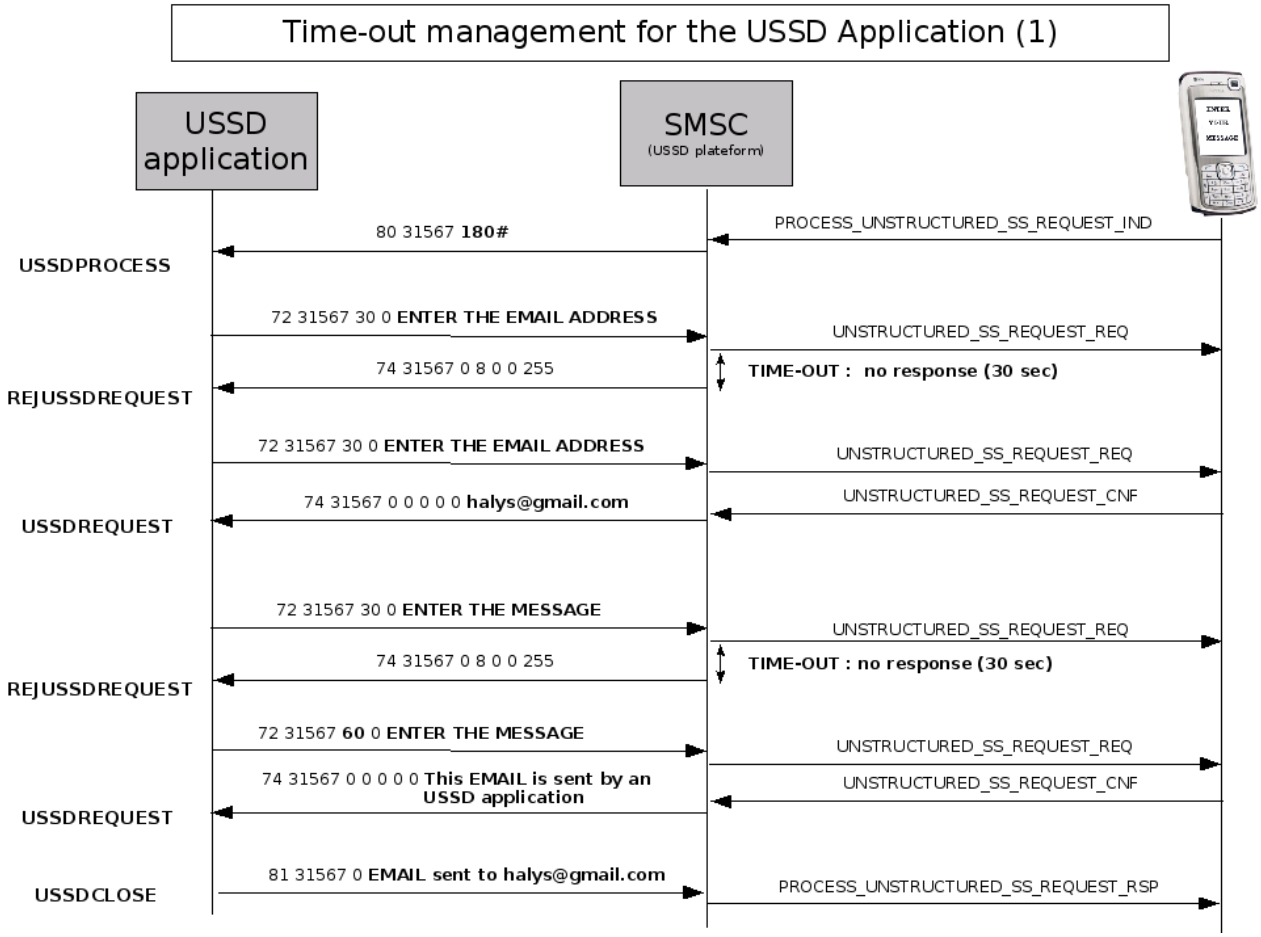
4.4.1 Time-out on application side

You have 30 seconds (compilation value) to send a submit_sm after received a deliver_sm. If the SMSC receive no request (REQUEST_REQ or NOTIFY_REQ) or no close (REQUEST_RSP), it will close itself the session. A RESJUSSDCLOSE tickets will be created.



4.4.2 Time-out on customer side

If the customer doesn't answer to a request from the application, a time-out signal is send to SMSC which will send to application an empty message with the error code: 0 8 0 0. The application can close the session or try again. It is also possible, as it seems in the example, that the time-out value was to short (30 seconds) to write a message in the answer. So, on the next try, it can be possible to put a time-out value a few long.



4.5 Billing for USSD

6 types of different tickets:

4.5.1 USSDPROCESS

This ticket is relative to a USSD receive by the application from a customer. It is created after the acknowledge of the application. If there is an error on the sending to the application, it will be an REJUSSDPROCESS with the error code.

4.5.2 USSDREQUEST

This ticket is relative to a USSD request sent by the application to the customer. It is created after the acknowledgement of the sending of the response to the application (on REQUEST_CNF). If there is an error on the sending to the application or/and on the response, it will be an REJUSSDREQUEST with the error code.

4.5.3 USSDNOTIFY

This ticket is relative to a USSD message sent by the application to the customer. It is created after the acknowledgement of the sending of the ack to the application (on NOTIFY_CNF). If there is an error on the sending to the application or/and on the response, it will be an REJUSSDNOTIFY with the error code.

4.5.4 USSDCLOSE

This ticket is relative to a USSD close sent by the application to the customer. It is created after have closed the session. If the session have been closed by the application, the ticket will be USSCLOSE, but if the session is close by the USSD plateform, it will be an REJUSSDCLOSE. It will show that the application have forgotten to close the session, or that the application have a lot of delay problems.

4.5.5 USSDPROCES_IN

Not used

4.5.6 USSDPROCESS_OUT

Not used