

Payment method based on USSD-commands

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Abstract— In this paper is given one method of constructing payment via commonly used mobile phone, SIM-card and plastic card based on USSD-commands.

Index Terms — e-payment system, e-commerce, USSD-Menu, USSD-command, plastic card, bank account.

I. PREREQUISITES OF E-PAYMENTS IMPLEMENTATION

NOWADAYS we can't imagine business and commerce without ICT. Government adopted many legislative acts, resolutions and decrees based on law and creating favorable conditions for online conducting of bargains. All these were done for the development of e-commerce and forming of required infrastructure as well.

Accepted law such as:

- "On Electronic Document Flow"
- "On Electronic Digital Signature"
- "On Electronic Commerce"
- "On Electronic Payments" stimulated penetration and practical use of e-payment instruments in e-commerce.

Existing e-payment systems require availability of Internet access, installing of special SW, in other words if user wants to make payment via Internet he/she needs PC or mobile device which has access to Internet and supports Java-applications, WAP/GPRS connection as well. Besides these mentioned some payment systems determine using of EDS (digital signature). One-time visiting of bank or e-payment system office needed too, with a view to be registered in the system, getting login/password and EDS.

But ideally, perfect e-payment system should be:

- widely available (easy of access)
- popular
- easily understood (simple)
- reasonable (moderate)
- reliable.

That is to say, developers should pay attention to factors, such no Internet access/failure of GPRS

connection, unavailability of PC, full-featured mobile phone or mobile device.

These mentioned suggest payment method to be simple, accessible and reliable at the same time with minimum requirements.

Developers should take note of increasing number of mobile operators' subscribers and plastic cards owners (personal accounts).

So we suppose that exactly in this sector we can implement such way of payment for subscribers, in order to create conditions to make orders by the means of commonly used simple mobile phone.

This payment method requires availability of simple mobile phone, SIM-card, plastic card or bank account. The installation of special SW, authentication with EDS, Internet/GPRS access, visiting of bank is not required.

All transactions will be realized via USSD-commands.

II. WHAT IS USSD-COMMAND?

Unstructured Supplementary Service Data (USSD) is a capability of all GSM phones. It is generally associated with real-time or instant messaging type phone services. There is no store-and-forward capability, such as is typical of other short-message protocols (in other words, an SMSC¹ is not present in the processing path). Response times for interactive USSD-based services are generally quicker than those used for SMS.

USSD is typically used as a 'trigger' to invoke independent calling services that don't require the overhead and additional usage costs of an SMSC, such as a callback service (e.g. cheaper phone charges while roaming), or interactive data service (e.g. stock quotes, sports results).

USSD is a standard for transmitting information over GSM signaling channels. It is mostly used as a method to query the available balance and other similar information in pre-paid GSM services. The function that is triggered when sending USSD is network-dependent and depends on the specific services the operator is offering.

Manuscript received July 22, 2011; revised August 3, 2011; accepted August 18, 2011.

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¹ A Short Message Service Center (SMSC) is a network element in the mobile telephone network which delivers SMS messages. When a user sends a text message (SMS message) to another user, the message gets stored in the SMSC which delivers it to the destination user when they are available. This is a store and forward option [1].

Example USSD codes:

*101#

*109*72348937857623#

After entering a USSD code on your GSM handset, the reply from the GSM operator is displayed within a few seconds.

USSD is the base of some payment methods such as SharEpay, SWAP Mobile in South Africa, Mobipay in Spain, M-Pesa in Kenya, and mPay in Poland [2].

III. DESCRIPTION OF NEW PAYMENT METHOD

All mobile operators offer USSD-menu service to their subscribers, so as to manage services and get required information.

As a case in point we can consider mobile operator – Ucell’s USSD-Menu. To enter to USSD-Menu subscriber should send following USSD-command:

*111#

As a result he/she receives list of services as below:

1. Current Balance
2. My services
3. Ucell DJ
4. U-Zone
5. Entertainment
6. Currency rate
7. Language change

Reply?

For example, subscriber wants to change phone language, and he/she should reply number “7”, after clicking button “ok”.

Then he/she will receive list of languages:

1. English
2. Russian

Reply?

Subscriber decided to change message language into English, which is under number “1”, so he replies number “1”. After successful language changing he/she will receive confirmation:

“Language changed successfully”.

All other changes and subscriptions for additional services can be realized according to this logical sequence.

So as we saw above Ucell offers seven kinds of services via USSD-Menu. But we can suggest additional

service, namely, “USSD-payment”, and add 8th service:

1. Current Balance
2. My services
3. Ucell DJ
4. U-Zone
5. Entertainment
6. Currency rate
7. Language change
8. USSD-payment

Reply?

When subscriber chooses service under number “8”, he will receive following list (*111*8#):

1. Registration
2. Internet Cards
3. Mobile Operators’ Cards
4. Taxi
5. Subscription for newspapers
6. U-Zone
7. Current Balance
8. Cash Transferring
9. Transfers’ Reports
10. ...

....

Reply?

Banks and mobile operators should make special connection (not Internet and GPRS). Based on this connection data exchange among subscriber’s bank, mobile operator’s bank and service’s bank will be realized.

First of all, subscriber should be registered in USSD-payment system. There is an important requirement: SIM-card’s and plastic card’s (or bank account) owner should be the same, namely, SIM-card and plastic card should be registered to only one person. If SIM-card’s and plastic card’s owner details are not the same subscriber could not use this service.

IV. DESCRIPTION OF REGISTRATION PROCESS

Subscriber sends:

*111#

And chooses “8” (*111*8#), USSD-payment, where from list he/she should pass registration stage (*111*8*1#):

1. After sending this command he/she will asked to enter plastic card’s 16-digit number with its 4-digit

password like below:

Enter your plastic card's 16-digit number with its 4-digit password.

Reply?

2. In next stage mobile operator sends these data to subscriber's bank to check if the data is correct, if such kind card is exists, and its password is same with password which was sent by subscriber, bank sends "card exists and owner's data is correct" answer to mobile operator.
3. Then mobile operator checks is SIM-card's owner details coincident with plastic card holder's details, if these data agree with each other, subscriber receives confirmation about successful registration, otherwise registration will be failed.

This payment method does not require login and password, after registration system automatically remembers subscriber and keeps him/her logged in.

But to confirm each transaction or payment subscriber will be asked to enter his/her SIM-card's pin-code. This stage is required in the case of stealing mobile phone. Also if subscriber made incorrect order, he has chance to cancel it, as at the moment of payment confirmation subscriber will receive such kind of message²:

You made an order with the cost ...
Service/good name ...
Please enter your SIM-cards pin-code to confirm your payment.

Reply?

So subscriber clicks "ok" button and replies pin-code (4-digit code).

If code is correct subscriber receives confirmation:

"Transaction completed successfully. Your balance is ..."

But if pin-code is incorrect or subscriber entered three times incorrect pin-code transaction will be failed.

Also in the order making process system will check:

Has subscriber required money in his/her plastic card to make payment for goods/services? This process will begin when subscriber chooses from list of options any good/service. For each category of good/services system sets its own minimum.

For example, if subscriber wants to buy Internet card, and selects this option, system automatically check has

he/she minimum means. Let's assume that as the cheapest card's cost is 5000 sum. Also subscriber should pay a commission for transaction (for mobile operator's services, as USSD-commands play the role of data transportation). If subscriber has no minimum money for buying card and paying commission percents, system notifies about balance of subscriber and asks to fill account.

Let's consider the process in which subscriber decided to buy Internet card.

So as I mentioned above, he/she sends *111*8# and chooses number "2" from following (*111*8*2#):

1. Registration
2. Internet Cards
3. Mobile Operators' Cards
4. Taxi
5. Subscription for newspapers
6. U-Zone
7. Current Balance
8. Cash Transferring³
9. Transfers' Reports⁴
10. ...

....

Reply?

Then he/she receive list of Internet providers, and subscriber should select one of them:

1. TPS
2. Sharq Stream
3. Flynet
4. ...

....

Reply?

Let's assume, that subscriber's provider is TPS, and he/she will reply number "1" (*111*8*2*1#) and get list where cards with different cost are listed:

1. 5000 sum
2. 10000 sum
3. 15000 sum
4.

...

Reply?

Subscriber has selected card with the cost 10000 sum,

³ This way you can transfer money to other person's account, if you would like to fill someone's account in this system.

⁴ This option helps you to control your expenditures, transactions, ex.: how much you spent today, this week ...

² Vasila Karimova, "E-payment systems of e-commerce", Proceedings of ICEIC2008, June 24-27, 2008, Tashkent, Uzbekistan, pp. 97-99.

which is under number “2” (*111*8*2*1*2#).

Finally, he/she receives notification about order cost, service/good name, and will be asked to confirm the payment with pin-code:

Your order is TPS Internet card.
Cost: 10000 sum.
Please enter pin-code to confirm.

Reply?

Subscriber sends pin-code and receives confirmation of transaction, and will be notified that he/she will receive Internet card details (pin-code, access number) via SMS.

Some people may say that this payment process is very long, and makes users to be confused.

In this case we can suggest special program-converter which should be installed to mobile phone and converts USSD-commands. Simpler saying, after installing SW to your phone you are not required to send USSD-commands, you will have GUI, you just select and click from existing options. But this method requires mobile phone which supports Java-applications.

REFERENCES

- [1] <http://en.wikipedia.org/wiki/SMSC> - Short message service center
- [2] <http://en.wikipedia.org/wiki/USSD> - Unstructured Supplementary Service Data



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