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# Platforms Used in Mobile Value Added Services

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***Abstract* – The Mobile Value Added Services (MVAS) are one of the most important revenue drivers in wireless environments all over the world. However like any other operator services these MVAS need an underlying platform and infrastructure to deliver the offered features and functionalities. In a mobile telecom operator environment there are multiple platforms available to support a subscriber facing value added service. This paper captures the most popular value added services available in a mobile telecom operator network and describes the various platforms used to support them.**

***Keywords* – Value Added Services, VAS, MVAS, SMS, IVR, WAP, GPRS, USSD, STK and CMS.**

## I. INTRODUCTION

Values Added Services (VAS) in the mobile services sector allows to grow traffic revenues, profit, provide benefits and the development of new markets (Lorenz and Tobiet, 2000). The services today have moved beyond their fundamental role of voice communications to a spectrum of non-core services, which in telecommunication parlance is called Value Added Services (VAS) (TRAI, 2009). In short, all services beyond basic voice calls and fax transmissions come under the category of VAS or also called enhanced services. Mobile VAS combines the characteristics of mobile telephones and the Internet (Lee, 2003). In simple terms, Value Added Services add value to service, enabling the subscriber to use the telephone, particularly the mobile phone or any end user terminal device for a host of purposes like sending short messages, pictures, play games, listen to music, read news headlines, astrology, get flight information, surf Internet and mobile banking including mobile payments (TRAI , 2011). Mobile VAS includes services such as (Telecominfo, 2009):

- SMS (short messaging services) – Text messages of 160 characters : P2P (peer-to peer) and A2P (Application to peer)
- MMS (Multimedia messaging services) – Send photos, images, screen savers, videos, wallpapers etc.
- USSD (Unstructured supplementary Service Data) – Interactive menu based services
- CRBT (Caller Ring Back Tone) – Plays pleasant music for the callers
- Video streaming – Watch on demand movies, TV serials, live sports matches
- Mobile advertisements – Post banners, promotions, sales discounts
- Polls and contests– Voting for your favorite contestants by sending SMS to the given short code
- Location based services – Friend finder, restaurants, malls etc
- Bulk SMS – Send greetings, compose one sms to multiple end-users simultaneously based on festivals, occasions, promote retail sales etc.
- m-commerce – Banking and secure financial transactions
- Social networking – Instant messaging (Mobile 2.0), sharing video, pictures, presence services, blogging
- IN services (Intelligent Network) – Call divert, call forward, televoting etc.
- Infotainment services – Sports news, current affairs, weather reports etc
- Surfing the Internet - browsing and content download through WAP portals

Different technical arrangements or platforms are presently being used by telecom service providers for delivering Mobile Value Added Services based on the type of content. For example SMS are used for downloading monophonic ringtones, whereas WAP/GPRS platform is used for downloading polyphonic and true-type ringtones.

## II. MVAS PLATFORMS

Some of the MVAS delivery platforms are following:

### *A. Short Message Services (SMS)*

To process and deliver SMS based value added services SMSC Platform is used by the telecom service providers. SMS can be person to person (P2P) and person to application (P2A & A2P). The subscriber sends an SMS to the server, which then sends back an SMS to the subscriber with the service requested e.g. downloading ringtones, seeking information like news, cricket scores, subscribing to jokes and accessing other such services (TRAI, 2011)

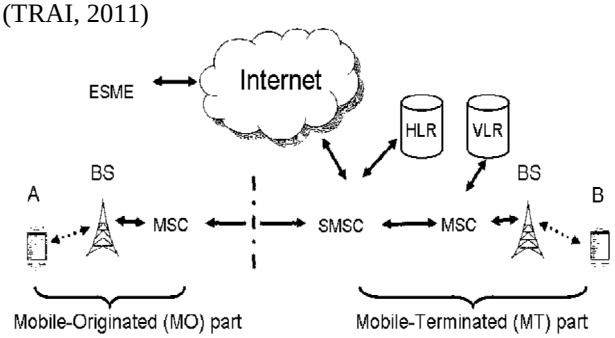


Fig.1. Network Architecture for SMS
(Source: Katankar and Thakare, 2010)

SMS messages are transmitted over the Common Channel Signaling System 7 (SS7). SS7 is a global standard that defines the procedures and protocols for exchanging information among network elements of wire line and wireless telephone carriers. These network elements use the SS7 standard to exchange control information for call setup, routing, mobility management, etc. **Error! Reference source not found.** shows the

typical network architecture for SMS communication. Conceptually, the network architecture consists of two segments that are central to the SMS model of operation: the Mobile Originating (MO) part, which includes the mobile handset of the sender, a base station that provides the radio infrastructure for wireless communications, and the originating Mobile Switching Centre (MSC) that routes and switches all traffic into and out of the cellular system on behalf of the sender. The other segment, the Mobile Terminating (MT) part, includes a base station and the terminating MSC for the receiver, as well as a centralized store-and-forward server known as SMS Centre (SMSC). The SMSC is responsible for accepting and storing messages, retrieving account status, and forwarding messages to the intended recipients. It is assisted by two databases: the Home Location Registrar (HLR) and the Visitor Location Registrar (VLR). The two databases contain respectively permanent and temporary mobile subscriber information, e.g., the address of the MSC the device is associated with (Katankar and Thakare, 2010).

### *B. Interactive Voice Response (IVR)*

This platform integrates computer and telephony to detect voice and touch tones using a normal phone call. The subscribers interact with an IVR system with or without embedded voice recognition technology for accessing VAS such as news, live talk to astrologer, movie information, jokes, listening to live commentary etc (TRAI, 2011) (Turner, 2004) and (Chotimongkol et al, 2012).

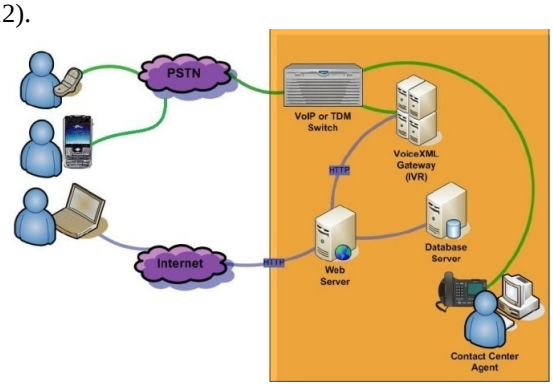


Fig.2. IVR System
(Source: Nortel, 2007)

VoiceXML (Voice eXtensible Markup Language (VoiceXML Forum, 2003) has been an important development in the standardization of IVR. There are competing standards for IVR, but VoiceXML seems to have attracted the most support. The basic idea of VoiceXML is that users 'fill in' fields of forms by speaking in response to prompts. VoiceXML platforms usually include sophisticated support for TTS (Text To Speech, i.e., synthesized speech output) (Talevski, 2008) and STT (Speech To Text, i.e., speech recognition). The completed information is then typically submitted to a program or database for further processing. VoiceXML lends itself to a wide variety of applications such as news and sports information, telephone banking, sales enquiries and orders, and travel bookings (Turner, 2004).

### *C. Wireless Application Protocol (WAP)*

It is a service which enable users the access to Internet on the mobile. These include basically data based value added services such as Internet browsing, MMS, entertainment, download music/video/wall papers, Games and Mobile TV etc. (TRAI, 2011) (Xiao-ling et al, 2004).

WAP Applications are usually comprised by WAP mobile terminal, WAP gateway and WAP content server (WAP Forum, 2002). Among them, WAP gateway protocol plays a "translation" role. Its main role is as follows: encode client HTTP request into binary stream and obtain the results of the implementation, as well as compression of the WML page to compile and send it into binary WML client. WAP content server is used to store network information. When the mobile terminal wants to access WAP content server, it send an URL request through a wireless network to the WAP gateway. WAP Gateway then analyzes the request, translate it and interact with the WAP content servers via HTTP protocol. At last, the response then will return to the WAP gateway to be decoded and compressed, and will be finally returned to the mobile terminal (Soriano and Ponce, 2002) (Weisen et al, 2010).

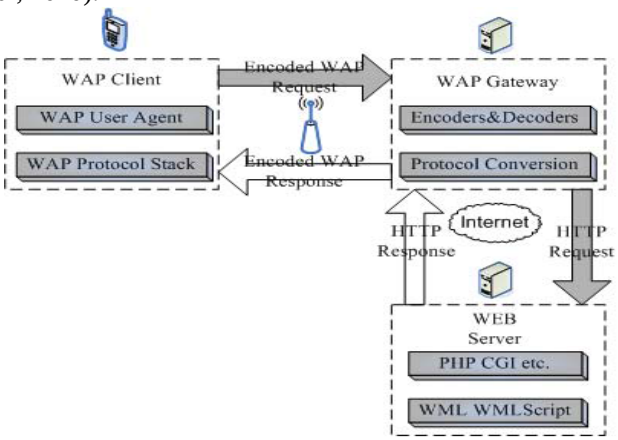


Fig.3. WAP Architecture
(Sources: Weisen et al, 2010)

### *D. General Packet Radio Service (GPRS)*

General Packet Radio Service (GPRS) (Kalden et al, 2000) is to reserve some physical channels exclusively for data traffic. The service package is based on end-to-end transfer of packet mode data among the users over the GSM. GPRS requires a packet mode only overlay network on GSM to provide both point-to-point (PTP) and point-to-multipoint (PTM) mobile packet data services (Mishra A., 2001). As a main feature of GPRS the services will be charged on a volume basis, i.e. the price is based on the amount of data transferred and not on the duration of the session (Ghribi and Logrippo, 2000). This is very well adapted to the bursty nature of data traffic and will help to speed up the penetration of WAP and other data services. In particular, Internet users appreciate to be always connected to the network which is now also supported with the GPRS "always on" feature (Tangemann et al., 2001).

Fig.4 illustrates the overall system architecture for a mobile satellite packet data system based on terrestrial GPRS. The Terminal Equipment (TE) such as laptop or desktop interfaces with Mobile Terminal (MT) in a standard way using Bluetooth, USB or Ethernet. The Packet Base Station Subsystem (PBSS) implements the satellite specific functionalities such as Physical and Data-Link layers as well as satellite radio resource management (Ravishankar, 2004).

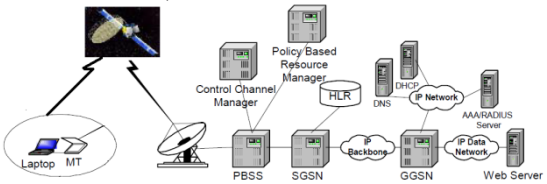


Fig.4. GPRS Architecture
(Source: Ravishankar et al., 2004)

The PBSS interfaces with Serving GPRS Support Node (SGSN) that implements mobility management, session management, data encryption, TCP/IP header compression and data compression. SGSN interfaces with Gateway GPRS Support Node (GGSN) (3GPP Specification on GSM **Error! Reference source not found.**). SGSN also interfaces with Home Location Register (HLR) for authentication and authorization for GPRS services. In order to provide differentiated services on an edge-to-edge basis, the GPRS QoS attributes can be mapped into IP DiffServ or *Multi Path Label Switching* (MPLS) between SGSN and GGSN. GGSN interfaces with external IP data network, including private corporate IP networks. In addition, GGSN interfaces with standard network IP elements such as *Dynamic Host Configuration Protocol* (DHCP) servers for providing dynamic IP addresses and *Domain Name Server* (DNS) servers for address resolution and *Authentication, Authorization, and Accounting/ Remote Authentication Dial In User Service* (AAA/RADIUS) servers for user authentication and billing with ISPs. SGSN and GGSN functionalities are same as terrestrial GPRS to permit certain key features to be available in the satellite system, such as inter-system mobility (Ravishankar, 2004) (Mishra, 2001).

### *E. Unstructured Supplementary Services Data (USSD)*

This is a method of transmitting information/ instructions over GSM network. Unstructured Supplementary Services Data (USSD) is a GSM service which enables high speed interaction between mobile customers and services, which usually take the form of applications. The USSD gateway forms part of the infrastructure which makes this interaction possible by acting as an interface between the services and the GSM network, allowing user interaction (Suddul et al, 2011) (Sarajlic and Omerasevic, 2007). It is a session oriented service where user gets a flash message in real time. Services like content download, cricket updates, jokes, news alerts etc. can be acquired by subscribers using USSD (TRAI, 2011)

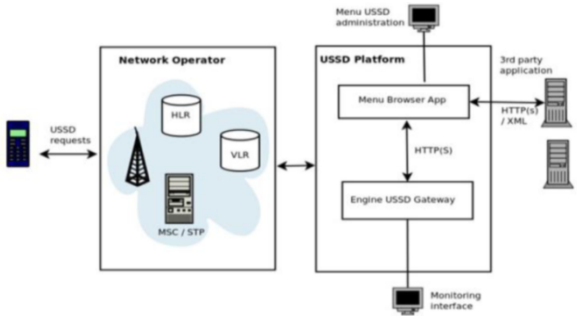


Fig.5. USSD Architecture
(Source: Suddul et al, 2011)

User requests a service by entering short code on mobile (i.e. *121*676#). Format of code is standardized, and content is specified for each service. Short code passes through mobile network to USSD Gateway and route to the application. The application sends back response to user, through USSD Gateway, into the same USSD session. One USSD session can contain unlimited message sequence, between user and application (Sarajlic and Omerasevic, 2007).

The USSD System in GSM generally lies as a mediator between Network (STP) and the Application provider. The Network connectivity remains very much like SMSC over SS7 i.e. SIGTRAN or HSL. The application provider connects to the USSD server over IP by means of HTTP or SMPP interface. The USSD transactions flow through the below network elements and session is maintained at each level. The menu can be either held at the USSD server or at the application level. The application system mainly works as a content provider for various operator business services (Gupta, 2010).

### *F. Call Management Services (CMS)*

Services like missed call alerts, call forwarding, voice mail, incoming call block etc. are provided using this platform (TRAI, 2011).

### *G. SIM Application Tool Kit (STK)*

The SIM Application Toolkit allows for the service provider or a bank to house the consumer‘s mobile banking menu within the SIM card. STK is the most secure method for mobile banking. It allows the bank to load its own encryption keys onto the SIM card with the bank‘s own developed application. Thus the consumer‘s data can be stored on the SIM Card and the consumer can be authenticated on the handset prior to having to carry any data across the mobile network (TRAI, 2011).

## III. VALUE ADDED SERVICES OFFERED ON DIFFERENT MVAS PLATFORMS

Table 1 represents the different value added services provided on different MVAS platforms:

Table 1: Value added Services offered on different MVAS Platforms

| Platform | Services | Sources |
|---|---|---|
| SMS | • SMS<br>• Ringtones CBRT<br>• Customized Wallpaper<br>• Animations<br>• Quiz<br>• Jokes<br>• Cricket / Match alerts<br>• News<br>• Astrology,<br>• Vaastu,<br>• Fengshui,<br>• Personality Test<br>• Banking Info Alerts<br>• Travel alerts details like Train, Flight Details etc<br>• Mobile Banking<br>• Ticketing<br>• Travel and Holiday Bookings<br>• Payment confirmations<br>• Due date reminder<br>• Location Infotainment Search<br>• Advertising<br>• Chat<br>• Pull on short code for contests, voting, information<br>• Push for advertising<br>• LBS System<br>• Enterprise IM<br>• Group Messaging<br>• DTH Recharge - ICICI<br>• SMS Banking – ICICI<br>• Interbank Mobile Payment Service (IMPS) – ICICI<br>• Devotional - Vodafone | TRAI, 2011<br>ICICI Bank, 2013<br>Vodafone Devotional, 2013 |
| WAP | • Video Clip<br>• Mobiles Games<br>• Mobile Themes<br>• Mobile Radio<br>• Movies Related Info<br>• Stock Portfolio Managers<br>• News Tickers/ Alerts<br>• Mobile Banking<br>• Ticketing<br>• Travel and holiday bookings<br>• Mail<br>• Mobile Greetings<br>• Dating, Chatting, Blogging etc.<br>• Infotainments<br>• SNC/UGC<br>• Internet search and advertising<br>• Messenger<br>• Location based Information's<br>• Internet mobile email<br>• Mobile calendar<br>• Access to internet and core business Applications<br>• Mobile VPN<br>• Push email over handheld devices ( e.g. Blackberry)<br>• Wireless email | TRAI, 2011 |

| Platform | Services | Sources |
|---|---|---|
| GPRS | • Internet browsing<br>• MMS<br>• Download music/video/wall papers,<br>• Games<br>• Mobile TV<br>• IMPS – ICICI<br>• Location Management<br>• GPRS Vehicle Location Tracking | TRAI, 2011<br>ICICI Bank, 2013<br>Seneviratnea and Sarikayab, 1998<br>Chai et al, 2006 |
| IVR | • Religious Chants<br>• Music on Demand<br>• Astrology<br>• Vaastu<br>• Fengshui<br>• Personality Test<br>• Mobile Banking<br>• Ticketing<br>• Astrology Service<br>• Voice SMS<br>• IVRS based contact centre's<br>• Self Help centre's<br>• Voice Portals<br>• DTH Recharge – ICICI<br>• Background Music Service - BA | TRAI, 2011<br>ICICI Bank, 2013<br>Boston Analytics, 2007 |
| USSD | • Content download<br>• Cricket updates<br>• Jokes<br>• News alerts<br>• Mobile Banking – ICICI<br>• Mobile Payments – HDFC<br>• M-Pesa | TRAI, 2011<br>ICICI Bank, 2013<br>Saxena, 2012<br>Kendall et al, 2012 |
| CMS | • Missed call alerts<br>• Call forwarding<br>• Voice mail<br>• Incoming call block<br>• Call Conference | TRAI, 2011<br>Vodafone, 2013<br>Huh et al, 2002 |
| STK | • Mobile Banking<br>• Airtel Money | TRAI, 2011<br>Airtel Money, 2011 |

## IV. CONCLUSION

This paper briefly surveyed all the Mobile Value Added Services platforms and their different application used by different telecom operators. It discussed the architectures and facts about different platforms being deployed, in the mobile computing arena. The architecture discussed above, needs regular modifications and enhancements to reach the subscriber, to show significance in day-to-day usage. Work is in progress to improve the different value added services with better efficiency, accuracy and improving the interfaces with the user. This paper maps these technical aspects to the architecture of different platforms for mobile value added services and expects that it will help to create more awareness, in the user community.

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