

Indian Ecosystem for Mobile based Service Delivery

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Abstract—Mobile governance (m-governance) is the obvious next step of e-Governance and many countries have started providing various government services on Mobile Devices. This paper describes initiatives taken by the Government of India for developing Mobile based service delivery ecosystem in India. The outcome of this initiative is a Mobile Service Delivery Platform (MSDP) which can be used to deliver public services through the various channels available on mobile phones

Keywords—Mobile Services Delivery Platform (MSDP), Mobile Services Delivery Gateway(MSDG), Application Store, Mobile Network Operators (MNO).

I. INTRODUCTION

e-Governance has emerged as a popular phenomenon to deliver government services around the world. However, e-Governance in an implementation sense is restricted primarily to the use of computer based internet access to deliver services. In countries where the penetration of computers and internet is relatively low, such as in India, there is an apprehension that the reach of e-Governance may be limited. The limited reach of e-Governance has made government think of new technologies, such as mobile phones, to reach the citizens and deliver public services.

The purpose of this paper is to provide the details about the initiatives taken by Government of India for public services delivery through mobile phones and describe the key components of the Mobile based Service Delivery Platform for e-Governance, which will facilitate the Service Delivery to the citizen on the mobile devices through various channels.

The growth of telecom-subscribers in India has been phenomenal with over 851.70 Million users at the end of June 2011. The overall tele-density in June 2011 was 71.11. The net additions are growing at the rate of over 15 Million per month. This means that India would have over 900 Million mobile-users by 2012[2]. Looking at the increasing number of mobile subscribers, it has become imperative to offer Government services over mobile-phones. This ensures the vision of NeGP(National eGovernance Plan by Government of India) of providing Government services to every citizen near their doorstep, becomes a reality.

Mobiles can be one of the largest Service Access Points for the government using its e-Gov exchange consisting of NSDG (National eGovernance Service Delivery Gateway), SSDGs (State eGovernance Service Delivery Gateways) and Domain

Gateways [19]. The current eGovernance gateway infrastructure should be extended for mobile governance. A separate infrastructure is required for:

- Seamless integration with backend departments through existing eGov exchange ,
- Common interface for mobile based services (SMS, USSD, GPRS, 3G, Cell Broadcasting, Location Based Services, etc). Mobile devices pose constraints in generating as well as rendering of the contents for the service delivery.

If we look at the type of mobile handsets used by the Indian citizens, we categorize them in three classes based on the type of channels available for service delivery on that particular mobile handset.

- **Basic Phones** which are very low cost handset and have minimal features, e.g. SMS and voice calls which can be used as the mode of service delivery.
- **Smart Phones** which are currently costly, but are mobile operating system based and offer most of the features and channels for service delivery.
- **Semi-smart Phones**, which comes in between the above two categories in terms of price and the features. Most of the phones in this category may not have the mobile operating system but at least most of them have J2ME or Java ME available.

II. RELATED WORK

The Government of Kerala has launched mobile based public services in a number of state government departments, such as agriculture, health, district administration, tourism, fisheries, motor vehicles, police, elections, etc..Health department in Kerala has launched “Dr. SMS”, a SMS based m-health information system for providing information on health resources and the medical facilities available in the locality of the resident [1][10].

The Government of Goa has launched a mobile governance initiative by establishing a SMS Gateway for providing SMS based services to residents. These services include SMS alerts for receipt of applications, shortcomings in the applications, and status tracking. The Gateway has integrated SMS into the e-services through API integration. Currently, the SMS Gateway services are being provided to the following departments: Goa State Pollution Control Board, Directorate of Accounts, Directorate of Printing and Stationery, Inspectorate of Factories and Boilers, Animal Husbandry and Veterinary services, and Commercial Taxes [1][11].

The Ministry of External Affairs, Government of India has

launched a SMS based status tracking service for passport applications. Passport Office, Delhi provides this service to all applicants enabling them to get the status of their applications by sending a SMS to a short code. Similar services have been launched by several other passport offices across the country, such as Ghaziabad, Hyderabad, and Madurai [1][12][13].

Greater Hyderabad Municipal Corporation has launched a unique mobile phone based Intelligent Garbage Monitoring System that enables the sanitary supervisors to report the status of cleaning of garbage bins through their GPS enabled mobile phones. They can also upload pictures of the cleaned bins through their mobiles in real time on the website. Any resident can view the status of cleaning of the bins at anytime on the website [1][14].

The State Bank of India offers Mobile Banking services on Java enabled mobiles phones through SMS/GPRS/WAP and on non Java enabled phones through WAP. The user of the Mobile Banking services is required to download an application which is available on their website [1][15].

Interbank Mobile Payment Service (IMPS) of National Payments Corporation of India (NPCI) provides instant, 24X7, interbank electronic fund transfer service through mobile phones [16].

Many countries around the world have also launched mobile based public service delivery. The Government of Singapore has identified mobile service delivery as one of the strategic thrust areas for Singapore's iGov 2010 Master Plan [1][17]. The Government of Bahrain provides one of the most comprehensive suite of mobile phone based 45 public services [1][18].

III. MOBILE SERVICES DELIVERY PLATFORM (MSDP)

MSDP (Mobile e-governance Services Delivery Platform) provides an integrated platform for delivery of government services to citizen over mobile devices using SMS, USSD, MMS, Voice, LBS, WAP, or through mobile applications installed on the mobile phones.

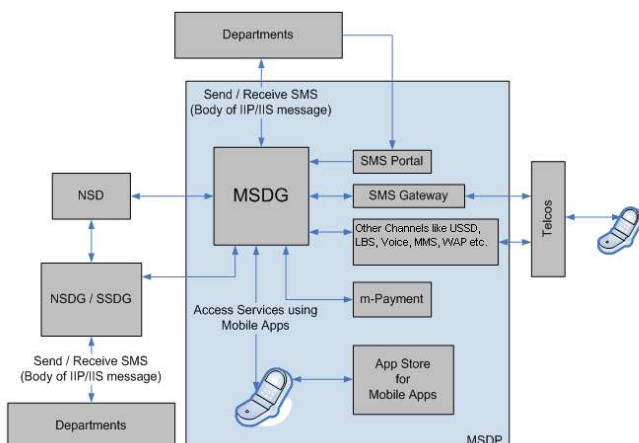


Figure 1. MSDP Architecture

The MSDP have the following subsystems to provide an integrated platform for the delivery of government services:

- Mobile e-governance Service Delivery Gateway (MSDG)
- SMS Gateway as a Service
- m-Gov App Store
- Mobile Payment Services
- Location Based Services
- Service Delivery on other channels e.g. USSD, MMS, Cell Broadcasting, IVRS etc.

IV. MOBILE SERVICES DELIVERY GATEWAY [MSDG]

NSDG/SSDG[19] had not been developed keeping in mind the requirement of the access of government services from mobile devices. MSDG is messaging middleware which facilitates e-governance services delivery on mobile devices, which is based on e-Governance Standard protocols IIP (Interoperability Interface Protocol and Specifications), IIS (Interoperability Interface Specification), IGIS (Inter Gateway Interconnect Specification) and leverage on existing infrastructure components i.e. constellation of gateways[19].

V. MOBILE APPLICATIONS AND APPLICATION STORE

There are lot of efforts are already being put in India, in terms of Back-end department automation and their connectivity via NSDG and SSDG[19]. Till now except for efforts in some States and Central government, the main channels of service delivery had been only web via CSCs (Citizen Service Centres) and through National and State portals. As the number of mobile subscribers is increasing, the mobile handset can be used as the service access provider.

As discussed above the mobile applications can be developed based on the three categories of mobile handsets described above. SMS and Voice based applications can be developed for the basic phones. Smart phones will be able to run most of the type of mobile applications developed. For the third category of phones, including SMS and voice, J2ME/Java ME based applications can be developed. These applications can be developed by independent developers or by any software firm. There is a scope for development of thousands of mobile applications in the e-governance domain. For hosting and managing these large numbers of applications, a application store is required same as provided by Apple, Google, RIM, Nokia, Samsung, LG, Microsoft etc. Once the developers have developed the mobile application, he/she has the biggest challenge of promoting the application and generating revenue. So there is a requirement of developing an ecosystem around the application store which offers the developers, channels to distribute and market the mobile applications.

A. Distribution Channels for Mobile Applications

Qusay H. Mahmoud [20], discussed various distribution channels for mobile applications.

- 1) **Device Manufactures:** With collaboration of mobile device manufactures, app store application can be loaded in the mobile phone itself. This can allow the citizen to

search, find, purchase and download mobile applications directly to their phones. In this distribution system developer decides the price of the application and receive some percentage of the revenue and does not pay for marketing, hosting, credit card, or charges for free applications. The Apple App Store [21] shares 70% revenue with the developer, whereas Blackberry AppWorld [22] shares 80% revenue with the developer.

- 2) **Mobile Network Operators:** Network operators also provide their sites to display, distribute ad sell mobile applications. Operators such as Vodaphone [23] and Airtel [24] also operate mobile application portal. In this model, billing is easier to the citizen for the purchased application. However the developers are charged with some fees for hosting their application.
- 3) **Third Party Distributors:** Third party distributors act as a middleman for the developer and the customer/citizen. The proposed m-governance application store fits in this model. The application store needs to handle the marketing, distribution, sales, and reporting processes of mobile applications on behalf of the developer. In exchange of this app store may take some percentage of the revenue generated. App Store needs to have partnership with phone manufactures, network operators, and technology vendors for testing the application on the mobile handset in that particular network.

B. Business Model

The mobile application development and the management of the application store infrastructure must be on the self sustainable model. This requires generating profits and revenue for the interested parties.

- 1) Advertisements can be displayed at number of locations and different points of time in the application. This is particularly relevant for free applications for generating the revenue. Mobile Marketing Association and the iAB (Interactive Advertisement Bureau) have published many guidelines for mobile advertisement which can be used.
- 2) Revenue can be shared from the network service provider, from the revenue generated from the increased usage of the network in downloading applications.
- 3) Sharing of revenue with the developer on each purchase of the mobile application.

C. Technical Details

The application after downloaded on the mobile handset can talk to the backend application via MSDG using SMS/http/https/WAP protocols. Application needs not to bother about the gateway protocols. MSDG will make all the gateway specific calls to the NSDG/SSDG. For example it will make Service Request and Service Poll on NSDG/SSDG on behalf of the application.

VI. SMS GATEWAY AS A SERVICE

The SMS Gateway will act as the common service of MSDG. This will help delivering the government services

using SMS. SMS is the way of asynchronous communication on the mobile platform.

The SMS based services have been broadly categorized into:

- Push SMS
- Pull SMS

PUSH based services: In case of PUSH based services, the response/ information is sent to the subscriber who has expressed his/her consent/ concurrence / willingness to receive such response/ information or solicited such response/ information on periodic basis at some point of time and not necessarily on per MO basis as in case of PULL based services.

Push based services can mostly be used for the notifications to the citizens. Suppose a backend department receives a request from the NSDG/SSDG for a particular service and the department wants the citizen to keep him/her updated about all the Service Processing Status. Let us consider a department which issues some certificates and defines the following types of status.

Status 1: We have received your application for the Certificate, your application id: xyz.

Status 2: We could not process your application, because one of the supporting documents was missing.

Status 3: Your application is processed and it will be delivered to you by post in xxx no. of days.

Now suppose the department application has just received the certificate request from the NSDG/SSDG. The department application can check that whether user has mentioned the mobile number in the application for the certificate. If it is there, then the department application can send the SMS to the citizen with the content in status 1. For this the department will make the SMS request message on the following url with mobile number(s), message content and provide username and password:

<http://msdgweb.mgov.gov.in/esms/sendsmsrequest>

This is one interface of MSDG, where it listens for the SMS requests. Once the MSDG, receives the SMS request on the above mentioned url, it forwards the request to the SMS gateway component, which in turn sends to the SMSC (SMS Center) of a Mobile Network Operator. This SMSC of the MNO forwards the SMS to the respective mobile number.

PULL based services: The PULL based services are those where the subscriber asks/ requests/ solicits for information/response for each query/ SMS sent to the application server on per message originated (MO) basis.

Shortcode 51969 has been allocated to MSDP by the department of telecommunication. This shortcode is the single point of access for all the pull based sms services on MSDG for the whole country.

The various stages of using the pull based services on the shortcode 51969 are:

Stage 1: Identifying Services to be customized for SMS pull model- Choosing the Right Services

Short and focused services are keys. There are two kinds of services usually deployed:

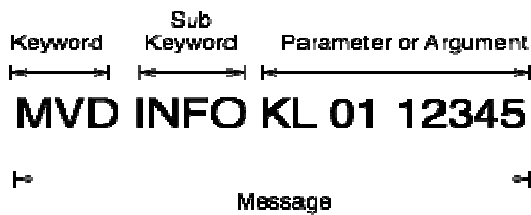
- **Informational Services** for citizen requests for the status of a particular activity.

A typical example is the status of the ration card application. When the citizen sends an SMS “GOA RATIONC XXXX” to the short-code 51969, the first word represents the keyword for the State, the second word RATIONC represents for keyword for the Ration Card service and the third word represent the application number. The citizen receives back a SMS with details of the status of ration card application with the application number XXXX.

- **Transactional Services** for when a citizen registers himself for a service for later delivery. A typical example is a citizen requesting for delivery of state-wide examination results. When he/she sends an SMS “MH SSLC 787689”, the first word being the name of the state and the second the name of the service e.g. name of the examination, third his registration number, the application stores his mobile number against his registration number and sends him the correct results when it is published.

Stage 2: Choosing Keywords, Sub-Keywords and Response Message Formats

Components of an Incoming SMS:



To make shortcode 51969 services easier to use, a citizen should not have to remember complicated keywords and sub-keywords for a service. A good shortcode service thus has a very flat hierarchy and should be simple to explain in the length of a single text message.

A suggested configuration has been described below.

- **Keywords:** Names of States
- **Sub-Keywords:** Names of Services and parameters/arguments
- **Responses:** Usually less than a single text message.

Example:

When the citizen sends an SMS “GOA RATIONC XXXX” to the short-code 51969, the first word represents the keyword for the State, the second word RATIONC represents for keyword for the Ration Card service and the third word represent the application number.

Recommendation: It is also recommended that every keyword has a configured HELP sub-keyword for service discovery. In case of an invalid SMS being sent, an instruction to use the HELP discovery service should be sent back.

VII. MOBILE PAYMENTS

The citizen needs to pay for services and for downloading applications from appstore, which are not free. Therefore MSDP has requirement of mobile payment services.

Mobile payment can be defined as a payment method where a citizen can use a mobile phone to pay for a public service. There are different ways in which payment can be done using mobile devices. In India, RBI (Reserve Bank of India), has issued regulations for mobile payment using bank account. Under the RBI regulations, various banks have come with different application which can be deployed on the mobile devices and can be used for mobile payments.

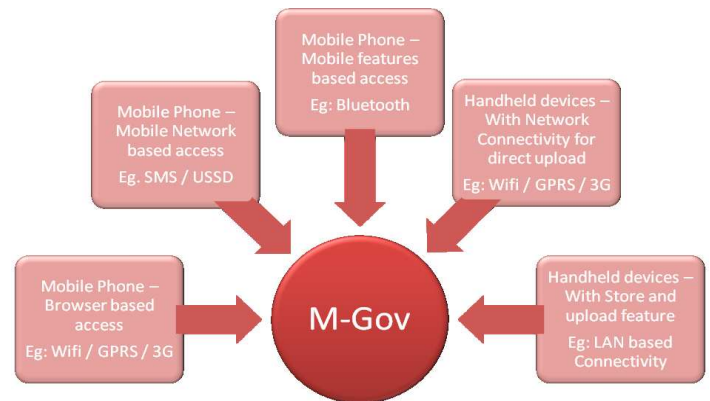
IMPS (Interbank Mobile Payment Service), launched by NPCI (National Payments Corporation of India) [29], can be used for mobile payment. To avail this service, user should have a mobile number registered with the bank where the user has the account and get a 7 digit MMID (Mobile Money Identifier) number.

RBI has also allowed for prepaid payment instruments also commonly known as Mobile Wallet. The service will enable the subscribers to exchange physical cash for virtual money which can be stored on mobile phones to pay for goods and services. Once the user loads up his phone with prepaid cash he can walk into specified merchant locations and purchase goods and services. The value stored on such instruments represents the value paid for by the holder, by cash, by debit to a bank account, or by credit card.

VIII. OTHER CHANNELS OF SERVICE DELIVERY (FUTURE ROADMAP)

Other Mobile technologies will also get integrated with MSDP over a due course of time. It has been envisaged that the following services will also be made available on the MSDP:

- Voice Gateway
- USSD Gateway
- Location Based Services
- Billing Gateway
- MMS Gateway
- 3G Gateway
- Cell Broadcasting Gateway
- SIM Toolkit
- On Device Portal
- Other Mobile Developments



IX. CONCLUSION

As the number of mobile subscribers is increasing rapidly and given its reach, it has become imperative to offer Government services over mobile-phones to ensure that the Government services are delivered to every citizen to their doorsteps.

Mobiles itself can be one of the largest Service Access Provider for the government services provided through eGov exchange formed through NSDG, SSDGs and Domain Gateways. The current architecture of NSDG/SSDG or the domain gateway should be supplemented with separate infrastructure for mobile governance. A separate infrastructure is required as:

- Seamless integration with backend department through existing NSDG/SSDG eGov exchange infrastructure
- It will provide common interface for mobile based services (SMS, USSD, GPRS, 3G, Cell Broadcasting, Location Based Services, etc)
- Mobile devices are constrained environment
- Needs to generate as well as render the contents for delivering the service on the mobile.

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