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E-Government through Cooperative Web Services

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ABSTRACT
This paper presents a service-oriented e-government infrastructure based on efficiently providing customized services to citizens. We aim at providing an e-Governance system using cooperative web services which is a service-oriented digital government system that aims at providing single as well as composite services to the citizens. The proposed architecture for cooperative web services manages the entire lifecycle of third-party web services. Our architecture wraps various government services by using web service technologies. It provides an integrated service framework that achieves a seamless cooperation among government agencies to provide prompt and customized services to citizens.We propose an improved passport system which is a service-oriented digital government system that aims at providing integrated services through a layer of cooperative web services.
Keywords— e-governance, digital government,cooperative web services,service oriented.

I. INTRODUCTION

Electronic Governance means using Information and Communications Technology (ICT) to transform functioning of the Government. Government generally consists of large and complex networks of institutions and agencies, which often need to interoperate to create value for citizens. Government agencies data are typically distributed over a large number of autonomous and heterogeneous databases with an equally large number of platform-dependent applications. Data and application integration thus require most attention to realize the DG vision. Moreover, complex applications involving coordination among various DG services and agencies need an integrated framework to efficiently access and manipulate the offered service functionalities. This requires a systematic support of query facilities. In addition, e-government applications would have to be built for average citizens that have no a priori special computer skills. Therefore, successful deployment of DG applications requires an efficient framework that accommodates autonomy, bridges heterogeneity, and integrates data and applications in the most useful and homogeneous way.

Problem with the data centric view is that it involves combining data residing in different sources and providing users with a unified view of these data. Technologies such as DAML-S and WSMO provide little or no support for specifying interoperation relationships. SWORD doesn't focus on relationships between web services or customized composite web service generation based on user profiles. Instead we move from data centric to service centric view which provides an integrated service framework that achieves a seamless cooperation among government agencies to provide prompt and customized services to citizens. The specific needs of citizens by providing customized access to the services with their desired quality. The introduction of web services has been a key to the wide and early adoption of service-oriented computing in industry and lately in government. Web services provide an efficient vehicle for users to access the functionalities available on the web.

Our work is aimed at improving the current e-Governance services with help of integrated service framework built using cooperative web services. We focus on adopting web services in digital government enables government agencies to: outsource from other services, compose existing services to provide value-added services, effectively handle privacy issues, and provide adaptive web-based user interface.

The rest of the paper is organized as follows. Section II briefly explains the related work in the area of service oriented digital government. Section IIIis focused on the proposed architecture to achieve seamless cooperation among government agencies using cooperative web services. Section IV gives overview of the application of the proposed architecture in the current system. Section V addsconcluding remarks to the paper.

II. RELATED WORK

Bouguettaya and Liu [3] proposed a service-oriented digital government infrastructure focused on efficiently providing customized services to senior citizens. They designed and developed a Web Service Management System (WSMS), called Web Senior, which provides a service-centric framework to deliver government services to senior citizens. The proposed WSMS manages the entire life cycle of third-party web services. In their work, they focus on the following key components of Web Senior: service composition, service optimization, and service privacy preservation. These components form the nucleus that

achieves seamless cooperation among government agencies to provide prompt and customized services to senior citizens.*T*he key components of WebSenior, whichconstitute the major contributions of their paper [3] are as follows:

- Service composition: This component performs three tasks: checking composability, checking soundness, andautomatically composing services.
- Service Optimization: This component performs a "user-centric" optimization that selects the compositionplan with the best quality based on users 'preferences.
- Service Privacy Preservation: This component mainlyconsists of two subcomponents that protect the sensitive information of users: Privacy-Preserving Data Filter(DFilter) and Privacy Profile Manager (PPM). DFilterensures that a user can access the information onlyif she has the requested credential. It first checkswhether the service requester is authorized to accessthe requested information using the credentialreceived with the query. It then rewrites the queryto ensure that all the privacy constraints areenforced. PPM enforces privacy in a finer granularitythan DFilter. It maintains a repository of privacyprofiles that store individual privacy preferences.

III. ARCHITECTURE

We organize architecture of the proposed system into four tiers: user interaction management, service management, service ontologies, and basic web services as follows:

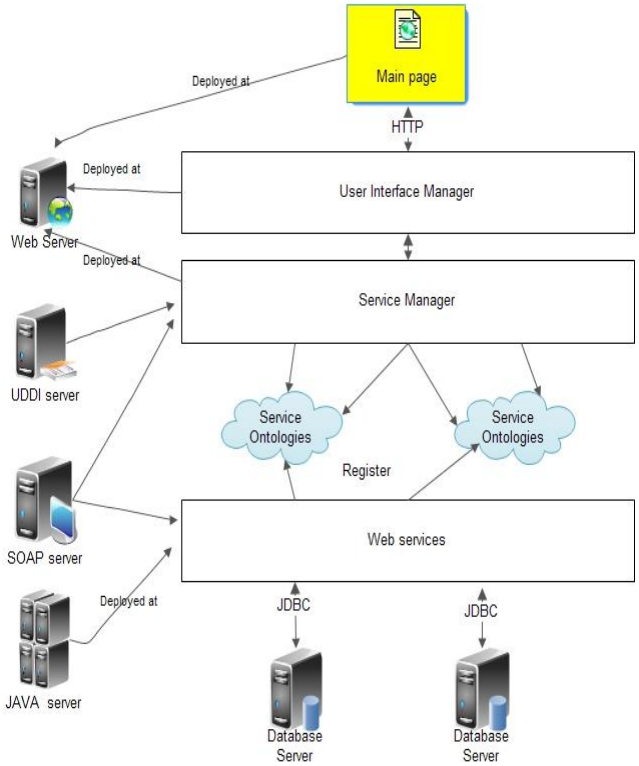

Figure 1Architecture of Proposed system

A. User Interface Management Tier

The user interface manager (UIM) APIs handle various aspects of the user interface. There are six components in this level: Adaptive User Interface Generator, User Authentication, User Behavior Monitor, User Behavior Analyzer, Request Handler, and User Profile Management. The functionality of the user interaction tier is to authenticate users, present service information, and record and analyze user's behavior. After identifying the user, the user interface will change adaptively according to user's static profile and his or her current operation behaviors.

B. Service Management Tier

This tier is the most important among all as it takes user requests from user interface manager and calls appropriate service. The task of identifying user needs, drawing conclusions on user behavior and providing appropriate composite service are the main issues here. There are five major components for service management in the passport system architecture, including service locator, service composer, and service optimizer, Privacy Manager, and execution engine.

C. Service Ontologies Tier

We use ontologies to organize services based on their domain of interests. The ontologies are also implemented as web services and can be accessed by using the same way as the basic services. Ontology is a common understanding in a particular domain of interest. It defines a set of terms shared by all parties in this domain. Services need to register with one or more ontologies. The main concern here is to support a distributed web at the level of data. It will actually work on bridging the heterogeneity within different platforms on which government services are provided. This would greatly facilitate the service discovery process, which can only search ontologies containing services of interest.

D. Basic Web Service Tier

This is a basic layer over which all the other layers will work. This layer will consist of implementation of the basic web services provided by government agencies. In our application, it actually implements the web services needed by passport system at different points. This will include services such as verifyVoterId, verifyElectricityBill, requestBirthCertificate,requestMarriageCertificate etc.

- Advantages of the proposed system are given as follows:
  1. Better coordination among different heterogeneous services. For example, passport service can use verifyVoterId service directly at the time of filling of application form only.
  2. Provides one stop service to the end user. Since verification of all the requisite documents can be done with the help of

cooperative web services, waiting time will be significantly reduced.

3. Efficient provision of services and execution among different administrations. Due to integration of required services, actual execution time and efforts are greatly reduced.
4. Can be built over existing service framework easily and that too cheaply as protocol for web services SOAP requires no overhead compared to the HTTP protocol.
5. Saves time, cost and human efforts as the intermediate process is automated.
6. Greater accountability and lesser opportunities for touts.
7. The cost of access for a user is the cost of travel (over a number of trips), opportunity cost of total time spent in waiting in offices, and the direct cost of bribe and a service charge for the intermediary. The cost of travel depends on the number of trips as well as the cost per trip. Our system will help reduce at least the number of trips applicant needs to make.

IV. APPLICATION

Currently the system used in the dispatch of passport to all of the applicants is as follows:

The core of the system is to get the online registration form (with details such as name, address etc.,) filled by the applicant whose testament is verified for its genuineness by the Passport Automation System with respect to the already existing information in the database. This forms the first and foremost step in the processing of passport application. After the first round of verification done by the system, the information is in turn forwarded to the regional administrator's (Ministry of External Affairs) office. The application is then processed manually based on the report given by the system, and any forfeiting identified can make the applicant liable to penalty as per the law. The system also provides the applicant the list of available dates for appointment to 'document verification' in the administrator's office, from which they can select one. The system forwards the necessary details to the police for its separate verification whose report is then presented to the administrator. The administrator will be provided with an option to display the current status of application to the applicant, which they can view in their online interface. After all the necessary criteria have been met, the original information is added to the database and the passport is sent to the applicant.

We propose an improved passport system which is a service-oriented digital government system that aims at providing integrated services through a layer of cooperative web services. Adopting web services in digital government enables government agencies to: outsource from other services, compose existing services to provide value-added services, effectively handle privacy issues, and provide adaptive web-based user interface. Our system will provide mechanisms that dynamically compose services, select service providers based on their quality attributes, and enforce the privacy of citizens when requesting and receiving government services. The specific needs of citizens are fulfilled by providing customized access to the services with their desired quality.

We use web services as a framework for implementing and deploying Digital Government (DG). We describe a Web Service Management System (WSMS) which is a service-oriented digital government system that aims at providing services to citizens. Adopting web services in DG enables government agencies to: outsource from other DG services, compose existing services to provide value-added services, effectively handle privacy issues, and provide adaptive web-based user interface. One of the biggest barriers to providing services to customers is the lack of integrated information systems. The challenge is how to get these varied systems to

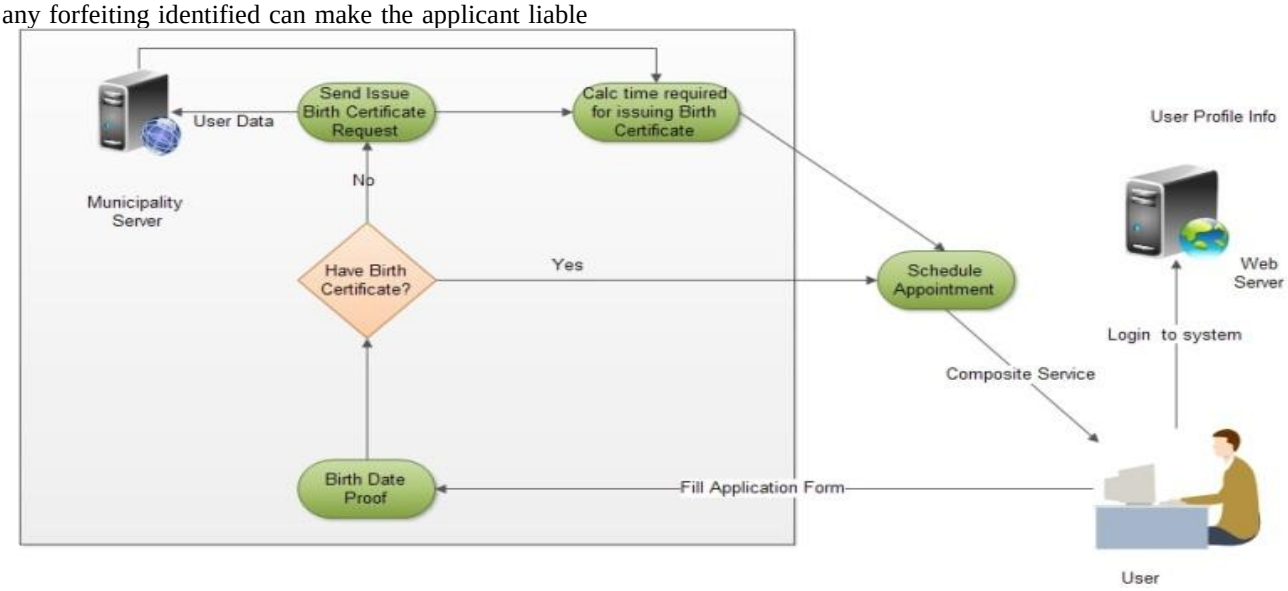

Figure 2 Composite processes for e-passport

cooperate and share information. Our WSMS wraps the legacy systems by using web service technologies. It provides an integrated service framework that achieves a seamless cooperation among government agencies to provide prompt and customized services to citizens.

Following fig. shows the online web-based process that user would follow. She would access from a computer in her home, and the system would automatically return a composite service that best fits user's needs. For that purpose, it uses user's personal information stored in a user profile and government rules and regulations defining eligibility conditions for a service. Consider scenario explained in the figure. The system asks for birth date proof. For this user must have his birth certificate issued by municipal office. If user has the birth certificate, he will be navigated accordingly and at the end appointment is scheduled in the free slot. If user does not have the birth certificate, system will automatically request the municipality server regarding the issuance of birth certificate. User profile data will be given to the municipality web server as needed. Web service for issuing the birth certificate will schedule appointment with the user and simultaneously calculate the overall time required for the whole task and inform passport server with it.Now passport service will schedule the appointment with the user according to the information provided by the issueBirthCertificate service. Hence user will be provided with the composition of various services and need not provide the same information again and again.

Our proposed system helps better coordination among different heterogeneous services. For example, passport service can use verifyVoterId service directly at the time of filling of application form only.It also provides one stop service to the end user. Since verification of all the requisite documents can be done with the help of cooperative web services, waiting time will be significantly reduced. Due to service integrated framework, there is efficient provision of services and execution among different administrations. Due to integration of required services, actual execution time and efforts are greatly reduced. Also the proposed architecture can be built over existing service framework easily and that too cheaply as protocol for web services SOAP requires no overhead compared to the HTTP protocol. At the end it saves time, cost and human efforts as the intermediate process is automated and tends to greater accountability and lesser opportunities for touts.'

V. IMPLEMENTATION

Passport Registration

After Login, user will be asked to fill the registration form. After completing this activity, user will be asked whether he/she has birth certificate. If not automatically a request to the birth data server will be sent, and depending on the reply from birth data server, appointment will be scheduled.

We first created a set of web services which will be consumed by the passport application at runtime. Following web services are created and published

1. BirthCertificate Web Service

Main task of this service is to get the birth certificate information of the requested user. This service automatically connects with the appropriate server which can be a remote sever depending upon the birth place pin code and returns required data with total no. of days required for processing birth certificate application. Using this data passport server can process with registration and schedule appointment accordingly.Pseudo code for the BirthCertificate web service is as given below:

```
        // Schedule Appointment
[1]read birth certificate information from user
[2]get birth server id using pincode
[3]get table name and column information using
sql metadata
[4]retrieve birth details
[5]if(all details match)
[6]then update appointment date
[7]     return success
[8]else return failure
        //Get Birth Information
[1]Read birth certificate information from user
[2]get birth server id using pincode
[3]get table name and column information using
sql metadata
[4]retrieve birth details
[5]if(all details match)
[6]then return success
[7]else return failure
```

2. VoterId Web Service

Main task of this service is to get the voter id information of the user and return to the passport system whether it is valid address proof or not. This service automatically connects with the appropriate server which can be a remote sever depending upon the block pincode and returns the results to the passport application.Pseudo code for the VoterId web service is as given below:

```
[1]read voter information
[2]get voter card server id using pincode
[3]get table name and column information using
sql metadata
[4]retrieve voter details
[5]if(voter card date < (currentdate – 2 years))
[6]then return success
[7]else return failure
```

3. ElectricityBill Web Service

Main task of this service is to get the electricity bill information of the user and return to the passport system whether it is valid address proof or not. This service automatically connects with the appropriate server which can be a remote sever depending upon the block pin code and returns the results to the passport application.Pseudo code for the ElectricityBill web service is as given below:

```
[1]read electricity bill information
[2]get electricity bill server id using pincode
[3]get table name and column information using sql metadata
[4]retrieve bill details
[5]if(bill date < (currentdate – 6 months))
[6]then return failure
[7]else return success
```

4. WaterBill Web Service

Main task of this service is to get the water bill information of the user and return to the passport system whether it is valid address proof or not. This service automatically connects with the appropriate server which can be a remote sever depending upon the block pin code and returns the results to the passport application. Pseudo code for the WaterBill web service is as given below:

```
[1]read water bill information
[2]get water bill server id using pincode
[3]get table name and column information using sql metadata
[4]retrieve bill details
[5]if(bill date < (currentdate – 6 months))
[6]then return failure
[7]else return success
```

5. AadharCard Web Service

Main task of this service is to get the Aadhar card information of the user and return to the passport system whether it is validor not. This service automatically connects with the appropriate server which can be a remote sever depending upon the block pin code and returns the results to the passport application.Pseudo code for the AadharCard web service is as given below:

```
[1]Read birth certificate information from user
[2]get birth server id using pincode
[3]get table name and column information using sql metadata
[4]retrieve birth details
[5]if(all details match)
[6]then return success
[7]else return failure
```

After this we have created our passport application which consumes all the above web services. Pseudo code of how we have integrated above web services to work with original passport registration system is given below:

```
[1] read username and password
[2] if(matched)
[3]     then navigate to applicant's home page
[4] else print "Login failed"
[5] accept form details
[6] navigate to address proof validation
[7] accept document information from applicant
[8] if(addressproof = voteridcard)
[9]                 then    accept    voter    id information
[10]                        call VoterIdService
[11]                        if(valid) navigate to birth proof page
[12]                        else    print error
[13]                                accept    another address proof document
[14]else if(addressproof = electricitybill)
[15]                then    accept bill information
[16]                        call ElectricityBillService
[17]                        if(valid) navigate to birth proof page
[18]                        else    print error
[19]                                accept    another address proof document
[20]else if(addressproof = waterbill)
[21]                then    accept bill information
[22]                        call WaterBillService
[23]                        if(valid) navigate to birth proof page
[24]                        else    print error
[25]                                accept    another address proof document
[26]else if(addressproof = aadharcard)
[27]                then    accept    Aadhar    card information
[28]                        call AadharCardService
[28]                        if(valid) navigate to birth proof page
[29]                        else    print error
[30]                                accept    another address proof document
[31] else           accept the input
[32]navigate to birth proof page
[33]if(userBirthDate > '26-JAN-1989')
[34]then if( birth certificate available)
[35]                then schedule appointment with passport office
[36]                else    call BirthCertificateService
[37]                        if(birthinfo is valid)
[38]                        then            schedule appointment with passport office
[39]                        else            schedule appointment with municipality office for birth certificate
[40]                                schedule appointment with passport office
[41]navigate to view application page
```

VI. CONCLUSION AND FUTURE WORK

Wedescribeaservice-centricframework, for e-governance services toprovide integrated and efficient servicetocitizens. We propose an improved passport system which is a service-oriented digital government system that aims at providing integrated services through a layer of cooperative web services.Inparticular,Adopting web services in digital government enables government agencies to: outsource from other services, compose existing services to provide value-added services, effectively handle privacy issues, and provide adaptive web-based user interface.Oneofourongoingworksisto implement the given system and performextensiveexperimentstoassesstheperformanc etheproposed system andits keycomponents. Also in current systems applicant is still required to have sufficient knowledge of computer and English. Our future scope also focuses on simplifying overall process from user perspective and efficient execution among different administrations.

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