

## Introducing Virtual Law offices in the Existing Judiciary

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*With the rise of omnipresent foundation of computing resources over the past years, every IT Setup is expanding their horizons in the Cloud services and related technologies. Cloud provides dynamically scalable virtualized computing resources as a service over the Internet and this key characteristic differentiates it from traditional computing paradigm. It is the application of Cloud and mobile computing technologies for improving communication between lawyers, their clients, and any other person involved. This framework basically digitalizes the existing judicial file system to form an e-library using Clouds infrastructure and using the internet services like GPRS or GSM / CDMA or 3G/4G etc for information retrieval from this e-library after the request has received proper authorization and authentication of the regulatory body. Data is received from both Web and mobile based applications so that each person can access the judicial data anytime and anywhere. For the realization of this system, a web interface is created with e-library serving as the main database and with user-friendly interface to do the above data acquisition and analysis which ultimately gives pace to the slow process of case management.*

**Keywords:** Applications, Cloud Computing, Data Interaction, Internet, E-library Regulatory body, Security

### 1 Introduction

The past few years have seen a great and an increasing thrust in computing technologies. In today's life users prefer to use web services for access to their data and applications through an ISP rather than manually visiting the service provider. Today, people use communication devices such as mobile and PC's for more than conversation purpose, they are also heavily demanded in various other areas like accessing Web services, video streaming through Internet etc. For example: Banking system is digitized, a user can access all of its banking services such as withdrawing, transferring money by simply accessing websites through their PC or mobile anywhere anytime in the world. Particularly in web services, this is especially true with the emergence of digital phones and Tablets using WAP (Wireless Application protocol) in order to provide cell phone access to special websites [1]. Web services, besides providing an easy access to various

services, bring with them a great deal of Transparency. Cloud computing is a 'metaphor' for internet. Cloud computing is basically storing of our data on someone else's Server, so rather than using our own hard-disk or maintaining our own Server within our office, we will use a third party server [2]. There is no need to install or store anything on local computers. This frequently takes the form of web-based tools or applications that users can access and use through a web browser as if they were programs installed locally on their own computers. The nice thing about Cloud computing is that it is Cost effective, you don't have to own the server hardware. It gives you flexibility because you can access your data anywhere as long as you have an internet connection. It makes you more Nimble. Cloud computing allows you to compete on a larger scale with other larger firms that have these resources to maintain these servers and purchase these software and pay licensing fee over and over again. So by using Cloud

resources, one can pay only a subscription fee every month instead of purchasing the software.

A. Some of the Services offered by Cloud

1) *Infrastructure as a Service (IaaS)*: Cloud consumers directly use IT infrastructures provided in the IaaS Cloud. Virtualization is extensively used in IaaS Cloud in order to integrate/decompose physical resources in an ad-hoc manner to meet growing or shrinking resource demand from Cloud consumers. An example of IaaS is Amazon's EC2 which allows users to rent virtual computers on which to run their own computer applications [3].

2) *Software as a Service (SaaS)*: Cloud consumers release their applications on a hosting environment, which can be accessed through networks from various clients by application users to achieve economies of scale and optimization in terms of speed, security, availability, disaster recovery, and maintenance. It can be accessed by the customers on pay per use basis. Examples of SaaS include Salesforce.com, Google Mail, Google Docs etc.

3) *Platform as a Service (PaaS)*: It is a development platform supporting the full *Software Lifecycle* which allows Cloud consumers to develop Cloud applications (e.g. SaaS) directly on the PaaS Cloud. Google App Engine is its famous known type.

4) *Data as a Service (DaaS)*: The delivery of virtualized storage on demand becomes a separate Cloud service - data storage service called DaaS, could be seen as a special type IaaS. DaaS allows consumers to pay for what they are actually using rather than for the entire database. Some DaaS offerings provide table-style abstractions that are designed to scale out to store and retrieve a huge amount of data within a very compressed timeframe, often too large, too expensive or too slow for most RDBMS to cope with.

B. Types of Cloud Models

1) *Private Cloud*: Computing architecture of this Cloud is dedicated to the customer and is not shared with other organizations and managed by the organization or a third party regardless whether it is located premise or off premise.

2) *Public Cloud*: The public Cloud is used by the general public Cloud consumers and the Cloud service provider has the full ownership of the public Cloud with its own policy, value, and profit, costing, and charging model. The customer has no visibility over the location of the Cloud computing infrastructure. The computing infrastructure is shared between organizations. Many popular Cloud services are public Clouds including Amazon EC2, S3, Google App Engine, Force.com, etc.

3) *Community Cloud*: Several organizations jointly construct and share the same Cloud infrastructure as well as policies, requirements, values, and concerns. The Cloud community forms into a degree of economic scalability and democratic equilibrium. For example, all the government agencies in a city can share the same Cloud.

4) *Hybrid Cloud*: The Cloud infrastructure is a combination of two or more Clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability. Organizations use the hybrid Cloud model in order to optimize their resources to increase their core competencies by margining out peripheral business functions onto the Cloud while controlling core activities on-premise through private Cloud.

## 2. Problem Statement

Till date, the above mentioned services of Cloud computing had emerged in fields of Hospitality management system, Machine monitoring system etc. Apart from these, there exists a system that lacks digitalization. That is the judicial system.

This system, mainly in developing countries, still involves a large scale paper or file work, administered manually and not much of transparency is provided to the end user. **How do we use Cloud resources for above mentioned aspects of judicial system?** [4].

The Solution: Remote monitoring by specialized Lawyer through communicating devices such as mobiles and Tablet PC's. Whole of courts documents will be stored on servers provided by the Cloud known as e- library (IaaS) and anyone who tries to access these files will use a software (SaaS) that will be designed dedicatedly for this purpose. The person accessing these files could be a judge, a lawyer or a client. There will be a regulatory body that will provide different access controls to different users of the e-library. Following is the prototype of above framework in a sequential manner:

(i). Courts existing library, which is based on contemporary file system, is transformed into e-library using the infrastructure provided by the Cloud which will form a Digitalized database. Proper

indexing of these files should be maintained according to some meaningful criteria. This criteria could be the year in which the case was filed, type of case (i.e criminal, civil case etc.), or the extent up to which it has been resolved [5].

(ii) A dedicated software service (SaaS) will be provided by any web hosting firm such as Amazon Web Services (AWS) to various users of e-library, to access the documents in it. Users will use a web browser available on any type of communicating device or PDA (Personal Digital Assistant) such as Tablet PC's or Mobile phones etc. to access this data at any time and at anyplace with a greater speed through a strong internet connection [6].

(iii) A Regulatory body will be placed in between the end user and e-library that will check the access control available on the database to different type of users i.e. lawyers, Clients or judges [7]. It will decide different privileges such as Reading, Writing and Updating on the database to different users trying to access the e-library [8].

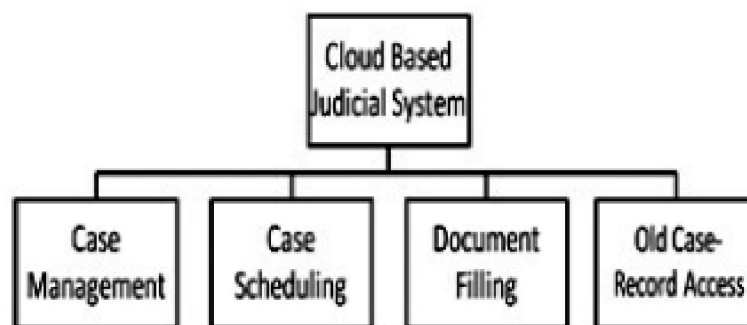


Fig.1. Prototype of the system

### 3. Proposed Solution

1) *e-library*: First of all we need to develop a database that will form the platform for the services we want to give to the end user [7]. This will be provided by using the IaaS service offered by the Cloud. We will either develop a Cloud of our own or use the services of some other third party public Cloud by paying a subscription fees every month or year. What we will do initially is that we will take all the existing

file system records available with the courts and different lawyers about different type of cases and put the whole file system on Cloud's infrastructure. This might take long time maybe a year or so. The infrastructure we could use would be of something like that of Amazon S3 (Simple Storage Service) [9]. This will develop the basic database for the various services we will provide to the users. This database will be called the e-library. Since, this

library uses the servers provided by the Cloud it will be highly flexible in terms of the amount of data it can store.

2) *SaaS for end users*: After we are through with our initial database development part, now we have to look upon how to access this database through the internet? For this purpose we will develop a dedicated software that will have a simple and interactive Graphical User Interface (GUI) that will be available to all the end users through the internet [10]. All of the users will have to register themselves before accessing the e-library and they will be provided unique Id's that will differ from user to user, depending on the type of user who is demanding the access. The main purpose of this software will be to fetch the data stored in e-library and display it on the user end through internet in a web browser i.e. Reading the particulars of any case from the library. Another purpose it needs to serve will be to write into the Cloud that may include updating and adding the data in the library, but this authority could not be provided to each and every user considering security issues. These services would depend upon the amount of authority available to the user who is accessing the library. One such SaaS service available is Law fusion direct software that provides hosted case management service for Lawyers (those who want to join it at will, moreover it is not for the whole judicial system).

3) *Regulatory Body*: Now we have both the e-library and a software service available to access it. But now the big issue arises as to how to keep track and maintain the different type of users that are trying to access the library for different purpose. Even more important part that needs to be dealt with is, unauthorized access by any user to the library. For this purpose, a regulatory body will be interleaved between the e-library and the end user. The

main functions of the regulatory body will be as stated below:

3.1) *User Authentication* :When the user makes an access call for the library it will be first passed through the regulatory body ,which will check which type of user it is i.e. whether it is a case client, lawyer or a judge appointed to that case and then, it will provide the proper access control of library to the user [11].

3.2) *Access Control of e-library*: Once the type of user is identified it is to be decided as to which user should be provided with what amount of rights. Following will be the access rights depending on the type of users:

3.2.1) *Client*: A client will only have the right to Read the case that he/she has lodged or the petition filed. He will be able to see the progress of the case or case summary but will not have the authority to amend the data present in library [12].

3.2.2) *Lawyer*: If the user is a lawyer he/she will not only have the right to Read but also the right to write i.e. file a petition on behalf of some client and case scheduling and case management. But he/she will not have the authorization to change the contents of the library [13].

3.2.3) *Judges*: If the user trying to access the library will be a judge then he/she will be provided with full access control to the e-library. He will have READING, WRITING and UPDATING rights to the data available through the library. UPDATING means that judge will have the authority to amend the data present in the library. Being the supreme authority this type of user will even have the control of closing a case for access to other type of users.

#### **4. Basic Block and Information Flow Diagrams**

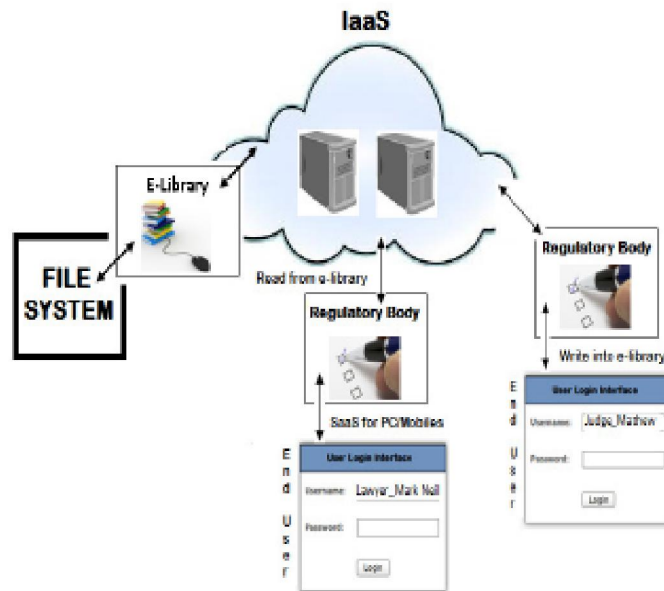


Fig.2. Information flow diagram

The above presented framework has some main components shown in figure 2.

- (i). The e-library which is formed using the data present in the existing File System into the infrastructure available in the Cloud.
- (ii). This library will form the main database for the web and mobile applications that want to retrieve any information from it.
- (iii). A regulatory body will also have be placed between the Library and End users

that is necessary from security point of view as it will give access controls to different type of user who are trying to access library for various interests of their own. Every information flow from library to the user must be authenticated from this regulatory body only then the information would be transmitted to the end user, where we have the SAAS application to access the data.

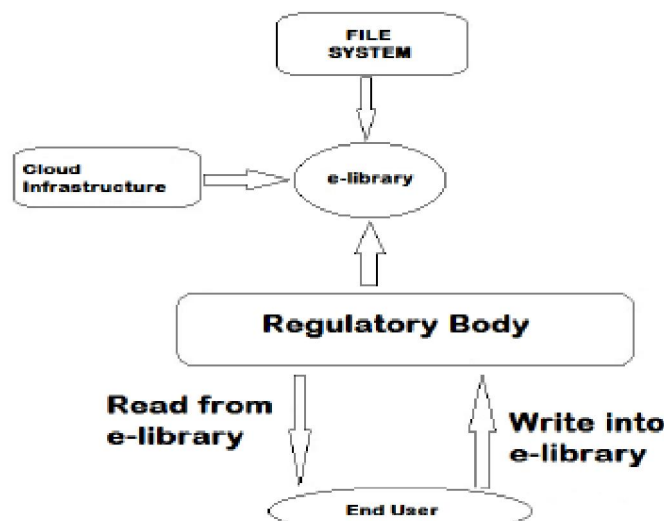


Fig.3. Block Diagram

**5. Issues to be considered**

*A. Database provisioning of the e-library.*  
 One of the basic issue that arises while

trying to implement the above scenario is that, initial storage of data in e-library or in other words we can say that, Digitalization

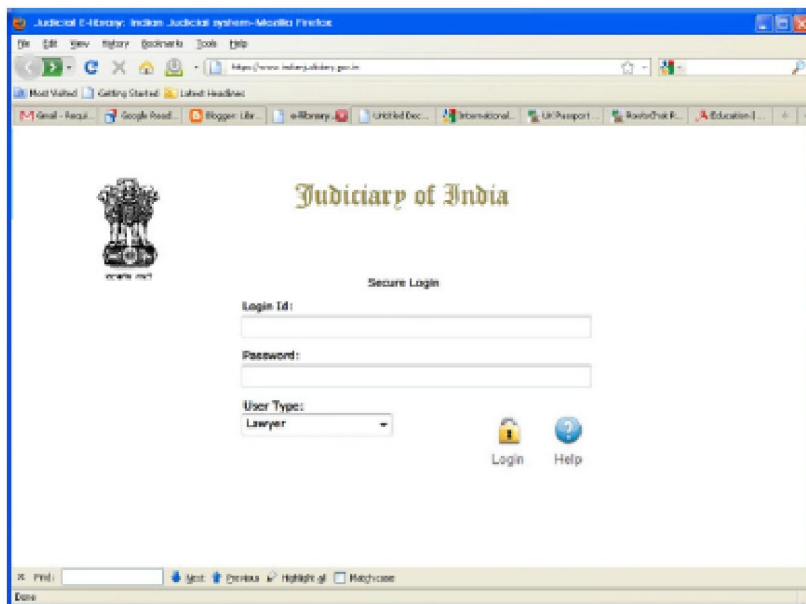
of data from File system into Servers of Cloud is a very time consuming and cumbersome process as there will exist millions of records that will have to be digitalize during this process to create the strong database, which the most basic requirement for this scenario to work [14].

*B. Who will actually own the Cloud?* Other important part is that, who will be providing the Cloud services for this purpose. As everything is confidential and a great deal of security issues will arise, the authorities access this services will have to decide a rightful Service provider. It will be a matter of trust for judicial system whether to go for a Private Cloud or a Public Cloud. Government can also setup their own Private Cloud which will assure the users of security of data to some extent [15].

*C. Mobile Phone-Connectivity* The access of information to users from the database available will be done both through web

and mobile applications. Data transference basically is done by access the web i.e by using web services. GPRS / 3G / 4G / Wimax services must be subscribed at both ends for this type of data transfer [16].

*D. Application for Computational and Work Analysis* A Web application interface for automatic data transfer, and an Open source based application such as android application is made for mobiles which possesses functionality inclusively able to access data over the internet and save it in own end database, to graphically present the data for analysis with parameters of a particular case, and also to pictorially display of various inferences like crime scene photos, weapons used etc. and able to transfer results or call or messages to the app at other end to some other user. Following is a prototype of the Web interface that could help meet the requirements for users using web services:



**Fig.4.** Web Interface

Following could be a prototype of Android based or some other Open sources application interface that will help the

mobile users to enjoy this service through mobile phones anywhere anytime:



**Fig.5.** Mobile Web Application

*E. Estimation of data that needs to be stored in the e-library:* Another major issues is to be taken care of is the estimation of data that is needed to be stored in the e-library as we are talking of a very huge amount of data the Cloud provider will have to be ready to give us that much of space on the Cloud and furthermore this will be a constantly increasing database that needs to be maintained and for this purpose estimation of data is very important before deployment of this idea.

## 6. Work to be carried

In order to set up a system that provides this information anytime and anywhere, there is a need to exploit latest software technologies to have SaaS and mobile application having features similar to that mentioned above.

### A. Infrastructure System Required

1) *SaaS Development:* The personal computer and the Internet have been the two driving forces in today's businesses. The personal computer has made a lot of tasks easier and has streamlined a lot of operations within an organization while the Internet totally changed the business model of a lot of companies, because it was able to reach an audience far from what traditional media could ever hope for. Now, the Internet and personal computers are changing the landscape again by changing how software is deployed to businesses and users. The current trend is slowly moving toward Software as a

Service or SaaS. Many companies are warming up to the idea of getting the same level of results but with lesser costs [17].

2) *Web Server:* Apache Tomcat can be used as a server for deploying the Java and web applications. The integrated environments which are used now-a-days have servers (Tomcat) already integrated in it.

3) *Algorithm for Efficient Data Searching:* We need an efficient algorithm for quick and accurate search requests from the e-library. A good search engine does not attempt to return the pages that best match the input query. A good search engine tries to answer the underlying question. If you become aware of this you'll understand why Google (and other search engines), use a complex algorithm to determine what results they should return [18].

4) *Creating Mobile Application for displaying records in an organized way:* Windows and Android platforms provide several options for you to save persistent application data [6]. The solution you choose depends on your specific needs and how much space your data requires.

## 7. Challenges

The implementation of above framework is bound to face following challenges:

A. *Security* Since the data to be stored and maintained in the library is very confidential therefore its one of the main challenges to maintain security of such a large amount of data [19].

*B. Size of Data Centre* Size of data centre is very large and it keeps on increasing as more numbers of cases are filed. So, it's difficult to estimate as to how much data needs to be stored in the Cloud's infrastructure.

*C. Innovation* To achieve a truly contiguous working, these solutions will require an unprecedented level of innovation to fully exploit the full spatial context of the surroundings from case scheduling to case management and everything else until the closing of case [20].

*D. Acceptance* The world wide acceptance relies on those who are in direct contact with them, and most of them will try to resist it, unless and until they are familiarized or gets acquainted with such smart technologies [21].

*E. Time consumption* The conversion of files into e-library takes a large amount of time which is not good to serve our purpose.

### Conclusion

With the progressive trends of Cloud infrastructure, their compatibility with communication devices and more and more dependence on Data center technologies, prospects of automating case management of Judicial System has edified. With the emergence of Cloud computing as universal system of computing resources delivered as a service, implementing such a system will get a robust start. This system will try to save the response time and increase transparency. Also with arrival of WIMAX and incoming technology (4G), data rate and bandwidth limitations will be subsided enormously and further helps in establishment of this concept.

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