

ACHIEVING FLEXIBILITY IN INTER-ORGANISATIONAL COMMUNICATION WITH CLOUD, SOA AND UID

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***Abstract:** Many inflexible systems have a rigid organisational structure that prevents them from being platform-independent and flexible. This paper explores cloud computing and SOA and discusses about how they can be 'synergized' to produce excellent results especially, flexible systems by achieving flexibility and agility, while also promoting savings on the institutional level. Furthermore, this paper focuses on India as an emerging economy with a huge quotient of scope with the introduction of its first ever UID (AADHAAR) that will uniquely identify each citizen of the country, and proposes an implementation plan to achieve flexibility in many communication systems across the country by exploiting SOA, Cloud and UID to form a unified inter-organisational communication system leveraging features like orchestration and choreography of web services in an SOA environment.*

***General Terms** – Cloud Computing, SOA, Orchestration, Choreography, Flexible, Inter-organisation, Communication*

***Keywords** – Agility, Cloud, Computing, SOA, Flexible, Systems, UID, AADHAAR*

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I Introduction

With the introduction of the concept of agility in the corporate world, organisations small and big across the world are striving to be agile. However, inter-organisational communication is still an area where organisations show a high degree of inflexibility. Several technologies facilitate intra-organisational communication, but there does not exist a commonly accepted unified system for inter-organisational communication mechanism. This is probably because of the reason that many organisations are more rigid and resistant to change because of the individualistic nature of their organisational structure, differences in their systems at hardware, software and operating system level and face problems and incur losses because of their inflexible systems. Some of the reasons for this are lack of portability, security and traceability aspects, among others. However, a common thread that runs through all the organisations is the services that these organisations utilize and provide in collaboration with each other. Hence, an amalgamation of organisations on this level would introduce potential scope for agility while keeping their organisational structure unchanged which has been one of the main reasons for the resistance to agile methods and up-gradation to more flexible systems.

The paper explores cloud computing and SOA and discusses about how they can be 'synergized' to produce excellent results especially, flexible systems by achieving flexibility and agility, while also promoting savings on the institutional level.

Furthermore, this paper focuses on India as an emerging economy with a huge quotient of scope, and proposes an implementation plan to achieve flexibility in many administrative systems across the country.

II. CLOUD COMPUTING

Cloud computing in the simplest terms includes unlike other computing models, storage of data along with the applications on a common repository, typically servers which form the 'Cloud'. This not only makes the system robust, flexible and 'agility-friendly' being beneficial and feasible, it also makes the clients 'thin' in the sense that they now provide for data inflow and information outflow leaving the rest to the 'Cloud' making it economically viable for the organisations that use it. ^[2]Capgemini and HP believe that within a few years the market will witness symbiotic relationships and collaborative services providing ad-hoc, real-time IT services between organisations. ^[2]A research by Capgemini and HP describes three technical characteristics of Cloud Computing: (1) Scale: Cloud systems offer higher processing power as compared to traditional systems, (2) Flexibility: Cloud computing can be used to handle a large range of processing tasks, and can be changed dynamically according to the demand, (3) Efficiency: Cloud computing utilizes a pool of computing power that enables sharing of tasks which reduces costs and massively improves processing speeds.

III SERVICE ORIENTED ARCHITECTURE [SOA]

SOA or Service Oriented Architecture proposes structuring of business functions in the form of loosely coupled, independent modules called services.

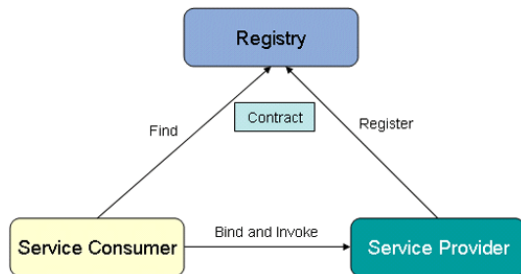


Figure 1: SOA – Services – Provider and Consumer, UDDI

Courtesy: Oracle Technology Network

In the internet domain, these are called web services which have special characteristics like loose coupling, abstraction, platform independence, ^[6]“composability”, among others. Services can be orchestrated in an intra-organisation environment and choreographed in the inter-organisational environment which can be leveraged to great use in the design of inter-organisation communication systems, which is explained later.

Such services rely on communication frameworks based on platform independent and globally accepted technologies like XML. These services are also discoverable using registry systems like UDDI (Universal Description Discovery and Identification). Upon discovery, followed by description, these services communicate using SOAP (Simple Object Access Protocol) that provides a messaging framework based on XML for communication between web services.

IV AADHAAR – UID OF INDIA

UID (Unique Identification) of India – ‘codenamed’ AADHAAR – is India’s effort to provide unique identification to its citizens in the form of a 12-digit number. This number can be used by applications and systems to authenticate citizens and even organisations (as explained later). UIDAI is working in the direction of UIDs in India. It is not only planned to identify the citizens of India, but also various organisations using a special technique ^[3]. This focus on identifying organisations with UID reveals the importance of organisations and their identification in a country like India.

The UID has several benefits: 1.) Unification: With its power to identify citizens and organisations of the country, the UID could be used to create unified systems across the nation which would not only make processing and functioning of systems easier, but would also make them transparent to a certain degree thereby making them more reliable. 2.) Reliability. 3.) Reachability: ^[8]Eventually, the UID is planned to be implemented in schemes

such as NREGA and PDS. Hence, the adoption of UID would ensure future compatibility and possibly integration of target systems with such schemes and other systems.

With the identification, traceability, robustness and traceability that it will offer, UID is sure to revolutionize the way India functions. Usage of UID in a system would ensure its accessibility to each and every citizen and business entity of the country. A more detailed explanation of the UID system including security, integrity and other issues is explained in the ^[3]paper by Hemant Kanakia et al.

V PREVALENT SYSTEMS

The prevalent systems are quite inflexible in terms of inter-organisational interaction because of the differences in their system structures. Differences may occur at hardware, software or operating system level. Organisations might be using incompatible hardware devices, software with different frameworks and/or platforms, and finally different operating systems that hinders inter-organisational communication.

There are also several factors that come into picture. Business Communication Models are the basic structures which primarily define how business transactions are to be handled. However the existing business communication models pose a number of obstacles in inter-organizational communication. 1.) Existing business models use technologies such as DCOM – Distributed Component Object Model which requires that business transaction applications be situated on the same network which implies that communication is restricted within the boundaries of the organization thus resulting in substantial losses for the organizations. Businesses in the modern world need to interact with each other as they are themselves loosely coupled and hence DCCOM fails to overcome a number of contingencies. 2.) Component Object Models are also quite frequently used in intra organization communication and given their set of properties they can be easily extended to inter-organizational communication. COMs are flexible enough to allow communication over various networks however, they only permit this communication to occur between homogenous applications. There exist no standard applications that organizations use for communication and hence each organization may end up using different applications which fail to satisfy the condition for applications to be homogenous. This once again results in unnecessary expenditure on the organization's part.

Furthermore, a commonly accepted system scalable to an inter-organisational level has not been identified probably because of the lack of a common identifier. Moreover, these organisations have structures different from each other. Such inflexibility is the cause of many losses and synchronisation problems that organisations face today. This is also one of the reasons why inter-organisational platform-independent solutions have remained a distant dream till date.

Other issues like need for a reliable, ‘global’ and trusted mechanism for identification of entities, and platform-independent service architectures also come into the picture. Hence, in a nutshell the various issues related to such inflexible communication systems are:

- 1.) Limited Scalability: Most of the systems are intra-organisational and not suited for inter-organisational communication.
- 2.) Platform Dependence: The organisations having rigid and inflexible communication systems are platform dependent which limits their scale of operation.
- 3.) Absence of a ‘Global’ platform for communication: There is no reliable and trusted public platform on which the organisations can communicate.

VI. PROPOSED FLEXIBLE SYSTEMS

The proposed systems would have the data along with the applications rested on the cloud in the form of web services contained in an SOA environment. The cloud would consist of a collection of servers that would store processing logic. These applications which are common to multiple organisations would thus create pervasive services bringing about uniformity, promoting reusability and also savings on the organisational level.

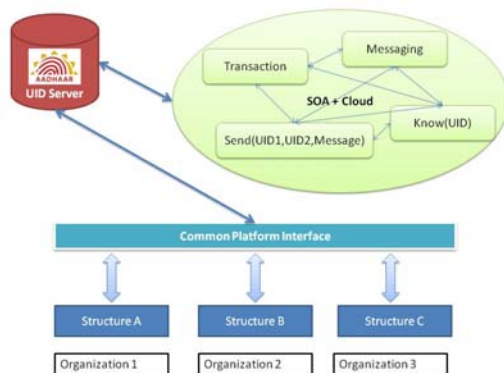


Figure 2: SOA, Cloud and AADHAAR

Moreover, various web services associated with this cloud would serve common business functions thus smoothening inter-organisational functioning by making them platform-independent. Thus, such systems while remaining uncompromised in terms of their structures would be able to interact with other organisations easily.

The proposed systems would require publicly available and tested web services that are open-source. Such systems would definitely require a high level of security that provides for traceability because of the distribution of users across the country. The security algorithms would also have to be public to a degree that the integrity of the system holds while clearly specifying the encryption steps unambiguously. Such security issues and their proposed solutions have been discussed later in a separate section.

Traceability could be provided using UID (AADHAAR) that would uniquely identify each citizen of the country. Using the UID system would also eliminate the need of a common

gateway system that would be available on a national basis. Thus, the UID system would not only act as a gateway system, it would also ensure a nation-wide reach to the citizens and organisations making it a very powerful tool in mapping the service consumers with the respective service providers.

Security Issues: Using the UIDs alone seems to be quite an unintelligent choice for systems requiring high levels of security. ^[3] The UID actually being an 11 digit number (the 12th digit being the check digit) has the power to uniquely provide about 80 billion IDs in contrast with the current requirement of about 6 billion IDs providing a density ratio of 0.05 hence making guessing of UID numbers an unintelligent choice. The legislation regarding the public display and disclosure of UIDs is pending hence the discussion regarding any security issues related to disclosure of UIDs are beyond the scope of this paper for now.

Another way of providing an additional and trustworthy layer of security would be to associate the UID of each employee with a key local to the organisation. The details of the keys shall be stored on the organisation's servers. However, such a scheme might even make the system more prone to attacks by providing a 'backdoor' to the attackers through the local organisational servers containing {UID, key} pairs.

To overcome this problem, we could follow the Static PIN and Dynamic PIN approaches mentioned in the paper by Hemant Kanakia, Srikanth Nadhamuni and Sanjay Sankar ^[3].

The choice however, remains with the organisation since the UID would only provide a gateway to the unified system where the transactions and processes would simply be defined by functions of the form:

function(To_UID, From_UID, Operation)

which would be exclusive of the local keys or static or dynamic PINs.

Many such design, implementation and security issues are discussed in the paper by Hemant Kanakia, Srikanth Nadhamuni and Sanjay Sarma ^[3], and UIDAI ^[8] hence, the discussion of the same is avoided.

VII WHY AADHAAR?

^[3]AADHAAR does not belong to any particular sector and is a pure identifier, and due to this distinct quality it can be used for delivering cross-sectional benefits. AADHAAR would not store any organisational information and hence, would make the system security planning for each organisation easier.

Furthermore, AADHAAR is a GOI initiative and hence is a trustworthy system that will encompass the whole nation making the proposed system available to all the citizens of India equally.

[3] AADHAAR has already identified business entities and organisations and planned to assign UIDs to them. This fact supports the scheme proposed and simplifies the implementation task to a great deal.

IX CONCLUSION

Cloud Computing is envisioned to be inevitable in the near future. SOA is one of the best practices organisations can adopt to leverage the cloud services effectively. The UID of India is on its way to a country-wide percolation storing in it a powerful tool to change the way services are exchanged between people and/or organisations. In the process of integration using these concepts and projects, the organisations will not only witness a synergic effect in the results but also enjoy the effect of the powerful services that emerge out of the system proposed in this paper.

Thus, a unified system for flexible inter-organisational communication could be realized that would not only promote savings on the institutional and organisational level, but also easier communication between organisations that would promote better B2B interactions and contracts. Moreover, the system being scalable and flexible has higher chances of survival in the future with backward compatibility because of the independence from organisational structures.

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