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Ubiquitous Banks: Cloud Based Design for Core Banking

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Abstract: Cloud computing has already started reaching markets in the form of Infrastructure, Platform and Software as a service; HRMS systems, Retail support, Banking and many more. Every business is trying to improve its quality of services by exploiting reduced overheads, downtime, and automation cost. In this paper, we have proposed Cloud Based Core Banking System architecture that can be used seamlessly for automating various banking services on cloud. This will not only improve the system efficiencies, but can also be enhanced further to provided more ubiquitous features which require minimal user intervention. Nevertheless, the cloud security features need to be integrated with multiple levels of authentication which will have to include biometric features like finger-print, palm-print, retina scan, iris scan and so on. Further, we have tried to compare this design architecture of Cloud Based Core Banking System with existing bank architectures in terms of its pros and cons in regards to the current core banking systems.

Keywords: Core Banking; Cloud based bank; Artificial Intelligence; Data mining; Cloud computing; Digital banking

INTRODUCTION

Banking Technology has shown dynamic crests and troughs almost every decade. From around 2000 BC in Assyria and Babylonia, where banking was born with the first prototype naive merchant bank, giving away grain loans to those who carried goods between cities to digital online banks of today which can credit loans on a single mouse click or pay your bills from home. We all know bank as a financial organization which accepts and loans money.

And, even today Banks are self-organizing and self-evolving. They keep on fine tuning their processes and information systems to match the rapid changes in economy as well as technology. In this paper, we have tried to abridge the technology gap between cloud as a service to core banking institutions to increase their returns on investment.

CORE BANKING

Core banking includes all basic transactions in a bank often termed as retail banking which include daily transactions in savings or current account like debit or credit, loans, recurring accounts etc. Other bank functions include branch banking, head office operations, SMS/ Mobile/Internet banking, OSS, ALM, AML, Delivery channels, HR and payrolls etc.

Our focus for this paper will be on core banking which can be sub-divided into transactions, payments, loans and mortgages at branches, ATMs, Internet banking, mobile banking and now e-wallets as well.

CLOUD COMPUTING

Cloud computing provides Internet-based shared or dedicated processing resources and data storage on demand. Though the perception and reality differ to some extent; the drivers (figure 1) like reduced cost and downtime still continue to motivate banking circles to upgrade frequently.

We have a choice between the following categories:

1. Infrastructure as a service (IaaS) offer online services to abstract the user from infrastructure like virtualization, server hardware, storage and networking; though applications, runtimes, databases, servers, security and integration are to be managed. In our context, the core banking virtualization, server hardware, storage and networking infrastructure will be out sourced to an external vendor and bank no more need to take pains for its down times.

2. Platform as a service (PaaS) offer online services to abstract the user from platform like virtualization, server hardware, storage and networking, runtimes, databases, servers, security and integration; though applications are to be managed. Banking will turn more ubiquitous in a sense that the security will also be a service outsourced to an external vendor.

3. Software as a service (SaaS) offer online services to abstract the user from software itself like virtualization, server hardware, storage and networking, applications, runtimes, databases, servers, security and integration; vendor manages all. In context of core banking, all the software services and databases will be out-sourced to an external vendor and banks need not bother about multiple vendors any more.

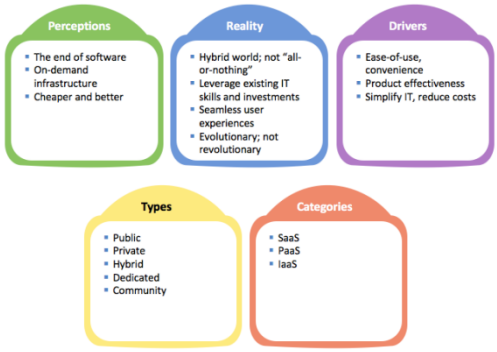

Figure 1: States of cloud computing

Typically, the applications in which security is of prime concern, a private cloud is owned by the organization. Though, the public clouds leverage the maximal sharing to reduce costs to a greater extent. Even, the nature of applications drive which type to choose depending on the distribution of demands for resources or services as being uniform and continuous or sparse and random. Such heterogeneous environments and needs often lead to a choice of hybrids of many different types and also evolve with times.

PROPOSED CLOUD BASED CORE BANKING SYSTEM

Core banking information systems can be divided into four main functional blocks (figure 2):

1. Data source,
2. Processing mainframe,
3. Data integration for loose coupling, repositories and
4. Applications.

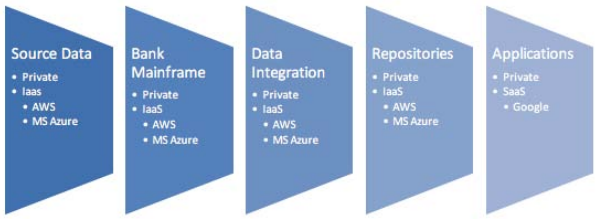

Figure 2: Cloud-based Core banking architecture

Data sources of core banking include customer, account and transaction databases which need to be secure so the best choice is a Private cloud database. The migration of all data sources which might be hosted on different databases can be done by using auto-transfer packages which are available for most of the commercial database packages. Thus, auto-transfer package can be used to migrate data from various data sources and batch jobs can be designed to run in back-end for data reconciliation.

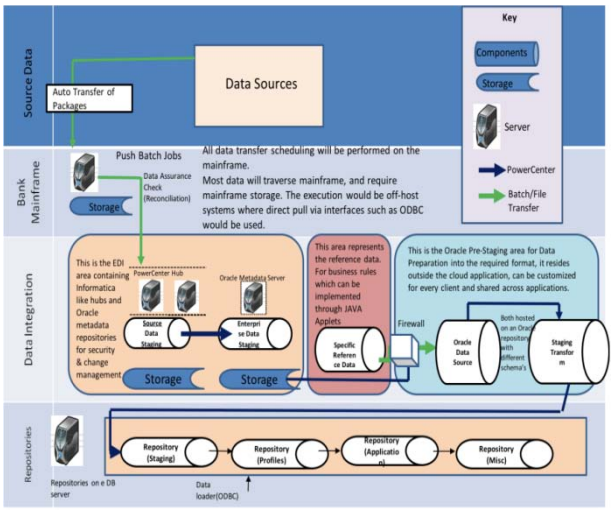

Figure3: Detailed Cloud-based bank architecture

Bank middleware mainframes are where the bank brain resides. All the business logic goes into bank owned middleware servers and databases which are typically virtualized and mirrored at various geographical locations to assist in disaster management and recovery. This layer helps to perform all the core functions like business rule validation and data cleaning, pruning etc. Thus, the middleware requires again a private Iaas cloud database to maintain the same level of security which might even need further enhancement using features like finger-print, palm-print, retina scan, iris scan in addition to existing passwords, OTP's, grid cards etc.

Data integration services like Informatica are often coexistent on Banking systems to allow loose coupling between production databases and the applications. These are vulnerable to being manipulated to get unauthorized access if not secured properly. Thus, data integration services have to be applied on a private cloud too and then the applications can be migrated to SaaS such as one provided by Google to present data to various users in customized formats. This will not only provide flexibility to update various personalized views as per user but also allow for ubiquitous user experiences. The detailed architecture is depicted in Figure 3.

Data integration is often staged into source, enterprise, other reference data for maintaining business rules etc while implementing repositories to keep archives of data like staging, profile, application and other miscellaneous. Power centers can be migrated in steps to a private IaaS cloud and applications can be upgraded to a private SaaS cloud to provide customized formats per client. This will not only improve the returns on investment by also reduce application downtimes. Technologies that can be used as per usage is illustrated in Table 1.

Table 1: Database Technology as per usage

Technology Used	DB Size	Cloud Service
TerraData	More than 100 TB	IaaS (IaaS model to be adopted for Big Datacenters)
Informatica Oracle Unix Websphere	More than 30 TB	IasS or SaaS (SaaS model requires support from multiple vendors supporting current servers for migration of each of the application to the new cloud environment, so IaaS can be considered)

MOTIVATING FACTORS

After Cloud adoption motivating factors include:

1. Higher return on investment,
2. Guaranteed services and
3. Flexible pay as-you use model for subscribed services,
4. Business efficiency and
5. Growth from scalable deployed solutions,
6. High productivity, and

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7. Cost efficiency through infrastructure optimization.

Thus, it will surely attract banking circles to upgrade as well.

CHALLENGES AND LIMITATIONS

The main challenges foreseen in migration of a typical core banking system includes reluctance of Banking fraternity towards cloud implementation in banking mainly owing to cost, security and dependencies like multi-vendor support for any technology upgrade, organization policy, vision and senior management approvals. Thus, the approach for transition of core banking systems to cloud has to be mutually agreed at Datacenter level, rather than application-wise, in order to get actual cost benefit of implementation as well as homogenous enterprise data architecture.

The migration plan has to be based on criticality of applications, the less critical ones can be upgraded and more to the cloud as phase one of migration. The most critical applications should be migrated in the last phase.

In addition, some lucrative ubiquitous features like a personalized banking assistant need to be proposed to promote this further.

Banking domain consists of various internal portfolios and services; out of which few are highly sensitive in terms of security. For example, AML (Anti Money Laundering) portfolio in a bank contains very sensitive information, which might not be kept at cloud due to bank's security standards. Similarly there are certain portfolios in bank which contain information that can be migrated onto cloud, but are bound by bank's policy in a way that the infrastructure cannot be shared with any other application within same bank itself.

It has another challenge to design homogenous cloud architecture at bank's datacenter level. Therefore all security factors needs to be considered in detail before moving any bank's infrastructure, virtualization, server hardware, storage and networking, applications, runtimes, databases, servers, security and integration.

Security can be enhanced by using several levels of authentication and authorization based on features like gait analysis at ATM, Retina scan on mobile & internet banking, palm and finger print scan on bank branches and varying combinations to surprise a trespassing hacker. Further, cloud being private cloud is a must for all banking systems due banks being more security critical financial aspects.

CONCLUSIONS

In this paper, we have proposed Cloud Based Core Banking System and also tried to design the architecture to support such a ubiquitous system using Amazon Web Services and Windows Azure Platform (cloud based platforms to build, host and scale web Applications).

Software-As-A-Service model is lucrative and seems to dominate as a preferred solution approach in near future due to increased return on investment and low maintenance overhead by banking circles. Though the security concerns for critical systems might need to be reviewed with vendor and this might restrict certain applications to IaaS or PaaS model.

The limitations like cost, security and various dependencies still continue to restrict the applications in banking circles to be migrated to this new era of out-sourced on demand access systems. The transition phase is on and the applications in future will be debiting, crediting, advising, designing products, selling, maintaining itself, personalizing and syncing newer versions of technology.

Technology will be self-evolving and advancing on its own, mutating with all possible threads of technologies in a multi-dimensional space of possibilities. And, the best part is all will be pervasive and will need no or almost nil manual supervision.

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