Challenges and Mitigation for Application Deployment over SaaS Platform in Banking and Financial Services Industry

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Abstract – Banking and Financial Services Corporations operating on cloud infrastructure is constantly upgrading the application and cloud technologies based on business requirements and new features available. With IaaS and PaaS platforms being managed and upgraded by cloud services providers, the SaaS platform is operated, monitored and governed by bank's technology department. SaaS continues to be the platform under constant upgrade and development considering the need and change in business scenarios. SaaS platform in cloud infrastructure also acts as a channel to enable banking business with new tools and techniques, keeping existing infrastructure capability & scalability within compliance framework. SaaS platform hosts critical applications required for every operations of Bank which includes core banking application, internet banking platform, Card processing applications, ATM & EFTPOS networks and security monitoring tools. Considering the business criticality and application value, SaaS platform is configured to avoid business disruptions. In this paper we have discussed the challenges in deploying the changes required in applications over SaaS platform and methods to mitigate those challenges with minimum or no disruption to cloud architecture infrastructure.

Key Words – Cloud Computing, Software as a Service (SaaS), Cloud Architecture, Banks, Offshore, Globalization

I. INTRODUCTION

With development in technology, stable legal conditions, cost efficiencies and established business model of Cloud computing, Banking & Financial Services Corporations continues to operate on cloud computing architecture infrastructure. Cloud computing architecture operating on IaaS, PaaS and SaaS infrastructure is maintained by technical and managerial resources across the globe. The resource availability and resource pooling is based on currency arbitrage, availability of offshore development centres and convenience of time zone. IaaS forming a physical layer of hardware components and PaaS with an application development layer remains stable once the scope of SaaS is defined. However, PaaS can be added for IaaS with changing time and need of applications over SaaS platform. In Banking and Financial Services Corporations, cloud solution architects constantly work on available IaaS and PaaS platforms to evaluate SaaS feasibility and application deployment challenges. The mix of available technical capabilities of cloud architecture, availability of resources (people and machine) and prioritization of projects on SaaS Platform gives rise to carefully understand, evaluate risk, assess impact, and to develop & implement mitigation steps to enable Banking & Financial Services Corporation with new tools and techniques. Having understood this, below are challenges for Banking and Financial Services for SaaS Platform:

1. Business Requirements and technology alignment - Flexibility to Implement new technology
2. Elasticity of cloud resources with changing time
3. New applications and Existing applications – data requirements and dependencies
4. Introduction of vulnerabilities
5. Application Migration
6. Technical Skills of Cloud Service Provider
7. Involvement of multiple teams across geography, offshoring and budgets
8. Change Management and Risk Management (ITIL Processes) - Outage, Code Dependencies
9. Continuous systems improvements to meet Regulatory and compliance Requirements

10. Vendor provided patches, code and objects
11. Quality Improvement and reduced Business Interruptions

Above factors play major role in implementing the application and its upgrade over SaaS platform. The need of round the clock availability of cloud makes it important to evaluate dependent data & applications and technical resources performing the application deployment over SaaS platform.

II. CHALLENGES AND MITIGATION FOR FACTORS IMPACTING SAAS DEPLOYMENT

Application deployment over SaaS infrastructure acts as step that enables business through technology. Application development and upgrade over SaaS infrastructure supports the everyday business operations for Banking and Financial Services. Below are challenges and mitigation for application deployment over SaaS infrastructure.

1. Business Requirements and Technology Alignment – Flexibility to implement new Technology: Applications in Banking and Financial Services business are developed on various technologies apart from JAVA, .NET, AS400, Mainframes etc. The business requirement includes deploying new applications based on new technology. Adopting to technology which is new and requires additional upgrade over current IaaS platform. The addition of new technology on new virtual machine (over IaaS) and installing all other configuration required to run the application smoothly will be the only way to meet business requirements. If the base server configuration does not supports the technology and platform, then business requirements will not be met and cloud architecture will have drawbacks / limitations.

   In order to mitigate this, the base server configuration, flexibility to allow installation of new technology and all required plug-ins, support all other features of new technology (code, security, features, tools, database), virtual machine configuration, timely updating patches and technology versions, listing all possible technologies supported by IaaS, request technology provider for all related files and objects required to run application smoothly on IaaS platform will help meet business requirements. Installing, operating and maintaining the development version of application and solving all the issues encountered will help to install production version without issues. Providing IaaS and PaaS platform details to application service providers will help select and design application over SaaS more precisely and save time.

2. Elasticity of Cloud resources with changing demand: Elasticity of cloud is a prime characteristic that acts as a decisive factor to select cloud infrastructure over application service provider infrastructure. The elasticity is important for application users' capacity (incoming traffic) and storage capacity. Elasticity help to decide the provisioning of resources and so the metering and billing to client. In Banking and Financial Services Corporations, considering the constant growth in business, the demand keeps rising, and so the elasticity needs to expand in nature. For new application deployment over Iaas and PaaS, need of additional space to accommodate files and data without impacting the input output ratio is important to keep latency issues away. With growing need of space to install and configure new applications, the IaaS platform is build keeping future demand in perspective. For Banking and Financial Services Corporations, the application upgrades and new installation occur every quarter which keep depleting the space. This may pose as a constraint to allow new application installations. Also, as part of end of the month and monthly back up activities the space gets reducing, that may hamper application installation plans.

   In order to mitigate this challenge, the IaaS selection, elasticity, expansion and alignment with PaaS & SaaS should be considered as a part of solution designing at architecture stage. The architecture building blocks (ABB) should consider the possibility of extension to meet future SaaS needs.

3. New applications and Existing applications – data requirements and dependencies: The new applications may require data (or reports or files) from existing application. This dependency acts a requirements for new applications to function as expected for business use. While deploying new application on SaaS platform, configuration, data requirements, functionality and outcome of new application logic should be evaluated to ensure the application needs are in synchronisation with other applications or data sources. For an old application, while updating the code or patches, the sequence of codes, objects and

patches plays an important role for correct installation. In some cases on code installation that has interface with other external applications like reporting applications, internet baking, ATM etc. “code / object refresh” may be required for changes to be effective under correct code.

In order to mitigate these challenges, for new application installation, the installation steps and timing of job to fetch data and / or files tested in development environment and then deployed over production environment. This help confirm the application functioning in the expected manner. For old application, the code or object update are sequenced by vendor (in case application is supported by third party) or by software engineering team if the application is developed in house). The code install in test environment help to reduce risk of code install failure in production environment.

4. Introduction to vulnerabilities: The vulnerabilities refer to system’s weak area which leads to code failures, errors, data leakages, security breaches and incidents reported (or identified) after installation of new applications or application codes upgrade for SaaS delivery. The vulnerabilities introduced causes issues of logging, incorrect application functionality, insufficient data, incorrect reporting, incorrect (or incomplete) banking operation’s procedures, introduction to manual tasks and unable to leverage technology to meet business requirements. The vulnerability and their mitigation is importance as they remove the basic essence of using technology to automate work and bring efficiency in business operations. As the vulnerabilities are introduced through technical changes, vulnerability assessment of codes is important part of SaaS application testing.

   In order to mitigate this, vulnerability assessment testing, data leakage testing, security breach testing, and system penetration testing for newly installed code or patches is performed. The outcome of the test results is shared with IT security and internal auditors (risk management team). This helps in code failures and issues after application deployment for SaaS delivery.

5. Application Migration: In cloud architecture infrastructure, due to change in data centres, establishing new data centres, need of new infrastructure for application, need of cloud service interoperability, cloud migration and data portability – as part of risk management and compliance framework, migration of application forms the key to meet changing business scenario. Application migration requires evaluation of compatibility with servers, storage capacity, database schema, security features of new IaaS and PaaS platforms. Considering these parameters, application migration and their availability after migration forms key to operate Banking business without disruptions. Application migration requires long duration and may take more than 6 months’ time depending on application components, database size, migration scripts development and testing. Application migration involve technical team with expertise of both code development and cloud architecture development. Application criticality based on business value delivered is also a key component to assess to determine the risk and tolerance level for migration. Ex.: Applications performing core banking business functions, internet banking, EFTPOS, digital devices performing financial transaction activities, VISA and Master Card processing applications and Email exchange and communication servers have no tolerance limits for failures and this should be made aware to migration teams.

   For application migration, planning of migration teams, evaluation of application components and dependencies, business criticality and application value, development of migration scripts, mitigating the risk arising due to failures, migration, performance and load testing for development instances and then deploying same steps for production instance helps migration applications and databases successfully.

6. Technical Skills of Cloud Service Provider: Applications over cloud services are developed in various languages. These applications are deployed over various platforms. The level of technical expertise in developing and using, application language and application platform, the analytical and logical skills to use technical language to deploy application and resolve issue observed, ability to investigate application code and provide detailed impact to business, ability to develop code and deploy code successfully and ability to convert code of one language into another language will determine the level of technical expertise of cloud service providers and cloud application support team. The lack of technical skills add more time resolve issues observed

during implementation on application on SaaS delivery model. The Technical team lacks guidance and correct way to identify root cause of issue and resolve. The time taken to resolve issue acts as outage (downtime) to Banking and Financial Services Corporations information system. The downtime cause direct financial loss and reputation damage to Banking and Financial Services Corporations.

In order to mitigate this issue, application implementer with relevant technical skills, correct number of technical resources in team, transparent communication among team members, project planning and correct steps in implementation plan determine the success of SaaS deployment. The technical expertise help confirms confidence of SaaS deployment team and probability of success. This helps in reducing the failed system changes and lower unplanned outages (and disruption) to banking business.

7. Involvement of multiple teams across geography, offshoring and budgets: Cloud infrastructure and its access by application support and maintenance team located across various countries makes it a perfect platform to leverage cost efficiencies and multiple skills. Banking and Financial Services Corporations operating on multiple applications for Banking business, Risk management, Dataware house, Anti-money laundering and counter terrorism financing monitoring applications, digital forensics and financial reporting. Each of this application provide specific services to meet objectives of Banking and Financial Services Corporations. These applications have unique code, security features and deployment & upgrade model. Considering the involvement of multiple departments in and applications, various team supporting applications are required to communicate on common platform to keep information and communication transparent available to everyone at all times. The projects involving multiple skills and located at various location requires planning the budget in multiple currencies. Banking and Financial Services Corporation are under constant challenge to keep IT cost low at the same time keep information systems up to date need to plan the budget keeping the resource availability at multiple locations.

   In order to mitigate issue, when project planning involves resource (people) planning and their billable rates are provided to Banking and Financial Services Corporations, which mentions total expenses for SaaS implementation. This helps optimising the expenses. Considering the currency arbitrage and forex rate positions (hedging), the net expenditure in local currency is presented to bank. The mix of offshore and onshore resources help minimising the net expenditure.

8. Change Management and Risk Management (ITIL Processes) - Outage: For application upgrades and installation over SaaS platform, compliance department makes it mandatory to follow the system change and release management process. Change and release management process help to evaluate the process followed in development and test environment, testing completed, installation methods, resource planning, vendors involved, code dependencies testing, errors and failures encountered and resolved. The change and release management process also sets guidelines for application installation on SaaS platform if there are outages / system downtime required for successful installation. The guidelines makes it mandatory to inform planned outage requirements 8-10 days in advance. The change and release management also makes it mandatory to test the “roll-back” scenario, to bring the information system back to original state if the application deployment fails due to unknown errors. The stringent guidelines for application deployment put responsibility over project managers to plan, build & test and deploy application with utmost precision within targeted timelines and as per business requirements. The overall objective of change and release management is minimize risk of downtime and unplanned outages to information system.

   In order to mitigate this, project planning is completed by adhering to ITIL processes. The business requirements, code development, code dependency evaluation, outage requirements, business units impacted by system outage, communication required for application deployment, roll-back planning, resource planning and vendors (Cloud service provider, application code owner, third party network support engineers) involved in application deployment work in collaboration to mitigate risk and meet the change & release management criteria. The errors and failures encountered during the project phase to ensure

the deployment over production instance is as required by business.

9. Continuous systems improvements to meet Regulatory and Compliance requirements: Banking and Financial Services Industry is constantly evolving to meet the needs of economy. Regulatory and compliance makes it mandatory to follow guidelines to reduce exposure to risk outside tolerance limits. Regulatory and compliance makes it mandatory to constantly upgrade and change informations to meet future requirements. The regulatory and compliance requirements are mandatory for Banks to continue its operating license. Continues improvement through regulatory and compliance guidelines also help to identify existing bugs in system and fix them to keep information system up to date with code, patches and security features.

   To control the risk associated with information systems and meet regulatory norms, risk parameters, risk reporting, risk events and scenarios, interrelation with economic indicators and probability of occurrence of risk events, application features that will help reduce risk is identified. These indicators are informed to project managers deploying the application over SaaS Platform, which helps make all involved team members aware of the importance, urgency, criticality and need for success of application deployment. The proactive informed approach helps to meet regulatory and compliance requirements.

10. Vendor provided patches, code and files (objects): Apart from in house build legacy applications, Banking and Financial Services Corporation operate businesses on various application that provide overall features required for banking business. These applications are provided by various vendors for term based license fee. With change in technology, business methods, regulatory requirements and contractual terms, vendors provide updated versions of code, patches to mitigate issues and files to support the overall behaviour of application as expected. The application vendors provide fixes, patches and new version on quarterly (of fixed duration) basis. Implementing these fixes over SaaS Platform to maintain overall health of systems is important to remain up to date with technology upgrades. Implementing these versions requires prioritizing, project planning, organizing and monitoring after implementation. These version upgrade also have to be implemented with existing bugs and projects. The dependency of code with projects, makes it complex task to implement. Any failures may cause outage or impact the existing functionality of information systems.

    In order to mitigate this, version upgrade (version release) planning is performed by dedicated team in Banking and Financial Services Corporations. These teams, liaise with project managers, vendors, IT security teams and business units to plan, prioritize and implement the new versions. The plan for new version release and upgrade is published by both vendor and bank at the beginning of the year to keep all involved stakeholder involved. The organization wide communication helps version upgrade important part of information systems technology upgrade calendar and makes the tasks simpler. The application version upgrades are supported by vendor, so any issues reported during implementation are mitigated in real time that prevents failures and loss of resources (time and investments). This way application upgrades over SaaS platform is kept stable.

11. Quality Improvement and reduced business interruptions: In Banking and Financial Services Corporations, operating and maintaining SaaS platform for every day “Business As Usual” (BAU) activities through applications is one of the major task to maintain the quality of services delivered to customers and employee. The quality is determined in terms of confidentiality, integrity and availability of application over SaaS platform. The access methods, network connectivity and ease of performing task determine the quality of cloud infrastructure. In Banking and Financial Services Corporations, while deploying applications over SaaS has to consider the impact to BAU activities, so the roll back plan and its testing becomes important. The outage and business impact assessment is crucial for overall quality improvement of project implementation, as it determines the overall stability of applications while serving the needs to business units. After application deployment, the incident reported and resolved within service level agreements (SLAs) help assess further changes required for in application.

    In order to mitigate this, the warranty period after application has been deployed, project hand over

documentation, the incident management and continuous improvement plan and monitoring help to improve quality of services delivered through applications. The method to categorize type of monitoring for application help to have a focused approach for quality improvement. Example, in Banking and Financial Services Corporation, for application deployed on an ATM network, ATM availability, Number of transaction processed, Card returned successfully for failed transaction, reports returned to head office, real time reporting of errors and failures will determine effectiveness of application deployment.

III. CONCLUSION:

Over a period of time, Banking and Financial Services Corporations have mitigated the challenges of application deployment over SaaS platform by involvement of all stakeholders of application, transparent communication across branches and head offices, clarity on requirements from applications, informed team members about criticality of change, importance of application deployment for business units, evaluation and correction in codes by technical resources, planning of future demands and common platform for all team members to connect and collaborate. With proactive approach to deal with pre-implementation challenges and prepared team for post-implementation challenges, continues to bring stability for application over SaaS platform.

IV. FUTURE SCOPE:

This paper enlists current challenges and their mitigation steps for application deployment over SaaS platform, however with change in technology, deployment methods and teams involved, new challenges will emerge, and further research will be required to identify mitigation plan. Further research can be conducted to evaluate specific challenges faced by project managers while application deployment specific to business units in Banking and Financial Services Corporations.

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