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Project Seminar

Streamlining Bidirectional DATA Synchronization with

Salesforce and Database

Submitted to-

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# Abstract

The goal of this project is to create a bidirectional synchronization system that will make it easier for Salesforce and a relational database system—such as MySQL—to exchange account data. The JDBC (Java Database Connectivity) protocol is utilized by the system to create an effective and smooth communication channel between these different data repositories. Define mapping rules, set criteria for synchronization event triggering, and configure data fields for synchronization are some of the key features (Organization, 2019).The system offers flexibility in data synchronization procedures by supporting Salesforce outbound messaging as well as polling mechanisms. To improve data selection efficiency and guarantee that only current and pertinent data is transferred between Salesforce and the database system, it also uses watermarking techniques. Organizations can achieve a high degree of configurability in managing their data integration processes by utilizing this bidirectional synchronization system, contributing to improved interoperability and data consistency between Salesforce and relational databases. The use of the JDBC protocol ensures communication infrastructure compatibility and reliability, making the synchronization system a strong solution for maintaining coherent and up-to-date account data across platforms. (Organization, 2019)

# Project Title

Streamlining Bidirectional Data Synchronization with Salesforce and Database

# Organization/Industry Description

Technocrat Corporation Ltd. uses Salesforce as its main customer relationship management (CRM) platform. They have a substantial amount of customer data in Salesforce that they have gathered over time, including account details, sales data, and customer interactions. Technocrat Corporation Ltd. made the decision to synchronize this data with their on-premises MySQL database to improve their analytics capabilities. To make this synchronization easier, they started working on a project to create a data migration system that uses the JDBC protocol.

Salesforce:

Salesforce operates in the CRM and cloud integration industries in the context of the bidirectional synchronization project. Its significance lies in providing a centralized platform for customer data, which aligns with the project's goal of efficiently synchronizing account data. (The Number 1 CRM Software, n.d.)

MuleSoft:

MuleSoft, as the integration middleware, plays a critical role in achieving bidirectional synchronization. It connects Salesforce and MySQL using the JDBC protocol, allowing data to flow smoothly between the CRM and the database. MuleSoft's Anypoint Platform simplifies mapping rules and ensures that the two systems communicate seamlessly. (Organization, 2019)

MySQL Database:

MySQL is the database system that receives and stores synchronized account data. The project entails configuring MySQL to manage bidirectional synchronization efficiently. The JDBC protocol guarantees a secure connection between MySQL and Salesforce. Its function is critical for storing and managing data in a way that complements the bidirectional information flow between Salesforce and the database system.

Overall Project Perspective:

The bidirectional synchronization project is a collaborative effort between Salesforce, MuleSoft, and MySQL. Salesforce serves as the CRM hub, MuleSoft as the integration engine, and MySQL as the storage backbone. The industry focus includes CRM, integration, middleware, and database management, with an emphasis on how these technologies work together to achieve efficient data synchronization.

# Problem Description

In today's business environments, organizations frequently rely on a variety of software systems to manage and utilize critical data. The challenge is ensuring that these systems exchange information bidirectionally in a seamless manner, especially when dealing with large datasets. In the absence of a strong bidirectional synchronization system, inefficiencies, data discrepancies, and hampered decision-making processes can occur. This project addresses the following serious issues:

* Database Inconsistencies Between MySQL and Salesforce:

Problem: Accurate reporting and analytics are hampered by inconsistencies and discrepancies in account data between MySQL database and Salesforce CRM.

The challenge lies in implementing a bidirectional synchronization system that guarantees data consistency by accurately reflecting updates and modifications made in one system to the other.

* Absence of Effective Data Synchronization Configuration:

Problem: It is possible that the systems in use today do not have an adaptable and effective configuration method for choosing and coordinating data fields.

The challenge lies in creating a system that enables users to customize the synchronization process based on organizational requirements by configuring data fields for synchronization, mapping rules, and synchronization triggers.

* Inefficient Data Retrieval Mechanisms:

Current methods for choosing which data to synchronize can be resource-intensive and ineffective, particularly when used for polling or outbound messaging.

The challenge lies in putting watermarking techniques into practice to improve the efficiency of data selection and make sure that only updated and pertinent data is synchronized between MySQL and Salesforce.

* Middleware Integration Challenges:

Problem: The data transfer between MySQL and Salesforce may be hampered by the absence of a smooth middleware integration solution.

The challenge lies in utilizing MuleSoft's Anypoint Platform and the JDBC protocol to enable seamless communication and guarantee error-free data synchronization.

* Making Certain Scalability and Dependability:

Problem: Ensuring the bidirectional synchronization system's scalability and dependability becomes critical as data volume grows. The challenge lies in designing the system to efficiently manage large datasets, maintain synchronization speed, and guarantee reliability even in the face of varying workloads.

# Organizational Sponsors

* Prof. Dr. Venugopal Balijepally – supervision and guidance
* Mulesoft developer - provided database for MySQL and Salesforce
* Mulesoft Integration Architect – polling mechanisms and mapping rules

# System Capabilities

The bidirectional synchronization system has a few features to meet the needs and overcome the obstacles that were found. It was created to enable smooth data interchange between Salesforce and a MySQL database using JDBC (Organization, 2019).The following are some of the system's primary features:

* Data synchronization that is bidirectional:

Capability: Bidirectional synchronization is enabled by the system, guaranteeing that additions, updates, or alterations made in either MySQL or Salesforce are precisely mirrored in the other system.

Benefits: Improved data consistency, the eradication of disparities, and guaranteeing that the most recent and correct information is included in both systems.

* Adaptable Data Set Up:

Capability: A customized and effective synchronization procedure is made possible by users' ability to effectively configure which data fields are synchronized.

Benefits: Provides flexibility to meet organizational requirements, allowing users to concentrate on pertinent data fields and cutting down on pointless data transfer.

* Charting Guidelines and Pointers:

Capability: Customized synchronization criteria are possible thanks to the system's support for configuring mapping rules and synchronization triggers.

Benefits: Assures regulated and rule-based communication by allowing organizations to set precise rules for data mapping and triggers for starting synchronization.

* Polling and Outbound Messaging Support:

Capability: To start synchronization, the technology supports both Salesforce outbound message and polling methods.

Benefits: Offers flexibility in the start of synchronization, accommodating various organizational preferences and guaranteeing responsiveness to data modifications.

* Using Watermarks to Ensure Effective Data Selection:

Capability: Watermarking techniques are employed by the system to pick data efficiently during synchronization.

Benefits: Reduces resource utilization and maximizes efficiency by only picking data that has been added or changed since the last synchronization.

* Making Use of the JDBC Protocol:

Capability: Using MySQL and Salesforce to communicate using the JDBC standard.

Benefits: Reduces compatibility problems, facilitates easy data transmission, and ensures a standardized and secure communication route.

* Connectivity with the Anypoint Platform from MuleSoft:

Capability: MuleSoft's Anypoint Platform is completely integrated with the system.

Benefits: Makes use of MuleSoft's integration middleware capabilities to guarantee dependable and effective data flow between MySQL and Salesforce.

* Dependability and Scalability:

Capability: Scalability and dependability are guaranteed by the system's effective handling of big datasets.

Benefits: Supports data volume expansion while preserving synchronization speed and dependability in the face of fluctuating workloads.

Through the combination of these features, the bidirectional synchronization system provides a thorough resolution to the issues surrounding data sharing between Salesforce and MySQL, improving the overall effectiveness of data management within the organization.

# Business Benefits

* Enhanced Data Precision – Consistent and current data is maintained in both Salesforce and MySQL because of the bidirectional synchronization technology. This increases the precision of the decision-making processes' precision and lowers the possibility of mistakes brought on by inaccurate or contradictory information.
* Increased Performance Efficiency – The synchronization process is streamlined by the triggers, mapping rules, and customizable configuration choices. Because organizations may customize the system to match their unique data synchronization needs without transferring extraneous data, this leads to greater operational efficiency.
* Resource Optimization – Resource optimization is aided by watermarking techniques for effective data selection. Through selectively choosing just the updated or new data since the last synchronization, the system reduces resource consumption, which results in lower costs and better performance. (Organization, 2019)
* Interoperability with Mulesoft – Interoperability is improved by integration with MuleSoft's Anypoint Platform. Businesses may make use of MuleSoft's middleware to enable seamless communication, which will enable efficient data flow between MySQL and Salesforce. (Organization, 2019)
* Improved decision making – Business Benefit: Decision-makers can rely on the integrity of information since precise and timely data is available in both Salesforce and MySQL. This helps the organization accomplish its strategic goals by enhancing the decision-making processes.

# Project Deliverables

* Synchronization Template: Provide a customizable template that allows users to configure data fields, mapping rules, and synchronization triggers between Salesforce and the database. (Organization, 2019)
* Support for Polling and Outbound Messaging: Implement synchronization mechanisms such as polling and Salesforce outbound messaging, giving users flexibility in how they trigger synchronization. (Organization, 2019)
* Database Table Schema: Include a predefined database table schema to help with testing and integration.
* Components (Mule connectors) for integration that communicate with Salesforce APIs to enable smooth data transfer and Postman for API testing. (Organization, 2019)
* Online Bidirectional Sync: Create a system that allows users to specify filtering criteria for bidirectional synchronization of accounts between Salesforce and the database. (Organization, 2019)
* Email Notification: Notifying using mail through SMTP connector in migration workflow

# Feasibility Analysis

* Technical feasibility:

Compatibility: The proposed approach for synchronizing Salesforce and MySQL using JDBC is theoretically workable. JDBC is a Java-based technology that is extensively supported by both Salesforce and MySQL. The system's design is scalable to support a rising volume of data and synchronization complexity.

* Operational feasibility:

The fields to synchronize, their mapping, and the criteria for when to initiate the synchronization may all be quickly configured with this template. This template may be set up to operate with Salesforce outbound messaging to make greater use of Salesforce API calls, or it can be polled using our convenient polling technique.

Workflow integration: Ascertain that the technology is compatible with existing procedures, hence minimizing interruptions to normal operations.

* Regulatory and Legal Feasibility:

To efficiently handle several records at once, this template uses batch processing and watermarking to choose just the most current things that are synchronized. To facilitate testing this template, a schema for a database table is provided.

# Solution Evaluation

* Efficiency –
* Enhanced Indexing and Queries: response time – 0.0014 seconds for MySQL and Salesforce databases.
* Processing in Bulk: Used UPSERT salesforce connector (Organization, 2019) for bulk processing.

For this prototype workflow- 1 million records can be migrated in less than 10 minutes.

* Bit by Bit Synchronization- Used watermarking for timestamp (Organization, 2019)and effective synchronization. Refreshing rate of 5000 milliseconds.
* Serialization of Data and Compression:

"onCompletePhaseException": null,

"loadingPhaseException": null,

"totalRecords": 10,

"elapsedTimeInMillis": 3530,

"failedOnCompletePhase": false,

"loadedRecords": 10,

"failedRecords": 0,

"failedOnInputPhase": false,

"successfulRecords": 10,

"inputPhaseException": null,

"processedRecords": 10,

"failedOnLoadingPhase": false,

"batchJobInstanceId": "6c53f180-9471-11ee-b2d8-5c628b1138a6"

* Scalability –
* Robust Architecture – Both Salesforce to Database Workflow and Database to Salesforce Workflow are scalable depending upon the requirements.
* Migration Overflow is highly scalable due to its multi-functionality because of its compatibility.
* Accuracy –
* Validation of Data: To guarantee that data exchanged between Salesforce and MySQL satisfies predetermined criteria, use strong data validation procedures. During synchronization, make use of validation rules, constraints, and data type checks to avoid errors and data format problems.
* Reliability –
* Consistency of Data: Establish processes in place to guarantee data consistency between MySQL and Salesforce. To find and fix any inconsistencies, this involves verifying and resolving data. To ensure atomicity, consistency, isolation, and durability (ACID characteristics) during data synchronization, use transactional processes.
* Security -
* Encryption: To protect data during transfer between Salesforce and MySQL, use secure protocols (such as HTTPS). This stops data manipulation or illegal interception.
* Authorization: Apply fine-grained access restrictions, specifying who can read, write, and edit data in MySQL and Salesforce. Setting the proper permissions for various user roles is part of this.
* Database Security: To fix security flaws, patch and upgrade the MySQL databases on a regular basis. Set up the database server in accordance with recommended practices for security.

# Lessons Learned

* Thorough Requirement Analysis
* Agile Adaptability
* User Training and Support
* Regular Performance Monitoring
* Scalability Considerations

# Limitations and Future Work

* Scalability Difficulties:

Description: Bidirectional synchronization solutions may face scalability issues as data quantities rise or as the organization grows.

Impact: Increasing danger of performance deterioration and difficulty meeting expanding data needs.

* Vendors Lock-In:

Reliance on certain suppliers for bidirectional synchronization solutions might cause problems for organizations should they choose to transfer systems or if the vendor has problems.

Impact: Less flexibility and interruptions if business requirements change or there are issues with a provider.

* Subjectivity to Network Stability:

Because bidirectional synchronization depends on reliable network connections between systems, network connectivity problems may cause it to malfunction.

Impact: Data discrepancies and synchronization disruptions during network failures.

* Performance Issues:

Description: The amount of data being exchanged, and the intricacy of the synchronization rules might affect how efficient bidirectional synchronization is.

Impact: Decreased synchronization times and performance constraints.

* Configuration Complexity:

Bidirectional synchronization system configuration can be tricky, particularly for big datasets and elaborate data models.

Impact: More time and work needed for initial setup and continuing upkeep.

# Appendixes:

MySQL Database on PHP Admin (XAMPP Installers and Downloads for Apache Friends , n.d.)

A screenshot of a computer

Description automatically generated

Salesforce Database on Cloud (The Number 1 CRM Software, n.d.)

A screenshot of a computer

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Database to Salesforce Workflow (Organization, 2019)

**A screenshot of a computer

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**A screenshot of a computer

Description automatically generated**

Salesforce to Database Workflow (Organization, 2019)

A screenshot of a computer

Description automatically generated

A screenshot of a computer

Description automatically generated

XAMPP Control Panel v3.3.0

(XAMPP Installers and Downloads for Apache Friends , n.d.)

A screenshot of a computer

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Postman for API testing/triggering

(Postman API Platform, n.d.)

A screenshot of a computer

Description automatically generated

Mailing Message on Gmail through SMTP connector triggered by Postman using GET method.

<http://localhost:8081/test> (Postman API Platform, n.d.)

A screenshot of a email

Description automatically generated

# References

* *Postman API Platform*. (n.d.). <https://www.postman.com/>
* *XAMPP Installers and Downloads for Apache Friends*. (n.d.). <https://www.apachefriends.org/>
* Mulesoft Organization. (2019, July 12). *Salesforce and Database Account Bidirectional Sync*. Mulesoft. <https://www.mulesoft.com/exchange/org.mule.templates/template-sfdc2db-account-bidirectional-sync/>
* *The Number 1 CRM Software*. (n.d.). Salesforce. <https://www.salesforce.com/>