International Journal of Core Engineering & Management
Volume-7, Issue-09, 2024 ISSN No: 2348-9510

IMPLEMENTING OPERATIONAL MASTER DATA MANAGEMENT TO GOVERN BUSINESS CRITICAL MASTER DATA FOR LARGE GLOBAL ENTERPRISE

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Abstract

In today's data-driven world, managing business-critical master data is essential for large enterprises to ensure consistency, efficiency, and agility in operations. Master data management is a critical methodology that helps organizations govern and centralize their key data assets, providing a single source of truth across systems and departments [4] [5]. This paper explores the implementation of an operational Master Data Management system for governing business critical master data in a large enterprise, addressing the technological, organizational, and process challenges. I propose a robust framework based on industry best practices, focusing on scalability, security, and operational efficiency. I also highlight the impact of an effective Operational MDM on business performance, data quality, and data-driven decision-making.

Keywords: Master Data Management, Operational MDM, Business-Critical Data, Data Governance, Large Enterprise, Data Integration, Scalability, Data Quality, Data Stewardship, Data-Driven Decision Making.

I. INTRODUCTION

The complexity of managing master data in large enterprises is rapidly increasing due to the proliferation of data sources, the need for real-time decision-making, and the globalization of business operations [1]. Master Data Management (MDM) addresses these challenges by providing a centralized framework to manage key business entities, such as customers, products, suppliers, and employees. Operational MDM focuses specifically on integrating master data directly into core business processes and at operational systems, ensuring that master data is timely, accurate, and available for day-to-day operations [2].

In this paper, I investigate the implementation of operational MDM for governing business-critical master data in a large global manufacturing enterprise. Business critical master data encompasses the essential datasets that drive the operations and strategic initiatives of an organization. Without proper governance, inconsistencies in data can lead to inefficiencies, missed opportunities, lost revenue and non-compliance with regulatory standards. [3]

II. MAIN BODY

Large enterprises face several challenges when managing master data sets:

- **Data Silos:** Different departments and business units manage their data independently, leading to redundancy, duplication, and data silos.
- **Data Inconsistency:** Inconsistent master data across applications and systems can result in erroneous reporting and incorrect decision-making.
- **Lack of Data Governance:** Without a clear governance model, there is a lack of accountability and standardization in managing master data.

- **Scalability Issues:** As the volume of data grows, enterprises struggle to manage master data effectively and ensure timely updates across systems.
- **Regulatory Compliance:** Enterprises must comply with data privacy and governance regulations such as GDPR, CCPA, and industry-specific standards, which require accurate and Ill-governed master data.

These challenges underscore the need for central operational MDM approach that integrates master data into business operations in a seamless and governed manner.

2.1 Operational MDM: Key Concepts and Importance

Operational MDM is a subset of MDM that ensures master data is actively used in the enterprise's daily operations. Unlike analytical MDM, which focuses on historical data and reporting, operational MDM supports transactional systems, providing consistent master data across systems such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), and Supply Chain Management (SCM).

2.1.1 Key Components of operational MDM

1. Data Modeling: Logical and physical data modeling are critical component of operational master data management. Having the right model is essential to be successful with master data management implementation.
2. Data Integration: Ensures master data flows seamlessly into different operational systems, providing real-time synchronization of data.
3. Data Quality Management: Validates and cleanses master data to prevent errors, inconsistencies, and duplication across systems.
4. Data Stewardship and Governance: Establishes clear ownership, policies, and procedures to manage master data.
5. Scalability: Supports large datasets and high transaction volumes, crucial for a large enterprise environment.
6. Security and Compliance: Safeguards data in accordance with regulatory requirements and internal policies.

2.2 Why Operational MDM is Critical for Large Enterprises

Large enterprises deal with complex ecosystems of applications, vendors, and data consumers. Without a centralized MDM system, inconsistencies in master data can permeate throughout the organization, leading to inefficiencies, increased operational costs, and legal penalties. An effective Operational MDM ensures that master data is accurate, up-to-date, and governed in real-time, enhancing the enterprise's ability to make data-driven decisions and comply with industry regulations.

2.2.1 Operational MDM Implementation Framework:

A. Data Governance Framework

1. Establishing a Data Governance Council: The governance council includes stakeholders from IT, business units, compliance, and senior leadership. This team sets data policies, defines key metrics, and resolves data-related issues.
2. Defining Data Ownership: Clear data ownership must be assigned to different data domains (e.g., customer data, product data), ensuring accountability for maintaining data

International Journal of Core Engineering & Management
Volume-7, Issue-09, 2024 ISSN No: 2348-9510

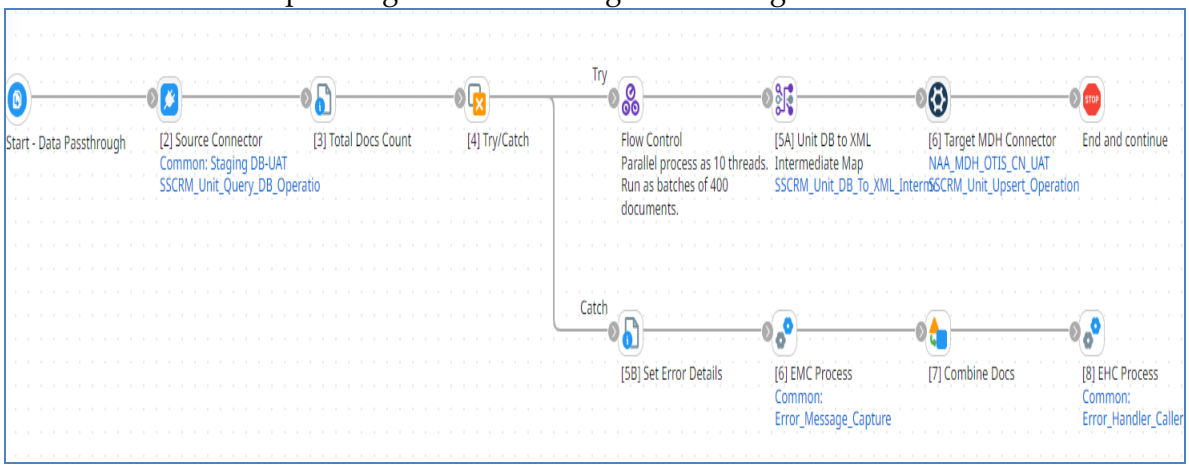
quality. [6]

3. Data Quality Rules: Implement rules to standardize data formatting, validation, and cleansing processes. Data quality metrics, such as completeness, accuracy, and consistency, should be tracked continuously.
4. Regulatory Compliance Integration: Embed regulatory compliance into data governance, ensuring that data privacy, access control, and data retention policies align with industry standards.

B. Technology Architecture

1. Data Integration Layer: The operational MDM system should integrate with the enterprise's existing systems via APIs, ETL (Extract, Transform, and Load) tools, and data connectors. These integrations ensure real-time data sharing between systems.

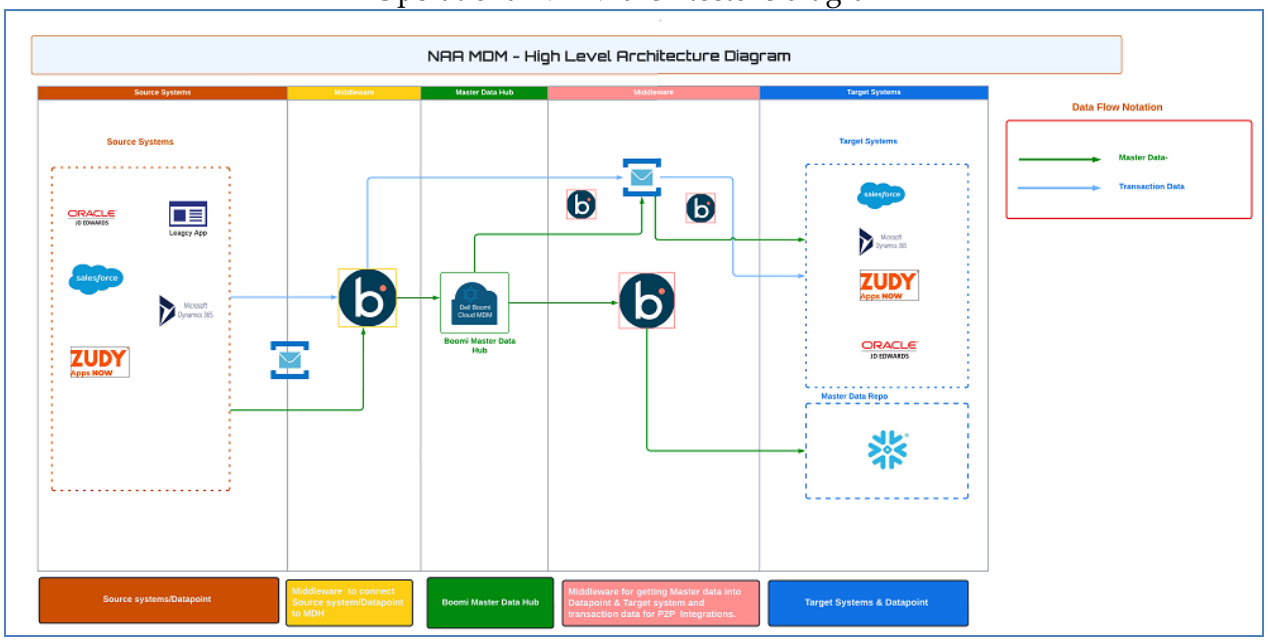
Sample integration flow using Boomi integration service



2. Master Data Hub: A central repository (or "hub") for storing, managing, and distributing master data across the enterprise. It enables bi-directional synchronization between operational systems. It shall support data stewardship by providing users ability to query both golden and quarantined records.
3. Data Profiling and Quality: Operational MDM platform must have features to profile the data and incorporate data quality rules based on profiling results and business necessity.
4. Pub/Sub Layer: Pub Sub layer needs to be established while interacting with high volume operational systems to enable fault tolerant data exchange.
5. Scalability and Performance Considerations: The operational MDM architecture should be designed to handle high volumes of master data transactions and support future growth.

International Journal of Core Engineering & Management
Volume-7, Issue-09, 2024 ISSN No: 2348-9510

Operational MDM architecture diagram



C. Processes and Best Practices

1. Data Stewardship: Data stewards play a critical role in ensuring the quality and consistency of master data across the organization. They act as custodians who enforce governance policies.
2. Automated Workflow Management: Automation should be integrated into master data workflows to streamline approvals, validation, and distribution processes.
3. Continuous Monitoring and Improvement: Establish key performance indicators (KPIs) for monitoring data quality and governance effectiveness, allowing for continuous improvement.

2.3 Risks and Mitigations

Despite the benefits of operational MDM, large enterprises may face challenges during implementation. These include resistance to change, complexity in integrating with legacy systems, and ensuring data quality at scale.

- Stakeholder Alignment: Aligning cross functional stakeholders such as business, technology on MDM framework, domains and data model is essential for the successful implementation of MDM program.
- Finding sponsor: Executive management buy in is needed to fund enterprise level MDM program, MDM programs typically demand high upfront investment.
- Change Management: Conducting training and awareness programs for stakeholders is critical to overcoming resistance to change.
- Legacy System Integration: Adopting middleware solutions and APIs can help integrate operational MDM with legacy systems without significant disruptions.

2.4 Case Study

Background: Large global elevator manufacturing enterprise faced significant data inconsistencies across its CRM, ERP and Product systems resulting in lost revenue, longer contract booking timeline and bad data quality. Company had most of the operational systems built on legacy technology such as mainframe along with few newer systems built on modern platform such as MS Dynamics.

Implementation: Company decided to implement Operational MDM using Boomi Master Data Hub to govern its business critical master data for its North America region, MDM program included multiple domains such as unit, building, customer, office etc.

- Data Profiling and Modeling: Historic data available in current operational systems was analyzed in a relational database and data model was built based on data availability and business necessity.
- Business Rules: Source to target mapping document was created with mapping between source data elements with target master data hub data elements.
- Model Deployment and Initial Data Load: Data model was deployed in master data hub with match rules and data quality steps. All the historic data was loaded to master data hub from the relational database using dedicated Boomi integration as per source to target mapping. Data was cleansed and validated before the load.
- Incremental Data Load: Event driven near real time incremental data load integrations are built between source systems and master data hub.
- Stewardship: Data in master data hub was continuously monitored by data stewards, quarantine records are analyzed and resolved by fixing the data in source systems.
- Data distribution: Data in master data hub was shared with operational systems based on the events. Data was also replicated in enterprise data platform for analytical purpose.

Results: Implementation of operational MDM resulted in following key benefits:

1. Master data sets were synchronized across operational systems in near real time, resulting in cost savings of more than > $1M /year in operational efficiency.
2. Contract booking time was reduced from 45 days to 5 days due to near real time sharing of master data between CRM and ERP system.
3. Creation of customer golden record resulted in recovering lost revenue of more than $5M by sending the invoice to correct email addresses.

III. CONCLUSION

Implementing an Operational Master Data Management (MDM) system to govern Business-Critical Master Data is a vital step for large enterprises seeking to streamline their operations, enhance data accuracy, and comply with regulatory requirements. The following key takeaways summarize the conclusions drawn from this paper:

- Data Consistency and Accuracy: Operational MDM provides a single source of truth across an enterprise, ensuring that master data is consistent and accurate across all operational systems. This consistency is essential for reliable data-driven decision-making and efficient business operations.
- Enhanced Data Governance: A robust data governance framework underpins successful Operational MDM initiatives, defining ownership, accountability, and quality standards.

Establishing a Data Governance Council and clear data stewardship roles are critical to maintaining high data quality and alignment with business goals.

- Improved Operational Efficiency: By integrating master data into core business processes, Operational MDM reduces the time and effort needed for data validation, correction, and duplication removal. This leads to smoother operations, faster response times, and improved service levels across departments.
- Regulatory Compliance: For large enterprises, maintaining compliance with data privacy and industry regulations is increasingly challenging. OMDM systems facilitate compliance by standardizing data policies, access controls, and retention schedules, helping to mitigate legal and reputational risks.
- Future Prospects in Operational MDM: As enterprises adopt advanced technologies, future Operational MDM systems may integrate artificial intelligence (AI) and machine learning (ML) to automate data quality checks, predict anomalies, and even autonomously manage data governance rules. This evolution could lead to more efficient, accurate, and scalable OMDM frameworks.

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