Leveraging MDG Key Mapping to Navigate Complexities in Supply Chain & Financial Systems with Diverse Key Identifiers

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Abstract

In today's globalized supply chain environments, enterprises often operate across multiple systems, each with its own set of key identifiers for products, customers, and suppliers. These heterogeneous systems create challenges in ensuring data consistency, integrity, and synchronization across different applications and platforms. This white paper explores how SAP Master Data Governance (MDG) and its "Key Mapping" functionality can be employed to solve the complex issue of aligning and interacting between systems that use different key identifiers. The paper discusses the challenges faced in such landscapes, provides solutions through SAP MDG Key Mapping, addresses exception scenarios, compares alternative industry approaches, and is supported by examples and scholarly references.

Keywords: SAP MDG, Key Mapping, Supply Chain Systems master data identifiers, Key sets, Data Integration, Master Data Management, Exception Handling, Data Consistency, data duplicates, MDQ

1. Introduction

The complexity of modern supply chain management is compounded by the multitude of IT systems used to manage master data across various regions, departments, and third-party systems. Each system may have its own method of identifying business entities such as customers, products, and suppliers. As organizations strive to unify their data for decision-making, regulatory compliance, and operational efficiency, the disparate key identifiers across systems present a significant challenge.

2. Problem Statement

Organizations that operate in complex supply chain environments typically utilize multiple IT systems such as enterprise resource planning (ERP), customer relationship management (CRM), procurement systems, and warehouse management systems (WMS). Each of these systems tends to have its own set of key identifiers for master data objects like customers, products, and suppliers. For example, a customer may be identified as CUST100 in the ERP system, while the same customer is referred to as ABC001 in the CRM system. These disparate key identifiers lead to several critical issues, including:

- **Data inconsistency:** Inability to synchronize master data across systems leads to fragmented views of key business entities.
- **Process inefficiencies:** Business processes, such as order-to-cash and procure-to-pay, can become error-prone and delayed due to mismatches in key identifiers across systems.
- **Reporting inaccuracies:** Analytical reporting that relies on unified master data becomes inaccurate, making it difficult for decision-makers to gain actionable insights.

- **Compliance challenges:** Regulatory requirements that demand clear, consistent tracking of master data across systems become harder to meet when key identifiers differ.

Given the rapid pace of business and the increasing reliance on integrated systems, organizations need an automated and scalable solution to map these different key identifiers and maintain data integrity across systems. SAP Master Data Governance (MDG) offers such a solution through its **Key Mapping** functionality, but the effective use of this feature comes with its own set of challenges and requirements that must be addressed.

This leads to a swarm of tickets, loss of unproductive manpower, cost to the company, duplicate data, unreliable master data and impacting customer experience.

3. Challenges in Multi-System Supply Chain Landscapes

3.1 Inconsistent Key Identifiers

In multi-system landscapes, each system may define its key identifiers differently for the same business entity. For instance, a supplier may be identified as SUP123 in an ERP system but XYS001 in a procurement platform. This disparity leads to difficulties in consolidating reports, executing business transactions, and maintaining master data accuracy [1].

3.2 Data Integrity and Synchronization

Ensuring that master data is consistent and synchronized across all systems is a significant challenge. Without proper alignment of key identifiers, transactions between systems can fail, leading to inefficiencies and delays in the supply chain [2].

3.3 Regulatory and Compliance Challenges

Many industries require strict adherence to regulatory standards, where traceability of products or customer data is essential. Disparate key identifiers complicate the ability to maintain clear audit trails and compliance with regulations such as GDPR or SOX [3].

4. Key Mapping in SAP MDG: The Solution

SAP MDG's **Key Mapping** feature is designed to address these challenges by enabling businesses to map external key identifiers from multiple systems to a single master data entity in the MDG hub. This allows the MDG system to maintain a global identifier while simultaneously managing the corresponding local identifiers for each system [4].

4.1 How Key Mapping Works

The Key Mapping framework in SAP MDG correlates an internal global key (the key used within the MDG hub) with the corresponding local keys from each external system. When data is exchanged between systems, MDG automatically translates the keys, allowing seamless interaction between them [5].

Scholarly references support the concept of key mapping as a pivotal solution in master data management for cross-system consistency [6], [7].

For example, The SAP MDG system maps the keys from the external systems to the global key in its central hub. The orchestration for key mapping involves the following actions:

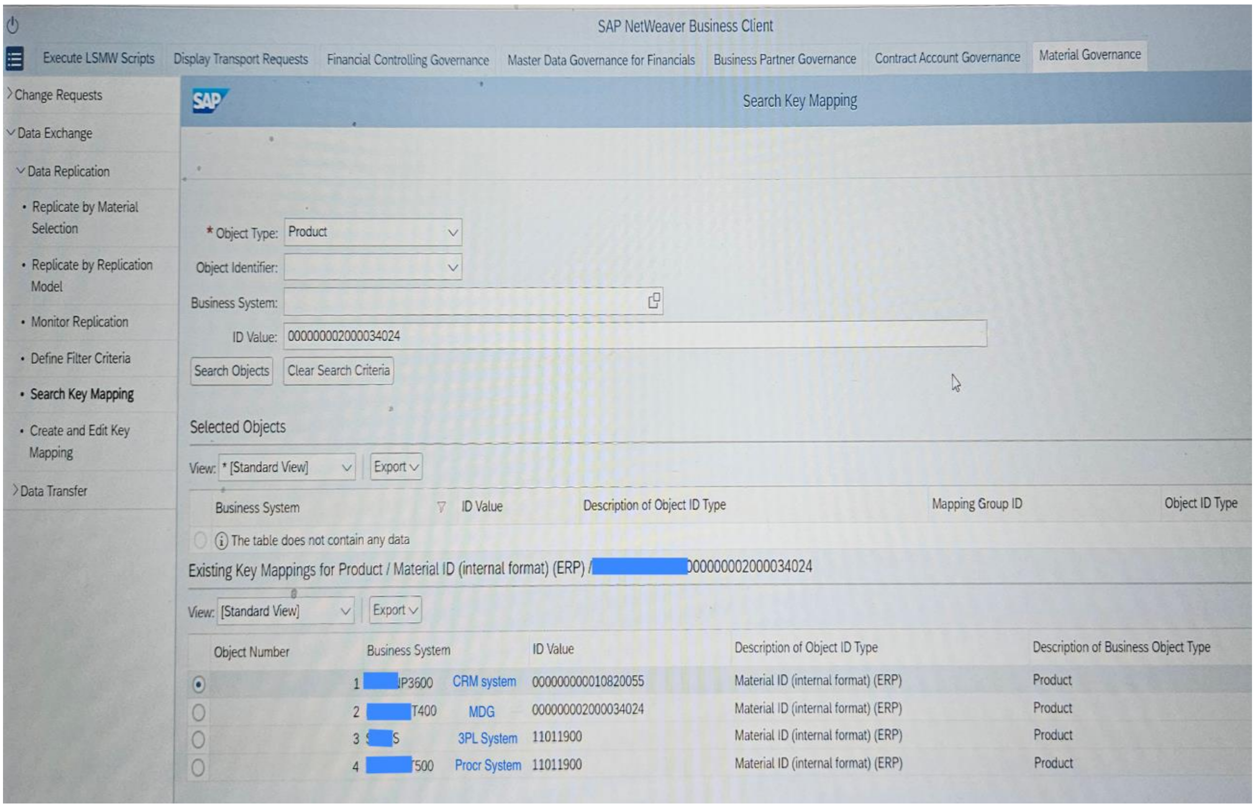
a. **MDG triggers synchronization** with the external systems, requesting the local keys for the entities. This process is part of replication and that can be extremely customized during a change request activation or after the activation. DRFIMG gives you the cockpit of replication customization.

b. **Mapping table in MDG** is updated when the acknowledgement comes back from target systems, linking the local keys from external systems to the MDG global key.

- Below example for MDG Material master has the global key *000000002000034024*, which in turn maps to relevant target systems with local key after replication.
- Global Key(GK) *000000002000034024* from MDG maps to *000000000010820055* in CRM system,
- 3PL system key *11011900* maps to MDG GK.
- Procurement system *11011900* maps to MDG GK.

Though this looks simple and trivial, in the real world each system will have different limitations sharing its key and the way it is technologically connected.

Picture KeyMapping ex# MDG screen for KM shows the global and local keys in ID value.


SAP NetWeaver Business Client
Execute LSMW Scripts
Display Transport Requests
Financial Controlling Governance
Master Data Governance for Financials
Business Partner Governance
Contract Account Governance
Material Governance
Change Requests
Data Exchange
Data Replication
Replicate by Material Selection
Replicate by Replication Model
Monitor Replication
Define Filter Criteria
Search Key Mapping
Create and Edit Key Mapping
Data Transfer
SAP
Search Key Mapping
Search Objects
Clear Search Criteria
Export

* Object Type: Product

Object Identifier:

Business System:

ID Value: 000000002000034024

Selected Objects

View: * [Standard View]

Business System	ID Value	Description of Object ID Type	Mapping Group ID	Object ID Type
ⓘ The table does not contain any data				

Existing Key Mappings for Product / Material ID (internal format) (ERP) /[redacted]00000002000034024

View: [Standard View]

	Object Number	Business System		ID Value	Description of Object ID Type	Description of Business Object Type
●	1	[redacted]P3600	CRM system	000000000010820055	Material ID (internal format) (ERP)	Product
○	2	[redacted]T400	MDG	000000002000034024	Material ID (internal format) (ERP)	Product
○	3	[redacted]S	3PL System	11011900	Material ID (internal format) (ERP)	Product
○	4	[redacted]500	Procr System	11011900	Material ID (internal format) (ERP)	Product

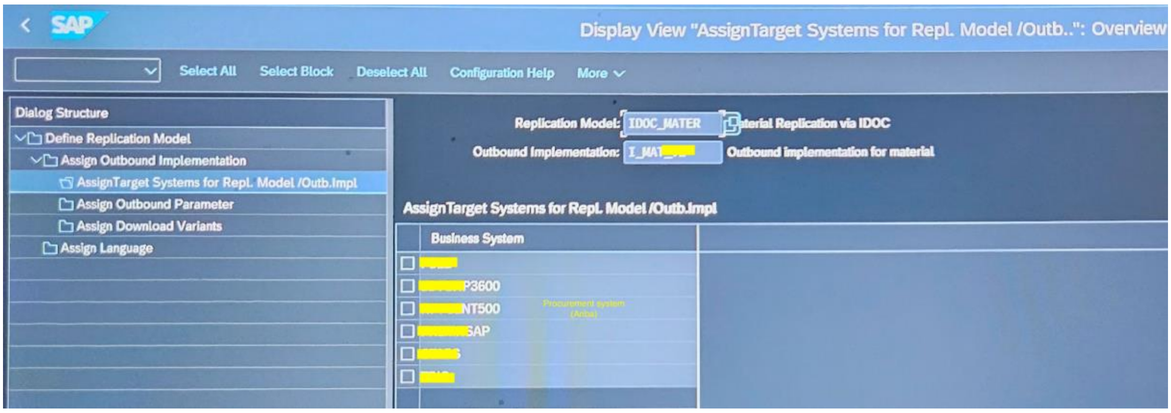
c. **Bidirectional communication** is established, allowing both external systems and SAP MDG to reference the same entity using either the global key or local key, depending on the context.

A heterogeneous SAP system can be connected by IDoc formats, where the ALEAUD can take the acknowledgements back and notify the source system.

Below *Picture# Replication model for Procurement system*, explains how the Procurement system(Ariba) is modeled in the replication framework of MDG to integrate through IDoc(Intermediate document, an SAP proprietary format based on EDI). SAP Transaction DRFIMG will give this cockpit configuration ability to house different business systems and its medium of transaction. Procurement system(Ariba) as a business system is configured as one of the replication systems in the format of IDoc as outbound implementations.

Prerequisite for this step would be to have a connection RFC(Remote function call) for the target systems.

Picture# Replication model for Procurement system# MDG system that connects to the Procurement system(NT500) through IDoc. Replication configuration by business systems.



Display View "AssignTarget Systems for Repl. Model /Outb..": Overview

Dialog Structure
- Define Replication Model
  - Assign Outbound Implementation
    - AssignTarget Systems for Repl. Model /Outb.Impl
    - Assign Outbound Parameter
    - Assign Download Variants
  - Assign Language

Replication Model: IDOC_MATER Material Replication via IDOC
Outbound Implementation: I_MAT[redacted] Outbound implementation for material

AssignTarget Systems for Repl. Model /Outb.Impl

	Business System
□	[redacted]
□	[redacted]P3600
□	[redacted]NT500
□	[redacted]SAP
□	[redacted]S
□	[redacted]

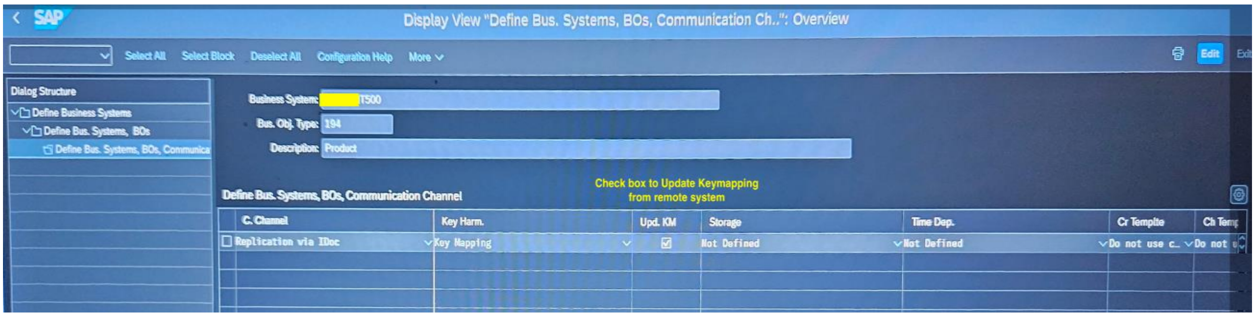
Procurement system (Ariba)

Configuration path for business systems in MDG # DRFIMG - Data replication - Define custom settings for data replication - Define technical settings - Define technical settings for business systems.

Configuration path for replication models in MDG# DRFIMG - Data replication - Define custom settings for data replication - Define technical settings - Define replication models - Assign outbound implementation - Assign target system for replication model / outbound implementation.

The below *Picture# Update Key mapping for Product master data from Procurement system into MDG* shows 194 as the product master & NT500 as procurement system which will use the IDoc as way of replication. The check box 'Upd. KM' is the one that drives the configuration to acquire remote keys/local keys to map into global keys.

Picture# Update Key mapping for Product master data from Procurement system into MDG



Display View "Define Bus. Systems, BOs, Communication Ch..": Overview

Dialog Structure
- Define Business Systems
  - Define Bus. Systems, BOs
    - Define Bus. Systems, BOs, Communica

Business System: [redacted]T500
Bus. Obj. Type: 194
Description: Product

Define Bus. Systems, BOs, Communication Channel

Check box to Update Keymapping from remote system

	C. Channel	Key Harm.	Upd. KM	Storage	Time Dep.	Cr Templte	Ch Temp
□	Replication via IDoc	Key Mapping	☑	Not Defined	Not Defined	Do not use c...	Do not u

If the external systems are capable of SOA based sync transactions, it allows an immediate response of local keys. The other mechanism will be to allow the external system to respond in its own time frame with a file or other asynchronous response. Then that is processed into the Key mapping functions. Though these are the best ways to architecture towards harmonization, *Types of integration architecture to be used between heterogeneous and non-heterogeneous applications,* explains a real-world scenario with many limitations. These ways one or the other or in combination can be adapted for implementation.

Table# Types of integration architecture to be used between heterogeneous and non-heterogeneous applications.

Integration architecture	**Description**	**Response Type**	**When to Use**	**Exception Handling**
IDoc (SAP to SAP)	Key mapping is handled using IDoc messages with ALEAUD for acknowledgment	Asynchronous	SAP systems using IDoc for integration and acknowledgment.	Use ALE error status messages to track and resolve issues.
SOA-Based Sync	Real-time, immediate response using web services for key synchronization.	Synchronous	External systems capable of synchronous SOA transactions.	Utilize error handling in SOA web services to retry failed transactions or raise alerts.
File/Batch Async	External systems send local keys at a later time via files or batch processes.	Asynchronous	External systems that do not support real-time integration.	Implement checksum verification, error logs, and retry mechanisms to handle incomplete or corrupt files.
RFC-Based Integration	Remote Function Call for real-time or delayed key mapping synchronization.	Synchronous/ Asynchronous	SAP and non-SAP systems capable of RFC-based communication.	SAP logs RFC failures and provides re-execution options to ensure reliability. nRFC, qRFC, sRFC can be used based on the need.
OData Services	Web services-based protocol for real-time key mapping via REST APIs.	Synchronous/ Asynchronous	Cloud-based or web-based systems.	Use HTTP response codes and error handling in OData services, along with retry policies for failed transactions.
BAPI-Based Integration	BAPIs allow real-time key mapping interactions between external apps and SAP MDG.	Synchronous	External systems capable of calling BAPIs for key mapping.	BAPI return messages handle errors, enabling transaction rollback or retry in case of failure.
SAP PI/PO (Process Integration)	Middleware solution for orchestrating and routing key mapping responses.	Synchronous/ Asynchronous	Complex integration landscapes needing central orchestration.	SAP PI/PO monitors and handles errors through alert frameworks, with automated retries and manual intervention if

				needed.
Email Notification-Based	Manual or semi-automated method using email prompts for key mapping responses.	Asynchronous	Systems or workflows requiring manual intervention.	Monitor for missed or delayed emails and set up manual follow-up mechanisms to ensure timely action.
Fiori Applications	User-friendly interface for manual key mapping entry via Fiori apps.	Manual	User-driven key mapping or systems without integration.	Implement field validation, error messages, and approval workflows to ensure correct key mappings are entered.

d. **Manual Key mapping**

There is always an exception and something goes wrong and we need a quick way to fix it. Like when Key mapping were imported wrongly on a project cutover we can use the below transactions to update the key mapping manually by a user.

Transaction MDG_ANALYSE_IDM is used to search master data key mapping by entities.

Transaction MDG_KM_MAINTAIN, is a web based UI to create, display, change and delete a key mapping.

e. **Data Exchange and Key Translation**

After the Key mapping is in place, Whenever there is a need to exchange data between systems, the key mapping ensures the correct identifiers are used:

- When data from CRM is sent to MDG, *000000000010820055* is translated to *000000002000034024*.
- When data from MDG is sent to the 3PL system, *000000002000034024* is translated to *11011900*.
- When Global Procurement requests product details, *000000002000034024* is translated to *11011900*.

This seamless translation occurs in real-time, using the mapping information stored in the MDG underlying tables with guid in the form of guid.

f. **Updates and Synchronization**

If a product's information is updated in the MDG hub, this information is synchronized across all the source/target systems. The system automatically ensures that the update is correctly attributed to the product, regardless of the local key used in any specific system.

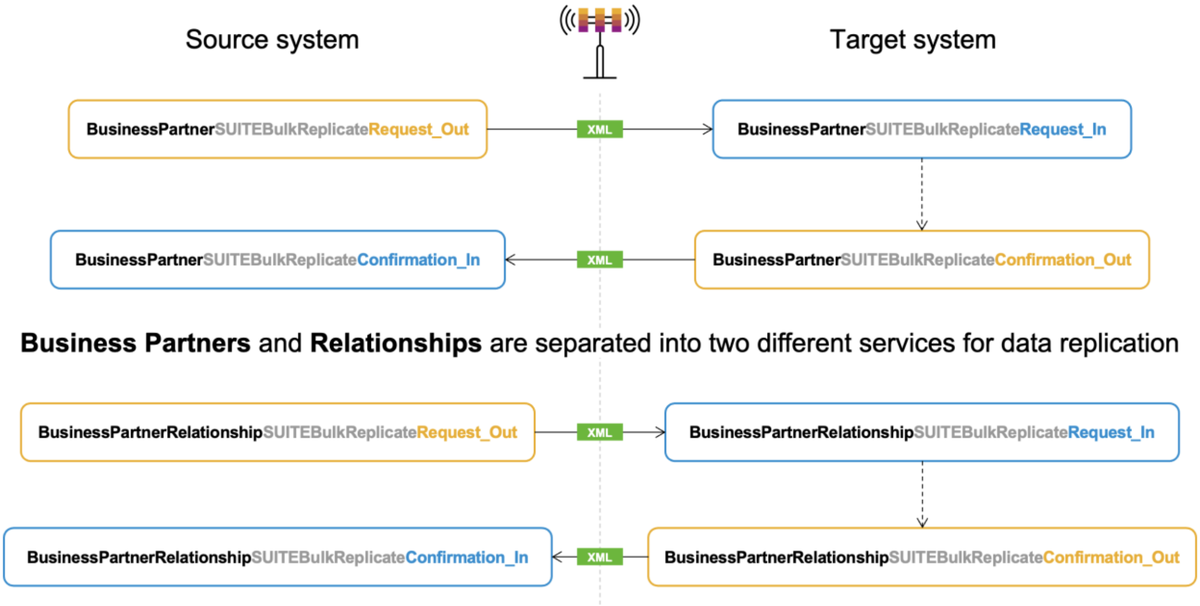
3. Key Mapping Example (web service based for a business partner)

Business partners(BP) are of master data, which are in use for Customer master, supplier master, Ship-To-Party, Sold-To-Party, Bill-To-Party, Remit-to-Party and more. The complexity of the BP varies on the business need. Usually a BP has a hierarchy of setup with one to many relationships.

For example in the *picture# BP-Relation* has a BP of a Sold-To-Party of a retailer with many Ship-To-Party(consider doors or delivering site) & bill-to-party are to be mapped. When a BP is created at a header level, it has to establish a relationship between the ship-to-parties. Both will take a global key of their own. Not necessarily the target systems need to have the same format. When implementing a solution, target systems need to be analyzed and carefully the keymapping should be configured. Below shows the 4 web services for business partners with replication starting point from Request_out, Request_in, Confirmation_out and ends with Confirmation_in. Key mapping will get created at the end of replication driving the configuration. Say if we need to make an exception not to create a not to create a keymapping for Bill-to-party, instead the target system uses source key, then, confirmation is taken in the source as token of acknowledgement and closes the transaction.

Likewise we have 4 webservices to establish the BP relationship to mention what ship-to-party will rollup to a BP.

Picture BP-Relation# Integration Services of Business Partner integration via Web Service (from sap.com BP key mapping)


Source system
Target system
BusinessPartnerSUITEBulkReplicateRequest_Out
XML
BusinessPartnerSUITEBulkReplicateRequest_In
BusinessPartnerSUITEBulkReplicateConfirmation_In
XML
BusinessPartnerSUITEBulkReplicateConfirmation_Out
Business Partners and Relationships are separated into two different services for data replication
BusinessPartnerRelationshipSUITEBulkReplicateRequest_Out
XML
BusinessPartnerRelationshipSUITEBulkReplicateRequest_In
BusinessPartnerRelationshipSUITEBulkReplicateConfirmation_In
XML
BusinessPartnerRelationshipSUITEBulkReplicateConfirmation_Out

4.2 Benefits of Key Mapping

- **Improved Data Consistency:** Ensures that master data is accurately mapped across all systems, minimizing discrepancies.
- **Operational Efficiency:** Reduces the need for manual intervention when consolidating data from multiple systems, leading to more efficient processes.
- **Compliance Support:** By maintaining consistent key identifiers, Key Mapping helps organizations meet regulatory requirements for data accuracy and traceability [8].

5. Comparison with Alternatives

Although SAP MDG Key Mapping provides an efficient and automated approach to managing disparate key identifiers, many industries still rely on alternative approaches. This section discusses common alternatives and their limitations.

5.1 Manual Data Reconciliation

Manual data reconciliation is a widely used approach where human operators identify and resolve inconsistencies in key identifiers across systems. This method often involves using spreadsheets or basic databases to track and align keys. While this method is relatively inexpensive to implement, it is highly error-prone, time-consuming, and inefficient for large-scale operations [10].

5.2 Point-to-Point Integration

In some cases, companies use point-to-point integration solutions to manage key identifiers. Each system is directly connected to another via custom scripts or middleware that translates the key identifiers between systems. While point-to-point integration provides automation, it creates a complex web of connections that is difficult to maintain, scale, and troubleshoot as the number of systems grows [11].

5.3 Inefficiencies of These Alternatives

High Error Rates: Manual reconciliation leads to a high potential for human error, which can propagate throughout the supply chain, causing inaccurate reports and disrupted transactions [12].

Scalability Challenges: Point-to-point integrations become increasingly difficult to manage as the number of systems increases, leading to maintenance bottlenecks and costly updates [13].

Lack of Governance: Neither manual reconciliation nor point-to-point integration provides a robust governance framework, making it difficult to ensure compliance and data integrity across the enterprise [14].

In contrast, SAP MDG Key Mapping addresses these inefficiencies by providing a scalable, automated, and governed approach to managing master data across multiple systems.

The ROI of alternate mechanisms may look attractive if the organization is smaller, even then the concept of centralized key mapping should be in-place to have a scalable and consistent data across systems.

6. Exception Scenarios and Handling in Key Mapping

6.1 System Discrepancies in Data Structure

If the structure of the master data differs significantly between systems, even Key Mapping may not resolve all issues. For instance, a system using composite keys (e.g., region and supplier ID) may require custom solutions to align with simpler identifier structures [15].

6.2 Missing or Incorrect Key Mappings

In cases where key mappings are incomplete or incorrect, transactions may fail. MDG provides alert mechanisms to notify users of such discrepancies, allowing corrective action. However, organizations must establish robust governance processes to minimize such occurrences [16].

6.3 Key Collisions

Key collisions occur when different entities in different systems share the same local identifier but represent different entities. SAP MDG allows users to create unique mappings to avoid conflicts, but careful planning is required to avoid introducing errors into the system [17].

6.4 Key Usage by upstream before the enrichment completes by a downstream

If a Key product has to be enriched by various systems downstream before being released to usage, then the acknowledgement from the various systems has to be kept in tandem or conditional. For this case, Key mapping had to be modeled to raise an event based workflow inorder to confirm on the completion of downstream impacts. SAP MDG(core 2019) does not provide a capability for this by standard, a custom solution had to be appropriate.

7. Best Practices for Implementing Key Mapping

Conduct a Thorough Data Audit: Understand the existing key structures and identify potential conflicts before implementing Key Mapping. Also do an extract to find what constitutes a key for certain systems, like a composite key. Where multiple keys attributes could form a key.

Establish Clear Governance Policies: Ensure that data governance processes are in place to manage key mapping changes and resolve discrepancies [18]. Governance should have legitimate audit trails and define the follow-up actions, like post-replication & reconciliation.

Continuous Monitoring and Exception Management: Implement monitoring tools to detect and correct exceptions in real-time. Use tools of alert management like AIF, Idoc monitors, sproxies, batch-reprocessors and others.

8. Conclusion

SAP MDG's Key Mapping functionality is a powerful tool for addressing the challenges of managing master data across complex, multi-system supply chain landscapes. By ensuring that disparate key identifiers are mapped and synchronized, organizations can enhance data consistency, operational efficiency, and compliance.

In contrast to alternative approaches like manual data reconciliation and point-to-point integration, which are prone to human error, scalability issues, and governance challenges, SAP MDG Key Mapping provides an automated, scalable, and governed solution that ensures data integrity across different systems. Moreover, Key Mapping offers flexibility to adapt to varying system architectures and supports regulatory compliance by maintaining accurate and traceable master data.

However, organizations must be prepared to manage exceptions, such as system discrepancies, missing or incorrect mappings, and key collisions, by implementing strong governance processes and continuous monitoring. By following best practices, including conducting data audits and establishing governance frameworks, businesses can maximize the value of SAP MDG Key Mapping and avoid common pitfalls.

In a rapidly evolving global supply chain landscape, SAP MDG Key Mapping is an essential tool for achieving seamless data integration, enabling businesses to streamline operations, improve decision-making, and stay compliant with regulatory standards.

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