

Enterprise Systems Integration

Introduction

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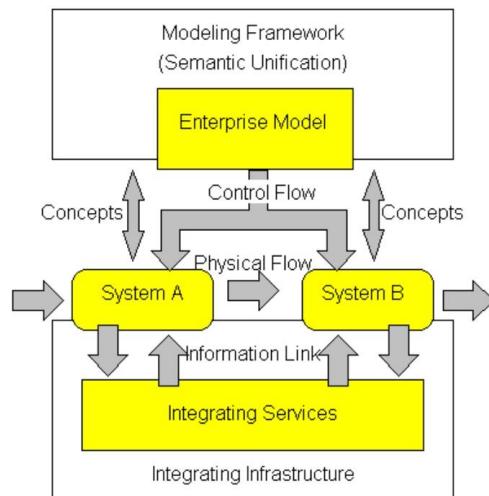
Enterprise integration overview

- ▶ Most enterprises have a burgeoning array of diverse applications, devices, clouds, and networks, not to mention exponentially growing volumes of data. Given the complexity, how can they react quickly to and meet ever-shifting customer demands? How do they stay responsive, resilient – and profitable? The answer lies in enterprise integration [1].

Enterprise integration definition

- ▶ **Enterprise integration (EI)** refers to the process of ensuring that all the software applications and systems within an organization work together seamlessly. It involves linking different computing systems and software applications to act as a coordinated whole.
- ▶ **EI** is the practice of connecting business applications, data, private and public clouds, processes, devices – and of course, people – across the entire IT landscape.

Enterprise integration definition



Why is enterprise integration important?

- ▶ The **key business benefits of EI** include:

Better customer insight. With EI, businesses can connect and interpret all types of information to gain a 360-degree view of their customers and audiences, and ensure compliance with privacy regulations.

Futureproofed IT landscape. EI can merge legacy systems with newer cloud technologies.

Why is enterprise integration important?

- ▶ The **key business benefits of EI** include:

Enhances Efficiency: By integrating disparate systems, organizations can streamline processes, reduce redundancy, and improve operational efficiency.

Improves Data Accuracy: Integration ensures that data is consistent across all systems, reducing errors and ensuring that all departments have access to the same information.

Supports Growth: As organizations expand, integration allows for the scalable addition of new systems and applications without disrupting existing workflows.

The Need for Enterprise Integration

- ▶ **Legacy Systems:** Many organizations still rely on older, legacy systems that were not designed to work with modern applications. Integration allows these legacy systems to communicate with newer technologies.
- ▶ **Heterogeneous Environments:** Organizations often use a variety of software applications from different vendors. These systems need to work together to provide a seamless user experience.
- ▶ **Data Silos:** Data stored in isolated systems (data silos) can create inefficiencies. Enterprise integration helps to break down these silos, allowing data to flow freely between systems.

Challenges in Enterprise Integration

- ▶ **Complexity:** Integrating multiple systems can be complex, especially when dealing with legacy systems, different data formats, and varying protocols.
- ▶ **Security:** Ensuring secure communication between integrated systems is critical. This involves managing authentication, authorization, and data encryption.
- ▶ **Scalability:** As organizations grow, their integration needs can become more complex. Ensuring that the integration architecture can scale to meet future demands is a significant challenge.

Types of integration

- ▶ There are a number of different types of integration connecting critical systems, processes, data, and applications across all lines of business within an organization.
- ▶ **Application integration:** Ensures that different software applications can communicate and share data. Techniques include APIs (Application Programming Interfaces), middleware, and service-oriented architectures (SOA).
- ▶ **Data integration:** Focuses on ensuring that data from different sources is consistent, accurate, and available to all systems.

Types of integration

- ▶ **User Integration:** Involves creating a unified user interface across different applications, enabling users to access all necessary tools and data from a single platform.
- ▶ **Platform integration:** With platform integration, a comprehensive set of software products enables IT professionals to develop secure integration flows that connect and govern disparate applications, systems, services, and data sources in the cloud. Platform integration is also closely related to integrated platform as a service (iPaaS).

What is application integration?

- ▶ Most companies – even small and midsize ones – use over 200 applications, each designed for its own specific purpose. But these applications don't always talk to each other, creating a whole host of problems: incomplete information, errors, contradictions, and delays.
- ▶ **Application integration** is the process of connecting independently designed software applications so they work together and share information in real time.

Different approaches to application integration

- ▶ **Enterprise application integration (EAI)** was accomplished in one of two ways:

1. Point-to-point (ad-hoc) model

It means that each application has to be customized to connect to the other applications.

This is a tedious work and highly error-prone. This model can be very hard to maintain over time.

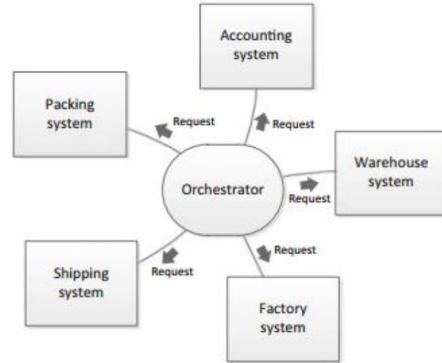


Different approaches to application integration

2. Hub-and-spoke (orchestrator) model - Enterprise service bus (ESB)

To solve these problems, the connections between applications are handled by an orchestrator- the hub.

All integration is, by design, dependent on the hub to function.



Different approaches to application integration

2. Hub-and-spoke (orchestrator) model - Enterprise service bus (ESB)

ESB is an architectural pattern whereby a centralized software component performs integrations between applications. ESB is the most common type of EAI.

ESB is a middleware solutions that are used primarily to integrate legacy and on-premises applications – they are not usually used to connect cloud-native apps.

Different approaches to application integration

3. Integration Platform-as-a-Service (iPaaS):

The most modern approach to application integration is iPaaS.

An iPaaS is a cloud-based service that integrates applications, data, and processes – usually in a simple and automated way.

With an iPaaS, you can build integrations between cloud and on-premises apps using APIs.

A combination of messaging, application connectors, data streams, enterprise integration patterns, and APIs that can be deployed faster and iteratively are more suited to modern application development.

Questions

- ▶ What is the primary goal of Enterprise Integration?
 - A. To replace all legacy systems with new software
 - B. To ensure that all systems within an organization work together seamlessly
 - C. To reduce the number of employees in an organization
 - D. To outsource IT operations to third-party vendors

Questions

- ▶ Which integration pattern involves directly connecting two systems?
 - A. Hub-and-Spoke
 - B. ESB
 - C. Point-to-Point
 - D. Microservices

What is data integration?

- ▶ **Data integration** takes data from different sources and cleanses, formats, and combines it into one data set that can be used to fuel analytics and business insights.
- ▶ **Importance:** In today's data-driven world, businesses rely on accurate, timely, and consistent data for decision-making. Effective data integration enables organizations to unlock the value of their data, providing a holistic view across various departments and systems.

The Data Integration Process

- ▶ The most commonly used data integration models rely on an extract, transform, load (ETL) process.
1. **Data Extraction:** The process of retrieving data from various source systems.
 - **Challenges:** Dealing with heterogeneous data sources, varying data formats, and real-time versus batch extraction.

The Data Integration Process

2. **Data Transformation:** The process of converting extracted data into a standardized format suitable for integration.
 - **Key Techniques:**
 - **Data Cleansing:** Removing duplicates, correcting errors, and standardizing formats.
 - **Data Mapping:** Aligning data fields from different sources to a common schema.
 - **Data Aggregation:** Combining data from different sources to create a summary view.

The Data Integration Process

3. **Data Loading:** The process of loading transformed data into a target system, such as a data warehouse, data lake, or operational system.

- **Approaches:**

- **Batch Loading:** Loading data at scheduled intervals.
- **Real-Time Loading:** Continuously updating the target system with new data.

How does data integration work?



- ▶ After the information is integrated, data analysis is carried out, providing business users with information they need to make informed decisions.

Data Integration Architectures

1. ETL (Extract, Transform, Load)

- ▶ **Overview:** The traditional approach where data is extracted from source systems, transformed, and then loaded into a target system.
- ▶ **Advantages:** Suitable for handling large volumes of data, provides comprehensive data transformation capabilities.
- ▶ **Disadvantages:** High latency (not real-time) and may not be suitable for unstructured data.

Data Integration Architectures

2. ELT (Extract, Load, Transform)

- ▶ **Overview:** A variation of ETL where data is first loaded into the target system and then transformed.
- ▶ **Advantages:** Better suited for big data environments and allows for parallel processing.
- ▶ **Disadvantages:** Requires powerful target systems, can lead to performance bottlenecks during transformation.

Data Integration Architectures

3. Data Federation

- ▶ **Overview:** Combines data from multiple sources into a virtual database without physically moving the data, allowing users to query the data as if it were from a single source.
- ▶ **Advantages:** Provides a unified view without moving data.
- ▶ **Disadvantages:** Can be complex to manage.

Data Integration Architectures

4. Data Warehousing

- ▶ **Overview:** A centralized repository where data from multiple sources is consolidated, transformed, and stored for analysis and reporting.
- ▶ **Advantages:** Provides historical data storage, supports complex queries and analytics.
- ▶ **Disadvantages:** High implementation and maintenance costs.

Data Integration Architectures

5. Data Lakes

- ▶ **Overview:** A storage repository that holds raw data in its native format until needed.
- ▶ **Advantages:** Scalability, flexibility in handling structured and unstructured data, supports advanced analytics and machine learning.
- ▶ **Disadvantages:** Can become a "data swamp" without proper governance.

Key Concepts in Data Integration

1. **Data Consolidation:** Combining data from multiple sources into a single, unified data store.
2. **Data Propagation:** Copying data from one system to another, often in real-time or near-real-time.
3. **Data Federation:** Providing a unified interface to query data from multiple sources without physically moving the data.
4. **Data Aggregation:** collecting and summarizing data from multiple sources to provide a high-level overview or insights.

Key Concepts in Data Integration

5. **Data Synchronization:** Ensuring that data across multiple systems is consistent and up-to-date.

Challenges in Data Integration

1. Data Silos

- **Challenge:** Isolated data sources that do not communicate with each other.
- **Solution:** Implementing data integration solutions that break down silos and provide a unified view.

2. Data Quality

- **Challenge:** Inconsistent, inaccurate, or incomplete data.
- **Solution:** Implementing data cleansing, validation, and quality management processes.

Challenges in Data Integration

3. Data Security and Compliance

- **Challenge:** Ensuring data privacy, security, and compliance with regulations like HIPAA.
- **Solution:** Implementing robust data security measures, encryption, and access controls.

4. Scalability

- **Challenge:** Handling large volumes of data from multiple sources.
- **Solution:** Leveraging scalable architectures like data lakes and big data platforms.

Challenges in Data Integration

5. Real-Time Integration

- **Challenge:** Integrating data in real-time without impacting performance.
- **Solution:** Using data virtualization and real-time ETL tools.

Questions

- ▶ Which of the following is the first step in the data integration process?
 - A. Data Transformation
 - B. Data Loading
 - C. Data Extraction
 - D. Data Aggregation

Questions

- ▶ Which data integration architecture is most suitable for handling large volumes of unstructured data?
 - A. ETL
 - B. Data Warehousing
 - C. Data Federation
 - D. Data Lakes

