Learning Outcomes

At the end of this module, the student should be able to:

1. Enumerate information-oriented system integration approaches.

2. Enumerate business process integration-oriented approaches.

3. Identify the technology components in system integration.

SYSTEMS INTEGRATION APPROACHES

- Software applications can be integrated using different approaches
  - Information-oriented
  - Business process integration-oriented
  - Service-oriented
  - Portal-oriented

Information-Oriented

- Integration of two or more systems by allowing simple exchanges of data between applications
  - Connecting databases
  - Deals with simple exchanges of data between two or more applications
  - Migrates data from source database to target database
- Disadvantage
  - Designers need to know all integrated systems in detail

Information-Oriented: Example

- Moving information between systems may require changing both the content and schema on the fly

Information-Oriented: Integration Concepts

- **Coupling**

- Bind applications together in such a way that they are dependent on each other, sharing the same methods, interfaces, and perhaps data
- Needs extensive changes in applications
- If source or target system changes, corresponding changes required in coupled systems as well
- Reusability
    o Allows common business processes to be reused
- **Cohesion**
    - "Act or state of sticking together" or "the logical agreement"
    - Applications and databases are independent of each other
    - Changes to source or target system should not affect others directly
    - Provides flexibility to integration
        o Allows addition, changes, and removal of systems without affecting integrated system

## Information Producers and Consumers

- Source and target systems are the entities that produce and consume information
- Types of systems that produce and consume information are
    - Database (integration using SQL, JDBC)
    - Application (API, adapters)
    - User interface (screen scraping)
    - Embedded devices (temperature sensors, call-counting machines)
- These systems are point of integration
    - since they are designed to produce and consume information

Approaching Information Integration

- Steps to approach information integration
    - Identify the data
    - Catalog the data
    - Build the enterprise metadata model
        o This model will be used as master guide for integrating the various information stores that exists within the enterprise
- A successful integration solution requires the enterprise to define both how the information flows through it and how it does business
- Different ways to connect
    - Data Replication
   - Data Federation
    - Interface Processing

Information-Oriented: Data Replication

- Moving data between two or more databases
- Accomplished by placing a software between databases
  - Extracts data from source database
  - Places data in the target database
- Advantage
  - Low cost and easy to integrate
- Disadvantage
  - Not suitable for integrating functions in applications
    o If methods are bound to data or shared along with data
 - Requires changes in source and target applications
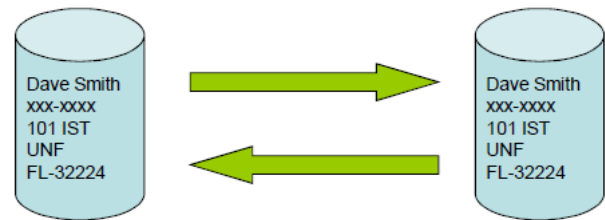
Information-Oriented: Data Federation

- Integrating multiple databases into a single virtual database
- Application access virtual databases
  - Integration software handles the collection and distribution of the data to the physical database
- Advantage
  - Can integrate different types of databases
- Disadvantage
  - Interface between application and database need to be changed
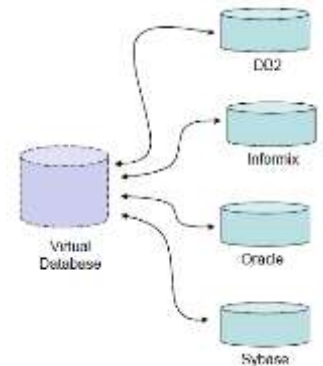
Information-Oriented: Interface Processing

- Integrating packaged and custom applications
  - Example: Enterprise Resource Planning (ERP)
- Adapters to connect custom and packaged applications
- Most popular integration approach
- Advantage
  - Efficient integration for commercially available software products
    - API solutions take into account for differences between schema, content, and application semantics when translating information to move between systems
  - Includes screen scrappers as points of integration
- Disadvantage
 - Little regards to business logic
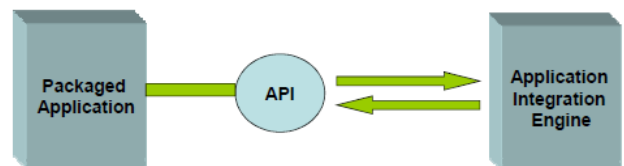
Business Process Integration-Oriented

- The goal of business process integration is to allow integration not only by sharing information but also by managing the sharing of that information with easy to use tools
  - Focuses on coordinating or managing information flow between source and target applications
  - Focuses on process logic while separating application logic
- Defined as applying appropriate rules, in an agreed upon logical sequence, in order to pass information between participating systems, as well as visualize and share application-level processes
- It is the ability to define a common business process model that addresses the sequence, hierarchy, events, execution logic, and information movement between systems
  - Central management of processes that exist on top of an existing set of processes and applications
  - Mechanism to manage movement of data and invocation of processes in order
  - Support for management and execution of processes that exists between applications

Business Process Integration-Oriented

- Binds disparate processes and create process-to-process solutions
  - Automates tasks performed by humans
- Advantage
  - Supports information and control logic flow
  - Automates tasks performed by humans
- Disadvantage
  - Focuses on process flow and integration of processes only
   - Not on user interface, updating databases or executing a transaction

Process Integration Model

Company A   Company B   Company C
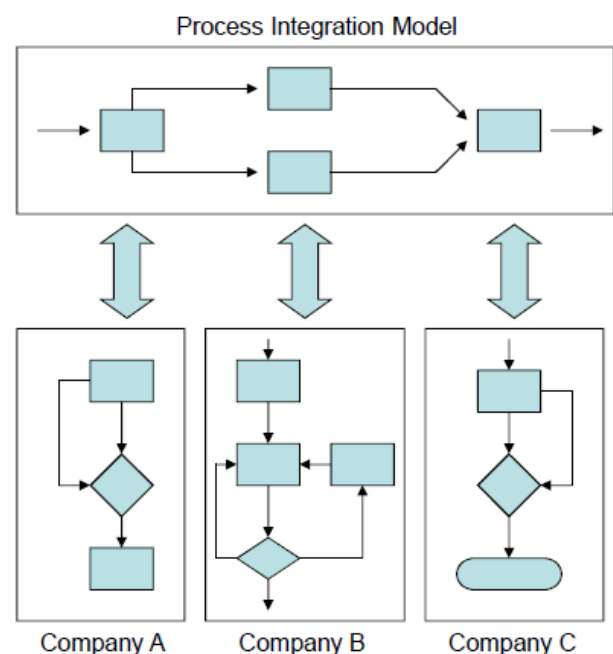
Business Process Integration-Oriented: Application Integration

- It is the ability to define a common business process model that addresses the sequence, hierarchy, events, execution logic and information movement between systems
- Idea is to provide single logical model that spans many applications and data stores
  - Providing the notion of a common business process that controls how systems and humans interact to fulfill a unique business requirement.

- Future of application integration
- Advantage
  - Supports information and control logic flow
  - Automates tasks performed by humans
- Disadvantage
  - Focuses on process flow and integration of processes only
   - Not on user interface, updating databases or executing a transaction

Objective
- Provides control mechanism of sorts that defines and executes the movement of information and the invocation of processes that span many systems

Common business process model

Company 1   Company 2
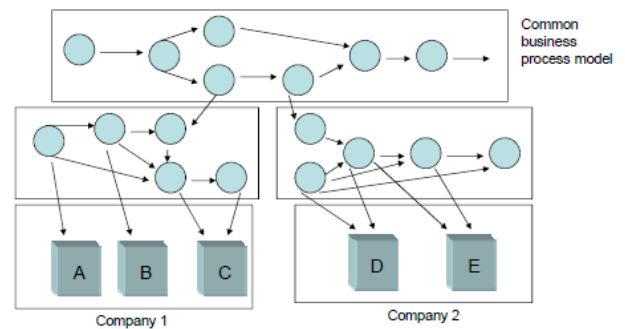
Technology Components
- Graphic modeling tool
  - Where business model is created and defined
- Business process engine
  - Controls the execution of the multi-step business process and maintains state and the interactions with the middleware
- Business process monitoring interface
  - Allows end users to monitor and control execution of a business process in real time and optimize where needed
- Business process engine interface
  - Allows other applications to access the business process engine
- Integration technology (middleware)
  - Connects the source and target systems

Graphic modeling tool

Application — Engine Interface — BPM Engine — BPM Interface

Integration Technology

Applications
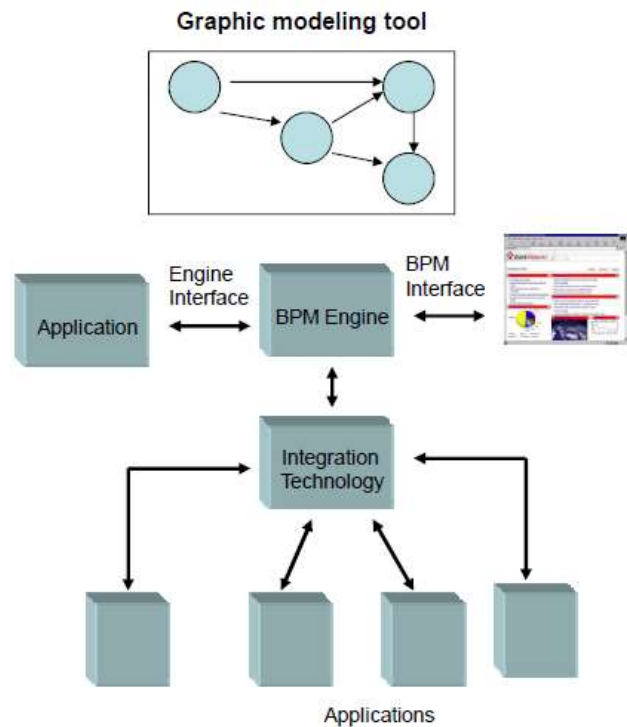
Three Technology Levels

- Process modelling
  - Information movement is defined here
  - Components of models are
    - The common process model
    - Real entities, such as companies, organizations, or people
    - The source and target systems
- Transformation, routing and rules
  - Information movement and formatting occurs here
  - Routing allows relevant information to be extracted from any source application, target application, or data store
- Messaging service
  - Responsible for moving information between all connected applications

Reference:

Enterprise Systems for Management, 2nd ed.

Next Generation Application Integration