Enterprise Application Integration

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Enterprise Application Integration

- By the end of this lecturer you will learn
- What is Enterprise Application Integration (EAI)?
- Benefits of Enterprise Application Integration
- Barrier of Enterprise Application Integration
- 3 Integration models
  - Presentation integration,
  - Data integration and
  - Functional Integration
- Message Oriented Middleware (MOM)
- Distributed Object Technology (DOT)
- Transaction processing monitors (TPMS)
- The Enterprise Application Integration Market

What is EAI?

- Definition by (EAI.ITtoolbox.com)
- It is the combination of processes, software, standards, and hardware resulting in the seamless integration of two or more enterprise systems allowing them to operate as one.

- Prior to EAI
- Lack of concept of Integration of corporate data because the IT systems were built in an ad hoc manner.
- Organizations are embracing a “buy before build” strategy that favors purchased application packages over internal development
- Application systems are built at different times by different groups operating independently of each other.
- Information cannot pass through from one applications (stand alone system) to another.

The Problem

"70% of all code written today consists of interfaces, protocols and other procedures to establish linkages among various systems"

"30% of entire IT budget is spent on building, maintaining, and supporting application integration"

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The Integration Problem (i.e. Opportunity)

- Multiple, disparate applications
  - Custom
  - Legacy
  - Packaged
- Multiple platforms
- Multiple databases
- Multiple transaction processors
- Multiple data entry points
- Multiple versions of the same data
- Incompatible business data

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Trends Driving The EAI Problem

- Growing adoption of packaged applications
- Base of business critical "legacy" systems
- Multiple platforms, protocols and technologies
- Internet is driving business to business activity

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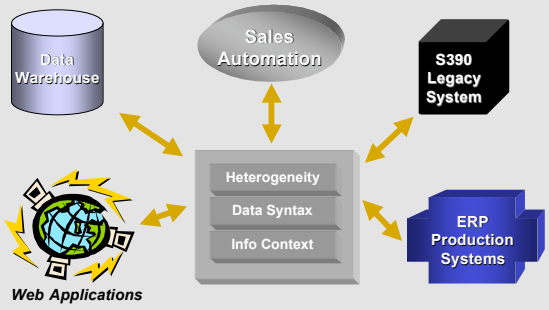
The Result—“Islands Of Automation”



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Benefits of EAI

- Improving Customer Relationships
- Improving Supply Chain Relationship
- Extend the life of some key legacy applications
- Reducing time to market
- Improving Internal Process
- Help support mergers, acquisitions and de-mergers more effectively
- Increase effective standardization within your application landscape
- Increase the responsiveness of your technology landscape to changing business needs
- Help realign your systems to meet your short- and long-term business needs

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Barriers to Effective EAI

- **Complexity of existing enterprise architectures**
  Each departments built their own systems with its own technologies.
- **Lack of skilled staff**
  on technologies such as Message Oriented Middleware (MOM), CORBA, Enterprise JavaBeans (EJB).
- **Security Issues**
  EAI provide more accessible information onto corporate network Legacy applications can be access by variety of users.
- **Change Management issues**
- **Rapid change of company's IT landscape and business environment**

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Integration Models

Definition

An integration model defines how applications will be integrated by defining the nature of and mechanisms for integrations.

1)Presentation integration (User Interface Integration)

Allows the integration of new software through the existing presentation of the legacy software. This is typically used to create a new user interface but may be used to integrate with other applications

2)Data integration

Allows the integration of software through access to the data that is created, managed, and stored by the software typically for the purpose of reusing or synchronizing data across applications

3)Functional Integration (Method Level Integration)

Allows the integration of software for the purpose of invoking existing functionality from other new or existing applications. The integration is done through interfaces to the software

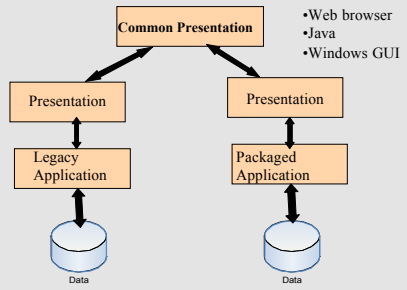
Presentation Integration Model

- Simplest form of integration
- Presentation refer to the user interface that provide access to an application
- Screen scraping
- Accessing the legacy through its existing presentation logic

Example of technologies

- 3270 emulators
- Terminal application libraries
- Screen to object translators
- Message broker and application server adapters

Presentation Integration Model



Pros of Presentation Integration

- Low risk, low cost
- Technology is available and stable
- Easy to accomplish
- Quickly implement
- Does not require changes to source or target systems
- Presentation logic is less compress compare to data or functional logic
- Does not require creating a new interface, or any interface

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Cons of Presentation Integration

- Performance
- Perceptions
- Only prolonging the EAI problem in many instances
- Only the data and interaction defined in the legacy presentation can be accessed
- Most limiting out of the 3 models
- No interconnection between the application and data

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Data Integration Model

- Data integration model goes directly into the database or data structure of an application bypassing the presentation and business logic to create the integration
- Using tools and data access middleware to access and integrate information from database such as Batch file transfer, Open Database Connectivity (ODBC), Data transformation
- Allow combine data from multiple sources for analysis and decision making or data extraction from one sources and reformatted into another.

Pros

- Greater flexibility than presentation integration model
- Availability of staff and technology
- Allow data to be reused across other application
- Inexpensive and proven technology

Cons

•Integration is tied to a data model, if a data model change, the integration may break

•Does not solve the ultimate method integration problem, more of a stopgap measure

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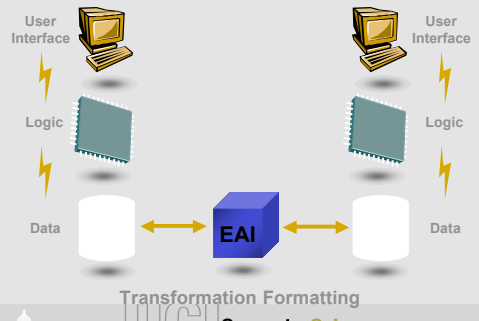
Data Integration Model



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Enabling Technology For Data Integration

Middleware
- Database-oriented middleware
  - ODBC
  - JDBC
  - Database gateways
- Message brokers and other MOM

Data warehouse tools and technology
- ETL

Database replication features

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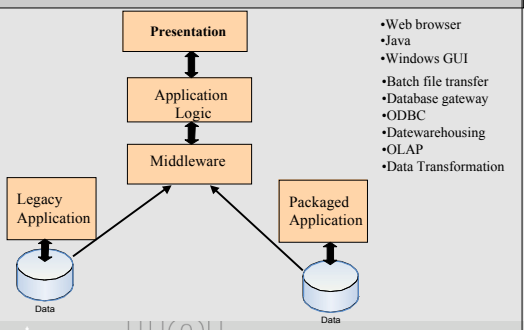
Data Integration Model



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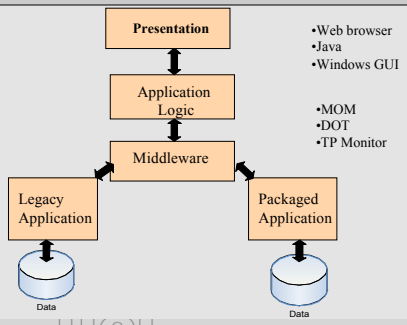
Functional Integration Model

- In business a significant portion of IT budget is spent on the creation of business logic (Implementation of business processing in a programming language)
- Functional Integration model integrate at the business logic level using distributed processing middleware
- Distributed processing middleware is a type of software that facilitates at the communication of requests between software components through the use of defined interfaces or messages

Three Categories of Distributed processing middleware
- Message Oriented Middleware (MOM)
- Distributed Object Technology (DOT)
- Transaction processing monitors (TPMs)

Functional Integration Model



Functional Integration Model

Pros
- Most robust integration capabilities Of all the models
- Provides true code reuse infrastructure for many enterprise applications
- Availability of technology and expertise
- Ultimate EAI solution for many enterprises

Cons
- Much more complex and expensive than the other approaches
- High learning curves for the software
- Takes a lot of time, architecture, and planning
- Enabling technology may not scale to enterprise class applications or fall short in other ways
- May be difficult to access the business logic of some applications because the sources code may not exist or there may be no APIs.

Message Oriented Middleware (MOM)

- MOM is a specific class of middleware that supports the exchange of general-purpose messages in a distributed application environment.
- Data is exchanged by message passing and/or message queuing supporting both synchronous and asynchronous interactions between distributed computing processes.
- MOM sends messages from one application to another using a queue. Client messages are sent to a queue and remain there until they are retrieved by the server application.
- The advantage to this system is the server application does not need to be available when the message is sent, instead, the server can retrieve the message at any time.
- In addition, since messages can be retrieved off the queue in any order, MOM can also facilitate retrieval of messages using priority or load-balancing schemes.
- Example of technologies such as IBM's MQ Series

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Distributed Object Technologies (DOT)

- DOT is a type of middleware that extends the concept of object-oriented technology to distributed processing. Interfaces are developed for applications that make software look like objects
- It allows software components to be moved, replaced, or replicated without affecting any other components.
- It can achieve good component integration and well suited to the creation of component based systems.
- But it is more complex compared to MOM because it requires a higher degree of coupling between application.
- In real life company combine MOM and DOT to solve the broad set of problems.
- Example of DOTs are DCOM/COM+, CORBA, Enterprise JavaBeans

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Enterprise JavaBeans Architecture

Sun Enterprise Java Beans architecture provide a distributed application framework

Web Clients	Java Applets
	Java Servlets
	Java Server Pages (JSP)
Database Access	Java Database Connectivity (JDBC)
Distributed Components	JavaBeans
	Enterprise JavaBeans (EJB)
Distributed Objects	Remote Method Invocation (RMI)
Object Directory	Java Naming and Directory (JNDI)
Transaction Service	Java Transaction Service (JTS)
Message Services	Java Messaging Service (JMS)

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Enterprise JavaBeans Architecture

- EJB technology defines a model for the development and deployment of reusable Java server components.
- EJB provide a set of enterprise component interface (APIs) for standardized components on the Java platform:
- The EJB API define a server component model that provides portability across application servers and implements automatic services on behalf of the application components
- The Java Naming and Directory Interface provides access to naming and directory services such as DNS, NDS.
- The Java Servlets and JSP APIs support dynamic HTML generation and session management fir browser based clients
- The Java Messaging Services API supports asynchronous communication through various messaging systems such as reliable queneing.
- The Java Transaction Service API define a distributed transaction management based on the CORBA Object Transaction Services.
- The JDBC Database Access API provides uniform access to relational database such as DB2, Oracle and SQL Server.

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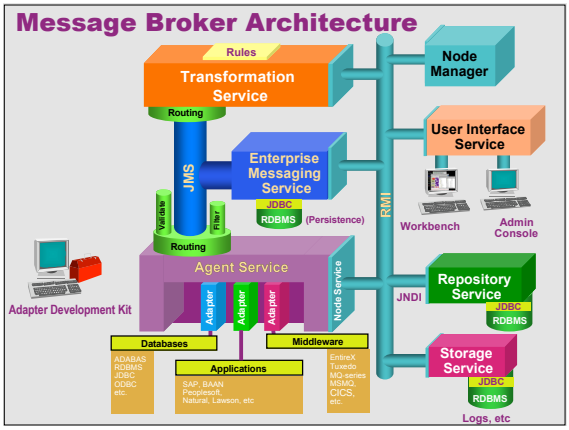
Message Broker Architecture



Transaction Processing Monitors (TPM)

Definition

- Transaction processing monitors are a type of middleware that preserved the integrity of a transaction. They supports feayures such as rollback, failover, auto restart, error logging and replication to eliminate single points of failure.
- TPM ensure a transaction maintains ACID properties
- A – Atomicity
- C – Consistency
- I – Isolation
- D – Durability
- TPM allows a transaction to be formed by the sender and then ensure it gets to the right place, at the right time and completed in the right order.
- Most Complex out of the 3 types of the middleware.
- Example of this technology is BEA's Tuxedo

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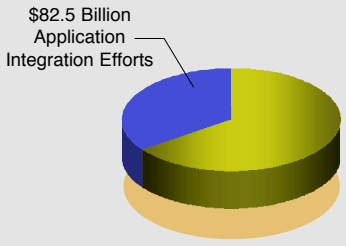
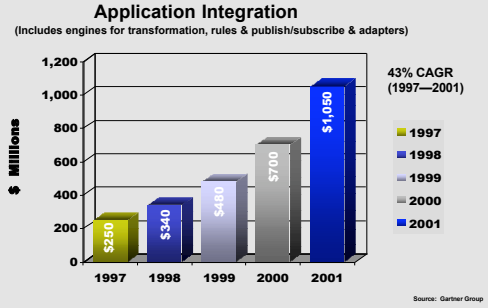
EAI is Expensive!



1998 IT Budget Total = $275 Billion

Source: Forrester Research

Enterprise Application Integration Market



Further Reading

Books:

- Enterprise Application Integration: A Wiley Tech Brief By William A. Ruh, Francis X. Maginnis and William J. Brown
- Enterprise Application Integration Addison-Wesley Information Technology Series) By David S. Linthicum

Magazines:

- EAI Journal.

Online:

- http://www.eai.ittoolbox.com
- http://www.javaworld.com/javaworld/jw-08-2002/jw-0809-eai.html (Enterprise application integration using J2EE)