Enterprise Application Integration Techniques

"The most important and fastest growing IT sector"

IDC Chairman Peter Vance

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Who am I?

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Today's Lecture

- Why is EAI needed?
- What does it do?
- How does it do it?
- Who uses it?
- Who's going to use it?

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Why use EAI? A little history…

- Cavemen used tools
  - Made them hunt better
- We use computers as tools
- To automate manual tasks
  - Data summary
  - Searching
  - Filling up your fridge…

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A little history…

- 1960s:
  - Tasks automated within departments
  - Computer systems grew "departmentalised"
  - These "stovepipe" systems were
    - independent of each other
   - narrow scope
  - Independent islands of computing:
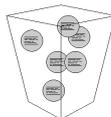
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A little history…

- What's wrong with that?
  - Each department works fine.
- BUT!
  - Systems needed to interact – and you can't just start again!!!
  - Customer information within a stovepipe system has value when viewed as a whole.
  - Desirable to integrate key systems with vendors and customers.

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A little history…

- 1990s:
  - Packaged software solutions such as ERP, PeopleSoft, JDEdwards, Siebel and Clarify.
  - Worked well individually, but not together.
  - Giving "information islands" again:
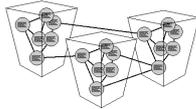
A little history…

- How do we get around these problems?
- Use Enterprise Application Integration Techniques

- Right, but what's that?

EAI Requirements

- EAI is used to solve all the problems previously mentioned.
- It must cover every part of an enterprise.
  - Architecture.
  - Hardware.
  - Software.
  - Processes.
- How?
  - Business Process Integration (BPI).
  - Application Integration.
  - Data Integration.
  - Platform Integration.

Business Process Integration

- Specifies the processes involved in the exchange of enterprise information.
  - "This allows organizations to streamline operations, reduce costs and improve responsiveness to customer demands."
- Can include:
  - process management.
  - process modelling.
  - workflow.
- Basically: What is needed at each step of each process??

Application Integration

- Goal:
  - bring data or a function from one application together with that of another application that together provide near real-time integration
- Can include:
  - business-to-business integration
  - customer relationship management (CRM) systems
  - web integration
  - building web sites that interact with multiple business systems

Data Integration

- For the last two to work, we must also integrate the data.
- Identify and record data.
  - Then build a metadata model.
- Data can now be shared or distributed across database systems, providing it is in a standard format such as COM+/DCOM, CORBA, EDI, JavaRMI, and XML.

Platform Integration

- Deals with the processes and tools that are required to allow these systems to communicate:
  - Optimally
  - Securely
- So ,data can be passed through different applications without difficulty.

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EAI Architectures

- There are two types of architecture in existence:
  - Point to Point
    - Traditional
  - Middleware
    - More modern

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Point to Point

- Systems communicate directly with each other:
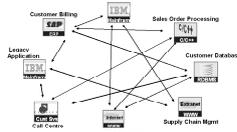
- Basic, traditional, easy, quick.
- But only when there are few systems!!

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Point to Point

- This solution does not scale up
- Five systems need 10 integration points:
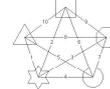
- Tight coupling, dependence, and number of integration points ☹
- We need to provide an intermediate layer - middleware

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Middleware

- Can mediate between applications:

- Provides generic interfaces.
  - allow applications to pass messages to each other.
- Five systems have only five integration points. ☺
- We can add and replace systems without affecting others.
  - Only the middleware.
- Middleware itself can perform operations such as routing, transforming, aggregating, separating, and converting on the data.
- Additional complexity in terms of setting up the middleware, and converting the applications to use the middleware APIs.
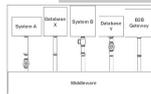
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Integration Methods

- Having chosen an architecture (usually middleware), pick an integration method:
  - Data level integration
  - User interface level integration
  - Application level integration
  - Method level integration

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Data Level Integration

- Backend data stores are integrated:
  - Push based: One application makes SQL calls on another application's database tables, through database links or stored procedures. Data is pushed into another application's database.
  - Pull based: Uses triggers and polling. Triggers capture changes to data and write the identifying information to interface tables. Adaptors poll the application's interface tables and retrieve the pertinent data. This pull based integration is used when an application requires passive notification of changes within another application's data.

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Data Level Integration

- Used when application does not provide any APIs or client interfaces.
- Need a good understanding of the business operations that may affect the application's data model.
- Typically the only option with most custom applications that lack APIs.

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User Interface Level Integration

- Ties integration logic to user interface code.
  - scripting based: The integration code is embedded into the user interface component events.
  - proxy based: Uses the integrated application's interface (through screen scraping) to pass data to and from the system.
- Used when:
  - direct access to the database is not easy or possible
  - when the business logic is embedded in the user interface

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User Interface Level Integration

- Often used in mainframe and client/server applications
  - Mainframes do not tend to have access to friendly data stores, and do not provide public APIs.
- However, generally used as a last resort:
  - Adding scripting logic to catch events with client/server applications difficult to maintain, as integration levels increase and more changes occur.
  - User interface changes can break integration triggers and logic.
  - Tight coupling - permanent link between maintenance of the interface and integration code.

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Application Level Integration

- Considered the best way forward:
  - uses the integrated application's integration frameworks and APIs.
  - transparent to the integrated application and preserves the application's data integrity.
- Application interface allows you to invoke business logic to preserve data integrity.
- E.g Siebel's Java DataBeans and SAP's JCA (J2EE Connector Architecture).

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Method Level Integration

- Less frequently used:
  - specialisation of the application level integration method.
- Aggregate common operations on multiple applications into single application.
- Generally used:
  - when each integrated application has a similar set of API or functional methods.
  - E.g. distributed component or CORBA technology.

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Method Level Integration

- Integrated applications must support a Remote Procedure Call (RPC) or distributed component technology.
- The main disadvantage is the tight application coupling in front components.
  - will break when changes are made to the integrated application API,
  - these problems will propagate down to the other applications that rely on them.

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Who Uses it?

- Without industry support, EAI will die
- Big industry. Market leaders:
  - BEA Systems
  - CrossWorlds Software
  - IONA Technologies,
  - Level 8 Systems
  - Mercator Software,
  - NEON (purchased in 2001 by Sybase)
  - IBM Global Services
  - Accenture
  - PricewaterhouseCoopers

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How is it used? Digital Designs UK

Project Name	Description and Technologies
Business Support System for Russian Government Agency April 2001 - December 2002 (planned)	The project is covered by a NDA so only a general description can be provided. The main contractor is one of the world's largest IT companies. Digital Design is developing the software part of the solution worth almost 1 million USD. The system is integrated with a standard industrial document management system, a search engine, and an Oracle database.
International Paper August 2001 - December 2001	Order-tracking system for client support personnel and company management. The system is integrated with Scala ERP, Prodis (production control system) and TPC (Transportation Process Control system). Main functionality is to provide information about order placement, production, stock availability, credit control, transportation and customer claims. The system is being used in the production environment serving a large number of International Paper's clients' requests.

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The Future of EAI

- Still a maturing technology, but with a brilliant future:
  - "The EAI market is set to become the most important and fastest growing IT sector in the next three to five years."
  - "Worldwide revenues in this market will jump from $5 billion in 2000 to nearly $21 billion in 2005."
- Not surprising that so many major companies are involved!!
- But the "cost of services, human issues regarding EAI engagements, and business-to-business integration challenges" may well slow growth

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Summary

- Why was EAI developed?
- What does it do?
- How does it do it?
  - Business Process Integration (BPI).
  - Application Integration.
  - Data Integration.
  - Platform Integration.
- Who uses it? BEA Systems, CrossWorlds IBM Global Services, PricewaterhouseCoopers etc
- Who's going to use it?
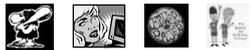
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Questions?

- Any Questions?

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Further Reading

- www.EAI.ITToolbox.com
- "Enterprise Application Integration" W. A. Ruh, F. X. Maginnis, W. J. Brown. Wiley 2000
- "TIGRA: An Architectural Style for Enterprise Application Integration" W. Emmerich, E. Ellmer and H. Fieglein. Proc. of 23rd Int. Conference on Software Engineering

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