Enterprise Application Integration

“A Tale of Two Factories”
A Manufacturing EAI Case History

Tomorrow’s Information Technology Solutions Today!

Competitive Edge Through Application Integration
Introduction

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What’s this Project About?

- Effectively managing Business and Technology changes through....
  - The internet revolution...
  - A global corporate integration followed by...
  - A major spin-off and sale involving...
  - 3 separate companies,
  - Vast differences in technology, business practices & corporate culture.
  - 20+ years of Legacy code & infrastructure....AND...
  - Doing it all “right the first time!” -- Economically and with “zero downtime.”....AND....
  - Saving over $3,000,000 in the process!
What are the Keys to Success?

- No Rocket Science involved...
  - Look for the “Renaissance people”
  - Business & People…(not technology) are the drivers
  - Experiment!!! Build small stuff that works and sells.
  - Reserve the right to be “smarter tomorrow than you are today!” - Open Systems & Standards Approaches.
Global Middleway Milestones

- Plant opened by 3M 1961.
- Plant and corporate IT systems developed 1975 - 1995.
- The DCE Decision (and it’s aftermath) 1994.
- First major WEB/EAI project completed 1993 - 1996.
- Plant spun off from 3M to Imation 11/95.
- Second major WEB/EAI project completed 1997 - 1998.
- Plant offered for sale by Imation 4/98.
- Installed first Linux server into the factory 6/98.
- Began Verastream Linux beta test 9/98.
- Plant Sale to Spectratech International completed 12/98.
- Spectratech begins production operations 1/99.
- Complete Linux Qualification, Begin 3rd major EAI project 10/99.
- Live 5/2000!
Middleway Architecture: “The Good Ole Days”
Circa 1992

- DEC VT- Terminal
- HP Terminal
- IBM 3270 Terminal
- Stand Alone PC's
- DEC VMS Cluster
- DEC PDP 11’s
- HP-3000
- IBM Mainframe
Middleway Architecture 1998

WEB Clients
- OSU
- X-Terminal
  - TCP/IP, Decnet, VT3K
- Verastream GUI or Character Based Clients
  - PC
- T1 To Internet

WEB Servers
- Web Servers
  - WRQ

VMS Cluster
- WRQ
  - RMS
  - Oracle
  - Flat

HP-UNIX Servers
- WRQ
  - Oracle
  - Flat
  - NT

HP-3000
- Allbase Turbo/Image Flat
- Oracle ODBC Flat

NT Servers
- WRQ

NFS
- PC Request
- VT3K

FSC EAI Case Study
## Cost/Benefit Analysis

### Object/Middleware Solution (Verastream WEB Client) vs. Traditional Client/Server Implementation

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost Of Traditional Client/Server</th>
<th>Cost of Verastream WEB Solution</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tech Support Contract</td>
<td>$33,417</td>
<td>$6,800</td>
<td>$26,617</td>
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<tr>
<td>Database Licensing</td>
<td>$192,000</td>
<td>$32,000</td>
<td>$160,000</td>
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<tr>
<td>Hardware Upgrades</td>
<td>$250,000</td>
<td>$0</td>
<td>$250,000</td>
</tr>
<tr>
<td>Hardware Maintenance</td>
<td>$20,000</td>
<td>$0</td>
<td>$20,000</td>
</tr>
<tr>
<td>Application Development</td>
<td>$75,000</td>
<td>$10,000</td>
<td>$65,000</td>
</tr>
<tr>
<td>Application &amp; DB Porting</td>
<td>$400,000</td>
<td>$100,000</td>
<td>$300,000</td>
</tr>
<tr>
<td>Client Software Licences</td>
<td>$20,000</td>
<td>$1,300</td>
<td>$18,700</td>
</tr>
<tr>
<td>Network Upgrades</td>
<td>$200,000</td>
<td>$0</td>
<td>$200,000</td>
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<tr>
<td>PC Client Upgrades</td>
<td>$40,000</td>
<td>$0</td>
<td>$40,000</td>
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<tr>
<td>Employee Training</td>
<td>$134,000</td>
<td>$2,200</td>
<td>$131,800</td>
</tr>
<tr>
<td>Estimated Lost Business</td>
<td>$650,000</td>
<td>$0</td>
<td>$650,000</td>
</tr>
<tr>
<td><strong>Total Cost</strong></td>
<td><strong>$2,257,427</strong></td>
<td><strong>$189,300</strong></td>
<td><strong>$2,068,127</strong></td>
</tr>
</tbody>
</table>
Our Recommendations

- Install T1 Link to Corp. HQ.
- Standardize on TCP/IP Phase out DECNET network.
- Phase out use of OpenVMS, HP-3000, HP-UX servers.
- Retain HP-UX workstations only as required.
- Use Verastream/Linux as the primary integration tools/technologies.
- Retain a mix of Xwindows & Windows 95/98/NT Clients.
- Retain existing Intellution FIXX/DMACS Process Control Packages running on NT.
- Phase out all other installed databases and use Corporate Standard FoxPro Database.
- Rearchitect Databases & Re-engineer Business Logic.
- Develop & Deploy new applications
EAI Strategic Objectives

- Provide the ability to access and integrate all business & technical information seamlessly between Middleway plant, other Spectratech/Southern Litho Plants and Corp HQ.
  - “Integration from the production floor to the customer’s door”
- Port Data from existing to new FoxPro Databases
- Re-architect Database Schema to improve data flow and integrity and allow easy integration with Corporate MTM software.
- Consolidate business logic to improve data integrity and eliminate extra data validation.
- “Provide User Transparent” Database/System connectivity and reporting.
- Provide a more “user friendly” interface to all systems & applications.
- Taylor applications to the workflow of the business, its customers & employees.
- Build a scaleable architecture that can “grow with the business”
  - Support global standards easy transition between platforms/databases.
- Meet Corporate Security Standards while providing “Single Sign On” user authentication for all data access
- Design and architect a solution with CTI in mind.
EAI Strategic Objectives

- Maintain a standard of virtually 100% system availability while minimizing downtime required for any reengineering or porting
- Reduce application development and maintenance cost/workload/complexity where possible by consolidating programming languages and tools.
- Minimize costs (Hardware/Software/Infrastructure)
Why Verastream?

- A superior product that provided a complete solution that addressed all major concerns
  - Performance
  - Flexibility
  - Scalability
  - Transparent Cross Platform/Cross Database support using Powerful N-tier architecture
  - Dynamic Application Partitioning & Fault Tolerance
  - Rapid Application Development and Ease of Maintenance
  - It functioned “As Advertised”
Verastream’s Unparalleled Support

- **Verastream supported all critical needs identified**
  - **Platforms** - OpenVMS, UNIX, NT (as well as many others)
  - **Databases** - Oracle, RMS, Allbase, Cobal, ODBC, Flat ASCII (as well as many others)
  - **Interfaces** - WEB, GUI (Windows/Motif) Character based
  - **Networks** - TCP/IP, Decnet, Novell, NetBios, NFS
  - **Popular TP Monitors**

- **Platform independent development tool set**

- **Fully Object Oriented language**
  - **Rapid Application Development and Easy Maintenance**

- **Allows for a “Vendor Independent Architecture”**
Universal Integration Engine

Application

User/Developer

Data Layer
Application Logic
User Interface

Object Translator

Operating System Interface

Interfaces to:
- Datasources
- Middleware
- Components

Windowing Interface

Hardware
Platform/OS Independence

Support For 28+ Platforms And Operating Systems

- AIX
- AS/400
- Amdahl
- OpenVMS Vax
- OpenVMS Alpha
- DG-UX
- HP-MPE/IX
- HP-UX
- Linux
- MS-DOS
- Windows ‘95
- Windows ‘98
- Windows NT
- SCO-Unix
- Sinix
- Solaris
- SUN-OS
- Tru64
- Unixware
- UNIX V.4

Universal Integration Engine

Hardware/Operating System

- Engine Shields Applications From The Environment
- Port Applications By Copying To Target Platform
- Easy Deployment In Heterogeneous Environment
Data Source Independence

- Uniform Database Interface
- Data Manipulation Via Generic Commands
- Fields Mapped To One Or More Physical Databases
- C and Component APIs For Custom Interface Development

Support For 25+ Commercial Databases/Data Sources

- ACU COBOL
- Adabas C & D
- Allbase
- ASCII
- Btrieve
- Clipper
- C-Isam
- dBASE III / IV
- DB2
- DataTrieve (RMS)
- FoxPro
- Informix
- Ingres
- SAP R/3
- LPI Cobol
- Mem Table
- MicroFocus COBOL
- ODBC
- Oracle
- Progress
- RDB
- RMS
- Solid
- Sybase
- SQL Server
- Teradata
- UniSQL
- Manugistics
Network/Middleware Independence

Support For 13+ TP Monitors and Messaging Systems

- Tuxedo
- Top End
- CICS
- MTS
- Jaguar
- TCP/IP
- Decnet
- DCE
- CORBA/IIOP
- DCOM
- MS-RPC
- ActiveX
- BAPI
- TIBCO
- MQ-Series
User Interface Independence

Support For Simultaneous Multiple User Interfaces

Character Based

Graphical
- MS-Windows 95/98/NT
- OS/2 Presentation Manager
- OSF Motif

Non-Graphical
- Character Mode
- Block Mode

Web Interface
- Java
- Dynamic HTML
Verastream Deployed in the Enterprise

Win 95, Win 98, Win-NT

Any UNIX Platform

> 28 different platforms

> 25 databases

WEB

Java, email, smtp/pop3, http

OpenVMS, AS/400 platforms

RMS, RdB

Any (GUI) or Character based VT-terminal
Where Did We Go From Here?

- Began Data port to FoxPro on Linux 9/99.
- Completed Data port to FoxPro 10/99.
- Began Data re-architecture 11/99.
- Completed Data re-architecture and began application development 1/2000.
Evolving Present/Future Middleway Architecture - May 2000

WEB Clients (Java)
- Apache
- X-Terminals
- Unix/Linux Workstations

Verastream GUI Clients
- Win 95/98
- Clients
- Leased T1 to Corp. HQ

Linux Web Servers
- FoxPro
- SAMBA

Plant Linux Servers
- FoxPro
- Corp. NT Servers

Plant NT Servers
- FoxPro Flat

Leased T1 to Corp. HQ
Summary of Benefits

- Greatly Simplified Application Development, Design, Database Porting & Re-architecture-- *Reduced time & costs by nearly 40%*
- Dramatically reduced hardware upgrade and support costs --*90% savings!*
- Reduced software and OS licensing costs by *two thirds!*
- Thin/WEB client dramatically reduces application deployment/maintenance costs -- *90% savings!*
- Provided a path for “zero downtime” reengineering/re-architecture -- *No lost business!*
- Easy customization to meet business needs & customer (user) requests. *Reduced Training Costs!*
- Open Standards - Architecture improves flexibility & allows us to use *“The Best Tools for the Job”* No doors are closed!
### Spectratech EAI Cost/Benefit Analysis
Traditional Client/Server/Platform vs. Verastream/Linux

<table>
<thead>
<tr>
<th>Item</th>
<th>Traditional Solution</th>
<th>Verastream Solution</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware Upgrade Costs</td>
<td>$250,000</td>
<td>$24,000</td>
<td>$226,000</td>
</tr>
<tr>
<td>Software, DB &amp; OS Upgrade &amp; Relicensing</td>
<td>$300,000</td>
<td>$110,000</td>
<td>$190,000</td>
</tr>
<tr>
<td>Hardware Support Costs</td>
<td>$100,000</td>
<td>$10,000</td>
<td>$90,000</td>
</tr>
<tr>
<td>IT Support &amp; Maintenance Costs</td>
<td>$400,000</td>
<td>$40,000</td>
<td>$360,000</td>
</tr>
<tr>
<td>Application Devel., Integration &amp; Porting Costs</td>
<td>$400,000</td>
<td>$250,000</td>
<td>$150,000</td>
</tr>
<tr>
<td>Estimated Lost Business</td>
<td>$250,000</td>
<td>$0</td>
<td>$250,000</td>
</tr>
<tr>
<td>Employee Retraining Costs</td>
<td>$16,000</td>
<td>$2,500</td>
<td>$13,500</td>
</tr>
<tr>
<td>Totals</td>
<td>$1,716,000</td>
<td>$436,500</td>
<td>$1,279,500</td>
</tr>
</tbody>
</table>
Other Technological & Business Benefits

- Verastream is an “Industrial Strength Pain Reliever”.
- It provides a very robust, platform independent, Rapid Application Development environment with a variety of databases and communications protocols.
- Application Development, Deployment & Maintenance are greatly simplified
  - Central repository of re-usable components/objects
  - Common source code for all platforms/interfaces
  - Easy to build custom applications which access multiple data sources/servers simultaneously and transparently
  - Easy to port applications from one platform or one database to another without the need to recode
  - Supports Team Development and Repository Management across the enterprise with a rich set of available tools
Other Technological & Business Benefits

- A distributed, dynamically partitionable N-tier architecture provides maximum power and flexibility at minimum cost
  - Can easily support a powerful “rules based” architecture for running the enterprise
  - Supports dynamic resource allocation & load balancing
  - Supports transparent migrations & major reengineering without business interruptions
  - Supports an infinite variety of client/server and server/server relationships to meet needs
EAI Challenges
(Dorothy, we ain’t in Kansas anymore!)

● The sword cuts both ways…

   *Power and Flexibility Do Have a Cost!*

● Both the Learning curve and “Sales curve” are MUCH steeper than for “traditional” products, solutions or development environments!
  ○ The complexity of EAI projects combined with the complexity of distributed architectures requires a different approach from start to finish.
  ○ In-Depth business AND technical knowledge are essential!
  ○ Both the product and the EAI solution require a broad and complex set of skills and a different thought paradigm than traditional application development.
  ○ Multi-tier, cross-platform Component/Object/Rules based architecture, design, development and deployment can be difficult to master.
EAI Challenges
(Dorothy, we ain’t in Kansas anymore!)

- The Power and Flexibility of this model and architecture demand broader skill sets, better cross-functional communications and greater discipline
  - Excellent communications between disciplines (both business and technical) is essential
  - A core group of project people with a balanced combination of technical & business knowledge is absolutely ESSENTIAL!
  - Thoughtful & Thorough “up front” modeling, definition & specs are an ABSOLUTE MUST!
Project Summary

- If properly designed and executed, a component based, object oriented middleware architecture can offer SIGNIFICANT cost savings benefits and efficiencies in designing, deploying, and managing enterprise business application integrations.
- Through two major EAI projects we have successfully developed, integrated and deployed an enterprise business IT infrastructure combining both legacy and state-of-the-art technologies in a heterogeneous cross-platform environment using a component based middleware architecture.
Discussion/Questions
EAI Considerations?