Integration Legacy Data

Legacy to COTS Migration

Manu Chatterjee, Chairman & President

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ASD at a Glance…

- Systems and Process Engineering
- 18 years commercial and government experience
- Global Presence…Global Partnerships

**Academic Partners**
- University of Maryland
- Penn State University
- UC Berkeley
- Stanford University

**Technology Partners**
- IBM, CSC, EDS
- Lockheed Martin
- Keane Federal
- Sun Microsystems

**Software**
- IBM, Oracle
- SunONE, BEA
- webMethods, Tibco, i2
- Manugistics, Plumtree

**Industry Partners**
- Hitachi
- Halliburton
- Bechtel
- ABB, GE
ASD Provides “Best Value” Solution Architectures

- Driven by business needs
- Optimize the implementation of commercial best practices
- Integrate legacy and modernized systems with commercial off the shelf software
- Accelerate “time to market”
- Quantify system performance and establish metrics
- Validate feasibility, scalability and usability
- Minimize investment risk by reducing uncertainty

- ASD has a proven solution methodology for moving from current legacy systems to an environment that integrates COTS packages and establishes links to commercial products and services
- This is an environment that fundamentally transforms the supported business processes
- ASD understands the problems and the solutions
Solution Methodology

1. Identify
   • Business Problems
   • Inefficiencies
   • Bottlenecks
   • Business Process
   • Desired Solution

2. Define
   • Solution Components
     • Identify business requirements and define scope
     • Create Solution Architecture

3. Develop
   • Build & Configure
     • Reference Solution Sets
     • Custom Solutions
     • Solutions for Verticals
     • Solutions for different business process
     • Customize based on Business Process
     • Customize with new ISV’s based on customers set/needs

4. Test Drive
   • Interoperability
   • Scalability
   • Availability
   • Serviceability
   • Manageability

5. Implement
   • Integrate Solution
   • Outsourcing Strategies
ASD Architectures

ASD eArchitecture Framework

- Functional Architecture
- Technical Architecture
- Data Architecture
Functional Architecture

Intelligent Transaction Portal

Middleware – Connectivity & Data flow

- ERP
- SCM
- PDM
- DSS

- Data Warehouse/DB
- Business Logic/Rules Repository

Data & Transactions

- Business Data & Transaction Data
- Business Process
- Business Knowledge

Legacy Systems

- Legacy Data Stores – VMS, DB2, Files
- Legacy Systems – Mainframe/Cobol etc.

COTS Value Additions

- Real-Time Visibility & Tracking
- Use of Web Services
- Interoperability between apps
- Standardization to SOAP, XML
- COTS plug and play transaction layer
- Unification of data islands life cycle
- Creation of KB and Formation of rules repository
- Use of existing interfaces or extensions to legacy systems
Data Architecture

Portal: Provides visibility and collaboration of all data in a secure, role-based manner

EAI: Data integration and propagation amongst applications

Functional Logic: Data and application logic are configured within one of these options

Data Cleansing/Data Staging: Data is normalized based on cleansing, reporting and analysis

Legacy Systems: Data is extracted as is. Application logic is defined in COTS, Portal, or Custom application
Level 1- Visibility across the organization; Guides user actions

Provides:
• Role based access to multiple cross-functional data
• Allows for Hybrid environment between Legacy and COTS
• Secure analysis of current operations allowing for better strategic planning
Level 2- Consolidated data and master business rule implementation for automated transactions

Data Warehouse:
- Less redundancy of data
- Data Consolidation

Portal

Business Rules Integrated

COTS

COTS

Legacy

Application Server Layer for
- Data impact between systems
- Functional & Data integration
Level 3 – *Integrated Data Environment*

Dynamic Data/Decision/Information Exchange

**EAI Message Bus**

- IDM/Knowledge DSS
- PDM
- ERP
- APS Network Command

**Portal**

- Standard views

- Integrated business function views
- Back-end systems invisible to average user
- Standard data fields for requisitioning, inventory, maintenance, etc.

**XML Integration Layer**

- Design
- Inventory
- Operation
- Maintenance
- History

**Data Channel**

**Legacy Systems**

**Stepwise Solution Methodology**

- Dynamic Data/Decision/Information Exchange
- Integrated business function views
- Back-end systems invisible to average user
- Standard data fields for requisitioning, inventory, maintenance, etc.
AF-SCP Phase 2
Functional & Technical Overview
Supply Chain Portal-Air Force (SCP-AF)

- Selected by HQ USAF IL-I to build prototype APS at OC-ALC
- ASD laid out the technical strategy
- ASD brought the system on-line
- Demonstrated not just feasibility but the way ahead

• Not just about APS
• A Case Study about COTS to Legacy Integration
• Applicable across many different problems
What Were The Issues?

- Batch processing and latency between disparate systems
  - Results in duplication, redundancy and inconsistency of data as well as delays in transaction execution.

- Functionality spread across disparate systems
  - Consolidation into fewer systems and a shared data environment can improve transaction execution, data integrity and required system/interface maintenance.

- Systems contain hard coded/embedded business rules
  - These are not flexible and cannot be externalized for use across systems.

- Lack of standardization between systems
  - Results in interfacing issues between systems.
What Did ASD Set Out To Do?

- Integrate a COTS software architecture with Air Force systems
  - Show interoperability between Commercial and Air Force technology.

- Utilize a portal architecture and middleware to perform transactions
  - Portal creates a “Community of Interest”
  - Transactions take place in both the Air Force systems and the commercial applications.

- Demonstrate an end-to-end Supply Chain transaction
  - Starts with an issue request and ends with a receipt of parts from GEAE, updating relevant Air Force systems along the way.

- Develop a roadmap of future directions for transformation of IT systems within the Air Force.
Phase 2 Overall Architecture
Commercial Architecture

Oracle 11i

- Oracle Application
  - Transaction/Business Logic

Oracle 8i RDBMS
- Transactional Data

Tibco Integration Manager
- Business Rules/Exceptions
  - Determining Business Logic to use

Weblogic Portal
- Process Driven Interfaces

Interchangeable Product Set. Being proven today by ASD.
Oracle 11i Application Setup

Organizational Setup
- Supply Organizations (RIC, SRAN, Bldg./Station Code)
- Maintenance Organizations (RIC, PSSD, RCC, Bldg./Station Code)

Chart of Accounts
Bill of Materials
- NSNs
- End Items
- Production Numbers
- Operation IDs

Transaction Setup (MILSTRIP/MILSTRAP Compliant)
- Issue Requests
- Back Orders
- Requisitions
- Purchase Order (GE)
- Redistribution Orders
- Receipts

Oracle 11i Role
- Standard Business Processes
- Non-standard Practices remain in the Legacy System(s)
Tibco Application Setup

Process Workflow (Based on D035A/K Logic)
- Inventory Search (D035A/K, Base Surplus and GE)
- Search Analysis – Specify the SoS
- Retail Inventory Available Workflow
- Wholesale Inventory Available Workflow
- Base Surplus Available Workflow
- GE Inventory Available Workflow
- No Inventory Available Workflow

Business Rules
- Type Transaction Code
- Urgency Need Designator
- Force Activity Designator
- Delivery Priority

The above workflows are based on business rules and are externalized outside of the business logic in Oracle 11i for more flexible maintenance and use across disparate systems.

TIBCO Role
- Routing (Workflow and Rules)
- Data Transformation
Analyze systems, which interface with D035 and replicate some of these systems’ functionality into Oracle 11i to show interoperability between D035 and Oracle 11i.

Consolidate portions of data and functionality into a single application with a shared data environment, which can interface with D035A/K.
In order to demonstrate direct transactions between Oracle 11i and D035, portions of the following functions were consolidated and merged into the Oracle 11i shared data environment:

(1) Issue Request Function
(2) Purchasing Function
(3) Receiving Function
(4) BoM Management Function

Proof-of Concept Approach

A Sample of D035 A/K System Interfaces

Oracle 11i

Oracle Application

Oracle RDBMS

BoM Management

Purchase Orders

Issue Request

Receipts

Purchase Orders

Receipts

BoM Management

Issue Request

Receipts

G402A

J041

DSS

G005M

D035A/K
Interfacing With D035

D035A/K Test Environment

ASD Test Environment

Oracle 11i

Oracle Application

Oracle RDBMS

Tibco

Receipt OrDEsent to GE

Portal

D035A/K

ASD Interface Program

iPlanet Web Server

MQ Series

Retail Inventory Available – Oracle 11i generates an Issue and posts it to D035K

Wholesale Inventory Available – Oracle 11i generates an issue request and sends it to D035K for processing

Base Surplus Available – Oracle 11i generates an issue request and sends it to D035K for processing

GE Inventory Available – Oracle 11i generates an issue request in D035K and a purchase order internally, which it sends to GE

Purchase Order sent to GE

Receipt Generation – Oracle 11i will generate a receipt, which will be sent to D035A/K to update inventory balances

Receipt from GE
MILSTRIP/MILSTRAP Transaction Formats

MILSTRIP Issue Request Transaction Format

- DOCUMENT_IDENTIFIER_CODE=D7A
- ROUTING_IDENTIFICATION=M44
- TYPE_TRANSACTION_CODE=M
- STOCK_NUMBER=2840013633593PR
- UNIT_OF_ISSUE=EA
- QUANTITY=00060
- DOCUMENT_NUMBER=MEPGEA22930255
- BLANK_01=
- BLD_STATION_CODE=MC35LL
- CONTROL_NUMBER=00180
- JOB_DESIGNATOR_CODE=A
- BLANK_02=++++
- UND_CODE=A
- FORCE_ACTIVITY_CODE=3
- SUFFIX_CODE=201
- BLANK_03=++
- DELIVERY_PRIORITY_CODE=1
- BLANK_04=+
- ISSUE_CONTROL_CODE=+
- OWNERSHIP_PURPOSE_CODE=A
- SUPPLY_CONDITION_CODE=A
- BLANK_05=+
- OPERATION_NUMBER=80MGE
- MATERIAL_COST_CODE=R
- ACTION_SUFFIX_CODE=PO
- STANDARD_REPORTING=XBA
- REQUIRED_DELIVERY_DATE=293
- END_ITEM_IDENTIFICATION=MEPG9H02930130
**Functional Data Mapping**

**DEFINITION:**

**Rules Business Object:** Define rules and parameters for all the transactional input. Defines the process flow.

**Transaction Business Object:** Defines the data elements that support MILSTRIP/MILSTRAP business transactions.

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**MILSTRAP Issue Request Transaction Format**

**Oracle 11i**

**Oracle Application**

**Oracle RDBMS**
80 Position MILSTRAP ISSUE REQUEST FORMAT

D7AM44M2840013633593PREA000060MEPGEA22930255+MC35LL00180A+++A3201++1++AA+80MGERPOSRD293MEPG9H02930130

Routing Identifier Code
Stock Record Account Number/RCC
Building/Station Code
Ownership Purpose Code
Supply Condition Code

National Stock Number
Unit of Issue
Operation Number

Document Identifier Code
Document Number
End Item Document Number

Organization
BoM
Transactions

ORACLE 11i

SHARED DATA ENVIRONMENT
MILSTRAP To TIBCO Data Mapping

80 Position MILSTRAP ISSUE REQUEST FORMAT

D7AM44M2840013633593PREA00060MEPGEA22930255+MC35LL00180A+++A3201++1++AA+80MGERPOSRD293MEPG9H02930130

Type Transaction Code
Urgency Need Designator
Force Activity Designator
Delivery Priority

Tibco Integration Manager
- Maintenance of business rules, constraints, parameters, exceptions, etc
- Maintenance of a Workflow Engine for managing Transaction Flows across systems
- Maintenance of a Business Object Model for improved interfacing between systems

ORACLE 11i

SHARED DATA ENVIRONMENT

ORACLE 11i
What Did We Accomplish?

● Connected a .com environment with a .mil environment
  – Demonstrated how commercial applications can be configured to support Air Force processes, business rules, functionality and MILSTRIP/MILSTRAP transactions.

● Enabled MILS transactions to be remotely invoked through a portal, generated in Oracle 11i and sent to D035A/K and GE systems for processing and execution.
  – Demonstrated how business logic can be modularized in the underlying systems while business rules, exceptions, constraints, etc can be externalized to an integration broker where change management is more readily accomplished.

● Developed a roadmap that emphasized reduction of system interfaces and eventual consolidation of disparate systems and data sources.
  – Demonstrated how functionality from multiple Air Force systems could be consolidated into fewer applications with a shared data environment to reduce batch processing and latency for improved transaction execution, less system maintenance and better data integrity.
  – With regard for the current trends and powerful forces at work in the industry
What Was The Value To The User?

- Faster transaction execution
- More accurate business information
- Reduction in redundant, inconsistent data
- Improved visibility and usability through an intuitive (browser-based) system interface, available world-wide
ASD’s SCP-AF Experience/Lessons

- Visibility and usability via portal
- Batch processes, latency
- Duplication, redundancy and inconsistency of data
- Consolidation of functionality with shared data environment
- Business rules inside of functional app – hard coded, duplicated, inflexible – change management
- Understanding existing business scenarios / reengineering
- Reducing Interface maintenance
- COTS/Legacy interoperability/transition
- Componentization of COTS (ERP, SCM, PDM, CRM, etc.)
- Configuring COTS to interoperate w/o customizing
- Better use of (legacy) authoritative sources – core functions, not business rules or edit checks (interface also an option)
- .mil to .com
- End-to-end supply chain
Just the beginning...
Additional Materials

The Way Forward
Way Forward Steps

As Is: Multiple Interfaces & Disparate Data Sources

Order Management

Issue Request Management

Inventory Management

Purchasing

BoM Management

Step 1: Consolidation of Interfaces through the introduction of an Integration Broker and Business Object Model

Integration Broker with MILSTRIP/MILSTRAP Bus Object Model

Order Management

Issue Request Management

Inventory Management

Purchasing

BoM Management
- The number of adapters grows faster than the number of apps: $N^2 - N$.

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Point-to-Point Adapters Become Progressively Costly and Time-Consuming to Manage and Maintain.
Dramatically reduces transformation work

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- Makes it easier to change app components
- Changes are easier to make to meet new business requirements

Hub/Spoke Plus a Generic Business Object Model is Extremely Efficient for Large Numbers of Applications
Step 2: Consolidation of disparate data and business logic into fewer systems with a shared data environment

Integration Broker

Stock Control System

Shared Data Source

Order Management
Issue Request Management
Inventory Management
Purchasing
BoM Management

Step 3: Integration of consolidated systems with each other

Integration Broker

Stock Control System
Data Source

Maintenance System
Data Source
Improved Utilization Of Existing Systems

Message Bus/Integration Broker

- **Portal**

  - Issue Request from Portal
  - Initiate automated cross-system workflow based on business rules

**Business Rules** → **Workflows**

**MILSTRIP/STRAP Business Object Model**

- **Issue Request from Portal**
- **Generate Issue Request**
- **Generate Requisition**
- **Generate Backorder**
- **Access Real Time On Order Status**
- **Access Real Time Inventory Balances**
- **Access Real Time Receipts**
- **Access Real Time Back Order Prioritization**
Batch Processing and Latency issues: The accuracy of the inventory balance, on order status and issue request requirements is jeopardized during the data transfer.

D035 maintains the basic logic, but the real-time analysis of data and proposed actions should be performed in the middleware, which will control the underlying applications based on business rules, which determine the optimal workflow given the circumstances.

Middleware accesses the authoritative sources to get the most accurate representation of inventory, issue requests and on order status and can then instruct D035 on real-time actions to be taken.
Exercise More Control Over Business Logic

Message Bus/Integration Broker

Business Rule Engine
Maintains configurable business rules, which generate standard data required for executing transaction like issue requests (D7A), which may be remotely requested through the portal

Workflow Engine
Decides which function to execute in the underlying application based on configurable decision points, exceptions and parameters

MILSTRIP/STRAP Business Object Model

D035
Executes required function based on directions from the workflow engine and generates and stores core transaction data

Hard Coded Business Rules

Business Functions
Issue Request
Backorder
RDO

Bypass hard coded business rules, which decide on which function to execute – This is now the job of the Workflow Engine
A Sample of Related Air Force Systems

- G005M
- G004L
- G402A
- D035
- J041

Consolidation Of Systems – Functionality and Data

Portal

Provide role based access, visibility, notifications, transaction status

Integration Broker

Externalize business rules, constraints, parameters, exceptions and decisions to an integration broker for easier maintenance, interoperability and standardization through the use of a Bus Object Model

Business Applications

Consolidate Data, Business Logic and Functionality into fewer systems with a shared data environment
In Conclusion…

- **ASD** is a leading Provider and Integrator of e-Business Solutions

- **ASD** is Successfully Providing these Solutions to Government & Commercial Customers

- Engineering Solutions for Plant Design (Process, Power, Refinery, Nuclear) geared to Customers’ Requirements, through utilization of ASD’s OPD System, Integrated with PDS and other Plant Design Tools

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