High Availability Implementation for JD Edwards EnterpriseOne

Ken Yeh, Manager, ERP Systems/JDE Enersource

Colin Dawes, Director of Technology Services, Syntax
Presentation Abstract

- Enersource Corporation has been delivering safe, reliable energy to the City of Mississauga since 1917. Enersource currently has 400 employees is the 3rd largest by demand of the 80 city-owned utilities in Ontario.

- Syntax has implemented a large number of high availability solutions for JDEdwards on various platforms.

- This presentation will review high availability options for JDEdwards EnterpriseOne. High Availability at the database, application and web tiers are reviewed in detail.
Agenda

- About Enersource
- Infrastructure Design Process
- About Syntax
- High Availability for EnterpriseOne
- Native JDEdwards & Middleware Solutions
- Syntax/Enersource High Availability Solution
- Questions
About Enersource

- Founded in 1917
- A Diversified Energy and Technologies Company
  - Regulated electricity utility serving the City of Mississauga
    - 3rd largest by demand of 80 municipally-owned utilities in Ontario
    - 200,000 customers
    - Leads all Ontario hydro utilities in reliability
  - Non Regulated Business:
    - Energy Services
    - Street Lighting for Mississauga and Brampton
- 400 Employees
- 90% owned by the City of Mississauga
- 10% owned by Borealis (an OMERS Company)
JDE Footprint at Enersource

- Financials
  - G/L, A/P, A/R, Fixed Assets
- Operations
  - Service Orders, Case Management, Time Entry
- Distribution and Logistics
  - Inventory, Procurement
- Human Resources Management
## JDE Technical History at Enersource

<table>
<thead>
<tr>
<th>DATE</th>
<th>ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 2003</td>
<td>Go-Live on OneWorld Xe</td>
</tr>
<tr>
<td>July 2005</td>
<td>Upgrade to JDE 8.10 Web Client on WAS 6.0</td>
</tr>
<tr>
<td>2011 (Planned)</td>
<td>Upgrade to JDE 9.0.2 -go live in Nov. 2011</td>
</tr>
<tr>
<td></td>
<td>Migration from AS400 to Windows 2008 R2/Oracle RAC on VMWARE &amp; WAS 7.0</td>
</tr>
</tbody>
</table>
Upgrade Objectives

• Additional Functionalities Available:
  – Functional:
   • Conditioned-Base Maintenance
   • Employee and Manager Self Service
   • Enhanced Security and Audit Functionality
  – Technical:
   • Streamline Support with Platform Consolidation
   • Compatibility with I.E. 8, Windows 7 and other software
   • General User Interface and Performance Enhancements

• Oracle Support
Infrastructure Design Process
Infrastructure Design Process

- Planning Session with Syntax March 2010
- JDEdwards Technology Stack
  - Initial goal was to move to complete Red Stack
  - Final Decision: Stay with Blue Stack
    - No enterprise licensing available for Red Stack
    - Separately licensed Oracle DB
      - In house expertise
  - Budget
    - $300K Infrastructure, Software, JDE Tech Services
EnterpriseOne Infrastructure

Browser Support

- **Browsers**
  - Internet Explorer
  - Firefox

- **Platforms**
  - Windows
  - Windows Mobile
  - Mac OS
  - Unix
  - Linux

Web Application Server

- Java Servlet Engine
  - IBM WebSphere
  - Oracle 10gAS
  - OracleWebLogicAS

- HTTP Server
  - IBM HTTP Server
  - Oracle HTTP Server
  - IIS

Business Logic Server

- TP Monitor
  - Native

- OS Platforms
  - Windows
  - Solaris
  - AIX
  - HP-UX
  - OS/400
  - Linux

RDBMS Server

- RDBMS
  - Oracle
  - SQL Server
  - DB2 (UDB)

- OS Platforms
  - Windows
  - Solaris
  - AIX
  - HP-UX
  - OS/400
  - Linux

Directory Services

- LDAP Platform
  - Microsoft Active Directory
  - Lotus Domino
  - IBM SecureWay
  - Oracle Internet Directory

Browser Support

- **Browsers**
  - Internet Explorer
  - Firefox

- **Platforms**
  - Windows
  - Windows Mobile
  - Mac OS
  - Unix
  - Linux
Infrastructure Design Process

- Platform (Hardware & Operating System) Architecture
  - Intel/Windows
    - Platform Consolidation (JDE last to be on AS/400)
    - CIS System Migrated off AS/400 in 2009
  - VMware
    - Direction set by Infrastructure Dept. for all servers
    - Ease of Maintenance and Reduced Cost
Infrastructure Design Process

• Business Continuity Strategy & Architecture
  – Disaster Recovery
    • Maintain Enersource’s leadership in service reliability
      – 24/7 Work Order and Materials Availability
    • JDE available at offsite location within 6 hours
  – High Availability
    • 99.96% annual applications uptime target
      – 1.3 hours of downtime during business hours allowed per year
      – Target to be increased each year
  • Risk Mitigation:
    – Migration from **KNOWN** AS/400 and DB2 to **UNKNOWN** Windows/Intel and Oracle DB architecture
    – 15 years on the AS400 platform (8 yrs for JDE)
Infrastructure Design Process

• Relational Database System (RDBMS) Architecture
  – Oracle 11g
    • Platform Consolidation
    • In house expertise
  – Oracle RAC
    • 99.96% target for application uptime

• HTTP & J2EE Application Server Architecture
  – WebSphere
    • Cost was included in the Blue Stack
    • Enterprise Licensing Model (Unlimited Users)
    • WebLogic not included in Red Stack at the time
About Syntax

- Oracle Certified JD Edwards Partner
- Oracle University Training
- Technology & Infrastructure Services
- Application Services
- Managed Services and Hosting
- IBM Infrastructure: Hardware & Middleware
Leadership and Experience

- 65+ JD Edwards new business installations
- 45+ EnterpriseOne upgrades
- 30+ Customers on versions 8.12 / 9.0
- IFRS/Reporting engagements
- Consulting, training and implementation relationships with over 200 JD Edwards customers and growing
- JD Edwards Hardware and Infrastructure expertise
High Availability for JDEdwards EnterpriseOne
High Availability Objectives

- Provide relief for business problems
- Minimize effect of component failures on users
- Automate fail-over procedures - no reconfiguration required
- Leverage existing technologies
- Maintain separation of layers
- Avoid failures through proactive system management
Determining High Availability Requirements

- What are your Business Continuity Requirements?
  - Recovery Point Objective (RPO) - "acceptable loss" in a disaster situation.
  - Recovery Time Objective (RTO) – “down time” or the duration of time within which a business process must be restored after a disaster (or disruption)

- Establishing your requirements will help you to:
  - Determine which solutions to implement
  - What priority to place on each solution
  - Determine how much hardware you will need
  - Determine what you are willing to afford
High Availability Fundamentals

- High Availability Requires a Server Cluster

- “server cluster” - a server cluster is a group of independent servers managed as a single system that work together to provide solutions to today’s business problems
JD Edwards System Architecture:

Components

- End User
  - Web Client

- Developer / Administrator
  - Windows Client

- Deployment Server

- HTML Server

- Enterprise Server

- Database Server

- Portal Server

- LDAP Server

- Business Services Server

- Transaction Server
Clustering Fundamentals

Three Tiers
- Presentation
- Application
- Database

Three Goals
=> Scalability and Availability
=> Application Resiliency
=> Data Resiliency

- Fail-over cluster services (active-passive)
  - Hardware and software solutions
  - Commonly used for Application and Database tiers
  - Microsoft Clustering Services, VMWare High Availability, etc.

- Scalable cluster services (active-active)
  - Hardware or software solution
  - Simply add nodes to achieve scalability
  - Commonly used for presentation tier
  - Oracle RAC, Cisco ACE, F5, etc.
Opportunities for Clustering

Fail-over Clustering (Active-Passive)

- Database Server
- Application Server (All OneWorld Services)

Scalable Clustering (Active-Active)

- Web Server(s)
- Terminal Server(s)
- Application Servers
Native JDEdwards & Middleware Solutions
Virtually Unlimited Scalability

Configurable Network Computing

Unlimited Tiers
Mix of Platforms
Clustered Databases
Maximize Price/Performance
High Availability

EnterpriseOne Logic Server(s)
EnterpriseOne Database Server(s)

Web Browser Client
HTTP Server
LDAP Server
J2EE Application Server
Transaction Server (Real-time Events)
Web Services Gateway
Portal Server
Vertical Scaling of EnterpriseOne

- EnterpriseOne is well suited to scale vertically by adding additional resources to the same server to handle load by:
  - Efficiently processing interactive requests by keeping core components on the same server
  - Reducing change management overhead for both hardware and software patching
  - Ease of administration, fewer servers to maintain
  - Reduces network/infrastructure failure points
Horizontal Scaling of EnterpriseOne

- EnterpriseOne is well suited to scale horizontally by adding additional servers to handle additional load by:
  - Utilizing distributed client/server configurations
  - Using load balancing hardware/software to hide complexity
  - Providing redundancy and scale on as needed basis
  - Allowing incremental capacity increases as needed
  - Reducing failure and capacity degradation in case of failures
Scaling the Presentation Tier

Hardware Solutions for Load Balancing/Clustering
- Cisco Switches
- Redline
- F5 - Big IP

Software Solutions for Load Balancing/Clustering
- WebSphere/Oracle Clustering
- IBM Edge Server
- Windows Clustering (DNS)
Business Function Fail-Over

- OCM can be configured for a primary and secondary data source for BSFN objects
- Business functions will fail over to the secondary data source
- Is not scalable by itself...

OLD SKOOL – no longer used
Business Function Balancing

- Business Functions can be load balanced through virtual host names
- Create a logic data source “JDEAPP”
- Use static host files on each client to map “JDEAPP” to real host names

OLD SKOOL – but “theory” still used
Multiple Security Servers

- The client JDE.INI file is modified to describe all OW security servers.
- A connection will be attempted with the first security server.
- Attempts will be made in a serial fashion until a successful connection is made.

OLD SKOOL – but “theory” still used
Scaling the Logic Server

**Interactive Processing**
- Assign separate resources pool for both Interactive and Batch
- Implement Virtual Server clustering with hardware solutions such as Cisco content switches

**Batch Processing**
- Multiple batch queues by functional area
- Setting priority based on business operations
Scaling the Database Server

**Database clustering/replication suggestions**

- Oracle Real Application Clusters (RAC)
- SQL Server clustering
- DB2/400 clustering
  - Mimix
  - Data Mirror
  - Vision
Syntax High Availability Solution
High Availability Solution

- 2 active-active horizontally and vertically clustered Web Servers running WAS 7.0 on Windows 2008 R2 virtualized on VMWARE
- 2 active-active Production Enterprise Servers on Windows 2008 R2 virtualized on VMWARE
- 1 Non-Production Enterprise Server on Windows 2008 R2 virtualized on VMWARE
- 2 node Oracle Real Application (RAC) Server Database 11g R2 cluster on Windows 2008 R2 virtualized on VMWARE
- 2 Cisco Load Balancers
- 1 node of each tier replicated to DR site
Enersource EnterpriseOne 9.0 Solution
High Availability Solution

- **Web Tier**
  - HTTP Server running on a Front-End (custom configured port 80) and Back-End port (JDE installed)
  - J2EE Application Servers (Containers) all have a “Default Host” port
  - 2 Web Servers each with 2 JVM’s. Each JVM has it’s own “Default Host”
  - Load balance between 4 JVM’s on 2 different servers
    - Balance by Session or by source IP
    - Configure “Sticky” Session Interval Timeouts
  - Failure triggered for either Front-End or Back-End HTTP port and/or J2EE “Default Host”
High Availability Solution

- Application Tier
  - 2 Physical App Servers
  - 1 Virtual App Server (default server)
  - Load balance between 2 Physical Servers
    - Balance by source IP
    - Configure “Sticky” Session Interval Timeouts
  - Create Database Triggers to update JDE tables based on implementation model.
  - Static mapping for Single Concurrent and Scheduler Jobs
High Availability Solution

- Database Tier
  - Oracle Real Application Cluster 11g R2 on Windows 2008 R2 virtualized on VMware
  - RAC on VMware requires RAW disk for the ASM (Automated Storage Management)
    - Backup limitations with some 3rd Party VMWare products
  - Special Configuration and Performance Tuning Required for RAC on VMware
    - Some documentation errors in Oracle Manuals
High Availability Benefits

- 24/7/365 uptime possible
  - Deploy to one node at a time (remove one server from the config at a time)
  - Move waiting jobs on one server to another server
- Oracle RAC 11g R2 with Tools Release 8.98.3.X or later supports TAF (Transparent Application Failure)
- Modular, scalable and flexible architecture
  - Add additional memory or CPU in VMWARE
  - Add additional nodes at any tier (Web, App, Database)
High Availability Limitations

- Failure at the Database and Application Tier are transparent (except for running batch jobs)
- Failure at the Web Tier requires users to log in again
- Single Concurrent Jobs require pegging and are active/passive
- Scheduler Jobs require pegging and are active/passive

**NOTE:** Virtual Queues remove the requirement for pegging and are planned for the next tools release.
High Availability Limitations

- Failures can occur outside of the main port (6015)
  - Only the very first process starts on port 6015
  - All other port numbers and associations to a specific JDEdwards kernel or network process are unknown
  - Unable to program load balancers to detect specific failures of any given kernel
  - Additional JDEdwards configuration required to ensure that no single kernel is a single point of failure
High Availability Cons

- Additional Servers Required
- Hardware Load Balancers Required
- Specialized skills required
  - Hardware Load Balancer
  - Oracle RAC
  - JDE Enterprise Server HA Configuration (virtual servers, custom triggers, load balance LDAP, etc.)
  - WAS Vertical Clustering
High Availability Lessons

- Plan your backup strategy early
- Need to establish an HA testing plan
- Educate and train your team
- Document and make your fail-over processes available to your team
Questions?