## BPEL People –
## BPEL Middleware as a Software Integration Solution for the City of Las Vegas

The City of Las Vegas, Nevada is a municipality consisting of over 600,000 residents occupying 131 square miles in southern Nevada. The City is one of the top tourist destinations in the United States with over 37 million annual visitors and has truly become a world-class resort and business conference destination. Las Vegas is also a very popular place to live. Southern Nevada region averages 2000 new residents a month which results in a never-ending challenge for the City to meet the needs of this ever-increasing population. Demographics of the City include:

- Founded in 1905
- Las Vegas City Population: 600,000
- LV Valley Population: 2,000,000
- CLV Land Area: 117 Square Miles
- Mayor/Council – Strategic arm
- City Manager – Operations arm
- 15 Departments Under CMO
- 3,300 Employees
- CLV Total Budget: $1.3B
- CLV GF Budget: $750M
- Oracle eBusiness Suite Customer since 1998

The City has built a strong foundation with the Oracle eBusiness suite of applications and database technologies. The modules implemented at the City include:

- Financials (GL, AP, AR, FA, PSB)
- Purchasing with iProcurement, iSupplier, Inventory
- HR, Advanced Benefits and Payroll
- Time and Labor
- Learning Management
- UPK

Technology Stack:
- Oracle 10g Database,
- Oracle 10g Application Server
- BPEL Process Manager 10.1.2.

Integration components:
- Oracle BPEL PM 10.1.2

Endpoints:
- Oracle E-Business Suite,
- SPL Utilities System
- Oracle Database

## Integration Strategy

In 2003 the City began a project for the environmental division of the City's Public Works Department. This division, known as the Water Pollution Control Facility (the Plant) manages all facets of wastewater treatment for city residents. In beginning this project a strategic information technology plan was developed. The goal of this plan was to create a vision and roadmap for how to maximize future growth with current resources at the Plant. The plan was completed in 2004 and an implementation program was identified. Multiple projects resulted from this program which included:
- Upgrades to the Plant infrastructure – 4 sites within the City operate and monitor the water treatment equipment;
- Change out of lab software for water testing;

- Change out of capacity and materials management software for the Plant; and
- System integration of all Plant software in addition to the City Oracle business applications.

As each of the projects was completed, a concurrent project was taking place to select an integration tool that could be used to meet the needs of the Plant. Criteria were defined, ranked and weighted to facilitate with this search.

Search criteria included:
  - External - 20% (stability, presence, fees)
  - Functional – 40% (Messaging, logging, exception, web)
  - Supplemental – 40% (Understandability, manuals, APIs, maturity, business process monitoring)

Vendor Evaluation included:
  - Market Analysis
  - Site Visits
  - Demo's
  - Ranking and Voting

Three integration products were considered, and Oracle's BPEL was selected as the integration tool of choice for the City. The primary deciding factor was the City's confidence that since BPEL met all of the requirements defined in the search criteria, it made most sense to use a tool from Oracle since the City's technology base was Oracle.

In 2005 the Plant selected and implemented SPL (later to become Oracle's Work Asset Management - WAM) application. One of the key project deliverables was to develop integration between SPL and the Ctiy's ERP activities (Purchase Requisitions, Purchase Orders, Receiving, Invoices, , Employees, etc.). Integration efforts with the City's prior Plant asset management application had been unsuccessful. The City intended to use BPEL to build the integration with WAM. Interfaces with Oracle BPEL were built in 10 person weeks. The interfaces include:
  - Employee
  - Vendor
  - Item*** Trigger 1***
  - Requisition*** Trigger 2***
  - Purchase Order
  - Receiving
  - Invoice
  - General Ledger (inventory transactions)
  - Timekeeping

*** Real time - Triggers***
*** Trigger1 = Saving the Inventory Item into the Catalog***
*** Trigger2 = Approving the Requisition***

Triggers have been developed that initiate workflow from WAM to the Oracle eBusiness suite. Trigger 1 occurs when an inventory item is defined in inventory in WAM.  This is necessary so that any subsequent order for that item can occur in WAM and EBS.

Trigger 2 occurs at the time a requisition is approved in WAM. This sends the requisition to Oracle so that it can be acted upon by a buyer or auto-generated standard PO's against a contract and releases against a blanket purchase order.
Other interfaces to WAM written with BPEL include passing:
- Employee information from Oracle Human Resources so that salary and benefit rates can be applied to the cost of work orders;
- Vendor information for use on the purchase requisition and return data from the Purchase Order;
- Purchase order detail from Purchasing

- Invoice paid information from Accounts Payable
- Inventory transactions (costing) from WAM to Oracle GL

A concurrent process runs at least once a day to pass the information from WAM into Oracle. In addition, employee time is tracked off of the Work Orders in WAM and then interfaced to Oracle Time and Labor (OTL) every two weeks.

# Process Flow
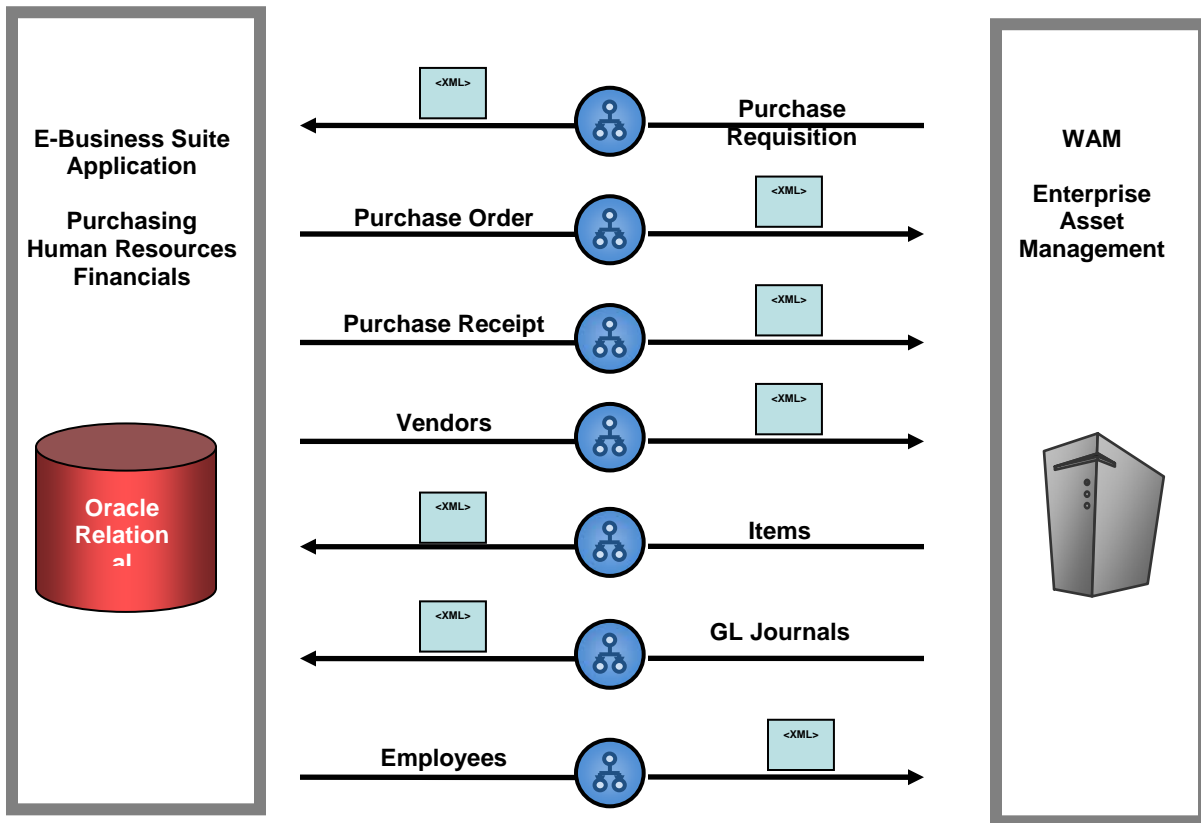


## Technical Overview

The primary approach for initiating the BPEL processes uses Oracle's Advanced Queue (AQ) technology. Business events in both systems as well as scheduled PL/SQL concurrent programs within Oracle E-Business Suite populate the custom Queue in order to launch specific BPEL processes. This prevents WAM and Oracle E-Business Suite from needing to communicate directly since they both communicate to BPEL through the shared Queue. It also establishes a central location for initiating BPEL processes, which improves manageability. As the source and target systems are based on an Oracle database, database links are used to establish connectivity between the two systems. When a job is entered into the queue, the BPEL process with the corresponding correlation ID, is initiated to process the values entered in the job request. For example, when a requisition is entered into the queue, it is entered with a predefined set of attributes that tells the requisition-BPEL process specifics about that requisition. With this information, the BPEL process can carry out its tasks.

To further improve the auditing capabilities of the BPEL integration, Innowave introduced another layer of monitoring that uses custom tables within the E-Business Suite database to track the status of various transactions. The BPEL processes update this auditing table in order to communicate details about

successful or failed instances. Business owners who depend on the BPEL processes may not have access to the BPEL Console, so by storing additional information about the processes in this audit table, solutions such as custom reports and forms can be built within the Oracle E-Business Suite for these users.

## SAMPLE CLV BPEL PROCESS
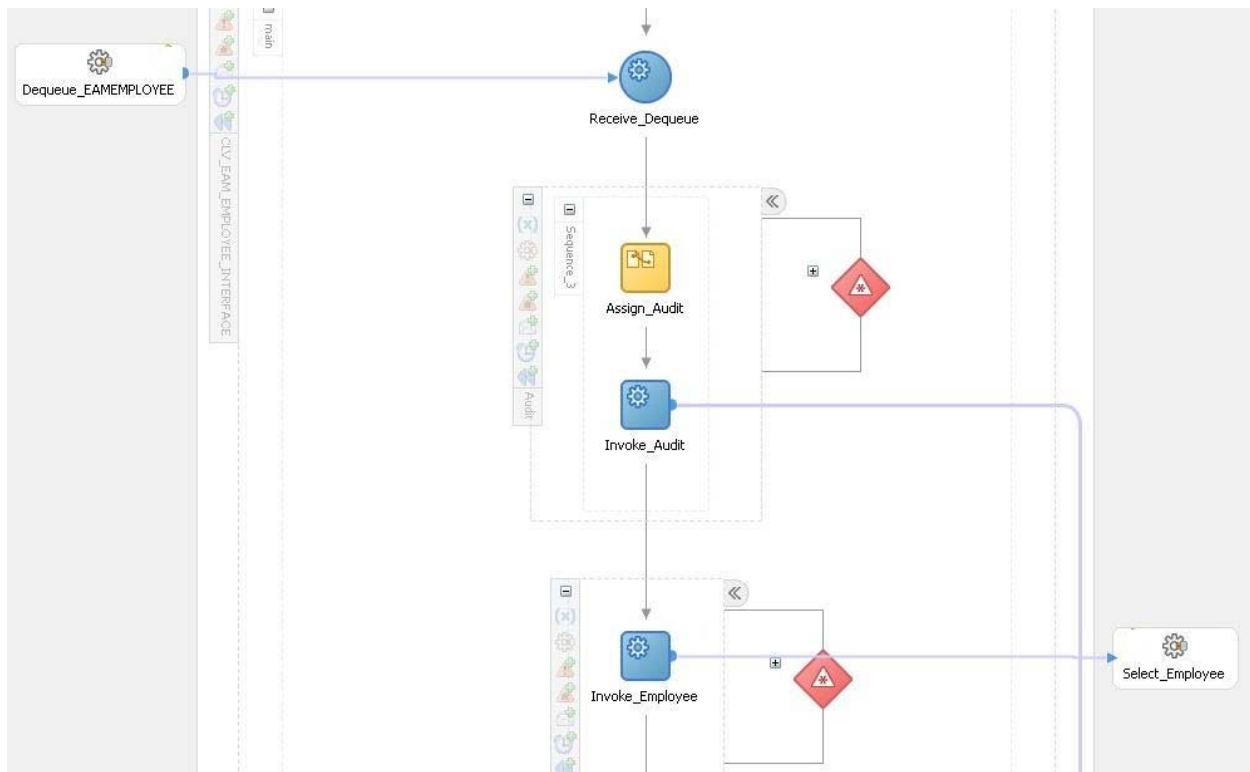


## Benefits

The City of Las Vegas has already seen many benefits as a direct result of use of the BPEL integration tool. The first phase of this integration was accomplished, through the help of Innowave Technology, in only one month's time. The implementation of BPEL followed the same project management methodology that the City uses for its other projects. City IT staff were delegated responsibility for working side-by-side with the Innowave consultants. A knowledge transfer was planned so that the City's staff could pick up from where the consultants left off and continue using this tool for other integration projects within the City. Due to the Oracle BPEL Process Manager's ease of use, the City developers were able to ramp up on the technology quickly thereby decreasing costs long-term for the City for future development efforts. On the user side one primary benefit was the lack of training needed on software they would seldom use, i. e. Oracle eBusiness suite. The Plant WAM users focus on their day-to-day application (WAM) and the City Hall staff are the eBusiness suite specialists. This has greatly increased efficiencies at the Plant.

## Lessons Learned

- Knowledge transfer is important
- Start with a Proof-of-Concept
- Allow and foster access to leaning materials and classes
- Encourage participation in user groups
- Select staff with Oracle applications development background

**<u>Future plans</u>**

BPEL is now the preferred integration tool used at the City of Las Vegas, and additional BPEL processes are currently being built to further improve the efficiency and manageability the City's other integration points. Future plans call for an enterprise cashiering system that will utilize BPEL to transfer data between miscellaneous City applications and the Oracle e-Business Suite in real time. Integration between the employee badge system and Oracle HR is also in process. A major BPEL project has begun a complex interface from the City's land development, asset management, and code enforcement application to have fees and payments routed automatically into the Oracle Accounts Receivable system for billing, tracking and monitoring. When payments are received in Oracle, the land management system is automatically updated to reflect these changes.

Currently, the City is at end of life on its existing hardware. IT department is now focusing on a complete migration to Oracle Linux and RAC. The RAC/Linux configuration will provide the ability to test, develop and QA in multiple environments with equal performance to the production environment.

**Conclusion**

The City of Las Vegas' Public Works department looked at the current process for work order creation and process flow and ascertained that in order to better the system and improve efficiencies they needed a way to integrate their key applications with the City's main financial system. This initiative involved tying together the City's Oracle WAM application for plant asset and operations management with the City's Oracle e-Business Suite 11i applications (HR, Payroll, Purchasing, Finance, etc.). This solution allowed a seamless integration between Plant operations and the City's main back office applications. The initial implementation in the Public Works department played an instrumental role in demonstrating the benefits of BPEL and has helped drive additional BPEL projects.


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