Business Process Management and WS-BPEL 2.0
What’s next for SOA Orchestration?
An Oracle White Paper
INTRODUCTION

Customer business processes span services and human activities; these processes need to be orchestrated in an agile fashion with end-to-end control, visibility, and rich exception management.

Business Process Execution Language, commonly known as BPEL or WS-BPEL, is an XML based standard markup language that is emerging as the answer to process orchestration requirements. BPEL has very rich and comprehensive orchestration semantics, is based on wide industry participation, and is broadly accepted.

Oracle believes that BPEL provides an important building block for Service Oriented Architectures (SOA). Oracle was an early adopter of the standard and provides one of the most mature, comprehensive, and scalable implementation. Since 2003, Oracle has been working with other industry players to evolve BPEL and its related standards.

Oracle’s strategy lowers total cost of ownership and reduces risk for customers through knowledge portability and increased interoperability.

EVOLVING ORCHESTRATION REQUIREMENTS

Orchestration is needed in Service Oriented Architecture to create:

- Business processes from services and human activities
- Coarse grained business services from fine grained services
- Integration flows to integrate various applications

Orchestration requirements include:

- Execution sequencing including serial, parallel, or other kinds of control flow dependency patterns
- Exception handling including transactions and compensations
- Data flow and manipulation
- Event handling including timers and other out-of-band events
BUSINESS PROCESS EXECUTION LANGUAGE (BPEL)

BPEL is a standard for business process orchestration. BPEL is participated and supported by a very broad range of companies including all major vendors; it leverages earlier languages including WSFL from IBM and XLANG from Microsoft. While the formal standardization is being finished up at OASIS, it has already emerged as the de-facto standard.

Some of the salient features of BPEL are:

- Rich sequencing semantics including parallel and asynchronous processing
- Uses a compensation based long running transaction (LRT) model
- Provides rich scoped fault handling capabilities
- Provides rich scoped asynchronous event handling capabilities allowing time based alerts as well as out-of-band events such as order cancellation
- Uses Web Services as the model for process decomposition and assembly; that is each BPEL process is a Web Service and can be composed as such in other BPEL processes
- Uses XML and XPath for data access and manipulation

“BPEL will emerge as the leading industry standard for Web services flow composition (0.8 probability).”

—David Smith
Gartner
WS-BPEL 2.0

WS-BPEL 2.0, commonly known as BPEL 2.0, is the evolution of BPEL 1.1 as a public OASIS standard and is currently available as a draft for public review. Oracle has been one of the driving forces behind the effort at OASIS, leveraging its deep BPEL 1.1 experience to mature the specification. Some of the salient changes in BPEL 2.0 from BPEL 1.1 are:

- **Improved data access** – Data access has been improved in BPEL 2.0. **Variable XPath Binding ($ notation)** makes BPEL variable data available in XPath expressions as XPath variables leading to simplified expressions (without requiring usage of bpws:getVariableData). **Message parts** are available as a variable for each part and may be referenced as $varX.partN. BPEL 2.0 also adds support for variables based on XSD complex types.

- **Improved data manipulation** – BPEL 2.0 enables complex XML transformations within BPEL processes by introducing `bpel:doXslTransform()`. Other improvements include attribute `keepSrcElement` to control whether the destination element name is overwritten, **inline variable initialization**, and **extension assign** to enable implementations to extend assign capabilities.

- **New activities** – BPEL 2.0 introduces some new activities, the most significant of which is **forEach**, which executes the enclosed scope, in serial or parallel, a variable number of times. Other new activities are **repeatUntil**, which repeats enclosed scope until specified condition is true, and **extensionActivity**, which improves the ability of BPEL implementations to provided extended activities.

- **Enriched fault handling** – BPEL 2.0 improves fault handling by introducing finer grain knobs in the **catch** construct, and a **rethrow** activity, which enables propagating the original fault from catch and catchall. Some advanced fault handling features are also introduced including **termination handler** and **exitOnStandardFault** attribute on scopes.

- **Advanced message operations** – BPEL 2.0 introduces **Join-style Correlation set** to enable multi-start process scenarios. It also allows **Local PartnerLinks**. It adds attribute **initializePartnerRole** to facilitate process binding during deployment. It also introduces an advanced concept of **messageExchange** to disambiguate relationship between incoming message activity and reply.

- **Syntax makeovers** – Many changes in BPEL 2.0 are syntactic in nature; examples include changes from ‘switch’ to ‘if-elseif-else’, from ‘terminate’ to ‘exit’, and differentiating different cases of ‘compensate’ by calling them ‘compensate’ and ‘compensateScope’.

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“BPEL is the future of the integration space in my view... Why? Because the value is so much higher when you provide not only a way to integrate applications, but also a way to create services from them and put them into business processes.”

— John Rymer, Vice President Forrester Research
• **Clarifications** – Number of changes in BPEL 2.0 is clarification to ambiguities in 1.1. These are targeted to vendors implementing BPEL.

**BPEL4People**  
Business processes typically require human interactions; however, BPEL 1.1 and 2.0 do not include human interactions and are limited to service orchestration. BPEL4People is a joint white paper by IBM and SAP proposing layering of human interaction capabilities on top of BPEL. Some of the important concepts in BPEL4People are:

- **People Activities** – People can perform tasks assigned to them by business processes
- **People Initiating Processes** – People can initiate processes such as Expense Report
- **People Managing Business Processes** – Business processes may require intervention to move the process forward
- **Transition between Human and Automated** – Business processes may change human activities to automated activities and vice versa
- **Escalations** – Escalation mechanisms are needed to escalate tasks that are not performed within expected time
- **Nomination** – Some situations may require performers to be assigned (nominated) on an instance basis (run time)

**ORACLE’S PRODUCT STRATEGY**  
Oracle believes that its customers benefit from adopting BPEL for process orchestration; these benefits include:

- **Comprehensive Functionality**: Many orchestration requirements are complex in their details such as fault handling and compensation and difficult to foresee. By adopting a standard based implementation, where the standard has gone through rigorous participation by broad industry section, customers can be confident that their solution is comprehensive.
- **Knowledge Portability**: Adopting a standard leads to lower total cost of ownership through knowledge portability. Customers do not need to train users on complex proprietary technologies with steep learning curves and no applicability outside the product. Standards such as BPEL allow customers to leverage best practices, patterns, training and other literature from a variety of vendors as well as to easily find resources already conversant with the technology.
- **Toolset Extensibility**: A standard based solution enables other value added providers to plug in their offerings. For example, modeling vendors are
able to generate BPEL and integrate with BPEL process execution environments.

- **Interoperability**: Many customers will have multiple orchestration platforms either because they come embedded in applications or because of departmental purchases. Being based on a common standard significantly increases the interoperability between different platforms.

- **Vendor Portability**: Choosing a standards based platform reduces vendor lock-in and facilitates migration from one vendor platform to another.

**Oracle BPEL Process Manager (BPEL PM)**

Oracle BPEL Process Manager was one of the first, and continues to be the leading, implementation of the BPEL standard. It provides a comprehensive and easy to use solution for creating, deploying, managing, and monitoring BPEL business processes.

Key features of Oracle BPEL PM include

- **Graphical Editor** – A graphical drag and drop native BPEL editor

- **Rich Binding Framework** – Binding to Java, EJB, JCA, JMS on top of standard Web Services, including more than 300 adapters

- **Human Workflow** – Include human activities and notification services

- **Business Rules** – Leverage rules for business driven and volatile decisions.

- **Modeling and Simulation** – Integrated with the Oracle BPA suite

- **Comprehensive Monitoring and Management** – Provides Business Activity Monitoring, administration console, and policy based security.
• **Un-paralleled Scalability and Availability** – Mature, scalable, and robust implementation proven by numerous live customer sites

• **Hot Pluggable** – Supports most major commercial application servers

**Oracle and BPEL 2.0**

Oracle is one of the driving forces behind BPEL 2.0 and is committed to it. We believe BPEL 2.0 makes BPEL 1.1 more mature and for our customers increases the benefits of adopting BPEL outlined in earlier section. Oracle BPEL PM will support BPEL 2.0 in some future release.

In the meanwhile, Oracle customers may have two concerns:

- How to leverage the enriched functionality in BPEL 2.0
- How will Oracle migrate from BPEL 1.1 to BPEL 2.0

**Using BPEL 2.0 functionality in Oracle BPEL PM**

As detailed in earlier section, changes in BPEL 2.0 may be categorized as very useful new features, advanced new features that most users may not require, and syntax makeovers and clarifications, which do not impact functionality from user perspective.

Prior to supporting BPEL 2.0 completely, it is Oracle’s intention to support the commonly useful new features so that our users may benefit immediately. Already, BPEL PM supports many of the useful new features in BPEL 2.0:

- Improved data access using the $ notation
- Powerful data manipulation using XSL Transformations
- Parallel forEach as FlowN
- Local partnerlinks

**Future Migration from BPEL 1.1 to 2.0**

Even when Oracle BPEL PM moves to BPEL 2.0, we intend to continue supporting existing BPEL 1.1 processes, giving our customers the flexibility of migration per their calendar. This is the strategy that Oracle BPEL PM already supports for other major enhancements such as Human Workflow in 10.1.3.1.

When Oracle BPEL PM moves to BPEL 2.0, we also intend to provide migration path for customers including automated scripts and tools. We anticipate that the migration for our customers should be straightforward with automated tools; this expectation is based on the fact that there are no semantic mismatches and it boils down to syntactic changes. Many other vendors will have a significantly harder problem migrating to BPEL 2.0 as they need to cope with semantic mismatches, being based on their own proprietary models or incompatible standards.
Oracle and BPEL4People

It is reasonable to expect that IBM and SAP will broaden participation in the BPEL4People effort and ultimately, submit it for standardization. It is Oracle’s strategy to promote and adopt open standards and we may contribute to this effort as and when appropriate. The good news is that Oracle’s product implementation is in line with the proposal, enabling us to enrich it with our customer experiences.

BPEL4People Capabilities in Oracle BPEL PM

Oracle BPEL PM adopts a very similar approach to BPEL4People and layers people capabilities on top of standard BPEL. The human workflow capabilities within BPEL PM address most of the concepts in BPEL4People and then much more.

The BPEL4People concepts discussed in earlier section are addressed and exceeded as:

- **Task Activity** – Specialized activity is available in the palette to invoke human activity. Oracle BPEL PM also generates default JSP forms for performing tasks.

- **Process Initiator and Owner** – In addition to activity performer, defines other stakeholders such as process initiator, process owner, and administrator.

- **People Management of Process** – Process owners and administrators can move stuck processes forward.

- **Rule based automation of People activity** – BPEL PM not only facilitates replacement of a human activity with an automated service, it also leverages Business Rules to control approval policies, automating approvals as appropriate.

- **Declarative Escalations** – Escalation policies are specified declaratively.

![Oracle BPEL PM diagram](image-url)
- **Nomination, Delegation, and Load Balancing** – Oracle BPEL PM not only allows nomination and delegation of work on an instance basis, it also allows rule based nomination and delegation as well as use of load balancing algorithms.

Some other important people features of Oracle BPEL PM are:

- **Declarative Pattern based Routing** – Common routing patterns such as management chain, group vote are declaratively specified. Patterns may be combined to create complex routing flows.

- **Rich Notifications** – Various notifications may be declaratively specified and delivered via multiple channels including email, voice, SMS, and Fax. Email notifications may be actionable.

- **Collaboration and Ad-hoc processes** – Participants in a process may collaborate via comments, attachments as well as request for information. Participants may invite other participants on an ad-hoc basis, if so authorized.

**Customer Proofpoints**

Oracle Fusion Middleware boasts some 28,500+ customers, many of whom are using the BPEL PM to address the orchestration requirements of Service Oriented Applications. Please see the SOA White Paper to read more about the customer scenarios and success stories.

**CONCLUSION**

BPEL has emerged as the standard for process orchestration enabling customers to build end-to-end business processes spanning applications, systems, and people in a standard way.

Oracle was an early adopter of the BPEL standard and continues to work with other industry players to evolve it. Oracle BPEL PM has successfully been used by many customers to build agile business processes with end-to-end visibility and control. Oracle’s adoption of BPEL lowers total cost of ownership and reduces risk for its customers resulting in process orchestration rapidly becoming a core feature of customer SOA stacks.