End-to-End Resource Planning (EERP) Model and Use Cases

Scenarios for demonstration of SOA-EERP TC specifications

Version WD-03

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For OASIS SOA-EERP TC
OASIS (Organization for the Advancement of Structured Information Standards) is a not-for-profit, international consortium that drives the development, convergence, and adoption of e-business standards. Members themselves set the OASIS technical agenda, using a lightweight, open process expressly designed to promote industry consensus and unite disparate efforts. The consortium produces open standards for Web services, security, e-business, and standardization efforts in the public sector and for application-specific markets. OASIS was founded in 1993. More information can be found on the OASIS website at http://www.oasis-open.org.

The purpose of the OASIS SOA-EERP TC is to define SOA End-to-End Resource Planning (EERP) standard which is a technology that optimizes deployment of services onto a SOA description of an application. This work will be carried out through continued refinement of the EERP Business Quality of Services (BQoS), EERP Business Rating of Services, and EERP Business Services Level Agreement (SLA) specifications submitted to the TC as referenced in its charter.
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Introduction

This document describes conceptual framework, technology model, and use case scenarios for SOA End-to-End Resource Planning (EERP).

EERP is a technology that optimizes deployment of services onto a SOA description of an application. The focus in EERP is on the characterization of the business characteristics of a service (called Business Quality of Service), characterization and accessing the reputation of potential service providers, and Business Service-Level Agreements.

The ultimate goal for EERP is to have optimization techniques in a novel way to improve business results. It models the business process and the range of potential services, then guide the selection and deployment of services based on the end-to-end business value. As the first step toward to reach this ultimate goal, SOA-EERP TC has approved three XML vocabulary specifications as committee draft that provides information for optimization and process improvements.
EERP Technology

Overview

As Service-Oriented Architecture (SOA) has matured as a development, deployment, and governance paradigm, the performance of SOA deployments has received increasing attention.

End-to-End Resource Planning (EERP) applies service discovery, composition, simulation, and optimization techniques in a novel way to improve business results. As the software industry has applied SOA to e-Business deployments, self-optimizing systems as exemplified by EERP have become more feasible and necessary.

Different deployments of services onto a business process have varying business value. For example, a shipper might offer faster but more expensive service. EERP models the business process and the range of potential services, and then guide the selection and deployment of services based on the overall end-to-end business value.

Modeling the business characteristics of a service is a prerequisite for estimating the business value of the process that uses those services; likewise, the reliability of the service provided needs to be understood. Finally, establishing agreements about the business service is essential to long-term value chain improvement.

Challenges on EERP

In the EERP model, challenges include:

- The discovery, selection, assembly, and management of services supporting business processes
- Monitoring and evolution over time of both the set of services selected and of the performance of the business process itself
- Determining the varieties of optimization to be supported

Enablers for Optimization

The focus of the SOA-EERP Technical Committee is on enablers for optimization and process improvement. Local and more global optimization of distributed business processes should prove more effective with consistent requirements and definitions.

The enablers are, for example, definitions of the framework for representing the business process service rating terms, such as how to represent cost, time, value, etc. We define "optimization" as maximizing business value by enabling improved real-life e-Business process and resource planning at both design time and run time.

Resources

Resources are services performed by people, machines, and hardware/software applications, and represented by SOA services. Defining the qualities of such a business service will be done with metrics expressed as Business Quality of Service (bQoS). The nature of bQoS varies across industries and services.
Business Processes

Business processes are optimized in order to reduce cost, improve efficiency, and otherwise improve business results. Extensions to Business Process Management Notation and execution environments such as WS-BPEL will facilitate process improvement through automatic optimization and evolution.

Usage of EERP Techniques

Parties who would have interest in this work include enterprises that deploy and manage solutions which use SOA techniques and which want to develop effective business processes and improve the performance and agility of those solutions.

Extensive applications of SOA-EERP techniques will likely be most cost-effective for long-running business processes, although SOA-EERP enabling specifications will also help in the definition and design of SOA end-to-end business processes.

Earlier versions of EERP, specifications for which are anticipated to be contributed, are currently deployed in industry portals in China to facilitate service selection and business process improvement.

Status in the TC

As of July 2009, three committee draft specifications of XML vocabulary have been approved by the SOA-EERP TC as Committee Draft (CD02). They are:

- SOA-EERP Business Quality of Service (bQoS)
- SOA-EERP Business Rating of Service
- SOA-EERP Business Service Level Agreement (SLA)

These XML vocabulary specifications will cover modeling the business characteristics of a service, credibility of the business services, and establishing agreements about the business service. However, the business processes aspects and how to interact with the resources are not addressed by these XML vocabulary specifications.

The SOA-EERP TC will continue the standard development works toward the ultimate goal of EERP. That is to model the business process and the range of potential services, and then to guide the selection and deployment of services based on the end-to-end business value.
Conceptual Framework and Message Flow

Overview

This session describes a conceptual framework in which these XML vocabulary specifications would fit into the overall picture. In addition to the current works that in progress at the SOA-EERP TC, the conceptual framework also describes some future works that will facilitate service selection and business process improvement from end-to-end.

The session will have a framework diagram and messages flow with brief descriptions to demonstrate why we are undertaking the current TC works as described in these three XML vocabulary specifications, and how they fit into the overall EERP architecture. It also has a timeline and sequence diagram to show how an implementation would use these specifications in an end-to-end fashion, and build a continuous business process improvement loop.

Conceptual Framework

Figure 1 is the conceptual framework for EERP. In this figure, the Business Quality of Service is represented as “bQoS”, Business Rating is represented as “Rating”, and Business Service Level Agreement is represented as “SLA” in the figure.

Service requester is the client system who requests a service through the EERP systems to find the optimal solution.

Service providers are providing business services. For each service provider, it can provide the same service but there is different bQoS and Rating. All services in this framework may be running on different platforms with different implementations, but they all support EERP query to provide bQoS, Rating and SLA information in XML format defined in this TC.

EERP Portal is the system that accepts the request from the Service requester performs bQoS and Rating queries, calculates the optimal solution and then return the result back to Service requester.

The third party rating provider will provide the rating service to a given service provider for its service. This rating service organization issues either an aggregated numeric number or an aggregated classification description to represent the rating measurement of the given business service.
Exchange Request/Response Messages

The current Committee Draft 02 (CD02) of three specifications only describes the XML vocabulary which can be the content of the message inside a SOAP or REST request/response. An EERP system can have the following messages exchange flow:

1. EERP Process Flow Request Message
2. bQoS Request Message
3. bQoS Response Message
4. Rating Request Message
5. Rating Response Message
6. bQoS & Rating Request Message
7. bQoS & Rating Response Message
8. SLA Request Message
9. SLA Response Message
10. EERP Process Flow Response Message
Messages #2 to #9 are request information over Internet for the data elements defined in these three specs. The results of these requests are used to calculate the optimal flow for a given set of services request.

Message #1 is the request and #10 is the response that will get the result of EERP optimization calculation, where a list of alternatives will be provided. Each node in the process will have a service provider assign to for each alternative.

Messages Sequence and Time-Line

![EERP Messages Sequence and Timeline](image)

Figure 2 -- EERP Messages Sequence and Timeline

Message Flow

The service requester wants to search for the optimal end-to-end solution for a given set of services. The following messages flow will happen:

1. Service Requester sends EERP Request message to EERP Portal
2. EERP Portal sends bQoS Request messages to all Service Providers to query the business quality of services.

3. Service Providers send bQoS Responses back to EERP Portal.

4. EERP Portal sends Rating Request message to all Service Providers to query the credentials that the Provider has.

5. Service Providers send Rating Response message back to EERP Portal.

6. EERP Portal sends Rating Request message to third party Rating to query the rating for giving Provider.

7. Third party Rating organization sends Rating Response message back to EERP Portal.

8. On the behavior of the Service Requester, EERP Portal can send SAL Request message to the Service Provider to obtain the commitments from the Provider.

9. Service Provider commits the agreement and sends the SLA Response message back to EERP Portal.

10. After the optimization calculation on all information that EERP Portal received from all Service Providers, EERP Portal sends EERP Response message back to Service Requester.

11. Service Requester sends SAL Request message to the Service Providers to obtain the commitments from the Service Providers for those no SLA service in the set.

12. Service Provider commits the agreement and sends SLA Response message back to Service Requester.

4.a Optionally, EERP Portal can send one request message to request both bQoS and Rating from Service Providers.

5.b Service Providers can response the request with both bQoS and Rating in one response message back to EERP Portal.
XML Vocabulary Specifications

Overview
As described previously, the current works in the TC includes the following three specifications of XML vocabulary:

- SOA-EERP Business Quality of Service (bQoS)
- SOA-EERP Business Rating of Service
- SOA-EERP Business Service Level Agreement (SLA)

This section gives brief descriptions on these three XML vocabulary specifications, their relationship and provides high level diagrams for their XML schema.

Relationship among Three Specifications
EERP applies service discovery, composition, simulation, and optimization techniques in a novel way to improve business results. It models the business process and the range of potential services, then guide the selection and deployment of services based on the end-to-end business value.

EERP Business Quality of Service (bQoS) Specification is an XML vocabulary by which a business application may communicate selected business characteristics of the service it provides. Modeling the business characteristics of a service is a prerequisite for estimating the business value of the process that uses those services.

EERP Business Rating of Services Specification is an XML vocabulary for information exchange on business creditability, reliability and reputation of the service providers. The creditability, reliability and reputation of the service need to be understood for estimating the overall business quality of the process that uses those services.

The business characteristics of the service defined in the bQoS specification and the business rating characteristics of the service defined in the Business Rating specification together will enable EERP to determine the varieties of optimization to be supported, and to select optimal end-to-end solution.

EERP Business Service Level Agreement for (BSLA) Specification is an XML vocabulary for information exchange by which a business application can manage and evaluate services with agreed business quality of service, obligations and terms.

Modeling the business service-level agreements to manage and evaluate services and establishing agreements about the business service is essential to long-term value chain improvement. The details of the business service level agreement defined in this BSLA specification will enable EERP to determine the varieties of optimization to be supported, and to manage the end-to-end business process.

EERP Business Quality of Service (bQoS) Specification
Figure 3 is the diagram of XML Schema for BQoS.
Figure 3 -- XML Schema for BQoS
The Business Quality of Service (BQoS) of the XML vocabulary is defined in XML Schema format that defines many quality measurement indicators. It has the following major elements:

- **BQoSPrice** indicates price or cost for the service
- **BQoSPerformance** indicates time to complete the service, or in the alternative, throughput and latency.
- **BQoSQualities** indicates additional properties and attributes.
- Any additional elements for quality of service.

### EERP Business Rating of Services Specification

The Business Rating of Services specification is for business reliability and reputation of the service and its services provider. It can have one or more of the following elements:

- **ListOfRating** element is for the rating aspect of service which is provided by third party and measured in terms of rates for the service. Each Rating element in the ListOfRating element is issued by a rating organization that has either an aggregated numeric number or an aggregated classification description to represent the rating measurement of the given business service.
- **Credentials** element is for the rating aspect of service which is measured in terms of credentials for the service that the service provider owns or holds. Credentials are issued by organizations for the service, such as licenses, permissions, certifications, associations, affiliations, etc. Each credential element in the Credentials element is a non-aggregated indicator for the rating measurement of the given business service, and it does not provide an aggregated value for the measurement.
- Any additional elements for the rating aspect of service. This can be one or more elements of `Performance:QualityAssessmentEvaluation` that will provider a mechanism for Service Rating Entities to provide their evaluation for how well the Service Provider fulfill the Quality Assertion(s) of its service.

The following Figure 4 is the diagram of XML Schema for Business Rating:
Figure 4 -- XML Schema for Business Rating

The BRating is the root element of Business Rating for EERP which is for business reliability and reputation of the service and its services provider. It has both ListOfRating and Credentials elements which are indicators to represent for business reliability and reputation of the service and its services provider.

ListOfRating element is for the rating aspect of service which is provided by third party and measured in terms of rates for the service. Each Rating element in the ListOfRating element is issued by a rating organization that has either an aggregated numeric number or an aggregated classification description to represent the rating measurement of the given business service.

Credentials element is for the rating aspect of service which is measured in terms of credentials for the service that the service provider owns or holds. Credentials are issued by organizations for the service, such as licenses, permissions, certifications, associations, affiliations, etc. Each credential element in the Credentials element is a non-aggregated indicator for the rating measurement of the given business service, and it does not provide an aggregated value for the measurement.

The Rating element represents a rating measurement of the given business service. The rating measurement is issued by a third party rating organization.
EERP Business Service Level Agreement Specification

EERP Business Service Level Agreement Specification defines business Service Level Agreement (SLA) between the service requestor and service provider for a given service.

Business SLA is a formal contract between a service provider and a client guaranteeing quantifiable business quality of service (bQoS) at defined levels.

It can have one or more of the following elements:

- SLAParties describes the parties invoked in the SLA for the service
- SLAParameters describes the parameters for the service, which are defined ways of monitoring of QoS metrics.
- SLAObligations describes the agreed SLA obligations for the service.
- SLATerms describes the agreed SLA Terms for the service.
- Any additional elements for the agreement of the service.

The following Figure 5 is the diagram of XML Schema for Business SLA:
The BSLA is the root element for BSEP - Business Service Level Agreement (BSLA). BSEP is a formal contract between a service provider and a client, guaranteeing quantifiable business quality of service (QoS) at defined levels.

Figure 5 -- XML Schema for BSLA

BSLA

SLAPartyType

- attributes

SLAPartyType

- attributes

Service Provider

- attributes

SLAParameterType

- attributes

ServiceProfileURI

- attributes

ServiceOperations

- attributes

Any

SLAObligations

- attributes

SLAObligations

- attributes

SLATerms

- attributes

SLATerms

- attributes

SLATerm

- attributes

Extension

- attributes

Additional element

Generated by XmlSpy www.altova.com
The following Figure 6 is the diagram of XML Schema for SLAObligations element within the Business SLA:

![XML Schema for SLAObligations Element](image-url)
Use Case Scenario and Examples

Overview

This section describes a use case to illustrate how these specifications would be implemented. A detailed scenario description, with some sample data, is presented to demonstrate how these three EERP specifications can be applied.

The Use Case

The example is to illustrate how the three specifications, which include EERP bQoS, EERP Rating and EERP SLA, can be implemented.

Often, a customer would like to use a client, who is an EERP-requester in EERP application system, to make a decision, via the EERP-portal, to satisfy his or her requirements, which are based on the selection of the appropriate business Services (Service-set) and the Service Suppliers (Supplier-set), or Service Providers (SP-set).

A typical EERP application system may be introduced as the following.
Scenario Description

Firstly, the Customer or Requester is Sichuan Mianyang Gas Corporation (<http://www.myrq.net>), a Chinese gas company which supplies natural gas to citizens living in the Sichuan Province, west of China. It has the requirement to order some gas meters for the local civilians.

Secondly, the Service is a batch of gas meter, and one of the Service Providers is Hangzhou Innover Technology Co. Ltd. (<http://www.innover.com.cn>), a gas meter producer that produces high quality IC-gas-meter in timely fashion. The Service Provider is located in Zhejiang Province, east of China.

Thirdly, the Third-party is 51Honest.org (<http://www.51honest.org/>), a rating organization that has the experiences to evaluate and certificate a service provider in the industry. 51Honest.org is located in the northern part of China.

Finally, a set of detailed sample data are listed in this section. They are formatted in xml and fitted the present drafted schemas (version 9) of EERP bQoS, Rating and SLA.

NOTE: All names in the scenario are fictitious names.

Actors

- **Service requester**: requests a service through the EERP systems to find the optimal solution
- **Service providers**: provides the service, each with a different bQoS and Rating
- **EERP Portal**: a system that accepts the request from the Service requester. It performs bQoS and Rating queries, calculates the optimal solution, and returns the result back to Service requester.
- **Third party Rating Provider**: provides the rating service for the service providers

EERP Example

Namespaces

Unless overridden by a namespace declaration inside an XML fragment, this document uses the following namespaces:

<table>
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<th>Prefix</th>
<th>Namespace</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td><a href="http://schemas.xmlsoap.org/soap/envelope">http://schemas.xmlsoap.org/soap/envelope</a></td>
</tr>
<tr>
<td>eerp</td>
<td><a href="http://docs.oasis-open.org/soa-eerp/eerp/200903">http://docs.oasis-open.org/soa-eerp/eerp/200903</a></td>
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</tr>
</tbody>
</table>
EERP bQoS Example

This bQoS example demonstrates an implementation of the EERP bQoS specification. The business quality of service on the gas-meters, including price, throughput and some properties, are formatted in xml according to the specification provided by the gas-meter producer, namely Hangzhou Innover Technology Co. Ltd. (http://www.innover.com.cn), the EERP Service Provider.

The bQoS message has the following items:

1) The price of the gas-meters is CNY(RMB) 120000.00 per batch, and 1000 gas-meters a batch delivery as usual

2) The throughput is 1000 gas-meters in one batch, per week or 7 days as usual.

3) Some of the gas-meter properties are listed here: integrated IC-Card-Box, with a solid iron shell.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<bqos:BQoS xmlns:bqos="http://docs.oasis-open.org/soa-eerp/bqos/200903"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <bqos:BQoSPrice>
    <bqos:Price>
      <bqos:Unit unitCode="EA">1000</bqos:Unit>
      <bqos:Amount currencyID="CNY">120000</bqos:Amount>
    </bqos:Price>
  </bqos:BQoSPrice>
  <bqos:BQoSPerformance>
    <bqos:Throughput>
      <bqos:Duration unitCode="DAY">7</bqos:Duration>
      <bqos:Quantity>1000</bqos:Quantity>
      <bqos:Latency unitCode="DAY">0</bqos:Latency>
    </bqos:Throughput>
  </bqos:BQoSPerformance>
  <bqos:BQoSQualities>
    <bqos:Property>
      <bqos:PropertyName languageID="zh-cn">外壳</bqos:PropertyName>
      <bqos:PropertyValue languageID="zh-cn">铁壳</bqos:PropertyValue>
    </bqos:Property>
  </bqos:BQoSQualities>
</bqos:BQoS>
```
By the way, this service provider is a gas-meter producer, which is Hangzhou Innover Technology Co. Ltd. (http://www.innover.com.cn) located in Zhejiang Province in eastern China.

EERP Rating Example

This Rating example illustrates the ratings and credentials on the gas-meters and its producer who is Hangzhou Innover Technology Co. Ltd. (http://www.innover.com.cn):

The Rating message has the following contents:

1) Credit rating on provider is amount to 980.1, rated by 51Honest.org (http://www.51Honest.org), a third-party organization in northern China

2) License on gas-meter production is issued in December, 1997, by a department in government that is Zhejiang Bureau of Quality and Technical Supervision in the P. R. of China (http://www.zjbts.gov.cn).

3) Certificate on gas-meter product is certificated as the first Dual-Explosion-Proof Certificate in November, 1997, Certificate is issued by a third-party organization that is National Supervision and Inspection Center for Explosion Protection and Safety of Instrumentation (NEPSI) in Shanghai in the P. R. China (http://www.sipai.com/sitiias/nepsi.asp)
EERP SLA Example

This SLA example shows the following agreement on the gas-meters between Hangzhou Innover Technology Co. Ltd. (http://www.innover.com.cn) that is a EERP Service Provider, and Sichuan Mianyang Gas Corp. (http://www.myrq.net), a EERP Service Requester:

The SLA will have the following terms:

1) The service will charge CNY(RMB) 120000.00 per batch as gas-meter products.

2) The reserve fee for guarantee will charge CNY(RMB) 0.00 per batch.

3) The Committed Time for delivery is 7 days (one week) or a little longer per batch, but not later than April 1, 2009.

4) The committed throughput is 1000 gas-meters in one batch, per week (7 days).

5) The penalty will be CNY(RMB) 0.00 per batch, if the entry #3 and #4 of the SLA cannot be met and fail to fulfill for provider.
<ServiceProvider SPID="1">
  <ServiceUri>http://www.innover.com.cn</ServiceUri>
  <ServiceProviderName>Hangzhou Innover Technology Co. Ltd, Zhejiang Prov., P.R.China</ServiceProviderName>
</ServiceProvider>

<!-- ServiceRequester:服务请求人  四川省绵阳市燃气公司 -->
<ServiceRequester>
  <ServiceRequesterUri>http://www.myrq.net</ServiceRequesterUri>
  <ServiceRequesterName>Mianyang Gas Corp., Sichuan Prov., P.R.China</ServiceRequesterName>
</ServiceRequester>

</SLAParties>

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    <hasCommittedTime>true</hasCommittedTime>
    <hasAvailabilities>true</hasAvailabilities>
    <hasCommittedThroughput>true</hasCommittedThroughput>
    <hasOtherTerms>true</hasOtherTerms>
  </ServiceOperations>
</SLAParameters>

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        <bqos:Amount currencyID="CNY">120000.00</bqos:Amount>
      </CommittedCost>
    </ServiceLevelObjective>
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    </ActionGuarantee>
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  <Obligation>
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      </ReserveFee>
    </ActionGuarantee>
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    </ActionGuarantee>
  </Obligation>
</SLAObligations>
<!-- No. 3 delivery after 7 days, BUT before 2009-04-01 -->

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  </CommittedTime>
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<td>WD02</td>
<td>2009-07-21</td>
<td>Szu Chang</td>
<td>Fixed review comments on Issue I060.</td>
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<tr>
<td>WD03</td>
<td>2009-08-05</td>
<td>Szu Chang</td>
<td>Get changes on Issue #I061</td>
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