

Next-Generation SOA Infrastructure

An Oracle White Paper
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INTRODUCTION

Today, developers are faced with a bewildering array of technologies for developing Web services. This white paper discusses the most important industry standards that are becoming available for developers to build interoperable services and composite applications, including JAX-WS, BPEL, WS-ReliableMessaging, WS-Addressing, SOAP with Attachments, MTOM, WS-Policy, UDDI, WS-Security and Service Component Architecture. Oracle has helped to define these standards and is using them as the basic building blocks for the Fusion Middleware platform. Because the Oracle platform is built from the ground up on standards, developers can create portable and interoperable services that are guaranteed to work together. And because Oracle's SOA environment is based on a common service infrastructure that is shared across the entire Oracle Fusion Middleware product, developers benefit from out of the box integration with the full range of Oracle SOA technologies, including BPEL, Human Workflow, ESB, and Oracle Rules.

EVOLVING REQUIREMENTS

Enterprise applications are moving from user interface driven applications to assemblies of re-useable and interoperable services. These services represent simple business functions intended to be assembled together into new applications. One of the key advantages of this change in application architectures is that services can be rapidly reused in new and changing business processes.

However, this approach to building composite applications and business processes doesn't work without a standards-compliant platform for building services. Interoperability is challenging because Web services protocols for messaging, reliability and optimization are complex and services may be hosted on multiple platforms. Without a platform designed around standards and targeted at interoperability, it is impossible to rapidly weave services together to meet continually changing business requirements. Oracle Fusion Middleware is built on a common service infrastructure and is designed to use industry standards for all its SOA functionality. Quality of service protocols and message optimizations are provided as cross cutting functions that can be enabled independent of business logic and the implementation strategy for services.

Many companies are recognizing the need to adopt standards in their efforts to build service-oriented applications.

Organizations also benefit from standards that describe not only how applications cooperate, but how they are built. Using SOA standards, organizations avoid platform lock-in and bring developers up to speed with readily transferable skills.

The next generation of development standards will focus on two key areas: providing a common model for controlling the relationships between services and allowing developers to implement robust Web services using only familiar Java objects. The key standards to support this are the Service Component Architecture and JAX-WS. Oracle is playing a leading role in the development of these standards and has built its next generation infrastructure based on them.

STANDARDS

Although there was an early explosion of proposals for Web services protocols, the standard platform for SOA is built on specifications focused in three areas: messaging; service description and discovery; and implementation.

Messaging

Well-understood and interoperable standards for sending messages between services are the basis for interoperability. For services to communicate with each other, messages are encoded according to the SOAP 1.1 and SOAP 1.2 specifications, and typically exchanged over HTTP. The SOAP standards are the foundation of network interoperability.

Two important standards are used to help provide more efficiency and compression in SOAP messages that include binary content: SOAP with Attachments and MTOM. The Oracle Service Fabric uses both optimizations to ensure that services can communicate as efficiently as possible.

While SOAP provides the basics of message exchange, more information is needed to provide message directives in asynchronous exchange scenarios. WS-Addressing defines message headers that are applied to SOAP messages to determine where responses should be sent and to provide correlation between messages.

In many cases, it is important to provide guarantees that asynchronous messages are delivered to services. Oracle has worked with the OASIS standards body to co-author and drive industry convergence around the WS-ReliableMessaging protocol, which is used by services to provide guarantees around the delivery of messages and the order in which messages are processed.

Security is one of the most important aspects of Web services for enterprise applications. Oracle is helping to lead the work in key standard committees around security and federation of identity using Web Services. In particular, SOAP messages are secured using WS-Security, which defines how authentication, encryption, and digital signatures should be used to secure communications.

Oracle actively participates in industry standard bodies from core standards groups such as W3C and the JCP to business-oriented standards organizations like OASIS and OAG.

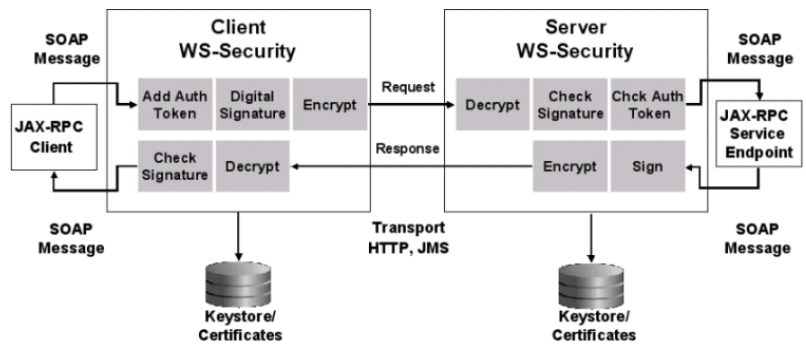


Figure 1: Overview of OracleAS WS-Security Architecture

Metadata for Describing and Discovering Services

Oracle's service infrastructure uses metadata standards to describe the messages and protocols used by Web services. These metadata standards are used by applications and infrastructure to guarantee that services can interoperate based on the requirements services place on users. The important metadata standards are WSDL, WS-Policy, WS-MetadataExchange, and UDDI.

WSDL describes the messages that a service can receive and send. It is the most basic contract language used to describe the business functionality offered by a service.

WS-Policy describes the quality of service characteristics and requirements associated with a service. Typical policies describe security requirements of a service, optimizations supported by a service such as MTOM, and whether the service uses WS-ReliableMessaging. Oracle Web Services Policy Manager provides the tools to build and enforce policies for Oracle Fusion Middleware.

WS-MetadataExchange is a handshake protocol that allows users to retrieve WSDL and WS-Policy documents associated with a service.

UDDI is a model used by service registries. It provides a common repository of metadata about services that can be used to discover what services are available and to select services that are available to use for building new composite services and business processes. Oracle supports UDDI in its enterprise Service Registry, which is a part of the core Fusion Middleware platform.

Implementing Services

JAX-WS is a standard defined in the Java community process that describes how Java developers can create Web services. JAX-WS, like many of the new JavaEE specifications eliminates much of the complexity associated with developing Web services. For example, JAX-WS provides a simple model for implementing business logic and exposing the contract as a WSDL interface using annotations on

the implementation code. By leveraging JAX-WS, developers build portable services using skills that can be widely applied across many products.

```
import javax.xml.ws.WebMethod;  
import javax.xml.ws.WebService;  
  
@WebService  
public class Echo {  
  
    @WebMethod  
    public String echoString(String p) {  
        return "echo" + p;  
    }  
}
```

Annotated Java Class for Web Services

Bringing It All Together

Oracle Fusion Middleware combines all the key standards discussed in this paper together into a common service infrastructure. This service infrastructure is shared across the whole middleware platform, guaranteeing a common, interoperable basis for deploying the next generation of enterprise applications. Developers can configure services deployed on the service infrastructure to leverage these standards using a composite service descriptor defined by the Service Component Architecture (SCA) standard. The SCA model provides an elegant mechanism to combine all the standards we've discussed into a simple description of services and their interactions.

Because standards are the necessary starting point for interoperability, Web services built with Oracle Fusion Middleware conform to two profiles defined by the main industry consortium on interoperability: WS-Interoperability Basic Profile 1.1 and Basic Security Profile 1.0. In addition, Oracle uses extensive testing frameworks focused on interoperability with major vendor platforms and open source Web services stacks and participates in public interoperability events where vendors are validating interoperability between platforms. This provides application developers with a firm foundation for building interoperable services that can be coordinated together to form new composite applications.

Oracle's Product Strategy

Oracle Fusion Middleware provides comprehensive tooling and infrastructure for the development and deployment of service-oriented applications based on J2EE applications, BPEL processes and ESB flows. Using the unified SOA tools provided in Oracle JDeveloper, it is trivial to bring these services together into a new generation of composite services and business processes for rapid development of enterprise applications.

Once built, services are deployed to the SCA-based service infrastructure, a runtime environment that provides a common bus for message delivery and network connectivity. The service infrastructure combines support for Web

Oracle invests in extensive testing to ensure standards compliance and interoperability with major vendors and open source Web services stacks.

services policies and protocols; other network adapters; and Java standards, with built in support for message flow tracing, business activity monitoring and the management of service metadata. The service infrastructure is shared across the Fusion Middleware Platform so that a single infrastructure provides these services to the full product suite.

End users benefit directly from the service infrastructure in a number of ways. First, the shared infrastructure means that Oracle's SOA products aren't merely pre-integrated; they share a common substrate that guarantees users are able to combine different technologies together into working composite applications.

Second, the service infrastructure includes the functionality required for an enterprise SOA deployment, including full support for Web services, metadata management capabilities and a UDDI service registry.

Finally, the service infrastructure is based entirely on standards, enabling users to utilize well-understood models for developing services and to readily integrate with third party systems. This flexibility to leverage existing investments and software from many vendors means that new business processes can be composed from assets that are broadly deployed across the enterprise.

Oracle Fusion Middleware is designed to maximize the benefits of open systems and the service infrastructure builds on this philosophy to provide users with the best infrastructure for building service-based solutions.

CONCLUSION

Services Oriented Architecture is now becoming the mainstream for enterprise applications. Support for the key standards JAX-WS, BPEL, WS-ReliableMessaging, WS-Addressing, SOAP with Attachments, MTOM, WS-Policy, UDDI, WS-Security and SCA as essential building blocks is a necessary foundation for the next generation of successful applications. In fact, without a robust, standards based platform that is directly focused on interoperability, it is impossible to build new composite applications using services. Oracle Fusion Middleware is the industry's only platform built from the ground up around the key SOA standards. Oracle's integrated platform approach to SOA guarantees that new services based on implementation technologies like Java, BPEL, and ESB will work together to provide complete solutions based on combining services into new composite applications and business processes.



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