



Oracle White Paper
December 2013

Mobility for Oracle Applications using Fusion Middleware

Overview

There is a change going on in how people access information that is as dramatic as when PCs replaced green screens on the corporate desktop. That change is the rapid adoption of smart phones and tablets as a way to access corporate applications.

Surveys by several organizations have found:

- 59% of employees use mobile devices to run line of business applications ¹
- 71% of companies are discussing developing custom mobile apps ¹
- 74% of companies allow Bring Your Own Device (BYOD) in some fashion ²
- Enterprise tablet adoption will grow by almost 50% per year ³
- By 2015, mobile app development projects will outnumber native PC projects by a ratio of 4-to-1 ³
- Mobile internet users will exceed desktop internet users by 2014 ⁴

Employees and customers that have grown accustomed to accessing web sites and applications from their mobile devices are now insisting on the same ability to interact with corporate applications. In many cases, the simplest way for IT to accommodate this is to implement a BYOD policy. While this has the advantage of requiring less hardware investment by the organization, new challenges emerge in the areas of security and management.

Mobile computing is also about more than just using the latest devices. Mobile computing is transforming business. Mobile devices provide new channels for customer and employee interaction. They can lead to dramatic process improvements and faster decision making. The true ability of mobile computing to impact how business is conducted has barely been realized. For example, just a few years ago who would have imagined that anyone could stick a small device in their smart phone and swipe a credit card to receive payment?

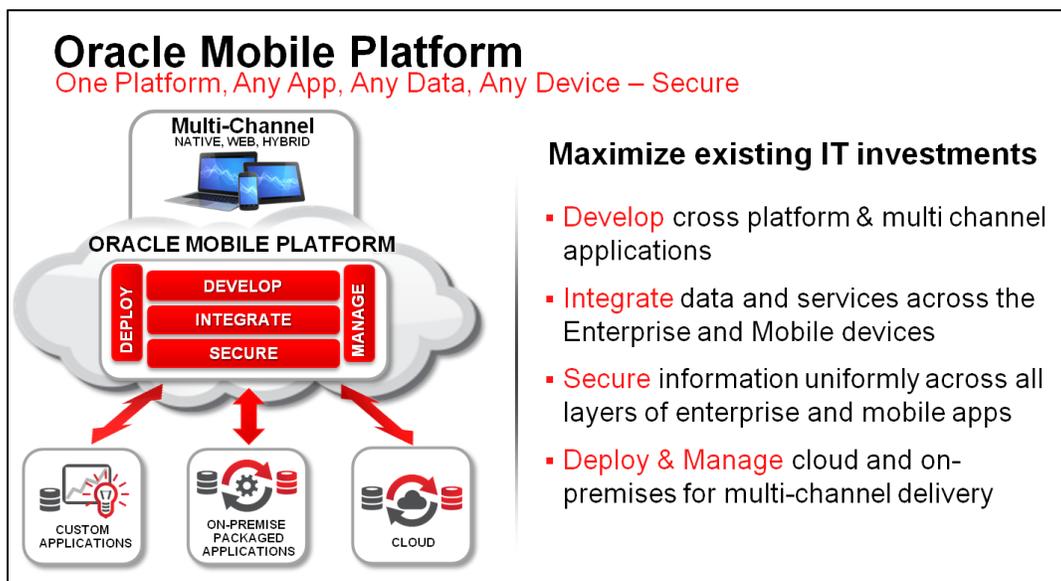
These trends mean that IT departments are under increasing pressure to deliver mobile enabled solutions to employees and customers. However, the traditional IT environments and skill sets may not be adequately prepared to support mobile solutions.

Mobile solutions span a broad spectrum of capabilities including applications, transaction processing, portals, internal management dashboards, gaming, etc. These mobile solutions must then be developed, deployed, secured, connected to existing business processes/applications and managed -- all of which bring about a unique set of challenges. For instance, connecting to the enterprise and complying with security policies is the most complex, time consuming and resource constrained part of mobility. While mobile application development is getting easier, the complexity to integrate with one or more cloud (or on-premise) based backend systems and complying with IT security policies continues to increase.

For this white paper, we will focus on enterprise mobile apps and how Oracle Fusion Middleware can be used to meet their business requirements. This paper will also describe how the various concepts described in the various sections come together via a mobile order management app for E-Business Suite that was developed using Oracle Fusion Middleware.

Oracle Fusion Middleware Mobility Platform

Oracle Fusion Middleware provides the tools and capabilities that are needed by organizations to deliver mobile apps, without requiring IT departments to completely retool or change existing processes. Fusion Middleware provides a complete solution that bridges new or existing applications in the data center all the way out to the mobile device.



Let us look at how Oracle Fusion Middleware supports the key technical requirements that are essential for a mobility platform.

Develop

Applications that are accessed on tablets and smart phones today generally fall into three categories: native apps, mobile web, and hybrid apps.

A native app is one that is built using the Software Development Kit (SDK) that is specific to a type of device. Apple, Android, Windows, etc. all have their own SDKs. When the SDKs are used, an app's features and appearance are optimized for that specific device and its operating system. The app can also interact directly with the storage on the tablet or smart phone and can use features on the device such as the camera, the address book, and the GPS.

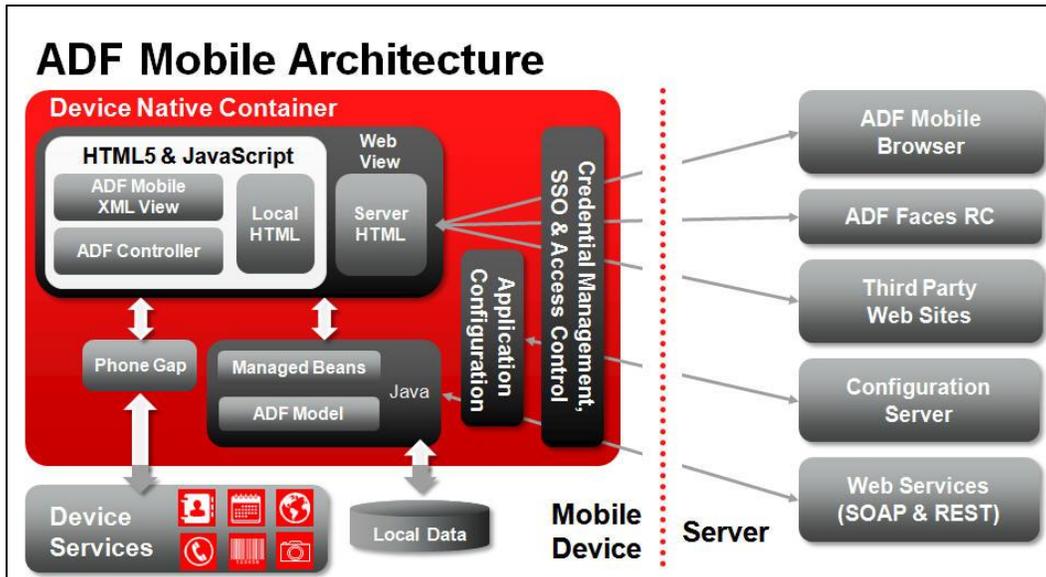
The down side of native apps is that they are not portable across different types of devices. An organization that wants to deliver a native app for both iOS and Android has to build the application twice: once in Objective-C for iOS and once in Java for the Android, using the platform-specific software development kit (SDK). Reusing code between the two platforms can be complex and difficult. This is not an ideal solution for most IT departments.

Web applications can be optimized for display in a mobile browser. Using responsive design, when a desktop or mobile browser requests a web page, the application that receives the request can detect the type of browser that made the request and can respond with different content based on the type of browser. Common types of optimizations that are done for mobile browsers include sending back smaller images, reformatting table layouts, and reducing the amount of HTML that is returned to the browser. The flexibility of this approach results in a high degree of reuse across different devices. Much of the same code can be used to deliver the web content to iPhone, Android and other types of devices.

The limitation of mobile web apps is that they normally are prevented by the mobile browser from interacting with the services on the device such as the camera, phone book, GPS, etc. On the plus side, the primary skill sets required to build mobile web applications are HTML 5 and CSS, with which most IT departments have at least some familiarity.

Hybrid apps attempt to combine the portability of mobile browser apps with the look and feel of native apps. With a hybrid app approach, a container is installed on the mobile device. The hybrid app runs in the container. The user interface of the app is built in a portable language, typically HTML 5 and JavaScript. The container allows the app to interact with the device services and storage. The container approach allows the same code to execute on different types of devices, simplifying code reuse and portability.

Oracle ADF Mobile answers the needs of organizations looking to develop cross device mobile apps faster. Leveraging the power of Java, HTML5 and declarative and visual development environment Oracle ADF Mobile accelerates the creation of on-device mobile apps for phones and tablets.



ADF Mobile enables developers to develop single-source applications that leverage Java/HTML5 and deploy the same application to both the Apple iOS and Google Android platforms. Oracle ADF Mobile provides a complete MVC development framework with declarative user interface definition, device services integration, built-in security (including out of box integration with Oracle Identity Management to provide SSO integration, local encrypted credential cache to support offline authentication, access control and enterprise security policies).

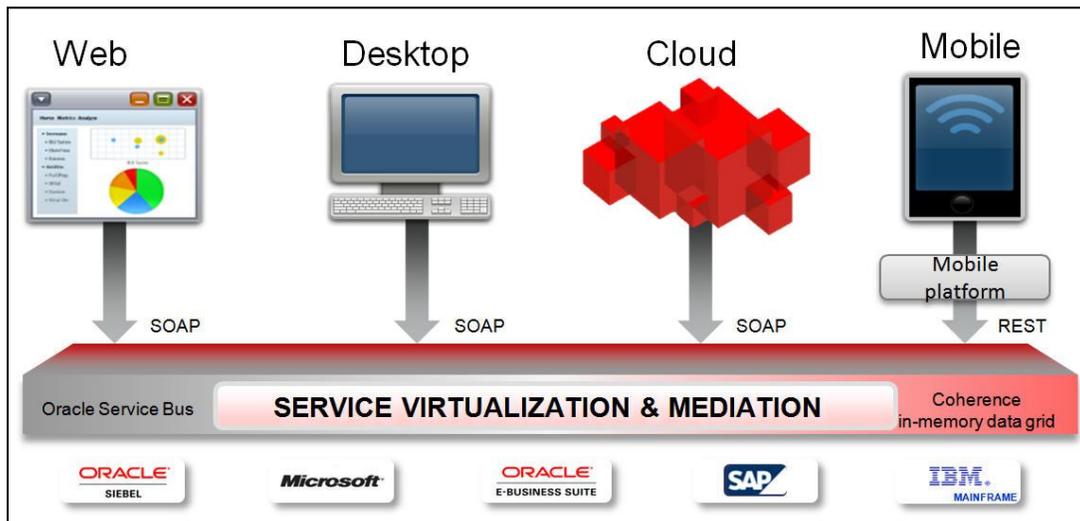
With ADF Mobile, developers can quickly and declaratively integrate with device services such as camera, phone, SMS, GPS, and so on, through a common binding layer. Instead of writing many lines of device-specific code, developers can drag-and-drop device service controls to expose the functionality to the mobile apps.

ADF Mobile also supports modularity via “features” and “feature archives”. A feature is a group of functionality within an ADF Mobile application. For instance, the artifacts within a feature may be a task flow and a few user interface screens, or may simply point to a local HTML or Remote HTML page. These features are packaged into a feature archive, or FAR files. As applications may comprise of one or more of these archives, it is possible to simply import feature archives from two different apps and create a new app that delivers the combined functionality.

Connect

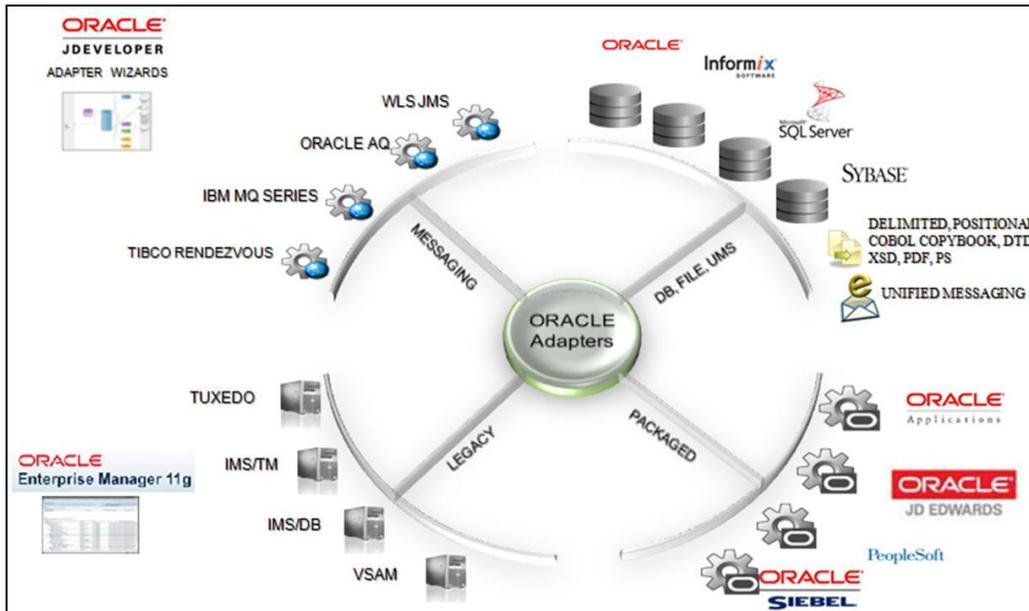
Service Virtualization & Mediation

While any new apps for mobile clients can be built with WebLogic Server, HTML 5, REST and JSON, the majority of existing enterprise applications are not built with these technologies. A way is needed to provide mobile clients with access to these existing application services. A service virtualization and mediation layer is needed to handle the changes in protocols and data formats between the mobile clients and the enterprise applications. Fortunately, this layer can be reused across mobile, cloud, desktop and browser based clients.

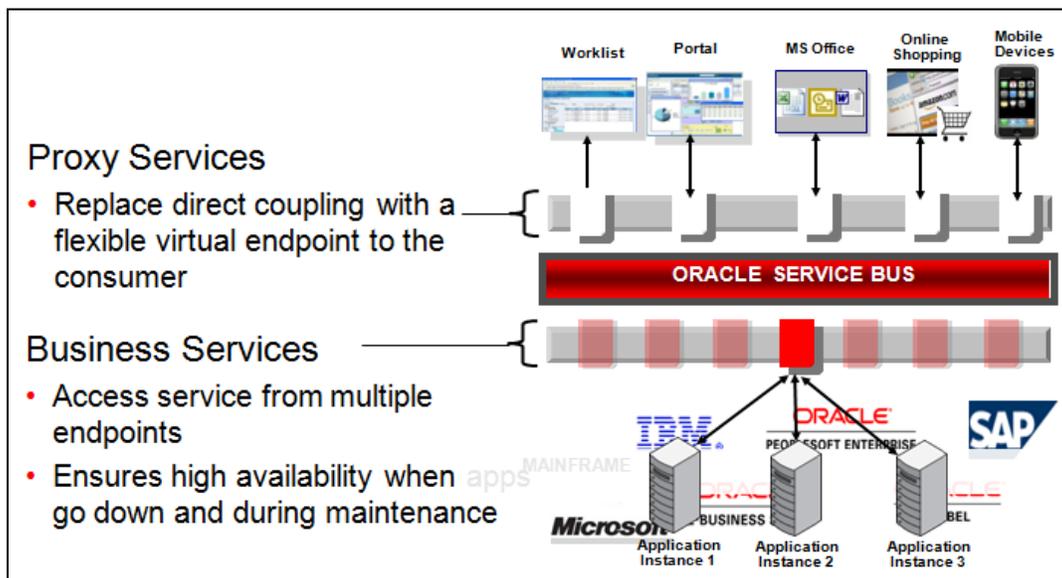


Oracle Service Bus provides this virtualization and mediation layer. Oracle Service Bus can connect to both clients and back end applications through numerous protocols, including REST, SOAP, HTTP, JMS, RMI and FTP. Supported message formats include JSON, XML, text and binary.

In addition, Adapters are available for numerous packaged applications, including E-Business Suite, PeopleSoft, and Siebel (among others) and can easily expose public integration interfaces from Oracle Applications as standard web services. These services can be created and configured in Oracle JDeveloper at design time using BPEL Designer.



In Oracle Service Bus terminology, a back end service is known as a “business service”, and an endpoint that is exposed to clients is known as a “proxy service”. One business service can be exposed through multiple proxy services, with each proxy service specifying a different protocol and/or message format. This separation of business and proxy services is how Oracle Service Bus provides a virtualization and mediation layer.



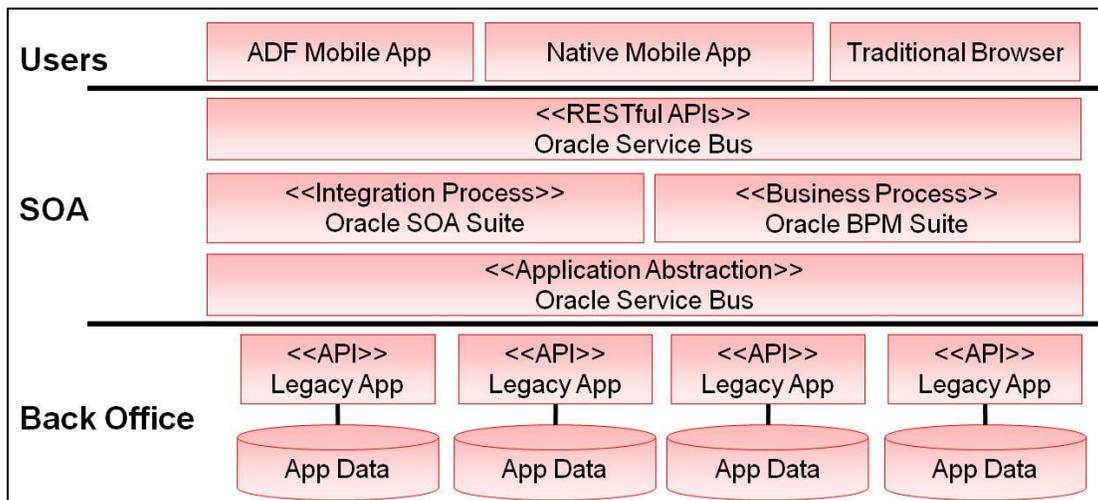
For example, an HTTP/SOAP based web service exposed by an SAP application could be configured as a business service to Oracle Service Bus. In turn, Oracle Service Bus could present a REST/JSON proxy service to a mobile client and a JMS/SOAP proxy service to

another cloud application. Requests from either the mobile client or the cloud application would be transformed and routed by Oracle Service Bus to the SAP application. Other applications and protocols would be added as needed.

The support for REST and JSON in Oracle Service Bus means that existing applications can be quickly and easily consumed by mobile clients.

Service Orchestration

Organizations that have already invested in creating Service Oriented Architectures are in a terrific position to take advantage of the shift to mobile computing. The discussion in the previous section focused on exposing existing services via the protocols and message formats that are optimized for mobile clients. As more and more applications and business processes are exposed via mobile, it is likely that new requirements will emerge to compose and combine existing web services in ways that were not previously anticipated



For example, assume that a products organization has existing service interfaces to its Customer Relationship Management, Shipping and Financial applications. Now the organization desires to allow customers to enter orders from their mobile devices. An order needs to be recorded in the CRM application, the order then needs to be routed through the Shipping application, and finally, the Accounts Receivable application must be updated so that the customer is billed. Although the core services are already exposed, something needs to orchestrate the order of the service calls, check for errors and exceptions at each step, and ensure that the entire business transaction is completed.

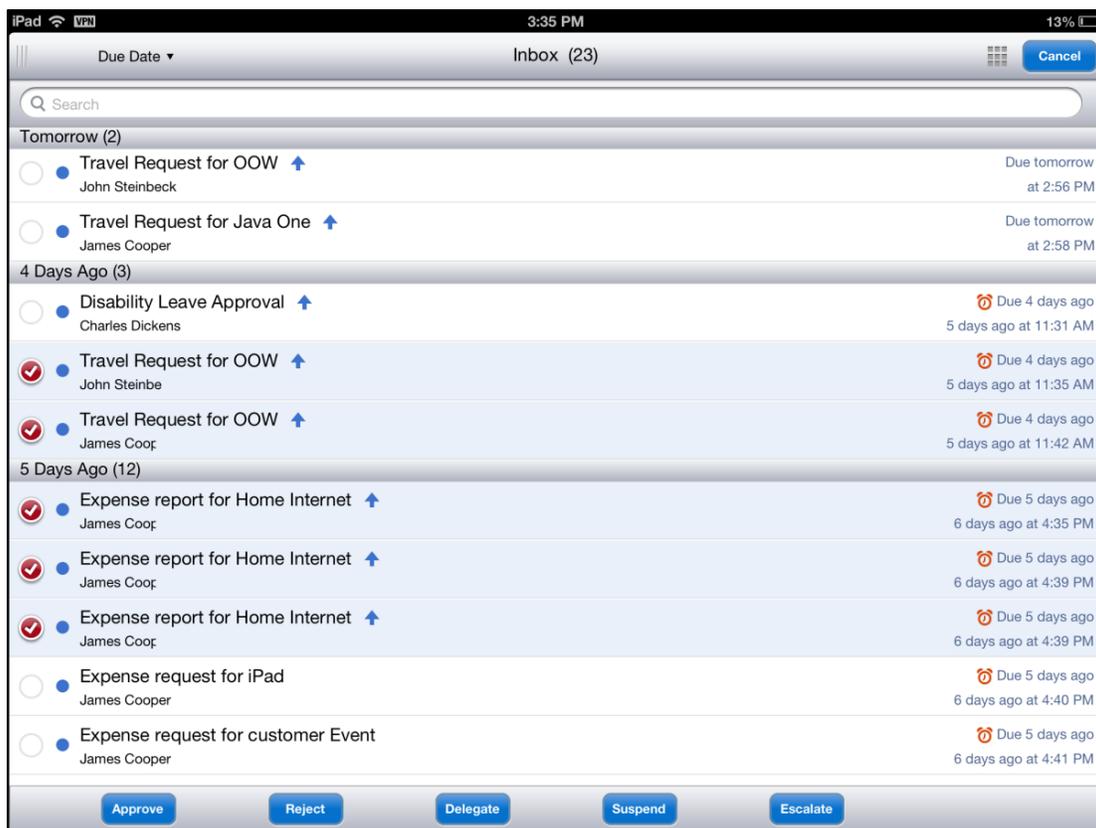
Orchestration across web services was a primary reason for the creation of the Business Process Execution Language (BPEL). It is an XML based markup language for composing a set of separate web services into an end to end process flow. In our example, BPEL can ensure that CRM, Shipping and Financial services are called in the correct order, and it can check for errors and exceptions along the way. BPEL allows for the composition of services into a new

application, and it is a major component of Oracle SOA Suite. Organizations can use Oracle SOA Suite as part of an SOA to compose new applications that are then exposed through Oracle Service Bus to mobile clients.

Business Process Management

Of course, not all business process interactions are application to application. In many situations, human workflow is necessary in order to accomplish a process. For example, expense reports must be reviewed by managers, people in different departments have tasks to do when a new employee is hired, and insurance applications may need to be routed amongst customer service agents, underwriters, and others. While there is still significant interaction with different IT systems to accomplish these processes, the amount of human workflow that is involved is enough to warrant using a tool optimized for these types of processes. That tool is Oracle Business Process Management, Oracle BPM.

In today's environment, workers expect to be able to interact with these process flows from mobile devices. Whether it's a manager sitting in a meeting with an iPad or a salesperson in the field with a smart phone, mobile users can participate in workflows that are being coordinated by Oracle BPM. The mobile user needs to be able to access her list of assigned tasks and work on them. Oracle BPM will soon offer a mobile task list app that will enable this functionality.



Deploy

Very few enterprise mobile apps for tablets and smart phones are completely self-contained on the device. These apps need to connect to application servers to take advantage of the vastly greater amount of information available at the enterprise level to not only deliver content, but to also process business transactions – e.g.: invoice approvals, order management. Ensuring scalability, performance and availability therefore adds to existing IT challenges. These challenges are magnified with B2C apps, where it is often difficult to predict the concurrent number of requests upfront.

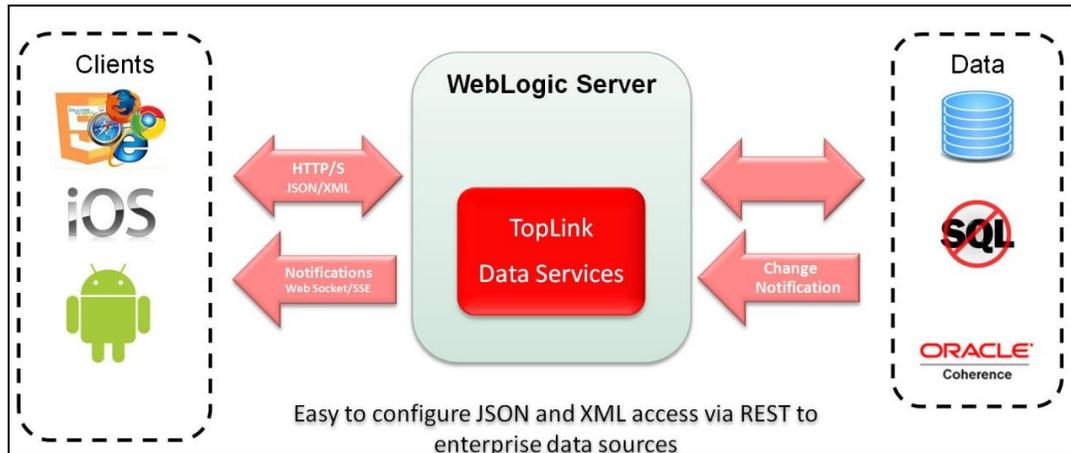
Oracle Mobile Platform offers a robust and enterprise grade deployment solution, via several features in the Oracle WebLogic Server.

Key among these features is support for HTML 5 and REST based web services.

A major standard in the HTML 5 specification is the WebSocket protocol. WebSockets provide a two-way, full-duplex communication over a single TCP connection between clients and servers. WebLogic Server supports the WebSocket Protocol, which allows both client and server to send data independently from the other.

Oracle WebLogic Server has supported the development and deployment of web services for years. In the past, the majority of the web services were built to utilize the SOAP protocol and to return data in an XML format. SOAP and XML work well for application to application communication. However, the size of XML documents and the extra processing power required to parse XML makes SOAP and XML a less than ideal choice for mobile application clients. A better alternative is to use Representational State Transfer (REST) as the protocol and JavaScript Object Notation (JSON) as the data format.

Oracle WebLogic Server also allows developers to build REST based web services through support for the JAX-RS specification. JAX-RS uses annotations to simplify the development of RESTful Web services. By simply adding annotations to your Web service, you can define the resources and the actions that can be performed on those resources. JAX-RS based services can also return data in the JSON format.



Further support for REST and JSON in WebLogic Server is provided by Oracle TopLink. TopLink is an object-relational mapping (ORM) and persistence framework for use in a Java environment. TopLink implements the Java Persistence API (JPA), provides support for REST based access to the JPA entities and for converting objects directly to and from JSON. Together, these features greatly ease the effort required to expose relational data in an organization's databases to mobile clients.

Secure

Secure the Device

Mobile devices need to blend seamlessly into the corporate computing landscape in order to preserve security without disrupting the workflow of the enterprise. Typically, apps running on mobile devices need to integrate with the enterprise-wide identity governance and access control infrastructure for security and compliance reasons.

Oracle Access Management Mobile and Social (OAMMS) is a single, integrated solution addressing both mobile computing and social networks security requirements in order to allow organizations to fully benefit from these disruptive technologies without risk. OAMMS secures mobile access to corporate resources by leveraging the services of Oracle Access Management via single sign-on (SSO) between browser-based and native mobile apps, strong and multi-factor authentication; device fingerprinting and device context based fine-grained authorization. In addition, the Mobile and Social solution also enables enterprises to securely leverage social identity for personalization and federated sign-on.

As organizations begin to deploy several apps for use on employee and customer devices, SSO can become an important feature. Mobile SSO allows a user to run multiple mobile apps on the same device without having to provide credentials for each application. The Oracle Mobile and Social Client SDK for iOS and Android provides the ability to create apps that participate in SSO.

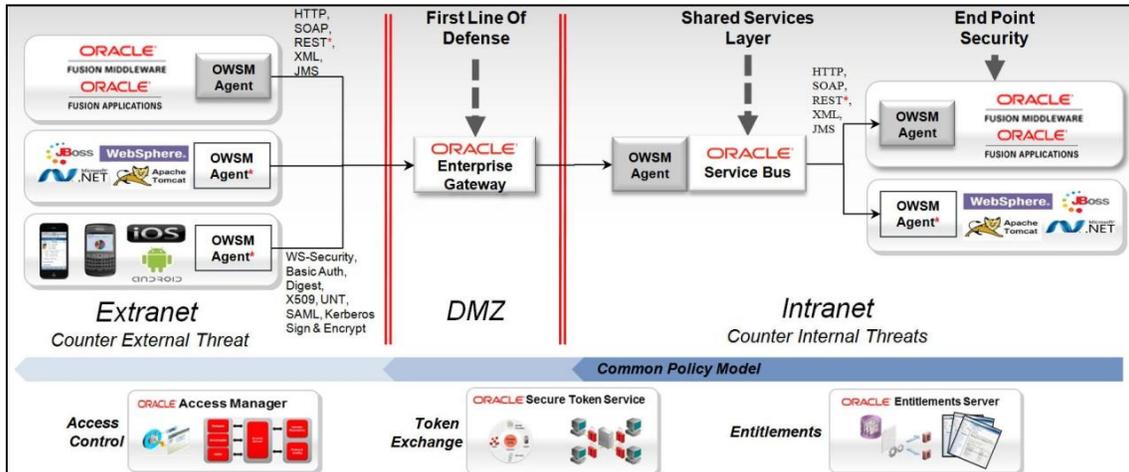
Mobile device loss and theft create a high security risk for users and companies, particularly when these devices are used to access corporate resources. OAMMS addresses this risk by providing a way to mark a device lost or stolen, and then implement specific policies that are enforced when a stolen device tries to access enterprise applications.

Additional challenges in mobile security have given rise to a whole new set of acronyms, such as MDM (Mobile Device Management) and MAM (Mobile Application Management). An MDM solution typically means that the IT department has the ability to control, encrypt data and enforce policies on the devices. MDM solutions work best in environments where the mobile device is provided by the organization. In a BYOD scenario, many users would balk at the idea of giving the IT department total control, including the ability to wipe all data, of a device they purchased. MAM takes the concepts of MDM and attempts to apply them just to the corporate applications. If an Oracle customer requires an MDM or MAM solution, Oracle has several partners with solutions in these areas.

Secure the App

Applications that will be exposed to mobile devices can place additional demands on IT in the area of security. It's perfectly reasonable to expect an organization's users to login to a VPN before accessing the organization's applications. However, logging into the corporate VPN is not feasible for external users (suppliers, partners) and hence the need to control access at

the DMZ layer to protect the APIs that have been exposed outside the firewall for mobile and other users.



Oracle API Gateway (OAG) is a standards-based, policy-driven, standalone software security solution that provides the first line of defense in Service Oriented Architecture (SOA) environments. Oracle API Gateway sits in the DMZ and intercepts requests for web services, whether the request comes from a mobile device or any other application. It can inspect the incoming payload for threats such as SQL Injection or XML Schema attacks, validate HTTP parameters, and provide protection against attacks such as cross site scripting or denial of service. Oracle API Gateway also provides features for Quality of Service monitoring, auditing and reporting.

Manage

Once the mobile apps are built, they can be distributed securely across the enterprise via the app store model. Apple and Google support this via the iOS Developer Enterprise Program and Google Play Private Channel. Oracle also partners with specific best-of-breed vendors such as MobileIron to deliver solutions in these areas.

While much attention is paid to the part of an application that runs on the device, this paper has clearly shown that much of what goes with a “mobile application” takes place behind the firewall. In most cases, the functionality on the device won’t work unless the back end services are reliable, available and scalable. As a result, monitoring and managing the back end services is critical. In keeping with the theme of extending existing IT assets to support mobile initiatives, Oracle focuses its management efforts on supporting the existing infrastructure.

Oracle Enterprise Manager provides a single console to manage these assets from a business and service perspective, including change and configuration management, patching, provisioning, testing, performance management, business transaction management and automatic tuning for these diverse environments.

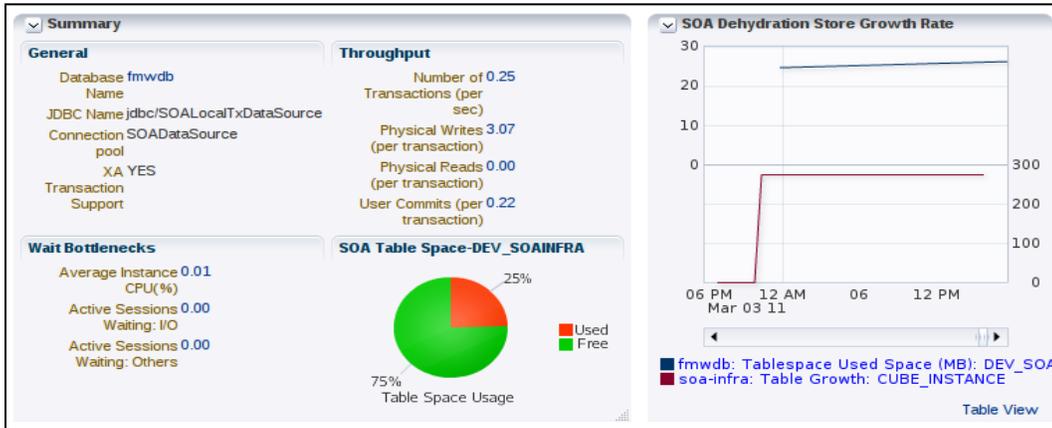
When the WebLogic Management Pack Enterprise Edition is used with Oracle Enterprise Manager, the following capabilities are available:

- Monitor and manage multiple WebLogic Domains and Servers centrally
- Obtain real-time, in-depth JVM diagnostics
- Analyze call paths and dependencies via graphical, architecture views
- Automatically discover and model dependencies between Java components, frameworks and web services.



If the deployment architecture includes Oracle SOA Suite or Oracle Service Bus, then the Enterprise Manager SOA Management Pack Enterprise Edition can:

- Monitor business transactions as they flow across tiers
- Monitor the performance of SOA implementation technologies such as Oracle SOA Suite and Oracle Service Bus
- Isolate and diagnose the root cause of SOA application performance problems



Execution

Performance

Top SOA SQL

SQL ID	DB Time (%)	Total DB Time (sec)	CPU (sec)	I/O Waits (sec)	Other Waits (sec)	Query
88v077cs94gak	100.00	5.00	0.00	0.00	5.00	call edn_dequeue...
4xvts5kvsf1w8	36.36	4.00	2.00	0.00	2.00	call edn_dequeue...
9kgasmbpp9mj6	14.29	2.00	2.00	0.00	0.00	delete from MEDIA...
cm5vu20ftnq1	20.00	2.00	2.00	0.00	0.00	select /*+ connect...
burvx480ynf57	33.33	1.00	1.00	0.00	0.00	SELECT 1 FROM ...

Mobile Order Management App for E-Business Suite

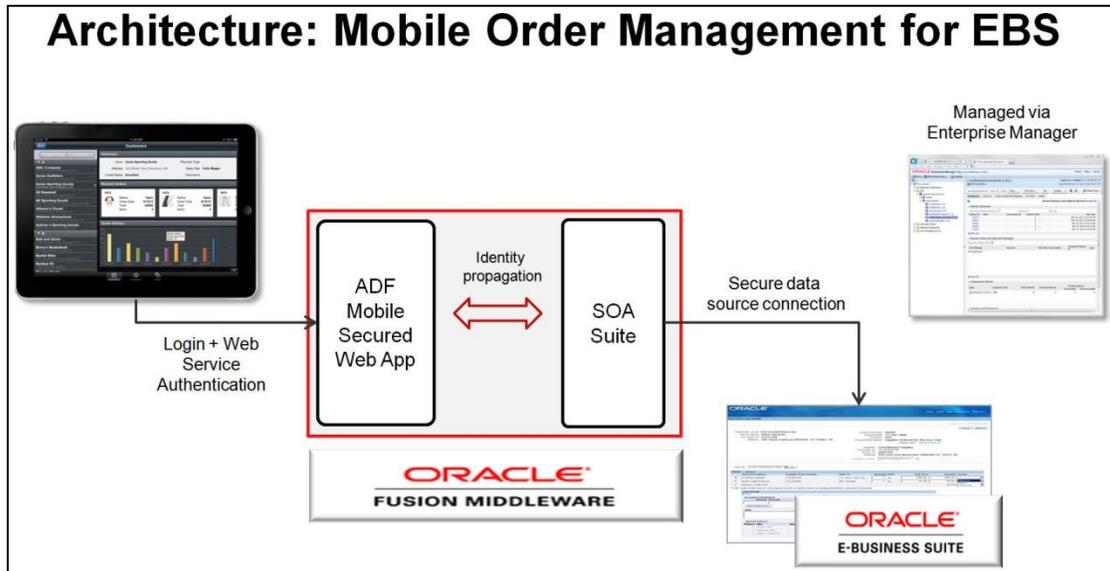
Mobile access to enterprise applications is fast becoming a standard part of corporate life. Such accesses increase organizational efficiency since mobile devices are readily at hand than their desktop counterparts. There are also a number of scenarios where the functionality delivered by desktop enterprise applications may not be sufficient for the mobile user. Among these are the need for a more modern user interface when accessed from a mobile device; business requirements such as approval/order management when the user is on the road; integration with native device capabilities such as GPS, camera, calendar and email contacts.

Let us consider a real world example that ties all of the previously mentioned mobility concepts together with the business requirements of today's mobile workforce. We have implemented an order management app that brings mobility to E-Business Suite. The app is built using ADF Mobile in the front end to render data retrieved via Oracle Fusion Middleware from the backend enterprise application (E-Business Suite).

The use case is order management for a sporting goods manufacturing company that provides its mobile sales force with real time access to the backend EBS data as well as business Key Performance Indicators (fulfillment accuracy, backorders and order status). Integration with native location services (GPS) provides the capability to launch Google Maps to automatically locate customers who are in the current vicinity of the user and also view Street View imagery. Transactional support (EBS order entry) from the device is also supported, depending on the user authorization level.



Solution Architecture



Solution Highlights

Showcase the use of Oracle Fusion Middleware to develop, connect, secure, deploy and manage a mobile app.

- Data (customer information, order history, inventory details) is retrieved from EBS via the SOA integration layer using the EBS Adapter. Oracle Service Bus (OSB) is used as a routing and conversion layer to convert from SOAP web-services to REST.
- EBS SDK for Java provides secure access to (EBS) data via built in authentication and authorization mechanisms. The SDK also provides for the reuse of the EBS user credentials (eliminating the need to separately provision users for the mobile app).
- Oracle Web Services Manager is used to secure the individual web service calls via a configurable policy management. The OSB Restful service is secured using HTTP authentication.
- ADF Mobile integration with native location services (GPS) provides the capability to launch Google Maps to automatically locate customers who are in the current vicinity of the user and also view Street View imagery.
- Transactional support (EBS order entry) from the device is also supported, depending on the user authorization level. This is achieved via a Role Based Access Control.
- Management and monitoring is via Oracle Enterprise Manager which provides visibility into process execution via an end-to-end graphical representation of the process flow. As SOA Services are invoked from ADF mobile, these instances are visible on the EM dashboard. Drill down capabilities provide a visual depiction of the process flow and audit trail for the SOA Composite.

Key Takeaways

The pressure on organizations to provide mobile access to their enterprise applications will increase as time goes on. Oracle Fusion Middleware provides a complete solution for developing, deploying, securing, connecting and managing mobile apps, without the need for additional mobile specific middleware layers. Using existing skill sets in Java, enterprise IT groups can now develop robust and functional mobile apps and deploy them to either iOS or Android devices, without changing a single line of code.

References

- 1 Symantec State of Mobile Computing Survey, January 2012
- 2 Aberdeen Group, February 2011
- 3 Vertic, The Year of the Enterprise Tablet, April 2012
- 4 Morgan Stanley Research, Internet Trends 2010

Additional Information

[Oracle AppAdvantage](#): Maximize the Value of Enterprise Applications with Oracle Fusion Middleware



Mobility for Oracle Applications using Fusion

Middleware

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