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Mobile Data Virtualization

From Managing Devices, to Apps, to Business Data through Mobile Data Access APIs

INTRODUCTION

Most enterprise mobile applications have one thing in common: they need to access business data. However, effectively accessing business data from mobile applications remains a major challenge for most organizations. While modern platforms, such as API gateways or enterprise mobile Backend-as-a-Service middleware, have taken the initial steps toward interoperating mobile applications with enterprise systems, the experiences are far from simple or scalable from the development standpoint. Accessing enterprise data from mobile apps should be as simple as querying a database from a web application, but sadly, today it is not.

This paper introduces the concept of mobile data virtualization as a foundational technology that can democratize the access of business data from mobile applications. We explain the different components of a mobile data virtualization solution, and the tangible value delivered to enterprises seeking to evolve their mobile operations management strategies from simply managing devices and applications to effectively managing the most precious asset of their mobile solutions: enterprise business data.

— Unlocking Your Business Data to Mobile

As enterprises continue adopting and building mobile business applications, access to business data becomes increasingly important in order to achieve development agility while enabling enterprise levels of security, management and operational readiness. From an enterprise mobile solution perspective, there are two main constituents that care deeply about streamlining access to business data:

Mobile App Developers: For mobile app developers, having simple, standard and open mechanisms to query data from enterprise business systems across different mobile app development platforms will drastically improve their productivity by removing the need to build the integration infrastructure required for each enterprise system.

DevOps: With enterprise mobile applications **regularly accessing business data, devops have become more conscious of enabling the right levels of security, access control and management capabilities related to those data assets.**

Types of Business Data

As organizations build more mobile apps, the need to establish the right architecture patterns and access control mechanisms for consuming mobile data from connected devices is fast becoming a top priority. From a conceptual standpoint, we can consider some of the following common types of business data:

- **Data in the device:** Mobile business apps often require offline communications with business data stored in the device. In this type of scenario, it's important to consider the encryption, privacy and other data protection mechanisms to guarantee the integrity of the data.

- **Real-time access to business data:** The simplest type of mobile integration with line of business data, this pattern is used by apps that need to access data from a line of business system in a requestresponse model. Mobile APIs based on RESTful patterns are the traditional way to architect this type of solution.

- **Event-based access to business data:** This pattern abstracts interactions on which enterprise systems push data in the form of events that are distributed to different mobile consumers. An event-based broker that mediates the communication between the line of business systems and the mobile apps is often required in this scenario.

- **Cloud-brokered access to business data:** The heterogeneous nature of business data access from mobile devices often requires a mobile middleware platform that brokers the integration between enterprise mobile apps and line of business systems. The elasticity and native scalability of cloud infrastructure makes them an ideal candidate to enable this type of mobile middleware.

- **Cloud-cached access to business data:** Complementing the previous point, enterprise mobile solutions often need continuous access to the same data sources, which becomes a performance bottleneck for most line of business systems that weren't designed for supporting mobile consumers. To address these scenarios, enterprises often rely on secured cloud cache mechanisms to store transient representations of the business data required by the enterprise mobile solutions.

These are some of the most common patterns we typically observe in enterprise mobile solutions. Establishing the right infrastructure and patterns to interact with mobile business data is an essential aspect of any modern enterprise mobile infrastructure.

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Why APIs Are An Enabler, Not the Endgame

Application programming interfaces (API) have become the default mechanism to interoperate mobile applications with enterprise systems. While APIs provide a foundation to enable the interoperability between mobile apps and enterprise systems, they should be seen as exactly that: an enabler. If you envision a large enterprise building dozens of mobile applications that interoperate with enterprise systems, the use of APIs still falls short of addressing some wellestablished challenges in the mobile app development lifecycle:

- **Every API is different:** The simple reality is that the API for accessing Oracle DB is going to look different from the API to access SharePoint or other backend system. Relying just on APIs means the onus falls on developers to constantly figure out how to interoperate with completely different APIs for performing essentially the same function: querying data.

- **Lack of data querying capabilities:** Typically, APIs are created to enable a specific business goal. Consequently, it's quite uncommon to encounter APIs in the enterprise that have been designed with extensive data querying capabilities typical of common mobile scenarios.

- **Multiple API calls to access a single data source:** In mobile scenarios, it is common to aggregate data from multiple systems to perform a specific function. For instance, a mobile sales enablement app might require access to the lead information stored in Siebel and Salesforce.com to retrieve the leads closer to a user location. By relying just on APIs, the mobile client application will be required to perform the distribute calls and aggregation logic, which is far from trivial in mobile scenarios.

- **Caching:** Most enterprise systems are not optimized for mobile users, which is why data level caching is such an important concept in mobile apps. However, standalone APIs do not provide caching capabilities by default; they can only enable such capabilities at the endpoint level, not at the data level.

- **Mobile client experience:** Despite the interoperable nature of most APIs, mobile developers still need to optimize the experience for a specific mobile client application platform, such as Sencha or Xamarin. In a large enterprise, most of these optimizations are rarely reused and known across different teams.

Based on some of the development challenges listed above, it is important to see APIs as an enabler for mobile data access, but they are not necessarily a complete solution. A truly streamlined experience to access business data from mobile applications requires a few additional building blocks, not the least of which is the basic notion of standards.

The Need for Standards

Let's go back to our original thesis that accessing business data from mobile applications should be as simple as querying data from a database. Well, for decades developers have been relying on standard protocols such as ODBC, JDBC, ADO.NET or OData to query data from databases. Those protocols are well understood and are supported by libraries on any major application development platform, making it extremely easy for developers to integrate with relational database systems. This standard experience drastically contrasts with current models to access business data from mobile applications, whereby developers have to leverage completely different and nonstandard APIs to access data from different systems.

As enterprise mobile app development becomes more mainstream, the need to leverage standard protocols to access business data from different enterprise systems will become more important to help abstract the underlying APIs from the mobile applications by leveraging a single and consistent interface.

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Introducing Mobile Data Virtualization

Mobile data virtualization is a relatively new concept in the enterprise mobile space. As a principle, mobile data virtualization abstracts access to business data from mobile applications by using standard protocols, mobile-first libraries and infrastructure. From a technology standpoint, a mobile data virtualization platform typically builds on top of a mobile API platform, such as enterprise mobile backend-as-a-service middleware (mBaaS), providing a new layer of abstraction that defines and exposes the different data sources used by mobile applications.

The important elements of a mobile data virtualization platform include the following: mobile data sources, mobile data access APIs and a mobile data catalog.

Mobile Data Sources

A mobile data source is a metadata definition of a data set relevant to a group of mobile applications. The definition of a mobile data source includes the underlying API used to access the data as well as the relevant parameters. An example of a mobile data source could be the customer invoice data stored in SAP or the leads information stored in Siebel and Salesforce.com. *Fig. A* illustrates that concept.

Data Access APIs

Once the mobile data source is defined, a mobile data virtualization platform exposes or virtualizes it using a standard data access protocol. Standards like the Open Data (OData) protocol are an ideal mechanism to expose the mobile data sources using an interoperable interface from mobile applications. By using OData, consumers can leverage an entire query language when accessing mobile data sources hosted in a mobile data virtualization platform.

SAP Orders	Salesforce.com Leads	Oracle Customers
SAP	**salesforce**	**ORACLE** DATABASE
Operation = "Get Orders" Parameters = {JSON Payload}	Operation = "Get Leads" Parameters = {JSON Payload}	Operation = "Get Leads" Parameters = {JSON Payload}

Fig. A - Mobile data sources are a metadata definition of a data set relevant to a group of mobile apps

Mobile Data Catalog

The mobile data catalog maintains a complete repository of all the mobile data sources used by mobile applications. This component of the mobile data virtualization platform is a perfect complement to well established concepts, such as the enterprise app store. In that sense, a mobile data catalog will allow devops to see and manage all the data sources used by a mobile application deployed in the enterprise app store.

Mobile Data Management

Once the data sources have been defined, the next logical step is to secure access to the data. A mobile data virtualization platform provides the necessary security and access control that enables the IT organization to secure access to the data used by the mobile application. You can think about this component as the equivalent to mobile device management, but at the mobile data level. Using this type of technology, devops can define and set mobile-first, context-aware policies that control access to the business data used by your mobile apps.

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The Mad Mobile Mobile Data Virtualization Platform

Mad Mobile recently launched its mobile data virtualization platform, an industry first for managing and securing mobile business data, at the data source level. Built leveraging Mad Mobile's proven enterprise mobile backend-as-a-service, this new addition to the Mad Mobile platform is a leap forward in evolving enterprise mobile operations management strategies from simply managing devices and applications to effectively managing the business data consumed by mobile apps.

The Mad Mobile Mobile Data Virtualization platform creates a virtual representation for all the enterprise data required for consumption by mobile applications. It does this by providing a virtual front-end to the backend systems presented as a common Data Catalog.

Enterprise IT and DevOps use the Data Catalog as a concise listing of all data items available from their systems for use by mobile app developers. From a single screen they define the following for each data source:

- Create new data source
- Name the data source
- Select which connector
- Select which operation
- Select which parameters
- Select whether to cache data or not
- Save the data source

Mad Mobile then exposes it using a consistent API via the Open Data protocol. From a single address, they can look at any app and see the corresponding pieces of data the app consumes.
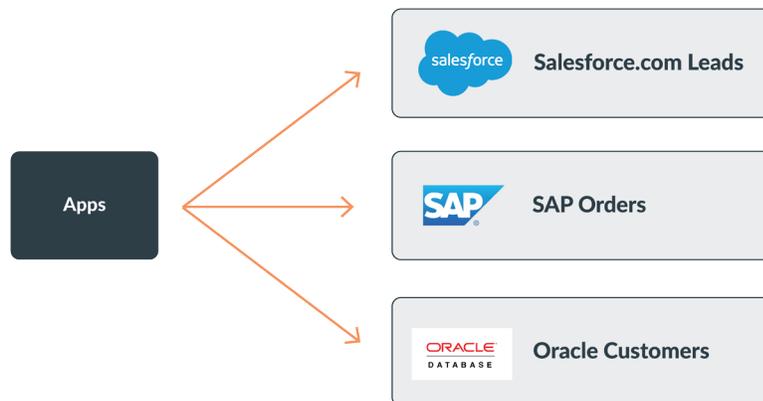

Fig. B - A mobile data catalog is used by DevOps to manage all the data sources used by a mobile app — deployed in the enterprise app store.

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Mobile Data Virtualization in Action

Mobile Data Virtualization eliminates much of the complexity of integrating with business systems for mobile app development. It does this by removing source system knowledge from underlying mobile data access needs. Instead of directly invoking APIs, which require developers to know where data resides and the syntax of each data source, developers can now use one syntax to invoke items from a common Data Catalog. Mobile data virtualization offers a consistent and standardized way to securely access enterprise data sources for mobile solutions, simplifying mobile app developers' work and IT management of mobile app infrastructure and security.

Fig D on page 13 shows the typical code mobile app developers have to write if they want to query all calendar list items on a SharePoint site using the Mad Mobile enterprise mobile app platform, before and after the mobile data virtualization layer is added.

MAD MOBILE

salesforce

SAP

YOUR DATACENTER

MOBILE APP

Fig. C - The KidoZen Mobile Data Virtualization platform creates a virtual representation for all the enterprise data required for consumption by mobile applications.

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Before mobile data virtualization, developers had to define how to access data on the client code and in the mobile app itself. All the complexity or definition of how to retrieve vacation information from SharePoint calendar items lived on the application, and users had to be given access to the application and query method used on the SharePoint service. If you wanted to modify the query, you had to update, retest, and redistribute the application to every user before it could take effect.

After mobile data virtualization, you simply define the data you want to access and then apply policies and rules to that specific set of data using a common Data Catalog. Developers now only need to add one normalized syntax to invoke SharePoint vacation information and calendar items from the Data Catalog. They no longer need to know what connector they are using, which piece of code the connector is using, whether the data being accessed is real-time or cached, or what security policies are associated with the data sources. And, changes to a data source only requires updating the catalog item once, compared to all the individual apps referencing the data.

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Mobile Data Virtualization Benefits

In addition to vastly simplifying data integration, mobile data virtualization brings new levels of security, management and access control capabilities to the data source level, eliminating the security risks inherent in direct API-level access.

- **Simplified data access:** access enterprise data through a Data Catalog so developers don't have to know which enterprise system the data resides in or what syntax the source system uses.

- **Data-level security:** bring unprecedented policy-level control over mobile app data access to the data source level, eliminating securit risks inherent in direct API-level access.

- **Simplified client code:** no need to distribute anything new or update client code if you want to modify any of the data source rules or policies.

- **Build common services:** create a business data catalog for common use and manage all the enterprise data sources relevant to your mobile apps using a consistent API.

- **Greater oversight:** Extend mobile operation management from devices, to apps, to data.

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What Does Mobile Data Virtualization Enable?

Once virtualized, DevOps can add policy management around enterprise mobile data, regardless of the apps consuming the information. Mad Mobile Mobile Data Management gives unprecedented control — including access, encryption and deletion — over data security and compliance throughout the mobile app usage cycle by allowing Devops to apply and enforce security and access control policies against the data consumed by mobile applications.

With just a few clicks, DevOps can exercise new levels of control — from global policy down to the data source — specifying which data sources get accessed by device type, status, user location or any other relevant factor. They can apply granular context-aware data policies to specific sets of data according to geo-location, device, application, network or mobile client. Action options can include denying access or requiring additional level of authentication and more. They can also apply policies to manage both data at-rest and data in-use.

For example, they can specify that dual-factor authorization is required for data requests originating outside of North America. They can refuse data access and wipe stored data from jail-broken iPhones. Or they can limit customer data access to specific roles, like the relevant salesperson — or to specific functions, like finance. And healthcare organizations can require a HIPAA compliance statement be displayed as well as prevent access from Windows phones or devices.
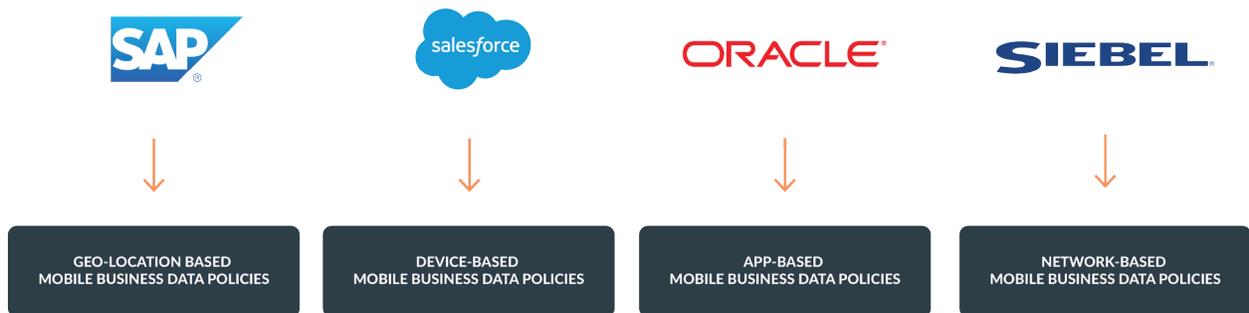

Fig. D - Mobile data virtualization lets you apply granular, context-aware data policies to specific sets of data according to geo-location, device, application, network or mobile client.