Coleridge’s Ancient Mariner, dying of thirst on the open ocean, famously cries, “Water, water everywhere / Nor any drop to drink.” Replace “water” with “data” and you have the cry of today’s mobile apps. Our world may be swimming in data, but little of it is optimized for mobile consumption.

Why? Simply put, the standards for middleware and backend data access that defined the web era don’t work for mobile. The mobile world brings different types and sources of data, different formats and payload sizes, different transaction volumes and usage profiles, and the end of connection persistence.

“Mobile,” as Forrester Research observes, “is pushing aging web architectures to the brink.”

The good news is that with the right architectural tier, one that delivers mobile-optimized APIs, an enterprise is positioned to make terrific innovation leaps – and at a pace their competitors can only envy.

How Mobile Broke the Three-tier World

In the days of web applications, we concerned ourselves primarily with connecting to systems inside the enterprise. This meant a relatively small number of backend sources, all behind the firewall. The original middleware solutions were designed for just this world, orchestrating data from a handful of enterprise systems, and rendering it to a powerful, plugged-in, big screen client device – the personal computer.

Mobile’s first challenge to the old web world is the expansion and diversification of data sources. Any mobile app worth its salt must orchestrate data not only from private enterprise systems, but also public clouds (e.g. Facebook, Twitter), corporate SaaS systems (e.g. Salesforce) and increasingly even smart appliances and the like drawn from the Internet of Things.

But the challenge doesn’t stop there. The regular, anywhere/anytime access habit of mobile users increases transaction volumes through apps, meaning that architectures must scale elastically. Furthermore, because mobile devices can’t count on an uninterrupted connection, the apps must continue to function when offline and gracefully synchronize to the backend when the connection is restored. As the following table shows, virtually every aspect of mobile app connectivity differs from the web.
These differences are too large to be bridged by the current three-tier standard.

**Mobile is pushing another tier into enterprise architectures, one designed to orchestrate data for the new app types, just as previous generations of middleware did for web applications.**

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### Criteria for the New Mobile Tier

There are five requirements for a good mobile architectural tier:

1. **Elastic Scalability**

   Mobility guarantees two things:
   - Anywhere, anytime demand for data and services which changes traditional usage profiles and drives up transaction volumes;
   - Users who are quick to issue the delete penalty to any app with performance hiccups.

   The first point speaks to the way mobile has changed user access patterns. Data transactions are no longer chiefly a 9-to-5,
desktop-bound activity. Users now expect full data access from the
grocery line, the airport terminal, the in-laws Thanksgiving table, and
so on. This changes usage profiles dramatically, in both transaction
volume and time of access.

The second point goes to the new primacy of the user. Mobile has
put a premium on effective, responsive app experiences. Too much
wait time and the user simply deletes the app in favor of a better one.
Given these new mobile realities, an architecture designed for elastic
scale is critical.

2. PREBUILT, MOBILE-OPTIMIZED APIS

Mobile's emphasis on user experience makes good client design and
development paramount, which means developers want maximum
simplicity for the server-side “plumbing” required to access data
and pipe it in the right format to the app. This is where application
programming interfaces – APIs – come in.

APIs are the lifeblood of mobility They give developers the simplified
access to the data and services needed to build amazing apps. In fact,
good mobile APIs act as a spur to innovation. Think of them as Lego
blocks: the better and more varied the collection of blocks you make
available, the better and more creative the objects people build.

An enterprise that makes mobile-optimized APIs widely to
developers is positioned to make terrific innovation leaps, and at a
pace that would never be achievable by top-down planning alone.

What are examples of the kinds of APIs the new mobile tier might
offer? For starters, there are the commonly required capabilities of
most mobile apps, such as the ability to manage push notifications
and geo-location services, or readily access a NoSQL database for
on-demand storage of app data, or seamlessly integrate with social
media services.

Beyond these core building blocks, the tier would also ideally provide
ready access to traditional corporate data stores such as Oracle, SAP,
Microsoft and the like. This access, or mobile “connectors,” would provide
the ability first to authenticate with these stores, and then perform
basic functions with their data: create, retrieve, update and delete.
3. A ROBUST CAPABILITY FOR BUILDING CUSTOM APIS

Of course not every API can be anticipated in advance. So the mobile tier should also provide developers an easy way to create the ones they need. An effective mechanism for building mobile APIs must include:

- **Orchestration**: the ability to leverage data from multiple data sources, all within a single mobile-optimized API.
- **Optimization**: boiling down the data set to its essential payload size for consumption by a mobile app. For instance, if a traditional web API returns 20 fields, the mobile variant might want only five.
- **Transformation**: converting the data format from legacy styles such as XML or SOAP to a mobile-optimized format such as JSON.

These API creation capabilities, coupled with ready access to enterprise systems as described above, ensure developers and app teams don’t bog down in laborious integration work.

4. SEAMLESS SYNCHRONIZATION

Mobile devices can’t count on a steady connection. In the event of a disconnect, the app should continue to function offline and synchronize when reconnected, without requiring user intervention or even awareness.

5. SECURITY & GOVERNANCE

Plainly this new tier must fit within the enterprise’s standing requirements for governance and security, as well as address newer, mobile-specific concerns such as the treatment of data both at-rest and in-transit.

Well, yes and no. Mobile demands a new tier, just as the web did. That much is clear. Attempts to get around this tier – for example via direct client-to-source connections, or web services, or MEAPs – all come up short. (See the appendix to this whitepaper for the reasons why.) But the good news is you don’t have to build this tier yourself. We’ve already done it.
The Appcelerator Platform includes a true, enterprise mobile backend-as-a-service (MBaaS) for a secure, elastically scalable cloud-based tier to mobilize any data source, public or enterprise.

The Appcelerator Platform's MBaaS delivers:

- The means to extend your enterprise architecture for the demands of mobile – seamlessly. No disruption to current systems and no rip-and-replace.
- An entirely open and extensible framework built on Node.js, with no proprietary technologies or threat of lock-in.
- Flexible deployment models including a multi-tenant public cloud or a virtual private cloud (VPC).
APPCELERATOR PLATFORM : MBAAS : ENTERPRISE CONNECTORS

With prebuilt, mobile-optimized data connectors for the most popular enterprise applications, the Platform delivers ready-to-use integration for mobile apps. This includes support for SAP, Oracle, Salesforce.com, Microsoft SharePoint and Microsoft Dynamics, as well as the ability to quickly create new enterprise integrations using the Platform’s API SDK.

**BENEFITS**
- Readily mobilize data from corporate enterprise systems
- Build new, mobile-optimized APIs with minimal coding

APPCELERATOR PLATFORM : MBAAS : PUBLIC CONNECTORS

As mentioned earlier, transformative mobile apps need access to a variety of data sources, both inside and outside the enterprise. In addition to enterprise connectors, the Platform’s MBaaS includes out-of-the-box mobile integration to a vast array of popular public apps and capabilities, including LinkedIn, Yammer, PayPal, DropBox, Google Calendar, Facebook, Twitter, and many others.

**BENEFITS**
- Eliminate the complexity of managing multiple APIs, lowering the cost of development and maintenance
- Orchestrate data from heterogeneous sources, both public and enterprise, for richer, more transformative app experiences

APPCELERATOR PLATFORM : MBAAS : CORE CAPABILITIES

At the heart of the Platform’s MBaaS is a suite of capabilities crucial to the new architectural tier driven by mobile. These include an API SDK for rapid development of custom APIs to mobilize any backend data source, as well as:

- Data orchestration to combine and normalize data from multiple sources
- Data optimization that delivers data payload sizes optimized for mobile
- Data transformation to convert legacy formats (e.g. XML) to mobile formats (e.g. JSON)
- Synchronization and security services for disconnected (offline) data transactions
Beyond this, there is a robust set of twenty out-of-the-box services needed for mobile apps, including push notification, geo-location services, photo management, and object storage.

The Platform’s MBaaS is built entirely on Node.js, an open and extensible framework that enables the use of tens of thousands of publicly available Node Packaged Modules (NPMs). This architecture also helps us to deliver unparalleled scalability: today our MBaaS handles more than 1.5 billion cloud API calls per month! And because our app development environment also leverages JavaScript, the Appcelerator Platform ensures developers can use a single, simple, powerful language for both front and backend development work.

**ENTERPRISE-GRADE SECURITY**

Our MBaaS security begins with comprehensive use of SSL to encrypt all data in-motion. This includes from app to MBaaS, as well as MBaaS to enterprise data. As a hosted mobile tier, the Platform’s MBaaS also ensures fully encrypted data storage, as well as a dedicated VPN for corporate system access when deployed as a virtual private cloud.

Most mobile discussions to-date have focused on the explosion in devices and operating systems, and the challenge of building great apps for a multi-platform world. It’s a key challenge, but not the only one. As described above, mobile is stressing the way traditional web architectures feed data to applications, as well as their mechanisms for performance and scale – the technical equivalent of a bridge collapse waiting to happen.

With the Appcelerator Platform, you not only can build great native apps at the speed of web, but also mobilize any data source, public or enterprise. After all, any app is only as good as its data.
The challenges of mobile connection have brought a rush of new (or repurposed) solution capabilities to fill the gap: MEAPs, API Management, MBaaS, new kinds of web services... But how do these things stack up against one another?

There are essentially four approaches to mobilizing data:

- Client-to-source (direct): Connecting the app via a web services layer
- Mobile Enterprise Application Platforms (MEAPs): on-premise solution for enterprise data access
- API management (mobile APIs specifically): API cataloging and administration services
- Mobile Backend-as-a-Service (MBaaS): mobile-specific data exposure and services. We make a distinction here between “traditional” MBaaS – which focus primarily on solving B2C use cases and connecting to public systems – and enterprise MBaaS, which include the capabilities of traditional MBaaS alongside enterprise connection and the security hardening (e.g. private deployment options) required by most companies.

The following table summarizes the pros and cons of each.

<table>
<thead>
<tr>
<th>APPROACH</th>
<th>SAMPLE VENDORS</th>
<th>GOOD FOR</th>
<th>NOT SO GOOD FOR</th>
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</thead>
<tbody>
<tr>
<td>CLIENT-TO-SOURCE (via Web Services)</td>
<td>N/A</td>
<td>Mobile web apps</td>
<td>Apps requiring data beyond what is exposed on the web site</td>
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<td></td>
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<td>Content-driven apps (e.g. newspaper, magazines, music)</td>
<td>Offline data access</td>
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<td>Apps that collect data from the mobile device/user</td>
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<td></td>
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<td>Response time and performance</td>
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<td>MEAPS</td>
<td>Antenna (now Pegasystems)</td>
<td>Connecting to enterprise data sources behind the firewall</td>
<td>Connecting to data sources that are either public or outside the enterprise firewall</td>
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<td></td>
<td>Verivio</td>
<td>Secure data source exposure in a consistent, managed way</td>
<td>Rapid availability of new device or cloud capabilities</td>
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<td></td>
<td>IBM</td>
<td>Alignment with existing enterprise technology’s (integrated MAM, web or desktop app integration, etc.)</td>
<td>Volume use, scalability</td>
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<tr>
<td></td>
<td>Kony</td>
<td></td>
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</tr>
<tr>
<td>APPROACH</td>
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<tr>
<td>API MANAGEMENT</td>
<td>Apigee</td>
<td>Managing complex catalogs of APIs for web and mobile app data usage: administer internal and external developer access to APIs; list and document complex APIs in a single place</td>
<td>Connecting to data sources that do not have pre-built APIs or a standardized method of data exposure</td>
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<tr>
<td></td>
<td>Layer7 (now CA)</td>
<td>Create and maintain consistent APIs schema and methods, regardless of endpoint</td>
<td>Services exposure: storage, locations, users</td>
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<td></td>
<td>Mashery (now Intel)</td>
<td></td>
<td>Data transformation and orchestration for mobile</td>
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<td></td>
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<td>Data security</td>
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<tr>
<td>“TRADITIONAL” MBAAS</td>
<td>Parse (now Facebook)</td>
<td>Rapid integration of services into mobile apps: storage, user admin, social integrations (Facebook, Twitter, etc.)</td>
<td>Custom services or connector development</td>
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<td></td>
<td>StackMob (now PayPal)</td>
<td>Cost effective for specific app functions</td>
<td>Accessing enterprise data sources (SAP, Oracle, Salesforce.com, etc.)</td>
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<td></td>
<td>FeedHenry</td>
<td>Developer prototypes and POCs</td>
<td>Highly secure apps</td>
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<td>Consumer apps that don’t require access to enterprise data</td>
<td>Predictable costs for app support</td>
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<tr>
<td>ENTERPRISE MBAAS</td>
<td>Appcelerator</td>
<td>Elastic scalability: users expect anytime access and superior performance</td>
<td>Budget-constrained organizations</td>
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<td></td>
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<td>Flexible deployment: public is not enough. Security needs may warrant VPC or Private options.</td>
<td>Enterprises that want to buy an off the shelf application, with zero customization</td>
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<td>Turn-key APIs: common APIs (e.g., Push, Key-Value Store) + pre-built data connectors.</td>
<td>Enterprises building a single app</td>
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<td>Easy custom APIs: orchestrate multiple data sources. Optimize and transform payloads.</td>
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<td>Seamless sync and other common services: offline/online sync, without user intervention</td>
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In a scorecard view, these approaches match up roughly as follows:

<table>
<thead>
<tr>
<th></th>
<th>WEB SERVICES</th>
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<th>API MGMT.</th>
<th>MBaaS</th>
<th>ENTERPRISE MBaaS</th>
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