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Enterprise Mobility & Connected Devices

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HTML5 Enterprise Mobility:
Strategy, Challenges and Solutions

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Executive Summary

The myriad options available to enterprise decision makers looking to mobilize B2B, B2E or B2C workflows and experiences is challenging and introduces significant complexity to the equation. Moreover, developing mobile applications for the enterprise is vastly more challenging than consumer app development in that issues such as off-line support and synchronization, uncompromising seamless backend integration and the ability to support large datasets are all critical requirements.

Research conducted by VDC confirms that enterprise mobile developers use multiple mobile development tools and platforms within their organizations, a trend we do not see changing. In addition the use of HTML5 for enterprise mobile application development continues to increase. The limitations, however, of HTML5 as a tool to develop robust cross-platform mobile enterprise applications is also very clear, especially when addressing some of the more critical development requirements. According to our research, these limitations were most acute with requirements such as managing large datasets, enabling robust security and application responsiveness. In addition, backend integration posed an especially acute challenge for HTML5 designed mobile enterprise applications, requiring substantial coding to support.

Adding to these complexities are the economic realities of enterprise mobility ROI, cost of development, and time to market pressures. Moreover, with developments like BYOD, the need for developing mobile applications that can port across a multitude of mobile device form factors and OS versions is only heightened. What enterprise mobile developers are fundamentally looking for is the ability to leverage the skills and the tools they have honed and they are especially averse towards locked or proprietary platforms that offer little flexibility. In these scenarios, the appeal of HTML5 to address efficient cross platform development requirements is obvious

Mobile Development Challenges

Enterprise mobile software development challenges are extensive. Moreover, these challenges are not unique to a particular type or size of organization, but can be seen industry-wide. From development economics and platform fragmentation, to access to capable mobile software developers, enterprises are looking for solutions that enable more efficient and agile development. Among the most prominent challenges are:

- **Fragmentation of mobile development strategy and technology**. This spans both mobile application development and mobile OS platform fragmentation. Enterprises are building multiple mobile apps with partial strategies at best. Furthermore, the constant mobile platform change adds further friction. Add to that the need to support BYOD and the diversity of development tools and platforms typically used within an organization and the challenges only multiply.
- **Balancing mobile application quality versus time-to-market and time-to-value**. The time-to-market and time-to-value pressures facing mobile enterprise application development are very real. As a consequence, mobile applications are being released with relatively little testing. Another emerging challenge is that traditional web developers are jumping into mobile development without acknowledging the inherent usage pattern differences between the two. Further, many of these developers lack the skills to fully support some of the more complex Objective C and Java resources required for mobile development. This is surfacing in the increasing proportion of time mobile developers are spending on problem resolution. According to our research, 47% of mobile developers today spend at least 50% of their time on problem resolution.
- **Mobilizing existing business systems and processes**. Many mobile enterprise applications being developed lack any real connection to existing business processes and, thus, have limited value. Most enterprise applications are not mobile enabled and very few provide reliable APIs or services to build new mobile user interfaces. Integrating mobile enterprise applications with back end or legacy systems is a significant challenge in enterprise mobility.
- **Managing multiple apps across multiple devices.** Managing mobile platform iterations and the constant form factor evolution creates additional design and especially life cycle management complexities. In addition, issues managing the deployment and control of mobile applications are becoming more prevalent, as organizations look for efficient ways to distribute, provision and support apps.
- **Enterprise apps have unique functional requirements**. Issues such as offline support, (incremental) data synchronization and security are critical requirements when it comes to enterprise mobile apps, especially in a line of business context. Minimizing or overlooking these can have direct implications on the quality, usability, and user adoption of the application that ultimately impacts the return on investment.

Addressing these challenges requires mobile first and enterprise-level design planning from the start. Mobile development strategies will also require the flexibility and openness to leverage any standard tools and must also enable seamless backend integration.
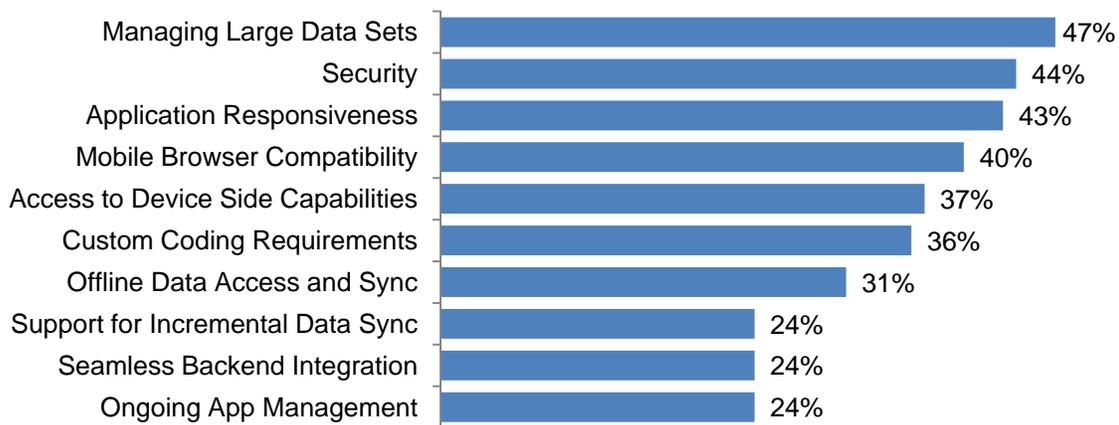
Enterprise HTML5 Use Increasing…However, Serious Challenges Remain

HTML5/JavaScript designed mobile applications have the potential to reach a broad audience, but there are very real functional limitations when used for enterprise mobile requirements. According to our research, **the most critical challenges include supporting large datasets, application responsiveness and security.** Additional issues encompass the ability to support offline capabilities, access to device-side functionality and ability to efficiently integrate with backend systems. While these are very real issues, tools and frameworks are emerging that bridge many of these limitations and are increasingly being adopted by enterprise mobile developers. According to our research, approximately **one in five mobile enterprise developers claim that HTML5 web apps are their primary approach to application development.**

A critical development advancing the viability of HTML5 cross platform development in the enterprise has been the introduction of standard protocols such as Apache Cordova (PhoneGap). These protocols provide developers a way to access native code from JavaScript and the resulting hybrid or wrapped applications bridge both native and HTML5 development paradigms. More specifically, frameworks like PhoneGap address the issue of using the same JavaScript in hybrid apps on different mobile operating systems. The ability to add native code plug-ins addresses the need to access device side capabilities such as the camera or the accelerometer. While these frameworks can improve development timeframes significantly, they also have limitations. For example, while a framework can automate displaying data and provide controls, developers will still need to write code to provide data to these controls – shifting the development challenges to back-end integration.

> **The HTML5 specification** was finalized at the end of 2012, meaning that developers have a 'stable' target to write applications for. Before the specification makes it to recommendation in 2014, the W3C will be focusing on interoperability and performance. Regardless, using HTML5 and JavaScript and CSS, developers have the potential to create rich web applications that are capable of running on any specification compliant device. According to VDC's Research, the use of HTML5 among enterprise mobile developers is growing and now one in five claim it as their primary approach to mobile development.

Exhibit 1: HTML5 Shortcomings for Mobile Enterprise Development

Shortcoming	Percentage
Managing Large Data Sets	47%
Security	44%
Application Responsiveness	43%
Mobile Browser Compatibility	40%
Access to Device Side Capabilities	37%
Custom Coding Requirements	36%
Offline Data Access and Sync	31%
Support for Incremental Data Sync	24%
Seamless Backend Integration	24%
Ongoing App Management	24%

(Source: 166 Enterprise Mobile Developers surveyed July 2013)

Key issues and considerations regarding the shortcomings of HTML5 for enterprise mobile development according to mobile developers include:

- **Managing large datasets**. As enterprise mobile applications become more sophisticated, the need to manage large datasets effectively is a growing requirement. According to our research 89% of developers indicated that their enterprise mobile applications supported large datasets frequently or occasionally. These developers identified "managing large datasets" as the single greatest shortcoming of HTML5 for mobile applications; ahead of security and application responsiveness.

- **Security vulnerabilities**. The growing popularity of HTML5 enterprise mobile applications will drive an increase in security issues. The compatibility of HTML5 across a wide range of mobile devices creates significant challenges for

securing enterprise data across differences in mobile browsers, operating systems, mobile databases, and encryption capabilities of each device. HTML5 vulnerabilities range from clickjacking issues to cross–origin resource sharing (CORS) and HTML5's unique geo-location and privacy issues. Some of the more critical requirements for skilled developers writing HTML5 enterprise mobile applications will include security and encryption management of local storage, addressing cross-origin resource sharing (which defines which data applications can interact with) and the impact of WebSockets on the effectiveness of existing network security solutions.

- **Backend integration and offline functionality**. The hidden risks associated with developing mobile HTML5 applications are far ranging and include the ability to integrate with behind the firewall legacy applications connectors, and addressing offline synchronization capabilities among others. Enterprise mobile apps often require complex data transactions integrated across multiple backend data sources. Although HTML5 provides a compelling solution for the front-end of enterprise apps, addressing these enterprise back-end challenges requires custom coding.
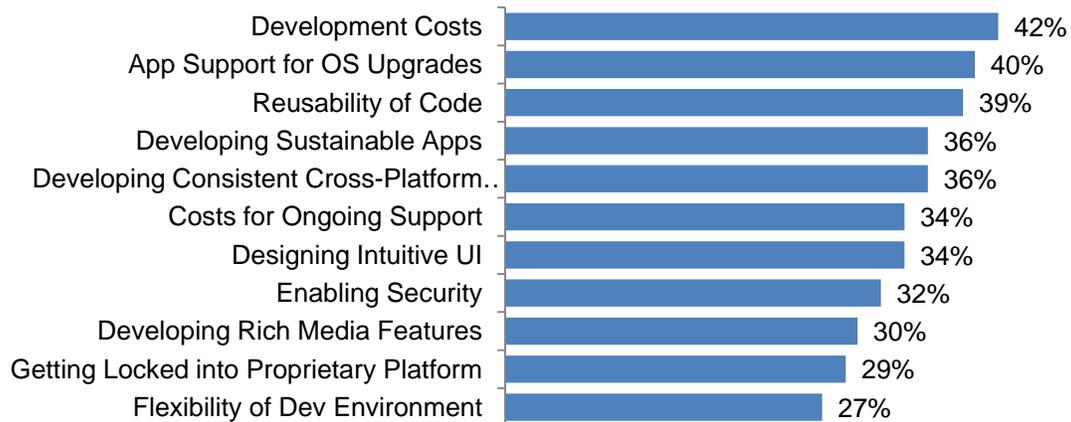
Front-End and Back-End Mobile Development: Two Different Animals

Whether native, hybrid or HTML5 web-apps, the number of mobile design and development tools available to developers continues to expand. Although mobile development within an enterprise is still an evolving competency – with access to skilled mobile developers a consistent challenge – the barriers to entry are gradually coming down. However, skill sets required for front-end and back-end development are fundamentally different. Providing developers with additional resources to support backend integration is a necessary yet often overlooked requirement.

Front-End Challenges

Some front-end challenges are common to overall application development including effective management of development cost, managing OS upgrades, and developing consistent application experiences across multiple mobile platforms. The top concerns cited by mobile developers span:

- **Code reuse**. To address time to market and cost of development pressures, developers are looking to reuse existing code whenever possible. However, enterprise mobile applications tend to have stricter demands when compared to consumer apps. Opportunities exist to reuse code for common tasks; however, customization is still required to meet specific enterprise application needs. Another challenge preventing greater code reuse is the accelerating pace of change among mobile platforms.

- **Access to skilled developers**. Developing mobile applications requires skillsets that include more complex Objective C and Java resources that most web developers are not as familiar with. While HTML5 and JavaScript bridge some of the gap, what will be critical are solutions that permit developers to build mobile apps using the technologies and tools that they are familiar with.

- **Tool flexibility**. What is very clear today is that mobile software developers are leveraging multiple approaches and tools to support their development initiatives. In fact mobile developers support an average of 2.5 development tools or approaches within their organization. Almost eight in ten developers confirm that they are building mobile applications for more than one mobile platform. As developers gain more and more choices in the tools that they use, that also adds significant complexity to the process, especially around mobile application lifecycle management. However, creating restrictions on tool use and leading developers to adopt a monolithic platform does not address the underlying needs or simplify the process.

- **Application sustainability and lifecycle management**. Mobile enterprise applications are often developed without clear foresight and lacking alignment with existing IT business processes to design, build, test and maintain apps. In addition, consumerization of enterprise mobility has created the expectation that apps will be updated frequently. Beyond the initial development and deployment, enterprises need to consider how their development approaches and infrastructure will support ongoing improvements and maintenance throughout the lifecycle of apps. For example, mobile application testing can be a substantially complex undertaking as subtle changes such as switching from one carrier network to another may have a profound impact on how a device operates.
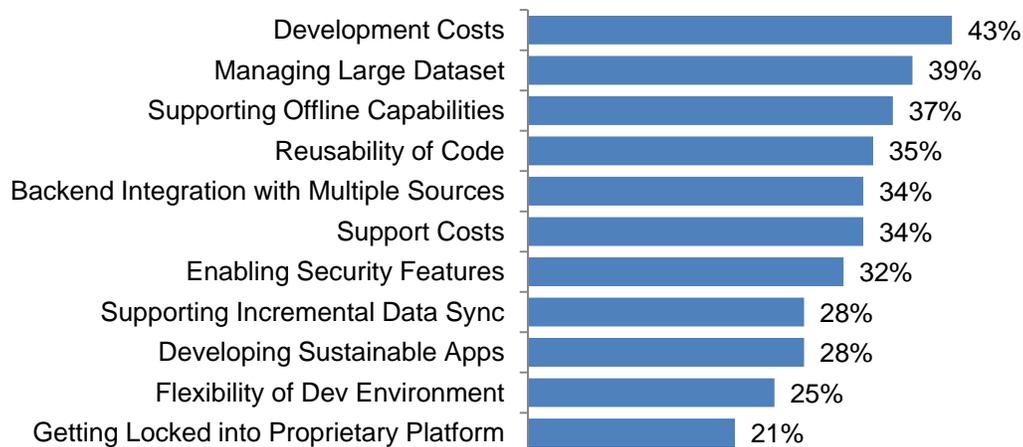
Exhibit 2: Front-end Mobile Development Challenges

Challenge	%
Development Costs	42%
App Support for OS Upgrades	40%
Reusability of Code	39%
Developing Sustainable Apps	36%
Developing Consistent Cross-Platform...	36%
Costs for Ongoing Support	34%
Designing Intuitive UI	34%
Enabling Security	32%
Developing Rich Media Features	30%
Getting Locked into Proprietary Platform	29%
Flexibility of Dev Environment	27%

(Source: 166 Enterprise Mobile Developers surveyed July 2013)

Back-End Challenges

Supporting enterprise developers supporting backend integration with capabilities such as identity management, offline storage, managing large datasets, integration with enterprise systems, messaging and others clearly represents a major requirement moving forward.

Currently, the biggest challenge for enterprise mobile applications is backend integration. What is similarly clear is that while this represents a critically important aspect of mobile development, one does not want developers spending the bulk of their time supporting these requirements. Moreover, the skill sets required for backend integration are substantially different than those required for mobile development. Currently, backend integration accounts for approximately 30% of a typical mobile initiative according to VDC's research. Moreover, mobile developers are further burdened by problem resolution with 47% of developers spending at least 50% of their time on this task.

Providing developers with a platform or approach that simplifies backend integration of mobile solutions will enable developers to focus more of their time on critical value adding tasks. Another critical challenge that more effective backend integration platforms address is application scalability. Often overlooked by developers, the need for effective application scalability emerges as the applications become more popular and widely adopted. A key function will be aligning the lifecycles of backend systems with which the mobile enterprise applications interface, especially in the context of the proliferation of APIs.

Exhibit 3: Backend Mobile Development Challenges

Challenge	%
Development Costs	43%
Managing Large Dataset	39%
Supporting Offline Capabilities	37%
Reusability of Code	35%
Backend Integration with Multiple Sources	34%
Support Costs	34%
Enabling Security Features	32%
Supporting Incremental Data Sync	28%
Developing Sustainable Apps	28%
Flexibility of Dev Environment	25%
Getting Locked into Proprietary Platform	21%

(Source: 166 Enterprise Mobile Developers surveyed July 2013)

According to our research, developers validated many of the critical back-end integration concerns and requirements for mobile enterprise applications. Among the most critical are:

- **Offline support**. According to our research, 89% of developers identified offline support as a critical requirement for the mobile enterprise applications they are developing. A synchronization strategy that incorporates incremental synchronization absolutely needs to be part of any enterprise mobile development initiative, especially for line of business mobile applications. Developers identified "supporting offline capabilities" as the third most critical backend development challenge. Critical is planning for robustness against limited connectivity and low bandwidth scenarios.

Exhibit 4: Offline Support Requirements
How Critical is Offline Support for Enterprise Mobile Apps?

11%

25%

64%

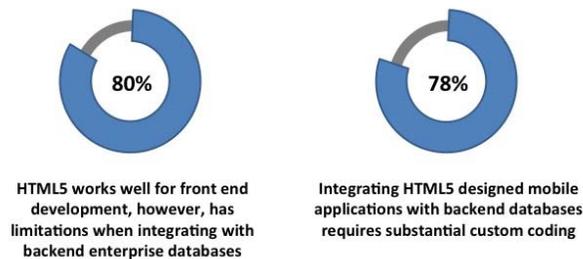■ Not Critical ■ Somewhat Critical ■ Extremely Critical
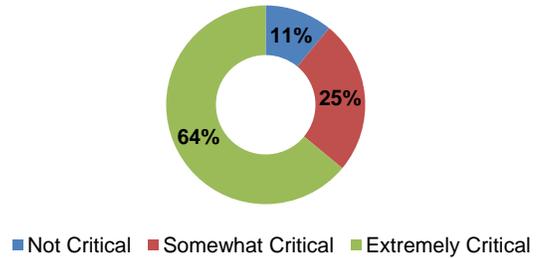
- **Managing Large Datasets and Integrating with Multiple Backend Datasets**. Almost nine in ten developers cited that their mobile enterprise applications either occasionally or frequently support large datasets, making this a critical capability when developing enterprise mobile applications. Another requirement and potential development challenge lies in the integration with multiple backend datasets or applications. The complexities and challenges scale rapidly with the number of backend databases with which the application interfaces. According to our research, almost eight in ten developers indicated that their applications are tied to two or more backend datasets.

- **Code reusability**. A frequent concern cited by mobile enterprise developers is that as the pace of platform development and change accelerates, code reuse is becoming a greater issue. The challenge becomes especially acute when having to design the UI and backend interfaces for a large data set.

- **HTML5 Coding Challenges**. One of the challenges with HTML5 when developing enterprise mobile applications clearly lies in the nuances between front-end development supporting the user interface and user experience and the requirements associated with backend integration. Developers agree that while HTML5 and frameworks such as PhoneGap are effective for front end development, the limitations when integrating with backend databases is substantial. Moreover, the need for custom coding is an unexpected reality when leveraging HTML5 for backend integration. These challenges portend the need for a more standardized approach to backend integration.

Exhibit 5: HTML5 Limitations
(Source: 166 Enterprise Mobile Developers surveyed July 2013)

% Mobile Enterprise Developers Agree…

80%

HTML5 works well for front end development, however, has limitations when integrating with backend enterprise databases

78%

Integrating HTML5 designed mobile applications with backend databases requires substantial custom coding

Currently, backend integration accounts for approximately 30% of a typical mobile initiative according to VDC's research. Moreover, mobile developers are further burdened by problem resolution with 47% of developers spending at least 50% of their time on this task.

Enterprise Mobile Development: Flexibility, Functionality and Efficiency

Enterprise mobility investment fundamentals are very strong as organizations respond to the need to provide access to critical enterprise content and applications to their growing mobile workforce. However, developing successful mobile enterprise applications is challenging especially in today's realities of BYOD and a multi-platform mobility. Recognizing the time to market and time to value pressures associated with many enterprise mobile projects, developers are thirsty for solutions that create greater efficiencies. This means enabling frontend developers with the tools and flexibility required to create rich and immersive user experiences and backend developers with robust backend integration across multiple platforms. This is paving the way for greater development of HTML5 enterprise mobile apps and use of frameworks such as PhoneGap. Although the value proposition of HTML5 in the enterprise is solidifying, it is especially important for organizations and mobile developers to acknowledge its limitations and adjust accordingly.

About the Research

VDC Research was commissioned by Verivo Software to conduct research among enterprise mobile software developers to analyze their development approach, assess their requirements and compare the capabilities and challenges of various approaches to mobile development. To support the research VDC Research fielded a survey in July and August, 2013 that was completed by 166 qualified respondents. The respondents consisted of individuals with direct experience and responsibilities for enterprise mobile application development either for their organization or their organization's clients.

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