



# GOING MOBILE

Considerations for Federal Mobile Application Development  
Part 2 of 3: Technology Platform

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## Introduction

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Google reported that beginning in 2013, more people will access the internet through a mobile device than a desktop computer. The growing popularity of mobile technology has given rise to a new group of stakeholders across the private and public sectors who expect the “anywhere, anytime, on any device” ability to consume and exchange information and conduct business. To keep up with this rapidly evolving trend, the federal government must engage its employees and constituents by developing mobile applications (apps). The government’s ability to develop useful apps can either be enhanced or constrained by *technology*— the tools, languages, and frameworks used to create the apps. This white paper provides government decision makers with an overview of currently available, end-to-end technologies for mobile app development, cost and security considerations, capabilities of each technology, and skillsets required for maintenance. The discussion is presented in five categories:



**Technology.** What enterprise technologies can agencies use to develop mobile apps?



**Capabilities.** Is the technology mature enough to meet agency mission needs?



**Cost.** Can the agency afford the technology?



**Security.** Will the technology pass government security requirements?



**Skillsets.** Does agency staff have the right skillsets to use the technology?

 **Technology**

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Despite the popularity in mobile device and application usage, enterprise mobile technology is still in its infancy. Tools, languages, and frameworks are still being built to accommodate common infrastructure functionalities, while features are still being developed to address cross-cutting concerns like security, logging, tracing, debugging, and performance measurement. Developers are often forced to choose vendor-specific technologies based on a particular mobile device's hardware and platform. While vendors like Samsung, HTC, Amazon, etc., offer unique technology capabilities, three vendors currently provide products and services for end-to-end mobile solutions, leaving government decision-makers with only a few options for enterprise-wide solutions: Apple, Google, and Microsoft. This technology overview will provide details on the popularity and market presence of these three end-to-end mobile solution providers to help government decision-makers understand the current enterprise mobile landscape, and introduce the emerging alternative of platform agnostic technologies.

## Apple

Apple is socially regarded as the leader of mobile technology innovations. The introduction of the first iPhone in January 2007 at the "Apple Worldwide Developers Conference" initiated a revolution in the mobile device industry. As of June 2013, Apple has sold 600 million iOS devices (iPod Touches, iPhones, and iPads), a significant jump from the 350 million iOS devices the company reported in 2012. Despite Apple's success, International Data Corporation (IDC) reported that although iPad still dominates the tablet market with 32% of the 45 million units sold in the quarter [Q2, 2013], its rate was down from 60% share in the year-earlier period. This statistic indicates that Apple may be losing some ground to other mobile technologies. Apple is moving toward capturing corporate and enterprise users by developing new products and applications; however any interest in government mobility solutions is not obvious. Their popularity and speed of innovation will undoubtedly have an influence on the public sector, as users will expect to conduct government business at the same level of convenience as they do in their personal lives.

"55 million households currently have at least one iPod, iPhone, iPad, or Mac lying around the house. Of the roughly 55 million households that don't currently have an Apple-made device, about 5 million said they planned to bring one into the fold sometime during 2012."

-CNBC All-America Economic Survey

## Google Android

Google entered the mobile application development race when they introduced Android in 2007. This platform was intended to allow users to perform searches on mobile devices. As of August 8, 2013, IDC reported that Google Android has 80% of the *global* consumer market share in mobile devices.

As of September 2013, Android has now been activated on one billion devices. Kantar reports that Google Android has 57.3% smartphone sales share in the United States compared to Apple's 39.5%.

-Kantar Worldpanel

Google Android's popularity is largely based on its open source operating system and unrestrictive licensing terms. Despite this massive global presence, Google Android has only a small part of the corporate and enterprise market, mostly related to Cloud and Microsoft Office compatible applications. For example, Google Android's Quickoffice allows anybody with a Gmail account to create new and edit existing Microsoft Office documents for free. This offering represents Google Android's attempt to become more useful in business settings and help users transition more easily from their desktops (a Microsoft dominant market) to mobile devices. Google Android is also working to penetrate the public market by offering mobile services that can seamlessly integrate with existing enterprise mobile solutions, such as Google Android Apps Connector for Blackberry Enterprise Server. These adaptations to existing popular technologies is harmonious with Google Android's primary draw—cost-effective accessibility to the average consumer and nearly unlimited ability for modifications for developers.

## Microsoft Windows

Microsoft has been a leader in both consumer and corporate markets for applications on Personal Computer (PC) platforms since introducing MS-DOS in 1981. Microsoft's Windows product dominates the worldwide PC market.

In June 2003, Microsoft introduced Windows Mobile as a mobile application platform for Pocket PC devices. Its market share in the U.S. peaked at 42% of all smartphones in 2007, but declined quickly to 3% in 2011 due to the introduction of iPhone and Google Android. At

The biggest mobile developer study in history with 6,000 respondents from 115 countries says that more developers plan to start developing for Windows Phone than any other platform.

-VisionMobile

present, the market share for Microsoft Windows products for mobile applications distantly trails Apple and Google Android. If Microsoft can develop mobile technology that matches the popularity of their PC, they might improve their influence in the public mobility space. In an attempt to gain this higher market share in the consumer, corporate, and enterprise markets,

Microsoft recently introduced Windows 8, Windows Phone, Windows RT and the Microsoft Surface device. Q4 2013 and Q1 2014 market analyses will help determine whether these new devices have an impact on Microsoft Windows' popularity.

### **Advantages of Vendor-Specific Technology**

Creating a mobile application using vendor specific technology gives an agency several advantages:

- Full device capability can be leveraged because apps will be designed with the unique flexibilities of the specific technology in mind.
- Same vendor makes integration seamless integration between tools, platform, frameworks, and languages.
- If only one platform is supported, developers only need expertise in languages and tools specific to vendor, so finding resources to create and maintain the application is simpler which can reduce cost.
- Security features are built-in within the framework.

### **Disadvantages of Vendor-Specific Technology**

- Agency missions and capabilities may require multiple devices from different vendors depending on their unique features, which will multiply the types of devices requiring support and increase the development effort.
- If multi-platform support is needed, development staff may need to learn tools and languages from multiple vendors, increasing the learning curve and the development effort.
- Different vendor security implementation practices produce integration and security risks.
- Costs may increase if agency infrastructure needs to support multi-vendor environments.

### **Platform Agnostic Technology**

Despite these advantages, vendor-specific technologies may lead to increased costs and limitations due to vendor lockdown and will cost more if the agency has to support multiple technology platforms. **Platform agnostic technology** provides a “build once, run everywhere” model. For example, HTML5, CSS3, responsive design, and JavaScript, define standard specifications for mobile applications, so any contractor can implement and support them. The flexibility in contractor support options and provides the government with increased opportunities for service procurement competition and cost savings.

Many vendors are attempting to define the standards for cross-platform mobile development and build the tools and frameworks to support the standard specifications. Although platform-agnostic technologies will likely represent the future of mobile technology, at present, they cannot stand alone and should be used as a supplement to the enterprise technology platforms and devices to create turnkey solutions. Currently, platform agnostic technology is limited to software applications; no hardware platform can support cross-platform mobile development. Advancements in platform agnostic technology are progressing incrementally. The development of an end-to-end, truly agnostic software and hardware platform would make a significant impact on federal mobility, as it would reduce the integration challenges many agencies face. As a result, federal agency decision makers need to create a monitoring and evaluation methodology that parallels this incremental progress, so that the continuous improvements based on new advancements in platform agnostic technologies are simultaneously integrated with an agency’s mobility strategic planning.

An agency’s approach to mobile app development can depend on planned or existing technology investments and technology currently used by intended audience(s). **Table 1** can help agency leaders decide if it makes sense to develop apps for a vendor’s products based on existing investments in tools, platforms, frameworks, and languages.

**Table 1. Major tools, platforms, frameworks, and language by vendor.**

Technology & Vendor	Apple	Google	Microsoft	Platform Agnostic
Tools	Xcode	Eclipse	Visual Studio	Apache Cordoba (PhoneGap) Appcelerator Eclipse Icenium Visual Studio Xamarin.Android Xamarin.iOS Xcode
Software Platform	iOS	Android	Windows Phone Windows Embedded Windows RT Windows 7 & 8	Chrome Firefox Internet Explorer Safari
Hardware Platform	iPhone iPad iPad Mini iPod	Nexus Android phones Third-party tablets	Surface RT Surface Pro Third-party smart phones and tablets	CSS3 HTML5 JavaScript
Languages and Frameworks	Objective C	Java	C# .NET Silverlight	Clojure CoffeeScript CSS 3, Less, Sass Dart HTML 5 JavaScript jQuery TypeScript

## Capabilities

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An agency's enterprise mobile vendor choice will be based on the capabilities required by the technology and the maturity of each of their technologies. Most capabilities required by federal agencies can be built using technology from Apple, Google Android, or Microsoft Windows. However, development and implementation teams must be able to assess the technology's maturity—*based on its time on the market and features provided*— and determine whether it suits the government's business need.

Apple leads in enterprise adoption because it was the first vendor to focus some effort in this type of solution, while Google Android leads in consumer adoption. Despite Apple's lead in enterprise adoption, neither Apple, nor Google Android focus on the government and enterprise market to provide every capability required, leaving ample opportunity for Microsoft Windows to gain a larger presence. The Executive Office of the President promotes the use of a shared platform in an attempt to “innovate more, with less.” As a result, the government's choice vendor will likely lie in its ability to meet the common needs of several agencies, rather than their niche offerings.

## Cost

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To accurately predict whether an agency can afford a particular mobile solution, several considerations including acquisition, operation, and maintenance, must be factored into the total. This white paper will focus on the software development costs for mobile applications and will present two licensing models: **open-source** and **commercial**.

### **Software Development Costs**

Without specific business requirements, determining the actual cost for app development is difficult. Agency decision-makers can make responsible choices by making these considerations:

- **Agency Budget.** Agencies must first determine the amount of money available for spending on mobile apps to ensure that the expected functionality is within their price range. For example, an agency's budget can determine whether they opt for a platform agnostic or vendor-specific solution. While platform agnostic solutions may have dependencies on the platform-agnostic developer to provide the latest capabilities of vendor-specific technologies, it can be a cheaper alternative to vendor-specific technologies if multi-platform support is required.



- **Desired Functionality.** The cost range to build an app is highly dependent on the expected functionality. Agencies must determine whether the app's business functionalities will provide the best financial, political, and social returns on investments.
- **Development, Maintenance, and Enhancements.** Hiring the right developers to create the mobile app is a critical consideration for agency decision-makers. When selecting a development team, decision-makers must consider the initial development costs, the cost to operate and maintain the app, and the cost to enhance apps to meet future needs.

## Licensing Models

The choice to select an open-source versus a commercial model depends on the agency's business requirements and budget. Apple, Google Android, and Microsoft Windows can support open-source and commercial licenses, but the maturity of their technologies within each category can vary significantly.

### *Commercial Models*

**Traditional commercial** models bear an initial cost and the buyer does not have access to the source code. **Free commercial** models offer the software for free, but still do not release the source code. Commercial models are attractive to the government because of the false perception that they are more secure than open source models.

### *Open-source Models*

In the spirit of collaboration and shared costs, government agencies are moving toward open-source models. The open-source model generally allows the enterprise to use it for free. This provides the advantage of low initial development costs, since the software is free and useful modules of code may have already been developed that can be re-used. Some open-source license models require a "pay it forward" philosophy requiring that all applications developed on it be open-source as well. Agencies requiring high security may avoid open-source models because critical modules such as security may be openly accessible, resulting in security risks and compliance issues. These agencies require a more restrictive open source license model. Details on various open source licensing models can be found at <http://opensource.org/licenses>.

Open source platforms are on trend with the Open Government initiative, as both are based on the principle that the best results come from transparent participation and collaboration. Open source software allows everyone to access information, collaborate, and benefit from the collective brainpower of expert developer communities.

While open-source models may be attractive to agencies with small budgets, because they only pay for the developers and not for the software or licensing, some open-source models require payment if the software is intended for more than private use. Google Android leads the open-source market because all of the software needed to build a mobile application is free. Their open-source model allows rapid and widespread adoption, but creates an issue with platform fragmentation. The many derivations of Android from different device manufacturers drive up the cost of development. Platform agnostic vendors help reduce this platform fragmentation issue and will lead this category by reducing the cost of labor for multi-platform support.

## Security

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Information security is a crucial consideration when developing mobile applications for many federal agencies. Mobile technologies must comply with both the E-Government Act of 2002 and the Federal Information Security Management Act (FISMA), which establishes security practices for federal computer systems. To aid in the development of a compliant mobile application, agencies should:

- **Define data security parameters.** Data must be classified in terms of sensitivity and privacy, and agency mobile security policies must comply with government regulations and laws.
- **Ensure built-in security.** Security must be part of the development plan and built into the platforms and applications at the start to reduce the security gaps that developers have to fill later. Mobile application containerization techniques can be used to keep each app's data separated in its own container, while allowing business/government apps to sit alongside consumer apps.
- **Determine access and permissions.** Most federal agencies have access restrictions and permission requirements depending on the type of data. Security measures can then be developed to align with these access and permission rules. For example, most agencies require Personal Identity Verification (PIV), often a two-factor security authentication, which can present challenges when using a mobile device. Biometric Associates released a Bluetooth-enabled app, baiBrowser, that lets users with Apple iPhones and iPads — and, eventually, Google Android devices — use Common Access Cards (CAC), PIV, Personal Identity Verification-Interoperable (PIV-I) or Commercial Identity Verification cards for authentication.

## Skillsets

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When developing a mobile application, an agency's internal or contractor staff must know how to use the tools, write code in the required languages and frameworks, and work within an environment that supports the technology. These skillsets can be entirely separate from the ones required to develop desktop and web applications for an enterprise. Agencies must consider the additional cost incurred by the steep learning curve associated with multi-platform support. Some of these costs can be avoided by outsourcing the job to an IT contractor with both vendor-specific and platform agnostic expertise. Government decision makers should ensure that their mobile app development staff or contractors have a working mastery of:

- Tools, frameworks, and languages for vendor-specific and platform agnostic technology
- User interface design to support mobile devices with multiple form factors
- Mobile device client-side programming versus server-side programming concepts
- Offline content handling for occasional connectivity
- Touch based device development
- Effective resource utilization (e.g. connectivity bandwidth cost and battery life support)
- Secured application containerization technique
- Software costs and licensing considerations
- Advantages and disadvantages of developing for specific platforms vs. platform agnosticism

## Summary

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When selecting the technology for mobile application development, no one-size-fits-all solution exists. Because the evolution of public policies and political agendas is often out of sync with the rapid advancement of mobile technology, the government faces challenges to determine their foremost mobile technology considerations, while still meeting stringent compliance requirements and maximizing financial, social, and political returns on investments. Agencies must consider not only the **technology**, but also the **cost** to the agency, **security**, the **capabilities** required, and the **skillsets** necessary to develop and maintain the solution. As mobile technologies and an agency's needs evolve over time, these five considerations should be revisited and revalidated. Making a solid mobility investment lies in the ability to understand and develop for the current mobile landscape and to strike a balance between rapid innovation and truly understanding how to develop compliant and effective solutions for government. For more information on federal mobile strategy and mobile application development, please email the REI Solution Architecture Team (RSAT) at [solutions@reisystems.com](mailto:solutions@reisystems.com)

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## About REI Systems, Inc. (REI)

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REI is a leading provider of web-enabled business solutions for the federal government and the commercial sector. Drawing upon our mission to deliver reliable, effective, and innovative solutions, the company works daily to solve complex homeland security, defense, health resources, criminal justice, and performance support issues. REI is strengthened by its commitment to exceeding customer expectations. REI has been serving government at all levels and major corporations since 1989. For more information, visit [www.reisystems.com](http://www.reisystems.com).

## About REI Solution Architecture Team (RSAT)

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RSAT is a group of skilled technical and business professionals who focus on generating new technologies, developing innovative solution approaches, and proactively addressing unmet customer needs in relation to high-priority government IT challenges. Contact RSAT at [solutions@reisystems.com](mailto:solutions@reisystems.com).

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