Six ways to accelerate Android mobile application development

Creating an integrated solution for collaboration among development teams

Contents

1 Weaving the invisible thread of innovation

2 Android development: vast opportunities and difficult realities

2 The challenges of Android application development

3 Six ways to enhance Android product development

7 IBM Rational solutions for Android development

Worldwide mobile device sales have skyrocketed. Key drivers of this explosion may include the desire for smart phones and the growth of the Android™ mobile operating system from Google.

This growth, in combination with a virtually endless appetite for user applications, has made the Android platform extremely popular with application developers. But as adoption rates have exploded, we have also seen increased complexity both in terms of component integration and in the quality of software that is needed to power mobile smart phones.

Weaving the invisible thread of innovation

The popularity of the smart phone can be attributed in large part to software—the invisible thread that enables today's innovations. It is software, together with systems engineering, that enables what we call a "system of systems"—the ability of software-intensive subsystems such as radio and power management, global positioning systems (GPSs), megapixel cameras, user interfaces, digital voice and audio, and protocols to work together as an integrated unit. This system of systems enables mobile phones to communicate with cell towers for transmitting and receiving data. It also allows the devices to integrate cameras, music, GPS functionality and more with different applications.

The integration of these systems is enabling developers to create powerful applications that greatly enhance the functionality of mobile devices. Mapping software, for example, uses GPS functionality to provide directions and guide users to a specific destination. The integration of systems further enables users to access weather updates and traffic delays in real time, helping users make more-informed travel decisions. This integration also powers solutions such as a popular application that enables car and truck owners to manage the end-to-end functionality of their vehicles—maintenance, navigation and more—from their mobile phones. It is easy to envision those capabilities extending even further in the near future.

The integration of systems also enables the creation of "cause and effect" applications, such as applications that enable users to scan a bar code with a smart phone, causing the application to automatically look up competitive prices for the item at other stores and online. This functionality enables users to purchase the item either online or at the store offering the best price.

As the capabilities of mobile devices expand, these software offerings will likely become more complex, making the development of applications increasingly challenging.

Android development: vast opportunities and difficult realities

Seemingly insatiable user demand is creating the opportunity to develop innovative applications that integrate multiple functions and subsystems, such as the automotive control application discussed above. However, application development for mobile devices also creates a complex set of challenges. For example, mobile developers need to understand the hardware for which they are developing. They must take into account factors such as memory capacity, screen size, touch screens and keyboards, and window size. They also face a variety of constraints, such as the strain that GPS functionality places on battery life.

In the past, traditional IT application development was minimally concerned with the end device. Applications were developed to run on the desktop. Today, more devices are instrumented, and intelligence is embedded in practically everything—cars, appliances, vending machines and more. Data is increasingly being transmitted from these instrumented devices, directly affecting how applications are developed. As the traditional IT and device-centric development domains converge, opportunities on the Android platform increase dramatically.

The challenges of Android application development

While opportunity abounds, developers creating applications for smart phones are faced with myriad challenges, some unique to the Android platform, including the following:

- **Prioritizing customer requests.** Developers are typically provided a variety of requests for functionality in devices and applications. This data is critical to the development of marketable applications, but it is often difficult to prioritize these requests. A key to developing successful applications is knowing which functionality is important to users.
- **Reusability.** To speed time to market and reduce cost, developers must investigate code reuse.
- **Complexity.** Device variability, such as different size screens or different input devices, can increase the complexity of the development process.

- **Testing.** Developers test their applications on the multitude of available devices—each with its own features. Other variables, such as WiFi, different phone networks, geographies and more, increase the complexity of effectively testing applications.
- **Resource variability.** Screen size and orientation, battery life, and memory all must be taken into account in the development phase.
- **Security.** As mobile devices are increasingly used to transmit confidential information such as medical records, credit card data and banking information, developers must build security into applications. Users downloading "rogue" applications and the need for compartmentalization of application data are major issues.

Six ways to enhance Android product development

In response to these key challenges, IBM has identified six ways to help teams accelerate development, improve productivity and lower the cost of Android product development. The rest of the paper will explore each of the six methods in detail.

Number one: prioritizing important stakeholder needs

Developing mobile applications demands that requirements be captured from a variety of sources—customers, analysts, marketplace research, internal stakeholders and more. Prioritizing these requirements is no simple task. Product and portfolio management (PPM) is a strategy that enables development teams to manage a variety of resources while developing requirements for a group of products. PPM can help teams achieve prioritization and gain a greater understanding of requirements.

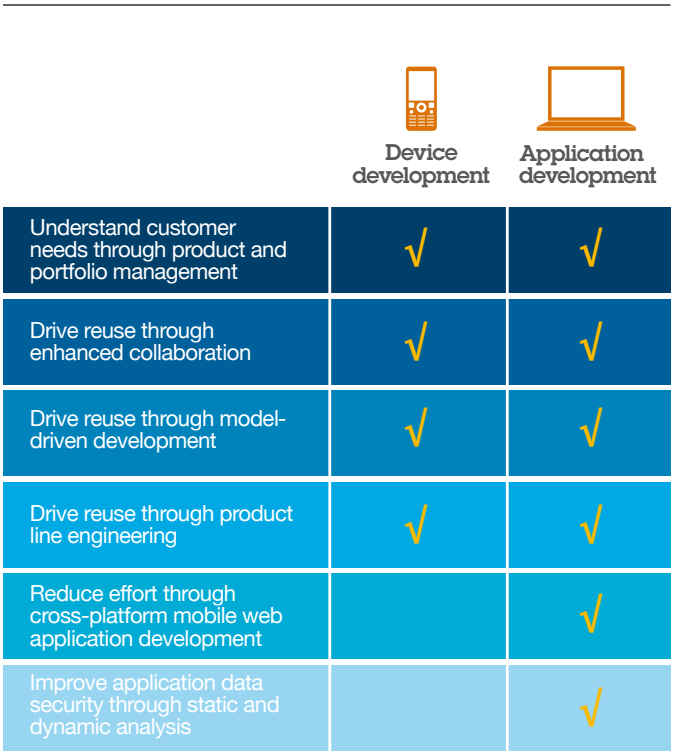

Figure 1: Developers can address the challenges and accelerate application development on the Android platform in six ways.

Tailored to address the unique needs of individual development teams, IBM Rational® Focal Point™ software is a web-based PPM tool. Rational Focal Point software enables users to capture input from stakeholders to determine which ones will provide the most value to the project.

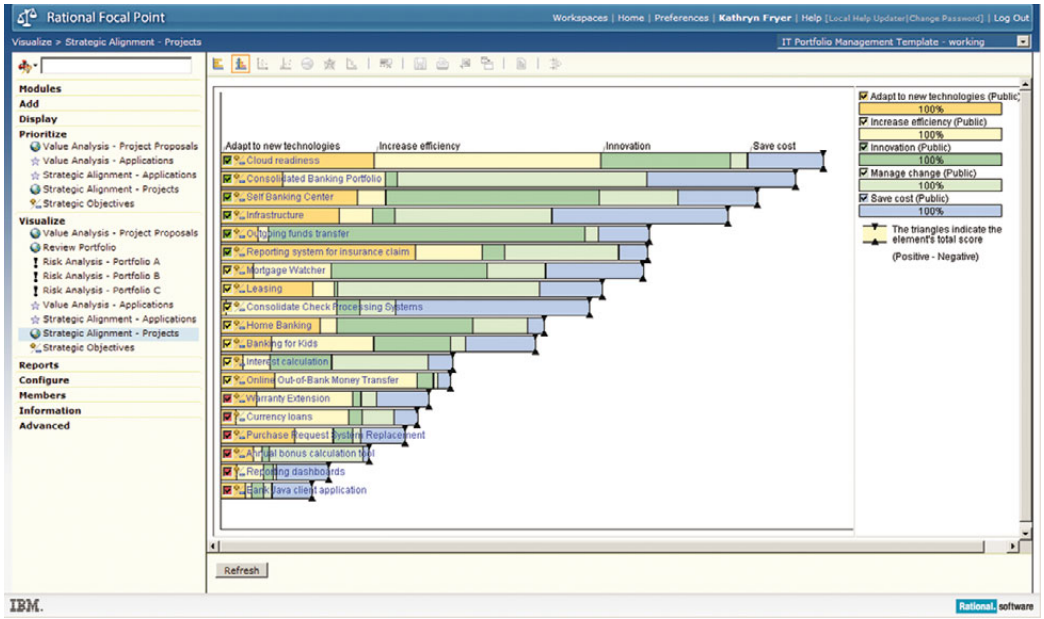

Figure 2: IBM Rational Focal Point software provides marketplace- and business-driven product and portfolio management, helping executives and teams to make the right decisions to deliver optimal software value.

Number two: enhancing collaboration and communication across the development life cycle

Development teams today are pressured to deliver more applications with fewer resources. The development challenge is compounded by the fact that resources are often scarce and teams can be geographically dispersed, making collaboration challenging and increasing the difficulty of applying consistent processes and standards across disparate projects and groups. Further, an agile methodology accelerates the development activity and highlights the need for integration of both tools and people working on the project. To help ensure the efficient development of products, team members need to have access to the relevant project data, such as scheduling, versioning, work items and more. All changes—to code, project status, assignments and so on—need to be tracked and made visible to everyone.

A common development environment such as IBM Rational Team Concert™ software includes agile planning and reporting on a common platform. Rational Team Concert software is an Eclipse-based, distributed development environment that helps teams collaborate, whether they are down the hall or around the globe. It enables the sharing, comparing and management of the flow of versions as well as enhancement requests among distributed developers, teams and projects. It even enables developers to store exact configurations so that another developer working remotely can run the same scenario on the same machine. Rational Team Concert software can improve collaboration with management and even outside suppliers through simple web-based graphical reporting.

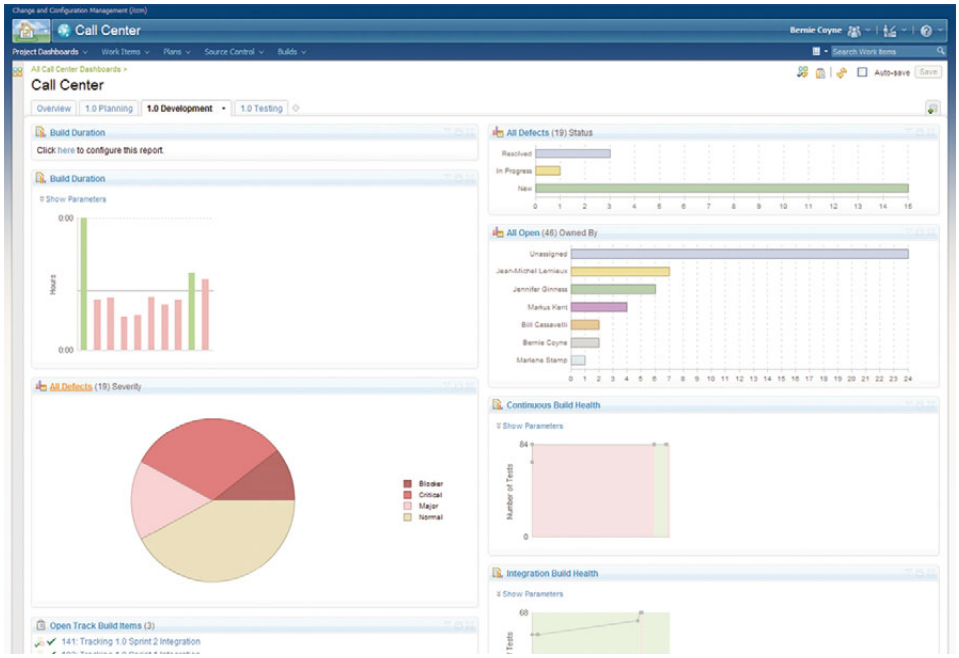

Figure 3: IBM Rational Team Concert software is a lean development environment for teams that includes agile, formal and hybrid planning and reporting, all on a common platform.

Number three: enabling reuse through model-driven development

Product engineering often depends on modeling to better understand complex, real-world systems. Model-driven development (MDD) has proven to be an effective means of helping development organizations address the challenges around delivering complex designs. It also facilitates reuse. Modeling helps by raising the level of abstraction from code to semantically rich graphical models. In Android application development, MDD enables development teams to take a look at not only the application but also the Android framework. In this way, developers get a better understanding of the design underlying the application programming interfaces (APIs), which can lead to better quality and provide a basis for process automation and design reuse. Modeling tools can enable model execution to verify design concepts early in the development life cycle. They can automatically transform models into code and make it easier to help define reusable components with the assistance of languages such as the Unified Modeling Language (UML). Overall, MDD helps you create comprehensive, consistent, deployable applications, whether they are for drivers,

applications or libraries. Modeling can also automate much of the documentation process, enabling teams to spend more time designing.

IBM Rational Rhapsody® software is a visual development environment that enables developers to create applications that reuse designs. Rational Rhapsody software can help development teams collaborate on requirements and validate functionality early in development as well as deliver high-quality products. Rational Rhapsody software also includes a model of the Android framework, making it easier for developers to work with and analyze.

Number four: taking reuse to the next level

Software development teams are discovering that a product-centric approach often leads to higher development costs and an inability to react quickly to change. One option to solving this problem is copying code from one project to the next, but in most cases that leads to major maintenance and upgrade nightmares.

Product line engineering (PLE) allows development teams to capitalize on common features and manage variability across each stage of the development life cycle. PLE allows developers to create a product architecture based on features in the product they are working on. The product line variations are derived from the product architecture, which creates an opportunity for reuse across different products in the family. This engineering approach to reuse can accelerate development cycles and works hand-in-hand with PPM to prioritize reuse.

Number five: enabling cross-device mobile web application development

IBM can help developers accelerate development for applications that go beyond the Android platform to run on multiple platforms. Traditionally, two main approaches have been taken to achieve this result.

One approach has been to customize development for each platform, tailoring code for that platform's specific APIs and language expectations. This made sense in cases such as gaming applications, where building in quick response is required. Unfortunately, this approach can create code redundancies when building for multiple platforms and can be costly to redevelop for each platform. Taking a web-based approach is another common way to develop cross-platform applications. Although this approach supports uniformly created applications, it limits the ability of services on the device to reach their full potential.

What is becoming increasingly common is to build hybrid applications using a combination of HTML5, JavaScript and even Enterprise Generation Language (EGL), a new standard open source language. This approach allows cross-platform development but also allows applications to interact with each platform's specific functionality.

IBM has a variety of Rational solutions that can help ensure your requirements are addressed when developing cross-platform applications. JavaScript and HTML5 development is supported by IBM Rational Application Developer software. EGL is supported by IBM Rational Business Developer software.

Number six: improving application data security through static and dynamic analysis

Mobile devices increasingly contain confidential data such as business documents, banking information, medical records and credit card numbers. But the security precautions that users have on their computers are often not on their mobile devices.

Users are also not always careful in granting permissions when downloading applications. They simply want the functionality and don't think about where the application comes from. The fact that Android applications are built on open source code and many of them reside on the web presents another security issue. These two factors increase the possibility for vulnerabilities.

Given these issues, rigorous use of static and dynamic analysis are keys to creating protected applications on an open platform that relies heavily on web-based delivery. Static analysis scans the implementation code for security holes, enabling developers to address these issues before building an application for testing. Dynamic analysis tests an application while it runs to determine security threats. Dynamic analysis can also enable developers to look at websites and find holes that can be exploited. The combination of both approaches helps identify all of the potential security issues in an application.

IBM Rational AppScan® software offers static and dynamic security testing for virtually all stages of application development.

IBM Rational solutions for Android development

IBM can help you meet the challenges and accelerate application development on the Android platform in six ways:

- Prioritize and manage requirements from a variety of stakeholders for improved decision making with a product and portfolio management approach using IBM Rational Focal Point software
- Enhance collaboration across development teams to achieve flexibility and cost efficiency with IBM Rational Team Concert software
- Enable the reuse of valuable intellectual property through model-driven development to lower costs; validate functionality early in development; and automate delivery of innovative, high-quality products with IBM Rational Rhapsody software
- Take a product line engineering approach to enable reuse across product lines
- Accelerate cross-device development and improve team productivity with IBM Rational Application Developer, IBM Rational Software Architect and IBM Business Developer software
- Address the security challenges of the Android platform through static and dynamic testing with IBM Rational AppScan software

In conclusion, IBM Rational software can help teams develop innovative applications for the Android mobile platform more efficiently and precisely and with reduced risk and cost.

For more information

To learn more about IBM Rational solutions for Android development, contact your IBM representative or IBM Business Partner, or visit: **ibm.com**/software/rational/solutions/electronics

Additionally, financing solutions from IBM Global Financing can enable effective cash management, protection from technology obsolescence, improved total cost of ownership and return on investment. Also, our Global Asset Recovery Services help address environmental concerns with new, more energy-efficient solutions. For more information on IBM Global Financing, visit: **ibm.com**/financing

IBM Corporation
Software Group
Route 100
Somers, NY 10589
U.S.A.

Produced in the United States of America
May 2011

Rational. software

RAW14265-USEN-00