Next Generation Mobile Java Based on CDC/OSGi Technology for Universal Middleware

Jon Bostrom
Nokia Technology Platforms, Reno, Nevada

"The Server in Your Pocket"
"Your Personal Web"
 "The Remote Control for WEB 2.0"
"Mobile Edge Server"
"Pocket Personal Agents"

Mobile device capabilities have grown significantly since the introduction of the first simple Java for mobile devices, released in 1999. Processing power, memory, networking, and power management all have taken big steps. On the other hand, the programming architecture and focus has changed very little. Most development in all languages on mobile devices is still focused on creating simple end user applications. This paper will focus on how that perspective changes with the addition of OSGi Java technology on the mobile device.

In the Mobile Java application space, innovation has been limited. There are several reasons for this, but two stand out. For the most part only the manufacturer has been able to enhance the platform and that enhancement can only take place after lengthy standardization work sometimes taking several years. This is far different from the environment in the larger Java community where through the "magic of middleware" 3rd parties can enhance the standard platform and offer those enhancements to end developers. Because of this a whole ecosystem has arisen including companies selling middleware like IBM, Oracle, BEA, SAP and many others in various vertical markets. In addition Community projects such as Spring, Wickets, and Eclipse also flourish and provide innovative middleware frameworks and toolkits that assist developers in making more creative and reliable applications for many different kinds of uses. A quick web search will show the millions and millions of web hits that surround this community and the wealth of resources it provides.

CDC/OSGi technology for the mobile device addresses this problem by creating a framework for middleware that is well suited to the mobile device. This Service Oriented Architecture (SOA) platform allows middleware services to be developed, deployed, executed and managed in a predicable way. This OSGi technology is well proven as it is already deployed as the heart of the Eclipse system, Telematics systems, and enterprise applications. Through the use of this "universal middleware" platform and the services it provides, new innovative solutions that will make the mobile device into a much richer computing system will be created. These solutions can be utilized not just by Java end developers but browser, flash and scripting developers using Java services as well.

Web servers based on Java have been delivering content to multiple clients for some time, This decoupled model where presentation (View), and user action (Controller) reside in the client, and business logic and persistence (Model) reside on the server is what

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makes most web based application work today. This differs from the tightly coupled model that is used today on the mobile, with MIDP, where the UI driven with Java widgets and all the rest of MVC are combined as a monolithic package. The CDC/OSGi technology brings the decoupled web model to the mobile for the first time as it provides out of the box capability to run a fully standard Java web server as a service.

The CDC/OSGi platform provides, out of the box, an http service that includes a standard Java servlet runner. This service creates a container where servlet code can execute and provide web server functionality immediately! Tools and frameworks that use the servlet structure can also run in this environment, so middleware tools like JSPs and others become possible for the mobile device. To this end Nokia has created a proof of concept middleware service that makes it easy for any Java Service to be exposed to any application environment that can make *httpobjectrequest* calls. This includes Javascript enabled browsers, flash script, other scripting languages like python, and of course other rich programming languages like Java and C++. This structure is the heart of what we describe as "The Server in your Pocket".

Once this platform is available many innovative solutions become possible. Any capabilities the device OS provides can be quickly wrapped in a Java service, web exposed, and consumed by any of the application environments described above. These capabilities can also be combined together into a single service along with networked based services to become a "Mobile Mashup" (a Mashup is a WEB 2.0 term for combining several web services into a single page). Such a Mobile Mashup

might wrap portions of a local phonebook, location, and PIM services together with WEB 2.0 remote mapping and buddylist to create a simple one-step WEB 2.0 service for mobile developers to call. In addition to wrapping and exposing these functions the Java service can add quality of service (QOS) semantics, error handling, and controlled degradation,(based on network availability), to the logic of the service in order to "harden" it for a quality user experience. These value added middleware Mobile Mashups can help end user developers create and deploy high quality user experiences much more quickly and in a more cost effective manner. These services can also provide a model for billing, security, and digital rights management as required by the solution.

Of course in the dynamic world in which we live, it is critical that these services get to the device when they are needed. A process much like delivering Javascript to the browser as it needs it, is also available for these middleware services for delivery on demand. We call it "Dynamic Service Injection". DSI uses the standard content download capabilities of the web combined with the administrative capabilities of the OSGi platform, to make it easy, transparent, and cost effective to get middleware services, applications, and supporting components to the right place at the right time.

When all of these capabilities are brought together in a mobile device containing multiple network connections, such as cellular, Bluetooth, and WiFi, you get new kind of platform, a true Server at the very edge of the network. Using this new "Mobile Edge Server", Bluetooth based devices can connect and instantly become not only

part of your personal web but part of the value to web developers and a much wider audience. Since OSGi also has UPnP capability built in, UPnP devices can also become part of a user's personal web quickly and easily.

Having the power of the Java Server executing multiple simultaneous services without the necessity of having constant user control, gives rise to the "Pocket Personal Agent". These agent services can act on the user's behalf, communicating, organizing, and checking on things that are important to bigger web community, exposing their the user without them having to continuously drive the interaction.

All of these things are possible in this new Platform and many more that we have not yet conceived. Bill Joy, one of the founders of Sun Microsystems, was fond of saying "all of the smart people in the world do not work for one company". By allowing all of the people in the community to add value to this new platform and evolve it in WEB-Time we are creating a system that truly is "Open for Middleware".