



Leveraging OSGi™ Technology

A Business Whitepaper

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Introduction

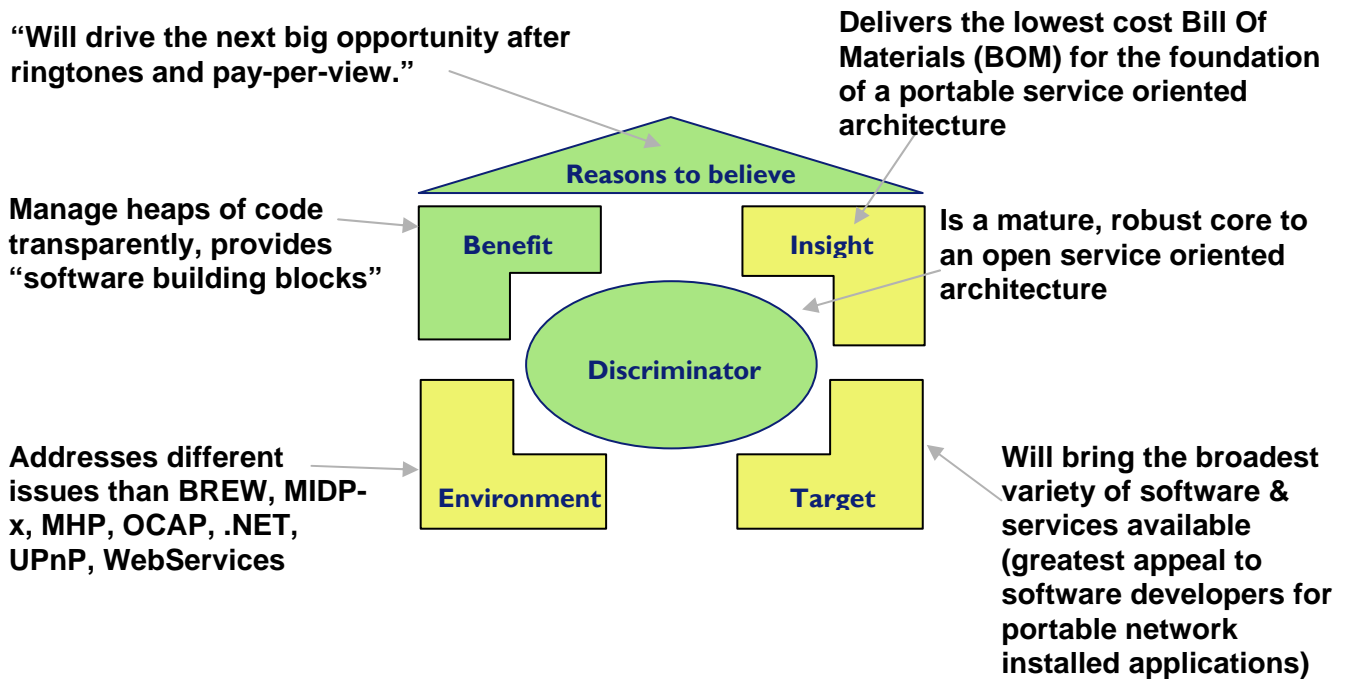
The OSGi™ Alliance brings together world-class technologists and business people dedicated to developing and promoting an open industry-standardized solution to address fundamental new challenges and opportunities facing us as we move into the future. Moving into a networked future where an ever increasing amount of the value of the devices that surround us is provided by software and the interaction of that software with networks.

Software has become an integral part of the devices we purchase and use in everyday life. Consumers are demanding more and more features in their devices, and these features are driven by software. Even with the addition of these service and application features, users require the devices remain very easy to use. Ideally these new capabilities are updated on request, when desired. So we need to leverage networks to easily and securely update and maintain the software in these ever more sophisticated devices, and remove that burden from the users.

The OSGi Alliance and its technology address the following challenges:

- How do we assemble, maintain, repair, and enhance that software affordably, transparently, efficiently, and reliably?
- How do we create the flexibility needed to accommodate the wide range of business models used in the market today for software and services, and enable new and profitable business models for the future?

The OSGi Alliance, and its technology



The New Business Opportunities Created by Ubiquitous Networked Devices

Digital networks have become a pervasive presence in modern life, able to reach us in virtually any corner of the industrialized world on a variety of devices that, on the surface, do not appear to be computer systems - but they are. Automotive electronics & telematics systems, smartphones, home and mobile entertainment devices have all the essentials – a central processing unit (CPU), memory, digital data input/output capabilities, and persistent storage (either local or remote or both) – and they all need software. Computer systems, and the software that drives them, have become a fundamental core to almost every electrical device we use today. They transform historically fixed function devices into intelligent, adaptable devices able to conform to new users demands.

Consider the potential users:

- The user (installed) base of digital mobile phones at the end of 2004 was almost 600 Million globally and is growing at about 16% per year, with an ever increasing percentage equipped with virtual machines
- At the end of 2004 the global number of homes connected to a broadband network was 144 Million and was growing at about 55% each year.

This creates tremendous new business challenges and opportunities, because of trends that move forward with unrelenting force:

- Software is becoming increasingly vital to the value of the devices we buy and use daily.
- All kinds of electronic devices are now capable of connecting to some form of network
- These ubiquitous networks are able to affordably connect these devices to the data and services we want.

There are several market drivers for consumers behind these trends. Consumers want choices in digital services and devices. They want to enjoy these services on different devices in different settings, and they wish the experience would be seamless across the different settings and devices.

Some of the market drivers for businesses behind these trends are different but just as compelling. Businesses want to take advantage of the ever increasing number of connected devices in the world to conduct their business. They want to improve their return on investment (ROI) by leveraging the large installed base of networked devices. They want to offer their services on the broadest possible array of electronic devices. And most of all, businesses want to stay in touch with their customers, whether they are at home, on the move, or at work.

The new challenges are numerous:

- How does a manufacturer maintain and repair the increasing complex software that resides in your home consumer electronics, your major appliances, your automotive electronics, or your digital mobile phone?
- How can service providers and operators securely provide and support profitable new services that require exponentially more computing resources to deploy than in the past?
- How can a manufacturer, service provider, or operator manage these software-centric devices in the network without burdening the customers with onerous, difficult, device software maintenance?
- How do manufacturers, service providers, and operators cope with the explosion of software complexity within devices and the services surrounding them?
- What technology can these stakeholders adopt that will effectively span all the hardware/operating system platforms embedded within all the devices you want to use?
- What technology can the participants in the value chain adopt to support them with the challenging operational, logistical and legal relationships that this environment will entail?

The new opportunities are vast:

- Improve customer satisfaction and repeat sales by dynamically repairing software defects and offering additional functions, features and services when requested by the consumer (after sales).
- Expand the range of practical services and applications by utilizing any computing resource that is available throughout the network to provide the solution – including those within the devices we commonly use;
- Expand the range of devices on which digital services can run, thereby dramatically increasing the installed base from the start.
- Bring the benefits of continually enhanced software services to customers, and the profits to their suppliers, by installing and managing it through the network;
- Increase a manufacturer's, service provider's, or operator's competitiveness by improving the time-to-market for their goods and services with a componentized, service-oriented environment;
- Increase competitiveness by leveraging the existing installed base of devices to achieve better return on investment (ROI).
- Increase the number of services that can be deployed by reducing the required initial investment.

These benefits can be best achieved by adopting an open, industry standardized, portable service-oriented computing platform. Hence, the key to addressing these challenges and opening up these opportunities is the technology developed and standardized by the OSGi Alliance, and provided by its Members - the OSGi Service Platform and its virtual execution environment.

Powering a Wide Range of Business Models

The OSGi Service Platform - while open in its development, advancement, and standardization - is also flexible and tunable to embrace a very wide range of business and payment models for the applications and services, which run on it. This is a natural characteristic of its dynamic software component architecture.

Applications and services installed into an OSGi Framework on a device:

- can exist within a completely "walled garden" service network and enforce its security;
- or can come from any provider reachable on a network;
- or any variant in between.

For example, dynamically installable software components such as a digital rights management system, or an e-commerce billing mechanism, might be deployed as OSGi bundles by an operator as a fundamental part of a complete service offering such as a digital music jukebox.

Subscriptions, pay-per-use, rental, and purchase payment models, as well as many others, are all possible within an OSGi Service Platform environment. Nothing within the OSGi Service Platform precludes a completely closed and protected, or a completely open network environment or any hybrid network environment

in-between these extremes. Mechanisms are provided within the OSGi Service Platform which assist and complement the deployer's choice of policy. These mechanisms are overviewed in the OSGi Technical White Paper and detailed in OSGi Specifications.

Business Reasons for the OSGi Service Platform

By incorporating OSGi™ Service Platform technology into their offerings, manufacturers and operators can manage the increasing complex cooperation necessary between different systems and suppliers. Due to its modular architecture they can deal with the challenges that their offerings need ever decreasing time-to-market while being inexpensive enough for the mass market.

The OSGi Service Platform provides the only industry-standard, componentized, service oriented architecture with these capabilities available today. Service-oriented software components can be quickly integrated to provide new functionalities, and those components can be updated as desired even after products have left the factory. This is a revolutionary capability for common products like the infotainment systems in cars and homes, commercial fleet management systems, and digital mobile phones that are all now able to securely access the Internet and other networks.

For many users it is invaluable to be able to continuously run vital applications and services locally while they are intermittently-connected or disconnected from a network. The OSGi Service Platform makes this possible. Using the OSGi Service Platform as the basis for product or service offerings introduces the capabilities mandatory for maintaining and enhancing products and services in the field - 7 by 24 - through the now ubiquitous networks surrounding us. This is vital as more and more of the value of products and services is dependent on the ever-increasing amount of software they contain. The software in products, and the services around them, can now be updated dynamically via secure networks, to fix problems, or add new functionalities and value to the user's devices or to make services available on a range of different-brand devices owned by a single user. These innovative capabilities open completely new business opportunities for lower-cost maintenance and repair, or the purchase of valuable new features. Expensive recalls and high development costs can be reduced to meet increasing consumer demands.

The OSGi Service Platform serves as a foundation for a rich client platform much more capable than any thin client, and yet it is still frugal with resources. It adds virtually no run-time overhead in terms of execution speed.

Using an OSGi enabled rich client platform, along with an OSGi management agent, could also provide OSGi applications and services with the ability to manage how and how much they use the underlying available networks. These applications or services could, for instance, manage network utilization/throughput, or provide a certain level of Quality of Service (QoS). This benefits both the network operator and the user. The operator could deploy services and applications that shape their network traffic to better optimize profits and provide the user with an enhanced user-experience from better throughput and QoS.

Where Does It Fit?

The technology of the OSGi Alliance, the OSGi Service Platform, can reside in any device with sufficient computing resources anywhere in the entire network - from the server at an enterprise or operator, to the network processors within the network infrastructure, to devices at the end points (e.g., smartphones). Within a given device the OSGi Service Platform is a vital software layer between the underlying virtual machine and the applications above, providing the ability to maintain, repair, and enhance the device's applications affordably, transparently, efficiently, and reliably. These essential capabilities extend the end-to-end programming model key to robust, enterprise-ready applications into a whole new class of computer systems – the pervasive devices around us like cars and mobile phones.

Interesting possibilities arise when software components can be moved to devices only if and when they are needed. Here is an example:

Near the end of the business day a real estate agent gets a call on her mobile smartphone from a new client requesting her property be listed for sale, so the agent enters the property address into her smartphone and agrees to meet the property owner at that address in 15 minutes. The real estate agent gets into her car and wirelessly docks her smartphone with her car's telematics system and transfers the new property address into the navigation application which guides her to the address to meet with her new client. After the agent has gathered the details of the property and entered them into her smartphone, she says her thanks and good-byes, and hops into her car to head home. While driving home, her smartphone, which is docked to the car telematics system again, transmits the data into the central multiple listing service database for prospective buyers to search. The car telematics system gives an audible confirmation that the data has been properly stored into the database. On arriving home the real estate agent grabs her smartphone and goes inside where her home network system detects her smartphone's presence. Resting a moment to watch some news, an alert is posted on her television in a graphics overlay that indicates that her new property listing has already received a buyer's offer. The agent moves to her home office PC to see the details of the offer and potentially complete the transaction.

The modular software components in this real estate sales force automation example were dynamically installed across various different networks into a variety of different devices which each had varying user interfaces and computing resources. The OSGi Alliance and its members see a mounting demand for such seamless software updates, as illustrated here, and strive to enable such scenarios with open OSGi technology.

Why an Open Industry Standard Instead of Using Proprietary Technology ?

Sophisticated end-to-end system solutions are often complex and can seldom be built from a uniform single supplier's technology, particularly when being integrated with existing critical systems. Open standards greatly increase the ease and capability to interoperate, facilitating the integration of innovative new products with valuable existent systems. This not only reduces purchase costs, but fosters the cooperation between the actors of the value chain needed for the full solution.

Competition between suppliers increases the implementation quality available to the market for open industry standards like those of the OSGi Alliance. Rigorous industry peer reviews of these specifications increases the quality of the standard itself.

Even if one company abandons an open industry standard, the solution will be maintained and further developed by other industry stakeholders, whereas single vendor approaches tend to be abandoned more quickly leaving its users no choice but to incur an expensive migration. Thus, an open industry standard better enables long term investment while increasing the return on that investment (i.e., better ROI).

Overcoming single vendor dependence such an open industry standard also increases the flexibility to choose between various suppliers of implementations and products based on the same standard. Even if the purchaser decides for another supplier after an initial deployment the switch between products based on the same open standard is usually much more cost-effective than a change between different proprietary technologies. While two suppliers' products based on the same open industry standard have the same interfaces, a change of a proprietary system requires a higher investment due to the extensive rework necessary to adapt to its interfaces.

Conclusion

The technology developed by the OSGi Alliance and its members provides the robust, mature foundation for a service oriented architecture the industry can build on. Its open industry standard approach fosters healthy competition to provide its adopters with interoperable, world-class products. The dynamic modular software component model it contains creates new needed capabilities to assemble, maintain, repair, and enhance that software affordably, transparently, efficiently, and reliably through the network. Combined these capabilities generate great and completely new business opportunities for exciting and profitable services.

Many organizations, both members and nonmembers, are driving added success by adopting and deploying OSGi technology. Organizations like the ERTICO Global Standard for Telematics (GST) project, BMW Group, BSH Appliances (Bosch und Siemens Hausgeräte GmbH), and DaimlerChrysler FleetBoard have all utilized OSGi technology to improve their projects and products for their audience and customers (more references and details available on the OSGi Alliance public website - www.osgi.org). High industry interest has propelled the formation of OSGi Users' Forums and Groups in many geographies including Japan, Korea, and France, with more to come. OSGi Users' Forums and Groups give technologists a place where they can learn more about the tremendous advantages of utilizing OSGi technology, and share experiences of how to best incorporate it in their products and services. The OSGi Alliance serves as a focal point of coordination for our Users' Forums and Groups and can help direct you to their websites and activities.

The OSGi Alliance and its members specify, create, advance, and promote wide industry adoption of an open service delivery and management platform. The OSGi Alliance serves as the focal point for a collaborative ecosystem of service providers, developers, manufacturers and consumers. This collaboration between industry stakeholders not only cultivates high quality technology, but also a robust cross-industrial design. The service delivery and management platform offers a horizontal software integration platform that is ideal for both vertical and cross-industry business models within home, vehicle, mobile and industry environments. It is designed to ease the development of new and exciting services and applications for the latest generation of networked devices. Adding an OSGi Service Platform to a device, enables the secure management of the complete life cycle of the software components in the device from anywhere in the network. Software components can be installed, updated, or removed on the fly without having to disrupt the operation of the device. Maintaining, repairing or enhancing software on local devices in such an affordable, transparent, efficient and reliable manner enables new and profitable business models for the future. By exploiting these unique after-market sales possibilities, device manufacturers, service providers and software developers are able to improve time-to-market and to reduce customer churn. Accordingly, the OSGi technology is already being delivered in products and services shipping from numerous Fortune Global 100 companies.

For further information please visit our web site <http://www.osgi.org> or contact:

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The OSGi Alliance and its members specify, create, advance, and promote wide industry adoption of an open delivery and management platform for application services in home, commercial buildings, automotive and industrial environments. The OSGi Alliance serves as the focal point for a collaborative ecosystem of service providers, developers, manufacturers, and consumers. The OSGi specifications define a standardized, component oriented, computing environment for networked services. OSGi technology is currently being delivered in products and services shipping from several Fortune 100 companies. The OSGi Alliance's horizontal software integration platform is ideal for both vertical and cross-industry business models within home, vehicle, mobile and industrial environments. As an independent non-profit corporation, the OSGi Alliance also provides for the fair and uniform creation and distribution of relevant intellectual property – including specifications, reference implementations, and test suites – to all its members.

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