WHITEPAPER

Open Source OS ~ The Future for Mobile?

This whitepaper is an extract from:

Mobile Open Source Operating Systems
Markets & Opportunities 2009-2014

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Open Source OS: The Future for Mobile?

This white paper covers the basics of OSs (Operating Systems) in mobile phones as well as giving an overview of the impact of both open-source and proprietary offerings. In the last few years mobile telecoms has entered a new era; the rise in popularity of the smartphone has made the OS (Operating System) a key element in the design, development and delivery of both the devices and services which an operator can offer. While very few end users are concerned about which specific operating system their smartphone uses, they are extremely interested in the applications and services which their phone supports, both of which may be a direct consequence of the choice of operating system.

What is an Operating System?

An OS is the most critical software element on any running processor-based device. The OS manages the hardware and software resources within a device and performs and manages basic tasks such as the recognition of input from the device keyboard and generation of output to the device's screen. It also ensures that different programs running at the same time do not interfere with each other. It is responsible for the management of memory and for communication within the device. OSs may be extended to add additional complexity and hence functionality to the code. In the mobile world, the more complex OSs will contain, for example, UI (User Interface) elements as these become increasingly important as the devices become more complex. As an example of this, the Symbian OS, integrates the functionality of three different UI options.

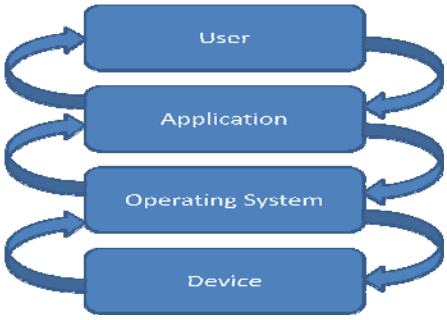
The OS is purposely hidden from the user who, as a general rule, will have no direct interaction with it. It is, rather, a base onto which the applications required by the user are loaded. This gives a four-layer construction; the user interacts with the applications which are loaded onto and managed by the OS which is in turn loaded onto the hardware of the device itself.

The OS is not only a key element in terms of the tasks it performs but the choice of OS will constrain or enable the functionality of the end device in two key respects; firstly that which is technically possible with any given OS and secondly that which is available, i.e. what applications have been developed for that OS.

The increasing complexity of both end devices and the processors they contain is placing complex requirements on the OS code. Current smartphones contain upwards of three processors with even the most basic phones generally using more than one processor. At present designs use a single main processor with additional processors for such functions as graphics but future devices, already in development, are multi-core devices which split the code which is currently placed on a single processor

across two or more. This development arises from the need for ever-increasing processing speed. Simply increasing processor clock speeds to generate increased processing speed results in power consumption problems which are incompatible with the major constraints of battery life and form factor which are key to the mobile device. The result is a need for multi-processor solutions, which necessitates at best, the revalidation of, and at worst the re-writing of, all of the OS code.

Figure 1: How Does the OS Fit into a Mobile Phone?



Source: Juniper Research

The OS, then, provides a software platform on top of which other application programs can run. The application programs have to be written for a particular OS so the choice of OS, therefore, determines to a great extent the applications that can be offered on the end device.

The OS also provides a consistent interface for applications, regardless of the hardware it is loaded on. Communication between the OS and the applications is done through an API (Application Program Interface) which allows a software developer to write an application for one device and have a high level of confidence that it will run on another running the same OS.

Open Source vs. Proprietary

At present there are two main types of OS in use in the mobile market; **proprietary** and **open source**.

Proprietary

In the case of the proprietary offering, the OS is fully owned and controlled by the developing company. The OS is licensed for use and a royalty paid for this; in the mobile market this can be up to $10 per use. In return the developing company provides support and updates to the OS software. Licensees, who would include handset manufacturers and operators, would then gain access to the OS code for use on their devices. Both handset manufacturers and operators would need to develop applications for their own particular needs. The company which owns the OS code would generally provide an SDK (Software Development Kit) which contains all of the details of the APIs along with a host of utilities which help with code development. They would also expect to offer considerable technical support to these key customers in return for the licence fees paid.

Third party application developers gain access to the OS code through developer partnership programmes, which often cost a considerable amount to join. Members have access to SDKs and support although this is often paid for either through a developer registration fee or on a cost per use basis.

The company which owns the OS has full control over who may develop applications for their OS and, because they define the APIs, also to what features of the OS may be accessed. It is however, dependant on revenue from licenses and any OS which made key areas of the OS inaccessible or difficult to use would find its customer base declining rapidly. The result is often a middle ground where the less contentious APIs are open to use but they may apply a sign-off process for the others which may have a more serious effect on the overall operation of the devices if they are used incorrectly. Again this sign-off process attracts a further charge from the OS company. Applications using these critical APIs can only be loaded on to the OS either when they have completed this process or if they are accepted by one of the handset manufacturers or operators who license the OS code for their own use.

Open Source

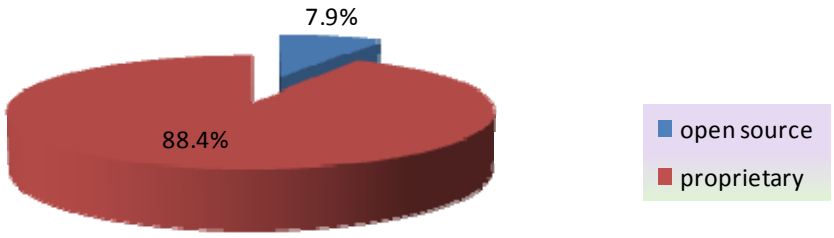
When the OS is open source, the governance is more complex. The source code is technically "owned" by the community but in reality, in order to function, these communities are led, generally by a board or a committee. There is no royalty paid for the use of the OS code and the community is supported by financial contributions from the lead members which would include handset manufacturers, operators, key software development companies and semiconductor companies. Developers may also join and there may or may not be a fee for this membership but it is generally small.

Contributions to the community may be either technical or financial and often at outset, one or more of the larger companies involved donates technology as well as engineering resources to the community. The source code is freely available under a licence agreement and the nature of the licence varies from one open-source offering to the next. The licensing model may also have an impact on the uptake of any open-source offering as some require that all code developed on the original source must be made available to the entire community while others allow developers to choose what they contribute.

The Changing Landscape

The last two years have seen rapid changes in the landscape of the mobile phone OS. In January 2007, the LiMo Foundation was founded, introducing what was a relatively new concept for the mobile industry, the concept of a fully open-source OS. This was followed in November of the same year by the announcement of the OHA (Open Handset Alliance) to which Google donated the Android OS. The final major development was Nokia's purchase of Symbian Ltd followed by the announcement that the Symbian OS would move to an open-source format under the collaborative management of the Symbian Foundation.

Figure 2: Proprietary vs. Open Source OS Market Share Prior to June 2008



Source: Juniper Research

While the developments by the LiMo Foundation, OHA and the Symbian foundation may suggest that the whole market is moving away from proprietary offerings in favour of the open-source OS, during this same period Apple has introduced its iPhone product which is based, as is its computer range, on a proprietary OS. RIM (Research in Motion) has also indicated that it has no intention of moving from its proprietary OS, used in its BlackBerry devices, the Microsoft Windows Mobile OS still has a significant share of the market and Palm is managing to maintain a few percent of it. However, the net result of these developments is a shift in position from proprietary to open-source OS such that over 60% of the smartphone market now uses an open-source OS. These seven are not the only players in the OS market but they represent over 98% of the market share in the smartphone market.

Why Open Source?

The idea of open source as a mainstream offering is relatively new in the mobile phone market but less so elsewhere. In the PC world open source came to prominence over 20 years ago and in fact the open-source business model is a well trodden route, having been adopted by giants such as IBM and Sun Microsystems as a viable business proposition.

Perhaps the most famous open-source product is Linux, which demonstrates some of both the better and the less desirable qualities of the model. Linux was initiated by an individual, improved by peer review and community collaboration and adopted initially only by that same community. However, both Linux and the open-source approach behind it were adopted by IBM when they were facing difficult times in their business. The brave decisions were made at IBM, which gambled on Linux, changed IBMs business fortunes and catapulted Linux into the mainstream. In this model, Linux became a popular alternative to other OSs. However, as an open source product, it was possible for anyone to modify the source code and the result was not one Linux OS but many different fragments from the one original source. The product came also came without any technical support and with no managed roadmap for future developments. In the longer term, this was resolved by companies such as Red Hat who have built a business out of taking one of the fragments and building a fully supported and controlled distribution of the Linux code for which they charge their end users.

A similar professional open source approach has been adopted by both the LiMo Foundation and the Symbian Foundation. The LiMo Foundation has even taken the approach of appointing one of its lead members, WindRiver, to manage the productisation of the LiMo OS. WindRiver, in common with all the other higher tier of members in the LiMo Foundation, is able to benefit commercially from the open-source product. OHA, on the other hand, have adopted a more traditional approach to the open-source OS. In the OHA model there is no professional distribution and the nature of the licensing makes it less likely that one will arise in the foreseeable future. In this model the key gain which makes an open-source approach attractive to Google which donated the technology is the access to the huge mobile market place with an OS which is already tailored to its other products. The donation of the Android OS technology can therefore be seen as a highly strategic business decision to purchase market share for other products.

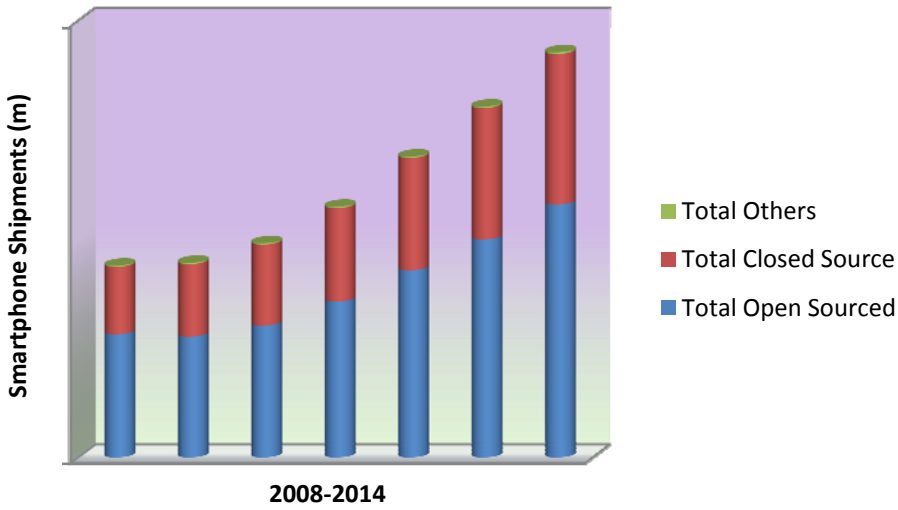
The Smartphone Market

The announcement in June 2008, of the purchase of Symbian by Nokia and the transition of the Symbian OS to open source changed the balance of the market from less than 10% of it using an open-source OS to over 60% doing so. The change however, is a gradual one, since the Symbian OS will transition to a fully open-source offering over a period of two years from the initial announcement. However, the immediate impact was a reassessment of the validity of open source as a basis for delivering an OS. Both the LiMo Foundation and the Symbian Foundation offer a Linux based product. There are vast numbers of Linux developers in the programming community so the open-source approach leverages the vast resource of the Linux developer community. With access to the OS of an array of mobile phones the developer community had a new outlet for its programming skills and with it the potential for generating substantial income for the individuals involved.

It was Apple, however, with its proprietary iPhone OS, which demonstrated the business model which capitalised on this by offering the AppStore as a means by which developers could offer their applications to the market through an iTunes style approach. Apple managed the website from which the applications were distributed and collected the money from the end users while the developer was able to set a price and received 70% of that with Apple retaining 30% as a service fee. This approach gave an easy route to monetisation of their efforts for the developers who have embraced the model wholeheartedly. The majority of the other major players in the smartphone market have now followed suit along with some network operators. Apple though, have both market lead and market credibility because of their iTunes business and Juniper Research believes that this will translate into a substantial growth in market share and a year on year growth which bucks the economic trends.

Juniper Research forecast the number of Smartphones shipped with open source operating systems (OS) will increase from 106 million this year to 223 million by 2014.

Figure 3: Total Number of Smartphone Shipments (m) Split by Open Source and Closed Source OS 2009-2014



Source: Juniper Research

The move to open-source OS has also encouraged developers to design new and attractive applications and with over 60% of the OS market is now based on open-source, and a sizeable pool of software design talent out there, there is a massive opportunity for innovation.

Order the Full Report

Mobile Open Source Operating Systems: Markets & Opportunities 2009-2014.

This whitepaper is taken from Juniper Research's report entitled Mobile Open Source Operating Systems: Markets & Opportunities 2009-2014.

This report compares and evaluates the value of the three consortiums: Symbian foundation, Lemo foundation and Open handset alliance (android) analysing at the business models for both proprietary and open source.

A six year regional forecasting suite including market share by operating system is provided as well as looking at relative year on year growth for smartphone operating systems. It also considers how the App Store approach has impacted the operating system market and discusses what the future plans are for the development of OS.

Each one of the open source operating systems are fully analysed providing; history, overview, indicative handset vendors, technical details and how the licensing process works. The report also includes an overview for proprietary operating systems.

Key Questions answered by this report:

- How has the recent trend towards open source impacted the rest of the value chain?
- How will the fortunes of the main players in the operating systems market develop over the next six years?
- How will the increasing openness in the operating systems market effect network operators?

- Why has the importance of the operating system risen from the invisible to the unavoidable?
- Will all the current operating systems survive over the forecast period?
- Why did Nokia buy Symbian and give away all of its technology?

For more details on this report visit the website www.juniperresearch.com or phone +44 (0)1256 830002.

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Publication Details

Publication date: July 2009

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