Our software strategy
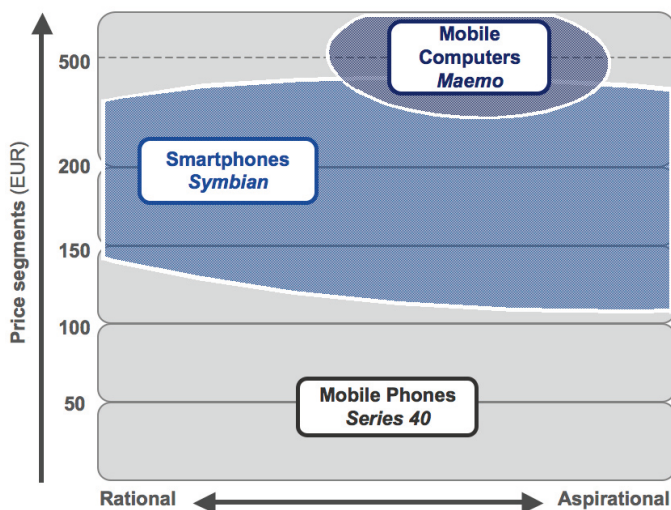
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Contents

December 2009

1. Executive Summary

Nokia's software strategy ensures we can address all consumer and market needs from affordable mobile phones from €20*, such as the Nokia 2180, to innovative mobile computers from €500*, such as the Nokia N900.

At Nokia, we are focusing our efforts on the software elements that offer greatest differentiation. Our major software investments today, therefore, are in renewing our user interface, building enablers for our services and enabling developer innovation.

Platforms to meet all market need

Nokia has three core software platforms – Maemo, Symbian and Series 40 – that coexist to meet distinct consumer needs across a complete price spectrum – meeting the more rational needs of business life to providing aspirational entertainment. All three platforms are open for publishers and developers to bring apps, content and services innovation.

Figure 1 Nokia platforms meet all consumer needs across a complete price spectrum.

Maemo, our advanced Linux based platform, offers an unparalleled mobile computing experience and will be our pinnacle platform for Nokia's solutions and services. We will look to create our flagship experience on Maemo with deep Ovi service integration; offering the most advanced performance and user experience.

Symbian is enabling us to bring smartphones to more and more people and ensures scale for our solutions and services, and for developers. It is already the market leading smartphone platform and enables Nokia to offer a wide and differentiated portfolio of devices. For Nokia, this includes music focused devices, such as the Nokia X6; to business devices, such as the Nokia E72; to our flagship smartphone, such as the Nokia N97. Symbian balances performance with cost advantage to enable Nokia to democratize smartphones to a global mass market. We plan to scale Symbian further to lower price points.

Series 40 provides the platforms for our mobile phones. Series 40 offers a rich phone platform experience including voice, messaging, Internet, media, apps and services. It is already the world's most used mobile platform. Series 40 is continuing to drive our market reach and scale especially in emerging economies.

We will continue to use the best technologies to meet our consumers' needs. This has been the case when entering the personal computing market with the Nokia Booklet 3G; for which we chose Windows 7. Windows was the pragmatic choice, with over 90% share of the personal computer market. It offers consumers a great and familiar experience. Nokia is also continuing to use our Series 30 platform in a limited number of mobile phone devices for highly price sensitive consumer segments.

2010 will bring new experiences

We are renewing our user interfaces on Maemo and Symbian for 2010. We are working to create a mobile experience that is natural and beautiful to use. We will offer a new visually exciting user experience with fast and smooth touch interaction, multiple Home screen pages, simplified navigation, multi-tasking and improved performance with new hardware.

Great user experience makes sense at every price point and to this end, we are continuing to invest in Series 40. In 2010, we plan to introduce support for QWERTY keyboards and multi-SIM, and also bring touch interaction on top of Series 40's recently renewed user interface.

Our services – such as Ovi Mail, Ovi Maps, Ovi Store, Ovi Music, Nokia Life Tools and Nokia Money – will also differentiate our market offering. Service and platform combinations will be decided by consumer need – with

* Approximate unsubsidized retail price excluding taxes

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Maemo and Symbian being the lead for Ovi, with services integrated into the user experience. Series 40 will offer selected and appropriate services.

Developers and publishers

Nokia will deliver an improved offering for developers and publishers. We plan to bring Qt and a common Web Runtime to Symbian and Maemo in 2010; Web Runtime for Web development and Qt for native development. Nokia has already shifted its services and device app development for 2010 to Web Runtime and Qt.

Web Runtime enables developers to utilize commonly used Web development skills and tools, and exploit device capabilities in their apps - such as GPS for location, phonebook, and calendar. Developers can use Aptana Studio, Adobe Dreamweaver and Microsoft Visual Studio - the leading development toolsets for Web app development. Many of Nokia's own services will be built on Web Runtime first and we expect Web development to be the primary development environment for long-tail developers.

Qt offers developers efficient native coding to build the highest performance apps and services. It offers a complete and modern development framework built on C++ and a leading development toolset with Qt Creator. Developers will be able to code once and recompile their apps for our platforms – Symbian and Maemo – and for other mobile and personal computing platforms – including Microsoft, Apple and Linux. We expect Qt to be used for optimum performance and more intensive apps including graphics heavy games and core device apps, such as music player and photo album.

We are continuing to invest in Forum Nokia and in the growing developer community it supports; now over 4 million registered members. In 2010, Forum Nokia will deliver a simplified and integrated development toolkit, enabling Qt and Web Runtime apps and services to be built on Maemo and Symbian. This offering will also enable developers to exploit our open services; building on our recent launch of a beta OVI SDK for Ovi Maps.

For our Series 40 phones, Forum Nokia will continue to provide tools and support for Java ME, continuing to address the mobile industry's largest developer community.

Ovi Store already provides developers and publishers the means to reach the world and monetize their innovation.

2. Architecture for differentiation and efficiency

We have worked to refresh our software architecture to enable increased innovation and speed to market. We have increased focus on the user interface, together with apps and services layers, as these areas bring the greatest differential in user experience.

At the same time, we have adopted open source practices and moved to extend the communities around our platforms and hardware layers. We believe that there are significant efficiency gains from open source collaboration. We are now evolving our services and devices architecture, integrating cloud computing to enable our solutions offering.

Device software architecture

Our device software architecture is comprised of hardware, OS platforms, developer frameworks, user interface frameworks, and apps and services. Our developer frameworks and Ovi API's enable developers, publishers and service providers to bring apps, content and services to our devices.
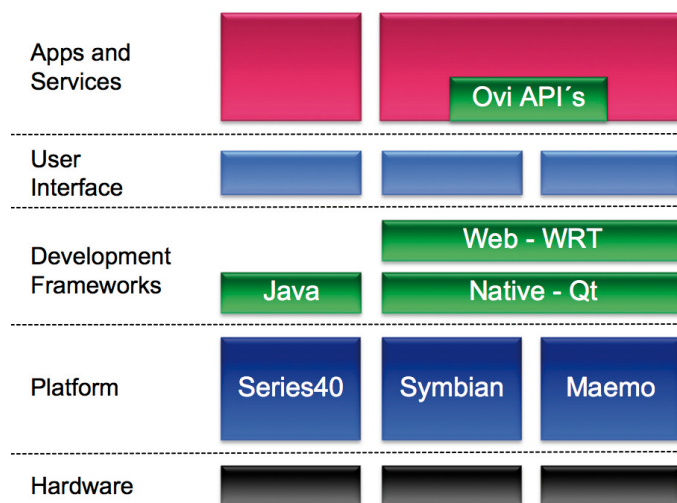
Figure 2 Nokia device software architecture is composed of several layers: hardware, OS platform, development frameworks, user interface, and apps and services.

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Fuelling app and service innovation

To increase innovation on Maemo and Symbian, we are separating and abstracting the platforms with cross-platform development frameworks – Web Runtime and Qt. This brings platform independence and minimizes the developers need to have specific platform development skills.
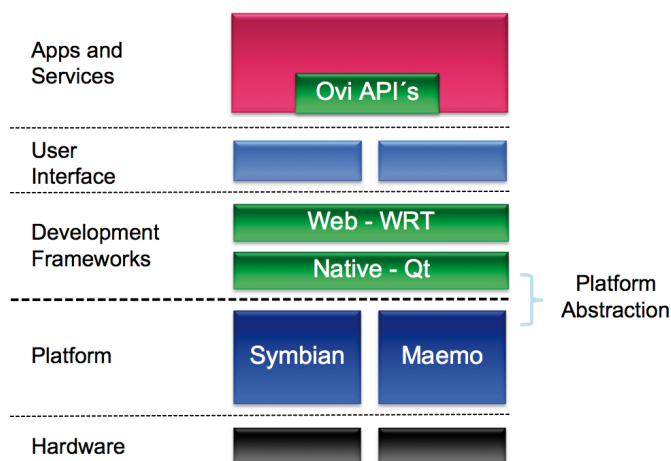

Figure 3 Platform abstraction: Development is no longer dependant on platforms with developers able to use widely adopted development frameworks of Web Runtime (WRT) and Qt.

Productivity through open source

Nokia is making significant use of open source software, as well as contributing to the open source community. Our open source approach is key to engaging a broad community – developers, operators, chipset vendors, OEMs, developers etc. We believe that the larger the ecosystem, the greater the innovation and thus the richer the user experience. We also see that the greater the scale, the greater the opportunity for value creation.

One example is WebKit; this open source software provides the basis for our common Web Runtime and for our browser on the Symbian platform. The common standard offered by WebKit ensures Web app and service innovation occurs, and works on our Web Runtime and browser. The WebKit community gains from contributions from a wide community – including Nokia, Google and Apple – with the community dedicated to bringing new features, such as HTML 5 and wider CSS support, to the benefit of Nokia and others.
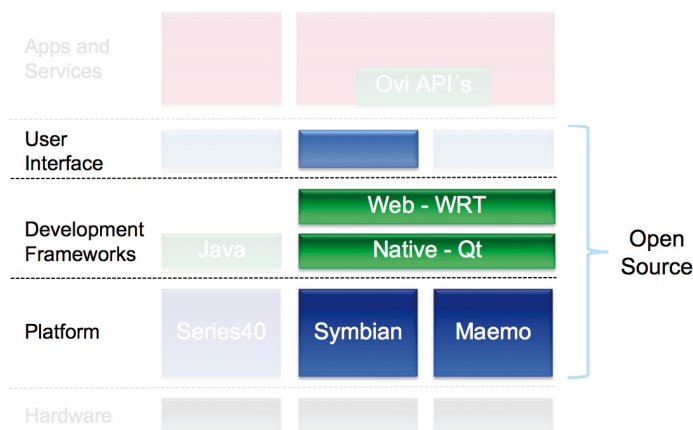
Figure 4 Open source components: Web Runtime (WRT) is based on WebKit; Maemo is built from multiple open source projects; Qt and Symbian are open source projects.

We see open source software as providing efficiency, especially in the development and maintenance of the platform and framework layers. Nokia is a principal sponsor for many open source projects including KDE community for Qt and the Symbian Foundation.

Maemo, in particular, is comprised of and contributes to many upstream open source projects, such as kernel.org, Mozilla and Gnome. Over 80% of Maemo is standard open source components. This reduces significantly the need to build and maintain our own code base enabling Nokia to focus efforts on differentiating layers in Maemo – user interface, apps and services. We estimate with Maemo that there can be a ten-fold cost advantage in software development and maintenance through using open source components. For example, Nokia gains from the shared maintenance and development of the Linux kernel; since 2005 more than 270 companies have contributed to the Linux kernel.org project and research estimates the total redevelopment cost of the Linux kernel to be $612 million. (Source: "Linux Kernel 2.6: It's Worth More!" David A. Wheeler")

Access to the best hardware

We are making it easier to bring new hardware to our platforms, so that we can more readily select the best hardware.

Our platforms are moving towards commercial chipsets supplied by multiple vendors, away from home grown chipsets. To this end, we have worked with our supplier

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partners to define standardized API's, so that we get verified and integrated chipset packages from these suppliers. These standardized API's provide an abstraction layer that creates hardware independence. This allows Nokia to bring new technologies more readily to our platforms, while ensuring full integration with the platform. For Symbian, these standardized API's are part of the Symbian Foundation offering.
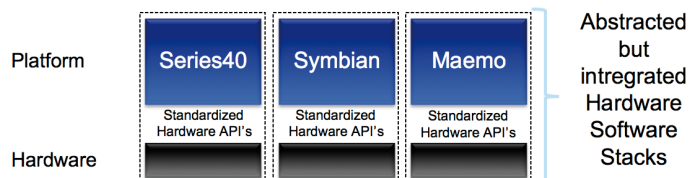
Figure 5 Hardware abstraction: Hardware can more easily be brought to platforms using standardized application programming interfaces API's.

The abstraction of development frameworks and hardware abstraction layers also enables future flexibility in software platform choices.

Cloud services

Nokia is changing the way we create and deliver our services. We are no longer building services separately. We are leveraging cloud architecture to build and deliver rich, interconnected consumer services. This architecture will provide Nokia, our partners and developers with a framework for rapid development of innovative and integrated apps and services. It will enable us to scale economically to support hundreds of millions of subscribers, allowing Ovi services to grow in value and relevancy over time through the accumulation and analysis of data. Our approach to consumer data is permission based, we will ensure that consumers have control over their data and actively opt for us to offer them a more personally relevant experience based on analysis.

Mobile devices will interwork with servers to create a rich user experience with mobile devices bringing contextual awareness to the cloud through sensors. We expect mobile devices to continue to act independently from the rest of the cloud when needed, as mobile devices will not always be connected. In the future, the memory and computational power of mobile devices will also be leveraged alongside the server-side capabilities of the cloud – enabling services to use the most

efficient and responsive resource at any given time.
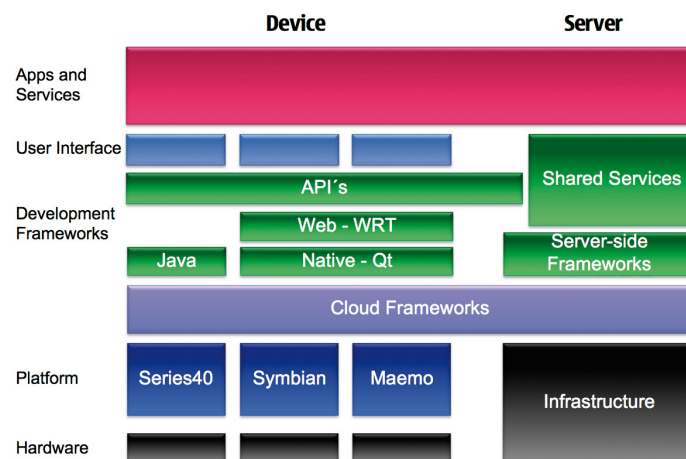
Figure 6 Nokia cloud architecture: Nokia is implementing cloud components on both mobile device and server-side.

The investments we have made in Qt, Web Runtime, Java, Web enabled device API's and Ovi API's are enabling us to build cloud computing into our solutions. Nokia is now implementing cloud framework components to enable device data caching, multiple device support and device sensor access.

3. Device platforms for all needs

Our three core software platforms - Maemo, Symbian and Series 40 – coexist to meet the distinct needs of our consumers and partners in every geography and market.

Mobile Computers – Maemo

With Maemo we are shaping the future of mobile computers. Mobile computers are bringing the power and memory we expect today with personal computers into a package small enough to fit in the pocket; with full Internet capabilities, cellular capabilities and high-resolution cameras. Maemo will deliver high performance and flexibility to build the next generation of mobile devices.

Maemo devices are now evolving from Internet Tablets. The new Nokia N900, based on Maemo 5, is aimed at technology enthusiasts and offers the full Internet with no comprise, the ability to multitask and a new user interface including the panorama desktop. In all areas we want to provide the industry leading experience, to

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this end, we are including market leading experiences, such as a Mozilla based browser, Microsoft Exchange email integration, and our own OVI branded services.

Maemo is about delivering an uncompromised experience with desktop performance and capabilities. To deliver this computing experience we will adopt the highest performance mobile hardware.

We see the role of computing and Internet increasing over the next two years, growing substantially the role of Maemo in Nokia's portfolio. Maemo will also deeply integrate our Ovi services into the user experience.

Open source

Maemo is an advanced Linux based computing platform. It uses the standard Linux 2.6 kernel - not an optimized mobile kernel - and other standard upstream open source components. In developing Maemo, we work in and with leading open source projects; in fact, over 80% of Maemo code is open source software. What we add is our expertise in user experience, user interface, hardware and services integration.

Maemo thus provides a direct path to open source innovation and allows us to attract partners and provides us an extremely flexible, no lock-in computing platform.
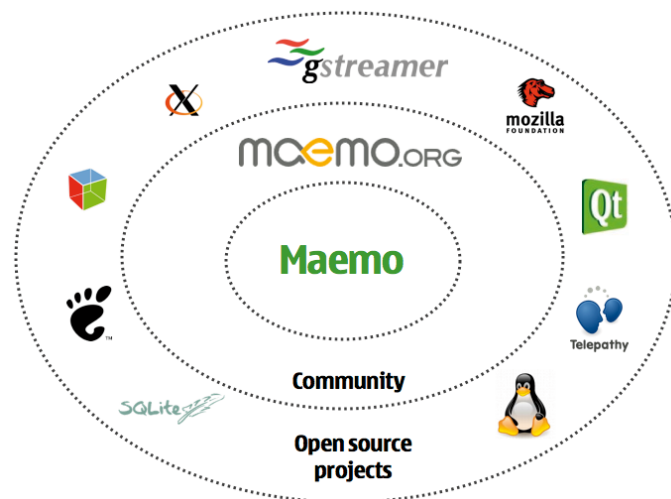
Figure 7 Maemo upstream open source projects including Linux kernel, Telepathy, Qt, Mozilla, GStreamer and Debian.

Customization

We are enabling our operator partners to tailor the Maemo based device experience to their market needs. The tools we provide enable operators to customize by selecting and deselecting apps, changing themes including colors and backgrounds, and installing their own content and bookmarks.

The next release - Maemo 6

Maemo 6 will create an iconic user experience with integrated Ovi services. Maemo 6 will have vertical scrolling on multiple Home screen pages and multi-touch interaction, such as pinching. We plan to scale Maemo to higher volumes and work to attract developers and partners to this platform. Developers will be able to build apps using our cross-platform developer frameworks of Qt and Web Runtime.

Beyond Maemo 6, we will continue to evolve this platform integrating next generation technologies and ensuring the highest performance experience. We believe that Maemo offers a compelling platform for mobile and other computing needs, and we will explore the potential to extend the Maemo ecosystem.

Smartphones – Symbian

Symbian is the world's market leading smartphone platform and Nokia's chosen smartphone platform. It accounted for 43.6% of all smartphones in 3rd quarter 2009 (Strategy Analytics). Symbian enables Nokia and other vendors to offer a wide and differentiated range of devices; today from around €150 to over €500* with devices such as the Nokia 5230 and Nokia N97.

With Symbian, we are bringing smartphone capabilities to more people at lower price points, including Internet, entertainment, and location-based experiences. Symbian is a core enabler for our solutions strategy offering the opportunity to scale our solutions to a global mass market. It balances performance with efficiency to enable differentiated product creation to meet the needs of multiple consumer segments and markets.

* Approximate unsubsidized retail price excluding taxes

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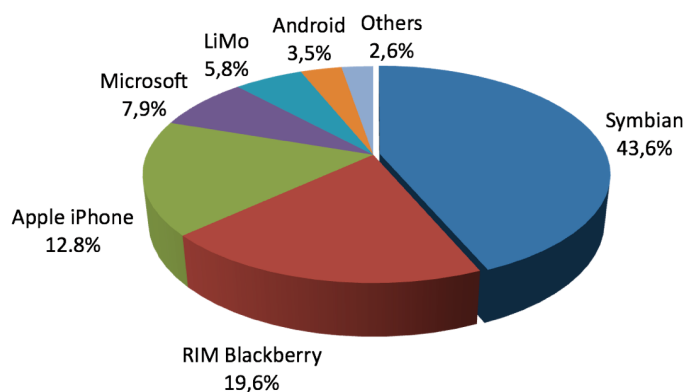
Figure 8 Smartphone shipments by platform Q3 2009 (Source: Strategy Analytics).

Figure 9 Symbian Foundation membership: Over 160 members.

Competitive advantages

Symbian's key advantages come from its telecoms history. It provides the most mature and complete smartphone platform available today. Symbian's market advantages including bill of materials, battery life and power management, memory footprint, optimized cellular connectivity, media codec support, security capabilities, IP protocol support and universal SIM compliancy. Symbian offers Nokia the ability to reach the global market with our smartphones with support for over 50 languages and provides leading operator customization and compliancy. These provide Nokia with a time to market advantages, a device cost advantage and support our operator customer's needs like no other smartphone platform.

Contributions to the Symbian Foundation

Nokia participates actively in the Symbian Foundation contributing to the code-line, working in the Foundation to manage the code-line and using Foundation Symbian releases on our device portfolio. Nokia expects to deliver our final Symbian^3 and initial Symbian^4 code package contributions in January 2010.

Over the last 12 months, the foundation has enlarged and unified the Symbian ecosystem, offering increased software and hardware innovation.

Focus areas

We realize some areas need work and we are actively working with the community to improve Symbian. Symbian^3 and Symbian^4 are bringing step changes in the user experience. For Symbian^3, we are bringing a much faster and responsive user interface, enabled by graphics accelerated hardware and software. Additionally, we are improving the usability, adding multiple Home screen pages, introducing single tap interaction throughout the user interface and offering multi-touch pinch-zooming.

For Symbian^4, we are redesigning the user experience; simplifying interaction and layout, bringing content to the fore and delivering a beautiful, fast and consistent user interface. We will be contributing common elements of the new user interface code to open source.

Bringing Qt to and enhancing Web Runtime on Symbian will enable easier and more productive app development. Standardized hardware API's also bring faster hardware technology innovation.

Mobile Phones – Series 40

Nokia is continuing to transform people's lives with mobile phones based on Series 40. Series 40, already the world's most used mobile platform, will bring the Internet to the next billion with mobile phones that support services such as Ovi Mail, Nokia Maps, Nokia Life Tools and Nokia Money. It provides the most efficient platform for product creation of any mobile phone platform and offers market leading flexibility for operator variant creation.

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Nokia is continuing to invest in Series 40 and we plan to bring touch to the platform in 2010. We will offer a compelling touch experience at a highly affordable price. We will also bring QWERTY keyboard support and dual SIM capabilities to this platform over the next year. The movement to commercial chipsets away from custom made will also extend the cost leadership of this platform.

4. Fuelling developer innovation

Our cross-platform development approach, based on Qt and Web Runtime, is making life simpler and more efficient for developers. In 2010, Web Runtime for Web development and Qt for native development will be the principal development environments for Maemo and Symbian.

Our common Web Runtime will enable Web developers to readily build apps using standard Web development skills. Developers can also access the device capabilities in Maemo and Symbian and our Ovi services using simple JavaScript API's.

Qt enables developers to code their apps once and then simply recompile their apps for both mobile and personal computing platforms. Qt today is widely adopted by developers with leading companies in over 70 industries using Qt for apps and services. Qt customers include HP, AMD, Google, Skype and Samsung.

For Series 40, we are continuing to support Java ME as the primary development environment. Our Web browsers also provide complete support for Internet services innovation and we are continuing to support other development environments.

Web – Web Runtime

Web Runtime offers a low barrier to entry for developers, attracting professional and long-tail developers alike, especially those focusing on Internet services. Web Runtime enables developers to use standard Web coding with HTML, CSS, JavaScript and Ajax. Web Runtime is built using the WebKit open source project components.

As part of our Web Runtime, we provide access to device services including phonebook, calendar, and GPS location. Developers can also build on our OVI services

such as for Ovi Maps via open application programming interfaces (API's) using JavaScript. Nokia provides Web Runtime plug-ins for Aptana Studio, Adobe Dreamweaver and Microsoft Visual Studio development tools. These enable developers to create, edit, test and deploy Web Runtime apps.

Already today, developers can build Web widgets for Symbian devices. During 2010, Symbian and Maemo will offer a common Web Runtime across both platforms. We also expect to fully adopt the W3C specifications once these are standardized by the W3C.

Native – Qt

Qt brings a development framework based on C++ with a complete user interface framework. Qt provides the richest application development environment and offers optimum performance. Qt provides common cross-platform libraries for development and produces compiled native apps.

Qt is widely adopted in the mobile and personal computing worlds and in other industries including consumer electronics and automotive. Qt makes it possible for developers to readily build apps across mobile platforms – Maemo, Symbian and Windows Mobile – and desktop platforms – Windows, Apple OS X and Linux.

We expect Qt development to be adopted for apps requiring highest performance, for example games and core device apps such as music player, Web browser and photo album. Developers are able to develop apps in Qt and compile to run on both Maemo and Symbian. Developers can start developing Qt based apps even for devices today, as the Qt preview for Symbian S60 3.2 and 5.0 and Maemo 5 are already available. These Qt implementations will be commercially available over the next few months which will enable existing devices to support Qt based apps.

From Symbian^4 and Maemo 6 releases, Qt will be an integral part of the platforms. This will enable developers to integrate their apps and services with the platforms' user interfaces and device apps, such as calendar and phonebook.

We will also be providing support for Maemo and Symbian in Qt Creator. Qt Creator is the cross-platform integrated development environment (IDE) for Qt development; it presently supports Windows, Ubuntu Linux, and Apple OS X.
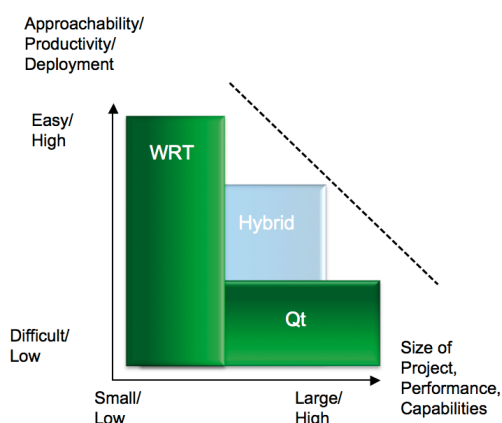
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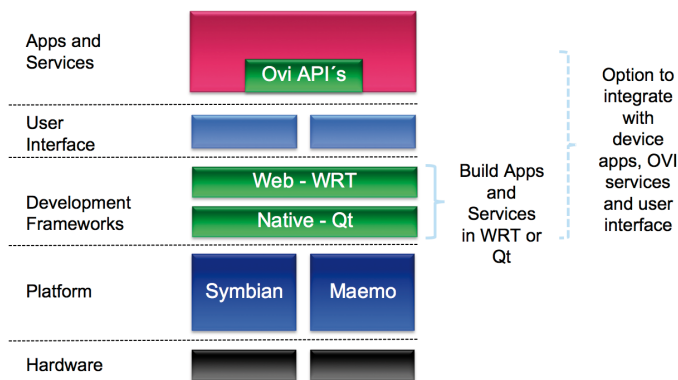
Figure 10 Developers can build apps and services with Web Runtime (WRT) and Qt with option to integrate with devices apps and OVI services, and into the platform's user experience.

We expect that third parties will have the occasional requirement to develop at the platform or hardware layer, such as for high performance graphics for games. For these cases, Nokia will provide additional middleware API's; for instance with games, we will provide direct access to Graphics Processor Units (GPU) through OpenGL ES API's.

Hybrid

Our implementation of Web Runtime and Qt will in the future enable developers to combine both Web and native paradigms when developing apps and services. Thus enabling the native development of app components that require high performance, for example a media player, while building other elements in Web, for example the apps' user interface. Developers will be able to exploit the best of both worlds, maximizing productivity and performance.

Figure 11 In future developers will be able to build using both Web Runtime (WRT) and Qt to balance productivity and performance.

Ovi SDK

Above both the cross-platform frameworks on Symbian and Maemo, Nokia is delivering an Ovi SDK with API's for Ovi Services – today this beta enables developers to embed navigation and maps functionality within their apps and services using JavaScript. We will continue to expand further our open API offering, enabling developers to build on our Ovi services.

Additional development frameworks

For Series 40, Java ME remains the principle development environment. Series 40 today, offers developers the largest uniform market of Java-enabled devices.

We are also continuing to support other development environments: Series 40 supports Adobe Flash Lite 3.1; Symbian also offers Java ME, Flash Lite 3.1 and Microsoft Silverlight; Maemo offers support for Adobe Flash 9.4. We also expect to move to full Adobe Flash support on Symbian.

To ensure the best Web experience on mobile, in 2010, our Web browser offering for Maemo and Symbian will adopt best-in-class engines ensuring that browser based Internet services render perfectly on our mobile device. We will ensure services – for example from Facebook, MySpace, Google, and Twitter – can exploit advanced browser capabilities like the latest JavaScript libraries and HTML 5. For Symbian, we will implement the tip-of-tree WebKit browser engine across all devices to provide a common browser environment for Web development.
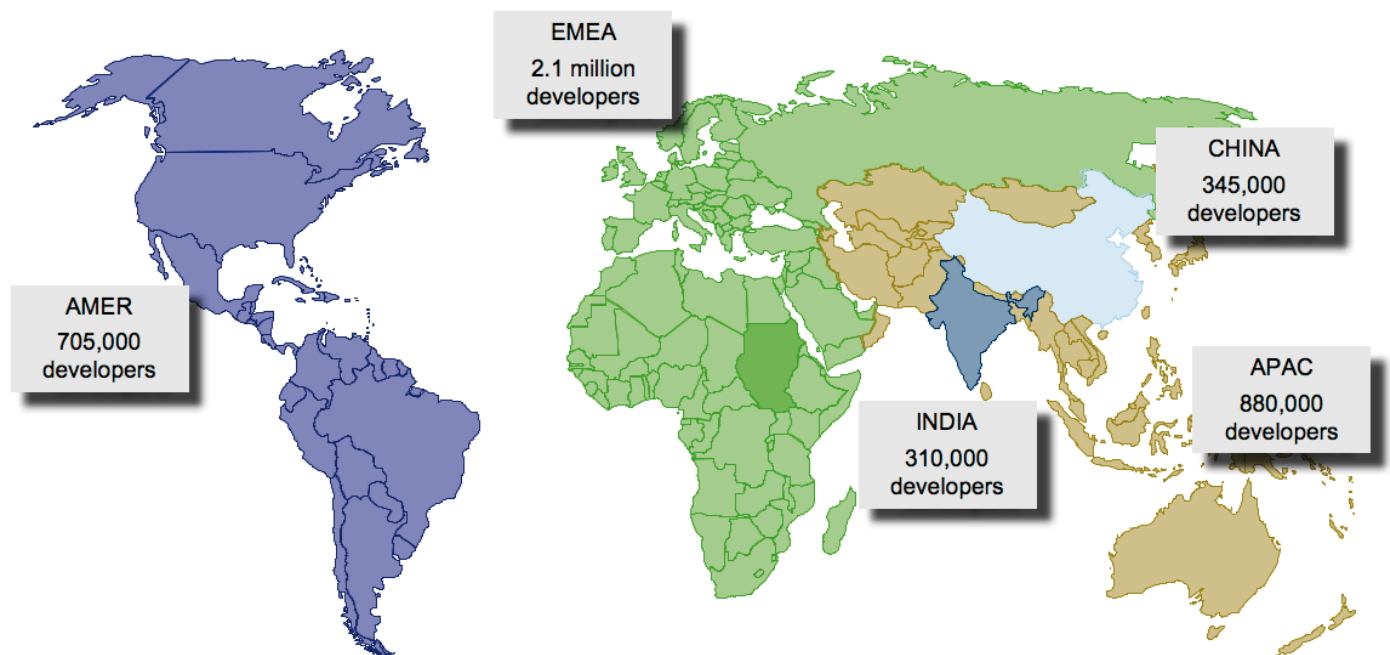
Supporting developers

We are working to make development more efficient and productive through our cross-platform approach. We are unifying our developer toolkit and will make it available in 2010 for development on Maemo and Symbian. We are also actively developing and integrating further our service offering into our developer toolkit.

Nokia is continuing to invest in Forum Nokia. Forum Nokia is the world's largest mobile developer community with more than 4 million registered members. Forum Nokia provides technical and business development support for members producing apps for Nokia devices.

Forum Nokia also enables developers to leverage Nokia's relationships with operators, distribution partners and retailers. Through Forum Nokia and Ovi Store,

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developers and publishers can sign up to distribute their apps reaching over 100 device models in over 180 countries. Developers can therefore easily monetize their apps and services through Ovi Store, while at the same time publish their content through independent app sales channels.

EMEA
2.1 million
developers

CHINA
345,000
developers

AMER
705,000
developers

APAC
880,000
developers

INDIA
310,000
developers

Figure 12 Forum Nokia registered members: Over 4 million developers globally.

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