Nokia Web Services –
Helping operators mobilize the Internet
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## Abstract

Among the most promising new technologies, Web services are sometimes referred to as the future of the Internet. With the many benefits offered to all mobile users by their platform-independent, service-oriented architecture, the mobile industry is likely to adopt Web services rapidly.

This white paper focuses on the opportunities for mobile network operators. By implementing a solution that puts the focus on the user and which can be deployed on leading mobile terminal and network platforms, it will be possible to offer new, informative, tailored, and entertaining services for both consumer and enterprise users. The operator puts a system in place that supports not only its own services but also offers smooth access to other services of interest to subscribers, while preserving their privacy.

The Nokia Web services architecture supports basic open standards such as HTTP, XML, and SOAP. Nokia also recognizes the need for proper security, service discovery, identity and session management support – crucial for fast adoption and lower cost per transaction. Offering convergence of the fixed and mobile domains, Nokia Web services are based on interoperable open standards, building a bridge to service providers that have not previously had the incentive or means to develop and offer mobile applications.
Introduction

Nokia is among the first companies to implement a service-oriented software architecture based on open standards. The support for such implementations will create a wide bridge between the fixed and mobile Internet worlds, and promises to be a trigger for the mass adoption of enterprise and consumer Web services, regardless of access method or user device. The mobile industry will enjoy major benefits from this evolution.

An excursion into the service-oriented architecture

A service-oriented architecture consists of loosely coupled software systems, which may run on multiple different operating platforms. Different software systems communicate by exchanging standardized, XML-based messages.

Both terminals and servers can function as Web services consumers and providers. This interactivity brings new flexibility to systems, allowing service developers the chance to concentrate on the creation of compelling and interoperable services. The open interfaces hide the architecture from the service.

A proper Identity Management solution, based on the open standard Liberty Alliance specifications, further improves the user’s experiences – less time needs to be spent entering information. The user will often only have to accept with a click, getting immediate access to the service. But, even more importantly, every transaction is based on user consent, including the sharing of identity information and provisioning of other personal data, making users more comfortable with using the mobile Internet.

The service-oriented architecture is the basis for many applications, including those providing the ability to customize content to a mobile user or their location, via a location service, as well as charging for content on every transaction.

XML (EXtensible Markup Language) is a flexible way to create an information format that can be exchanged in a consistent way. In its format, it resembles the HTML (HyperText Markup Language).

With Web services, it is the service interfaces that are the main focus, rather than the underlying architecture, encouraging the creation of services that exchange information between the endpoints. An example of this is the mobile terminal providing its location, or the user’s presence information, to the Service Provider endpoint, which can then further personalize the delivered service.

Figure 1. A mobile, service-oriented world
Develop-Run-Enjoy!

As a concept, Nokia’s end-to-end platform architecture can be subdivided into three logical parts:

- **Develop** – for cost-effective and future-proof development of solutions for all kinds of mobile terminals
- **Run** – Operators and enterprises can benefit from interoperable, reliable mobile services, which reduces the need for integration and management resources.
- **Enjoy** – Users will have exceptional experiences when accessing and consuming mobile services.

Nokia Web services

The Nokia Web services architecture is an important part of the Nokia end-to-end platform. The framework is also an excellent example of how open standards are used to create a fully functional, best-in-class solution. It will co-operate with several other platform components, and provides developers and vendors with a common way of creating and implementing Web services. The architecture is based on the common Web services standards SOAP and XML, and is enhanced by the identity-based Liberty ID-Web Services Framework specifications. The main benefit of the Nokia Web services architecture is that it hides much of the underlying complexity from developers.
and service providers, reducing the effort when developing and implementing new services. Figure 3 on the previous page illustrates the key components of the Nokia Web services architecture.

There are several good reasons for implementing Web services support in mobile devices, as such support enables new revenues from enhanced, attractive applications that are not restricted by a browser user interface. Moreover, it offers new revenues from applications that use Web services to combine several enablers within one application, creating a better user experience and more valuable services.

Another advantage is that Web sites can use profile information to create personalized service access, without needing to authenticate or know the user.

The end-to-end Web services implementation also makes it easy for mobile operators to provide services to enterprises that run Web services applications on terminals, based on the concepts of Location, Presence, Messaging, Profiles, Authentication, and Payment/charging.

**Requirements – how to achieve adoption**

Web services have a good chance of becoming a widely deployed technology, but for this to happen, all aspects need to be considered when designing the solutions. Shown below are some requirements, highlighting aspects of particular importance for mobile network operators:

- It must be possible for developers to focus on the actual applications on top of the framework. The interfaces should ideally be open, and to some extent adapted to the type of services in question (for instance location, presence, location, payment, etc.)

- It must be easy to link service providers to the ecosystem without a lot of time-consuming integration work. The operator is key to connecting mobile subscribers to the preferred operator-specific or third party services in a smooth, reliable, safe, and cost-effective way. For this to be possible, the operator needs to create bilateral, mutually beneficial business agreements with service providers.

- Smaller operators must have the option of outsourcing the whole, or parts of, the service-oriented architecture (such as identity provider and discovery services), in the most cost-effective way

- It must be possible to implement the same architecture for different domains – users must be able access the services from several domains by using the same methods and credentials

- The user experience must be improved and the user must have confidence in the level of security and integrity provided by the system.

- The services should be enhanced with mobile-specific parameters, such as location, mobile user profiles, presence and payment preferences.

- The security and integrity aspects must at the very least include an efficient two-way authentication method, appropriate encryption, and secure payment mechanisms. Also, identity information should only be shared with the user’s consent.

**Service examples**

The service-oriented architecture will eventually offer a huge number of services – interactivity between Web Service Consumers and Providers will enhance the functionality, while making the services easy to use will improve the experience for the user. The operator is in a particularly favorable position, with the ability to offer compelling service packages based on both their own and third party solutions. For the user, it will be very easy to access an application, use it, and move on to the next in a seamless way. It will also be possible to blend services right from the start.

Some examples of service use are given below:

**Printing a picture from a mobile phone, using a print service**

On the way back from work, José receives a Multimedia message from his friend Miguel, currently on a business trip in Barcelona, along with his new mega pixel phone. José wants to print the picture so that he can give a copy to Marie, Miguel’s girlfriend. When José walks into his house, and opens up the imaging application, he sees that a new option has appeared on the application menu – ‘Print to <my-local-printer>’.

This is because his terminal has discovered that a printing device was readily available, and was running a compatible printing service. The imaging application acts as a service client.
Locality-based search
Janet is thirsty and a little tired. She is sure a coffee would make her feel better. She opens a search interface on her mobile terminal, and searches for coffee shops nearby. The results show her all the coffee shops within walking distance of her current location. Her terminal is running a geo-location Web service, which is configured to release her location coordinates whenever she requests a local search. The geo-location service is a Web Services Provider (WSP). In addition, the local search interface is a Web Services Consumer (WSC), consuming data offered by a WSP on the network, which can be personalized based on data offered by a geo-location service.

Corporate e-mail access
Timo is traveling, and needs to quickly check his e-mail by accessing his corporate LAN. With his Web services-enabled mobile terminal, he can fire up his e-mail client on the terminal, which will automatically use the VPN-protected access point to send a message to his Exchange server asking for all the e-mail headers in his inbox, and the calendar items for the next day or two. His terminal e-mail client is accessing the Exchange server using WebDAV messages to a MS Exchange service proxy that translates WebDAV/HTTP messages to native MAPI protocol messages when talking directly to the Exchange server.

Streaming media client
Rob has his mobile subscription and his ADSL account provided by the same operator. A big fan of radio, he frequently uses a broadband radio service when working at home. He downloads a service client to his phone, creates a bookmark list of his favorite stations, and has streaming radio media delivered to his mobile terminal. He can now use the same customer login details to have authenticated access to the streamed media, both with his home computer and with his mobile phone.

Summary of operator benefits

New revenue sources
- Obtain revenues from own services, 3rd party revenue/cost sharing, and differentiation through service offerings.
- Meet the demands of all customer profiles. Users can easily edit their personal profile to include the most preferred services.
- Access through a number of devices such as PC, Laptop or mobile phone, with the same credentials and personalized user profiles. This shifts the focus towards the actual service consumption, rather than the authentication and service discovery processes.

Cost effectiveness
- The underlying architecture is hidden from the service.
- Opportunities to supply richer services.
- Lowers the barrier to implementing technology.
- Implementation largely on top of the existing infrastructure – only limited additional investments needed.

Differentiation
- For large operators – collaborate among the group’s different local operators, including the sharing of Service Providers, etc. Set up own federated network.
- For small operators – team up with SPs and ISPs, etc, to reinforce own service offerings.
- For alliances – collaborate in setting up the ecosystem to increase purchasing power and enhance the service supply.

Interoperability
- Interoperable – the framework provides full mobile ecosystem support, as well as being open for collaboration partners on the fixed Internet.
- If the mobile operator also offers (wireless or fixed) broadband Internet access, it is possible to provide customers with one subscription for all services.

Summary of user benefits

Convenience and Choice
- Easy to discover, access and use any service.
- Same principles applied, regardless of the access method and the user device.

Integrity and Confidence
- Ability to decide which personal information to share.
- Security features support secure transactions.
Key points

- The Nokia Web services architecture builds bridges between the mobile network and a new world of compelling services, including enhanced Internet-based services.

- The Liberty Alliance specifications make it possible for the mobile operator to create and manage a converged service ecosystem in a cost-effective way.

- Adoption by customers will be encouraged by ease of use, choice and user integrity, at reasonable costs.

The Nokia Web services architecture can help to achieve easy development, access and consumption of connected data services.