WAP over GPRS

Realizing the potential of mobile services

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Introduction

WAP and GPRS:
key drivers of mobile services

The Internet and Mobility are the main drivers behind our economy. One comprises the world's biggest library and at the same time functions as a global communications and collaboration environment. The other represents the natural way of working – the untethered way. WAP, the de facto standard, brings them together, enabling anywhere, anytime access to information and services from any device over any network. In turn, this accelerates the creation of the Mobile Information Society in which the addition of mobility to the Internet creates new opportunities for companies and further enriches the daily lives of people.

GPRS is a packet-switched service for GSM that mirrors the Internet model and enables seamless transition towards 3G networks. It transmits IP packets very efficiently, allowing profitable services to be marketed at attractive tariffs. GPRS is therefore an excellent platform for wireless data services and applications.

WAP is designed to deliver content in the optimal format for display on thin-client devices, such as mobile phones. In addition, WAP-compliant services and applications run over all network types, both current and future. The optimal user experience comes when WAP content is delivered over a packet-switched service such as GPRS. In this environment subscribers can elect to have instant access to WAP services (similar to accessing the Web over LAN, cable modem or DSL).
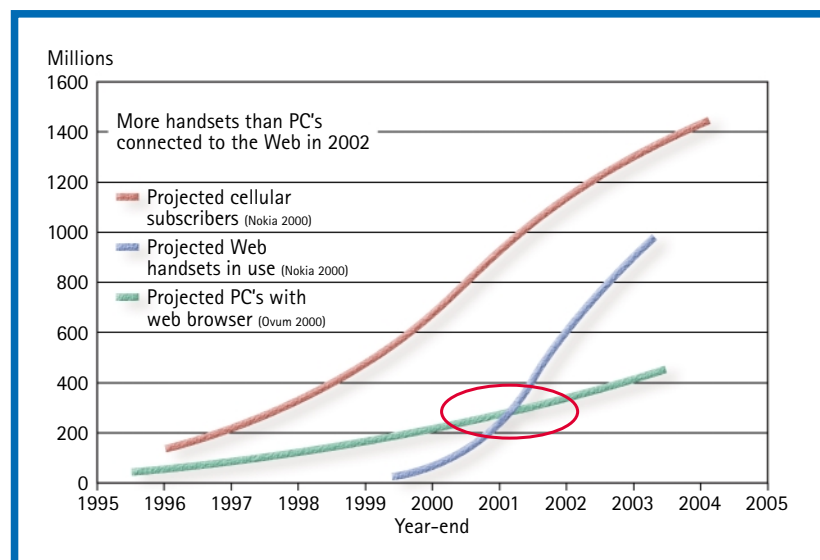
Millions

More handsets than PC's connected to the Web in 2002

Projected cellular subscribers (Nokia 2000)
Projected Web handsets in use (Nokia 2000)
Projected PC's with web browser (Ovum 2000)

Year-end

Figure 1. Mobile Internet outlook

Take-off time
WAP has taken off rapidly and looks set to get the mobile data revolution rolling in 2001. Around 40 million WAP-compliant phones were shipped in 2000 and the estimate for 2001 is 180 million. Moreover, users are currently accessing mobile portals over circuit switched data (CSD) links, which indicates the high value they place on the content. Thus, when the same content is delivered over GPRS the user experience will be enhanced and it is likely that more and more portals will be bookmarked.

This indicates that the market for WAP services and applications will be massive and the longer-term potential is simply staggering. By the end of 2003 there will be around 1 billion users of wireless devices and usage of wireless content will be an accepted part of everyday life, both for consumers as well as mobile professionals.

WAP over GPRS is the key enabler of this mass-market opportunity. The sooner network operators implement packet switching the sooner the mobile data revolution will take off.

New operator business models
GPRS enables operators to implement various charging models for mobile services. The simplest is a flat rate charge, e.g. USD 50 per month for unlimited access. Others involve charging for the amount of data transmitted, e.g. 5, 10 or 20 MB per month, or for the number of individual transactions.

In addition to flat rate, tariffs may be based on the amount of browsing events (transactions), the data volume (pricing bits), time, and services (pricing the content). Combinations of different models can also be employed, and revenues can be shared with content providers.

GPRS is a very efficient medium and it consumes far less air resources. Therefore the result is that operator costs for WAP over GPRS services are significantly lower than with WAP over circuit switched data (CSD).

Enabling the breakthrough: the network

GPRS is a robust technology that has been proven in operator networks. As with all new technologies, performance in live network environments under conditions like massive service usage, heavy and bursty data traffic levels, and during busy hour voice traffic needs to be carefully monitored and services tuned.

Instant access:
the new wireless paradigm
In an optimized service environment, the user can access the first page of a WAP session in about five to ten seconds. Delivery of subsequent pages will take about two to four seconds. With always-on mode it will even be possible to access the first page nearly as quickly as subsequent pages. Of course, the actual access delay depends on the size of the information deck and the response time of the content server.

GPRS users are on-line via logical connections, the Internet model. Communications channels are only employed during transmission sessions but are instantly available. Thus, staying on-line all day does not, in itself, incur any additional charges.

Efficient use of precious resources
Packet switching allows the resource to be shared by many users. For WAP browsing, this means that relatively high user densities can be sustained without having to make significant increases in network capacity.

This service can therefore be attractively priced, for example, flat rate basic access may be offered with supplementary charges for added-value services. The combination of low prices with a mobile service experience represents a win:win scenario. Users start with a very convenient, affordable and useful service. Operators derive additional revenue. Users subscribe to more and more services and operators get more income.

The battery life of WAP terminals is another important resource. Because the instant access link is logical, little power consumption is needed during idle time.

Data rates not an issue
WAP is optimized to transfer data in a very compact format. Messages between a thin-client device, such as a mobile phone, and the WAP server rarely exceed a length of 100 Bytes uplink (query from terminal to server) and 1000 Bytes downlink (WAP deck sent from server to terminal).

Most terminals use a single time slot for uplink data transfer and multiple timeslots for downlink. 1000 Bytes are transferred through the air interface in roughly 0.5 seconds (assuming the use of 2 timeslots). This clearly indicates that the data rate of the bearer is not an issue.

Security
Security in WAP and GPRS is performed at different protocol layers. Basically GPRS provides security at the bearer layer, WAP adds security on top of the transport layer.

GPRS provides a high level of security for all applications. The first step is to authenticate the mobile terminal with standardized GSM techniques. After that, all data between the mobile terminal and the Serving GPRS Support Node (SGSN) is encrypted.

WAP security is based on Wireless Transport Layer Security (WTLS), which is independent of the underlying bearer. And for establishing secure connections between the WAP gateway and content servers on the Internet, Secure Sockets Layer (SSL) is used.

Roaming
Normal GPRS roaming principles apply with WAP over GPRS. It can be expected that operators will interconnect their GPRS networks, and that roaming WAP users will always be connected to the WAP gateway of the home network. To increase the consumer benefit from WAP services, it should be allowed to connect to local services via local WAP gateways when visiting other operators' networks.

Enabling the breakthrough: the services

Huge demand for mobile services

The market for mobile services is new and therefore hard to quantify, but the success of short message services in Europe indicates that it will be huge. In December 2000 alone, over 15 billion text messages were sent over GSM networks worldwide. This includes also services such as games, chat, information database queries, icon and ringing tone downloading, and picture messages. Likewise, the number of users of NTT DoCoMo's i-mode service in Japan at the beginning of March 2001 was 20 million and over 300,000 new subscribers are added every week.

At the same time, the amount of WAP content is exploding. Already in August 2000 there were about 4.4 million WAP pages (according to Pinpoint.com); the equivalent figure in the development of HTML content was just over 1 million. Today, there are more than 5 million WAP pages (according to Pinpoint.com) and several hundreds of thousands of WAP developers worldwide.

According to the WAP Forum, there are 50 million WAP-enabled devices in the hands of customers. This does not even include the 10+ million palmtop computers which have WAP browsers available for use and several million 2-way interactive pagers, which are now also being manufactured with WAP browsers incorporated into their operating systems.
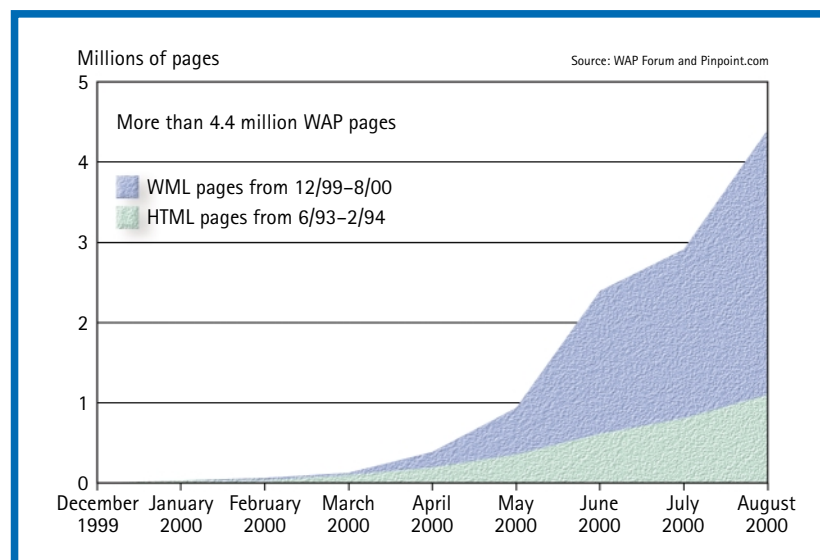

Figure 2. WAP content is exploding

After only one year of commercialization, there are more than 8 million WAP subscribers worldwide using over 40 different phone models. In the UK, the Genie WAP site had 10 million hits in September 2000 and 88 million hits in January 2001 – an increase of more than 500% in just six months. BT Cellnet announced that 10% of it's total subscriber base of 10 million customers (1 million) are now using WAP handsets and 660,000+ of that million are WAP subscribers.

These facts prove that the market exists for mobile data services. Today, these services are currently being delivered over circuit switched data (CSD), but the end user experience is enhanced with GPRS. Fortunately, the WAP standard was designed in order to allow content to be delivered over any bearer service. Thus, there is no need for developers to make changes to their WAP-

compliant services or applications when delivery is enabled over GPRS, 3G or any other network.

Why GPRS opens up the market

In addition to the services of today, the characteristics of GPRS together with new business models opens up a brand new set of opportunities. The new medium is ideal for interactive games played between two or more participants. These may be the kind of fast-response games played by children or teenagers or games such as chess that take a long time to conclude. Moves can be considered while mobile and then dispatched. Other examples of applications that involve real-time interaction or long lasting sessions are on-line auctions, chat, newsgroups, and gambling.

Fast response times together with a reasonably low price level will also enable increased usage of, for example, directory services that

operate around the clock and allow users to find the information they need in a few seconds. This feature can also be used for real-time voting in TV contests, which in turn can be linked to special offers of that individual's preference.

The combination of GPRS and WAP Push works well together and enables timely services which are triggered based on user preferences. The user experience with WAP Push is convenient because the WAP Push message can be shown by the browser as a WML deck with links etc. WAP Push provides a standardized interface towards content providers thus enabling easy creation of new applications and services.

Mobility also involves idle time, e.g. sitting in buses, trains and taxis or relaxing over a cup of coffee. Many people would like to fill that time by reading the news headlines

or other sources of information that have been created for display on mobile devices such as smart phones.

Information can also be leveraged. A group of friends might be having a drink and then decide to go to the cinema. They check out the local films, make a selection, and then link through in order to reserve seats and pay for the tickets. Payment could be registered on the phone and displayed in order to gain admission. With the possibility for lower overall costs for scenarios like this, they will become more likely to be used.

In the increasingly mobile business life instant connectivity offers excellent opportunities in increasing working efficiency, enabling employees to have access to business critical information while on the road. In addition, urgent messages can be pushed to employees mobile

terminals keeping key personnel constantly up-to-date. Also, approval processes can be accelerated using mobile terminals and digital signatures for confirming decisions and transactions.

Also, Mobile phones supporting GPRS enable the user to choose how to receive incoming phone calls during a session. Diverts can be set, if WAP sessions are not to be interrupted. Otherwise the phone is set to receive calls, during which GPRS will be put on suspended mode. After ending the call, the WAP session can then be resumed.

With many possibilities including location dependent services, virtually anything and everything is possible. Thus, WAP over GPRS represents a massive opportunity for developers in terms of creativity and market potential.

Nokia Developer NetPoint

Subscribers perceive value through the services and applications to which they subscribe. That is where their 'loyalty' lies, not with the technology or the service provider. Operators who move up the value chain to become network service providers must therefore ensure that they are able to offer a comprehensive portfolio of local and global services on their mobile portal as well as "traditional" mobility applications (such as messaging).

That is a key objective of Nokia Developer NetPoint, which incorporates the global Nokia

Artuse™ Developers Program with more than 1,000 existing developer companies. Developer NetPoint, accessible via **www.forum.nokia.com**, is a developer alliance focusing on business-to-business developer opportunities and early access to Nokia's Mobile Internet solutions, especially regarding the operator and service provider business.

For developer partners, Nokia offers access to application development environments, tools and expertise combined with marketing support activities so that developer companies get top services to boost the creation of attractive mobile

services. In turn, operators, service providers, and enterprises benefit via the opportunity to see visualizations of services and applications developed on standards such as WAP. They can also meet the front-line developers and content providers whose services are introduced, integrated, or distributed via Nokia sales channels.

Today, Forum Nokia (www.forum.nokia.com), the on-line community for third party developers of mobile applications, includes around 400,000 registered members (March 2001).

Solutions enabling WAP over GPRS

Nokia can provide full solutions to enable WAP over GPRS services depending on the needs of operators, service providers and enterprises.

GPRS network for Operators
To assist operators with everything from planning and building the GPRS network to billing for data packets, Nokia offers a solution based on proven telecommunications and IP routing expertise. Nokia's GPRS network is designed to be flexible – it allows operators to start small and expand capacity as business grows, while keeping transmission and interconnection costs to a minimum.

Nokia's complete solution for creating and implementing GPRS data services includes both IP core and radio network infrastructure, as well as systems integration and integrated GPRS service and billing solutions. Nokia provides operators with consultancy in planning GPRS business processes, service creation and charging.

The Nokia GPRS core network protects investment by evolving smoothly and cost-efficiently to 3G technology. This means that a significant part of investment in hardware, software and skills can be re-used when migrating from GPRS to 3G networks.

Service delivery platforms for operators and service providers
The Nokia mPlatform Solution is a powerful and comprehensive enabling solution for offering mobile services. Designed for

operators and service providers, it combines the key elements for offering value-added messaging, entertainment, mobile e-commerce, and information services and includes open interfaces for application development. The solution is network and terminal independent and works over different access methods, e.g. WAP, GPRS, 3G, and fixed network access technologies.

A modular solution, Nokia mPlatform Solution divides into several layers: the core products like WAP gateways, location tracking servers and profile directories; and enhanced access solutions, such as proxy servers and authentication.

One of the key elements of the Nokia mPlatform Solution is the Nokia Artuse WAP Gateway. This multi-technology gateway links WAP services on the Internet or

intranets with the mobile network, thereby enabling operators and service providers to offer their subscribers convenient access to mobile services. Since IP-based bearers such as GPRS are optimal for WAP services, Nokia Artuse WAP Gateway is enhanced for seamless WAP over GPRS and equipped for GPRS specific user authentication and charging. Terminals can use either GPRS or circuit switched data (CSD) for content retrieval during Push sessions. Some other key features of the Nokia Artuse WAP Gateway include: WAP push; support for cookies; and flexible billing and performance monitoring.

To enable a better user experience, Nokia mPlatform Solution allows for an additional level of intelligence to be incorporated in relevant areas. This guides the subscriber through various options based on rules and knowledge of

Figure 3. Operator WAP gateway scenario
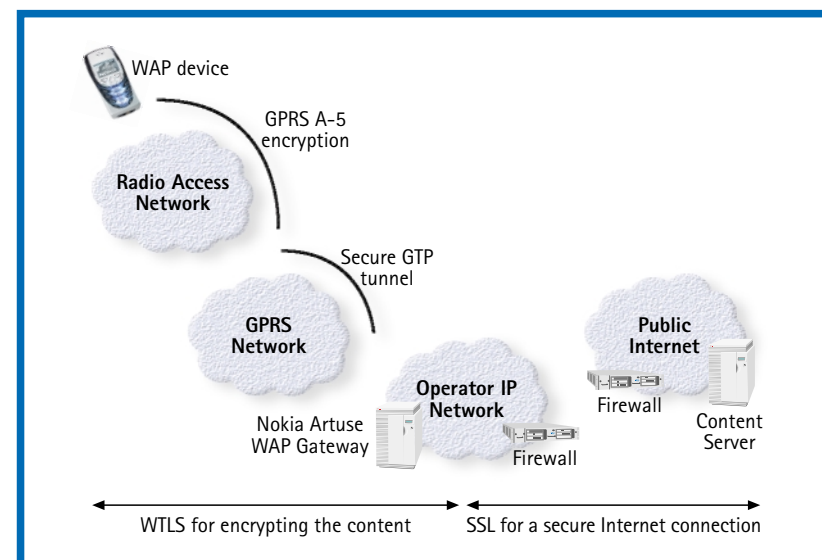
previous requests. For example, if a plane ticket is booked for Paris and the next option chosen is that of city guides, then the solution will immediately show a guide of Paris. In this way the perceived value of the service offer is significantly increased and subscriber loyalty retained.

Nokia mPlatform Solution can be enhanced with advanced functionality by adding modules, for example, for mobile e-commerce, location, advertising, multimedia streaming, and community services.

Nokia also offers operators a variety of applications, including messaging, travel, shopping, information, and financial applications. In addition, there are mobile entertainment services as well as an advanced development platform for developers and publishers of interactive entertainment.

Service delivery platforms for the corporate market and service providers
The WAP gateway functionality can also be located in, for example, an operator's network in such a way that only the application server is hosted by the enterprise or service provider. However, having the WAP gateway within the enterprise's or service provider's own IT network and behind their firewall provides benefits such as complete control, better security, and availability of services independent of operators. In this case, the service is then accessed through the GPRS network of one or more operators.

The Nokia Activ Software Suite is a product family providing state-of-the-art mobile connectivity for an enterprise's existing information systems, intranet, and extranet services. It has been especially designed to match the needs of an enterprise that wants to provide secure and reliable mobile services either to their employees or customers.

The Nokia Activ Server's WAP gateway functionality offers a strong and secure architecture for deploying mobile connectivity. Additional security and encryption protocols, access to corporate e-mail servers, calendar synchronization and the ability to use the MSISDN numbers of terminals for personalization of services are available as product options. The product also includes over-the-air WAP settings activation functionality, allowing consumers to get the settings or the service bookmark conveniently to their phone from a Web site or via SMS.

The Nokia Activ Server also adapts WAP content so that it matches the characteristics of specific end-user devices, and it is equipped to integrate or develop customized content filters. This is a particularly important feature since it relieves application developers from having to tailor content for each device separately.

The distributed and modular architecture of the Nokia Activ Server Enterprise Edition provides highly reliable services even under the most demanding use. The system can be easily expanded to match a growing load by adding new servers with a minimum of effort or disruption to service. Fault tolerance is achieved by means of self-monitoring and recovery capabilities.

Figure 4. Corporate WAP gateway scenario
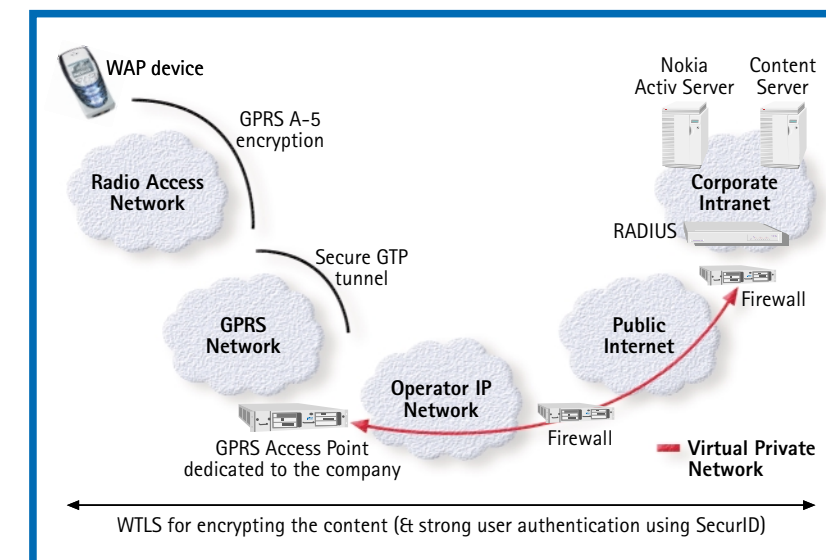
Conclusions

WAP over GPRS together bring mobile services one step forward on the road of evolution towards 3G services. With packet switching, the best delivery method, the role of WAP, as the mobile enabling standard, will remain significant. Content created to this standard is optimized for thin-client devices, such as mobile phones, and is also future proof, enabling it to be deployed on 2.5G, 3G and other networks. GPRS features efficient use of resources, instant access, fast delivery of information and innovative charging models. WAP and GPRS therefore represent a winning combination for operators, service providers, enterprises as well as the application developers.

Already today, WAP services are being accessed by millions of people over circuit switched data (CSD). There are several million WAP pages and several hundreds of thousands of developers worldwide. In addition, around 180 million WAP-compliant phones will ship in 2001. Thus, the market is primed and will take off as more and more operators implement GPRS on their networks.

Nokia support for mobile services is without equal. Nokia recognizes that subscribers perceive value through the services and applications to which they subscribe. Nokia Developer NetPoint therefore addresses this issue by supporting developers to create top services and then introducing these developer companies through Nokia's sales channels.

Nokia also provides platforms and complete solutions for operators, service providers and enterprises. The Nokia mPlatform Solution, for example, is a powerful and comprehensive enabling solution for offering mobile services and it includes open interfaces for application development. In addition, Nokia mPlatform Solution allows for an additional level of intelligence to be incorporated in relevant areas thereby enhancing user experiences. There is a comprehensive portfolio of local and global services as well as the more traditional mobility applications. Plus there are modules that can be added to provide additional functionality, for example, for mobile e-commerce and location services.

Nokia's Artuse WAP Gateway is a multi-technology gateway that links WAP services on the Internet or intranets with mobile networks. Features include WAP push and support for cookies. And Nokia Activ Software Suite offers an open software platform that provides state-of-the-art mobile connectivity for an enterprise's existing information systems and services.

Thus, Nokia has the technology, the solutions and the support needed for enabling you to operate in the Mobile Information Society and realize the potential of mobile services.