



The Value of WAP Push

About Openwave

Openwave Systems Inc. (Nasdaq: OPWV) is the worldwide leader of open IP-based communication infrastructure software and applications. Openwave is a global company headquartered in Redwood City, California. For more information, please visit www.openwave.com.

Openwave, the Openwave logo and the family of terms carrying the "UP." prefix are trademarks of Openwave Systems Inc. All other trademarks are the properties of their respective owners.

Copyright © 2001 Openwave Systems Inc. All rights reserved. December 2001.

The Value of WAP Push

Contents

| | | |
|---|--------------------------------------|----|
| 1 | Push Background | 4 |
| 2 | What Is WAP Push? | 5 |
| 3 | The Value of WAP Push | 8 |
| 4 | Subscriber Privacy | 13 |
| 5 | Demand For Push-enabled Applications | 14 |
| 6 | WAP Push Compared to SMS | 15 |
| 7 | Successful Customer Deployments | 16 |
| 8 | Conclusions | 17 |

1 Push Background

What is Push?

A push is a message sent to a mobile subscriber without an explicit request from the subscriber at the time the message is delivered. Broadly speaking, these messages could be person-to-person, application-to-person or even application-to-application. We will limit this discussion to the first two types. Some examples of push applications that exist today include alert messages for news, stock quotes and daily horoscopes. Users subscribe to these services and receive alerts according to their preferences. WAP push opens up a new world of possibilities extending far beyond just simple alerts, which are the predominant uses of push today.

Wired Internet

Push received much market notoriety in the mid to late 1990's, with wired-Internet information push services such as Pointcast. The hope was that Internet users would clamor for subscription services that would automatically send them only the information they need, making it more convenient to receive information by eliminating the need to seek it on a regular basis. A broad market never materialized for two reasons. First, visiting Web sites became a daily habit of Internet users, so push services provided little incremental value. The ease-of-use of Web browsers on a desktop computer made it very easy to search and browse. Second, delivery of messages or data was limited to the desktop, so if a user was away from the desktop, there was no easy way of accessing time-critical or location-specific information, thus further diminishing the value of push. As a result, the wired Internet push functionality has since been relegated to desktop/server and device management, where software can be automatically updated using push, thereby reducing IT management costs. Basic push functionality also still exists in the form of email, such as newsletters and direct marketing.

Mobile World: A New Beginning

The tremendous growth of data-enabled handsets opens new opportunities for push-enabled services with potential that is only beginning to be realized. Data-enabled mobile phones provide a new medium that allows people to not only make or receive voice calls, but also communicate in new ways and to access new and old applications and information anywhere and anytime. The success of Short Message Service (SMS) for person-to-person communication is a prime example of a new way to communicate using push. Yet the potential is much greater, and technologies are evolving to build upon the early success of SMS.

2 What is WAP Push?

WAP push is an open standard developed by the WAP Forum to provide push capabilities that enable new applications and dramatic improvements to existing push-enabled services. Openwave is fully committed to the open standards and actively participates in forums, such as WAP and 3GPPWAP, which discuss push. WAP push is currently provided with the Openwave™ Mobile Access Gateway Release 5.0.

WAP push provides a standard means to send data to a mobile subscriber without an explicit request from the subscriber at the time the data is delivered. In the normal client/server model, a client requests a service or information from a server, which then responds by transmitting information to the client. This is known as “pull” technology. The client pulls information from the server. The World Wide Web is the best example of pull technology, where a user enters a URL (the request), which is sent to a server, and the server answers by sending a Web page (the response) to the user (Figure 1).

Although WAP push is also based on the client/server model, it provides a means to send data to the subscriber without an explicit request from the client at the time of delivery (Figure 2). Note in Figure 2 that the user receives a stock chart and can immediately purchase the stock (symbol ABC) with just one click. This is not possible with alternatives to WAP push, such as standard SMS.

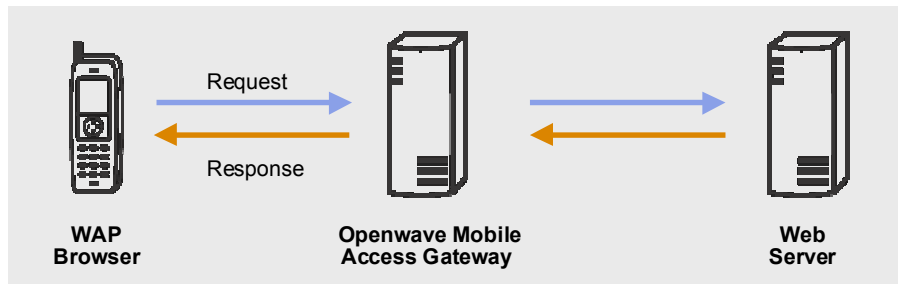


Figure 1: Traditional “Pull” Request-Response Model

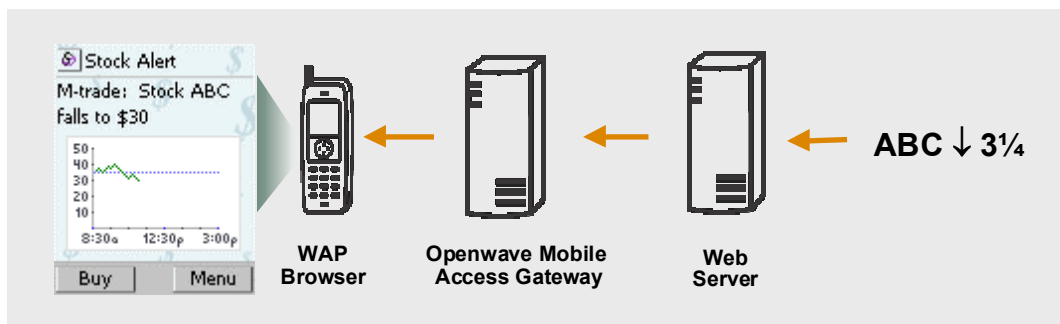


Figure 2: WAP Push Stock Alert

The WAP push system transports data to a WAP-enabled handset without the intervention of a user. In normal Internet communications, a client requests data or services from a web application and the response is delivered to the requesting client through a conventional WAP pull gateway. Using push technology, Web applications

can transfer data to a handset without an explicit user request at the time of delivery. A WAP push operation occurs when a Push Initiator in the Internet domain transfers content to a client in the WAP domain through the Push Proxy Gateway.

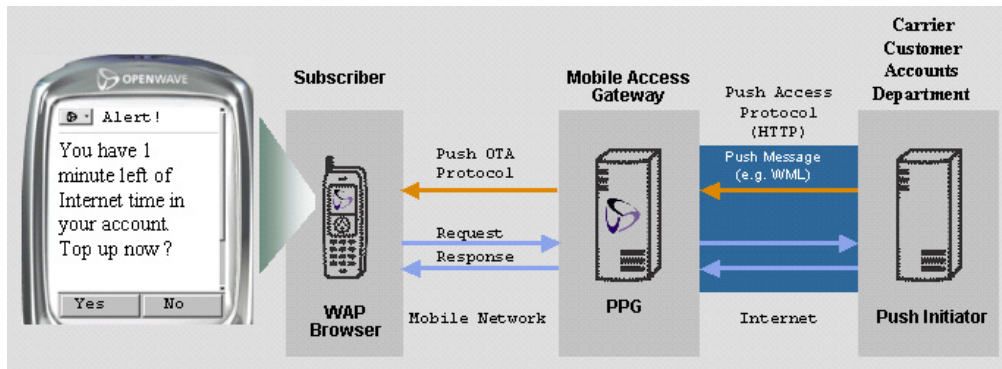


Figure 3: WAP Push System Example

In Figure 3, a subscriber's mobile Internet access account is running low on minutes. The carrier's customer accounts system sends a push message to the subscriber to notify the subscriber of the low account balance. With one click the subscriber can replenish the account using credit card information stored at the carrier's account system. The top arrows depict the push message. The request/response arrows represent the subsequent WAP session established when the recipient decides to replenish his/her account balance after receiving the push message—done with one click. The key components of the system are described below.

Push Initiator: A Push Initiator is the entity (e.g. an application, such as a news site) that originates push content and submits it in the form of a push request (using Push Access Protocol) to the Push Proxy Gateway for delivery to the handset. Each submission has a unique identifier. The Push Initiator can request the outcome of a submission (delivered or undeliverable), check the capabilities of a specific client device and check the status of a previous submission or cancellation of a submission.

Push Proxy Gateway (PPG): The PPG is the access point for pushes from the Internet to clients. The PPG can implement policies including: Push Initiator access control, error detection in push content, client address resolution, content translation and protocol conversion (HTTP to WSP, HTTP to UP.Notify). From the PPG, the push message is delivered to the handset using the Push Over-The-Air (OTA) Protocol.

WAP Push Client: A WAP push client is included in a device (e.g. mobile phone) capable of accepting WAP push content. It hosts applications, such as a WAP browser, that can receive and process the push content. It also hosts the Session Initiation Application (SIA), which can be used by the gateway to ask the client to initiate a WAP session.

A WAP push operation occurs when a Push Initiator in the Internet domain contacts a PPG and delivers content for a destination client using the Push Access Protocol (PAP). The PPG then pushes data to a client through the Push OTA Protocol. And in addition to providing simple proxy gateway service, the PPG provides the Push Initiator with handset capability lookup services, thus allowing the Push Initiator to select or format the appropriate content for a particular handset. The PPG can also notify the Push Initiator about the status of the push operation. The push subsystem is described in detail in documentation that accompanies the Openwave Mobile Access Gateway Release 5.0 document set.

Key Benefits

WAP push offers many benefits to subscribers, developers and carriers.

Subscribers Benefits

- More content: get more information, sound, graphics
- Improved usability: seamless integration of the application, delivered content and the user task at hand (e.g. receive the stock quote and purchase stock with one click)
- New applications: enhanced subscriber-to-subscriber interactions, such as auction, IM and multi-user games and applications
- Security: WTLS ensures privacy of data transmissions

Developer Benefits

- Bring subscribers back to applications again and again with one click
- Text, WML, graphics, and sound can be delivered
- Deliver more content, new applications, improved usability: zero or one-click to interact with application
- Access to millions of existing handsets
- New applications with new capabilities:
 - Deliver the right content by querying the handset capabilities
 - Deliver content according to urgency with content priority
 - Confirm delivery of messages
 - Bring the server-based application immediately to the user by requesting data session initiation
 - Deliver to groups of users with multi-recipient addressing
 - Ensure freshest data on the handset with cache operations
 - Deliver data to specific client-side applications, such as the browser, MMS, WTA and more
 - Ensure up-to-date information with message canceling/replacing, status querying and specify quality of service for multiple types of bearers using an open standard protocol
 - Support SMS-only handsets with automatic plain text transformation based on handset capabilities
- Easy to develop using Openwave SDK

Carrier Benefits

- New opportunities for revenue: deliver services not possible before with enhanced application capabilities
- Increase mobile Internet adoption: bring relevant services and information to subscribers
- Increase usage of existing services: pull revenue (WAP, Voice, Messaging, other services)
- Open standard: allows service providers to build a scalable development community with rich SDKs
- Supports broadest set of handsets: WAP 1.2 compliant handsets and also supports millions of existing Openwave™ Mobile Browsers in the market
- Access control: prevent unsolicited content with fine control of access to subscribers (access control list, content type, priority, size)
- Billing: billing event logging allows flexible billing schemes for push messages

3 The Value of WAP Push

Wireless operators judge the success of their mobile Internet offering by measuring the adoption of services, the increase in wireless usage, and an increase in Average Revenue Per User (ARPU) per month. WAP push allows carriers and content developers to increase subscriber adoption and usage, and offers enhanced revenue opportunities with improved and new applications. Figure 4 summarizes a general framework for driving mobile Internet adoption. Push can play a key role in facilitating the highlighted areas.

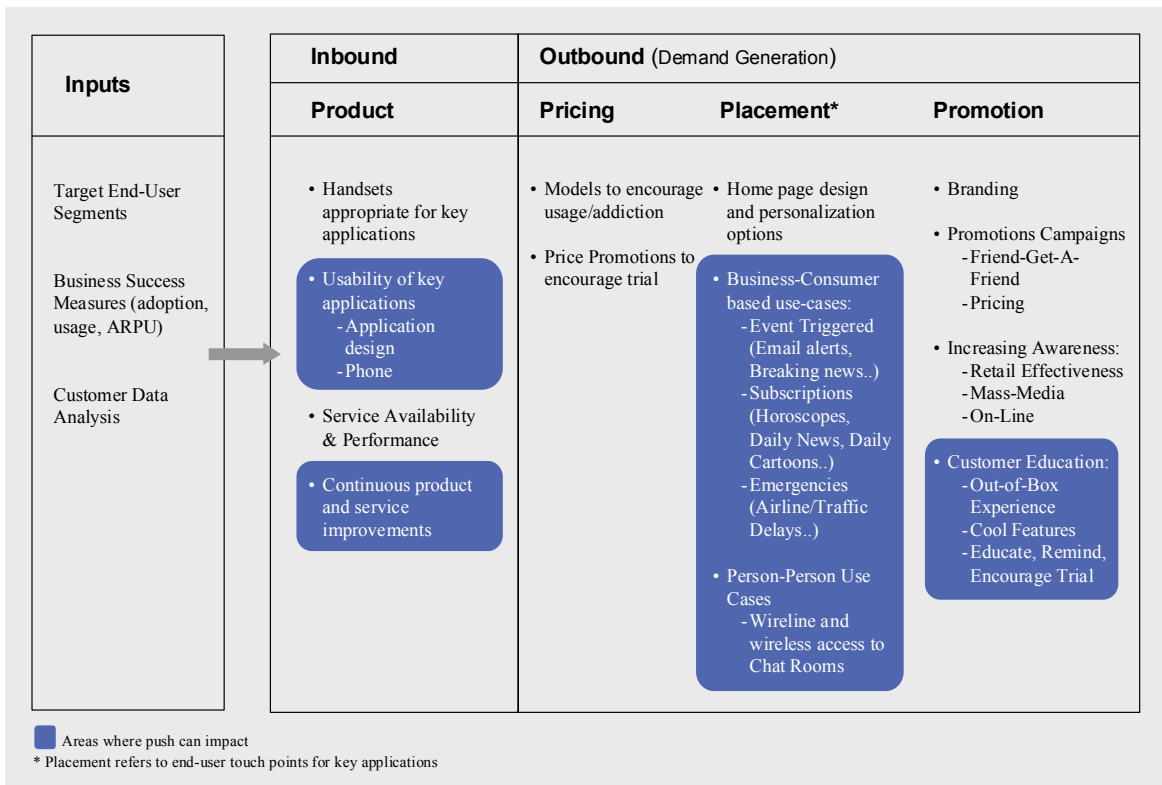


Figure 4: Push Drives Mobile Internet Adoption and Usage

Deliver Valuable Information Anywhere, Anytime

WAP push allows carriers and content developers to enhance their services by enabling delivery of valuable, rich content when and where subscribers need it most. As a result, WAP push can significantly increase trial and usage.

WAP push can enhance just about any information-based application.

Application Examples

Consumer: news, availability of new ring tones, traffic, email, games, sports scores, horoscope, promotions, stock information, person-to-person greetings, calendar events, airline schedule changes, banking/financial

Enterprise: dispatching services, inventory replenishment alerts, paging, CRM, IT system administration, other enterprise applications

Educate and Induce Trial

One challenge faced by many carriers and content providers is how to properly introduce the value of key mobile Internet services to new mobile subscribers. One solution is to allow new subscribers the option to receive push notifications during the “introduction” phase of their service. The carrier or content provider could send a message to introduce subscribers to a different service each day for the first two weeks of mobile service. The first message may introduce them to key phone features. The subsequent messages may introduce them to a mobile Internet application, such as chat, email, games or news, depending on the subscriber. With the enhanced usability of WAP push, the subscriber could immediately experience those services by simply clicking on the links within the message.

Improve Usability

WAP push delivers dramatic improvements in usability, which will increase mobile Internet adoption and usage. For example, Openwave evaluated the task of receiving a stock alert, retrieving the details of the stock quote, and then making a stock purchase. Using standard SMS delivery of the stock alert on the network of a major US carrier, and the current WML site of a major brokerage firm, the subscriber has to make 36 clicks from the receipt of the stock alert to the completion of the stock purchase. Using the WAP push delivery mechanism would require only six clicks, an 83% reduction in clicks.

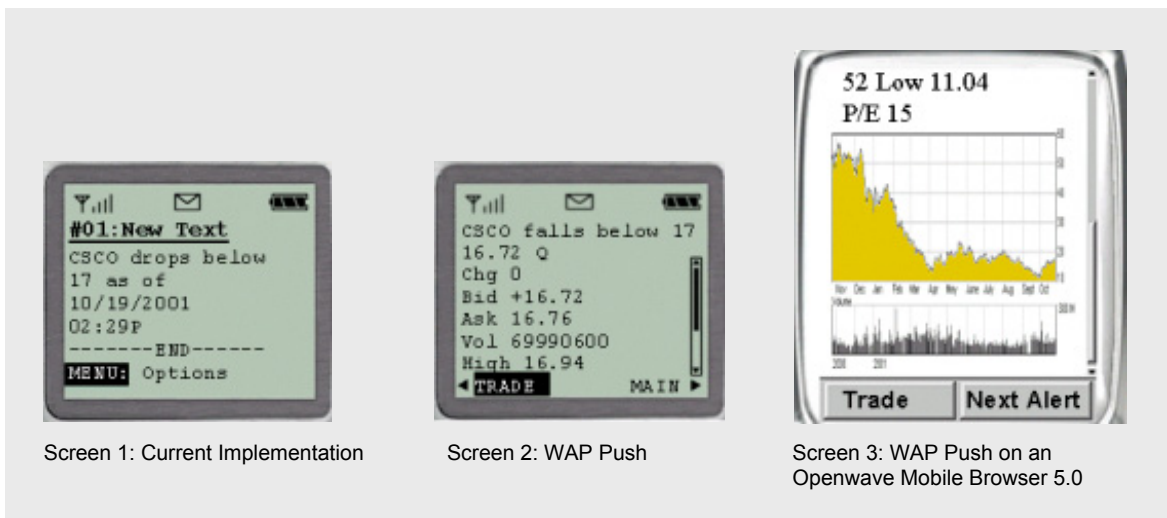


Figure 5: WAP Push Dramatically Improves Usability

Screen 1 is a current implementation of a stock alert. It provides little information and does not allow the subscriber to immediately get more information or initiate the transaction. The “Menu” link only allows the subscriber to save the message, erase the message or read the next message. In order to get the full stock quote, the subscriber must click out of the message inbox, launch the browser, navigate to the stock quoting service, navigate to the quote function and then enter the stock symbol.

Screen 2 is a WAP push implementation. The subscriber receives the entire stock quote and is immediately able to trade by clicking the “Trade” link. Note the scroll bar indicating that there is much more information on the quote. A standard SMS message provides little information on the stock.

Screen 3 is a WAP push implementation on a handset with Openwave’s new version 5 browser. It not only allows delivery of the entire stock quote, but also delivers the stock chart. Again, the subscriber is able to immediately trade by clicking on the “Trade” button.

With WAP push, subscribers can receive a notification of new ring tones or characters and be able to immediately download them without extra clicks or making a phone call. News alerts can now contain more information with a link to immediately receive more in-depth articles. A subscriber running low on their prepaid account can instantly replenish it when they receive an alert. Email alerts can now include more text as well as a link to allow immediate reply. Traffic alerts can now include alternative routes. Promotional messages can now include a relevant image and the link for an immediate purchase, thus enhancing response rates and brand-building at the same time. Quick polls/surveys can be sent to subscribers to determine service satisfaction or new service ideas. These are only a few examples of improvements that are possible.

WAP push complements SMS functionality by providing a content delivery alternative that allows the subscriber to immediately receive larger content and directly interact with the application within the context of the subscriber’s task. This functionality is especially critical for applications that require the recipient to immediately take action by interacting with the application.

Push to SMS Handsets

Openwave’s WAP push solution allows carriers and developers to take advantage of WAP push while supporting the large installed base of handsets that only support SMS messages. The PPG automatically transforms WAP push messages to plain text SMS messages and delivers them to handsets that can only receive SMS messages. This functionality delivers messages according to the highest known push capabilities of the receiving handset, thus eliminating the need to develop applications to the lowest common capabilities available today, which is plain text SMS. The PPG takes care of the transformation automatically, allowing more capable handsets to take advantage of WAP push without forcing developers to sacrifice the large installed base of SMS handsets.

Push to Millions of Handsets

Handsets often constrain the applicability of new technologies and services. Before developers will take advantage of a new feature, even if it is a standard, they want some assurance of the number of handsets and subscribers they can reach. In addition to supporting all WAP 1.2 compliant handsets, Openwave’s implementation of WAP push can transmit push messages to millions of existing handsets. Through its unique backwards compatibility feature, Openwave has ensured relevance to the millions of existing Openwave handsets in the market by making WAP push transparently compatible with our earlier implementation of push, available since the 3.x versions of the Openwave Mobile Browser. This means developers can code to the WAP standard yet reach millions of handsets already in the market.

Deliver New Applications

New interactive applications are now possible. By enabling immediate interaction with an application, WAP push facilitates the creation of multi-user applications, such as messaging, auctions, games and others, which are only limited by the creativity of carriers and content developers. New applications open new opportunities for carriers and content developers to capture more revenue from subscribers. For example, Openwave has developed a sample live application not feasible before WAP push—a real-time, interactive auction for football tickets. Participants receive notifications of higher bids and can counter bid with one click. Such level of interactivity was not practical before WAP push.

Enhanced Application Development

WAP push provides a rich set of development capabilities that allow content developers to deliver better applications with features such as secure data transmission, handset capability querying, multi-user addressing, message delivery confirmation and message delivery prioritization. The ability to specify intrusiveness enables the content developer to specify the urgency of the message. A very urgent message may interrupt the user by displaying the message, and a less important message may just provide the user with a passive indicator, such as a beep. It also allows the content developer to build an application that automatically launches the browser or initiates a phone call without user input, all subject to the access privileges that the carrier or the subscriber allows. Message delivery is no longer limited to 160 characters of text. WAP push allows larger content including WML and MIME content, such as graphics and sound. With the ability to query handset capabilities, carriers and content developers no longer have to write to the most common denominator. For example, enhanced application features can now be intelligently delivered to the relevant, high-value subscriber segment that may own more capable handsets.

Developer Interest

WAP push will become a fundamental application capability. Nearly one thousand developers worldwide have already begun to take advantage of the power of WAP push. Additionally, the vast majority of carriers have already enabled push using Openwave's previous implementation. WAP push is also gaining tremendous support with Openwave's latest version of the Mobile Access Gateway. As a result, developers can build applications and services that can be accessed by millions of subscribers today.

Continuous Service Improvement

Push can also be used to gather timely market research data. Opt-in polling of customers using short, push-enabled surveys in exchange for extra anytime minutes or other incentives can provide immediate market data on customer satisfaction, phone feature preferences and competitive switching threats. Carriers can improve existing services, predict the appeal of new services, plan for handset deployments and gauge competitive value propositions with timely data directly from the subscriber base. Figure 6 shows a hypothetical survey that can be easily implemented with WAP push.

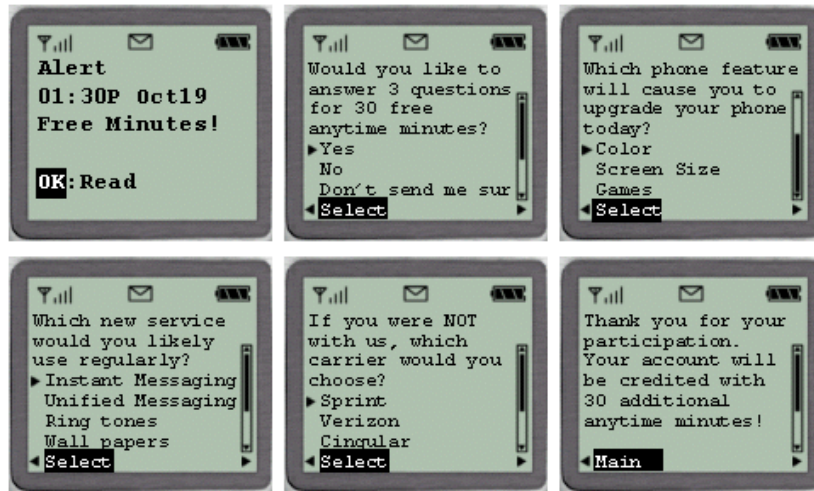


Figure 6: Hypothetical Customer Survey

4 Subscriber Privacy

Push-enabled applications must consider subscribers' concerns about privacy and intrusiveness. Subscribers must understand how they were placed on any push message distribution list, and they certainly do not want irrelevant, unsolicited messages. Implementation of the examples and application concepts in this paper must all take these concerns into consideration. To address subscriber concerns, push-enabled applications should comply with the fundamental rules for earning trust from subscribers.

Provide Access Control and Policy

Openwave's WAP push solution provides a robust set of access control capabilities that include black/white lists that limit access to specific application providers. These capabilities also enable fine control of the content and message delivery options that are allowed for each content developer. Operators should also consider providing guidelines to content partners who develop push-enabled applications. The guidelines would help to ensure that users do not receive unwanted push messages and that applications are designed in the most user-friendly fashion.

Provide Privacy Statement

Carriers and application developers should consider providing a statement of privacy that incorporates mobile push-enabled applications. For specific ideas on the privacy guidelines, refer to well-known non-profit organizations, such as TRUSTe, who provide privacy certification for Internet applications. The same privacy principles that apply to the wired Internet also apply to the mobile Internet.

Set Expectations

Set expectations with the subscriber by informing them of the kinds of messages they will receive and the value of the information for the associated applications. For example, in the "Educate and Induce Trial" concept discussed above, setting subscriber expectation can be done at the retail level (POS material or sales reps) or through the first push message. The first message would inform or remind the subscriber that they will receive messages on some frequency during the first two weeks after receiving their new phone, that these messages will introduce them to specific features or services and that they can choose to not receive any more of these messages.

Deliver Valuable, Relevant Information

Ensure that the right information is targeted and delivered to the right users. From the subscriber's perspective, ensure that there is real value in the messages that they will receive. Irrelevant messages may be considered "spam." Effective targeting can be accomplished by allowing the user to select (opt-in) the push-enabled applications, topics or features that they would like to engage with—either at the retail level or through the first push message. For example, in the "Educate and Induce Trial" concept discussed previously, the subscriber could be allowed to choose the features or services which they would like to learn about during the first two weeks of receiving their new phone.

Enable Easy Opt-out

Always provide an obvious mechanism for the subscriber to opt-out of receiving push messages. This can be accomplished with by providing that option with each push message. Subscribers will become annoyed if they continue to receive messages that are not valuable to them.

5 Demand for Push-Enabled Applications

Carriers are relying on new and advanced services to increase minutes of use, retain subscribers and differentiate service offerings. Push is one tool that will enable carriers to realize this potential.

Market research suggests that there is latent demand for push-enabled mobile data services. Additionally, for those applications with strong interest from mobile users, most can be significantly enhanced with push.

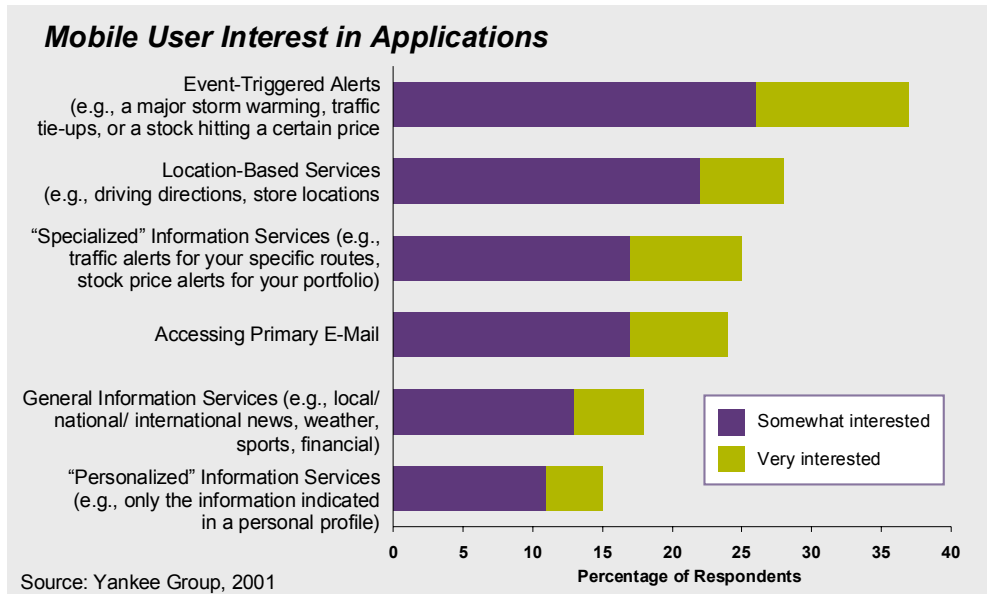


Figure 7: Demand for Push Mobile Data Services

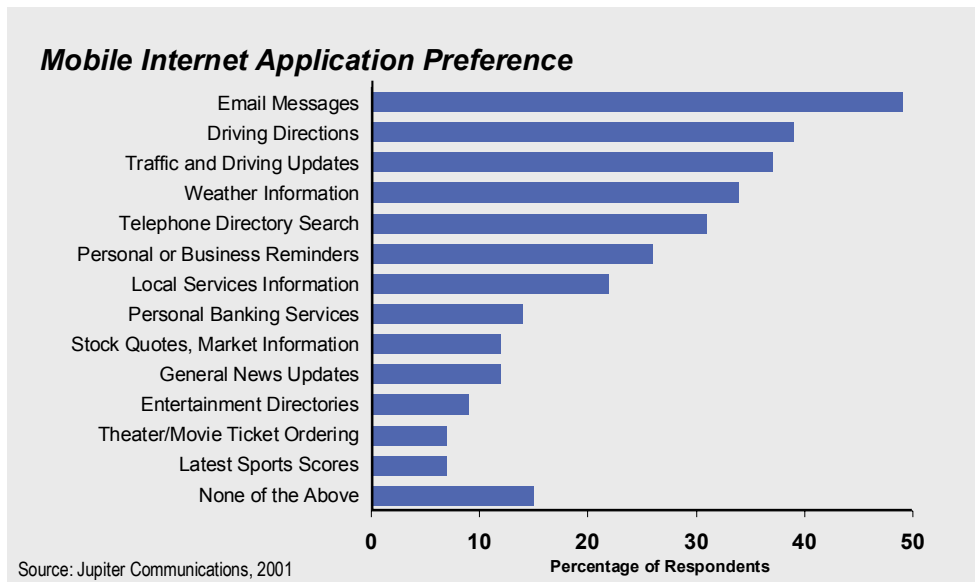


Figure 8: Mobile Data Services Can Be Enhanced with Push

6 WAP Push Compared to SMS

Push is sometimes compared to standard SMS. However, there are a number of significant differences. Although the PPG may use SMS as an underlying bearer if required by the Push Initiator, the push system can add great value to SMS and should be considered complementary. The following is a list of additional benefits offered by the push system:

- **Active Content:** Content is active (i.e. allows users to interact immediately), can be used to stimulate user access and is compatible across different handset vendors. Additional enhanced features, such as the ability to include WML and content replacement using HREF or unique identifiers, offer the ability to create an enhanced user experience. If the push is unread by the user, it may be silently replaced by subsequent push messages under the control of the Push Initiator, ensuring that up-to-date content is always in the handset.
- **Push Access Protocol:** The PAP is an open standard access protocol allowing the service provider to build a scalable development community with sophisticated developer toolkits available.
- **Rich Feature Set:** The WAP push system offers a rich feature set including application level control of intrusion based on urgency of the information, application level confirmation of receipt of push message, delivery notification to the Push Initiator, multi-recipient addressing and device capability discovery and utilization.
- **Cache Control:** Cache control offers the ability to affect the dynamic storage of data on the handset.
- **Over The Air:** The PPG offers access to a number of bearers and the ability for the initiator to specify, in terms of Quality of Service, the preferred mechanism. Additionally, authentication and secure push are available.
- **PPG Control:** The PPG proxy offers the service provider a number of sophisticated mechanisms to tailor service for particular Push Initiators and to offer differing degrees of access to a wide user community of WAP capable and pre-existing Openwave Mobile Browsers.

7 Successful Customer Deployments

Openwave has a number of customers successfully using push capabilities to drive adoption and usage. These customers include Sprint, Nextel, LGT, Telefonica and TIM. Many European operators are upgrading to the Openwave Mobile Access Gateway Release 5.0 to take advantage of the recently launched M-Services Initiative, of which WAP push is a key enabler.

Sprint PCS in the U.S.

As the market share leader in net subscriber additions and the lowest churn in the United States, Sprint PCS has proven that push-enabled applications can make a significant difference in adoption and usage. Sprint continuously improves the services it offers to subscribers and deploys technologies that will improve the user experience. One example is AOL Instant Messenger. Within two weeks of implementation, the push-enabled service generated over 1 million minutes of use.¹ Push allows the subscriber to be alerted when friends are online and when the subscriber receives a new instant message. More importantly, it allows the subscriber to immediately respond to the message with one or two clicks. Push enables an experience on the mobile handset that is very close to that of the desktop. Sprint's Shortmail service is also push-enabled, allowing person-to-person exchange of messages with the various benefits—the recipient is notified of messages, is able to immediately respond with one or two clicks, can send images, can view the message thread, and messages are not limited to 160 characters.

Overall ARPU contribution from data subscribers is estimated to be approximately \$1 per month, implying an approximate \$10 incremental ARPU per data subscriber per month.² Sprint's overall ARPU is approximately \$60 per month, and only a few dollars of ARPU separate the largest carriers in the U.S. Other push services include email message notifications, news updates, stock changes and more.

LGT Korea

LGT is a Korean operator who has deployed the Openwave Mobile Access Gateway and leverages its push capabilities to launch a wide variety of services. LGT has researched the push market extensively and push will continue to play a significant role in its success, accounting for a significant volume of data transactions. Expected benefits include “pull” traffic and increased usage of related services.

LGT has over 4.3 million voice subscribers, of whom over 70% are WAP users.³ LGT has achieved a response rate much greater than 10% to push notifications. Push services offered by LGT include Email notifications, news, trivia and entertainment applications. This proves that subscribers respond to a well-designed push program that delivers truly valuable content and applications.

Telesp Brazil

Telesp is a relatively new South American mobile operator that has achieved one of the world's fastest adoption rates of mobile Internet services within the first 12 months of deployment. Telesp has achieved 22% mobile Internet penetration⁴ by delivering personalized services targeted at a specific segment, attracting prepaid users and delivering compelling applications in a short space of time.

Openwave push technology underpins the key messaging applications of person-to-person messaging (Torpedo), email and notifications. The success of this operator underlines the success factors discussed previously, demonstrating how an operator has accelerated adoption and increased data ARPU.

In conclusion, Sprint, LGT, and Telesp have demonstrated push to be a powerful application capability that increases mobile Internet adoption and revenue. Push provides significant improvements in the usability of

¹ Merrill Lynch 4/1/01 report, “The Mobile Internet: What's Happening Today? What's Coming Up?”.

² Ibid.

³ LGT web site.

⁴ Telesp data sources: Data Subs: 1.077M (Q3/01), Source: Telesp Cellular Press Reports of Subs who tried WAP-based services 'at least once'; Goldman Sachs report 11/6/01 says 5M subs at end of Q301.

applications, allowing proven Internet applications like instant messaging to be effectively replicated on the mobile Internet. It takes mobile person-to-person messaging to a new level of usefulness, and it enables developers and operators to deliver valuable content, information, and applications to subscribers anywhere and anytime.

8 Conclusion

WAP push opens up a new world of possibilities for mobile Internet services. It is a fundamental application capability that multiplies the power of the mobile Internet by enabling new applications and enhancing existing applications. It brings to subscribers the information they need when and where they need it most, thus allowing content providers to bring subscribers back to valuable services again and again. Based on open standards, WAP push can be implemented today with Openwave Mobile Access Gateway Release 5.0, which supports millions of existing Openwave handsets and all WAP 1.2 compliant handsets.



Openwave Systems Inc.
1400 Seaport Boulevard
Redwood City
California 94063
U.S.A.
Corporate +1 650 480 8000
Europe +44 1442 458 800
Japan +81 3 5909 6100
<http://www.openwave.com>