1. **What is WAP?**

- Application environment and set of communication protocols
- Optimized for mobile phones & wireless.
- Extension to Mobile Networking technologies (means) & Internet technologies (content)
- Standard for bringing the internet content and other Value Added Services [VAS] to wireless networks and mobile phones, smart devices.
- A device independent network protocol
- Allows genuine differentiation as well in terms of hardware, applications and services as in pricing.
- Builds on existing internet standards.
- WAP hides all the underlying wireless network technologies that are prevalent. It is agnostic to the wireless protocol [such as GSM, CDMA, and TDMA]
- Open standard that has been developed jointly with major companies in the telecom and computer industries

The Wireless Application Protocol (WAP) is an open, global specification that empowers mobile users with wireless devices to easily access and interact with information and services instantly.

WAP bridges the gap between the mobile world and the Internet as well as corporate intranets and offers the ability to deliver an unlimited range of mobile value-added services to subscribers—indeed of their network, bearer, and terminal. Mobile subscribers can access the same wealth of information from a pocket-sized device as they can from the desktop.

WAP is a global standard and is not controlled by any single company. Ericsson, Nokia, Motorola, and Unwired Planet founded the WAP Forum in the summer of 1997 with the initial purpose of defining an industry-wide specification for developing applications over wireless communications networks. The WAP specifications define a set of protocols in application, session, transaction, security, and transport layers, which enable operators, manufacturers, and applications providers to meet the challenges in advanced wireless service differentiation and fast/ flexible service creation. There are now over one hundred members representing terminal and infrastructure manufacturers, operators, carriers,
service providers, software houses, content providers, and companies developing services and applications for mobile devices.

WAP also defines a wireless application environment (WAE) aimed at enabling operators, manufacturers, and content developers to develop advanced differentiating services and applications including a micro browser, scripting facilities, e-mail, World Wide Web (WWW)–to-mobile-handset messaging, and mobile-to-telefax access.

People on the move need services, information and entertainment that can keep up with them. With access to mobile services, decisions and interactions happen here and now. The value of mobile services to end-users is boosted by three separate elements: personalization, time-sensitivity and location awareness. Combining these three effectively adds even more value.

Wireless application protocol (WAP) is a protocol that has successfully established a de facto standard for the way in which wireless technology is used for Internet access. WAP technology has been optimized for information delivery to thin-client devices, such as mobile phones.

Mobile services powered and WAP have been widely accepted by users. By 2004, the number of WAP users in Western Europe is estimated to grow to well over 200 million (source: Cahners, In-Stat Group). In part, this growth is driven by the introduction of General Packet Radio Service (GPRS), WAP 2.0, Bluetooth and Mobile Commerce.

- **Purpose of WAP:** To enable easy fast delivery of relevant information and services to mobile users.
- **Type of devices WAP will use:** Handheld digital wireless devices such as mobile phones, pagers, two-way radios, smart phones and communicators -- from low-end to high-end.
- **Wireless networks that WAP work with:** WAP is designed to work with most wireless networks such as CDPD, CDMA, GSM, PDC, PHS, TDMA, FLEX, ReFLEX, iDEN, TETRA, DECT, DataTAC, Mobitex and GRPS.
- **Operating systems compatible with WAP:** WAP is a communications protocol and application environment. It can be built on any operating system including PalmOS, EPOC, Windows CE, FLEXOS, OS/9, JavaOS etc. It provides service interoperability even between different device families.
- **Equipment manufacturers interested in WAP:** Being a global open specification suite, WAP has generated the critical mass for manufacturers. This has opened up new product and marketing opportunities in the wireless industry and provides new revenue to participating companies.
2. **Why Choose WAP?**

In the past, wireless Internet access has been limited by the capabilities of handheld devices and wireless networks.

WAP utilizes Internet standards such as XML, user datagram protocol (UDP), and Internet protocol (IP). Many of the protocols are based on Internet standards such as hypertext transfer protocol (HTTP) and TLS but have been optimized for the unique constraints of the wireless environment: low bandwidth, high latency, and less connection stability.

Internet standards such as hypertext markup language (HTML), HTTP, TLS and transmission control protocol (TCP) are inefficient over mobile networks, requiring large amounts of mainly text-based data to be sent. Standard HTML content cannot be effectively displayed on the small-size screens of pocket-sized mobile phones and pagers.

WAP utilizes binary transmission for greater compression of data and is optimized for long latency and low bandwidth. WAP sessions cope with intermittent coverage and can operate over a wide variety of wireless transports.

WML and wireless markup language script (WML Script) are used to produce WAP content. They make optimum use of small displays, and navigation may be performed with one hand. WAP content is scalable from a two-line text display on a basic device to a full graphic screen on the latest smart phones and communicators.

The lightweight WAP protocol stack is designed to minimize the required bandwidth and maximize the number of wireless network types that can deliver WAP content. Multiple networks will be targeted, with the additional aim of targeting multiple networks. These include global system for mobile communications (GSM) 900, 1,800, and 1,900 MHz; interim standard (IS)–136; digital European cordless communication (DECT); time-division multiple access (TDMA), personal communications service (PCS), FLEX, and code division multiple access (CDMA). All network technologies and bearers will also be supported, including short message service (SMS), USSD, circuit-switched cellular data (CSD), cellular digital packet data (CDPD), and general packet radio service (GPRS).

As WAP is based on a scalable layered architecture, each layer can develop independently of the others. This makes it possible to introduce new bearers or to use new transport protocols without major changes in the other layers.

WAP will provide multiple applications, for business and customer markets such as banking, corporate database access, and a messaging interface.
3. WAP ARCHITECTURE

The request from the mobile device is sent as a URL through the operator's network to the WAP gateway, which is the interface between the operator's network and the Internet.

### COMPONENTS OF WAP ARCHITECTURE

- **WDP**
  The WAP datagram protocol (WDP) is the transport layer that sends and receives messages via any available bearer network, including SMS, USSD, CSD, CDPD, IS–136 packet data, and GPRS.

- **WTLS**
  Wireless transport layer security (WTLS), an optional security layer, has encryption facilities that provide the secure transport service required by many applications, such as e-commerce.

- **WTP**
  The WAP transaction protocol (WTP) layer provides transaction support, adding reliability to the datagram service provided by WDP.

- **WSP**
  The WAP session protocol (WSP) layer provides a lightweight session layer to allow efficient exchange of data between applications.

- **HTTP Interface**
  The HTTP interface serves to retrieve WAP content from the Internet requested by the mobile device.
4. How WAP Works?

WORKING MODEL OF WAP

- Uses the in-built micro browser to make a request (in WML format)
- Passes the request to WAP Proxy
- WAP Proxy Translates WAP requests to WWW requests
- WAP Proxy Encodes and sends the responses from the web server into the compact binary format (WWW or WAP content)
5. **WAP Components**

- **Client / Applications**
  - Browser like software embedded into the device.
  - Presents information
  - User interaction through applications.

- **Server**
  - Information portals on stocks, news, sports, business information etc.,
  - Service portals for email, tell mail, voice mail, infotainment etc.,
  - Commerce portals for banking, shopping, booking, auctions etc.,

- **WAP Gateway**
  - Bridge between telecom and computer [Inter/Intra Net] network.
  - Does the protocol transformation [WAP to HTTP or vice versa]
  - Conversion between binary encoded data to content format and vice versa.
  - Other value additions
6. Comparison b/n Internet & WAP

**WWW Programming Model**

**WAP Programming Model**

**Internet**
- TAPI [Application]
- HTML
- Java Script
- HTTP [Session & trns]
- TLS-SSL [Security]
- IP [Network]
- Link Layer

**WAP**
- WTAI
- WML
- WML script
- WSP, WTP
- WTLS
- WDP
- Bearers like CSD, SMS,
7. **Services**

- **Entertainment**: Music, Games, Graphics, Video
- **Communication**: Email, SMS, MMS, Unified messaging, Chat, Video Conferencing
- **Transactions**: Banking, Broking, Mobile Wallet, Booking reservations, Shopping, Auctions, Betting.
- **Business**: Cost, Inventory, Product and Corporate information.
- Push and Alert services

**➤ SMS (Short Messaging Service)**

The Short Message Service (SMS) is the ability to send and receive text messages to and from mobile telephones. The text can comprise of words or numbers or an alphanumeric combination. SMS was created as part of the GSM Phase 1 standard. The first short message is believed to have been sent in December 1992 from a Personal Computer (PC) to a mobile phone on the Vodafone GSM network in the UK.

Each short message is up to 160 characters in length when Latin alphabets are used, and 70 characters in length when non-Latin alphabets such as Arabic and Chinese are used. For a relatively simple messaging service, there are a lot of elements that need to be taken into account when developing and deploying SMS! However operators who take the time and trouble to invest in SMS will find appreciative customers and appreciating revenues. As such, please say "Yes to SMS"!

**❖ STANDARDIZED PROTOCOLS E.G. WAP**

The introduction of standardized protocols such as SIM Application Toolkit and the Wireless Application Protocol (WAP) contributes to an increase in messaging usage by providing a standard service development and deployment environment for application developers and business partners. These protocols also make it easier for users to reply to and otherwise access messaging services through the provision of custom menus on the phone. As such, whilst these protocols are only a means to an end and not new messaging destinations or services in their own right, they are likely to lead to 10-15% uplift in total SMS volumes.

**❖ TERMINAL DEVELOPMENTS E.G. SMART, HANDHELD COMPUTERS**
The introduction of more friendly and easy to use terminals contributes to increases in messaging usage by providing simpler access to messaging services. Terminals such as smart phones make it easier for users to originate, reply to and otherwise access messaging services through the provision of a QWERTY keyboard rather than the limited keypad on standard mobile phones. As such, whilst these terminals are only a means to an end and not new messaging destinations or services in their own right, they are likely to lead to 10-15% uplift in total SMS volumes.

As such, there are various steps that mobile carriers can and should take to spur the development of WAP usage. Each of these steps is complementary and useful in making WAP a success. It is the combined effect from these steps that has led to the significant and almost exponential growth in the usage of WAP by many developed network operators in the late 1990s.

 ➢ Consumer Applications using WAP

The vast majority of WAP usage is accounted for by consumer applications. It is not uncommon to find 90% of a network operator's total WAP traffic being accounted for by the applications described in this next section. The main consumer applications based on WAP are:

- **CORPORATE EMAIL**

  The Short Message Service can be used to extend the use of corporate email systems beyond an employee's desk and office PC. With 40% of employees typically away from their desks at any one time, it is important for them to keep in touch with the office at all times. Corporate email systems run on Local Area computer Networks (LAN) and include Microsoft Mail, Outlook, Outlook Express, Microsoft Exchange, Lotus Notes and Lotus cc: Mail.

  Corporate email notifications are similar to Internet email notifications. Users are given information such as the sender and subject of the email. Any emails of a business or personal nature that are sent to the corporate email address can be sent out over the wireless network.

  Because unlike Internet email notifications, corporate email services tend to use the existing corporate infrastructure and email addresses, this kind of email application tends to generate significant average quantities of short messages per user. Very few corporations have so far extended their office email systems out to the wireless environment, leaving a large opportunity for the deployment of such services.

- **AFFINITY PROGRAMS**

  Some mobile network operators view the development of the Short Message Service as low down in their overall priorities- because few users select the mobile network solely or primarily on the basis of WAP. However, affinity programs- which are also known as
lifestyle packages- are a large opportunity for mobile network operators with the potential to secure large numbers of new customers, in which WAP is an integral part of the offering.

Affinity programs are the result of collaboration between mobile carriers and other companies in different industries with large customer groups. Affinity partners include television companies, sports clubs, supermarkets and other retailers, airlines and banks. WAP can be used to provide customers will all kinds of reminders and information such as frequent flyer miles status, overdue videotape rentals, appointment reminders and prescription drug pick-up notifications.

All parties to affinity programs can potentially benefit from the partnership- mobile network operators gain access to a largely new set of potential customers and affinity partners get to offer their customers new convenient services to their customers- offering differentiation possibilities against their competitors.

For affinity programs, the mobile phone may be branded with the affinity partner's logo and may have custom and personalized packaging. The route to market- i.e. the sales channel for the affinity product- is likely to be different from that of standard mobile phone purchases. Typically, the customized phones are marketed and distributed using direct mail- customers receive information about the affinity program through an insert into their statements or bills and they can then sign up and receive the package containing the mobile phone by post. A single bill, lower rates and easy access to the services are often features of the affinity package.

**MOBILE BANKING**

Let us take a closer look at a specific kind of affinity program- mobile banking.

The successful implementation of mobile banking programs incorporates several different elements discussed in this guide, such as Information services and SIM Application Toolkit.

Affinity programs and related lifestyle packages are a fast growing area of mobile communications, because as competition between network operators increases, differentiation and customization for specific user groups will be necessary to extend mobile phone penetration and usage. As such, they are likely to be a significant generator of short messages.

**ELECTRONIC COMMERCE**

Electronic commerce applications involve using a mobile phone for financial transaction purposes- this usually means making a payment for goods or transferring funds electronically. Transferring money between accounts and paying for purchases are electronic commerce applications.
The convenience of paying for purchases using WAP must be weighed against the related issues of security, integration with the retail and banking hardware and systems, and money transfer issues. However, this area of electronic commerce applications is expected to contribute to growing WAP traffic in the

- **CUSTOMER SERVICE**

By providing mobile phone customers with information about their account, the Short Message Service can help to avoid the need for expensive person to person voice calls to customer service centers. In the customer service environment, WAP can help to deliver account status information, new service configuration and so on, in particular when standard WAP is combined with a protocol such as SIM Application Toolkit or Wireless Application Protocol. Some network operators find significant financial justification for deploying a value-added services platform on the basis of what they save in customer service costs alone.

- **VEHICLE POSITIONING**

This application integrates satellite positioning systems that tell people where they are with WAP which lets people tell others where they are. The Global Positioning System (GPS) is a free-to-use global network of 24 satellites run by the US Department of Defense. Anyone with a Global Positioning System (GPS) receiver can receive their satellite position and thereby find out where they are.

Many commercial GPS receivers also incorporate support for the Russian equivalent of the Global Positioning System.

The Short Message Service is ideal for sending Global Positioning System (GPS) position information such as longitude, latitude, bearing and altitude. GPS information is typically about 60 characters in length, leaving room for other information such as the vehicle registration details, average speed from the tachometer and so on to be transmitted as part of the same short message.

Because the position updates are automatically generated, mobile network operators find that vehicle positioning applications are amongst the leading generators of short messages.

- **JOB DISPATCH**

160 characters is sufficient for communicating most delivery addresses such as those needed for a sales, service or some other job dispatch application such as mobile pizza delivery and courier package delivery.

The Short Message Service is used to assign and communicate new jobs from office-based staff to mobile field staff. Customers typically telephone a call center whose staff takes the call and categorize it. Those calls requiring a visit by field sales or service
representative can then be escalated to those mobile workers using WAP. Job dispatch applications can optionally be combined with vehicle positioning applications—such that the nearest available suitable personnel can be deployed to serve a customer.

WAP can be used not only to send the job out, but also as a means for the service engineer or sales person can keep the office informed of progress towards meeting the customer’s requirement. The remote worker can send in a short status message such as "Job 1234 complete, on my way to 1235".

Because of the need to communicate with mobile workers and effectively and cost-effectively serve customers, such job dispatch applications are likely to be steady generators of short messages.

- **REMOTE POINT OF SALE**

WAP can also be used in a retail environment for credit card authorization. It is particularly convenient to use mobile technology when making sales from, for example, carts in the middle of isles at shopping malls, at flee markets or at sports stadiums, where it would be inconvenient to trail a fixed telephone wire. A mobile phone is connected to a Point of Sale terminal such as a credit card swipe and keypad. The credit card number is sent to a bank for authorization. The authorization code is then returned as a short message to the Point of Sale terminal.

- **REMOTE MONITORING**

The Short Message Service can be used to manage machines in a remote monitoring environment. This application provides people with valuable information from a remote location when an important event occurs that they need to know about. The information is automatically delivered electronically without having to constantly employ physical resources locally on the off chance that such an event occurs. Examples of remote monitoring applications include remote meter reading, sending computer system fault information to mobile phones and notifying companies about empty vending machines.

Now that we have looked at the major applications that WAP facilitates, let’s take a closer look at some of the factors that facilitate the achievement of the messaging milestones.

- **M-COMMERCE**

E-commerce conducted through mobile devices is m-commerce. Currently m-commerce works in many ways. One shining example is Japan's i-mode service that provides all e-commerce functionality—m-banking, m-ticketing, m-payment, m-sports, m-stock price checking and m-stock-broking. Lesser mortals elsewhere have many other forms of m-commerce today.
We take a broader definition of e-commerce -- not mere payment system but all aspects of decision-making in a business context. This includes customer prospecting, order processing, catalog management, order taking, procurement, production, transporting, shipping, invoicing and final payment. Let us look at the role of m-commerce in a typical business transaction.

- **MMS (Multi-Media messaging System) - Send More Than Just Words**

One of the most recent developments in mobile messaging is known as multimedia messaging service (MMS). Just as the traditional short message service (SMS), multimedia messaging provides automatic and immediate delivery of personal messages. Unlike the WAP however, MMS allows mobile phone users to enhance their messages by incorporating sound, images, and other rich content, transforming it into a personalized visual and audio message.

But MMS technology offers more than just a broadening of message content. With MMS, it is not only possible to send your multimedia messages from one phone to another, but also from phone to email, and vice versa. This feature dramatically increases the possibilities of mobile communication, both for private and corporate use.

Multimedia messaging reshapes the landscape of mobile communication, making it more personal, more versatile, and more expressive than ever before. That's why we're thrilled by it, and we think you will be too. To see more of the new MMS technology, and to have a look at the amazing new MMS-enabled mobile phones

- **Content**

Although MMS encompasses a wide range of content types, it is a logical extension of WAP, making it easily adoptable for today's generation of mobile users. Another advantage of MMS is that the message is a multimedia presentation in a single entry, not a text file with attachments, making it much simpler and user-friendly.

- **Compatibility**

The MMS standard lists JPEG, GIF, text, AMR voice, and other formats as supported media types, while unsupported formats are handled in a controlled way. Like WAP, MMS is an open industry standard, and MMS messages can be delivered using existing networks and protocols. MMS is also bearer-independent, which means it is not limited to GSM or WCDMA networks.

- **Performance**

The speed of MMS transmission, although quick, is still dependent on the message size and on the bearer used. However, since the receiver is not aware of the ongoing transmission before the message has been delivered, the delay is imperceptible, making MMS as convenient to use as WAP.
8. Benefits of WAP

➢ Operators

For wireless network operators, WAP promises to decrease churn, cut costs, and increase the subscriber base both by improving existing services, such as interfaces to voice-mail and prepaid systems, and facilitating an unlimited range of new value-added services and applications, such as account management and billing inquiries. New applications can be introduced quickly and easily without the need for additional infrastructure or modifications to the phone. This will allow operators to differentiate themselves from their competitors with new, customized information services. WAP is an interoperable framework, enabling the provision of end-to-end turnkey solutions that will create a lasting competitive advantage, build consumer loyalty, and increase revenues.

➢ Content Providers

Applications will be written in wireless markup language (WML), which is a subset of extensible markup language (XML). Using the same model as the Internet, WAP will enable content and application developers to grasp the tag-based WML that will pave the way for services to be written and deployed within an operator's network quickly and easily. As WAP is a global and interoperable open standard, content providers have immediate access to a wealth of potential customers who will seek such applications to enhance the service offerings given to their own existing and potential subscriber base. Mobile consumers are becoming hungrier to receive increased functionality and value-add from their mobile devices, and WAP opens the door to this untapped market that is expected to reach 100 million WAP–enabled devices by the end of the year 2000. This presents developers with significant revenue opportunities.

➢ End Users

End users of WAP will benefit from easy, secure access to relevant Internet information and services such as unified messaging, banking, and entertainment through their mobile devices. Intranet information such as corporate databases can also be accessed via WAP technology. Because a wide range of handset manufacturers already supports the WAP initiative, users will have significant freedom of choice when selecting mobile terminals and the applications they support. Users will be able to receive and request information in a controlled, fast, and low-cost environment.

It is expected that the Internet service providers (ISPs) will exploit the true potential of WAP. Web content developers will have great knowledge and direct access to the people they attempt to reach. In addition, these developers will likely acknowledge the huge potential of the operators' customer bases; thus, they will be willing and able to offer competitive prices for their content. WAP's push capability will enable weather and travel information providers to use WAP.
9. WAP & Blue Tooth

Today’s Environment

- Too many wires and connectors
- Portable devices don’t work well together
- No anywhere seamless connectivity

Blue Tooth is an extremely low-cost (as low as eight dollars) technology that permits very many devices (cellular phones, PCs, Organizers, Palm-Top, Hand-held computers, printers and even wristwatches!) using wireless communications over freely available electromagnetic spectrum.

Bluetooth is a local area low power radio link between devices. Many of the usage scenarios for Bluetooth will also involve one of the devices communicating over the air using WAP. While many Bluetooth members are also WAP members, and it is expected that many future handheld wireless devices will deploy both Bluetooth and WAP technology, the two technologies fundamentally address different problems.

➤ Bluetooth Features

- Uses the Industrial, Scientific & Medical [ISM] Band – 2.45GHz ensures mobility around the world
- Multimedia support [Voice & data] – Data rate of 1Mbps
- FHSS access scheme & OdB Tx power means low interference.
- Open standard.
- Data connection via short-range (10m) adhoc networks using the license –free 2.45 GHz (ISM) band
- Low cost RF modules for mass market (Target price : $5)
- Low power consumption.
- Voice and data transmission
- Applications mainly for all portable devices
- Forget Plug and Play – Just Play
- High data rate
- Increases interoperability
- Digital convergence
- Crucial component of the wireless world!
10. **Success With Mobile Business**

Mobility is one of the key factors reshaping the way today's business is conducted. Constant availability is quickly becoming an essential part of future competition. Businesses that choose to embrace the concept of the Mobile World will reinvent themselves as real-time organizations, where access and interaction are instant.

Mobile applications help bring flexibility, efficiency, and customer focus to your business. WAP offers many solutions for corporate mobile phone users interested in the possibilities of wireless mobile technology. These innovations range from checking their email accounts to accessing their corporate databases, all from remote, wireless locations. Private individuals are already managing their finances smoothly through mobile phones.

The number of global mobile intranet users is estimated to grow to over 80 million by 2003 (Source: Robertson Stephens). A large number of companies are already extending their corporate applications to WAP-enabled phones.

By going totally mobile, businesses and organizations can improve on the services they provide for employees and customers. These mobile applications can be tailored to match their unique business needs, and help them become more productive and efficient.

11. **Disadvantages of WAP**

- Low Bandwidth
- High Latency
- Less Connection Stability / Unpredictable Availability
- Small Display
- Limited Input Facilities
- Limited Memory and CPU
- Limited Battery Power
- Security Concerns
- Software need to be written for the WAP
12. **WAP Forum**

- An industry association - develops the world standard for wireless information and telephony services on digital mobile phones and other wireless terminals
- Ensure product interoperability and growth of wireless market
- WAP Forum Started in June 1997
- **Founder:** Ericsson, Motorola, Nokia, and Phone.com (Unwired Planet)
- **Objectives:** Network standard, Open to all, Application scale across transport options (GSM, IS-95 etc.), Application scale across device types (mobile phones, PDAs)

13. **The Future of WAP**

The tremendous surge of interest and development in the area of wireless data in recent times has caused worldwide operators, infrastructure and terminal manufacturers, and content developers to collaborate on an unprecedented scale, in an area notorious for the diversity of standards and protocols. The collaborative efforts of the WAP Forum have devised and continue to develop a set of protocols that provide a common environment for the development of advanced telephony services and Internet access for the wireless market. If the WAP protocols were to be as successful as transmission control protocol (TCP)/Internet protocol (IP), the boom in mobile communications would be phenomenal. Indeed, the WAP browser should do for mobile Internet what Netscape did for the Internet.

As mentioned earlier, industry players from content developers to operators can explore the vast opportunity that WAP presents. As a fixed-line technology, the Internet has proved highly successful in reaching the homes of millions worldwide. However, mobile users until now have been forced to accept relatively basic levels of functionality, over and above voice communications and are beginning to demand the industry to move from a fixed to a mobile environment, carrying the functionality of a fixed environment with it.

Initially, services are expected to run over the well-established SMS bearer, which will dictate the nature and speed of early applications. Indeed, GSM currently does not offer the data rates that would allow mobile multimedia and Web browsing. With the advent of GPRS, which aimed at increasing the data rate to 115 kbps, as well as other emerging high-bandwidth bearers, the reality of access speeds equivalent or higher to that of a fixed-line scenario become evermore believable. GPRS is seen by many as the perfect partner for WAP, with its distinct time slots serving to manage data packets in a way that prevents users from being penalized for holding standard circuit-switched connections.

The services available to users will be wide-ranging in nature, as a result of the open specifications of WAP, their similarity to the established and accepted Internet model,
and the simplicity of the WML/WMLS languages with which the applications will be written. Information will be available in push-and-pull functionality, with the ability for users to interact with services via both voice and data interfaces. Web browsing as experienced by the desktop user, however, is not expected to be the main driver behind WAP as a result of time and processing restraints.

Real-time applications and services demand small and key pieces of information that will fuel the success of WAP in the mobile marketplace. Stock prices, news, weather, and travel are only some of the areas in which WAP will provide services for mobile users. Essentially, the WAP application strategy involves taking existing services that are common within a fixed-line environment and tailoring them to be purposeful and user-friendly in a wireless environment.

Empowering the user with the ability to access a wealth of information and services from a mobile device will create a new battleground. Mobile industry players will fight to provide their customers with sophisticated, value-added services. As mobile commerce becomes a more secure and trusted channel by which consumers may conduct their financial affairs, the market for WAP will become even more lucrative.

(a) Will WAP comply with Third Generation wireless standards?

Yes, WAP has been designed to be as independent as possible from the underlying network technology.

(b) Is WAP necessary with higher bandwidth 3G networks?

Even as bandwidths increase, the cost of that bandwidth does not fall to zero. These costs result from higher power usage in the terminals, higher costs in the radio sections, greater use of RF spectrum, and increased network loading. In addition, the original constraints WAP was designed for -- intermittent coverage, small screens, low power consumption, wide scalability over bearers and devices, and one-handed operation -- are still valid in 3G networks.

-WAP in the Competitive Environment

Competition for WAP protocols could come from a number of sources:

- Subscriber identity module (SIM) toolkit—The use of SIMs or smart cards in wireless devices is already widespread and used in some of the service sectors.
- Windows CE—This is a multitasking, multithreaded operating system from Microsoft designed for including or embedding mobile and other space-constrained devices.
- JavaPhone™—Sun Microsystems is developing PersonalJava™ and a JavaPhone™ API, which is embedded in a Java™ virtual machine on the handset. NEPs will be able to build cellular phones that can download extra features and
functions over the Internet; thus, customers will no longer be required to buy a new phone to take advantage of improved features.

14. **Summary**

WAP provides a markup language and a transport protocol that opens the possibilities of the wireless environment and give players from all levels of the industry the opportunity to access an untapped market that is still in its infancy.

The bearer-independent nature of WAP has proved to be a long-awaited breath of fresh air for an industry riddled with multiple proprietary standards that have suffocated the advent of a new wave of mobile-Internet communications. WAP is an enabling technology that, through gateway infrastructure deployed in mobile operator's network, will bridge the gap between the mobile world and the Internet, bringing sophisticated solutions to mobile users, independent of the bearer and network.

Backed by 75 percent of the companies behind the world's mobile telephone market and the huge development potential of WAP, the future for WAP looks bright.