Overcoming Security Challenges in WAP Protocol

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Abstract
Wireless application protocol (WAP) is an application Environment and set of communication protocols for wireless devices. WAP enables any data transport: TCP/IP, UDP/IP, SMS, or USSD. WAP utilizes plain Web HTTP 1.1 servers: CGI, ASP, NSAPI, JAVA, Servlets, etc. WAP specifies a wireless application Environment and Wireless Protocols and bridges the gap between the mobile world and the Internet. The basic construction of WAP architecture with WAP stack with different layers. In a real WAP solution, the main components include WAP Device, Bearer, WAP Gateway, Content, and Content Server. Communication of mobile client and Web server happens through WAP gateway. WML and WML script are used to produce WAI’ content. WAP functioning includes sending the request from the mobile device is sent as a URL through the operator’s network to the WAP gateway. WAP security is very important issue. WAP may have attacks like Interception, Modification, Fabrication, and Interruption. This paper also includes limitations of WAP, Strengths of WAP, WAP today and in future, Risks with WAP.

Keywords: WAP, Cryptography, Bluetooth, WML, Nokia, Attacks RFID, Criminal

1 WIRELESS COMMUNICATION
Wireless application protocol (WAP) is an application environment and set of communication protocols for wireless devices designed to enable manufacturer, vendor, and technology independent access to the Internet and advanced telephony services.

2 INTRODUCTION TO WAP
Wireless Application Protocol Facilitates communication between a wireless device and a gateway, which in turn allows communication with Internet Of intranet-based resources. Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

- Wireless Application Protocol (WAP) is an open, global specification, developed and deployed by the WAP Forum, that allows for the development of Internet and Web-based services for mobile phones and other wireless digital devices. Its founder members include the major wireless vendors of Ericsson, Motorola, Nokia, and Phone.com (formerly Unwired Planet and now Openwave Systems Inc).

- The WAP specification addresses the limitations of wireless networks (low bandwidth, high latency, and unpredictable availability and stability) and wireless devices (limited CPU, memory, and battery life, and a simple user interface). It specifies two essential elements of wireless communication: an over-the-air wireless protocol and an application environment.

- WAP gateways form the connection between clients on the wireless network and applications hosted on application servers on the Internet. The WAP gateway builds a bridge between the telecommunication and computer networks by routing requests from wireless clients to the application servers. It can be physically located in either network, though it is needed in only one of them.

WAP client, WAP gateway and WAP server are important elements of WAP.

Following is the list of WAP developers:
AT&T, GTE, Sprint PCS, US West, Nextel France Telecom, Telenor (Norway), Bell Mobility (Canada), Japan Telecom, Nokia, Ericsson, Motorola, Qualcomm Samsung Palm Computing (3Com), IBM
WAP Gateway

Wireless Application Protocol (WAP) is an open, global specification which empowers mobile users with wireless devices to easily access and interact with information and services instantly. In common language, a large number of device manufactures like Nokia, Ericsson, Motorola and software developers like IBM, Microsoft, Oracle have agreed on one common standard.

WAP gives mobile phone users access to Internet or web services through handheld devices. WAP Gateway technology provides a solution to the growing demand for wireless mobile services across the world. WAP Gateways act as a bridge between the mobile world and the Internet and offers WAP services like encoding of WML pages, end-user authentication-system.

WAP uses the underlying web structure to enable communication between content providers and mobile devices. This wireless protocol employs Wireless Markup Language (WML) for application contents instead of Hypertext Markup Language coding.

A useful & utility feature of WAP technology is the ability to support telephony service integrated with micro-browsing of data. WAP Gateways acts as a proxy between wireless networks & the Internet while encoding WAP data into byte codes.

Communication of mobile client and Web server happens through WAP gateway.

3.1 WAP functioning

WAP provides multiple applications, for business and customer markets such as banking, corporate database access, and a messaging interface.

3.2 Architecture of the WAP Gateway

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 additional aim of targeting multiple networks.

4 WAP Protocol Stack

WAP protocol stack mainly provide WAE (Wireless Application Environment for WAP)

WAP Protocol stack

The basic construction of WAP architecture can be explained using the following model. The order of the independent levels – which are a hierarchy - has the advantage that the system is very flexible and can be scaled up or down. Because of the different levels – or stacks - this is called the "WAP Stack", which is divided into 5 different levels.

- Application Layer: Wireless Application Environment (WAE).
• Transaction Layer: Wireless Transaction Protocol (WTP).
• Transport Layer: Wireless Datagram Protocol (WDP).

Each stack overlaps with the stack below. This stack architecture makes it possible for software manufacturers to develop applications and services for certain stacks. They may even develop services for stacks which are not specified yet.

The WAP stack is an entity of protocols which cover the wireless data transfer. The diagram above shows the order of the different stacks and their protocols. This includes the stacks responsible for the layout as well as the stacks responsible for the actual data transfer. The highest level or stack is the one which deals with the layout. A lower stack is responsible for the transfer and the security through WTLS (Wireless Transport Layer Security). All stacks lower than this one are being called network stack. Due to this hierarchy of stacks any changes made in the network stacks will have no influence over the stacks above.

Wireless Application Environment

The WAE specifies an application framework for wireless devices such as mobile telephones, pagers, and PDAs. In essence, the WAE consists of tools and formats that are intended to ease the task of developing applications and devices supported by WAP.

WAE user agents: Software that executes in the user’s wireless device and that provides specific functionality (e.g., display content) to the end user.

• Content generators: Applications (or services) on origin servers (e.g., CGI scripts) that produce standard content formats in response to requests from user agents in the mobile terminal. WAE does not specify any standard content generators but expects that there will be a variety available running on typical HTTP origin servers commonly used in WWW today.

• Standard content encoding: Defined to allow a WAE user agent (e.g., a browser) to conveniently navigate Web content.

• Wireless telephony applications (WTA): A collection of telephony-specific extensions for call and feature control mechanisms that provide authors advanced mobile network services. Using WTA, applications developers can use the micro browser to originate.

5 WIRELESS Markup Language

Wireless Application Environment (WAE): It is “user visible” layer with WML interpreter (Web Browser), WMLScript interpreter, Wireless Telephony Application. WML is inherited from HTML, but WML is based on XML, so it is much stricter than HTPL. WML is used to create pages that can be displayed in WAP browser.

WML was designed to describe content and format for presenting data on devices with limited bandwidth, limited screen size, and limited user input capability. It is designed to work with telephone keypads, styluses, and other input devices common to mobile, wireless communication.

Important features of WML include the following:

• Text and image support: Formatting and layout commands are provided for text and limited image capability.
• Deck/card organizational metaphor: WML documents are subdivided into small, well-defined units of user interaction called cards.
• Support for navigation among cards and decks: WML includes provisions for event handling, which is used for navigation or executing scripts.

**WML Script:**
WML Script is a scripting language with similarities to JavaScript. It is designed for defining script-type programs in a user device with limited processing power and memory.

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<thead>
<tr>
<th>Tag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
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<td>Access control</td>
</tr>
<tr>
<td>&lt;card&gt;</td>
<td>Card definition</td>
</tr>
<tr>
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</tr>
<tr>
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<td>Header information</td>
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<tr>
<td>&lt;footer&gt;</td>
<td>Footer information</td>
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<td>Form</td>
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<td>&lt;field&gt;</td>
<td>Field</td>
</tr>
</tbody>
</table>

**Key WML Script features include the following:**

**JavaScript-based scripting language:**-WMLScript is a subset of JavaScript, with some extensions.

- **Procedural logic:** WMLScript adds the power of procedural logic to the Wireless Application

- **Event based:** WMLScript may be invoked in response to certain user or environmental events.

### 6 WAP SECURITY ARCHITECTURE

WAP security is very important issue. WAP may have attacks like

1. **Interception:** An unauthorized party gaining access to an asset will be part of this attack.
2. **Modification:** An unauthorized party tampering with it is part of this attack.

### 3. Fabrication:
An unauthorized party inserts counterfeited objects into the system.

### 4. Interruption:
An asset is destroyed.

#### 6.1 Components of Security

The Wireless Transport Layer Security (WTLS) is a optional layer or stack which consists of description devices. A secure transmission is crucial for certain applications such as e-commerce or WAP-banking and is a standard in these days. Furthermore WTLS contains a check for data integrity, user authentication and gateway security following are the major security issues related to WAP.


### 7 LIMITATIONS OF WAP

WAP provides small pages and Pages have to be small and slow transmission speeds. The gateway itself is a security concern.

### 8 CONCLUSION

WAP is daily need of mobile users. Using WAP it's easy for mobile users to access internet and other networking services through mobile. It gives anyone access to an indefinite amount of information at any time and is expandable. But it is uncertain i.e. If connected then we can use it.

### 9 REFERENCES