

Welcome All
Jan 2002



W A P



Waffle And Pancake
Technology

Introduction

Wireless Application Protocol



Mobile phone, PDAs



becomes increasingly popular, you can be sure that one of the greatest innovations in the upcoming decade will be the introduction of **WAP**.

WAP

Wireless Application Protocol

WAP is an application environment (WAE) and set of communication protocols for wireless devices to access

- internet
- advanced telephony services.

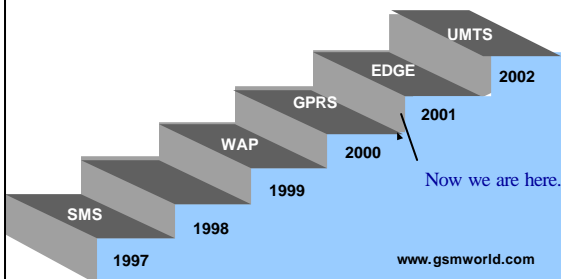
WAP

Wireless Application Protocol



Example of mobile phone data stair

GSM



Change of Role of the Mobile Phone:

Communicate and Organise

- Telephony
- Address book
- E-mail and SMS
- Calendar
- WAP browser
- Notepad
- Speaker phone
- Alarm Clock
- Calculator
- PC synchronization



WAE

Wireless application environments

The environment includes:

- microbrowser
- scripting facilities
- email
- www to mobile handset messaging
- mobile to telefax access

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Internet Model

To write a WAP enabled page to a wireless device, you must have:

- > a wireless device contains a **microbrowser**;
- > content and applications are hosted on **web servers**;

and

- > you need to write a **wml** document.
(**Convenience?**)

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Internet Access

- In the wired internet, web servers pass on HTML data to web browsers connected to ISP.



- In the wireless internet, web servers pass on WML (Wireless Markup Language) data to mobile device microbrowser through **WAP Gateways** connected to ISP. (**\$Pnet ?**)

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WAP Gateway (WAP server)

- Served as an HTTP proxy for mobile users to allow subscribers to access any site on the www. (of course **WML** data)
- Played as a gatekeeper to maintain a database of subscribers and providing a connection number, such as 1766888 for Sunday. (**Important?**)

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WML

Wireless Markup Language

- Based on eXtensible Markup Language (XML).
- Specifies application content for narrowband devices like cellular phones (14.4Kbps) and pagers (512bps). (**Broadband 3G ?**)
- Features – content can be text, images, selection lists, etc. It lets the micro-browser know what you want to display on the screen. (**MMI?**)

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WML

Handicaps

- WML content is static and there is no way to extend the language without modifying WML itself.
- complement – **WMLscript** provides general scripting capabilities to the WAP architecture. (**Tell you the WML first.**)

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WML

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Getting start

- First, start your favorite text editor (i.e. Notepad).
- Secondly, you need to type in these bits of code as standard:

```
<?xml version="1.0"?>
<!DOCTYPE wml PUBLIC "-//WAPFORUM//DTD WML 1.1//EN"
"http://www.wapforum.org/DTD/wml11.dtd">
```
- You can see that WML document is an XML document.
- The DOCTYPE is defined to be wml, and the DTD is accessed at http://www.wapforum.org/DTD/wml_1.1.xml.
- The document content is inside the <wml>...</wml> tags.
- Each card in the document is inside <card>...</card> tags and actual paragraphs are inside <p>...</p> tags.

WML

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syntax

WML defines elements.

- Elements have one or more attributes (provide additional information for the device to handle the elements).
- User interface components called cards. Cards forms a deck. (A device which receives a WML deck displays the content defined in the first card and wait for user's response.)

WML

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elements

- Elements include:
 - Formatted text (text, images and links)
 - Input elements (wait for user's response)
 - Select elements (allow user to choose)
 - Fieldset elements (define the field of other elements)

```
<element attrib1="value1" attrib2="value2" ...>
  content
</element>
```

WML deck

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	Comments
<wml>	a deck started
<head>	
access control	
</head>	
<template>	define something to entire deck
characteristics that apply to all cards in the deck	
</template>	
<card>	define something to individual card and supersede deck level action. If not defined, the card will follow what defined in the template.
define actions and interface with user	
</card>	
</wml>	the deck finished

WML card with navigation

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	Comments
<card id="name">	name - tell you which card
attribute	
value	
element	
<do type="type" label="label">	do - users' device will do this type - specifies function key label - the function key's name
<go href="url">	go - connect to the "url" The "url" can be, for example: - "otherdeck.wml" - "otherdeck.wml#card8" - "#card2"
</do>	
</card>	end of the element

WML with multiple decks example 1 (1)

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```
<!--deck1.wml-->
<wml>
  <template>
    <do type="options" label="deck2">
      <go href="deck2.wml"/>
    </do>
  </template>
  <card>
    <do type="accept" label="Left">
      <go href="#card2"/>
    </do>
  <p>
    Here is deck1.
  </p>
</card>
```

WML with multiple decks example 1 (2)

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```
<card id="card2">
  <p>
    Here is deck1 card 2.
  </p>
</card>
</wml>

<!--deck2.wml-->
<wml>
  <card>
    <p>
      Here is deck2.
    </p>
  </card>
</wml>
```

WML paragraphs and line break

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```
<wml> <!-- c:/wml/pgphbk wml -->
  <card>
    <p align="center">
      Hello World!<br/>a line break
    </p>
    <p mode="wrap">
      This line will wrap to fit the screen.
    </p>
    <p mode="nowrap">
      This line do not wrap.
    </p>
  </card>
</wml>
```

Comments

- p – start a paragraph
- center – center alignment
- br – break the line
- /p – finish this paragraph
- wrap – automatically change line to fit screen

WML text formatting

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```
<wml>
  <card>
    <p>
      normal<br/>
      <b>bold</b><br/>
      <i>italic</i><br/>
      <u>underline</u><br/>
      <big>big</big><br/>
      <small>my age</small>
    </p>
  </card>
</wml>
```

Comments

The result will be like that:

normal

bold

italic

underline

big

my age

WML displays special characters

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WML reserves <, >, *, " and ' characters. To display them, you need to convert :

<	<
>	>
*	&ast
"	"
&	&
\$	&dollar
Non-breaking space	
Soft hyphen	­

WML table

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```
<wml>
  <card>
    <p>
      <table columns="3">
        <tr>
          <td>SUN</td>
          <td>MOON</td>
          <td>STAR</td>
        </tr>
      </table>
    </p>
  </card>
</wml>
```

Comments

The result will be like that:

SUN	MOON	STAR
-----	------	------

WML images (1)

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```
<wml> <!-- manimage.wml -->
  <card>
    <p>
      This is my image
      
    </p>
  </card>
</wml>
```

Comments

img src – image file path

alt – specified text will be display if the device cannot support the required image.

The result will be like that:

This is my image  in a paragraph.

Tricks to make an image.bmp

WML images (2)

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```
<wml> <!-- localimage.wml -->
<card>
<p>
There is an image of a family.
<br/>

</p>
</card>
</wml>
```

Comments



WML link-anchor

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```
<wml> <!-- anchorim.wml -->
<card>
<p>
Link:
</p>
<p>
<anchor title="View">
<go href="images.wml"/>
  MAN 
</anchor>
</p>
</card>
</wml>
```

Comments

Anchor is another way for navigation.

WML links can anchor to text.

WML links can anchor to image.

ACCEPT key is labeled as View

WML prompts user to input

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```
<wml> <!-- useinput.wml -->
<card>
<do type="accept" label="ENTER">
<go href="#shown"/>
</do><p>
Key in your phone number: <br/>
<input name="phonenumber"
  format="NNN\|NNNNNNNN"/>
</p></card>
<card id="shown"><p>
Thanks!<br/>
Your phone no. is <br/>
$phonenumber<br/>
I shall call back you asap.
</p></card>
</wml>
```

Comments

input – prompt user to input variable is phonenumber

N –8 numeric characters

\$ - to display the value of the variable at run time.

WML input & mask display

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```
<wml> <!-- userpass.wml -->
<card>
<do type="accept" label="ENTER">
<go href="?passwd=$(passwd)"/>
</do><p>
Password: <br/>
<input name="passwd"
  format="&N" type="password"/>
</p></card>
</wml>
```

Comments

type="password" cause the device to mask the user entered characters

?passwd=\$(passwd)" is used to return data stored in variable passwd.

WML text entry format

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A – any symbol or uppercase alpha
a – any symbol or lowercase alpha
N – any number
X – anything (uppercase)
x – anything (lowercase)
M – anything (uppercase first character)
m – anything (lowercase first character)

For example, format="NN*M". It is to ask user to input 2 numbers followed by any number of symbols, numbers or alphabetic characters.

WML prompts user to select

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```
<wml> <!-- useselect.wml -->
<card>
<do type="accept" label="ENTER">
<go href="#shown"/>
</do><p>
Choose a reply by:
<select name="reply" ival="3">
<option value="phone">PHONE</option>
<option value="fax">FAX</option>
<option value="email">EMAIL</option>
</select></p></card>
<card id="shown"><p>
Thanks! <br/>
I shall reply you by $reply asap.
</p></card>
</wml>
```

Comments

select – prompt user to input variable is reply

ival – default selection

\$ - to display the value of the variable at run time.

WML select an item then do a task

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```
<wml> <!-- use sel2.wml -->
<card> <do type="accept" label="ENTER">
  <go href="#shown"/></do><p>
Choose a payment method:
<select name="pay" i value="2">
<option value="cash">CASH</option>
<option value="cheque">CHEQUE</option>
<option onpick="#enteracc">AUTOPAY</option>
</select></p></card>
<card id="shown"><p>Cheers! <br/>
Your wages will pay by $pay.
</p></card>
<card id="enteracc"><do type="accept"
label="confirm"> <go href="#shown"><setvar
name="pay" value="autopay to account
$acc"></go></do><p>
Enter your account:<input name="acc"
format="NNN1-N1-NNNNN"/></p></card>
</wml>
```

Comments

onpick – after choosing a selection item to trigger a particular action.

In the example, the user is to ask for an bank account if the selection is AUTOPAY.

setvar – pass a value to variable

WML return data to other application (1)

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```
<wml>
<card>
<do type="accept" label="ENTER">
<go href="http://www.dino.com/stock.cgi"
method="post">
<postfield name="stocknum"
value="$stocknum"/>
</go>
</do>
<p>Enter stock number:
<input name="stocknum" format="4N"/>
</p>
</card>
</wml>
```

Comments

\$(stocknum) – to make a reference to the variable "stocknum"

Method=" post" & postfield element is used to return data in a go task.

WML return data to other application (2)

33

```
<wml>
<card>
<do type="accept" label="ENTER">
<go href="http://www.dino.com/stock.cgi?
stk=$(stocknum)"/>
</do>
<p>
Enter stock number:
<input name="stocknum" format="4N"/>
</p>
</card>
</wml>
```

Comments

\$(stocknum) – to make a reference to the variable "stocknum"

Now the data return is directly by the URL argument stk=\$(stocknum)

WML fieldset

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```
<wml> <!-- fieldset1.wml -->
<card>
<do type="accept" label="ENTER">
<go href="#shown"/></do>
<p>
<fieldset title="Phone book">
Phone book add entry
NAME: <input name="NAME"
format="*A"/><br/>
Phone number: <input name="PHONE"
format="*8N"/>
</fieldset>
</p></card>

<card id="shown"> <p>
$NAME <br/>
$PHONE <br/>
Stored.<br/> </p></card>
</wml>
```

Comments

fieldset acts as an organizational container for a group of elements

WML timer

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```
<wml> <!-- timer1.wml -->
<card><do type="accept" label="Run">
<go href="#wait"/></do>
<p> Enter duration:
<input name="interval" format="*N"/>
</p></card>
<card id="wait" ontimer="#finish">
<timer value="50" name="interval"/>
<do type="accept" label="Quit">
<go href="#finish"/></do>
<p>Waiting for 0.1 x $interval second... </p>
</card>
<card id="finish">
<p>Finished!</p>
</card>
</wml>
```

Comments

timer - use about 0.1 x specified value second and invoke a task automatically for that period

ontimer – when the timer expires, the device will go to the URL specified by the ontimer attribute

WML Tips

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- WML is case sensitive. All elements and attributes must be lowercase.
- <!-- Comment is here.-->
- The key to constructing an efficient and easy-to-use WML services is
 - Group your information into cards and decks.
 - Create mechanisms to let users navigate between them.

WML size limit of a deck

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- Usually you are recommended to limit your deck size to be 1200 bytes because of packet size limitation.
- What can you do if you need more???????

WML with multiple decks example 1 (1)

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```
<!--deck1.wml-->
<wml>
  <template>
    <do type="options" label="deck2">
      <go href="#deck2.wml"/>
    </do>
  </template>
  <card>
    <do type="accept" label="Leff">
      <go href="#card2"/>
    </do>
    <p>
      Here is deck1.
    </p>
  </card>
</wml>
```

WML with multiple decks example 1 (2)

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```
<card id="card2">
  <p>
    Here is deck1 card 2.
  </p>
</card>
</wml>

<!--deck2.wml-->
<wml>
  <card>
    <p>
      Here is deck2.
    </p>
  </card>
</wml>
```

WML script

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- Problems of WML
 - WML content is static and no way to extend the language without modifying WML itself
- WMLscript provides general scripting capabilities to the WAP architecture so as to complement the WML

Application of WML script

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- Checking the validity of user input
- Accessing to facilities of the device, such as, make call, send messages, access SIM.
- Generating messages and dialogs locally
- Allow extensions to the device software and configuration of the device when it was deployed

WML script debugging

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- Formal debugging facilities are limited
- Human being debugger is the best. How-to?
 - Build your WMLscript code incrementally and then test it, correct it.
 - Build a function structurally complete but without detail implementation
 - Use your simulator to test the code.
 - Then build the details one block at a time
- Or use the print and println functions in Console library.

WML script

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- WML script language features
 - operators and expressions
 - Lexical structure
 - Literals
 - Variables
 - Data types
 - Reserved words
 - Pragmas
 - Statements
 - Functions

WMLscript – Lexical structure

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- Case sensitivity
- Ignore spaces, tabs and line breaks
- Comments like those in C and C++
`/*comments*/`
`//comments`

WMLscript – Literals structure

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- Integer literals
- Floating-point literals
- String literals
- Boolean Literals

All these are similar to C

- Invalid literals – denote invalid values, i.e.
`var x = 8;`
`var y = 0;`
`If ((x/y)==invalid) //Here is invalid.`

WMLscript – Declarations

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- WMLscript supports variables declared inside functions or passed as function parameters
- Not necessary to declare the data type
- Not initialized, default will be an empty string ""
- All are similar to C
- The look will be like that:
 - `var x;`
 - `var john,dino,peter;`
 - `var money = 3;`
 - `var name = "haha"`

How to call WMLscript libraries

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Example:

```
var x = -2;  
var y = Lang.abs(x);
```

// Lang is one of the WMLscript libraries. The function abs() is to calculate the absolute value of an input parameter.
So y = 2.

WMLscript Library - functions

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- **Lang** – abort, abs, exit, float, parseFloat, parseInt.....
- **Float** – ceil, floor, int, maxFloat, minFloat, pow.....
- **String** – charAt, compare, elementAt, find, trim.....
- **URL** – getHost, getPath, getPort.....
- **WMLBrowser** – getCurrentCard, getVar, go, setVar.....
- **Dialogs** – alert, confirm, prompt.....
- **Console** – Print, PrintLn.

WML to WMLscript interface

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WML can call WMLscript functions declared with **extern** directive.

```
e.g.<!-whoareu.wml->
<wml> <card> ... <setvar name="who" value="Dino"/> .....<p>
<do type="accept" label="gotowmls">
  <go href="namename.wmls#callbyWML()"/>
</do>.....</p>.....</card> .....</wml>
```

```
e.g.//namename.wmls
extern function callbyWML()
{
  var myname = WMLBrowser.getVar("who"); //myname = Dino
  .....
}
```

WMLscript to WML interface.

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WMLscript passes result to WML

```
e.g.//namename.wmls
extern function callbyWML()
{
  var myname = WMLBrowser.getVar("who"); .....
  WMLBrowser.setVar("who", "MaMa");
  WMLBrowser.go("whoareu.wml#myfriendcallme");
}
e.g.<!-whoareu.wml->
<wml> <card> ... <go href="namename.wmls#callbyWML()"/>
</do>.....</card>
<card id="myfriendcallme"> <p>
My friends call me $(who).
.....</p></card></wml> <!--My friends call me MaMa.-->
```

WAP Security

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- Between Wireless device and WAP server – WTLS
- Between WAP server and internet – SSL
- Between internet and Web server – SSL

Encryption, safe?

Dino Ma

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