Design and Implementation of an internet based Calendar System
(WML - Version)

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Overview of this presentation

- Introduction
- Requirements Analysis
- System Architecture
- Class System
- Scripts (Rexx)
- Database „CalendarStore“
- Screenshots of the Prototype
- Future work

Introduction
How do I connect to WAP?

- You need a WAP phone
- Option is called ’Internet’ or ’Services’
- information you need to know are

(available from your operator: T-D1, D2,...):

- Dial-up number (set up for a certain gateway)
- IP address (takes you through a gateway)
- Log-in name (sometimes required)
- Password (sometimes required)

Introduction
Connecting to WAP without a WAP device

- Can be done with an WAP emulator:
  - "NOKIA WAP Toolkit version 2.0 “ http://www.forum.nokia.com/
  - „WinWAP 3.0 Pro - Free trial version“ http://www.winwap.org/WinWAP3P.exe

Introduction
Aspects of this work

- PC-Terminal vs. WAP-Device
  - **costs**
  - **comfort**
- Combined use of PC and WAP-Device
  - **Designing**
    a system for both device types
  - **Implementation**
    of a system for both device types

Introduction
PC-Terminal vs. WAP-Device

- Costs
  - of providing informations for the devices
  - of using devices to get informations
- Comfort
  - Inputmodes and displays
  - mobility of the informations

Introduction costs

- of providing information for the devices
  - Updating costs are similar
- of using the devices to get information
  - WAP device
    - 0,2 € / min. for using a gateway of a provider
    - Further costs for infos from Content-Providers
  - PC – Terminal
    - 0.01 € / min

Introduction comfort

- Inputmodes and displays
  - PC-Terminal
    - Input: Mouse, Keyboard (101/102 Keys)
    - Display: ? 200 words in 20 lines
  - WAP device
    - Input: numpad ? 20 keys
    - Display: ? 10 to 20 words in 2 to 5 lines
- Mobility
  - WAP: „mobile internet“
  - PC-Terminal: „internet cafe“

Introduction
Combined use of PC and WAP-Device

- Designing a system for both device types
  - Supports HTML and WML
  - Priority has HTML
  - a common database is used
  - WML is an enchanced feature of the system

"mobile internet"

Introduction
Combined use of PC and WAP-Device

- Combined implementation
  - of static pages
    - Problem when updating the web informations
    - Both, HTML and WML must be updated separately
  - or dynamicly generated pages?
    - No problem when updating web informations
    - Only the common database must be updated
    - Scripts are needed!

Introduction
Standards

- IETF – Internet Engineering Task Force
  - **Internet Calendaring and Scheduling Core Object Specification**" [RFC 2445]-November 1998
- WAPFORUM - an organization of several big internet and telecom companies
  - „**WAP Architecture Specification**" – 30 Apr 1998
  - „**WAP WML**" – 19 Februar 2000
- W3C – WWW Consortium
  - "**HTTP 1.1**" – [RFC 2616] – June 1999

Introduction „Web-Calendar“

- A prototype for mobile devices:
  - **http://swt.wi-inf.uni-essen.de/~emasovic/index.wml**
  - only retrieve of appointments
- The HTML-prototype:
  - **http://swt.wi-inf.uni-essen.de/~tjungman/logon.html**
  - edit, retrieve,… of appointments
- For testing ✍ Username: **tt** Password: **tt**

Requirements Analysis
This work

- Target of this work
  - Retrieving of personal appointments via WWW
  - User Agents:
    - Web-browser
    - WAP-device
- Emphasis of this work
  - Designing and implementation of the WAP part of the information system

Requirements Analysis Components (1/2)

- Components to be designed
  - Session-Management
  - Common Database („CalendarStore“)
  - Static WML
  - Dynamic WML (scripted by „Rexx“)
- Required Components
  - „MySQL“ – Database
  - „Apache“ – Server
  - „Rexx“ – Interpreter
  - „Nokia“ – WAP-Emulator

Requirements Analysis Components (2/2)

- Used interfaces of the Components
  - CGI ✍ INTERNET-DRAFT
  - HTTP ✍ [RFC 2616]
  - WAP ✍ WAPFORUM.ORG
  - “Rexx/SQL” ✍ interface to SQL databases

Requirements Analysis Session-Management (1/2)

- **Hidden-Form-Fields** specified in HTML 4.01
- **Post-Fields** specified in WML 1.1
- **Cookies** specified in [RFC2109]
- **PATH-Info** specified in CGI

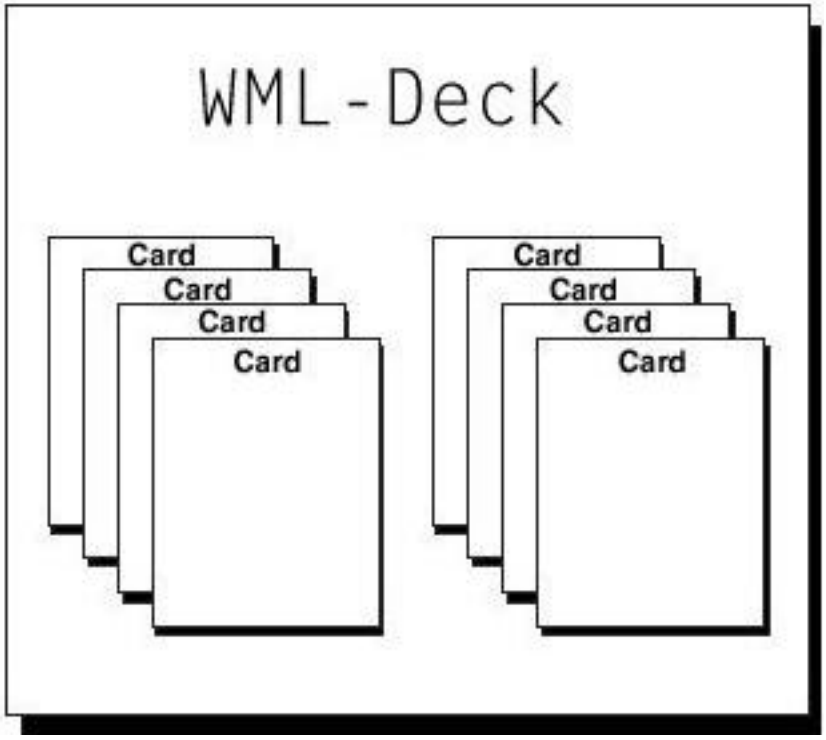
Requirements Analysis Session-Management (2/2)

- **Post Fields** specified in WML1.1 [1]

```
<do type="accept" label="login">
 <go href="cgi-bin/login.cgi" method="get">
  <postfield name="user" value="$(user)" />
  <postfield name="pw" value="$(pw)" />
 </go>
</do>
```


[1] - („**WAP WML**“ – WAP-191-WML – WAPFORUM - 19 Februar 2000 – URL: http://www.wapforum.org/what/technical.htm)

Requirements Analysis
WML-Decks (1/2)



Requirements Analysis
WML-Decks (2/2)

- WML-decks are defined in WML1.1
- Is used for specifying content and user interface for narrowband devices
- WML is an application of XML [2]

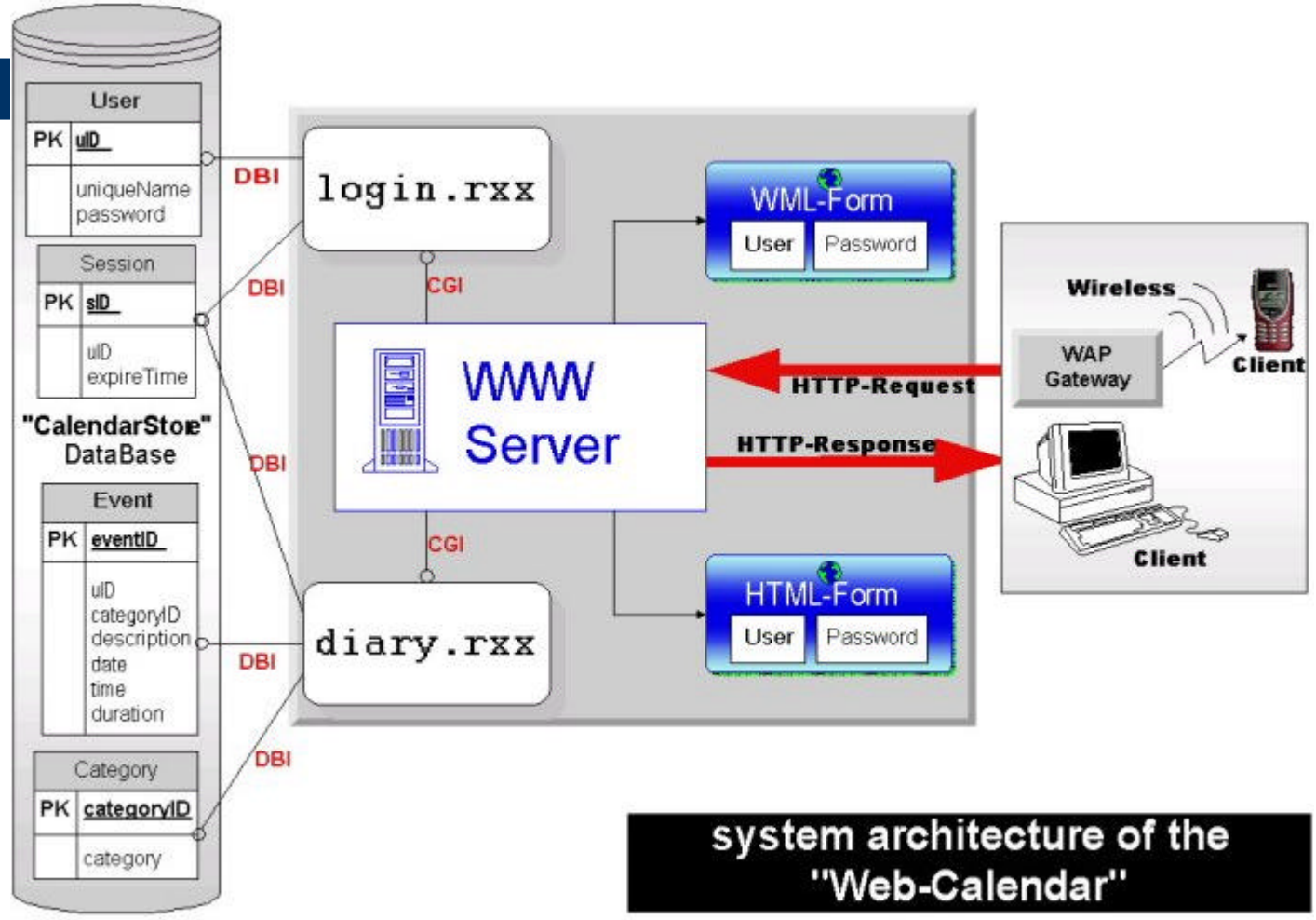
[2] - "Extensible Markup Language (XML) 1.0 (Second Edition)", Tim Bray, Jean Paoli, C. M. Sperberg-McQueen, Eve Maler, W3C Recommendation 6 October 2000 – URL: http://www.w3.org/TR/REC-xml

Requirements Analysis Database

„CalendarStore“ is needed

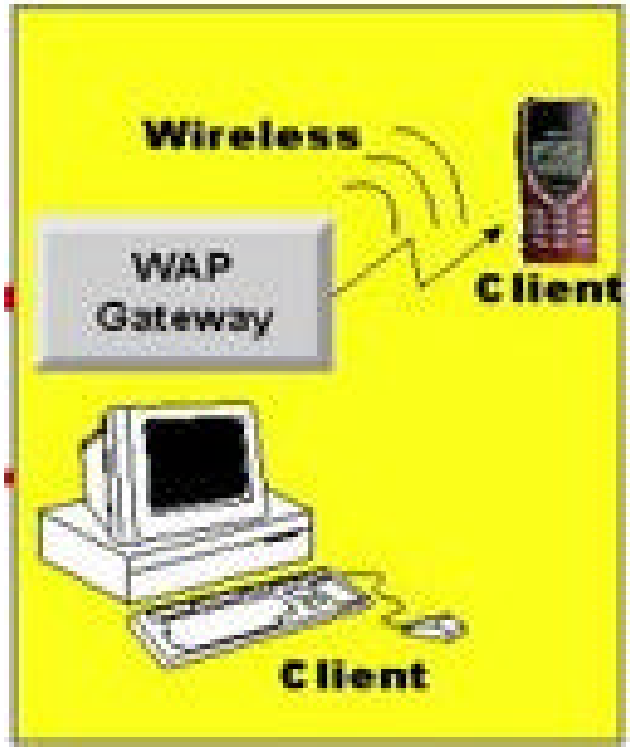
- For administration of users and passwords
- and the session management temporarly,
- To categorize users appointments,
- To store the journals of the individual events.

System architecture



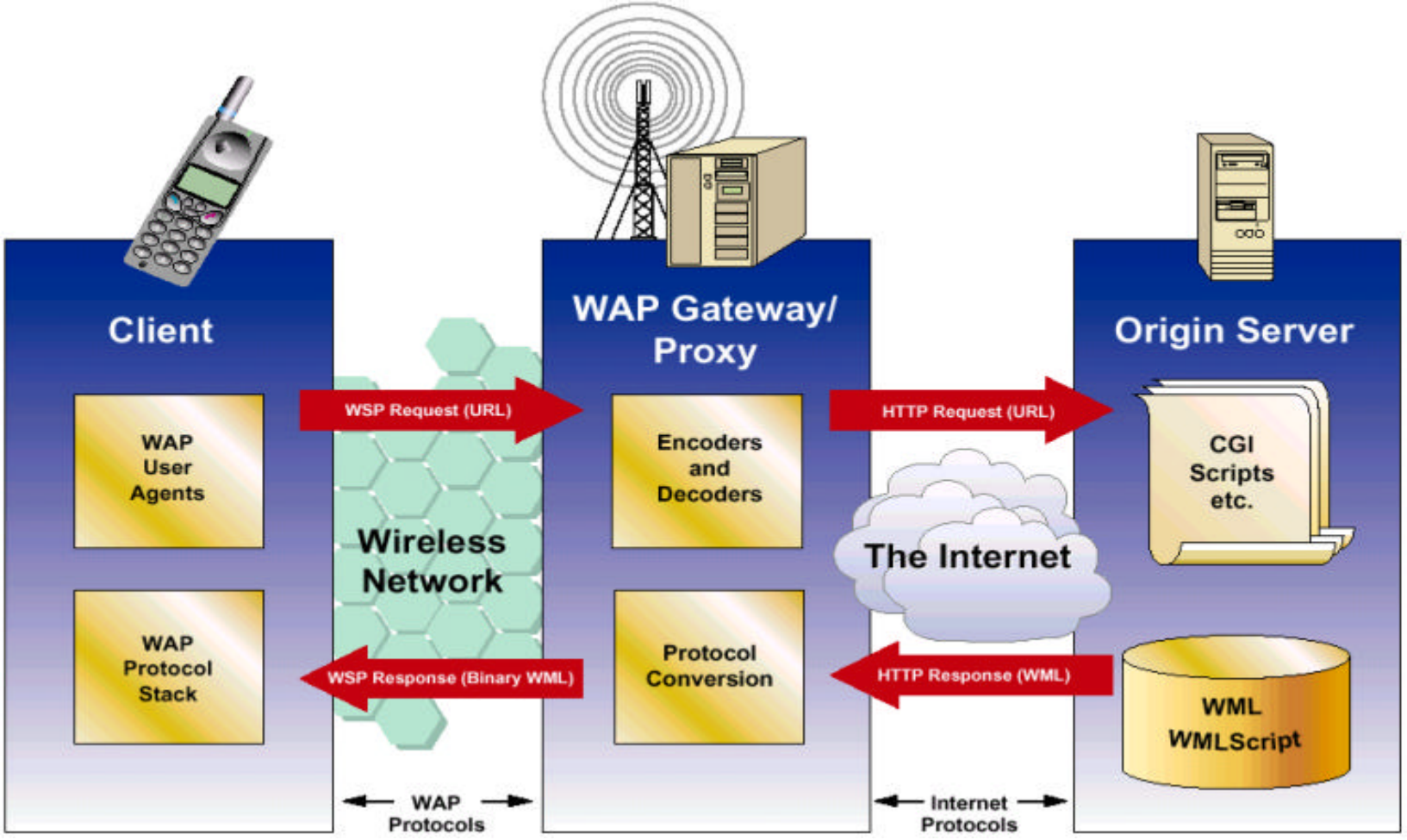
system architecture of the "Web-Calendar"

System architecture
Clients



- Clients/User Agents:
  - Web Browser
    - Communicates with the system via internet (HTTP)
  - WAP Device
    - Communicates with the Internet (HTTP) via a WAP-Gateway

System architecture HTTP and WAP (1/2)



System architecture HTTP and WAP (2/2)

- WAP Devices communicates with the Gateway via WAP [3]
- WAP-Gateway communicates with the Web server via HTTP [4]

[3] - „**WAP Architecture Specification**“ – WAPFORUM - 30-Apr-1998 – URL: http://www.wapforum.org/what/technical.htm
[4] – [RFC 2616] – “**HTTP 1.1**” - June 1999 - T.Berners-Lee, P. Leach, L. Masinter, H. Frystyk, J. Mogul, J. Gettys – URL: http://www.w3.org/Protocols/rfc2616/rfc2616.html

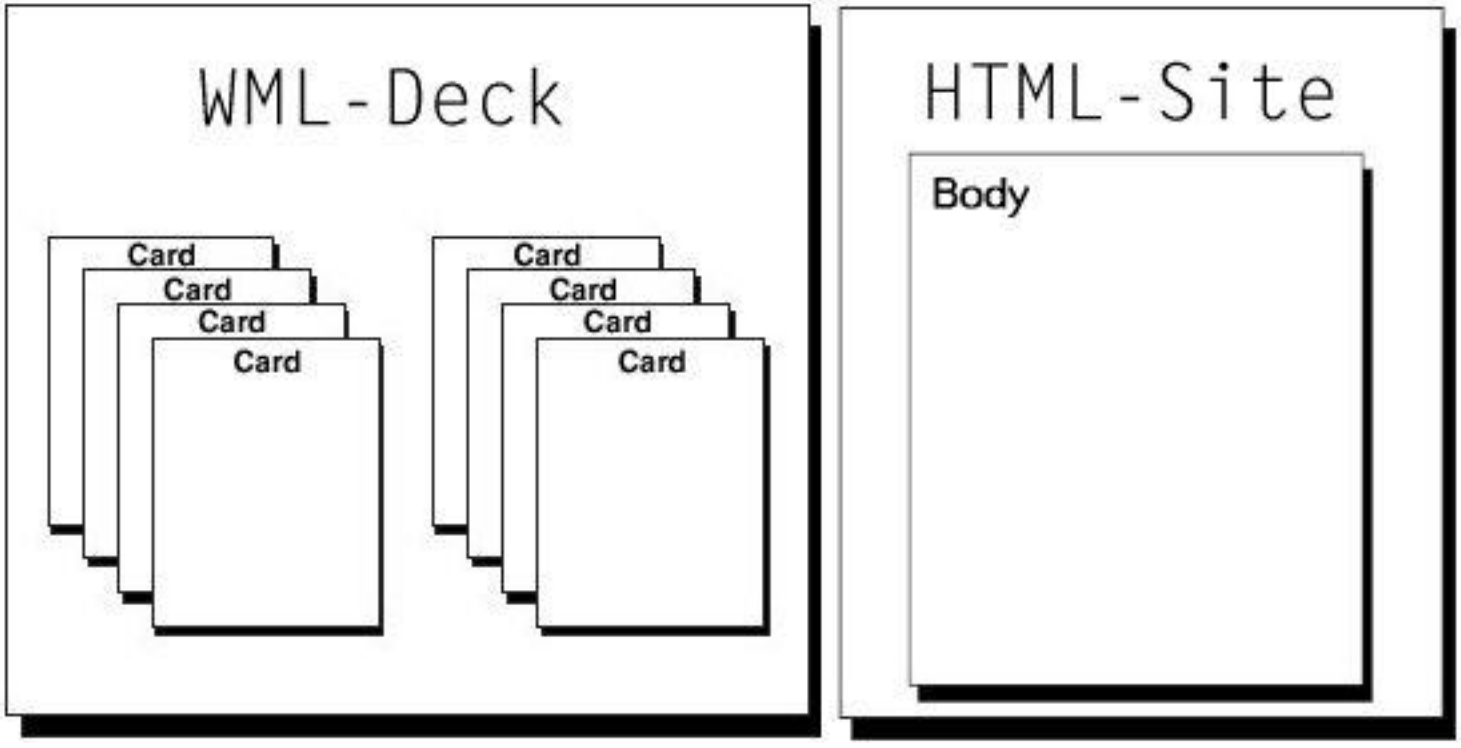
System architecture WWW-Server

- The used Server is an Apache [5]

  - Is a HTTP Daemon
  - receives requests
  - sends apropriate responses
  - presentated in HTML or WML
  - Interfaces are CGI and HTTP
  - Executes scripts

[5] - Apache HTTP Server Project – URL: http://httpd.apache.org

System architecture
HTML vs. WML (1/2)



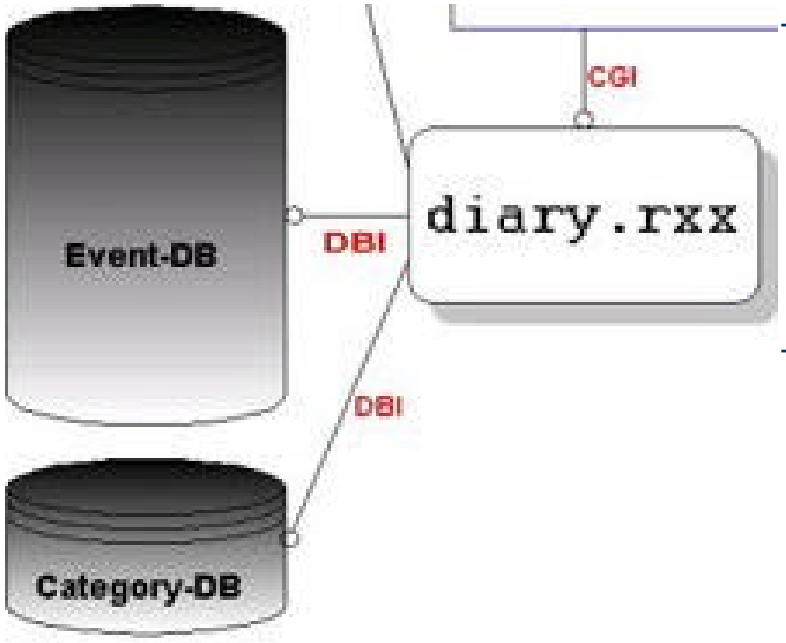
System architecture
HTML vs. WML (2/2)

- HTML pages cannot be displayed on a WAP device
- A WML-deck contains several WML-cards
- Each WML-Deck has to start with th following directives
  - **<?xml version="1.0"?>**
    - directive for the XML Parser
  - **<!DOCTYPE wml PUBLIC "-//WAPFORUM//DTD WML 1.1//EN" „http://www.wapforum.org/DTD/wml_1.1.xml">**
    - The URL of the DTD, to check if document is "valid"

System architecture login.rxx

- Suplies the login function
  - **Validates** the input data (name, password) with the entries in the database
  - In the case of succesfull validaton a **session ID is generated**
  - and **stored** in the session database temporarly
- the logout function is also supported

System architecture diary.rxx



- Shows the appointments of the user from the Event - database
  - By selected view-type
    - Day
    - Week
    - Month
    - Year
  - By selected category from the Category-database
    - All
    - Birthday
    - Meeting
    - Call

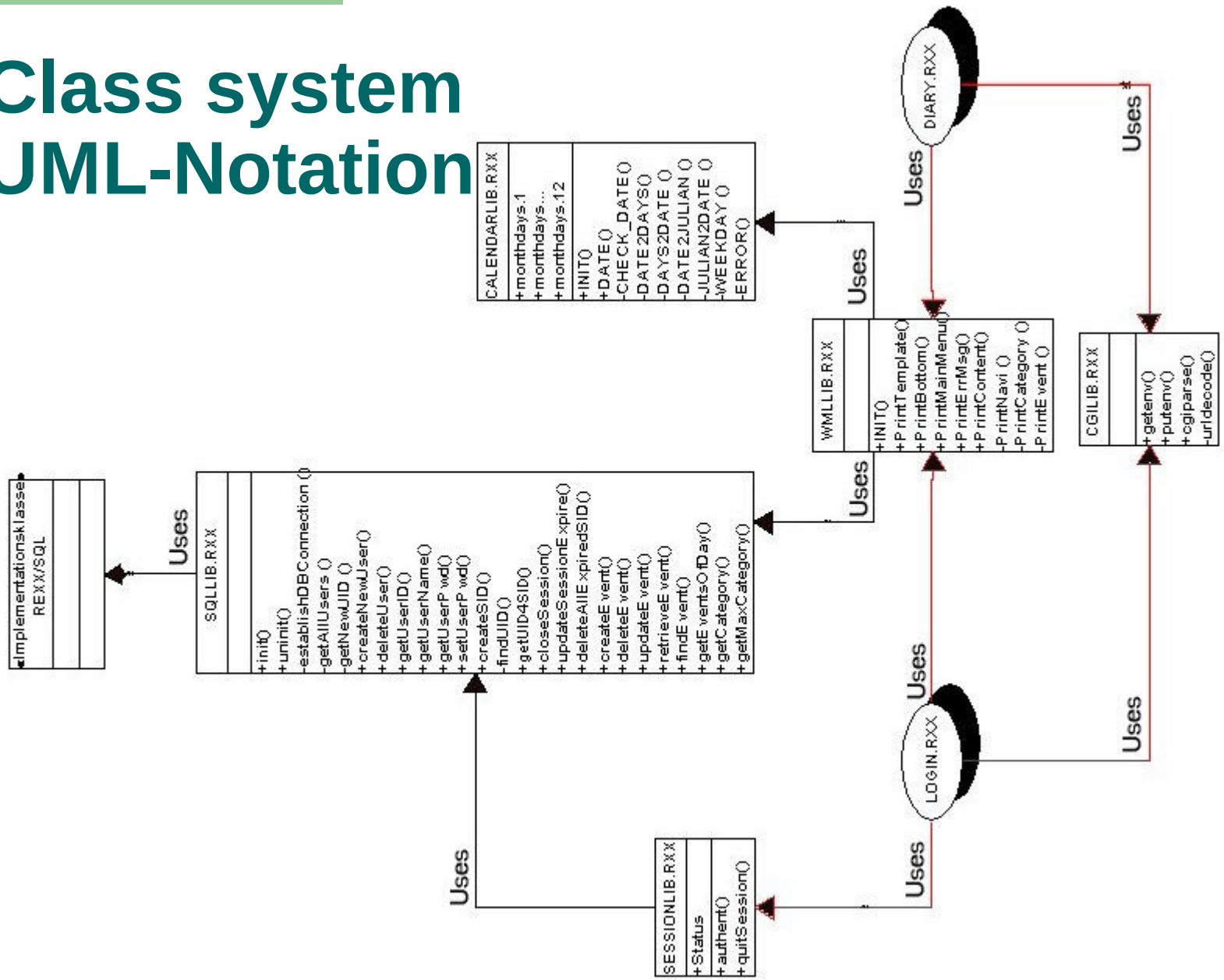
Class system

- All file names (almost all,;)) correspond to the class name with the addition “…lib.rxx”

  e.g.

  - File: "**cgilib.rxx**" containes only one class
    - `::CLASS cgi PUBLIC`
  - File: "**sessionlib.rxx**" containes only one class
    - `::CLASS session PUBLIC`

Class system UML-Notation



Class system
UML-Notation (2/2)

- The figure shows the **class hierarchy**
  - `::REQUIRES "[name_of_the_classlib]"`
- as well as all **methods**
  - `::METHOD [name_of_the_method] PUBLIC`
- and **attributes**,
  - `::METHOD[name_of_the_method] ATTRIBUTE`

the one class supplies

Class documentation

- The classes are documented separately
  - Individual method calls,
    `[a_instance_of_the_class]~[method]()`
  - the expected arguments
    `[a_instance]~[method](ARG1,...ARGn)`
  - and the return values (RESULT in Rexx)
    `[a_instance_of_the_class]~[method]()`
    `RESULT`

Class documentation cgilib.rxx

- simplifies the access to environment variables
- suplies a method "cgiparse", which url-decodes and parses the QUERY_STRING [6]
- Based on CgiParse() from Sascha Prins

Source-Code:http://swt.wi-inf.uni-essen.de/~emasovic/src/cgilib.rxx

[6] – [RFC2396] – „**Uniform Resource Identifiers URI**“ - T. Berners-Lee, R. Fielding, U.C. Irvine, L. Masinter - August 1998
URL: http://www.ietf.org/rfc/rfc2396.txt

Class documentation SQLLIB.rxx

- regulates the access to the database
- methods are supplied for the manipulation of database contents of the database "CalendarStore“
- This class uses the Rexx/SQL - INTERFACE from Mark Hessling

Source-Code:http://swt.wi-inf.uni-essen.de/~emasovic/src/sqllib.rxx

Class documentation WMLLIB .rxx

- simplify the dynamic generating of the WML-decks
- e.g the processing instructions are generated "<?xml version="1.0"?>" in this class
- The DTD is referenced, too

Source-Code:http://swt.wi-inf.uni-essen.de/~emasovic/src/wmllib.rxx

Class documentation SESSIONLIB .rxx

- supplies a method needed for authentification of users
- after a successful authentification a session ID is generated
- The outlog-function with the following deletion of the session ID from the database “CalendarStore” is also supplied

Source-Code:http://swt.wi-inf.uni-essen.de/~emasovic/src/sessionlib.rxx

Class documentation CALENDARLIB .rxx

- suplies methods that symplify operations with dates
- Only one method: **DATE(ARG1, ARG2)**
  - ARG1 – a date [YYYYMMDD]
  - ARG2 – a operation
    e.g.
    - „nd“ – next day
    - „nw“ – next week

    and so on
- Based on datergf.cmd from Rony G. Flatscher

Source-Code:http://swt.wi-inf.uni-essen.de/~emasovic/src/calendarlib.rxx

Class documentation REXX/SQL version 2.3 [7]

- “consists of a number of external Rexx functions which provide the necessary capabilities to communicate with the SQL database „
- is used by "sqllib.rxx" to communicate with the SQL database "CalendarStore".

[7] – “**Rexx/SQL”** - powerful interface to SQL databases – M. Hessling - 12 September 2000
URL: http://www.lightlink.com/hessling/rexxsql/

Scripts
login.cgi

- is a shell script
  ```
  #!/bin/tcsh
  ```
- sets the necessary environment variables
  ```
  setenv LD_LIBRARY_PATH
  /net/swt/u/students/tjungman/rmysql/lib
  ```
- executes the “login.rxx" script with the appropriate Rexx interpreter
  ```
  /usr/bin/rexx login.rxx
  ```

Source-Code:http://swt.wi-inf.uni-essen.de/~emasovic/src/login.txt

Scripts
login.rxx

- is a Rexx script
- logging in
  - After the succesfull authentification
  - a session identifier is generated
- and logging out
  - session Identifier is deleted from the session DB

are processed by this script

Source-Code:http://swt.wi-inf.uni-essen.de/~emasovic/src/login.rxx

Scripts
diary.cgi

- is a shell script
  ```
  #!/bin/tcsh
  ```
- sets the necessary environment variables
  ```
  setenv LD_LIBRARY_PATH
  /net/swt/u/students/tjungman/rmysql/lib
  ```
- executes the “diary.rxx" script with the appropriate Rexx interpreter
  ```
  /usr/bin/rexx diary.rxx
  ```

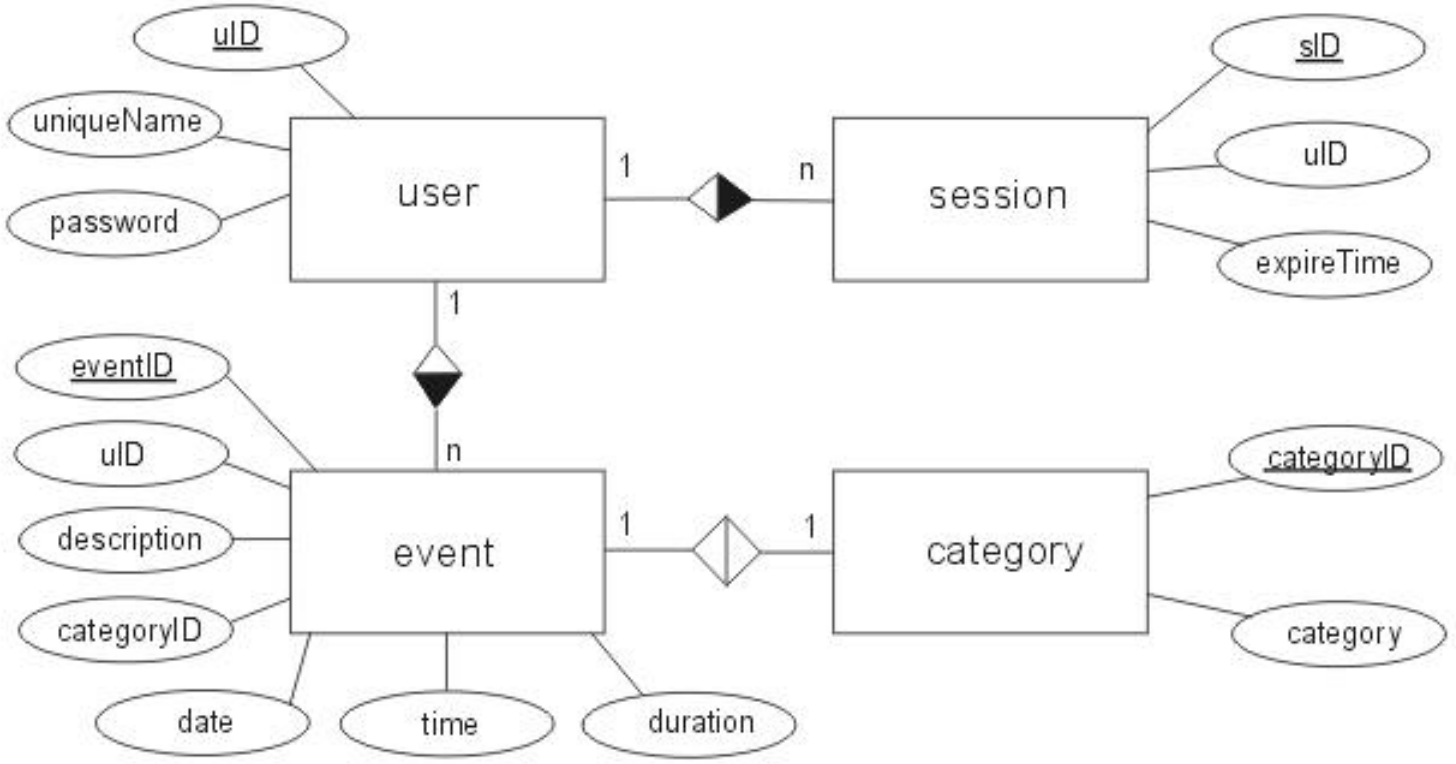
Source-Code:http://swt.wi-inf.uni-essen.de/~emasovic/src/diary.txt

Scripts
diary.rxx

- is a Rexx script
- With each request the session ID is validated and the timer reseted
- the desired information (suitable to the session!) are displayed according to the selected display options
- modification of the appointments or the creation of new ones is not offered

Source-Code:http://swt.wi-inf.uni-essen.de/~emasovic/src/diary.rxx

Database „Calendarstore“ (1/2)



Database „Calendarstore“ (2/2)

- **User**
  - (uID,uniqueName,password)
- **Event**
  - (eventID,uID,categoryID,description,date,time,duration)
- **session**
  - (sID;uID,expireTime)
- **category**
  - (categoryID,category)

Screenshots of the prototype Login-Menu

Index.wml - LOGIN

- entrance page ("index.wml")
- only static page of the system
- is a WML-form
- expects the user name and the user password as input
- input data are passed with the GET method to the "login.rxx"-script

Screenshots of the prototype Main-Menu (1/2)

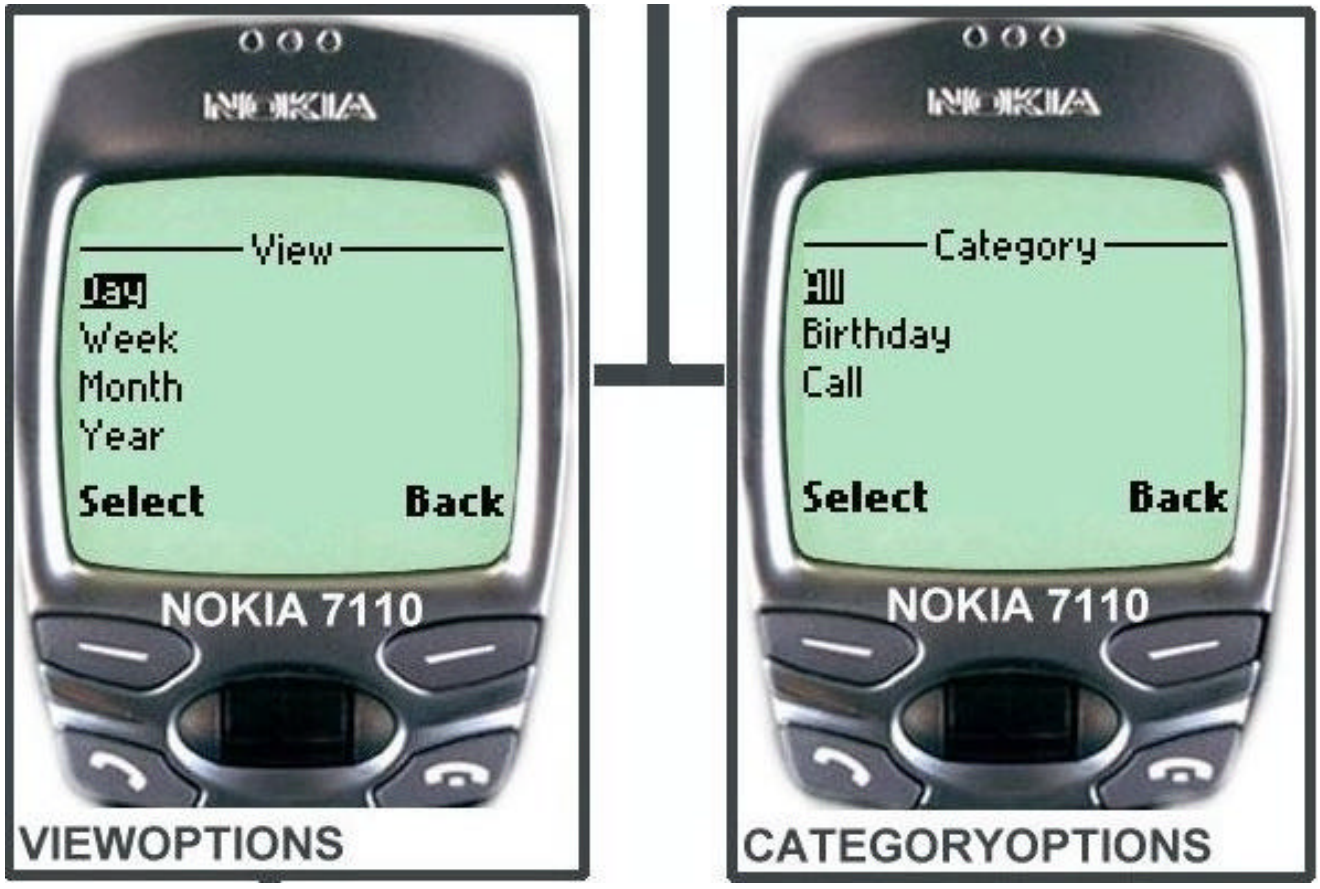
Main-Menu

- After successful authenti-fication the Main-Menu is displayed
- **„View“**-type
  - day, week, month, year
- Appointment-**”category“**
  - All, birthday, call, meeting

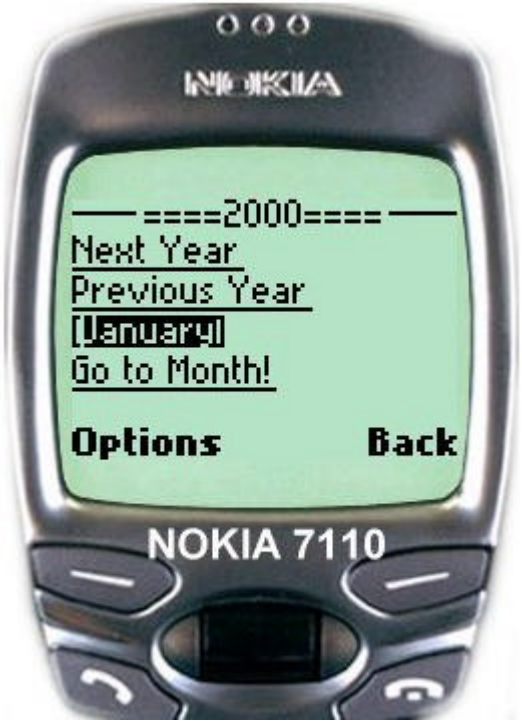
can be selected by the user

- executes the “diary.rxx”- script
- logout function is supplied in the option menu

Screenshots of the prototype Main-Menu (2/2)

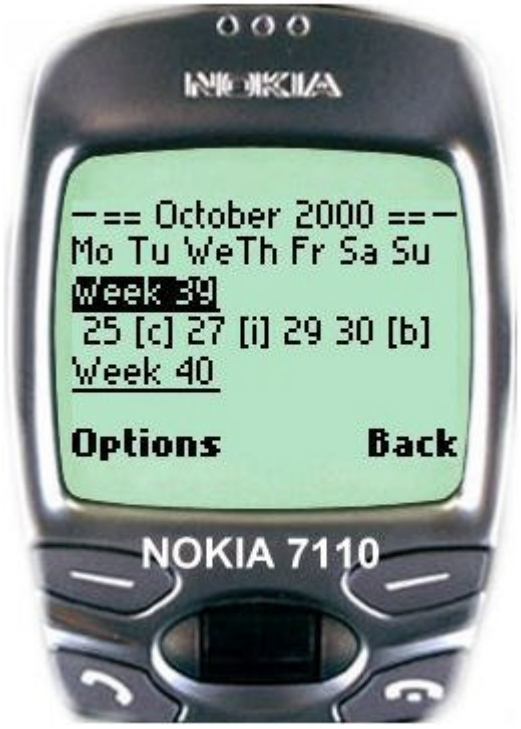


Screenshots of the prototype View-Types (1/5)



- „Yearview“
- Only scrolling between years available
- No direct access of e.g. the year 1436
- After selection of the desired year and month the monthview is displayed

Screenshots of the prototype View-Types (2/5)

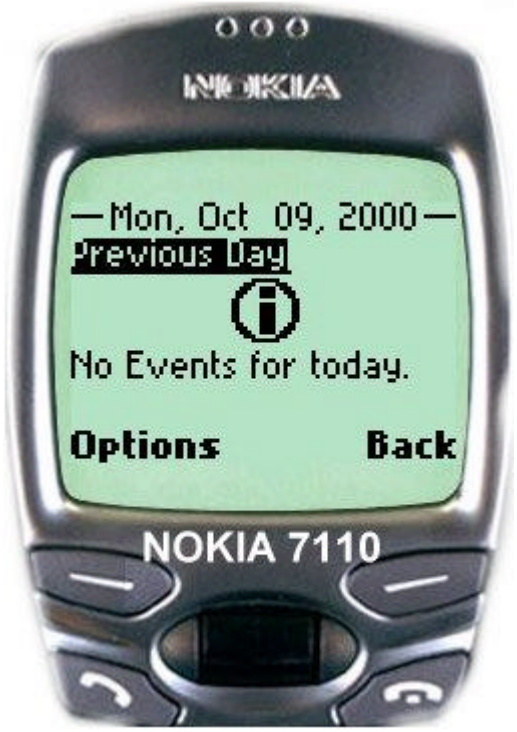


- „Monthview“
- Scrolling between month available
- different categories of appointments are differently signed in the week-overview
  - [c] – call
  - [b] – birthday
  - [i] – all
- After selection of the desired week the weekview is displayed

Screenshots of the prototype View-Types (3/5)

- „Weekview“
- Scrolling between days available
- Different categories of appointments are signed with different images
- When no events in database found image is not displayed
- After selection of the day the dayview is displayed

Screenshots of the prototype View-Types (4/5)



- „Dayview“
- Scrolling between days available
- if journal entries for the day exists they are displayed in this view-type
- In the options-menu is a link to the Main-Menu

Screenshots of the prototype View-Types (5/5)


Birthday


Call


Meeting


All

- WBMP
  - The image-type of WML
  - WBMP (WML Bitmap)
  - 2 Colors

```
<img src="img/meeting.wbmp" alt=„a meeting"/>
```

Future work

- The system still offers no memory function by SMS or something similar. A memory function would complete the system as a commercial product and make it more competitive on the market.
- The data communication of the server to the Client could be made more secure with WTLS[1] and protect by the way the system and the data users against attacks from outside

[1]The WTLS Protocol – Wireless Transport Layer Security based on TLS 1.0