

Appendix S3

EDAPHOWEB: Web-based control and data display software

Website: <http://edaphoweb.helion.hu>

The control software is composed of three subunits: (1) a relational database for permanent data storage, (2) a control unit for tracking the operation of the probes and loggers, and (3) a web-based application for analysis and display. Each unit of EDAPHOLOG System (probes, loggers) is controlled by the Java®-based control software that has been developed specifically for this purpose. The database was developed on Oracle®. Data display is also carried out by the control software. The control software enables us to follow the operation of the system in real time and to handle each probe and logger simultaneously via the Internet. Either raw or processed data can be retrieved and displayed in either table or graph formats.

EDAPHOWEB supports the entire monitoring procedure (Fig. 1):

- the 'Projects' menu box corresponds to the installation of the monitoring sites (Fig.2);
- under the 'Devices' menu EDAPHOLOG units can be set up (Fig.3);
- in 'Options' we can send SMS messages to the loggers (Fig.4);
- and the 'Graphs & Data' menu relates data queries and displays (Fig.5). The spatial distribution of the monitoring sites is shown on an interactive Google Maps application, while incoming and outgoing SMS messages are displayed in an independent window.

Figure 1. In the first window **incoming** and **outgoing** SMS messages, **error messages** and **GPRS** data can be seen with their log times. Messages can be filtered by type of message or logger ID by using **Rec ID**. When clicking a message, a new window with detailed information appears. Data and charts corresponding to the project can be viewed in the **Graphs & Data** tab. Data and figures can be queried either for each monitoring site and probes separately, or summarized for the whole project.

The screenshot displays the EdaphoWeb web application interface. At the top, there is a navigation bar with tabs for 'Projects', 'Devices', 'Options', and 'Graphs & Data'. The 'Options' tab is currently selected. Below the navigation bar is a map of Hungary with several red location pins indicating monitoring sites. To the right of the map is a 'Message log' section. It shows a list of messages with columns for time, GPRS status, voltage, temperature, and other data. Below the message log is a 'CHOOSE REC DEVICE' section with input fields for 'REC ID', 'Phone Number', and 'PIN Code'. The interface also includes a 'Logout' button in the top right corner and a 'Map' button above the map.

remote time: 05/03/2013 15:13:30
 GPRS_server: 29/01/2013 17:07:20
 GSM_server: 17/12/2012 19:38:01

Message log

GPRS SMS in SMS out Void ERROR

« prev 1 / 723 next » Rec ID:

GPRS [17:53] 1040-- -4200mV | 15°C | 5
 GPRS [16:45] 1032-- -4200mV | 4°C | 3
 GPRS [15:25] 1016-0124 - 5.9V | 3°C | 1/161
 GPRS [15:25] 1016-0124 - 5.9V | 3°C | 2/160
 GPRS [15:25] 1016-0124 - 5.9V | 3°C | 3/159
 GPRS [15:25] 1016-0124 - 5.9V | 3°C | 1/158
 GPRS [15:25] 1016-0124 - °C = 3, 3, 3, 3, 3, 3, 3, 3 (28/12 06:41)
 GPRS [15:25] 1016-0122 - °C = 4, 3, 4, 4, 3, 3, 4, 4 (28/12 06:37)
 GPRS [15:25] 1016-0124 - 5.9V | 3°C | 2/157
 GPRS [15:25] 1016-0124 - 5.9V | 3°C | 2/156
 GPRS [15:25] 1016-0124 - 5.9V | 3°C | 3/155
 GPRS [15:25] 1016-0124 - 5.9V | 3°C | 2/154
 GPRS [15:25] 1016-0124 - 5.9V | 3°C | 4/153
 GPRS [15:25] 1016-0124 - °C = 3, 3, 3, 3, 3, 3, 3, 3 (27/12 22:40)
 GPRS [15:25] 1016-0122 - °C = 3, 3, 4, 3, 4, 4, 4, 4 (27/12 22:36)

CHOOSE REC DEVICE

REC ID Phone Number PIN Code

Figure 2. Projects window. You can review which project is active at the current time and which one is shut down, or when it was set up or last modified. By clicking on one row you can enter one monitoring site. Information about the monitoring site is shown, as well as information about the state of the data logger used. If you scroll down, you can see the state of the probes used in the monitoring plots linked to the monitoring site. From Monitoring Sites it is possible to access the following data: Installer, linked receiver, status, last logging date, warning logs, log efficiency, number of probes connected to it, charge level of the batteries, signal strength and temperature at the time of last signal.

The screenshot shows the EdaphoWeb interface. At the top, there is a navigation menu with 'Projects', 'Devices', 'Options', and 'Graphs & Data'. A 'Logout' button is in the top right. Below the menu, the breadcrumb trail reads 'All Projects > MEDAPHON Pilot Project > Kaposvár 2'. The main content area is a table of site information:

Monitoring Site	Kaposvár 2.	State	live
Installer	Bánszegi Oxána	Last Logging	28/12/2012 17:53:25
Owner of Area	Kaposvári Egyetem	Logging Warning	WARNING
Contact Person		Log Efficiency	80.9%
Timezone	Europe/Paris (GMT+01:00)	Linked Probes	4
Field Type	Natural/semi-natural grassland	Vegetation	Fű
Handling Type	Öntözött		
REC device	1040	Battery	full
Location	46.368490° ; 17.850690°	GPRS Signal	good
Install Date	19/11/2012	Temperature	15°C

Below the table is a 'Photos' section with three images and a 'show on map' button. At the bottom of the page, there are buttons for 'Make Live Monitoring Site', 'Delete Monitoring Site', and 'Edit'. A '+ New Monitoring Spot' button is also present. Below this is a table titled 'List of Monitoring Spots':

Number	Probe ID	State	Last Log	Log Warn	Log Eff.	Battery	Temperature
1	0048	live	22/12/2012 17:55:00	WARNING	82.5%	low	3,4°C
2	0098	live	22/12/2012 17:54:56	WARNING	80.8%	low	1,84°C
3	0185	live	22/12/2012 17:54:56	WARNING	82.4%	low	2,19°C
4	0173	live	22/12/2012 17:55:00	WARNING	78.1%	low	3,11°C

Figure 3. Devices window. Within Devices, data on loggers and probes installed in the EDAPHOLOG System can be seen. Current status, charge and other technical information of the loggers is listed. Probes are handled in the same way. By choosing a logger, further information can be seen: SIM card, phone number, PIN number, project name to which the logger was linked, GPRS signal intensity, etc. Under Probe Devices you can see the current status of the probes. Each probe has its own ID.

The screenshot displays the EdaphoWeb interface. The top navigation bar includes 'Logout' and tabs for 'Projects', 'Devices', 'Options', and 'Graphs & Data'. The left sidebar has 'REC Devices' and 'Probe Devices' sections. The main content area shows a detailed view for REC ID 1003. Below this view are buttons for 'Delete REC Device' and 'Edit'. A '+ New REC Device' button is also visible. At the bottom, a table titled 'List of REC Devices' provides a summary of several devices.

REC ID	State	Last Log	Log Warn	Log Eff.	Probes	Bat. Signal Temp.	In Use
1003	live	28/12/2012 01:38:30	WARNING	81.9%	4	full good 15°C	yes
1004	live	11/12/2012 06:29:40	WARNING	83.2%	4	full strong -8°C	yes
1005	live	19/12/2012 12:59:04	WARNING	84.8%	4	full strong 23°C	yes
1006	live	10/12/2012 18:03:10	WARNING	100%	4	full good -5°C	yes
1007	live	19/12/2012 11:37:37	WARNING	42.0%	4	full good 17°C	yes
1008	live	18/12/2012 14:40:38	WARNING	87.2%	4	full strong 3°C	yes
1009	live	28/12/2012 11:34:54	WARNING	83.3%	4	full good 13°C	yes
1010	live	19/12/2012 06:18:56	WARNING	40.4%	4	full good 17°C	yes

Figure 4. Options window. In Options, an SMS can be sent by Internet phone applications to the loggers. The loggers are configured remotely by sending an SMS which contains a special command message. The drop-down menu is used to choose a logger, and clicking the Send button will then send it an SMS message with the appropriate command. By clicking the icons on the bar, a specific communication window will be made available. In this window, incoming and outgoing messages of the current logger can be tracked.

The screenshot shows the 'Options' tab in the EdaphoWeb interface. At the top, there are navigation tabs for 'Projects', 'Devices', 'Options', and 'Graphs & Data'. A 'Logout' button is in the top right corner. Below the navigation is a section titled 'CHOOSE REC DEVICE' containing a table of configuration fields. A dropdown menu is open for the 'REC ID' field, showing options 1008 through 1014. Below the configuration table is a 'COMMANDS' section with five rows, each containing a command name and a 'Send' button. At the bottom, there is a 'USER SETTINGS' section.

REC ID	Phone Number	PIN Code
State	Last Logging	Logging Warning
Project	Monitoring Site	Linked Probes
Log Efficiency	GPRS APN	Server
Firmware	Alert SMS	Alert 2nd SMS
SMS Center	Radio Off [hrs]	GPRS Upload [mins]
Alerts	GPRS Signal	Temperature
Battery	Shake Sensor	
Is Opened?		

COMMANDS

- Restart Logger Send
- Send Data on GPRS Send
- Send ID of Active Probes Send
- Turn on Sleep Mode Send
- Get GSM numbers from Logger Send

USER SETTINGS

Figure 5. Graph & Data window. Here you can set if you want to retrieve data summed or averaged. By clicking **Generate Graph**, graphs will be generated. The data is displayed on a time graph where duration is adjustable with a sliding button. Raw data can be exported into Excel.

