

NOKIA REMOTE SENSING PLATFORM MIDDLEWARE AND DEMO APPLICATION SERVER: FEATURES AND USER INTERFACE

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ABSTRACT

The document is aiming in providing sufficient information about features and user interface of the main elements of the Nokia Remote Sensing (NORS) platform. The first chapter gives a general overview of the NORS platform. The second chapter provides a description of the main features of the system, including features of the Application Server (AP) and Phone Gateway (PG). The following chapter describes graphical user interface of the application server and middleware. The fourth chapter presents the user interface of the phone gateway. The document is concluded by the Annex that contains copyright information, disclaimer, distribution information, and so on.

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GLOSSARY

AS	Application Server
BT	Bluetooth
BTLEE	Bluetooth Low End Extension
GPL	GNU General Public License
GPRS	General Packet Radio Service
GUI	Graphical User Interface
IG	Intermediary Gateway
IMEI	International Mobile Equipment Identity number
M2M	Machine to Machine modem
MIDP	Mobile Information Device Profile
N-RSA	Nokia Remote Sensing Architecture
NORS	NOKia Remote Sensing platform
PG	Phone Gateway
RSS	Really Simple Syndication dialect of XML
SSI	Synchronous Serial Interfaces
XML	Extensible Markup Language

1. INTRODUCTION

The document provides sufficient information about features and user interface of the main elements of the Nokia Remote Sensing (NORS) platform. The NORS platform is the test platform for sensor networks that is implemented according to the Remote Sensing Architecture (N-RSA) High-Level System Architecture specification [NRSA]. The main advantage of the presented platform is that it reduces amount of sensor data transmitted to the end system. It is achieved by defining special rules for sending data only when it is necessary and performing some preprocessing of the data (e.g. data aggregation). The main characteristic of the NORS system architecture is that the intelligence required for information processing is moved closer to the information collecting sensors. The data collecting sensors call Intermediary Gateway (IG) that has capability of performing certain reasoning, and reasoning requires proper sensor and sensor data abstractions as well as capabilities of combining simpler sensor data into more complex one.

This document is focused on describing user options and giving filling about provided experience when using the following two parts of NORS:

- Configuring and using Application Server and middleware application.
- Configuring and using Phone Gateway application.

2. DESCRIPTION OF THE MAIN SYSTEM FEATURES

- Subscription-based remote sensing to locally obtained sensor data
- Support for arbitrary number of mobile gateways (reads from the configuration file)

2.1 Features of the Application Server

- Links N-RSA server middleware (library)
- Uses simple configuration file for gateway information (phone number, IMEI, phone (gateway) location and/or ownership, SMS wakeup option)
- Supports phone and M2M gateways (M2M is woken up by SMS)
- Calls simple discovery and acquisition API of N-RSA server through menu GUI
- Requires public IP to have gateways connect
- Allows for telnet into server with remote control of the server
- Allows for automatic scripting of acquisition requests after particular gateway connects (good for static measurement scenarios)
- Generates dynamic web pages with discovery and acquisition information
- Server to be open sourced under GPL as a demo as to how to write an N-RSA server

2.2 Features of the Phone Gateway

- Handler structure allows for integrating any local sensor protocol
- Currently supported handlers:
 - Local and remote (via BT) camera
 - SSI over BT (with sensors for temperature, humidity, light, pressure and others)
 - SSI is open Nokia spec for local sensing
 - SSI over BTLEE (low power BT extension)
 - BT beacon (scans surrounding BT devices with MAC and friendly name)
 - etc.
- Queries to sensor symbols
- SSI sensors implement threshold-based query

- Planned to move to XQuery over TinyML
- N-RSA started explicitly on mobile phone, remotely via SMS on M2M device (N12)

3. GRAPHICAL USER INTERFACE OF THE APPLICATION SERVER AND MIDDLEWARE

This chapter describes graphical user interface (GUI) of the demo Application Server and middleware provided in the standard distribution of N-RSA package. If the N-RSA package is not installed on your PC, you first need to install it using “Installation guide for the Nokia Remote Sensing Platform” [NORS] that can be requested from the document authors.

Before starting the Application Server, please make sure that your PC is visible outside and for that it has to be connected to a public IP network. For starting the Application Server you need to execute N_RSA_AS_wo_Sierra.exe program that is located in Exec (or Exec-DevC) subdirectory of your RSA_AS package directory. If you want to use AS with GPRS support of Sierra wireless card (which is used when having M2M devices in the testbed) you should execute N_RSA_AS.exe located in the same subdirectory. You also can use the executable scripts (.bat files), which simply create a loop to automatically restart the main executable after failure.

3.1 N-RSA Middleware

First the Application Server starts N-RSA Middleware and the corresponding status window (as it is shown in Figure 1) appears on the screen.



Figure 1: N-RSA Middleware status screen

The process of launching N-RSA middleware consists of loading information about allocated phone gateways, and activating N-RSA connection for the given IP address and port. The set of phone gateways is specified in GWphones.txt file, placed in the same directory where the executable modules are located. This default file name can be changed to any preferred name by using “Settings” button at the N-RSA Middleware Status window. The settings window is also used for changing N-RSA IP address, N-RSA port and for setting the GRPS flag. The N-RSA middleware settings window is presented in Figure 2.

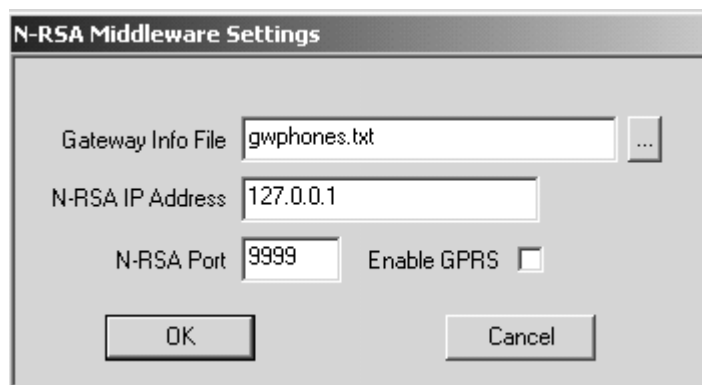


Figure 2: N-RSA Middleware settings screen

The gateway info file format syntax is self-explanatory and the file header contains enough comments to allow you make proper configuration of the gateway settings. Basically definition of each phone-gateway consists of 4 lines, where the meaning of lines is as follows:

1. Phone number, starting with prefix “+”.
2. International Mobile Equipment Identity (IMEI) number. On the Symbian phone the IMEI number can be obtained by typing the following command – *#06#. Usually the IMEI number is a 15-digits number.
3. Text specification of the phone (gateway) location and/or ownership.
4. The wakeup SMS parameter, 0 = no wakeup SMS, 1 = wakeup SMS. Note that the phone number entry in the configuration file does not really matter if you are not using SMS wakeup for phones (important only for M2M devices).

3.2 N-RSA Application Server

The next window, which automatically appears on the screen after the middleware settings window is the main window of N-RSA Application Server. The window provides a top level menu with the following three options: Project, Acquire, and Discover. The screenshot of the main window is provided in Figure 3.

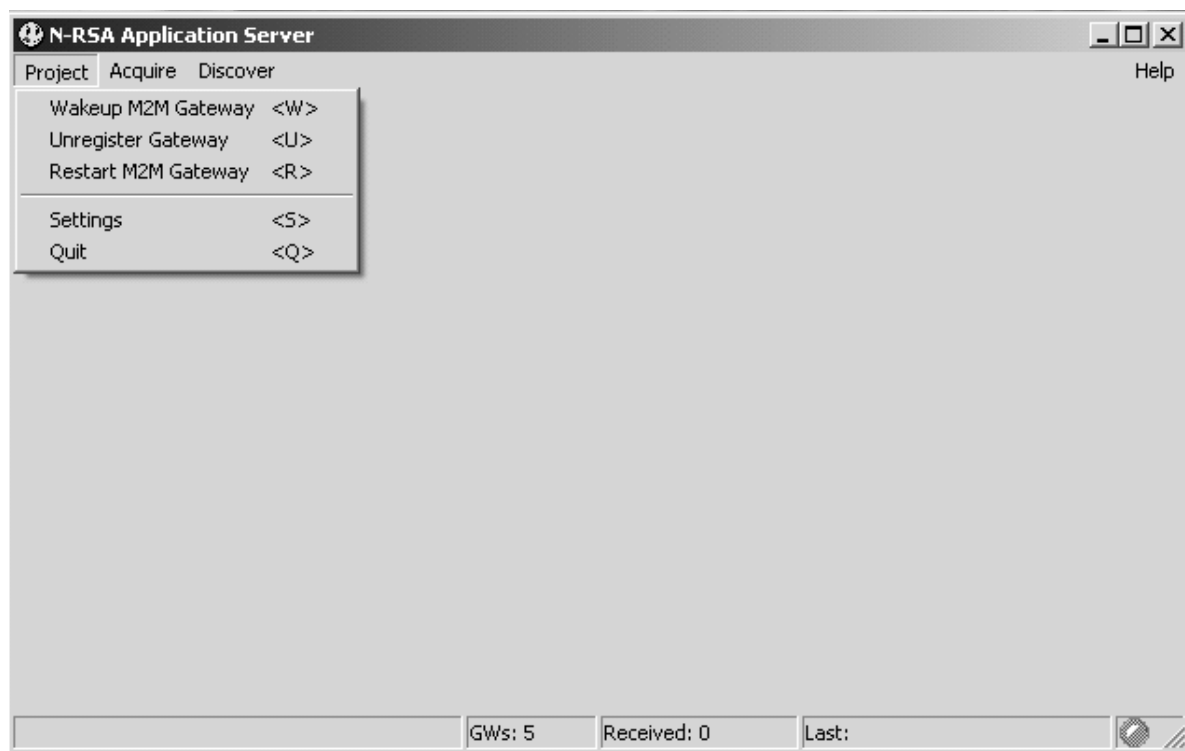


Figure 3: N-RSA Application Server GUI

The first submenu (“Project”) contains three options for managing phone gateways (“Wakeup M2M Gateway”, “Unregister Gateway”, and “Restart M2M Gateway”). It also provides Application Server settings controlling option (“Settings”) and program exit option (“Quit”). All three gateway management options have similar format, when the user only needs to specify the target gateway for the corresponding management operation. For example, Figure 4 illustrates a choice window that appears after executing the “Wakeup M2M Gateway <W>” option.

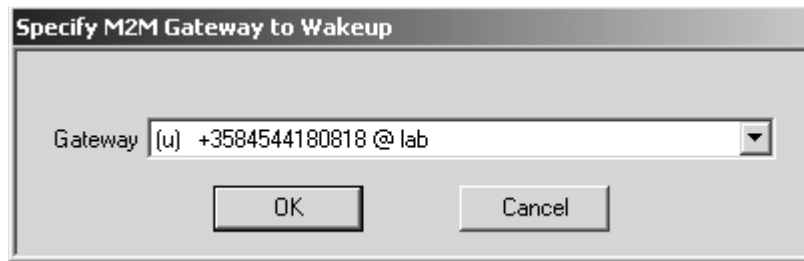


Figure 4: N-RSA Application Server Wakeup M2M Gateway screen

Similar choice windows appear for the “Unregister Gateway <U>” and “Restart M2M Gateway <R>” options, and the assigned functionality in all three cases is clear from the option names.

The next option in the first submenu is “Settings <S>”. By using this option you can modify all main settings of the N-RSA Application Server, such as configuration of communication with the Global SensorPlanet Server, Telnet settings including port number and password, settings for HTML and RSS feed creator, and the information acquisition settings, including settings of the acquisition view window parameters, and file name for the scripted data acquisition. The default acquisition script file name is scripting.txt, and the example of this script file you can find in the same directory where the main executable is located. The N-RSA Application Server Settings window is shown in Figure 5.

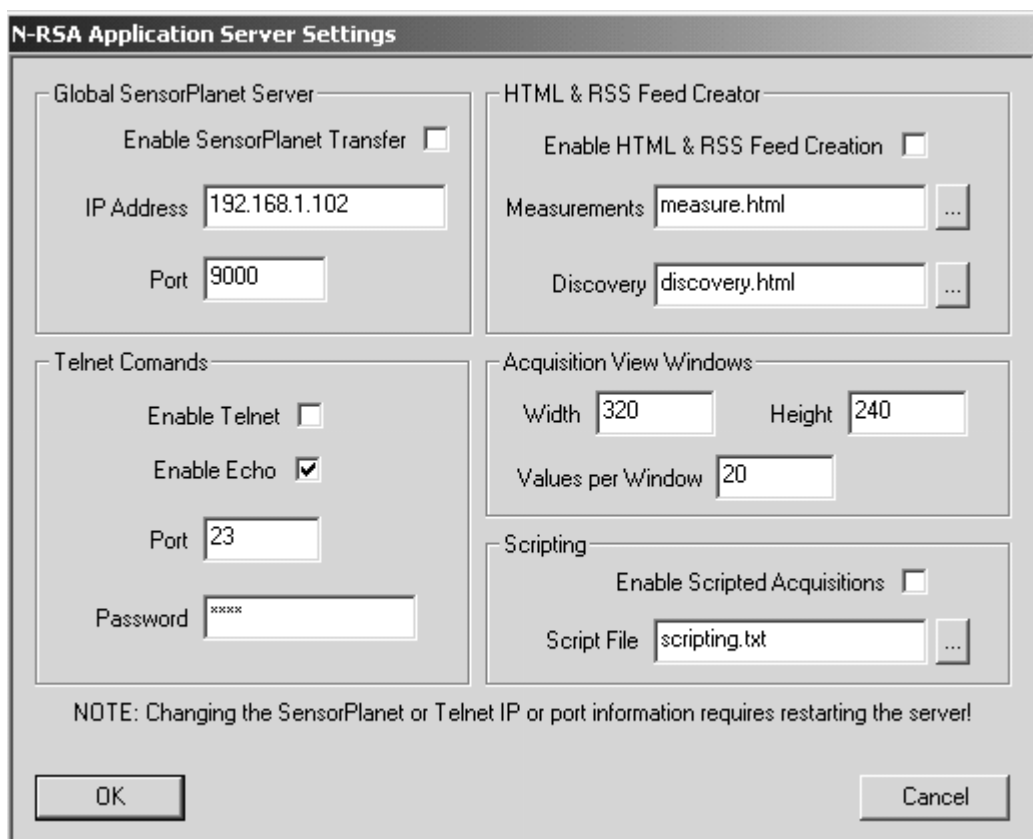


Figure 5: N-RSA Application Server Settings screen

The N-RSA acquisition scripting file is a part of the N-RSA application server (not the N-RSA middleware). This file includes acquisition requests to be executed in scripting mode, i.e. once a particular gateway connects to the application and publishes the sensor data acquisitions are created with the given queries. Note that one can create several acquisitions for each gateway. The current file format is very simple, you have to specify: gateway number, number of queries, query strings (one in each line).

The last option in the first submenu is “Quit”, which is a proper way of closing the N-RSA Application Server program.

The second submenu (“Acquire”) contains two options for managing acquisition: “Create Acquisition” and “Terminate Acquisition”. The “Create Acquisition <A>” option allows to specify a new query for acquisition for a selected Gateway, and in the same window you can set flag whether you want to create the acquisition view window. The format of “Create Acquisition <A>” window is presented in Figure 6.

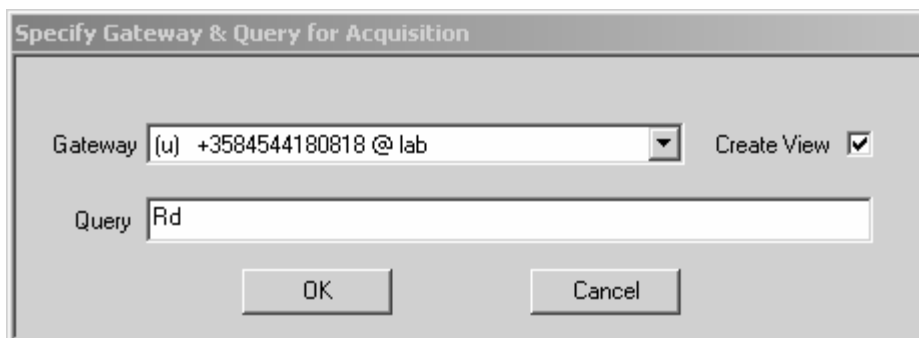


Figure 6: N-RSA Application Server Create Acquisition screen

The second option “Terminate Acquisition <T>” allows to terminate a selected acquisition.

The third submenu (“Discover”) contains only one option – “Show Available Sensors <D>”. This is a kind of monitoring option that allows to check information about available sensors for each gateway, and the corresponding window you can see in Figure 7.

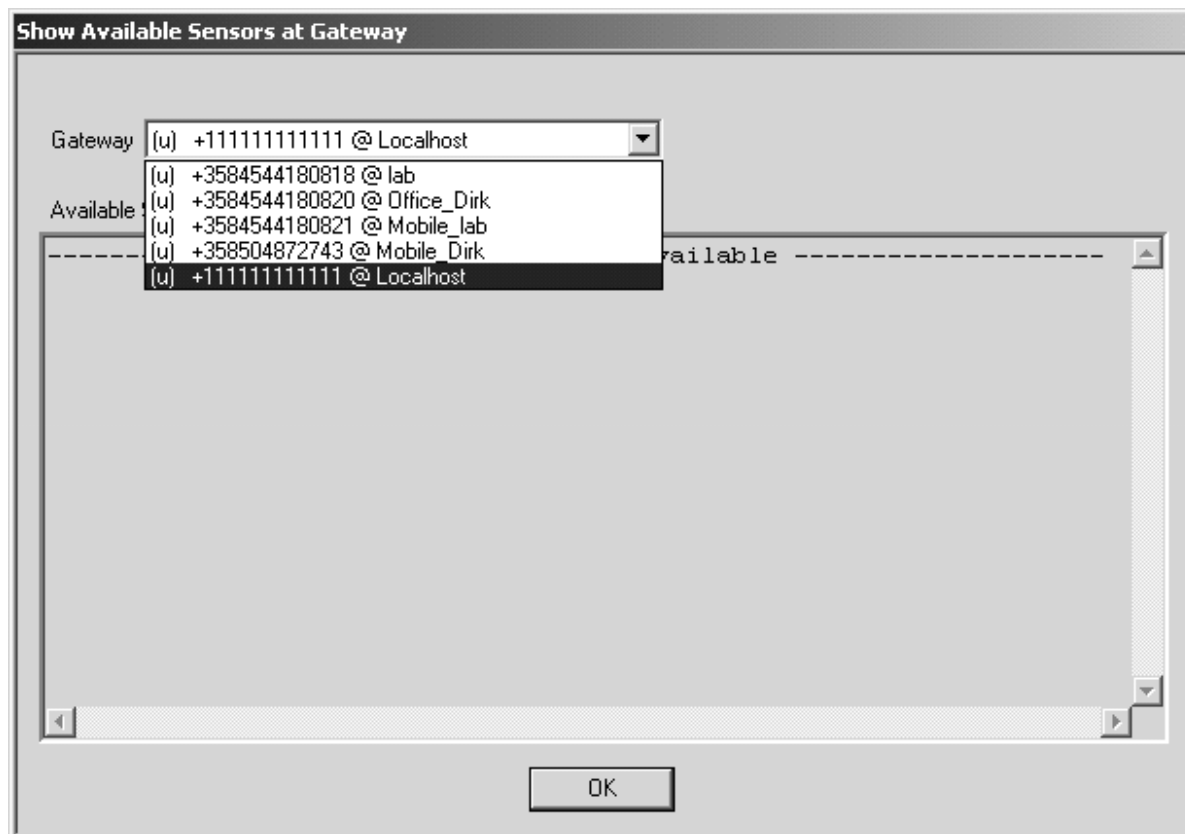


Figure 7: N-RSA Application Server Available Sensors screen

This is basically all functionality available in the provided demo version of the N-RSA Application Server.

4. USER INTERFACE OF THE PHONE GATEWAY APPLICATION

This chapter describes the user interface of the phone gateway application. If the Phone Gateway Application is not installed on your mobile device, you first need to install it using “Installation guide for the Nokia Remote Sensing Platform” [NORS] that can be requested from the document authors.

The Phone Gateway application should be available from the main menu of your Symbian phone, and by starting it you will see the main menu of N-RSA phone GW, as it is shown in Figure 8.



Figure 8: Main menu of the N-RSA Phone Gateway application

The main menu provides three options: “Start” that allows to start the N-RSA phone gateway, “Configure” that is used for configuring settings of the N-RSA PG, and “About” that provides basic summary information about your version of N-RSA PG application. The Options menu (available on click of left control button) contains two options: “Select” and “Exit”, which are self-explanatory.

On selection of the “Start” option you will be transferred to the phone gateway main operational mode as it is shown in Figure 9.

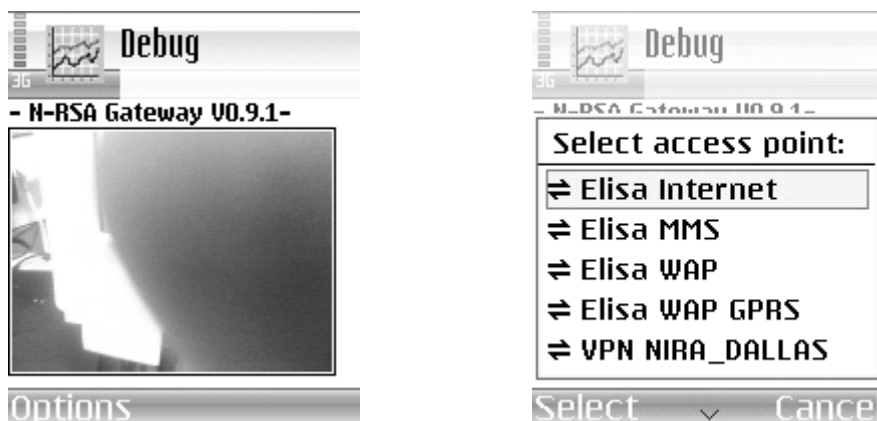


Figure 9: Start submenu (Main→Start) and the set of available options

After clicking “Start” option the user has to approve (by answering “Yes” to the corresponding question) usage of the network and allow N-RSA Phone gateway application to send and receive data. If network usage is approved, the user has to select the network access point for the list of available access point, as it is shown in the right part of Figure 9. After selection of the access point, the application is transferred in the main operational mode of the N-RSA Phone gateway application, which shows output of the main sensor (by default it is local camera), as it is illustrated in the left part of Figure 9. The available Options submenu contains only one option “Exit”, selection of which results in leaving from the N-RSA Phone gateway application.

The next option in the main menu is “Configure”. This option can be used for configuring your N-RSA Phone gateway application. By selecting this option you will be transferred to the phone gateway configuration submenu that it is presented in Figure 10.



Figure 10 : Configure submenu (Main→Configure)

The configuration submenu contains two options: “General” – that allows to set general parameters of the phone gateway, and “Handlers” – that is used for configuring set of the available sensors. The Options menu, as for the main menu contains only two options: “Select” and “Exit”.

By selecting option “General” the user launch the following configuration window, as it is illustrated in Figure 11.



Figure 11: General configuration options submenu (Main→Configure→General)

By using the General configuration menu, the user can define whether the application should work in debugging mode (by default it is off), set the International Mobile Equipment Identity (IMEI) number of the mobile device, and define the Application Server (AS) IP address and port (by default it is set to 127.0.0.1:9999). Note that you have to set IMEI number of your mobile device manually, as the default number only gives an example of IMEI format and does not much to the real IMEI of your device. On Symbian phones the IMEI number can be obtained by typing the following command: `*#06#`. For the AS IP address and port, please refer to your AS installation settings. More information about installation and settings of the application server you can get in [NORS].

The second option in the configure menu is “Handlers”. By clicking this option you will get the list of available sensors, as it is illustrated in Figure 12.

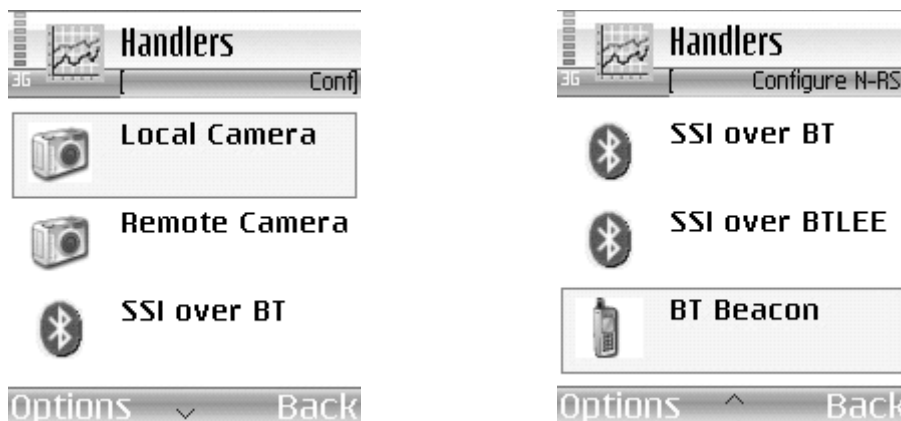
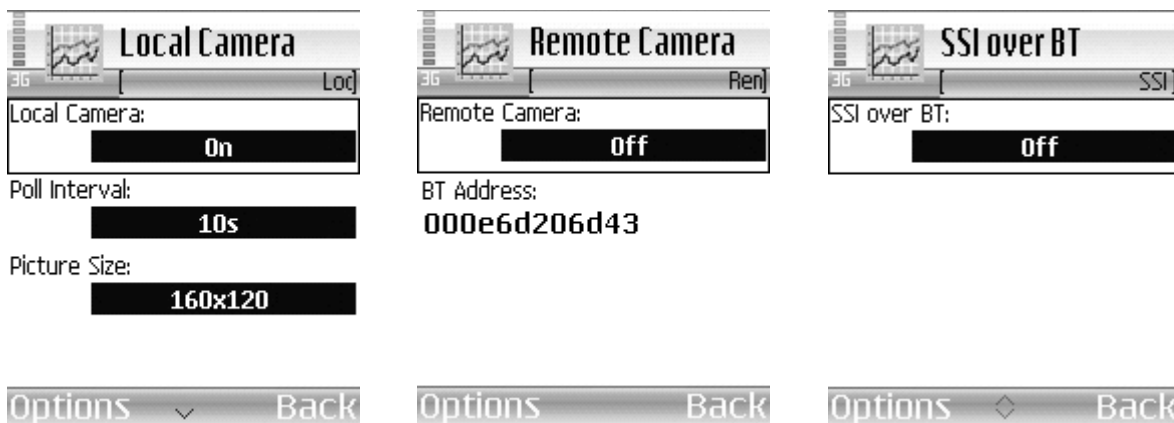


Figure 12: Handlers configuration main submenu (Main→Configure→Handlers)

The provided list of handlers allows you to configure settings of the available sensors. Depending on the mobile device and version of N-RSA phone gateway application, the set of available sensors might be different, but the most common set of handlers is presented by two screenshots in Figure 12.

By clicking on the handler you get the list of available setting, which differs from handler to handler, but all of them have a mandatory first option of whether the corresponding device should be ON or OFF.

The examples of handler setting windows are illustrated in Figure 13.



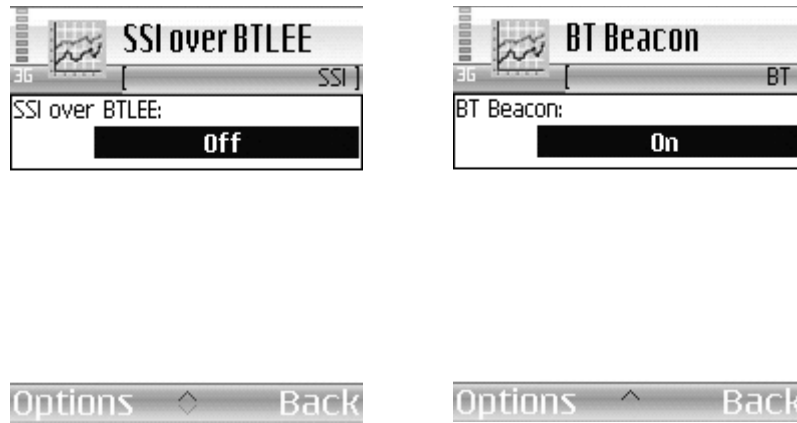


Figure 13: Handlers configuration submenus for the available devices

5. REFERENCES

- [NORS] Elena Balandina and Dirk Trossen, "Installation Guide for the Nokia Remote Sensing Platform", Nokia Research Center / Helsinki, 31.03.06
- [NRSA] Dirk Trossen and Dana Pavel, "Report: N-RSA High-Level System Architecture", Nokia Research Center / Helsinki, 13.02.06

ANNEX A

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A.3 Information distribution

In addition to the document of the package itself, including this document, we offer you a number of documents in order to get more information about the N-RSA system architecture, its specifications and protocols used. Note that the documents are created and distributed by Nokia Oyj. They are freely downloadable.