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Towards Evaluation Study on Commissioning and Operation of Industrial Wireless Sensor Networks

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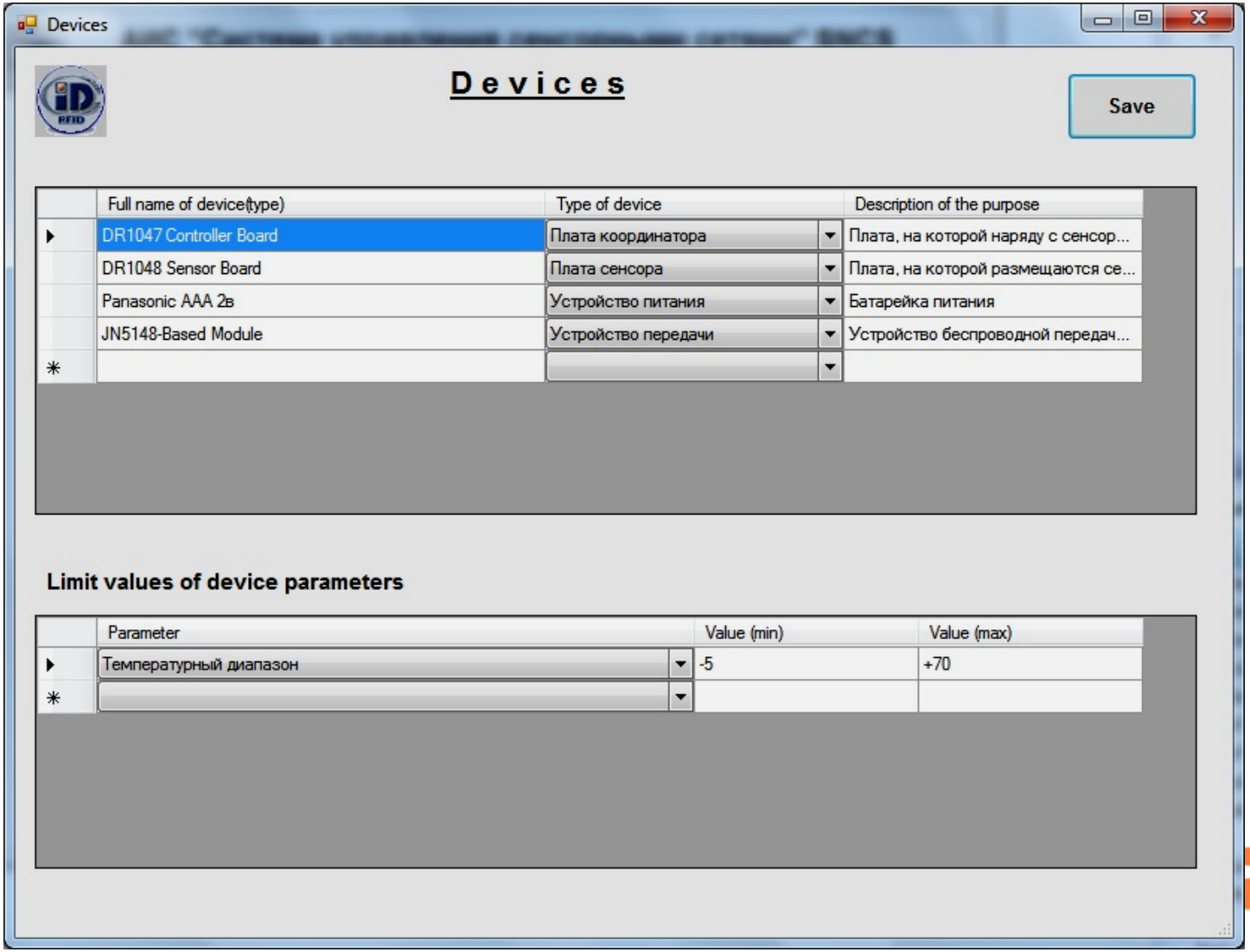
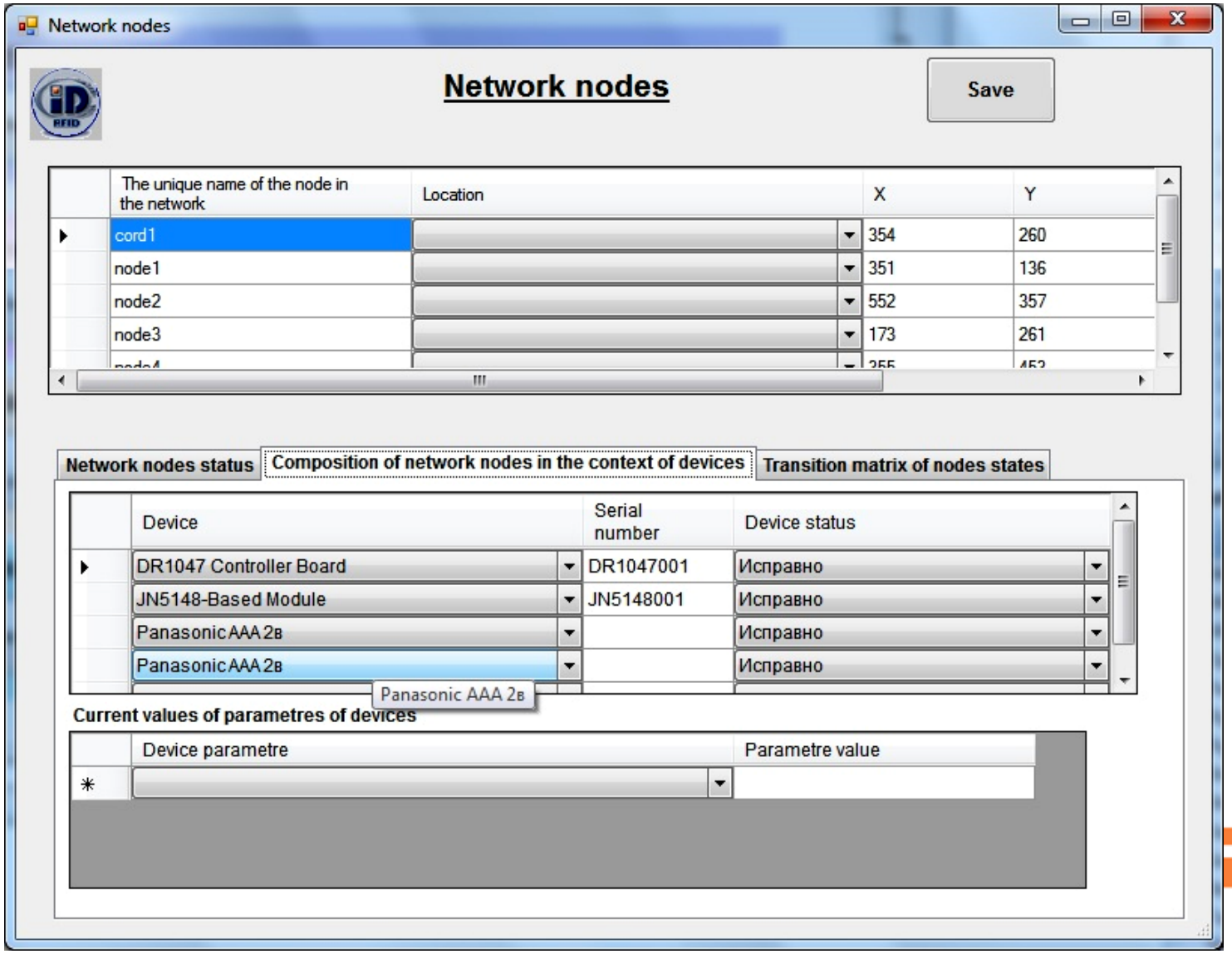
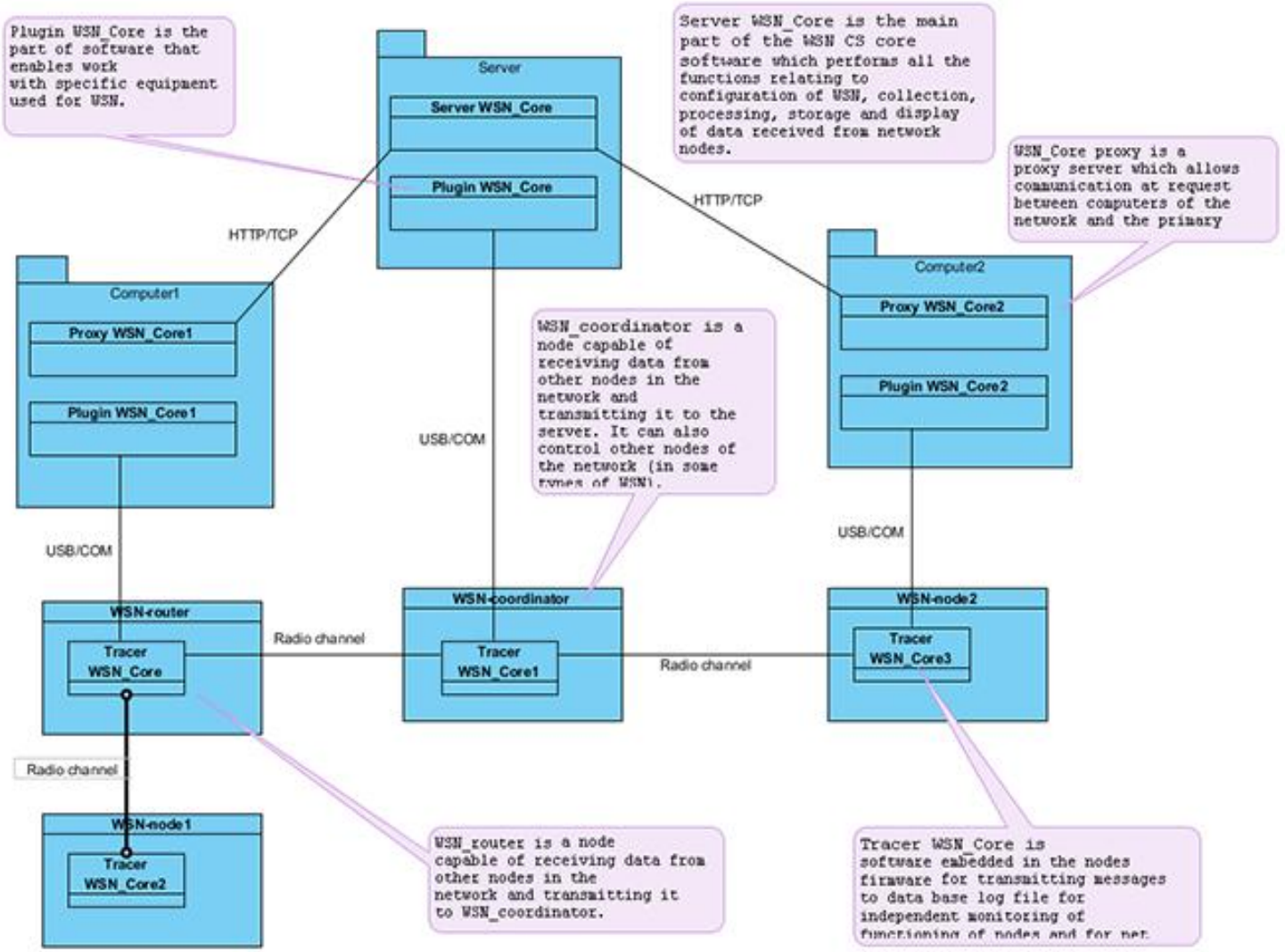
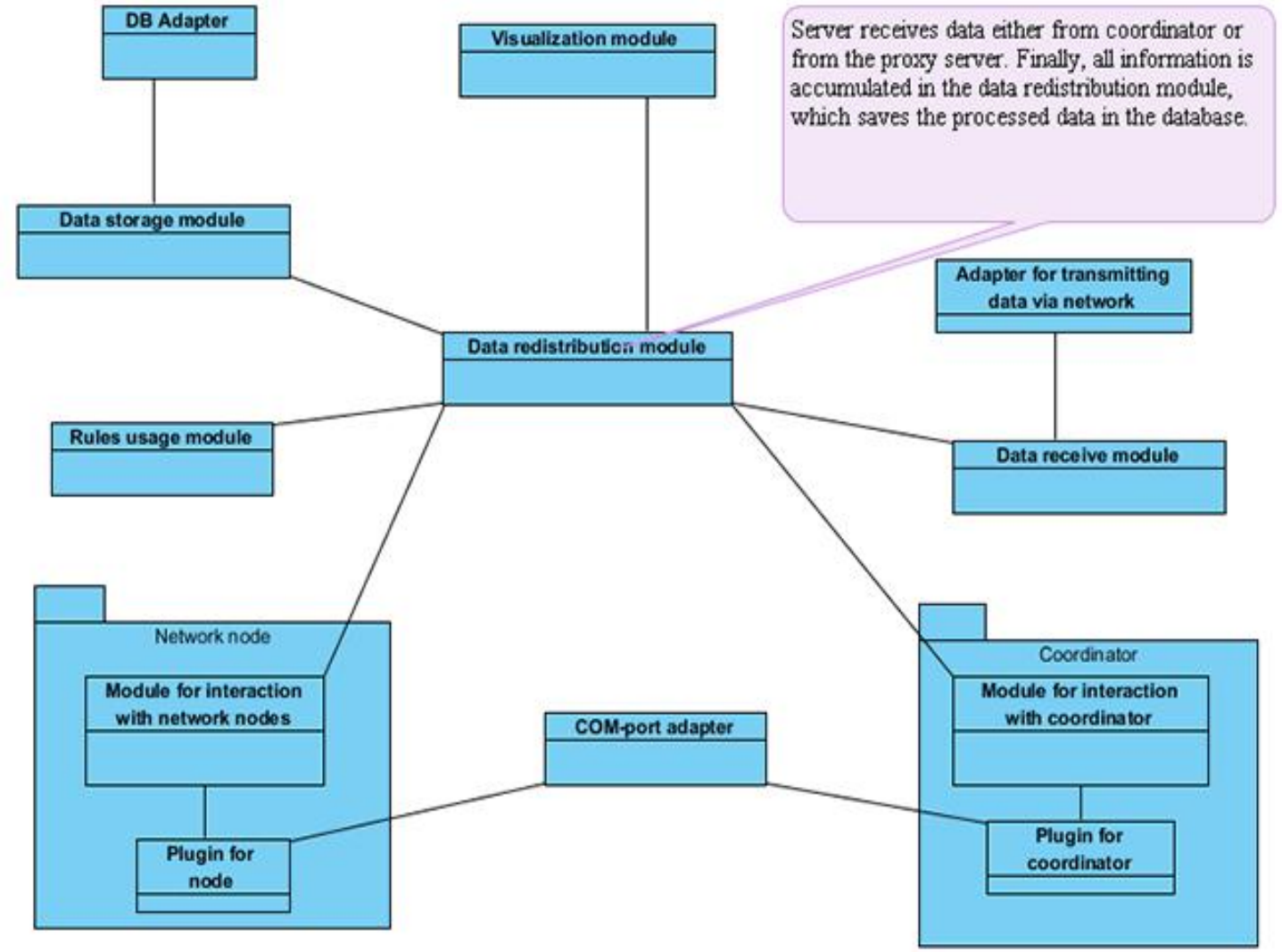
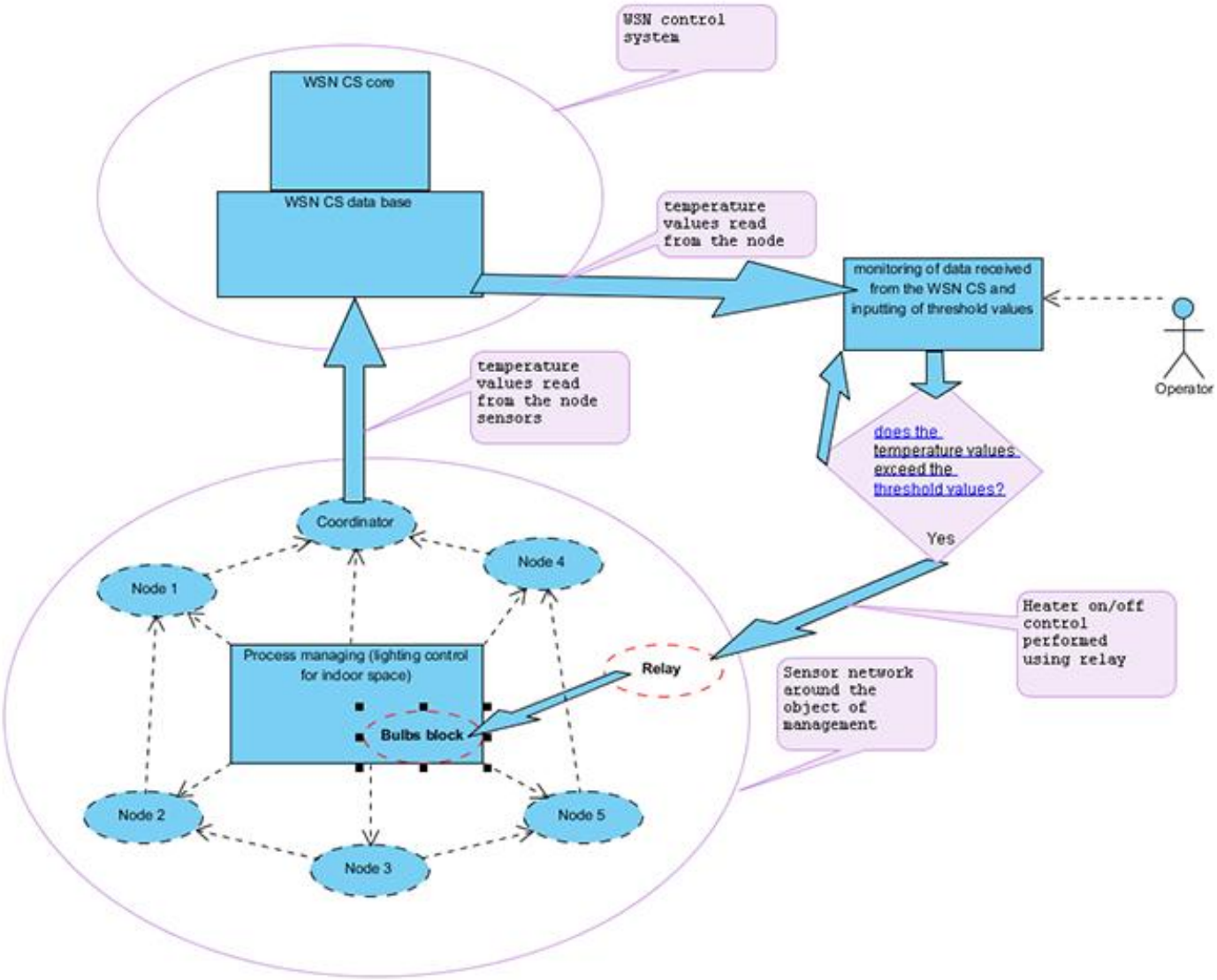
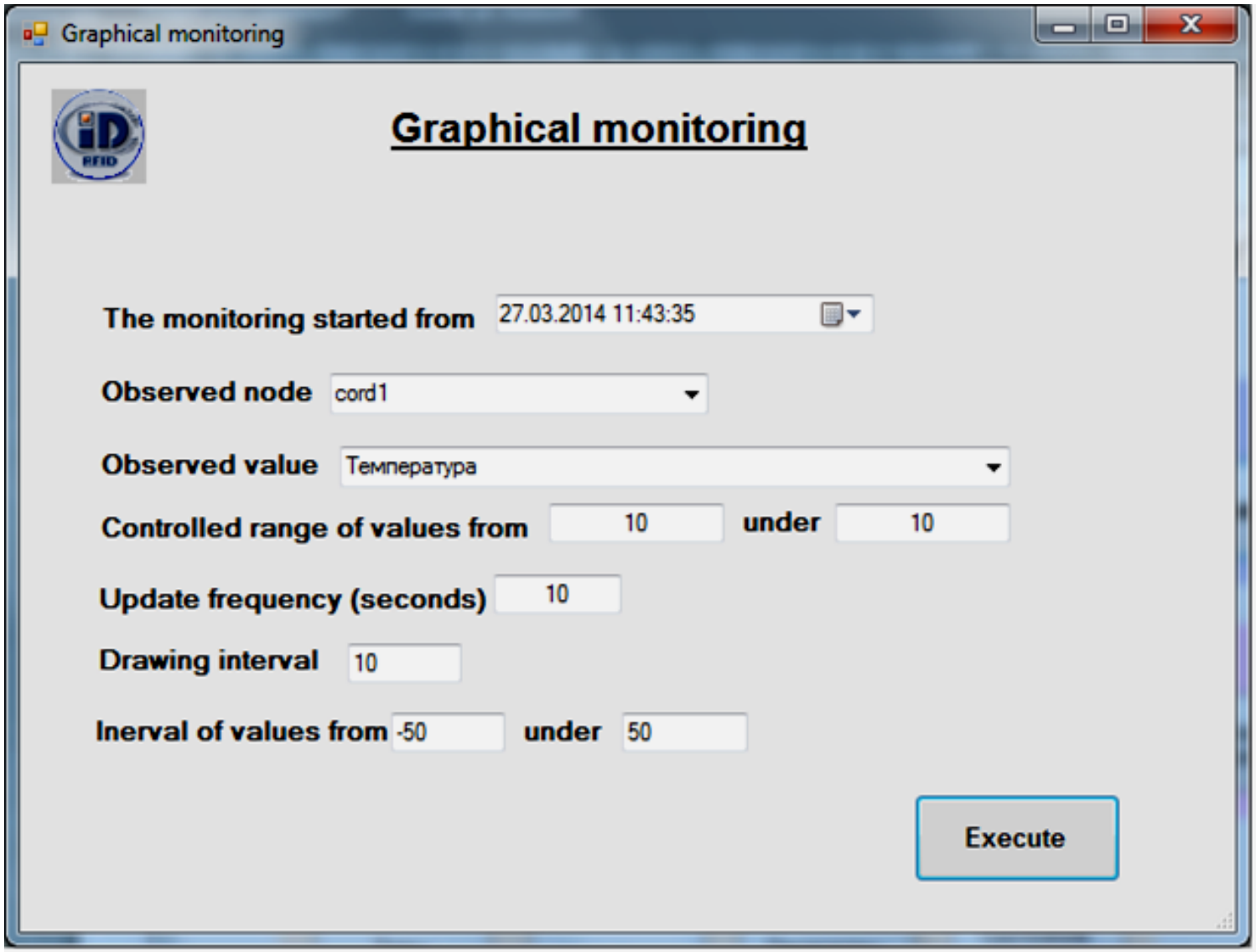

Devices
Devices
Save
Full name of device(type)
Type of device
Description of the purpose
DR1047 Controller Board
Плата координатора
Плата, на которой наряду с сенсор...
DR1048 Sensor Board
Плата сенсора
Плата, на которой размещаются се...
Panasonic AAA 2в
Устройство питания
Батарейка питания
JN5148-Based Module
Устройство передачи
Устройство беспроводной передач...
Limit values of device parameters
Parameter
Value (min)
Value (max)
Температурный диапазон
-5
+70

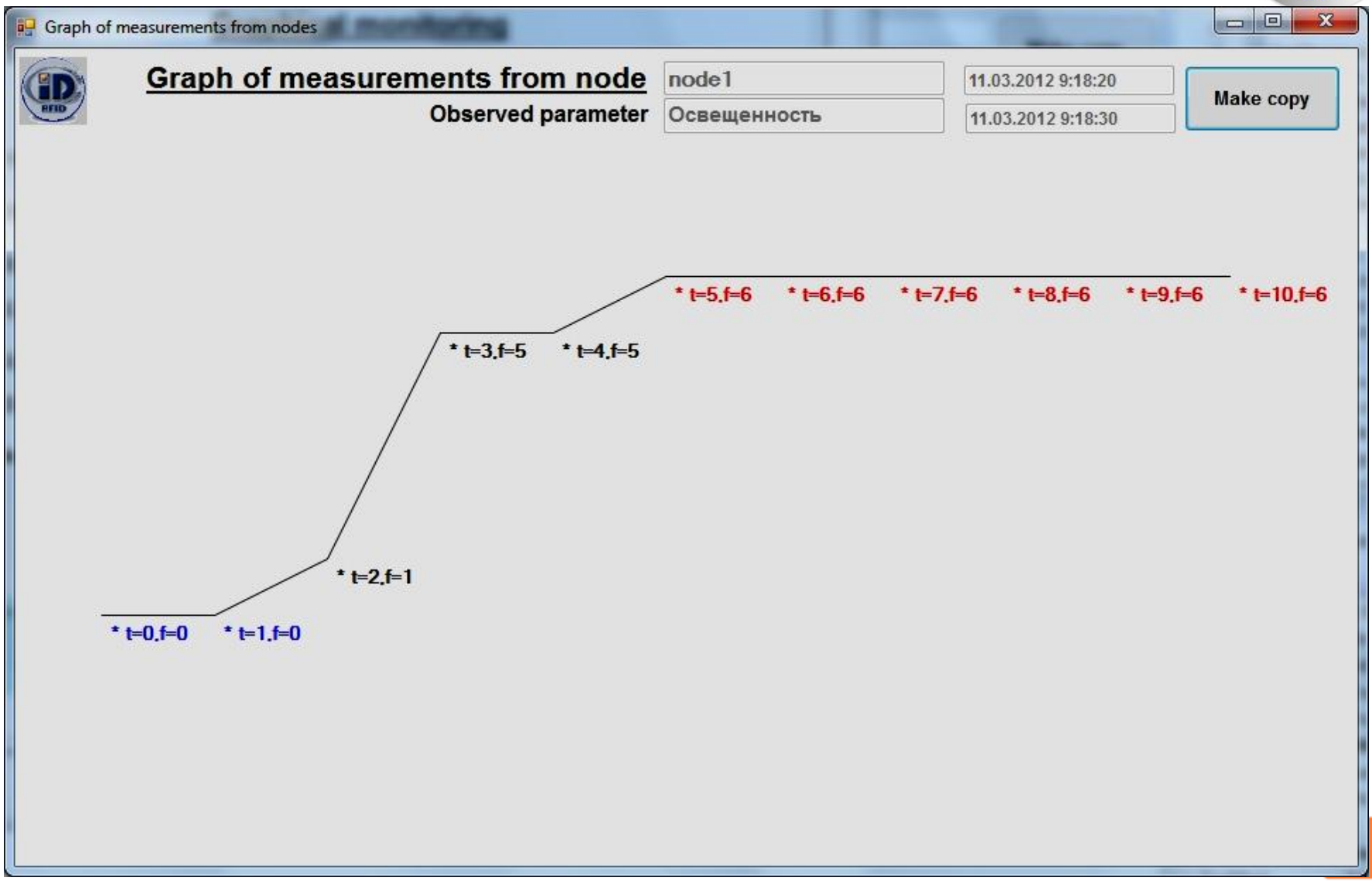

Network nodes
Network nodes
Save
The unique name of the node in the network
Location
X
Y
cord1
354
260
node1
351
136
node2
552
357
node3
173
261
Network nodes status
Composition of network nodes in the context of devices
Transition matrix of nodes states
Device
Serial number
Device status
DR1047 Controller Board
DR1047001
Исправно
JN5148-Based Module
JN5148001
Исправно
Panasonic AAA 2в
Исправно
Panasonic AAA 2в
Исправно
Panasonic AAA 2в
Current values of parametres of devices
Device parametre
Parametre value


Plugin WSN_Core is the part of software that enables work with specific equipment used for WSN.
Server
Server WSN_Core
Plugin WSN_Core
Server WSN_Core is the main part of the WSN CS core software which performs all the functions relating to configuration of WSN, collection, processing, storage and display of data received from network nodes.
HTTP/TCP
HTTP/TCP
WSN_Core proxy is a proxy server which allows communication at request between computers of the network and the primary
Computer1
Proxy WSN_Core1
Plugin WSN_Core1
Computer2
Proxy WSN_Core2
Plugin WSN_Core2
WSN_coordinator is a node capable of receiving data from other nodes in the network and transmitting it to the server. It can also control other nodes of the network (in some
USB/COM
USB/COM
USB/COM
WSN-router
Tracer WSN_Core
Radio channel
WSN-coordinator
Tracer WSN_Core1
Radio channel
WSN-node2
Tracer WSN_Core3
Radio channel
WSN-node1
Tracer WSN_Core2
WSN_router is a node capable of receiving data from other nodes in the network and transmitting it to WSN_coordinator.
Tracer WSN_Core is software embedded in the nodes firmware for transmitting messages to data base log file for independent monitoring of


DB Adapter
Visualization module
Server receives data either from coordinator or from the proxy server. Finally, all information is accumulated in the data redistribution module, which saves the processed data in the database.
Data storage module
Adapter for transmitting data via network
Data redistribution module
Rules usage module
Data receive module
Network node
Module for interaction with network nodes
COM-port adapter
Coordinator
Module for interaction with coordinator
Plugin for node
Plugin for coordinator


WSN control system
WSN CS core
WSN CS data base
temperature values read from the node
monitoring of data received from the WSN CS and inputting of threshold values
Operator
temperature values read from the node sensors
does the temperature values exceed the threshold values?
Yes
Coordinator
Node 1
Node 4
Process managing (lighting control for indoor space)
Relay
Bulbs block
Heater on/off control performed using relay
Sensor network around the object of management
Node 2
Node 5
Node 3


Graphical monitoring
Graphical monitoring
The monitoring started from
27.03.2014 11:43:35
Observed node
cord1
Observed value
Температура
Controlled range of values from
10
under
10
Update frequency (seconds)
10
Drawing interval
10
Inerval of values from
-50
under
50
Execute


Graph of measurements from nodes
Graph of measurements from node
node1
11.03.2012 9:18:20
Observed parameter
Освещенность
11.03.2012 9:18:30
Make copy
* t=0,f=0
* t=1,f=0
* t=2,f=1
* t=3,f=5
* t=4,f=5
* t=5,f=6
* t=6,f=6
* t=7,f=6
* t=8,f=6
* t=9,f=6
* t=10,f=6

Concept of wireless sensor network

The role of innovative technologies in monitoring, status tracking and managing of objects of critical importance has increased recently. Wireless sensor networks (WSN) are one of the latest achievements in this field.

Wireless sensor network is made up of miniature computing devices – sensor nodes which size doesn't usually exceed one cubic centimeter. A sensor node includes a processor, memory storage (flash-memory and RAM), digital-to-analog and analog-to-digital converters, an RF transceiver, a small power supply and sensors.

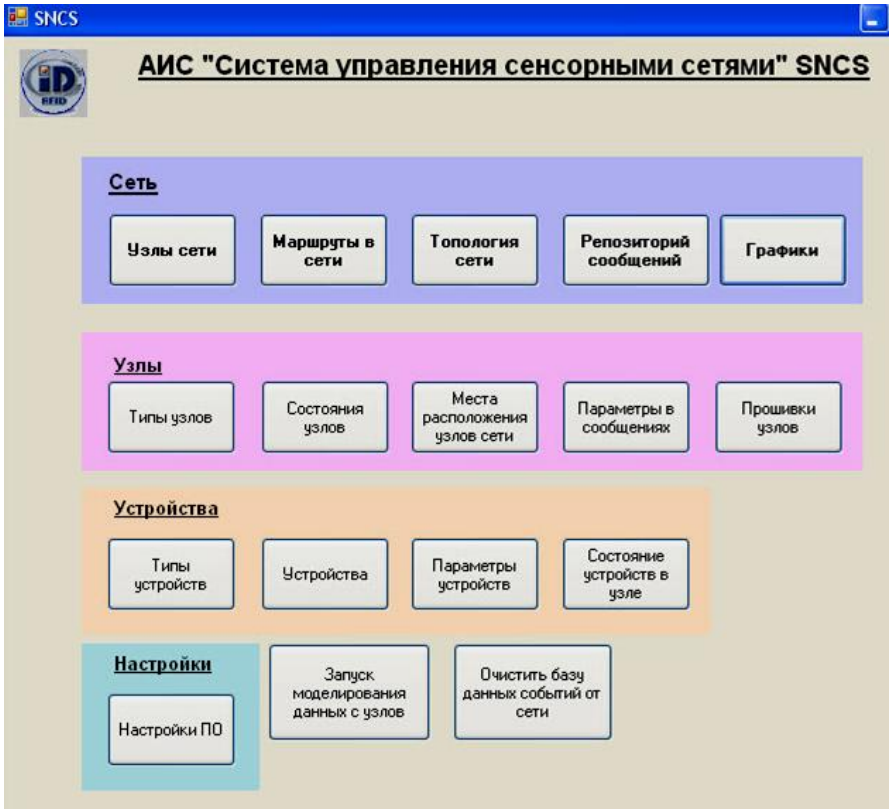
Variable sensors can be attached to a node: from the most common which measure temperature, pressure, light level, to specialized, capable of measuring, for example, background radiation level and content of CO2.

Exterior view of sensor nodes and different physical devices (sensors):

Equipment for a WSN model

- An NXP JN5148 training kit was used for the experimental model of WSN.
- The kit includes one coordinator, connected to the server via a USB port, and 4 sensor boards. Each of these sensor boards has 3 sensors (temperature, humidity and light) which are connected to the coordinator via radio channel.

Software of the experimental model



To manage a WSN and the experimental model, a software was developed which describes any WSN as detailed as to the description of nodes it includes, network topology with graphical representation of the values received from the sensors of the WSN nodes.

Experimental model

- Experimental model - a hardware and software suite which uses radio channel to receive data on temperature, humidity and light from 4 network nodes and further stores these values in the database;
- Operator inputs threshold values for the values that should be measures. If the measured value exceeds the threshold, a signal is sent which switches on a corresponding light indicator on demonstration panel of the model. There are four rows of light indicators on the panel (one row per node). Each row contains three light indicators (one indicator per sensor).

Thank You

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