

ProSense @ Belgrade

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Aleksandar Crnjin

Goran Rakočević

Marko Stanković

Mihajlo Velkovski

Milovan Kovačević

Branko Pavlović

Ivan Pajović

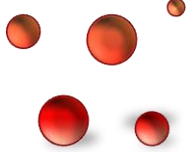
Žarko Perić

Miloš Solujić

Žilbert Tafa

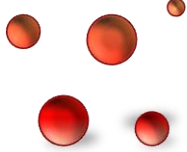
Predrag Ćirković

Introduction



- EU Seventh Framework programme (FP7)
- Promote, Mobilize, Reinforce and Integrate Wireless Sensor Networking Research and Researchers:
Towards Pervasive Networking of WBC and the EU
- Project start date: 01-03-2008
- Duration: 2 years

Project Team



Director for EU: Dr. Srđan Krčo, Ericsson, Ireland

Director for Serbia: Prof. Dr. Veljko Milutinović, UB

Team members

1. *Technical consultants:*

M.Sc. Miloš Cvetanović

M.Sc. Zaharije Radivojević

Medical team of doctors

2. *Employees:*

Stanislava Stanković

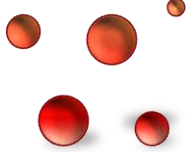
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Project Team



3. *Volunteers:*

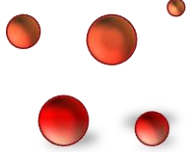
Mihailo Velkovski
Milovan Kovačević
Branko Pavlović
Žarko Perić
Miloš Solujić
Predrag Ćirković

Associate members from Montenegro and Novi Sad:

Sandra Bijelić
Milena Đukanović
Zorica Suvajdžin
Ivan Pajović
Žilbert Tafa

Website: prosense.etf.rs

Project Partners



Ericsson Ireland Research Centre – EIRC

LM Ericsson Ireland (LMI)

<http://www.ericsson.com>

INRIA

France

<http://www.inria.fr>

Department of Electronic, Electrical and Computing Engineering
University of Birmingham (UB), UK

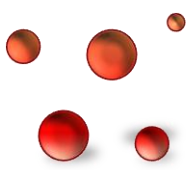
<http://www.bham.ac.uk>

Institute of Telecommunications,
Warsaw University of Technology (WUT)

Warsaw, Poland

<http://www.tele.pw.edu.pl/index-en.html>

Project Partners



Research Academic Computer Technology Institute (CTI)

Patras, Greece

<http://www.cti.gr>

Department of Communication Systems

Jozef Stefan Institute (JSI)

Ljubljana, Slovenia

<http://www.ijs.si>

Faculty of Electrical Engineering and Information
Technologies

Ss. Cyril and Methodius University Skopje (FEEIT)

Former Yugoslav Republic of Macedonia

<http://www.feit.ukim.edu.mk>

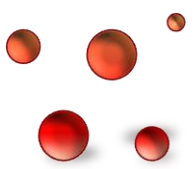
School of Electrical Engineering (ETF)

University of Belgrade

Serbia

<http://www.etf.bg.ac.yu>

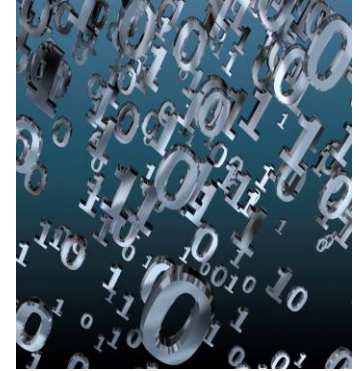
Project Objectives



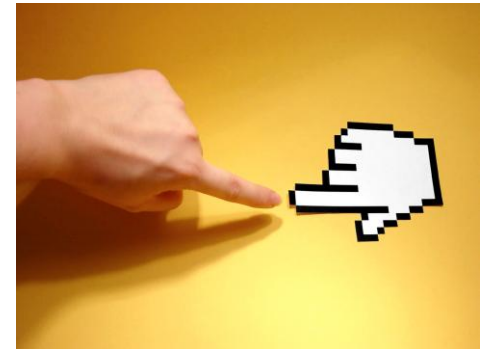
- Improvement of the research potential and capability of selected WB research centres (Belgrade and Skopje above all) and their development into wireless sensor networking centres of excellence
- Building tight relationship between the WBC and the EU institutions and researchers through collaboration on specific use cases with high significance for socio-economic needs of the WB countries
- Two use cases, one for each WBC centre, have been selected as particularly interesting and beneficial for the WB region: personal health monitoring systems (ETF in charge) and emergency/disaster recovery applications (FEEIT in charge)

Challenges vs. Experience

- The concept of using microprocessors integrated with sensors has become trend in the majority of European countries as well as in The United States of America



- Development in the area of WSNs' infrastructure and communication protocols is very important part of today industry and academic research



- Other people experience, gained from many worldwide projects give us the opportunity to face challenges ahead

Application Statement

ETF team is working on several scenarios, which can be broadly categorized to:

- public health monitoring
- personal health monitoring
- sport and fitness
- common infrastructure



List of Use-Cases

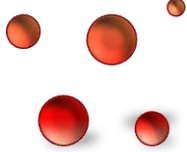
- Smart Running Track
- Common Health Gateway
- Interactive Street Sensing
- Sea Monitoring System
- Mine Sensor Chat

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Various ProSense Activities



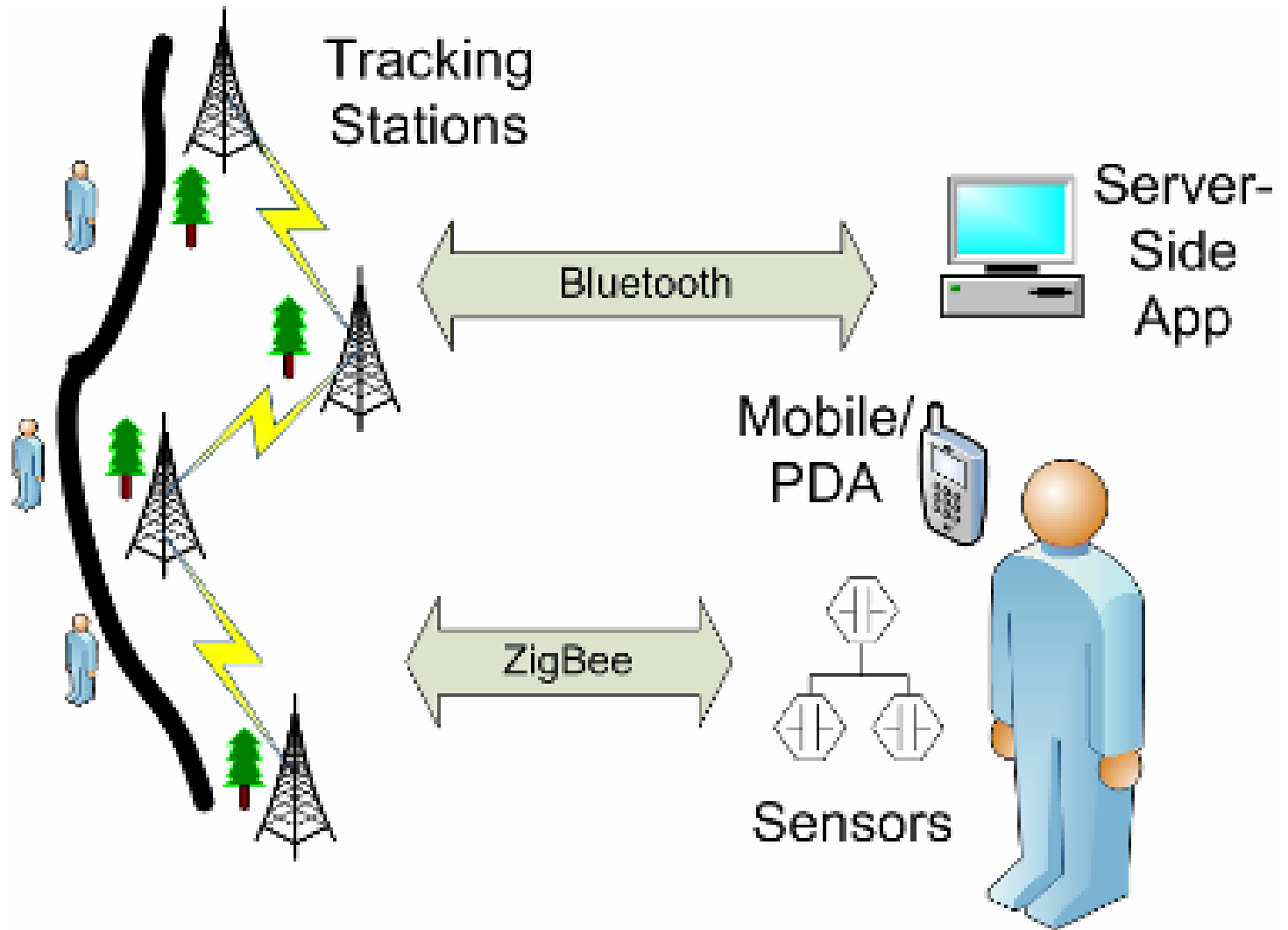
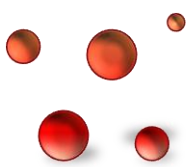
Smart Running Track - SRT



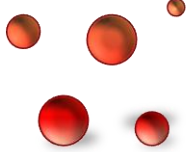
- Fitness/Personal health project
- Smart, competitive environment for runners
- Runners - able to see their position and the position of other runners on the track map displayed on their mobile phones
- Runners - able to review their main health parameters (such as blood pressure, body temperature, the amount of calories burned)
- Personal health monitoring - performed by a physician, who will use a supervisor computer to do the necessary work



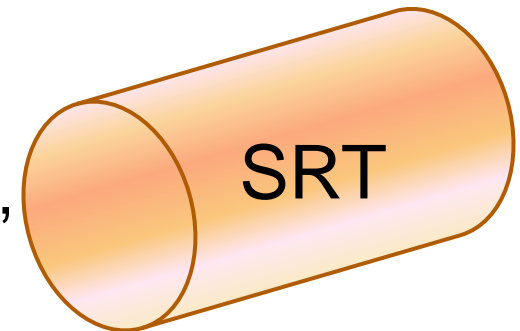
SRT Architecture



SRT Software



- On each of the different hardware devices of the SRT project, different software is being developed to implement the proposed capabilities:
 1. SRT Track Server Application, running on the supervisor computer
 2. SRT Mobile Application, running on mobile phones
 3. A sensing and forwarding application, deployed on sensor nodes
 4. Stub Application, simulates the entire system as a black box, to provide test input to the Track Server Application until the network is deployed

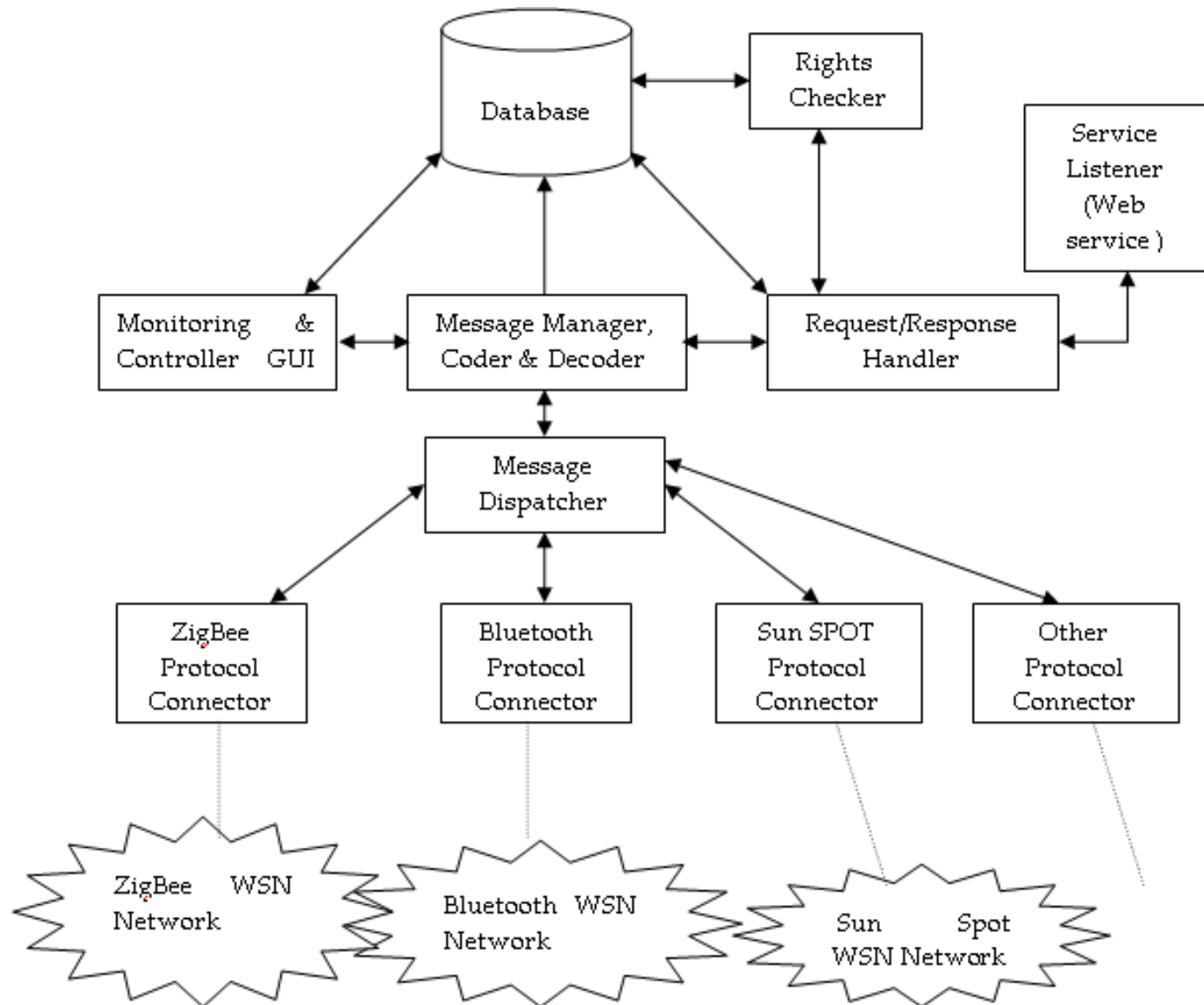


Common Health Gateway - CHG

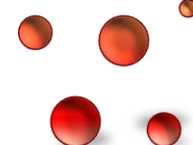
- Common infrastructure component in various personal health care monitoring systems
- Gateway software component that lies on desktop computer and functions as a gateway to the various WBSNs based on different protocols and platforms (ZigBee based, SUN SPOT, Bluetooth...)
- Component offers a unique interface based on XML messages to the user desktop graphical applications in order to acquire sensor data
- Component unifies and translates specific WSN formats of messages to a single format, more descriptive and suitable



Common Health Gateway



CHG Software

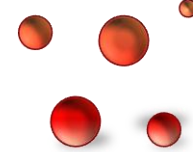


The typical working scenario is as follows:

- A user application first issues a request to the CHG
- The request is in XML format, and consists of the type of the request, id of wsn (or alias name), id of sensor node (or alias name), and id of certain sensor
- The CHG translates the received message into an internal format, and after validating access rights executes it
- During the execution, the database will be queried to check if the requested data has already been stored
- If requested data are not found, the internal request will be translated to the appropriate format for selected WSN
- Specific components, so-called Connectors, are responsible for translation of requests to the format for certain wireless sensor networks



Interactive Street Sensing

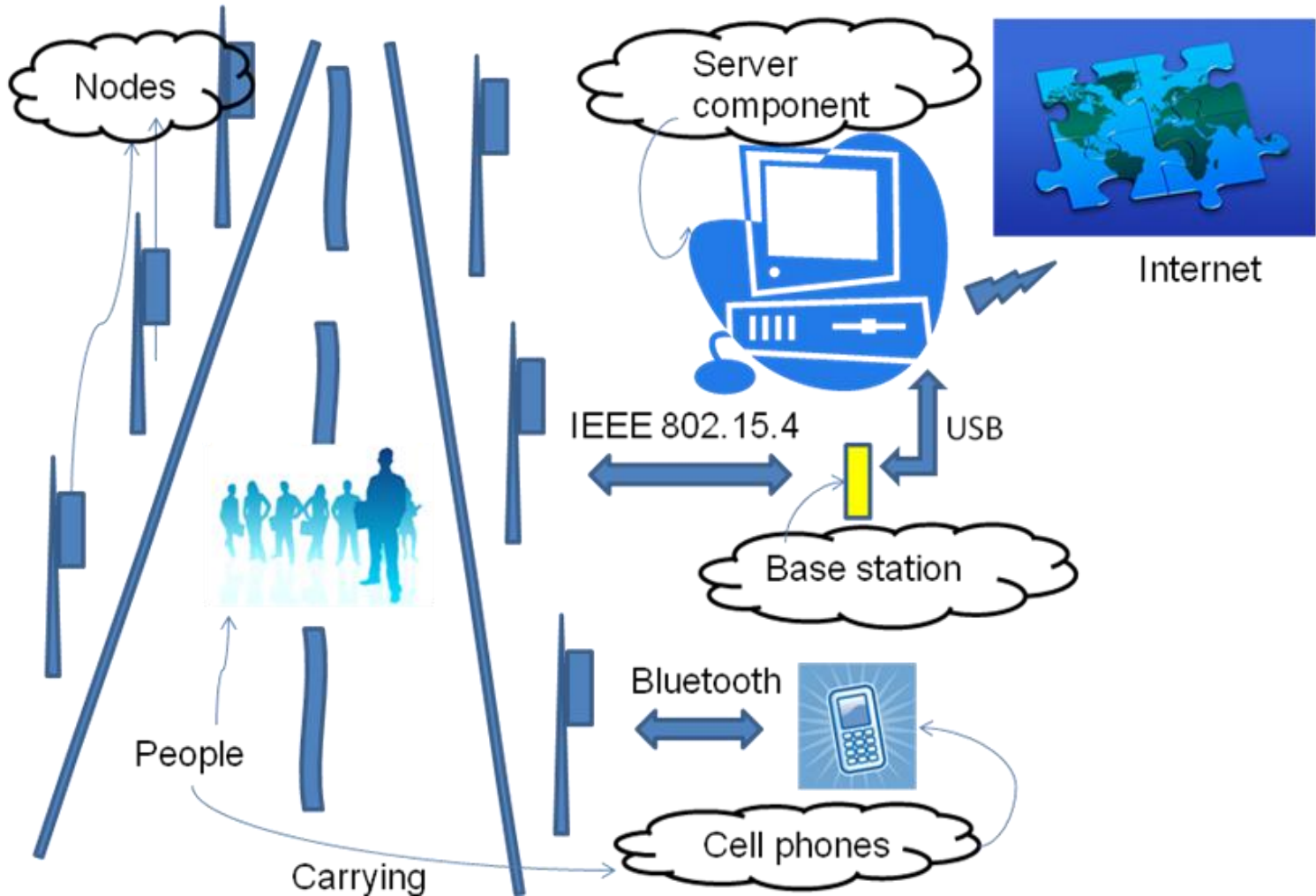


- ISS presents innovative approach to walking activity, from the medical as well as from the human daily life perspective
- The main idea is to make streets “alive” by using sensor network infrastructure and human interaction
- The network will be arranged as the composition of nodes equipped with different sensors, like temperature, light, pressure, humidity, CO, CO₂, O₂
- Human interaction to deployed sensor network will primarily be based on mobile phone usage
- This use-case assumes that the deployed small scale network will be integrated into larger scale networks, especially the Internet

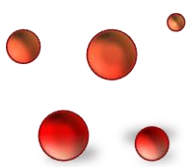


Interactive Street Sensing

ISS architecture overview



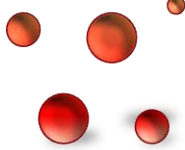
ISS Software



- ISS software component is formed from four applications, running on four different hardware elements: sensor node, mobile phone, base station and server application.
- Sensor node application is based on J2ME and Java API for Sun SPOTs
- Mobile phone application is J2ME based component
- Base station application is also based on J2ME and Java API for Sun SPOTs
- Server application is J2SE compatible, with additional SQL programming

This usage scenario also includes proper simulation software, entirely Java-based

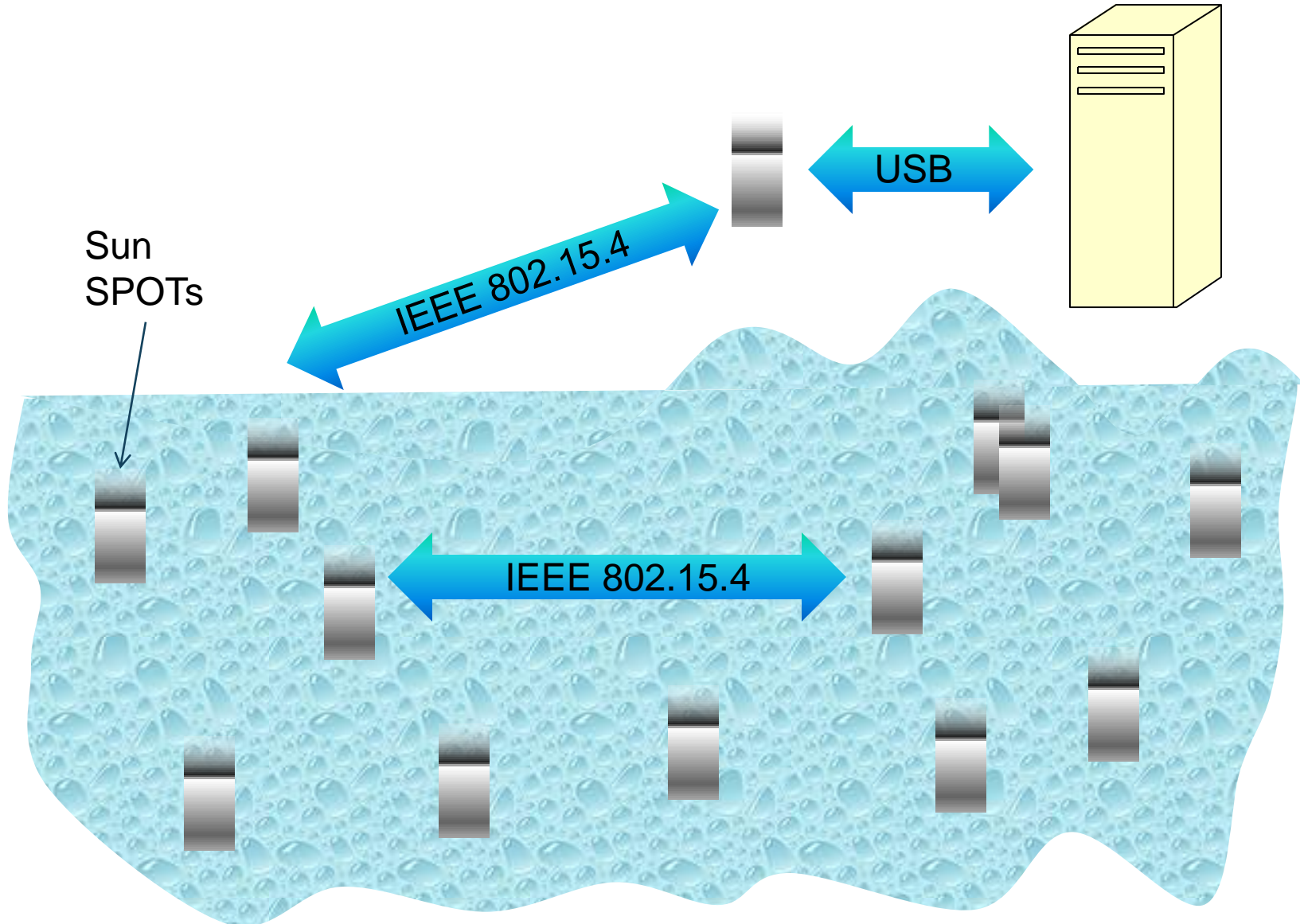
Sea Monitoring System - SMS



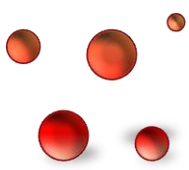
- In association with Porto MN group we are considering concept of putting sensor nodes into the sea, in the Bay of Kotor in order to monitor sea life and parameter
- This could help improvement of touristic impressions on the Adriatic sea



SMS Architecture



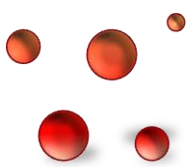
SMS Architecture



Porto Montenegro



SMS Software



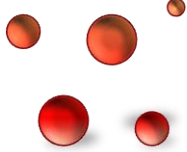
In this case, software components include:

- Sensor node application
- Base station application
- Desktop application

Sensor nodes are Sun SPOT based,
so entire software is Java based

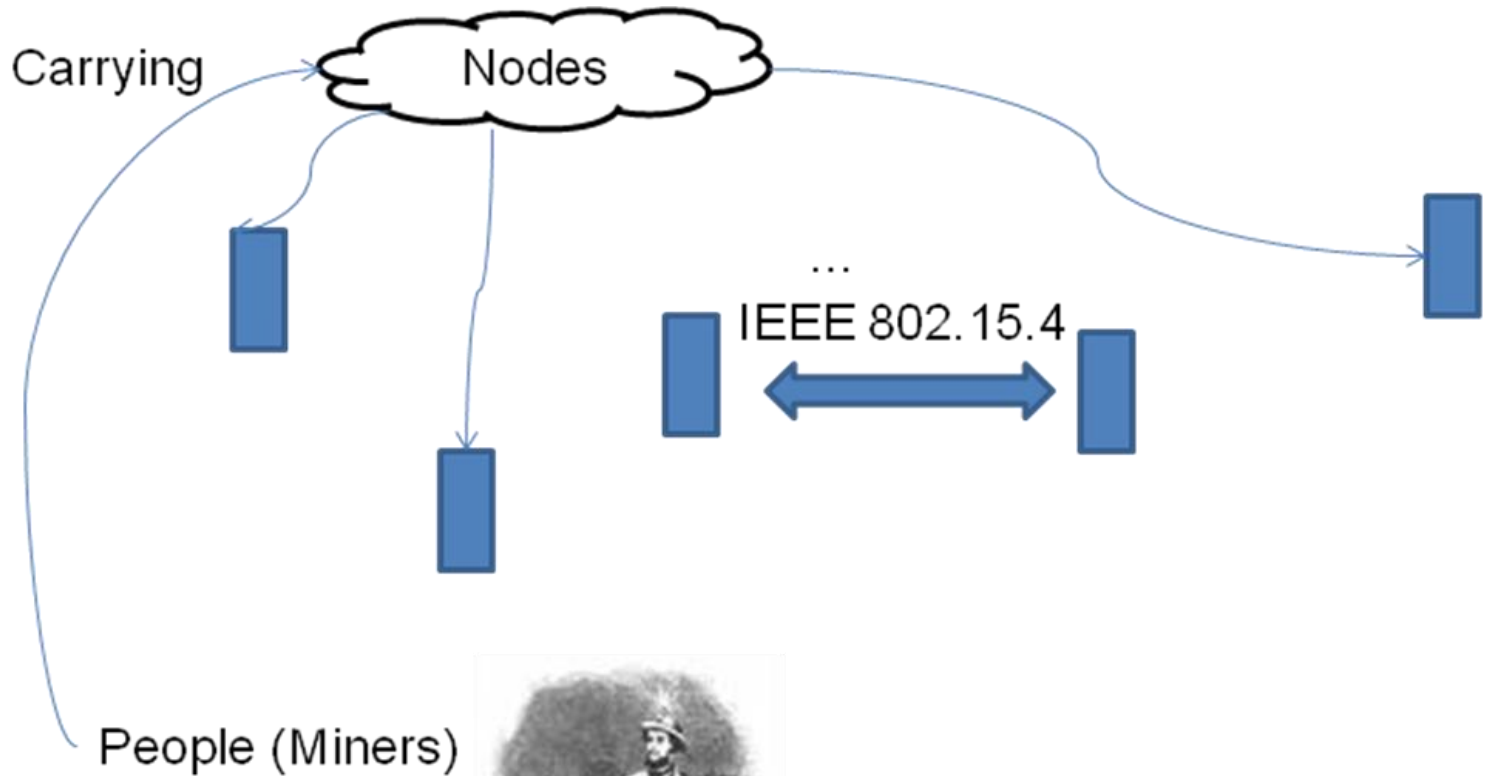
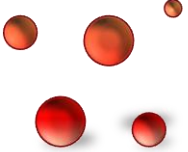


Mine Sensor Chat - MSC

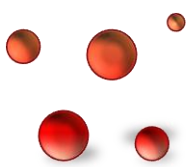


- MSC is a relatively simple scenario, but with a lot of benefits for the miners' health and life threats prevention
- The system should prevent dangerous accidents in the mine areas and provide more security for the miners
- The idea is to enable sensor nodes to detect dangerous substances in the mines (CO, CO₂ as the most hazardous), in order to secure miners' activity
- This will be achieved by placing the nodes as part of the miners' equipment, and enabling communication among them

MSC Architecture

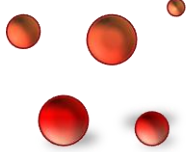


MSC Software



- In this case, programming is based on J2ME and Java API for Sun SPOTs
- The main part of the application is a precise definition of the communication protocol, which will be accurately provided during the implementation process

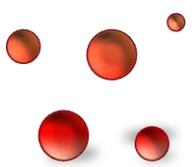
Various ProSense Activities



- Integration of ProSense team from Belgrade with Ericsson Ireland through collaboration and exchange of young researchers
- Expansion of WSN idea on the territory of Serbia and Montenegro, by deploying WSN centers at Niš, Novi Sad, Podgorica, Tivat, Ulcinj

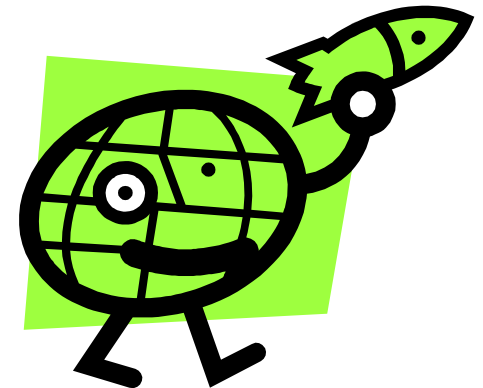
Future Plans

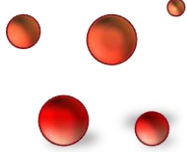
- Evolving towards future trends in the area of computer science and network communications
- Full application development for presented scenarios
- Deployment of developed wireless sensor networks
- Integration of Serbian and Macedonian sensor infrastructures through University of Patras in Greece, as an interposer into large scale network on the European level
- WSN course establishment at the School of Electrical Engineering in Belgrade



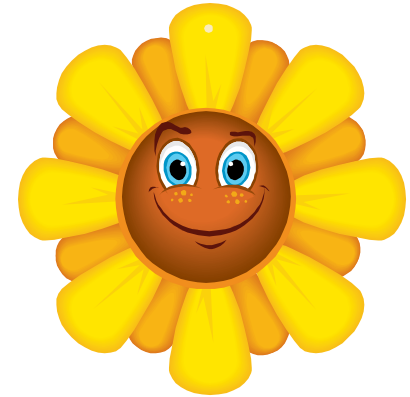
The End

- ProSense Belgrade team is wideopen for collaboration
- WSNs are very important subject and we are willing to popularize this subjects in the area of WBC in order to achieve WSNs' deployment in these areas and their integration into large scale networks on the European Level





Thank you
for your attention
Questions?



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