RFID Based Solution for Collecting Information and Activating Services in a Hospital Environment

Santtu Seppänen
Intelligent Systems Group
University of Oulu, Finland

Jukka Riekki
Intelligent Systems Group
University of Oulu, Finland

Muhammad Ikram Ashraf
Centre for Wireless Communications
University of Oulu, Finland

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Contents

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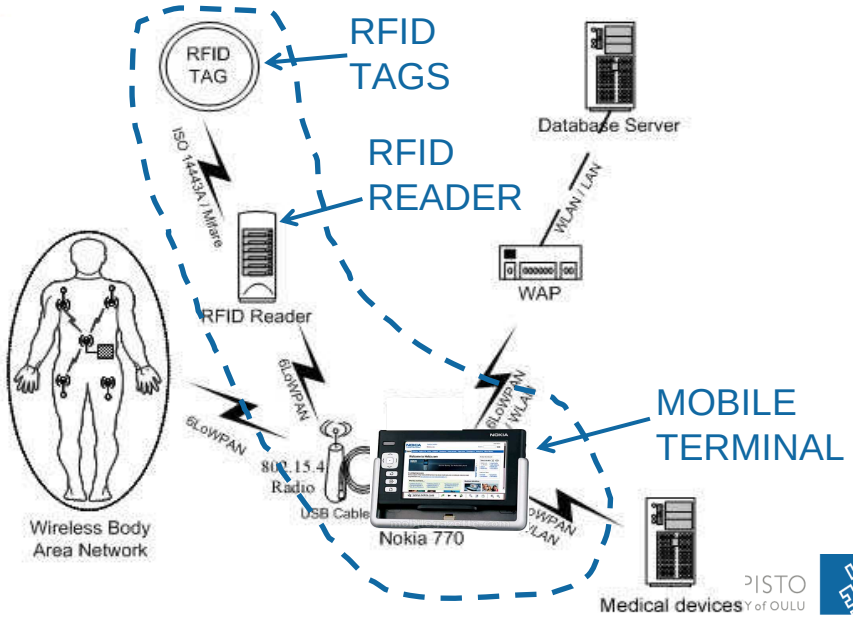
Introduction

- A staff member carries
  - a mobile terminal and
  - an RFID reader that communicates wirelessly with the terminal
- Various useful applications possible
- A staff member needs to just touch an RFID tag with the reader, for example,
  - to display patient information on the mobile terminal's display,
  - to establish a communication link between a medical device and the terminal, or
  - to read the values of sensors carried by a patient

System Description



System Description

- Information producers and locally available services are marked with RFID tags
- When the user reads an RFID tag with the RFID reader
  - the corresponding service is activated / information accessed
- The application using the RFID tag data can run in the terminal or in a server
- The application can use the data read from the tag (e.g. a patient identifier)
  or
  tag data can be used to establish a communication link with a data producer
  - e.g. a Bluetooth communication with a medical device

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Technologies

- Wireless terminal: Nokia 770
- RFID reader
  - NFC (Near Field Communication) compliant
  - the reading distance is short, the user has to nearly touch the tag with the reader
  - tags: Mifare (ISO 1443A standard) or FeliCa type operating at 13.56 MHz; common tags can store 512 and 1024 bits
- Short-range wireless radio between 770 and the reader
  - IEEE 802.15.4 compliant
  - low power consumption
  - our most recent prototype uses the 6LoWPAN protocol
  - Sensinode's product: NanoModule

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Technologies : Data on Tags

- NFC Data Exchange Format (NDEF) messages read from tags; these messages are composed of records
  - Applications use record types to identify the semantics and structure of the record content
- URI type
- Text type : a freeform plain text field
- Smart Poster type : URLs, SMSs, or phone numbers
  - Actions that trigger an application in the device can be described as well
- Record types can be specified using absolute URIs and MIME types as well
- Own record types can be specified

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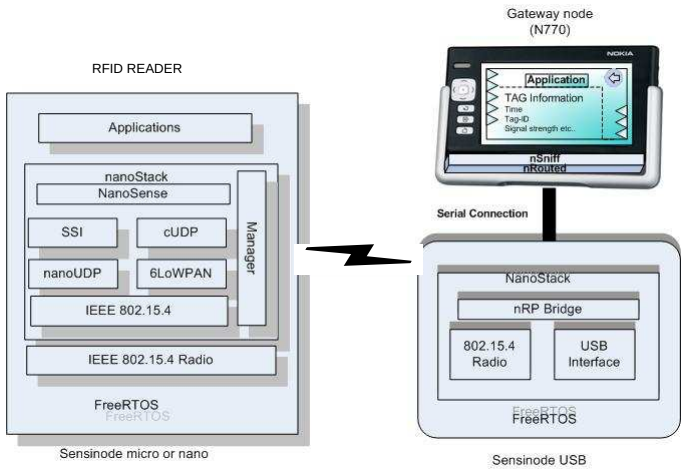
Implementation



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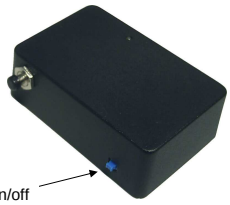
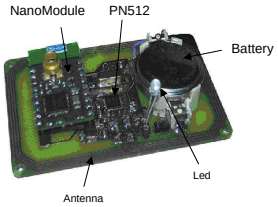
Implementation : RFID reader

- The RFID reader reads from an RFID tag
  - tag serial number and the stored data
- RFID : NXP PN512 reader chip, antenna
- IEEE 802.15.4 : Sensinode's NanoModule
  - integrated RF transceiver with MCU
  - holds the software
  - transmits messages to the terminal
- Battery holder and led

RFID-tag

RFID-reader





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Implementation : Nokia 770

- Extra casing contains Micro or NanoModule, battery, recharging electronics
- Modifications for 770: new driver for USB, power for the USB, nRouted application
- Micro or NanoModule is connected to the USB port that operates in host mode
  - The module converts the received 6LoWPAN packets into nRoute protocol format and send them through USB to the nRouted application
  - An application has a socket connection to nRouted

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Implementation : Nokia 770

- Our Ideasilo application framework facilitates building applications that utilize RFID data
  - Augments data received from RFID tags by data received from a designated content server
  - Contains a set of application modes
- Currently implemented modes
  - Management mode : for general management of tag information
  - Ordering mode : for creating a general order form
- We have implemented a Laundry Order Application
  - Filling orders takes a considerable amount of time in hospitals!

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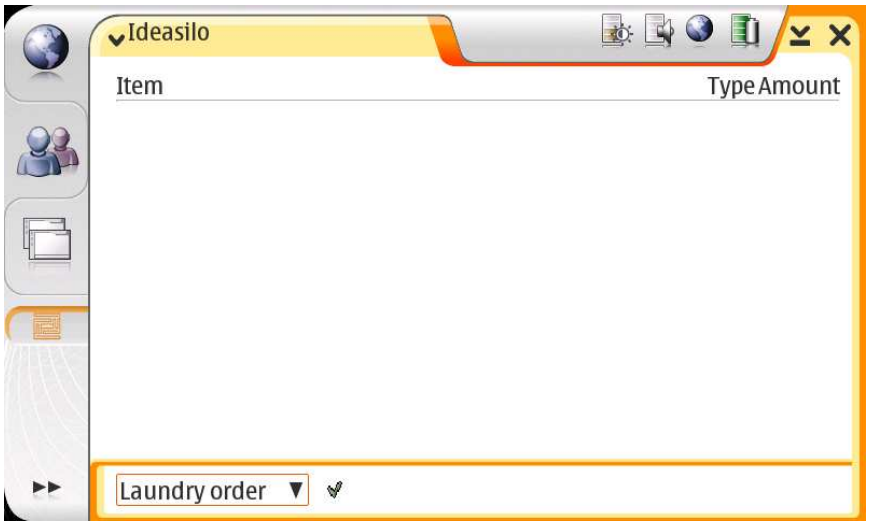
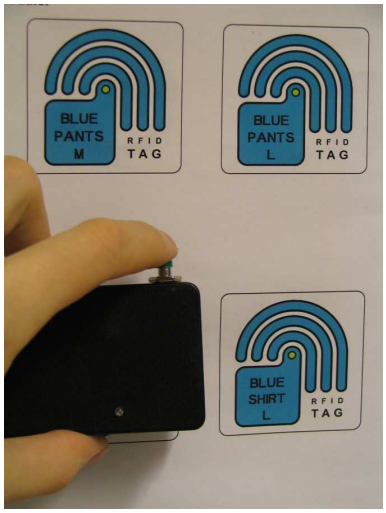
Laundry Order Application

- Initial Ideasilo ordering mode screen



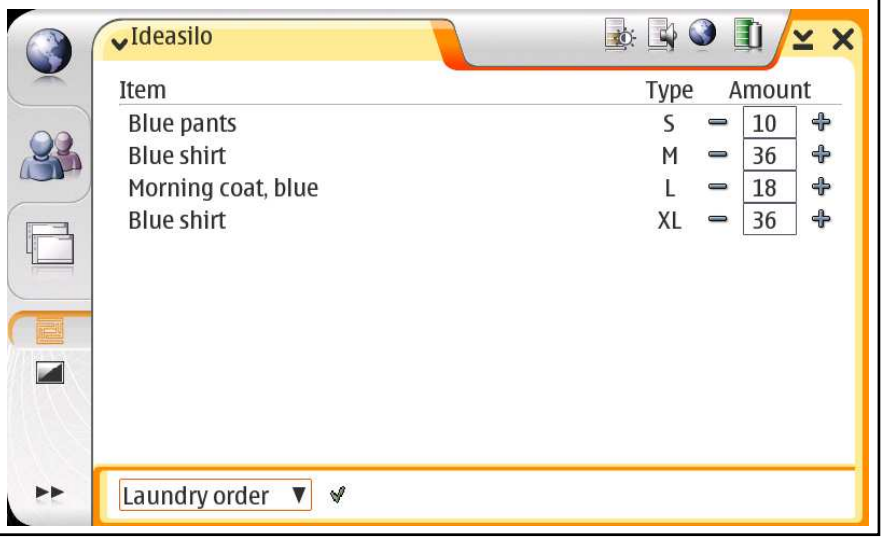
Laundry Order Application

- Reading an RFID tag



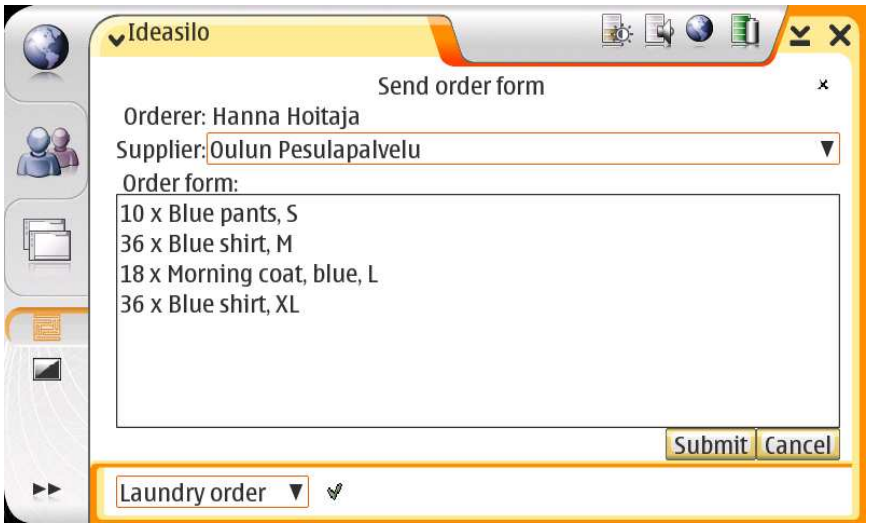
Laundry Order Application

- Ordering mode screen after reading a number of tags



Laundry Order Application

- Reviewing the final order form



Future Work

- RFID reader
  - Writing information to RFID tags
  - Communicating with RFID readers (e.g. Nokia 6131 NFC)
  - More ergonomic casing; reducing power consumption
- Ideasilo
  - UI improvements, e.g. audible feedback
  - User identification
- Short-range network for smart spaces
  - The RFID reader communicates with an 802.15.4 access point that is mounted in the local environment
  - The wireless terminal receives the RFID data through its WLAN connection
  - Advantages:
    - Any application can utilize the RFID data : terminals, servers
    - The RFID reader can be used alone; e.g. a wall display shows information

Acknowledgments

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Contact Information

jukka.riekki@ee.oulu.fi

OULUN YLIOPISTO
UNIVERSITY of OULU