Near Field Communication (NFC) technology

An Enabler of the Internet of (Medical) Things

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Home/Tele monitoring

- The answer for chronic diseases
  - Hypertension
  - Heart Failure
  - Diabetes

- Information is a central asset in the healthcare system and key to
  - prevention, detection and diagnosis
  - individualized and optimized therapy

- The patient has to be involved into information flow
  - patient centered data acquisition
  - closed loop by reminder and compliance feedback
Therapy Management System

**Health Status**
- Weight
- Heart rate
- Blood sugar
- Blood pressure
- Abdominal girth
  ...

**Others**
- Reminders
- Messages
  ...

**Quality of Life**
- Well-being
- Sports activity
  ...

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**Outcome Data**

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**Trendview & Alerts**

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**Feedback & Reminders**

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**ARC - Data Center**

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**Physician**

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**Patient**

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**Therapy adjustment**

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... a powerful eHealth toolbox

- Absolute mobility (can be used almost everywhere)
- Ubiquitous availability (almost everybody has one)
- Voice and data connection
- Versatile computing platform (JAVA)
- Adequate user interface
Mobile phone based data acquisition


Near Field Communication (NFC)

- contact less communication interface
- electromagnetic coupling (RFID)
  - 13.56 MHz carrier
  - low power demand
  - data rate up to 424 kBit/s
  - operating range of 5 – 10 cm
- touch-based computing
  - ad-hoc pairing
  - automatically data exchange
  - automatically program launch (content dependent)
- developed by NXP (former Philips), Sony and Nokia (NFC Forum)
  - standardized under ISO 18092, 21481 ECMA 340, 352
  - compatible to various RFID standards (MIFARE, FeliCa, ISO 14443, ISO 15693)
- integrated in consumer devices, particularly in mobile devices
  → mobile phone
NFC-enabled mobile phone provides...

- **contactless SmartCard - function**
  - mobile phone acts as token
  - contactless payment and ticketing

- **RFID reader/writer – function (various standards)**
  - tag contains commands to launch functions
  - „touchable services“ → tag keeps link to external services and information
  - logistic and administration issues

- **direct peer2peer communication**
  - consumer electronics: exchange of multimedia files
  - synchronization/exchange of contacts …
  - pairing: exchange settings for BT & WIFI communication
Development of an NFC-enabled medical device family

- NFC module
  - CE marked
  - various interfaces
  - customizable firmware

- Integration into
  - Blood pressure measurement devices
  - Weight scales
  - Blood glucose measurement devices
  - CardioMon hemodynamic monitor
  - …
Touch-based data acquisition
Advantages of NFC

- intuitive solution
  - simple data acquisition just by touching
  - user initiates the process

- high usability
  - easy to use and learn
  - minimal interaction with display and keypad
  - no type errors, fake entries

- Easy to set-up (“Out of the box”)
  - No special software (for simple scenarios)
  - No manual configuration and settings
  - No search and pair procedure
utilizing contactless smartcards and RFID tags

- login procedure
  - tag with ID information
  - behind the users photo
  - launches the application

- entry of well being
  - icons with RFID tags
  - 5 different well being states

- medication intake
  - RFID tag attached to pill boxes
  - keeps following info
    - drug name
    - dose / pill
    - sum of pills
A combination of JAVA and NFC

- customized client application
  - Nokia NFC SDK (free)
- reading NFC-enabled devices and RFID tags
- covers various use cases
- offline data acquisition by local data storage
- manual or automatic synchronization
- multi user management
- increased data security by means of authentication and end-to-end data encryption
Workflow example
Summary & Conclusions

- Mobile phones are able to provide an interactive link between chronic patients and their physicians.

- Manual solutions lack in terms of usability.

- A new approach based on NFC technology has been developed and prototypically implemented.

- Results obtained so far indicate that this NFC – based approach has the potential to be a significant step towards the “ideal” patient terminal.

- Mobile phones with NFC technology may thus provide patients with a powerful eHealth toolbox to Keep In TOUCH with their caregivers.
Mobil phones and NFC to bridge the gap

Enabling „The Internet of (Medical) Things“
eHealth2008 & eHealth Benchmarking 2008
Medical Informatics meets eHealth

Motto und Programm der Konferenz zielen darauf ab, eine gedankliche Brücke von der Forschung zur Anwendung von Informations- und Kommunikationstechnologie im Gesundheitswesen zu schlagen.

Ort: Vösendorf bei Wien

Die Teilnehmer erwartet ein umfangreiches und vielseitiges Programm, bestehend aus Hauptvorträgen, wissenschaftlichen Beiträgen, einge-ladenen Vorträgen nationaler und internationaler Experten, Workshops und Interoperabilitäts-Demonstrationen.

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