Near Field Communication (NFC) technology

An Enabler of the Internet of (Medical) Things

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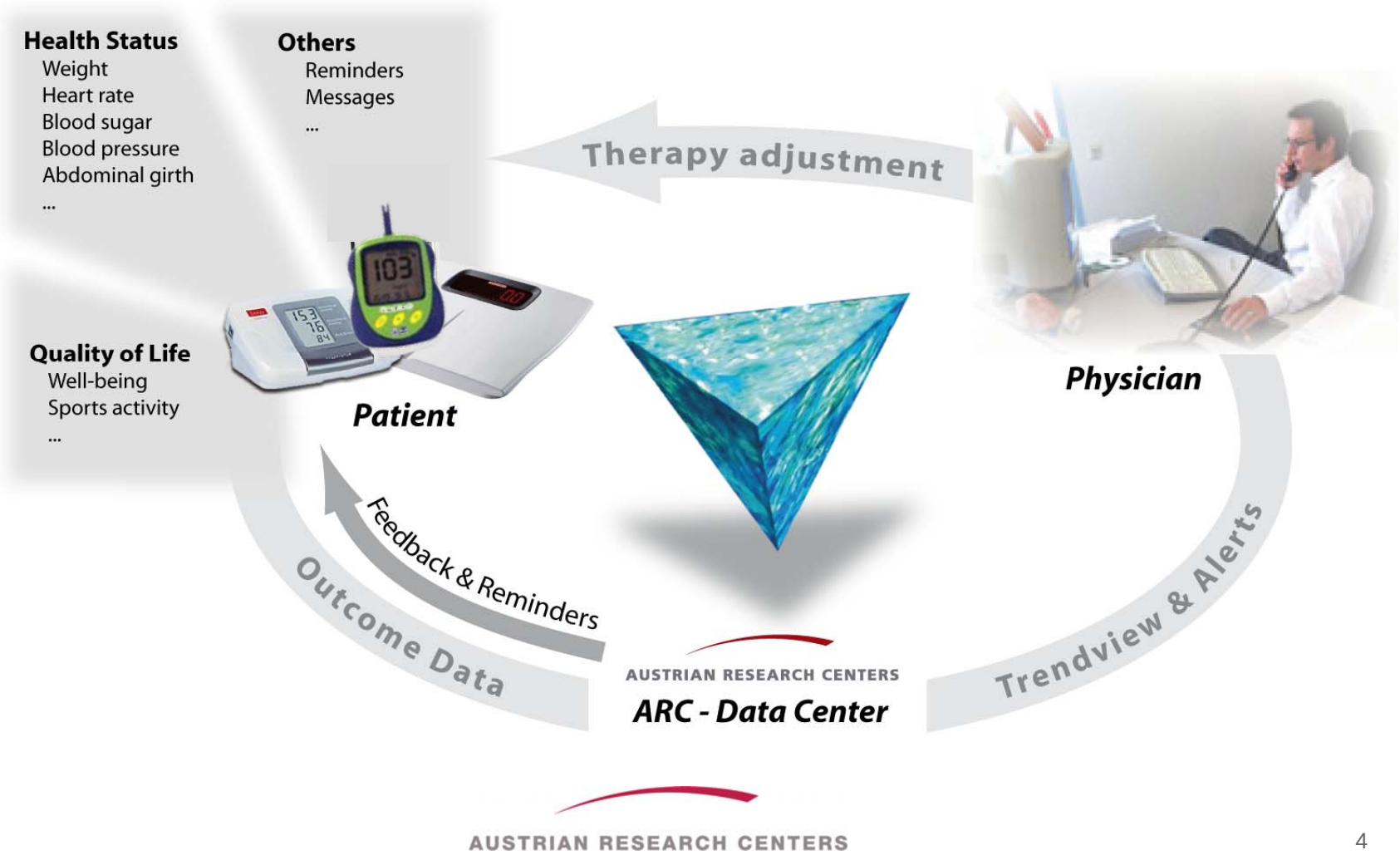
Home/Tele monitoring

- 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



… 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

Mobile Phone
WAP-Browser

Smartphone
JAVA based on-/offline

Near Field Communication

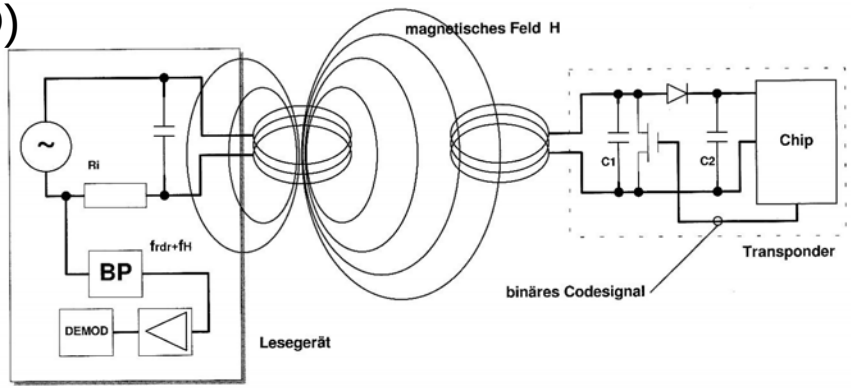
Scherr D, Zweiker R, Kollmann A, Kastner P, Schreier G, Fruhwald F. Mobile phone based surveillance of cardiac patients at home. Journal of Telemedicine and Telecare 2006;5:255-261

Kollmann A, Riedl M, Kastner P, Schreier G, Ludvik B. Feasibility of a mobile phone based data service for functional insulin treatment of type 1 diabetes mellitus patients. Journal of Medical Internet Research 2007 Dec 31;9(5):e36

Morak J, Kollmann A, Schreier G. Feasibility and Usability of a Home Monitoring Concept based on Mobile Phones and Near Field Communication (NFC) Technology. In: Kuhn K et al. (Ed). Proceedings of Medinfo2007. IOS Press, p 112-116, 2007

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 (contend 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

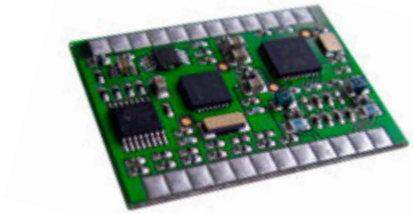
- **RFID reader/writer – function (various standards)**
  - tag contains commands to launch functions
  - „touchable services“ → tag keeps link to external services and information
  - logistic and administration issues

- **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

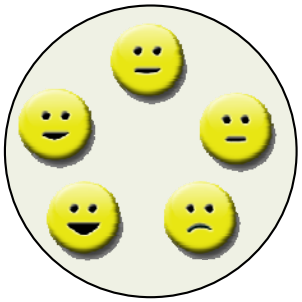
Advantages of NFC

- 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

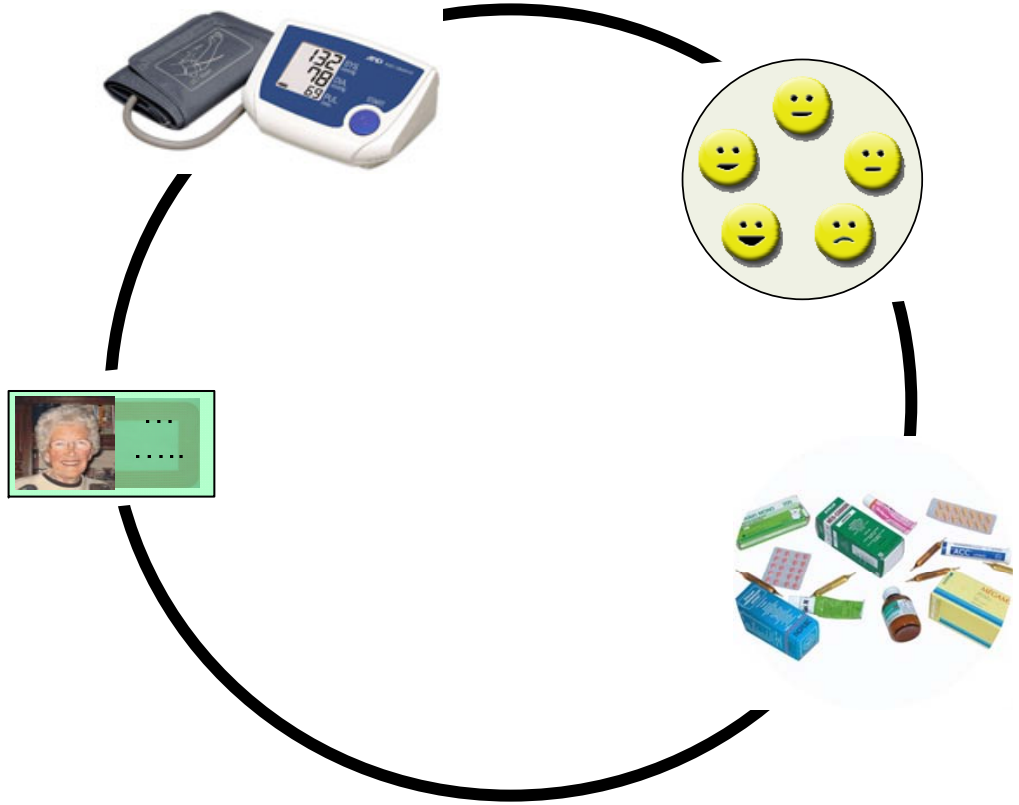


- medication intake
  - RFID tag attached to pill boxes
  - keeps following info
    - drug name
    - dose / pill
    - sum of pills

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

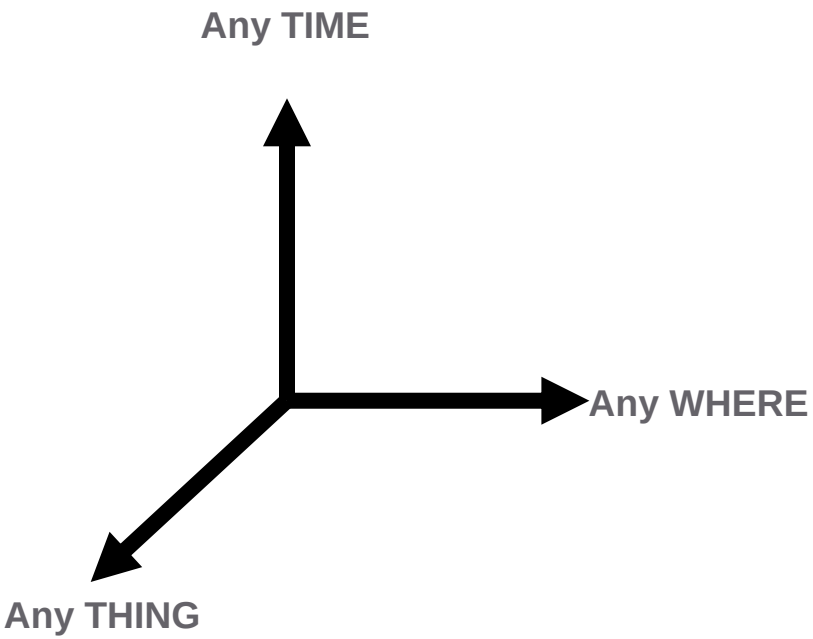
Workflow example



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“**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