


Automated NFC enabled Rural Healthcare for reliable patient record maintenance

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Outline

- Introduction
 - Remote Healthcare Scenario
 - Mobile healthcare with Body Sensor Networks
- Issues of Interest
- NFC (Near Field Communication)
- Proposed Architecture
- Conclusion and Future Work

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Remote Healthcare Scenario

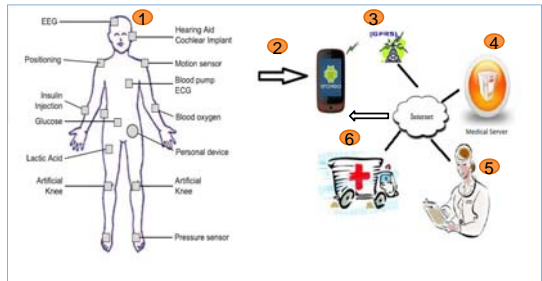
  

Remote Rural Villages Disaster struck Areas

➤ Number of Doctors per 1000 in India : 0.6
[Jhunjhunwala,2007]

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Mobile Healthcare with Body sensor networks



[Bart, Ingrid et al., 2010]

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Rural Telehealthcare

➤ **Issues of interest:**

- Reliability patient record
- Training of healthcare helpers
- Automation for fast processing of patients

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Traditional Form Based Mobile Applications

➤ **Manual interface:**

- Step 1: Enter Patient ID
- Step 2: Medical Sensor Data interface
- Step 3: Send data to medical server

➤ **Problems:**

- Error in patient record entry
- Time consuming form entry
- Training of healthcare helper

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Automated Application

Requirement for health monitoring of Mass population and lack of trained healthcare helpers:

- Reliability of patient record
- Simple interface
- Fast processing of patients

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SmartPhone Communication Interfaces

- Wifi
- Bluetooth
- Near Field Communication

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NFC (Near Field Communication)

- Contactless short-range communication
- Based on Radio Frequency Identification (RFID)
- Mobile 13.56 MHz RFID reader and writer
- Information at < 4 centimeters
- Maximum communication speed of 424kbps



[NFC-Forum, Available: <http://www.nfc-forum.org>]

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NFC Modes

➤ Modes

- **Active device** - generates own RF field
- **Passive device** - retrieves power from RF field of other device

➤ Reader/writer mode:

- Use the mobile to read/write external tags



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NFC Applications

➤ Easy interfaces

- Applications – ticketing, contactless payment etc

➤ Improved Healthcare procedures

- Alzheimer patients incidents on NFC tags
[Bravo, Hervás et al, 2008]
- Avoid errors in medication in hospitals
[Lahtela, Hassinen et al, 2008]
- NFC tags for pneumonia detection in Karachi, Pakistan
[Adam, Guido et al, 2009]

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Proposed Solution for Automated HealthCare

➤ NFC to trigger Bluetooth with Passive Tags

➤ Community Healthcare center

- Healthcare helper
- Body sensor
- NFC tags
- NFC enabled Smartphone

➤ Purpose


- Patient Records
- Automate health flow

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Automated Healthcare system Main Components


➤ **NFC TAG with the Patient ID**

- Type 2, Mifare Ultralight
- Type 1, Topaz with 144 bytes memory capacity




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Automated Healthcare system Main Components





➤ **Simulated Pulse Oximeter Sensor**

- Java Bluetooth application
- Linux with bluez




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Automated Healthcare system Main Components






➤ **NFC Enabled Android based Smartphone
Google Nexus S**

- Analysing module
- Visualization module




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Automated Healthcare system Main Components

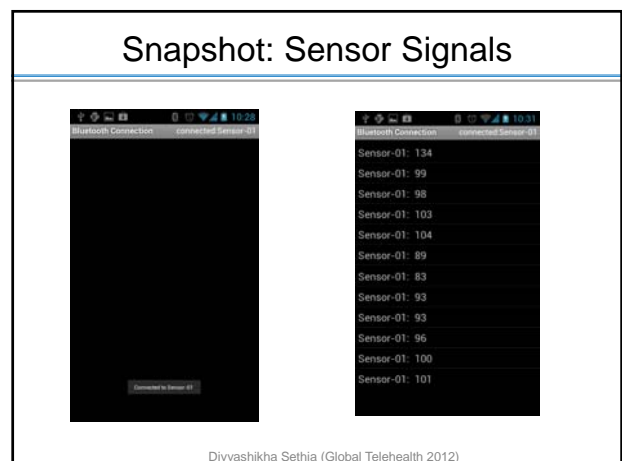
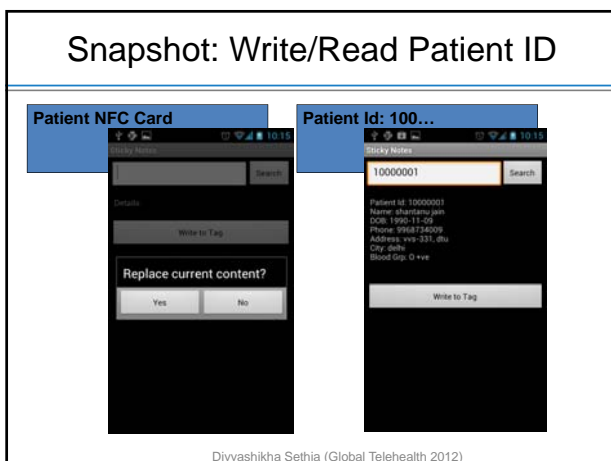
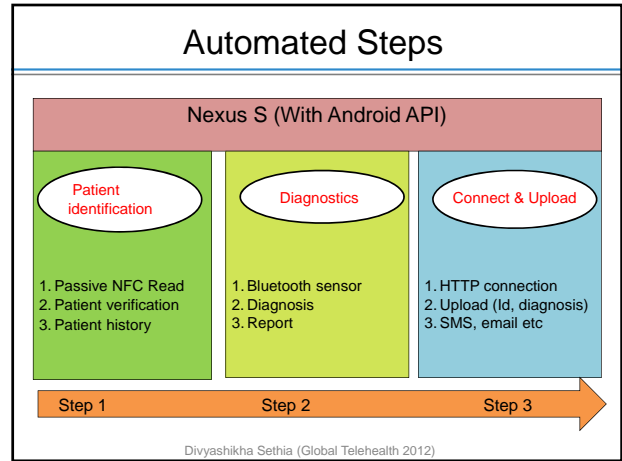
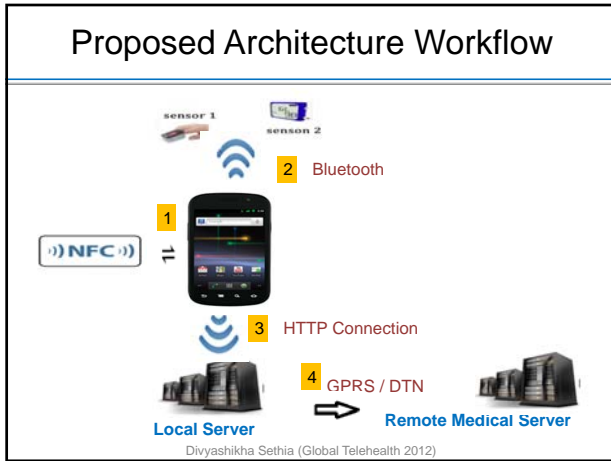


➤ **Local Server**

- Medical Database
- Remote Medical Server



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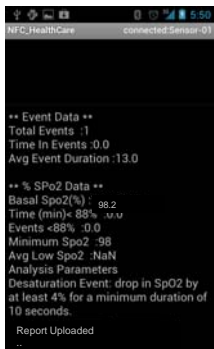
Snapshot: Report Generation

> Standard Rules For Report Generation

- Normal SpO2 range: 96 – 99%
- Acute condition:
 - SpO2 < 88%
 - Desaturation event: SpO2 drops by 3 to 4% in 10 seconds

> Basal SPo2

- Average of top 20% readings



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Conclusion

> Benefits

- Easy to Use intuitive Interface
- Patient identification and history
- Automatic generation of preliminary reports
- Early Disease diagnosis

> Application

- Remote areas with bulk population
- Lack of trained healthcare helpers

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Future Work

> Live Deployment using body sensors

- Rural healthcare and emergency
- Elderly home healthcare

> Efficient algorithms for report diagnosis

> Security of Health care data with NFC

- Health data security
- Privacy patient

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THANKS

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