

Wireless Congress 2004

Mobile Gateways for Medical Applications

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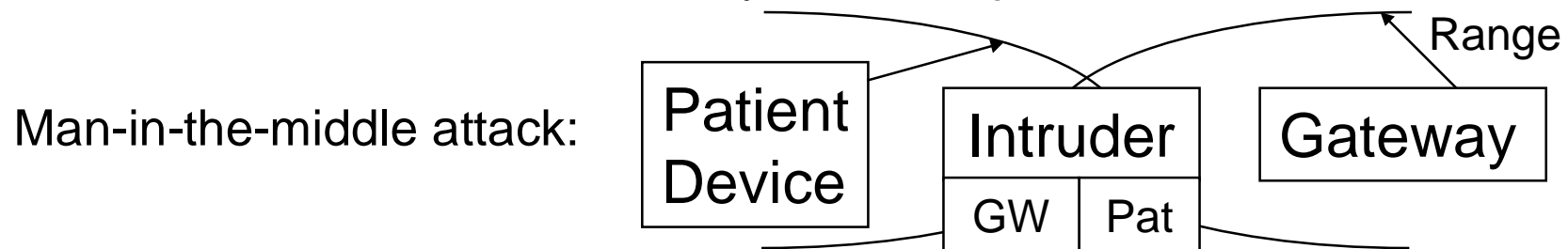
Content

- Opportunities and caveats of wireless networking
- Presentation of existing wireless network technologies
- Mobile gateway applications
- Special issues regarding medical appliances
- Requirements of patients and doctors
- Example applications
- Conclusion and outlook
- Questions / discussion



Opportunities and Caveats of wireless Networking

- Opportunities:
 - No wires make systems flexible and extensible
 - No connectors inhibit mechanical failures
 - No connectors allow less incompatibilities
 - Less installing costs
 - Opportunity for handover and spontaneous networking
- Caveats:
 - Intruders may observe data without being detected
 - Exposure to attacks (man-in-the-middle, manipulated packets)
 - The communication may be interrupted



Existing WPAN Systems

- Proprietary Systems
 - In various ISM bands (433 MHz, 868 / 915 MHz, 2.4GHz)
 - Proprietary protocols, various data rates
- Bluetooth
 - 2.4 GHz ISM Band
 - Gross data rates of 1Mbit/s
 - Use of profiles (cable replacement, object push, headset..)
- 802.15.4/ZigBee
 - 868 / 915 MHz and 2.4 GHz ISM band
 - Gross data rates of 20/40Kbit/s, 250Kbit/s
 - Later: Use of profiles (lighting, industrial control)

WLAN and WMAN Systems

- WLAN: IEEE 802.11
 - High acceptance
 - In 2.4 GHz ISM band
 - Promoted by PC appliances
 - Relatively high costs for embedded appliances
- WMAN:
 - Mostly point-to-point or point-to-multipoint connections
 - Wireless backbones connecting local networks
 - Examples
 - Trunk Radio (proprietary solutions)
 - IEEE 802.16 systems (being specified / released)

WWAN Systems

- Relatively high infrastructure costs
 - Administrated by Mobile Service Providers
- Technical progress
 - GSM/CSD (Global System for Mobile Communications)
 - Circuit switched
 - Maximum data rate: 9.6kbit/s
 - Data service: SMS
 - GPRS (General Packet Radio Service)
 - Packet switched
 - Maximum data rate: Up to 53.6kbit/s (theoretical 160kbit/s)
 - “Always On”
 - UMTS (Universal Mobile Communication System)
 - Maximum data rate: Up to 5Mbit/s

Special Issues regarding Medical Appliances

- Patients must not be exposed to insalubrious radiation.
- Electrical impacts (e.g. by defibrillators) must not influence the device's function or even harm the patient or the vetting staff.
- Device malfunctions must not harm the patient, but cause a stable status.
- All hardware and software modules must be approved.



The Need for mobile Gateway Applications

- WWAN adaptor aspects:
 - Possible exposition of the patient to electrical and electromagnetic fields
 - High energy consumption
- WPAN adaptor aspects:
 - Limited range
 - Reduced power consumption for extended battery life cycles
 - Reduced transmit power
 - Extended inactive periods
 - Small form factors, especially for implants
- General:
 - Hierarchies may reduce the amount of transmitted data

Requirements of Patients and Doctors

- Patient Requirements:
 - No reduction of the patient's cruising range
 - Comfort while wearing the devices
 - No influence on surrounding appliances / the patient's health
 - Security against intruders
 - Stable system without interaction
- Doctor's Requirements:
 - Access to the measured parameters on demand
 - Common access to data for vetting doctors and specialists
 - Easy-to-use software blanking superfluous values
 - Automated trend monitoring and evaluations

Example Applications:

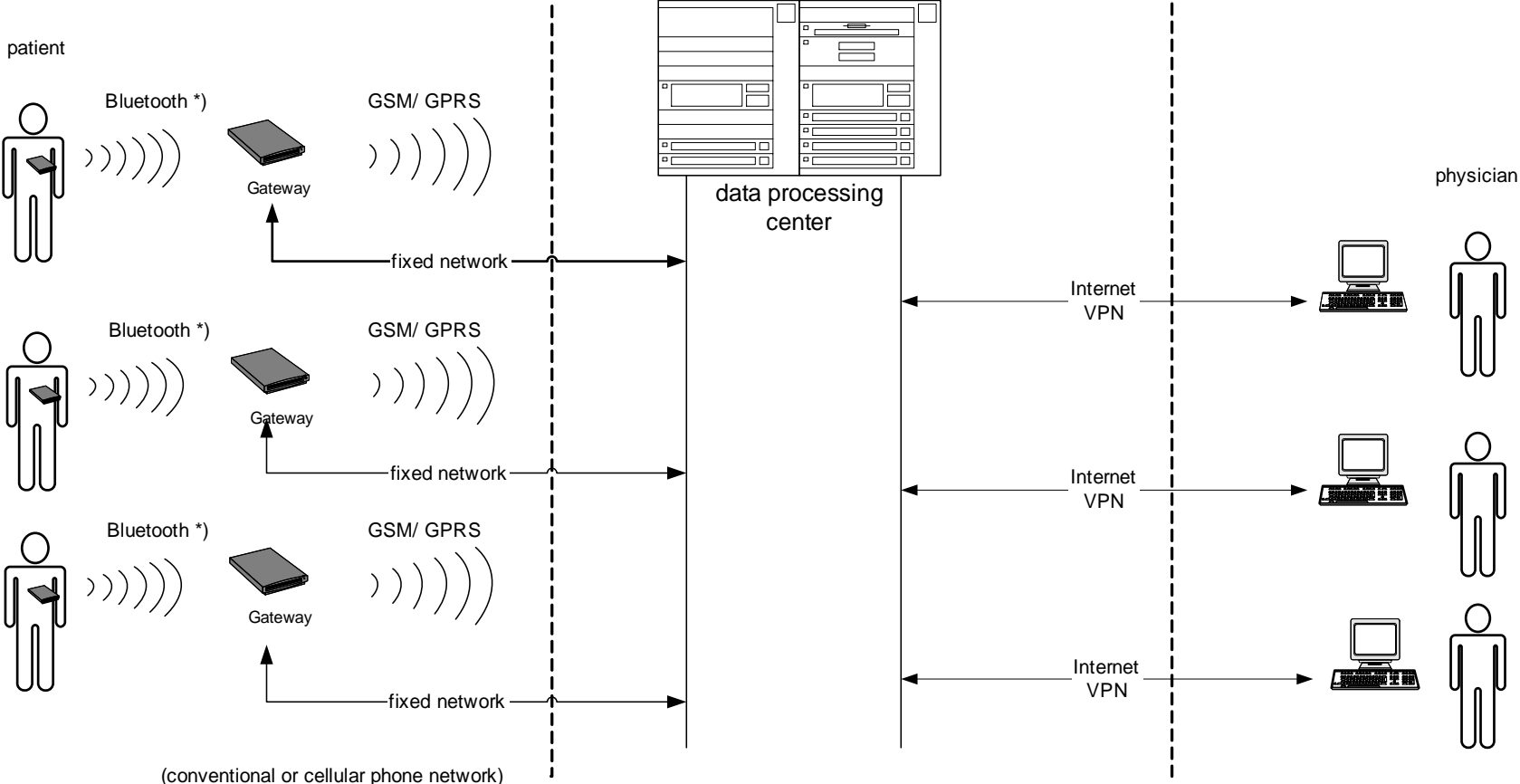
- Medical Application:
 - Emergency ECG
 - Home Monitoring
 - Central Patient Monitoring in Hospital
 - Central Disease-Management



- Industrial Application:
 - Remote Service and Diagnostic for Field Devices
 - Remote Measurement with Field Devices

The Presented System

block diagram: telemetry infrastructure / e.g. Home-Monitoring



*) ZigBee under construction



Conclusion and Outlook

- Mobile systems supporting interchangeable radio standards can provide suitable solutions for a wide range of applications.
- Carrier independent solutions guarantee stable, long-term platform solutions in a fast growing and changing situation of communication standards.
- As doctor's time is very limited, and the number of elderly patients with reduced mobility increases, the need for remote diagnosis and central data collection will raise.
- The high requirements for medical appliances opens many use-cases in industry and home automation.

Thank you for your attention

Do you have
any questions?



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