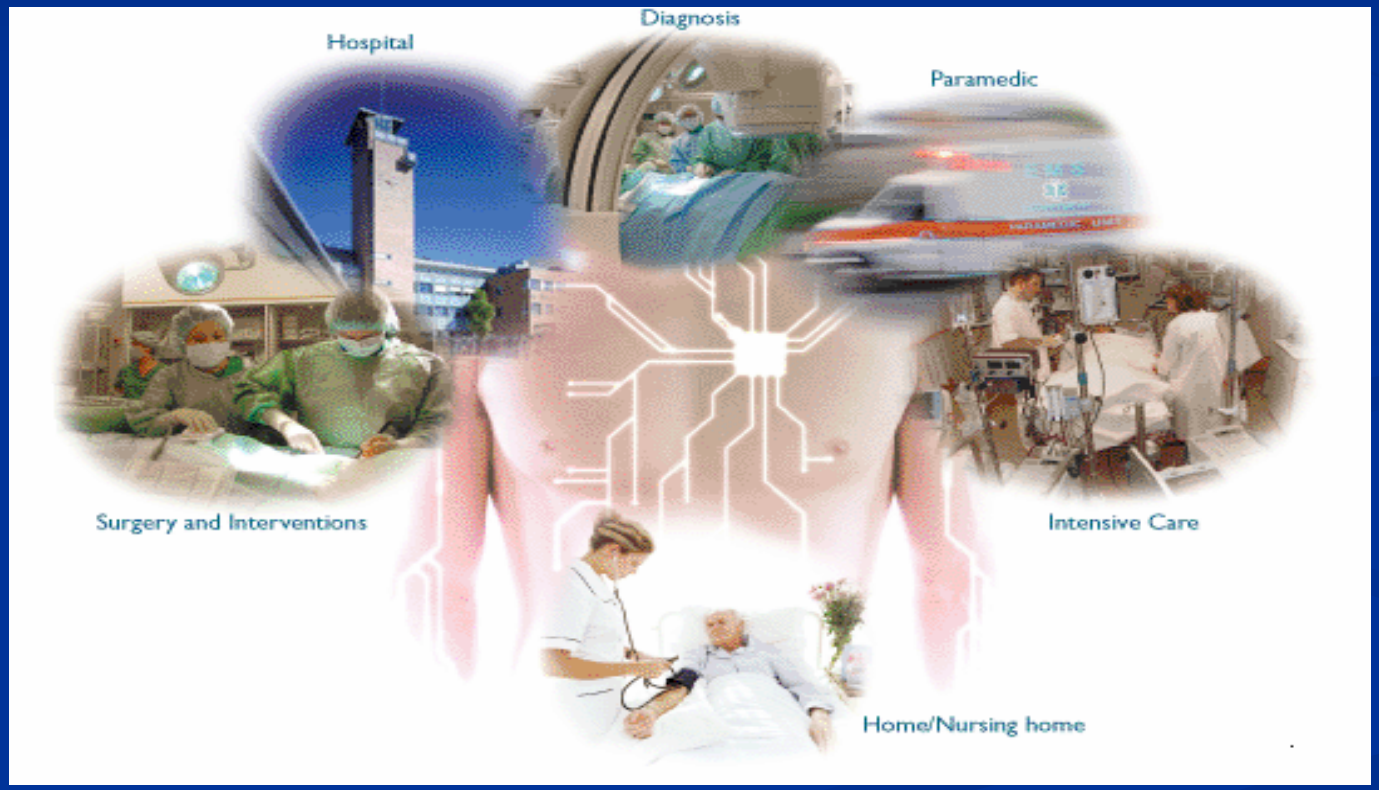
BWSN

Biomedical Wireless Sensor Network

Nordic Collaboration Project



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BWSN Partners

- Acreo AB
- Ericsson AB
- Imego AB
- Interventional Centre - NNH
- MemsCap AS
- Millicore AB
- Novelda AS
- Novosense AB
- VTT Information Technology

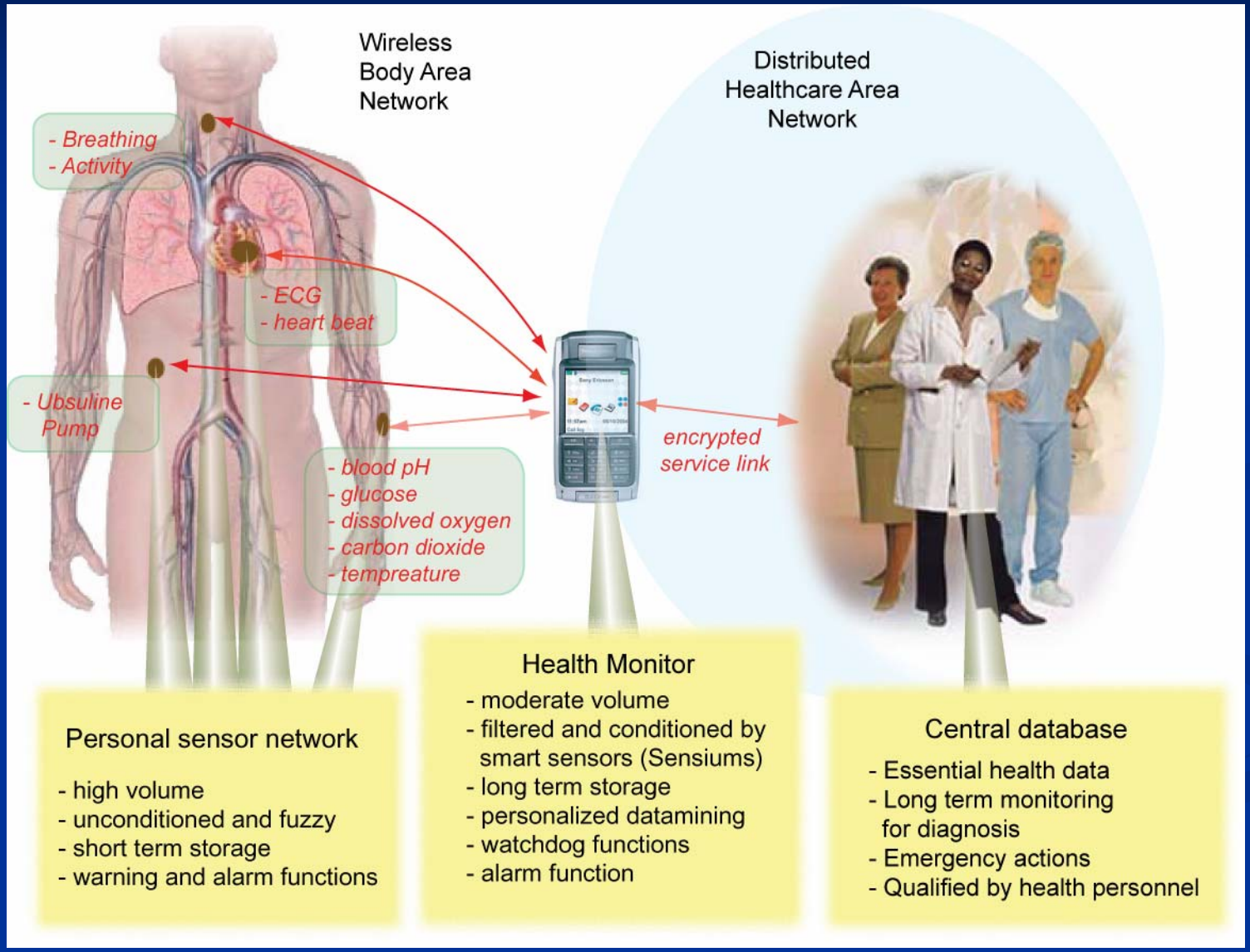
Overall Project Objectives

- Biomedical wireless sensor network as a basis for collaboration on product and services opportunities
- Sensors integrated with different communication solutions
- Tested and verified in user environment – “Approved by IVS”
- Promotion in the market included input to sensor communication standardization

Background

- Increased population with chronicle diseases (e.g. diabetes 1 and hearth diseases), especially among old people
- Treatment and monitoring costs are high and increase dramatically
- Preference of treatment and medical monitoring in own environment (e.g. at home or at work), related to person rather than place
- Preference of complete mobility
- Preference of personal control with external communication for monitoring diseases and medication

BWSN as part of Personalized Healthcare

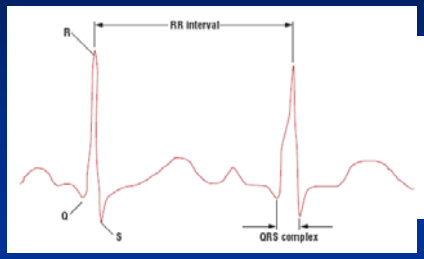


Biomedical Sensor Networks

- Sensors integrated through a sensor network with applications that communicates with a supervisory unit and medical expertise for monitoring diseases and medication.
- Number of sensors adapted to the patient's diagnosis
- Mobility means use of wireless sensors and ultra low power consumption
- Electronic tags for finding personal belongings (medicines, keys) as part of the solution

Body Sensors

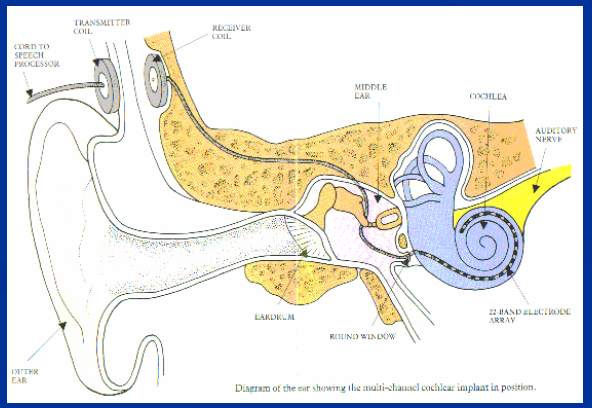
- **ECG monitor**
  - R-wave detection
    - *Bradycardia*
    - *Tachycardia*
    - *Sinus arrest*
    - *Ventricular tachycardia with broad QRS complexes*
    - *Supraventricular tachycardia with narrow QRS complexes*
- **Blood pressure**
- **Chemical sensors**
  - Glucose sensor
    - Blood gases
    - Artificial pancreas
- **Activity sensor**
- **Breathing sensor**
- **Body temperature**



Implants

- **Heart stimulators**
  - Classical, successful implant

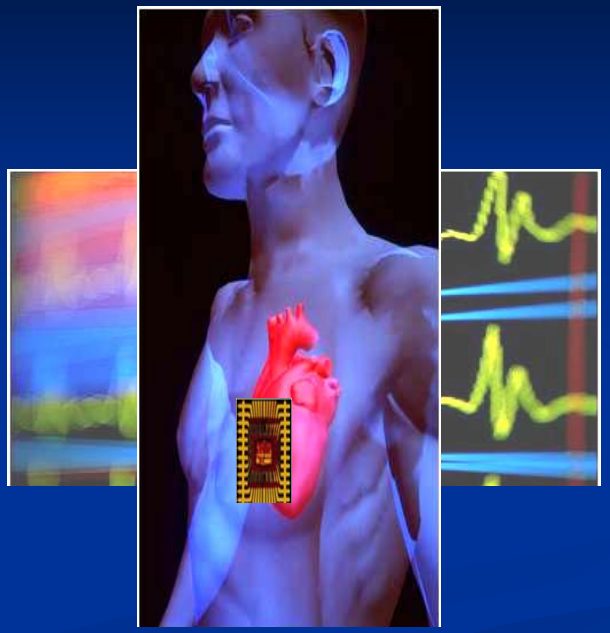
- **Cochlear implants**
  - Electrical stimulation of auditory system
  - 80% of deaf-born may hear!

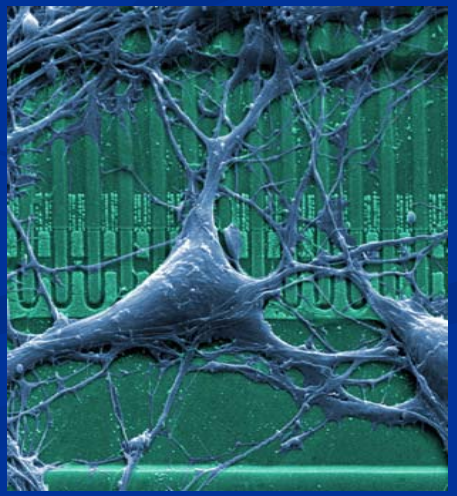


- **Retinal implant**
  - Promising preliminary trials
  - Complicated and demanding

The Bionic Man

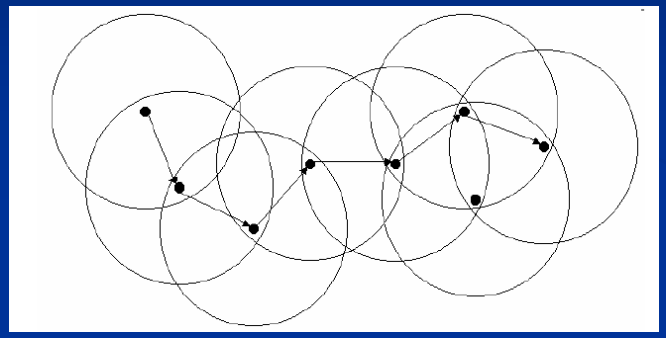
- Biomedical microelectronics
  - Emerging field
    - Great potential
  - Important
    - Life saving
    - Chronic diseases management
      - Getting older….
  - Demanding
    - Interdisciplinary
    - Driving technology
    - Driving development
      - Like power aware EGM algorithms
  - Serving society
    - Improving quality of life





Biomedical Wireless Sensor Networks

- Networking sensors
  - Self-configuring
  - Self-organizing
  - Serving large number
    - Short range smart sensors
    - Inexpensive in large numbers



- Must adapt continuously to changes
  - New nodes
  - Nodes disappearing

Challenges

- **Monitoring vital signs**
  - Reliable
  - Flawless
- **Alarm functions**
  - Qualitative and well-founded
  - Controlling errors
- **Small wearable devices**
  - Wireless
  - Robust
  - Battery operated
  - Ultra low power
  - Bio-compatible
- **Closing the loop**
  - Controlling medication
- **Real-time processing**
- **Reliability across several wireless links**

Opportunities and Challenges

- Medical sensors, wireless communication solutions and sensor networks are a multi-billion business increasing rapidly (both product and services)
- Norway has technology / product providers collaborating with advanced user environments
- Need to strengthen the R&D effort in order to speed up product development and create an industrial structure with enterprises of various size
- Need to establish national and international commercial clusters in order to reach the market and promote solutions

Major challenge: organizing and initial fund the use of medical sensor networks in primary health care