LOCALIZATION AND ROUTING FOR HEALTHCARE APPLICATIONS

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objectives

- studies and development of adaptive transmission and dynamic routing techniques for integrated, heterogeneous (wireline, wireless, sensor/ad-hoc, localization) networks in clinical environments:

  – robust and reliable communications,

  – power/energy efficient,

  – low electromagnetic radiation

  – exploring relevant side information: location, contexts.

Work done in 2011-2012

- focused on the study and development of localization and wireless sensor network routing techniques suitable for healthcare applications.

- investigated various learning-based approaches to develop more accurate estimation algorithms for RSS-based indoor localization and tracking → developed algorithms have been used to design and deploy a real-time tracking, monitoring, alerting and control system in the Geriatrics Department of the Royal Victoria hospital.

- developed energy-efficient location-based and cluster-based routing algorithms for wireless sensor networks (WSN) → implemented a WSN-based patient monitoring system prototype.

Real-time Locating System
for Healthcare Applications

Collaborator: Dr. Marc Beique, MUHC, RVH

Workflow Analysis and Organizational Setup Improvement

**Visual statistical results**

Movement heat map

Statistical data
- Movement pattern
- Site visit statistics
- Total walking distance

Map

Internet + VPN

(I,x,y,z)

Server

GUIs

API

(I,x,y,z)

RTLS

2.4GHz
6.0GHz

Personal Tag

Medical staff

Receivers

Equipment Tag

Device

online

RTLS Data Proc.

RTLS Data Capture

offline

Database

Patient wandering alert system: provide patient tracking and alerting for those cognitively-impaired patients who have an AWOL potential.
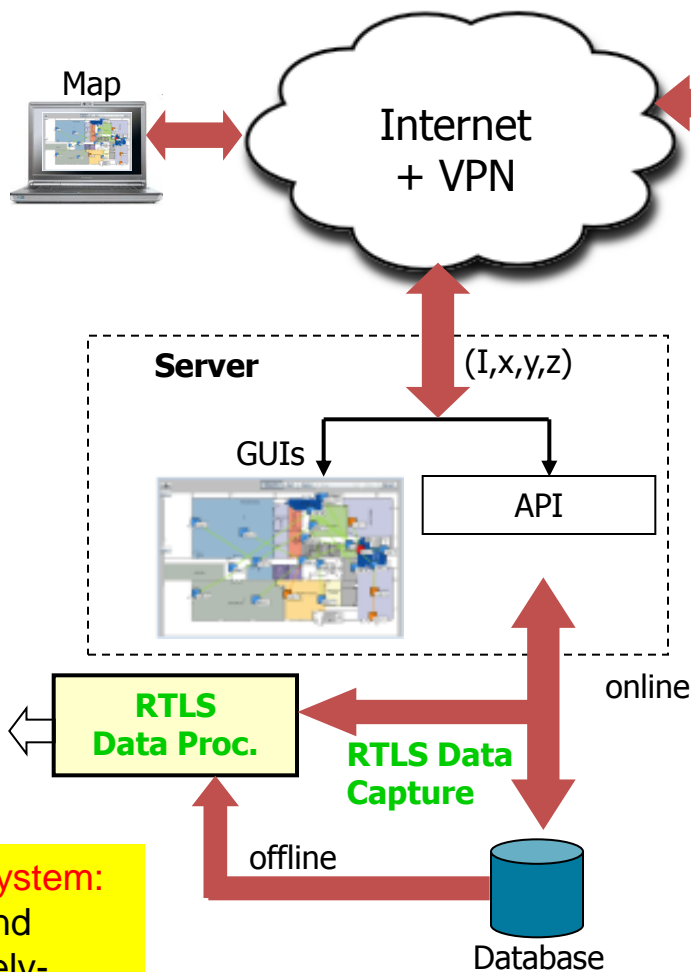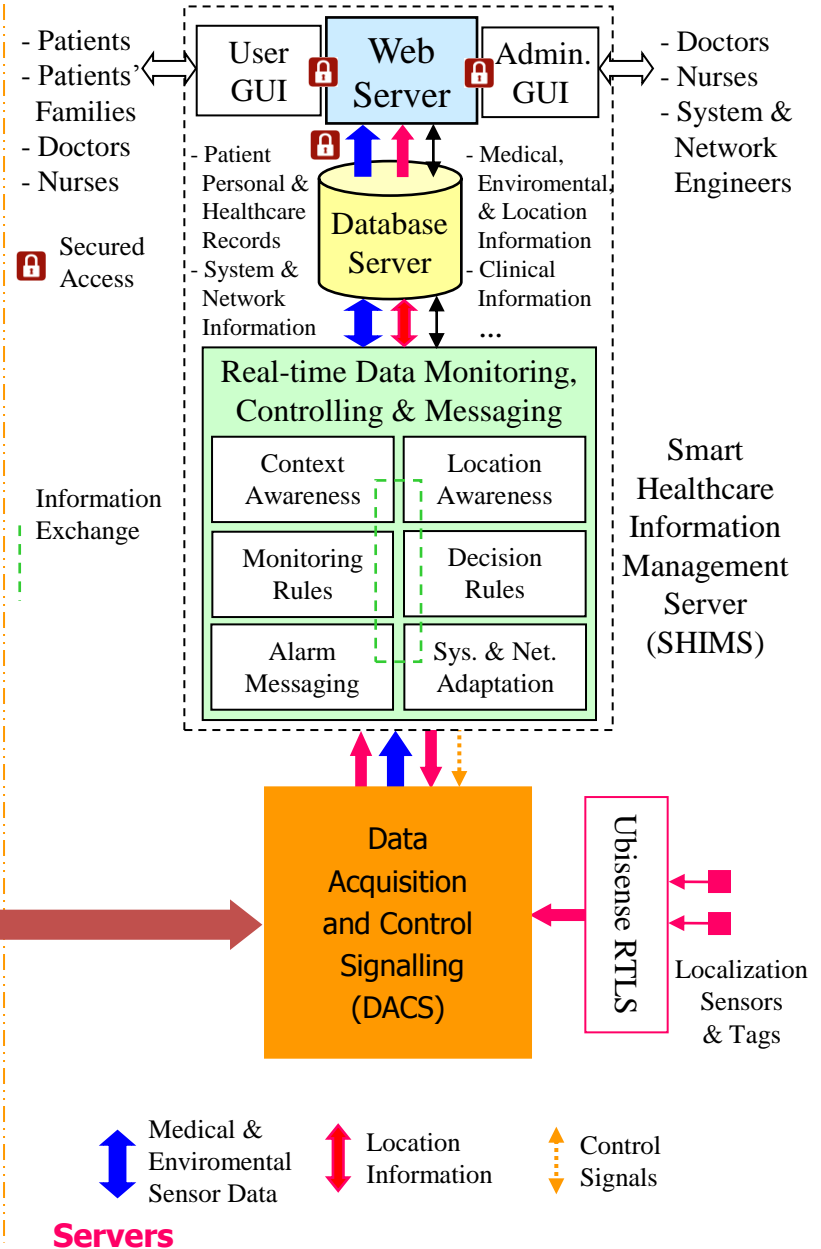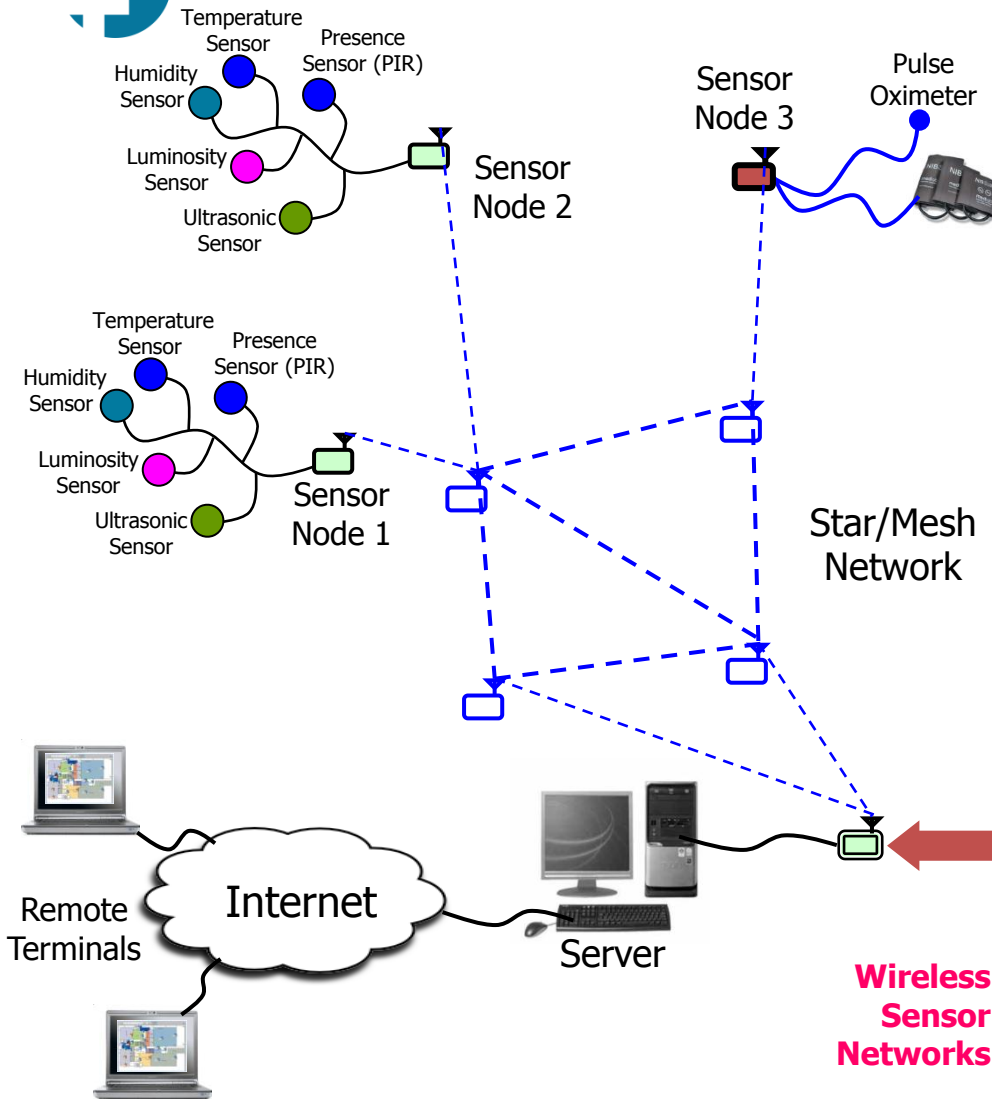
Collaborator: Dr. Allen Huang, MUHC, RVH
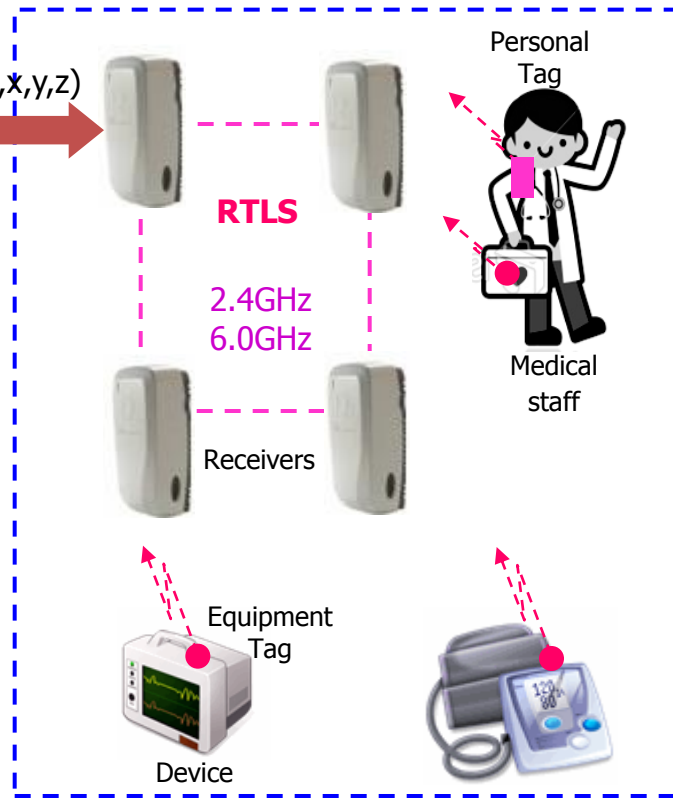
Studies, development, implementation and evaluation of post-processing algorithms to improve the accuracy of real-time locating systems.

develop, design, and deploy a *real-time tracking, monitoring, alerting and control system* in the Geriatrics Department of the Royal Victoria hospital (Collaborator: Dr. Allen Huang, MUHC, RVH)

The system includes:

- UWB and WiFi-based positioning algorithms,
- hybrid wireless/wireline door control sub-systems
- Wireless alerting sub-systems
- Application software suites

The system can

- Monitor real-time positions of patients
- Display the location/movement information to the nurses
- Trigger necessary actions (alarms, door-lock,…)

Wireless Sensor Network for Healthcare

Wireless Patient Monitoring System

(Collaborator: Dr. Marc Beique, MUHC, RVH)

patient's vital signs: blood pressure, oximetry, electrocardiogram (ECG), body temperature

- offering functionalities and performance of a conventional patient monitoring system
- allowing patient's mobility, 360° access, convenient and fast transfer.
- enhancing patient care quality of service,
- Improving efficiency,
- saving time and costs.

Attached to stretcher

View & Control Terminals

Wireless Sensor Network
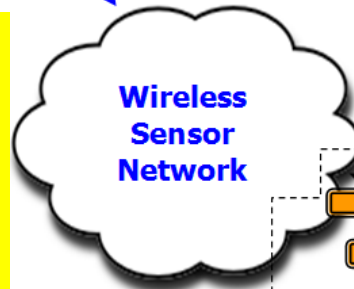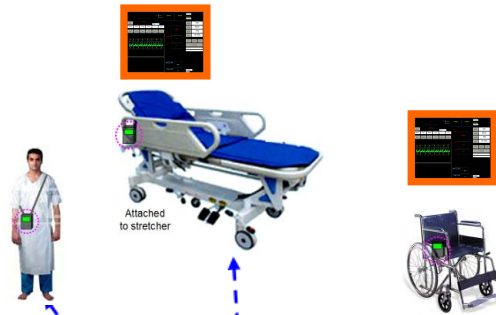
Gateways

Wireless/Wired Local Area Network

Server
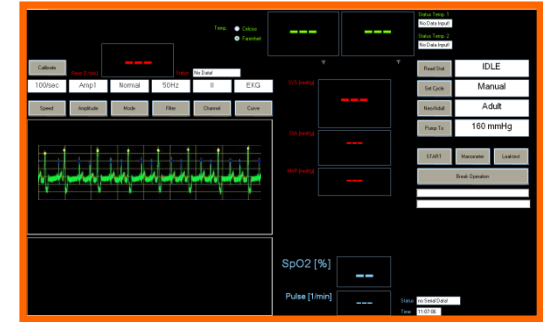
Routing in WSN

- developed various energy-efficient location-based and cluster-based routing algorithms for WSN.

- consideration of *multipath* routing in WSN for performance enhancement