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ACTIVITY MONITORING

Goal: assisting the discharge team in determining whether the patient needs to remain hospitalized

Sensors Instead of Video Surveillance:

- Increased privacy for the patient
- Easier to process the information

Activities Monitored:

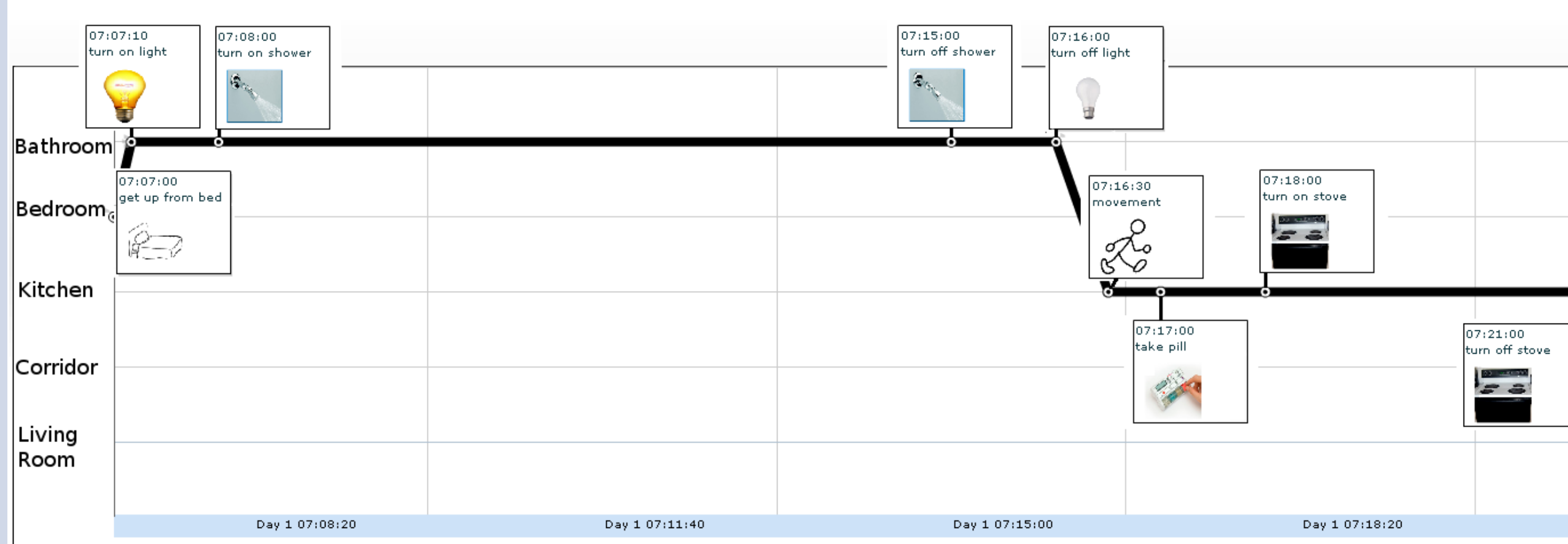
- Medication adherence (smart medication dispensing device)
- Sleeping patterns (bed pressure sensor)
- Patient movement (motion sensors)
- Usage of furniture (pressure sensors)
- Usage of appliances (electricity sensors)
- Usage of doors, drawers, kitchen cabinets (magnetic reed switches)
- Bathroom usage (sink/toilet/shower) using switches, motion and humidity sensors

Environmental Parameters Monitoring:

- Temperature
- Ambient light
- Relative humidity

Reports and Visualizations

- Textual report summarizing the patient activities during their stay
- Interactive graph showing all recorded activities
- Virtual world representation, allowing replay of different time windows



WIRELESS SENSOR NETWORK

Reliability:

- All transmissions explicitly acknowledged to address packet loss that can occur in wireless networks
- Automated monitoring and alerts to detect failed sensors

Energy Efficiency:

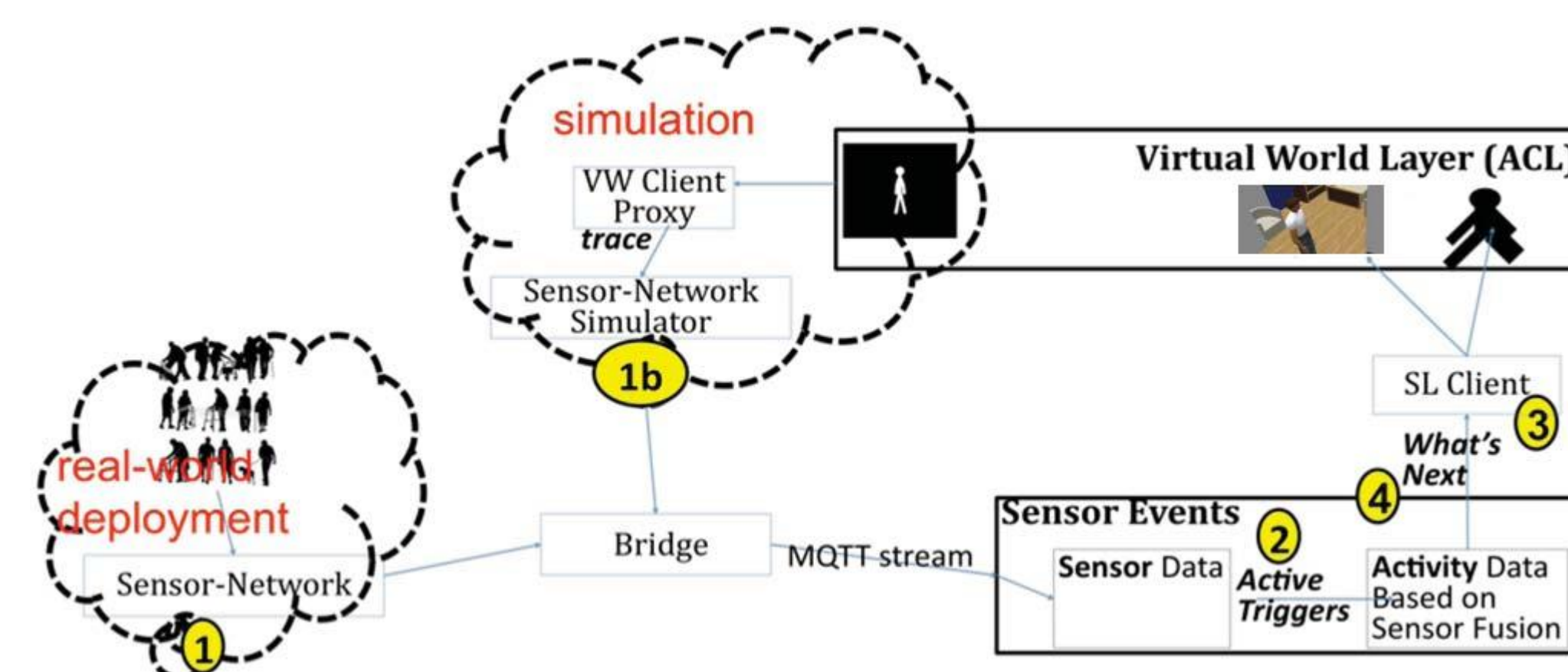
- Sensors are battery powered and need to be energy efficient
- Transmissions are minimized while still sending all data quickly
- Ultra-low power components are utilized

Security:

- All data being transmitted or stored is strongly encrypted

Heterogeneous Network:

- Custom ad hoc wireless network
- XBee wireless network
- Medsignals pill dispensing device
- Underlying protocols are different and need to be unified



Data Collection and Processing:

- Sensor and medical data is collected at the bridge
- All data is converted into a unified MQTT-compliant stream
- All data is imported into IBM SensorEvents for storage, analysis and visualization

FUTURE WORK

- Determine which sensors provide the most useful information and focus on them
- Utilize data analysis tools such as IBM Clinical Analytics to automatically infer information from the sensor and medical data

References

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2. N. M. Boers, D. Chodos, P. Gburzynski, L. Guirguis, J. Huang, R. Lederer, L. Liu, I. Nikolaidis, C. Sadowski, E. Stroulia: The Smart Condo Project: Services for Independent Living. In C. Röcker and M. Ziefle (eds.) E-Health, Assistive Technologies and Applications for Assisted Living: Challenges and Solutions, IGI Global, 2011 (ISBN 1-60960-469-5), pp. 289-314.

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