Background

Wireless Body Sensor Networks have the potential to revolutionize healthcare. They reduce cost and improve quality of care by reducing physical barriers to prevention, detailed monitoring and continuous real-time reporting.

However, the difficulty of application development is a large barrier to adoption. We aim to remedy this by providing tools for BSN application developers.

What is Spine?

Spine is a software framework that automates and simplifies common tasks in BSN application creation. It is based on a Java and TinyOS software stack.

Extensible: Developers can define custom functions to extend node capability.
Developer-focused: Common tasks are automated to allow for rapid application deployment.
Communication Management: A TDMA schedule is dynamically assigned based on application requirements.
Power Management: To save power, nodes are duty-cycled according to the communication schedule.

We have developed and tested many sample applications including a real-time posture classification system and a tool to monitor range of motion in post-operative patients.

Hardware

Sensors
Compatible with any 802.15.4 device running TinyOS. We have tested two sensor devices built on the Tmote Sky.

Gateway
Compatible with any Java-capable device. We have tested various PCs and the Motorola E680i.

Acknowledgements

Spine is being developed as an open-source project in collaboration with research labs at six institutions:

- UC Berkeley: Victor Shia, Ruzena Bajcsy
- Telecom Italia: Roberta Giannantonio, Filippo Tempia, Marco Sgroi
- University of Calabria: Raffaele Gravina, Antonio Guerri, Giancarlo Fortino
- Cornell University: Phil Kuryloski
- University of Texas, Dallas: Roozbeh Jafari

Network Service Manager (NSM)

Service Requests
- Query node capabilities
- Query request progress
- Request data
- Request to push data

Events
NSM returns requested data asynchronously when it is ready. Data is identified by a unique identifier.

Error Handling
An application may pre-specify alternate actions in case a request cannot be completed. If unspecified, error notifications allow the application to choose actions based on current node status.

Local Sensing and Processing
The sensor nodes sample and buffer data according to the constraints of current data requests.

All node data requests are abstracted via functions.

Functions can simply return raw data or perform local processing.
Developers can define functions that implement:
- Processing algorithms
- Logic to control communication
- Local storage

Reporting of real-time local function activation

Software Framework for Wireless Body Sensor Networks

Spine: Software Framework for Wireless Body Sensor Networks

http://chess.eecs.berkeley.edu/