MSR Sense
The Microsoft Research Networked Embedded Sensing Toolkit

Stewart Tansley, PhD
http://research.microsoft.com/~stansley

Adapted from:
Feng Zhao & team
Networked Embedded Computing Group
Microsoft Research
http://research.microsoft.com/nec
Network Embedded Computing at Microsoft Research

- **Researching the intersection of:**
  - Network Systems
  - Embedded Systems
  - Information Processing & Control

- **Programming models, architectures, tools**
  - Programming abstractions, service architecture, resource management
  - End user vs. System developer; Declarative vs Imperative

- **Computing with uncertainties**
  - About the environment & system
  - Modeling reliability, resource-aware and task-oriented computation, co-design of information & software architectures

- **Innovative application areas**
  - Security, Transportation, Healthcare, …

- **See web page for more information**
Approach

• How to manage multiple simultaneous uncertainties
  – Across the system and information, under resource constraints

• Build tools that we & others can use in the research community
  – A framework to allow any sensor to provide sensor data to client for storage/processing/visualization
  – Allow both in situ & replay
  – Lightweight, simple interfaces, leverage off-the-shelf products

• A key result: MSR Sense toolkit
  – Launched in December 2005
  – Shared Source release to academic & research community
  – >5000 downloads (mid February)
MSR Sense Toolkit Overview

- Connect, process & visualize sensor mote data from micro-servers.

- Let Microsoft Excel handle the calculations, analysis & even visualization.

- Provide real-time, historical & aggregate views.
Data Collection

Visualize Events/ Process Data

User Interface / Data Processing
(MS Excel)

SQL Query / Report
Raw Data + Processed Data

Gateway
(MicroServer)

XML packets

Status / Sensor Readings
(TinyOS Packets)

Database
(MS Access / SQL Server 2005)

Archiving Events

Sensor Net
(Tmote Sky)

Task Graph Configuration
Raw Data Streaming

Data Collection

Archiving Events
System Components

- **Excel 2003**
  - Worksheets
  - Xml Maps
  - Cell Functions
- **Packet Stream Player**
  - Familiar, simple interface for streaming data
  - Similar to other media-centric players, i.e., Connect, Play, Record, Next, Previous, etc.
- **Packet Database**
  - Session data
  - Packet data
- **Microserver**
  - Data provider
MSR Sense Today

Alpha Release, v0.1.3a – January 2006

• **mSEE** (pronounced *musée*, and spelled *miuSEE* in source code):
  – The microServer Execution Environment is a component-based runtime system that can be dynamically tasked to collect and process sensor data. It comes with a limited library of signal processing and event detection algorithms.

• **mSIC** (pronounced *music*, and spelled *miuSIC* in source code):
  – The microServer Interaction Control is a user interface for tasking microservers and receiving data.

• **MoteForwarder**:
  – The MoteForwarder converts serial T-mote interfaces (via USB) to socket server interfaces. This is a .NET solution for TinyOS SerialForwarder.

• **Senscel** (pronounced *sense-cell*):
  – Senscel is an extension for Excel that allows users to visualize streaming data from msEE through an Excel spreadsheet interface, and to archive and retrieve data from a SQL database.
System Platform

- .NET Framework 2.0
- Office 2003
  - Native XML Support
- Visual Studio Tools for Office System
  - Automatic Interop with Excel object model
- SQL Server 2005
  - Native XML support for storage
- Visual Studio 2005 for development
= -39.60 + 0.01 * Raw Data
Demo
How to get the toolkit

- [http://research.microsoft.com/nec/msrsense/](http://research.microsoft.com/nec/msrsense/)
- Microsoft Research Shared Source License Agreement
- Take a flyer:

![MSR Networked Embedded Sensing Toolkit](https://research.microsoft.com/nec/msrsense/)

**MSR Networked Embedded Sensing Toolkit**

[http://research.microsoft.com/nec/msrsense/](http://research.microsoft.com/nec/msrsense/)

The MSR Networked Embedded Sensing Toolkit (MSR Sense) is a collection of software tools that allow users to collect, process, archive, and visualize data from a sensor network. The toolkit seamlessly bridges TinyOS-based sensor motes to popular Microsoft platforms such as Excel, SQL Server, and IIS/ASP.NET/HTML Web Services. The current v0.1.2a release contains:

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  - geeSE (pronounced goose, and spelled msrsense in source code): The microServer Execution Environment is a component-based runtime system that can be dynamically tasked to collect and process sensor data. It comes with a limited library of signal processing and event detection algorithms.
  - 
  - geSE (pronounced goose, and spelled msrsense in source code): The microServer Interaction Center is a user interface for testing microservers and receiving data.
  - 
  - MSEforwarder: The MSEforwarder connects serial TINA interfaces (via USB) to socket server interfaces. This is a .NET solution for TinyOS BetaForwarder.
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  - Sensors (pronounced sense-able): Sensors is an extension for Excel that allows users to visualize streaming data from USB through an Excel spreadsheet interface, and to archive and retrieve data from a SQL database.

MSR Sense is intended to meet the needs of academic researchers and not-for-profit commercial research in sensor networks and network embedded computing.


Please visit [http://research.microsoft.com/nec/msrsense/](http://research.microsoft.com/nec/msrsense/) for more information, software download, and tutorials.

Please send email to [sensors@microsoft.com](mailto:sensors@microsoft.com) for questions and support.

MSR Sense has been produced and made available by the Network Embedded Computing research group at Microsoft Research. [http://research.microsoft.com/nec/](http://research.microsoft.com/nec/)