



A System Engineering Simulation Tool and Data Base Proposal for Optimizing Applications of Wireless Sensors

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Discussion Topics



- **Machine-to-Machine (M2M) Market Lesson's Learned**
- **Power of Simulation and its Role with Wireless Sensing**
- **CPIAC Sensor Database**

M2M Market Information



- Machine (M2M) Systems
 - An expanding aerospace and commercial market area (<http://www.machinetomachinemagazine.com/>)
 - At least \$200B annual industrial segment
 - Major technological problems in M2M systems
 - Communication congestion - too much data, too little bandwidth
 - System inflexibility - change is expensive and time consuming
 - System cost – initial acquisition costs slow market growth

M2M communications consists of using a device to capture an “event” relayed through a network to an application, translating the captured event into meaningful information

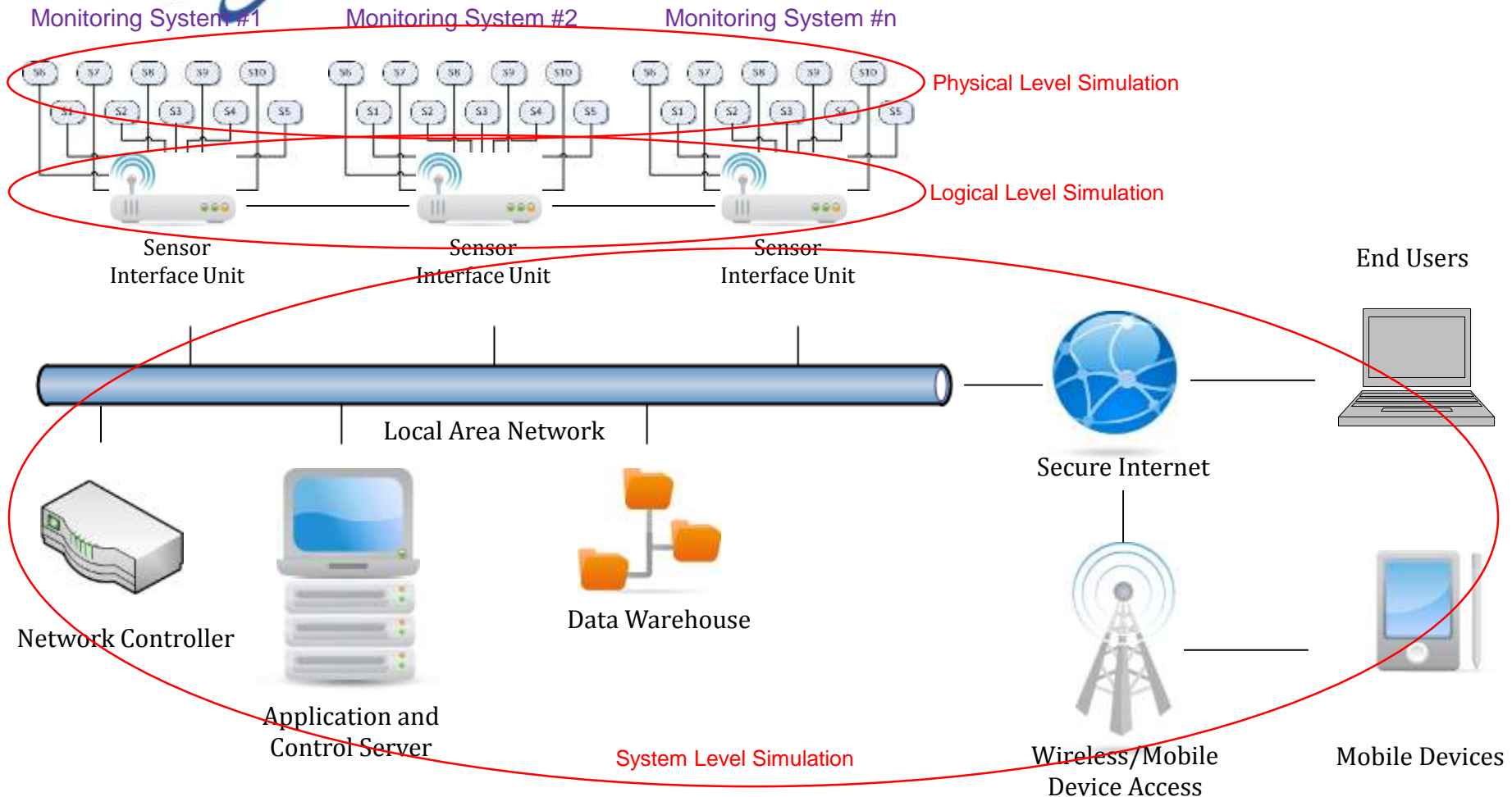
Power of Simulation



- Embedded, distributed, and multi-platform monitoring systems can be complex
- Simulation allows complex systems to rapidly evolve with advanced development tools and a more rapid iteration cycle
- Simulation shortens the development cycle for both hardware and software
- With good simulation, results transfer to intended host environments with complete logical integrity (**100% return on investment**)

Simulation Reduces Upfront Costs and Pays Off Through the Systems Life-Cycle by Facilitating Assessment of Change Requirements, Impacts Due to Obsolescence and Software/Hardware Upgrades

Typical Monitoring System Architecture



***Elements of a System Architecture can be Simulated with High Fidelity
Enabling Management of System Complexity and Communication Congestion***

Sensor Database



- Chemical Propulsion Information Analysis Center (CPIAC) is developing a secure, online, portal for the collaborative collection and dissemination of sensor related information
- Access has ITAR restrictions (U.S. Citizens only)
- CPIAC to Design, Implement and Host/Maintain an Online Tool for JANNAF to:
 - Allow the secure exchange and collection of information on sensors
 - Wiki-like functionality: Users create new entries based on standard forms
 - Documents can be attached as references for each sensor
 - Search capability based on keywords or filtering by criteria
 - Data reviewed prior to posting by an approving authority
 - CPIAC to perform initial data population using NASA sensors database



CPIAC Sensor Portal



- **Part A: The so-called “living document” on the application of sensors**
 - Wiki type functionality
 - An online reference with persistent collaboration
- **Part B: The sensors database**
 - Persistent online repository of information & data on sensors
 - Sensors of interest to user community
 - Government and industry users
 - New entries / changes reviewed by a trusted authority
- Database being created with NASA , US Air Force and US Department of Energy funding



CPIAC Online Portal



[Home](#) | [Help](#) | [Logout](#)

JANNAF HM Sensors E-Pub

Keyword search

[Introduction](#)
[Sensor Requirements](#)
[Dedicated Wire Sensor-to-RHN](#)
[Fieldbus for Sensor-to-RHN](#)
[RF Sensor-to-RHN](#)
[SAW Sensor-to-RHN](#)
[Acoustic Sensor-to-RHN](#)
[IR Sensor-to-RHN](#)
[Standardized Interfaces](#)
[Vehicle Health Analysis Tools](#)
[Appendix A: Definitions and Acronyms](#)

JANNAF HM Sensors Database

Keyword search

Manufacturer:

Model Number:

Measurement:

Sensor Type:

Sensor Output:

Units:

TRL:

[Add new sensor](#)

[Approve new sensors*](#)

Welcome to the JANNAF HM Sensors Portal

The Modeling and Simulation Subcommittee Integrated Health Management Panel is pleased to present the JANNAF Health Management Sensors Portal. The portal gives users access to the JANNAF HM Sensors E-Pub, a living document on sensor technology, and the JANNAF HM Sensors Database allowing users to search for specific sensors that are available or under development and provides a mechanism for community added sensors which will be approved for acceptance into the database as a task of the IHM Panel.

Example

Sensor communities of interest are encouraged to submit their sensor specific data to CPIAC for inclusion into database
CPIAC Primary POC is Nicholas Keim e-mail: nkeim@cpiac.jhu.edu



Summary



- **The M2M market is large and provides information/lessons learned that can be valuable for munitions health monitoring**
- **Robust multimode simulation significantly reduces life cycle cost of M2M systems and provides confidence prior to major investment**
- **CPIAC sensor database will be a common repository for sensor users**
 - **Sensor providers are encouraged to participate by submitting sensor info to CPIAC**