# 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

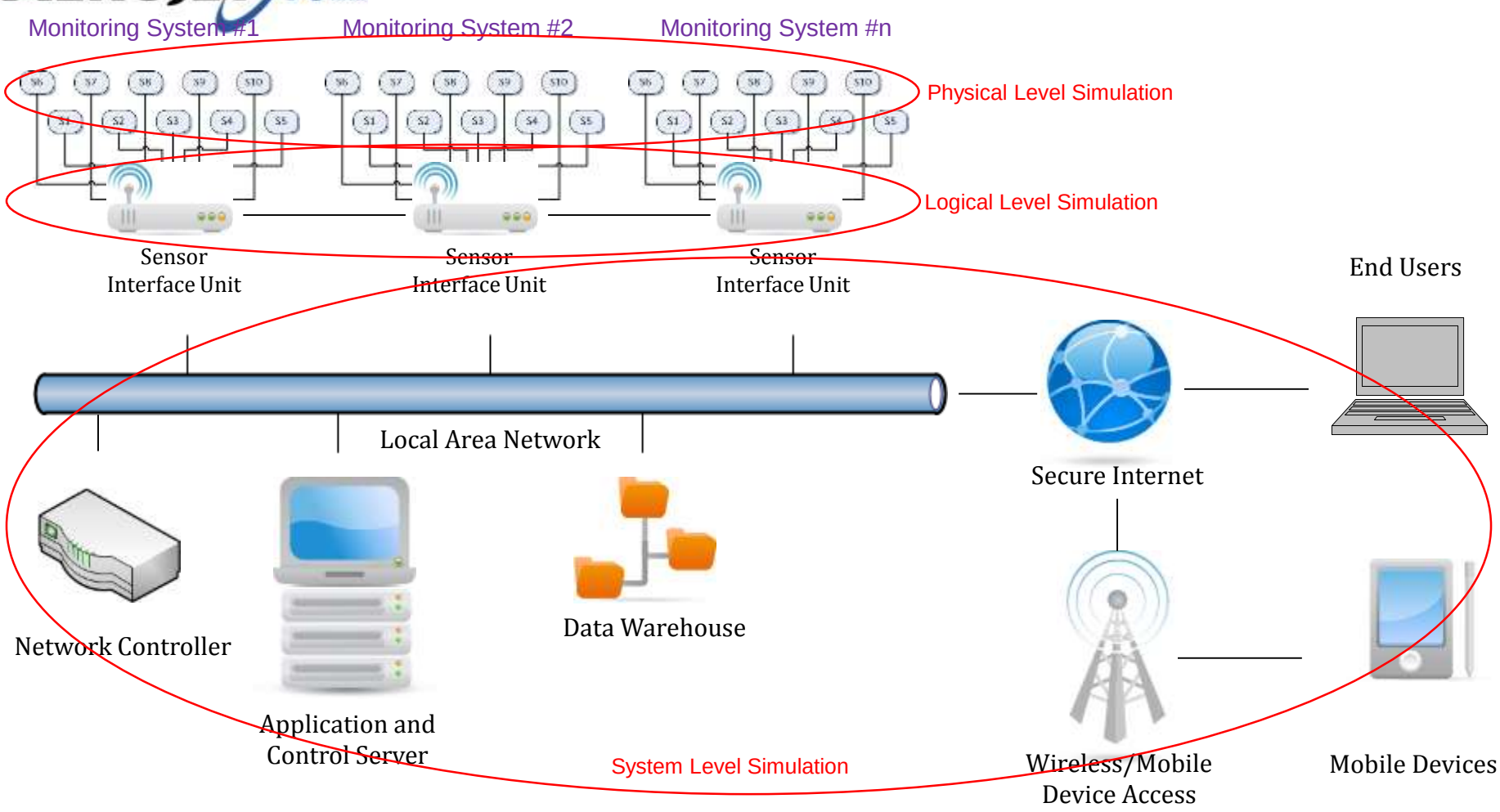
***M2M communications consists of using a device to capture an "event" relayed through a network to an application, translating the captured event into meaningful information***

# 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**

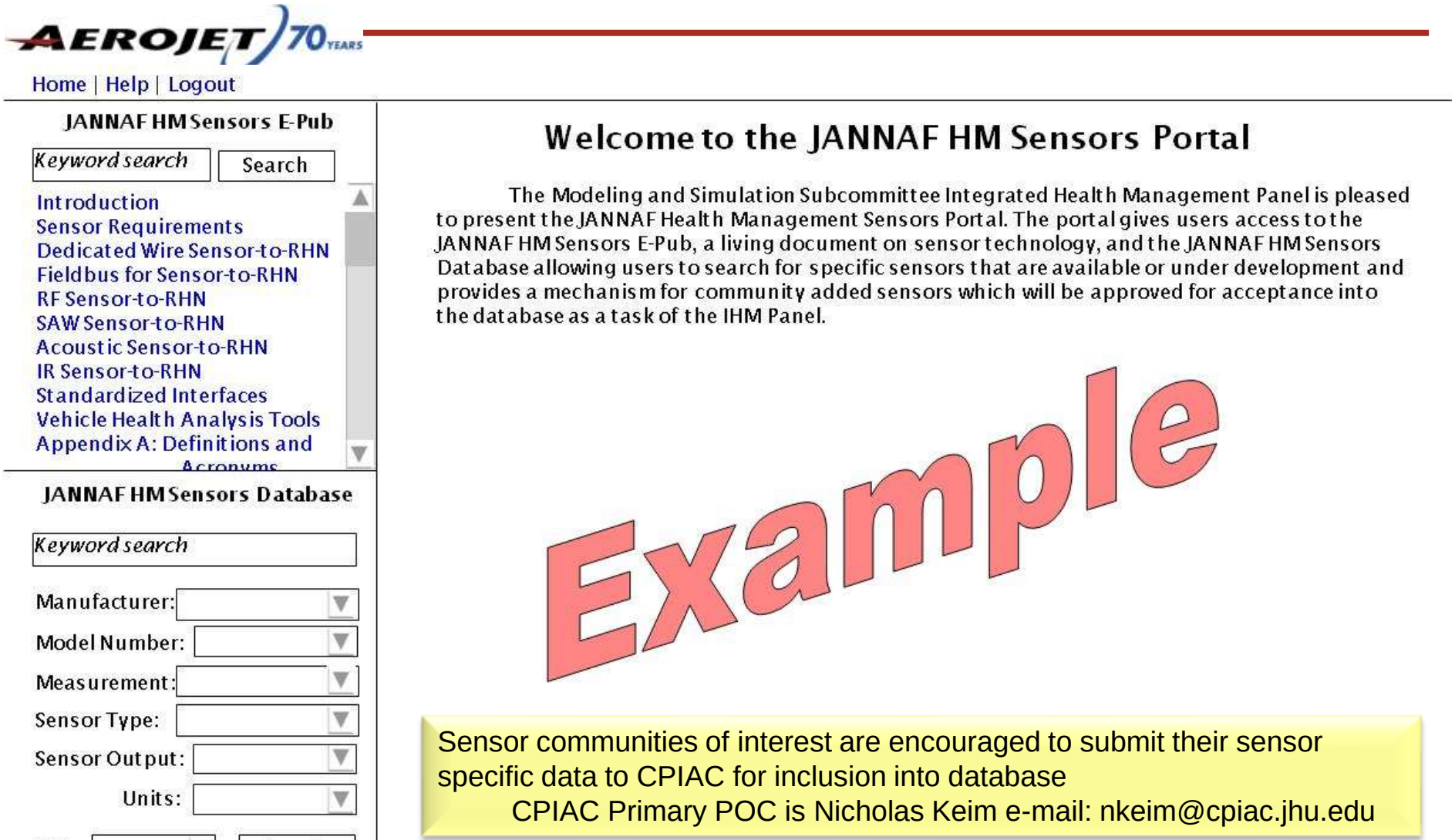
# CPIAC Sensor Portal

- **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




Sensor communities of interest are encouraged to submit their sensor specific data to CPIAC for inclusion into database

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# 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**