Center for Embedded Networked Sensing

Integrating Wireless Sensor Networks

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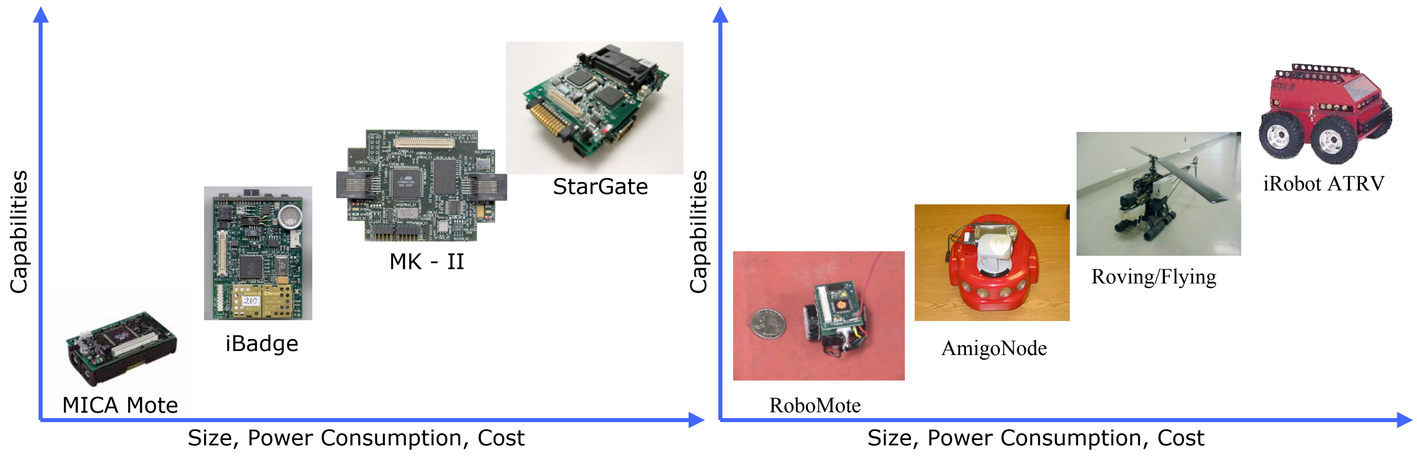
Introduction: Diversities in Software Algorithms, Sensors, and Actuators.

Complex multi-dimensional tradeoffs

- **Multiple *execution plans* can satisfy the same end user's need.**
- **Tradeoffs exist among different *execution plans*.**
  - **Power consumption**
  - **Message latency**
  - **Accuracy**
- **Some operational environments are better suited to specific *execution plans.***



Problem Description: How to Efficiently Express Users' Need?

How to provide intuitive abstraction?

- **Describe *what* the user interests are, but *not how* to achieve them.**
  - Difficult task for end users to find all possible execution plans and exploit tradeoffs
  - Abstractions must be easy to map to execution plans!
- **Enable sharing of abstractions.**
  - *Portable* format and *extensible* language are the key!

How to map abstraction into execution plans?

- **Export well-known performance metrics from database.**
  - Energy, latency, accuracy, etc..
  - *Metrics description* is a must!
- **Promote reuse of existing software primitives through performance metrics.**
  - Common database for storing software primitives and service abstractions is needed.

Proposed Solution: SensorMod: *Sens*or *M*odeled *O*bject *D*escription

Intuitive core objects

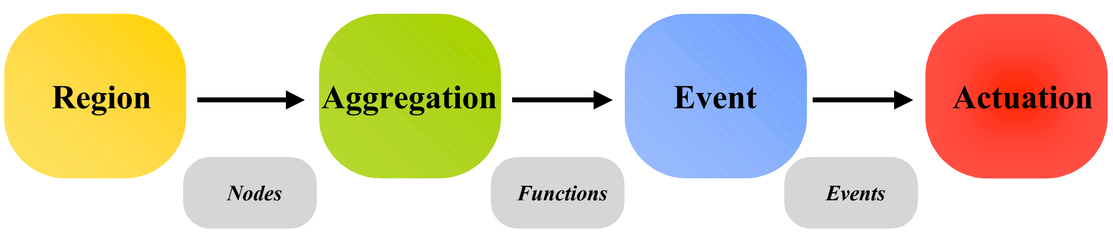
- ***Region*:**
  - Describe dynamic set of nodes executing task during runtime.
  - E.g. nodes qualifying constraints of set of attributes.
- ***Aggregation*:**
  - Describe aggregation functions.
  - E.g. spatial maximum, temporal minimum, window average, etc
- ***Condition*:**
  - Describe set of event condition of user interest.
  - E.g. spatial maximum greater than 100.
- ***Actuation*:**
  - Describe set of actions upon event detection.
  - E.g. real-time streaming, triggering, logging, etc.

Portable and extensible language

- **XML Object Description for sharing**
  - XML parser is freely available.
  - Well-structured and *portable*!
- **Encourage subclassing**
  - *Extensible* through specialization!
  - Enable expressing data through *typing*.

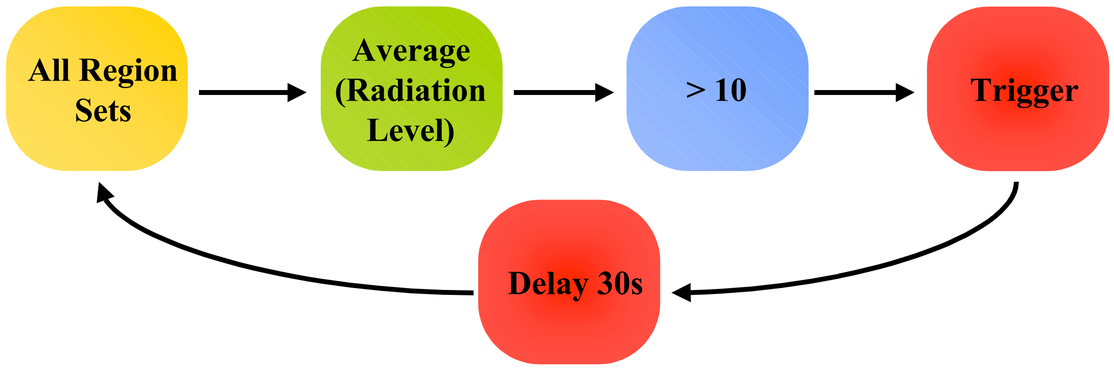
Users, Users, Users!!!

Easy-to-use data transformation graph

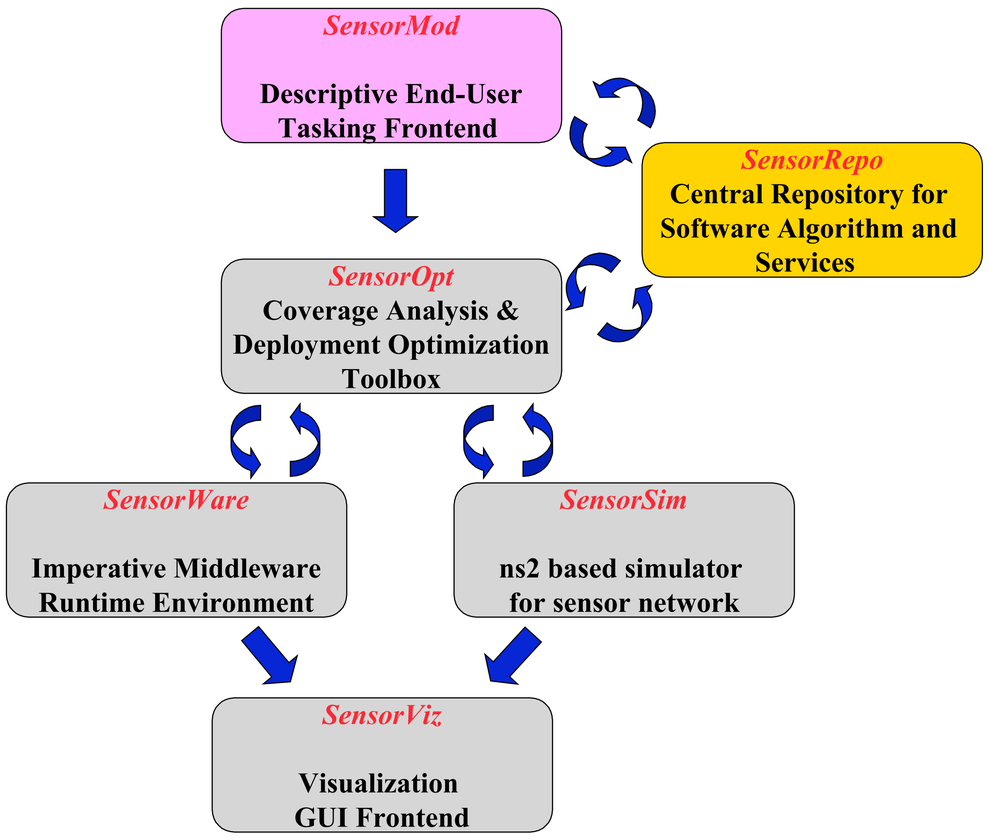


Example

- **Monitor for regions where average radiation level > 10, upon detection send event to user and track every 30 seconds**



Sensor* Architecture Position



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