Outline

- Embedded Software/Systems Research
  - Introduction
  - Current & Future
- Q&A
Introduction [7]

- Trend of Change in Embedded Software
  - More Complex
    - Customers’ increasing demand for more elaborate functionality
  - Modular
  - Adaptive
    - Downloadable modules that dynamically reconfigure the system
  - Network Aware
Introduction (Cont’d)

- Problems of Using Existing Techniques
  - Required Domain Expertise
    - Processing sensor data or controlling actuators
  - Extravagant Use of Hardware Resources
    - Layers of abstraction, elaborate algorithms, or statistical optimization
  - Ad Hoc Definition of Components (Modules)
  - Static Role of Components
  - Unsophisticated Framework

Mechanism by Which Components Interact
Introduction (Cont’d)

- Problems of Using Existing Techniques
  - Use of Subroutines
    - Finite computations
      - Taking predefined arguments & producing finite results
  - Use of Processes & Threads for Concurrency
    - Not easily characterizable aggregate
  - Mismatched Assumptions about the Role of Time
    - Reducing time to a total order of discrete events
  - Varying Communication Bandwidth & Latencies

Need for a Metaframework Dealing with Time & Concurrency
Introduction (Cont’d)

- **Metaframework**
  - Mixing frameworks hierarchically
    - A component in one framework being an aggregate of components in another
    - Domain polymorphism
      - Domain polymorphic component
      - Domain polymorphic interface that an aggregate of components exposes
  - Operating in Multiple Domains with Clear Semantics

**Software Infrastructure with Which a Framework Is Realized**
Reference