Distributed Information Processing

15th Lecture

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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

Software Infrastructure with Which a Framework Is Realized

Operating in Multiple Domains with Clear Semantics