




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

Not Suitable for Nonterminating Computation Transforming an Unbounded Stream of Data; e.g., Speech Coder

□ 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

Software Infrastructure with Which a Framework Is Realized

- Domain polymorphic component

- Domain polymorphic interface that an aggregate of components exposes

Operating in Multiple Domains with Clear Semantics

Reference

- [Lee05] E. Lee, "Embedded Software: Building the Foundation," Berkeley EECS Annual Research Symposium, University of California at Berkeley, February 2005, <http://www.eecs.berkeley.edu/IPRO/BEARS/2005/index.shtml>