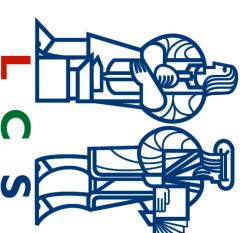
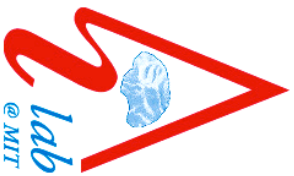


MIT9904-12: Cooperative Computing in Dynamic Environments

Nancy Lynch and Idit Keidar



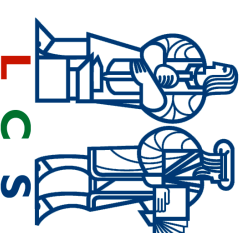
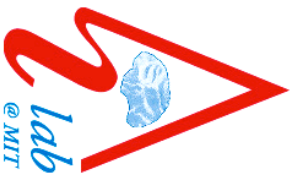
Project Overview

- Develop models, analysis and verification methods, and algorithms for distributed systems.
- Focus on highly dynamic systems.
 - Participants may join and leave the system and may change location.
 - Network topology may change.
 - Components may fail and recover.
- Address the problems of such complex environments
 - By developing formal modeling and analysis techniques based on interacting state machines.
 - By developing useful "building blocks" ---definitions of global services and efficient algorithms to implement them.

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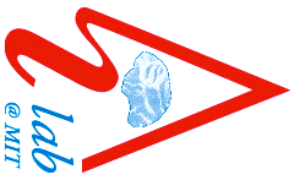
Progress Through June 2002

• Formal modeling and analysis

- Case study and tool development papers related to the tool ioa2ls and the IOA simulator [Bogdanov, Lynch, Garland, Kiri et.al.]
- Detailed design of the IOA composer [Garland, Tauber]
- Started work on translating IOA to Isabelle [Luhns, Garland]
- Verification of NePi with the IOA Toolkit [Kawabe]
- HIOA language for specifying hybrid systems [Mitra]
- New pasting and substitutivity results for DIOA [Attie, Lynch]

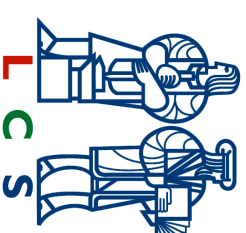
• Algorithms for dynamic distributed systems

- Dynamic Atomic Broadcast algorithm [Bar-Joseph, Keidar, Lynch]
- RAMBO: Reconfigurable Atomic Memory for Basic Objects [Lynch, Shvartsman]
- LAN implementations of RAMBO, optimizations for RAMBO [Gilbert, Fan et.al.]
- Performance evaluation of distributed algorithms over the Internet [Bakr, Keidar]
- Formalization and verification of reliable multicast with caching [Livadas]
- Performance analysis of GCS and a GCS based application [Khazan]



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Research Plan for the Next Six Months

- Formal modeling and analysis
 - Implementation of the IOA composer and the IOA code generator
 - Implementation of the IOA to Isabelle translation tool
 - Evaluation of HIOA
 - Design of Timed IOA
- Algorithms for dynamic distributed systems
 - Performance analysis of RAMBO for a larger number of situations
 - Continue work on the implementation and optimization of RAMBO
 - Analyze the correctness and the performance of the caching-enhanced multicast algorithm
 - A fault-tolerant overlay network algorithm for a dynamically-changing wide-area network
 - New algorithms for resource allocation in highly dynamic networks