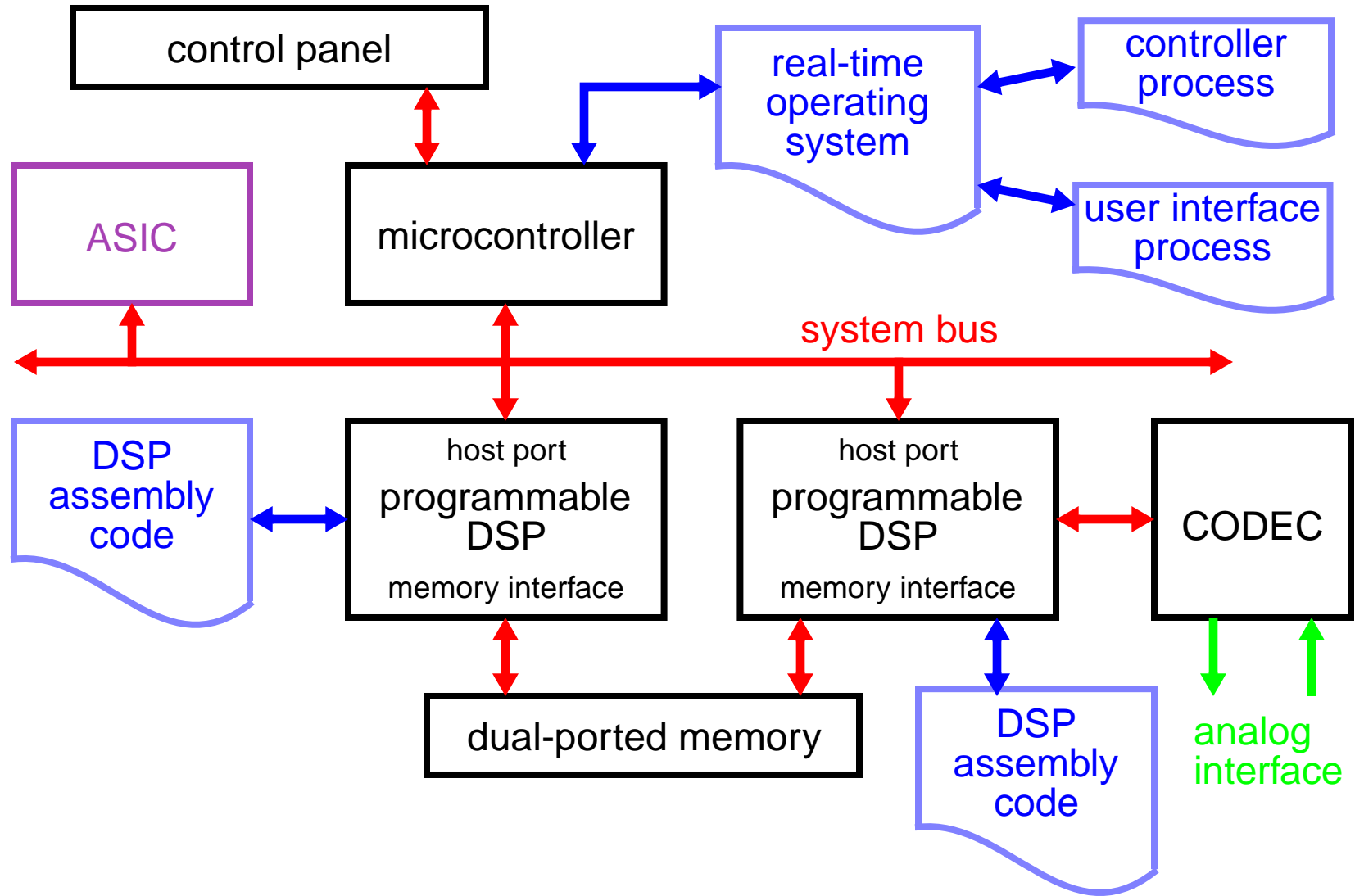
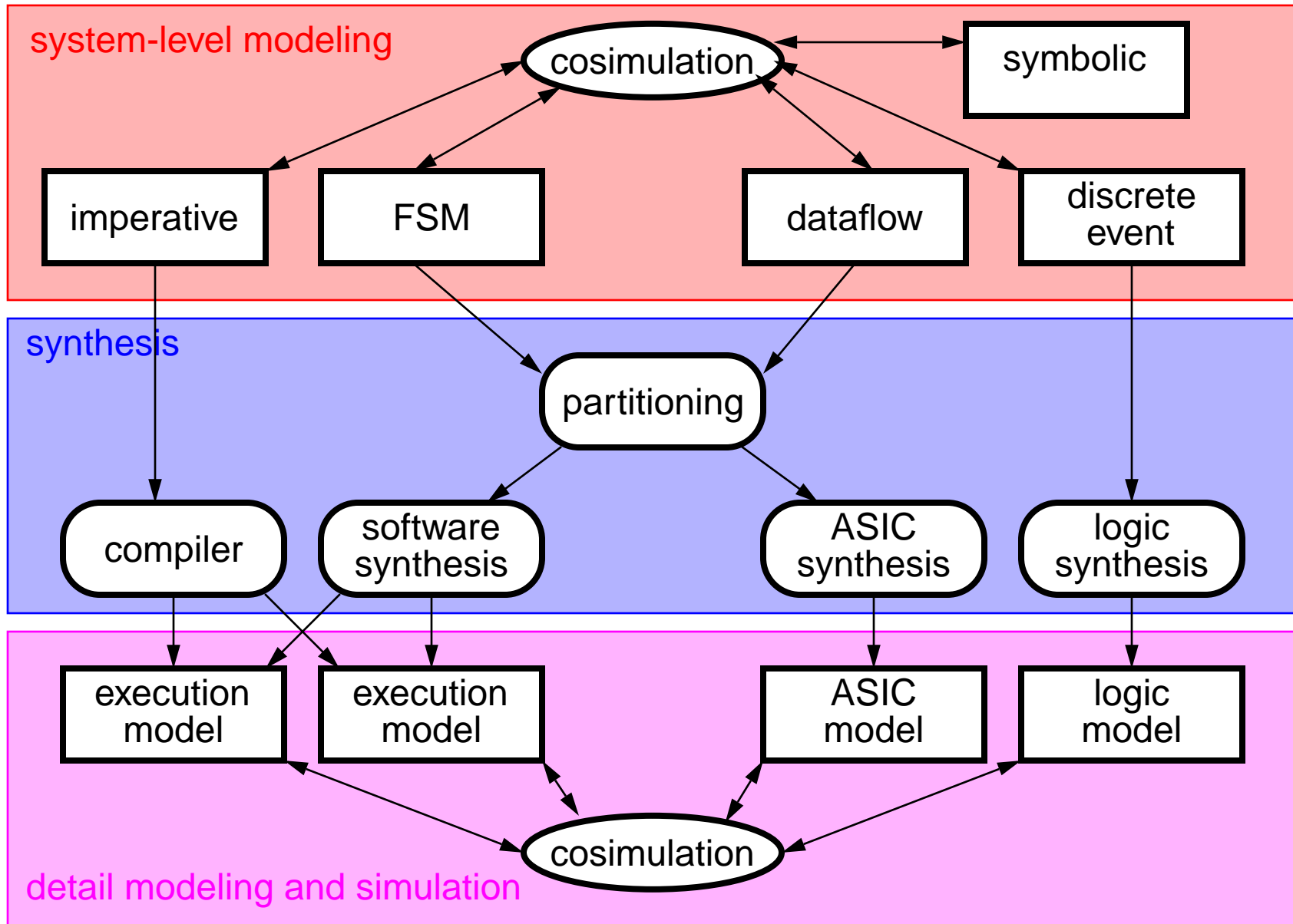


Typical Embedded Signal Processing System



Heterogeneity in System-Level Design



Ptolemy Project

Design Methodologies for Heterogeneous Systems

- Formal models of computation
- Hierarchical compositions of models form complex systems
- Synthesis and partitioning algorithms
- Laboratory to test design methodology is the **Ptolemy software environment**

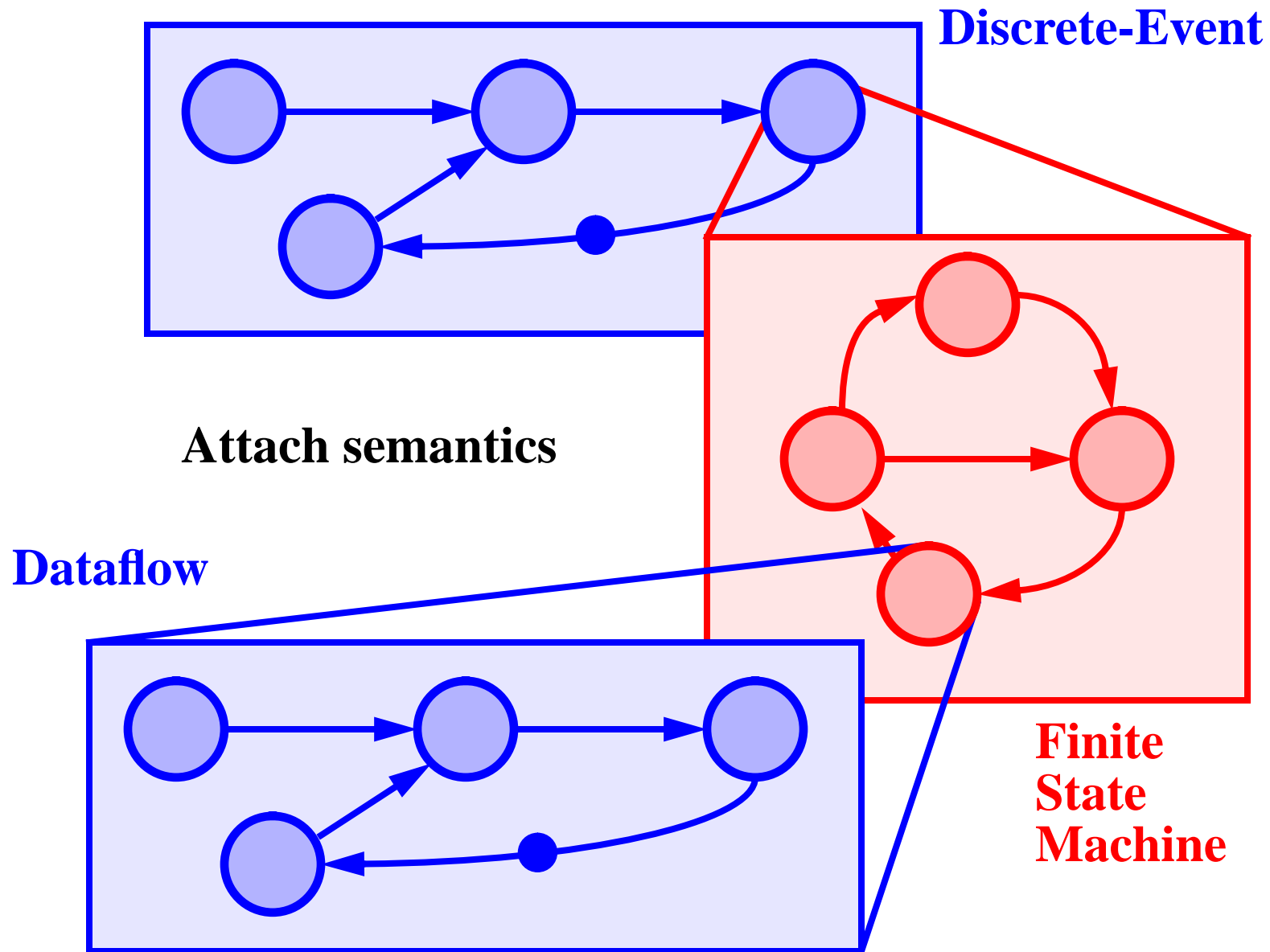


Claudius Ptolemaeus

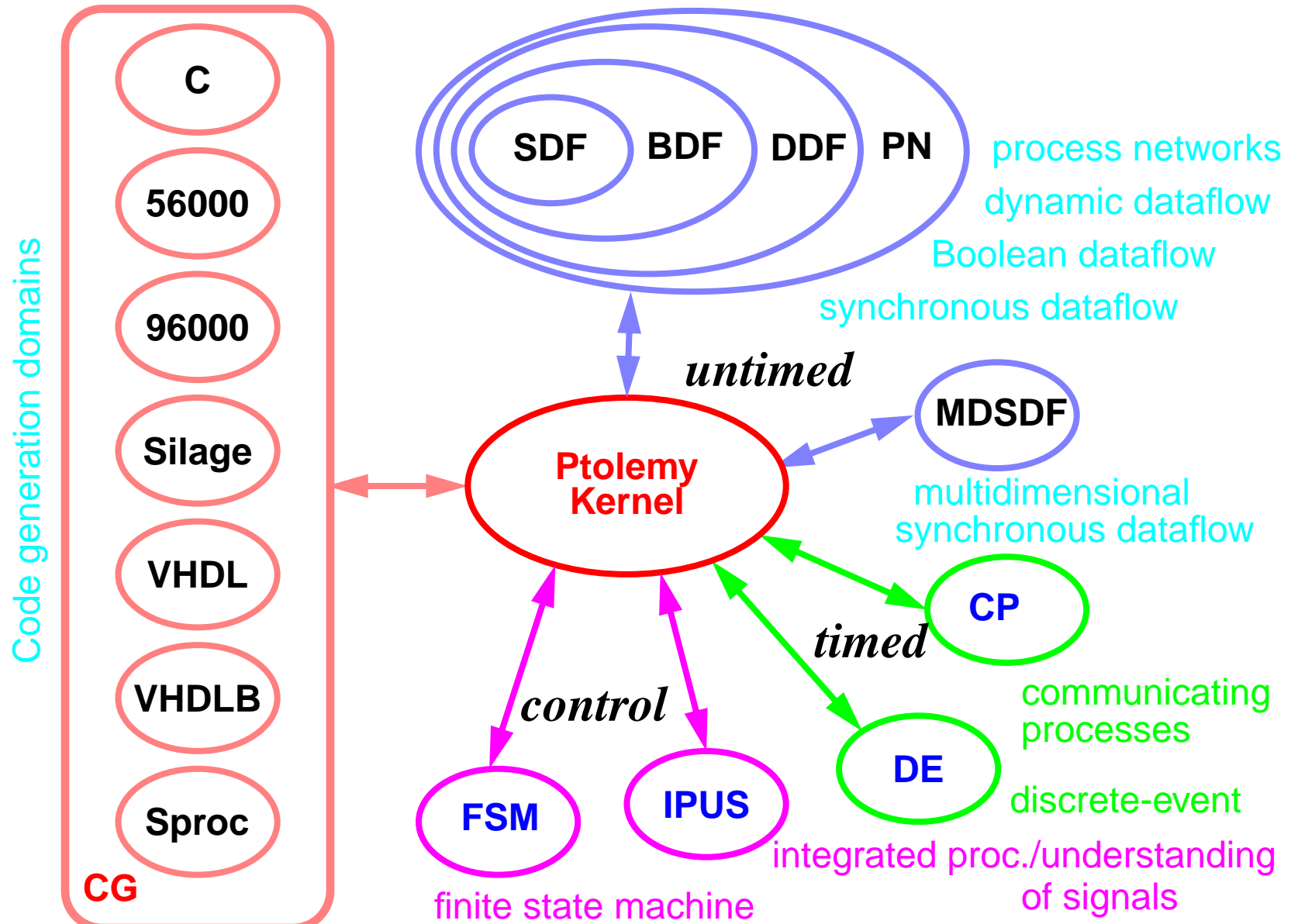
Personnel

- Directors: Profs. Edward Lee and David Messerschmitt
- Staff: 4 post-doctoral, 1 software manager, 2 administrative
- Students: 13 graduate and 3 undergraduate

Hierarchical Graphs As Underlying Abstract Syntax



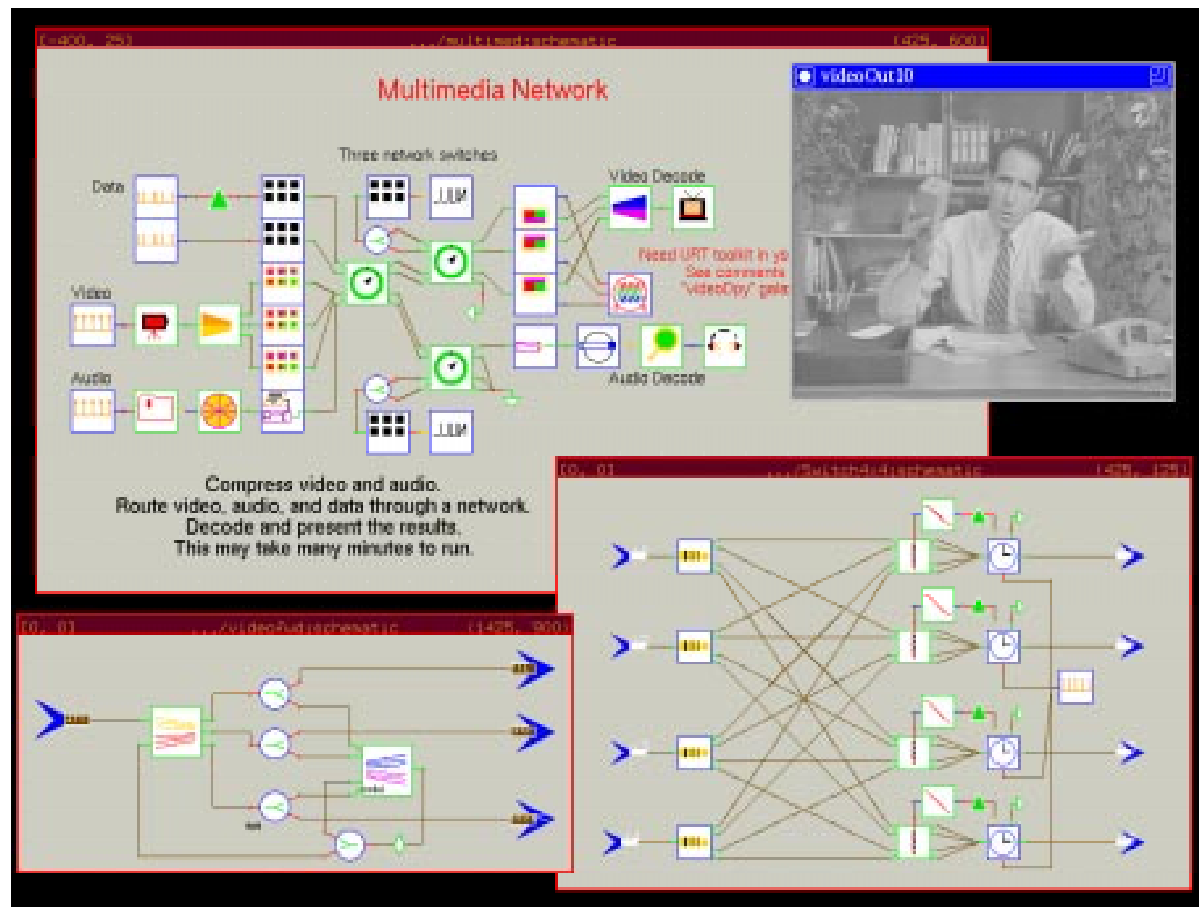
Computational Models (Domains) in Ptolemy



Heterogeneous System-Level Design in Ptolemy

Mixing Models

- ATM network with three 4x4 switches
- Detailed model of each switch with queueing and routing protocols.
- Dummy traffic (Poisson arrivals) to create congestion.
- Test traffic (video and audio) to measure subjective performance.



Multiple models of computation may be used in the same system. Here, dataflow is used for signal processing, while a timed discrete-event system models a communication network.

Open Research Issues in System-Level Design

	Topic	Example
<i>Specification</i>	Integrated documentation	Parameter relationships
	System optimization	System rearrangement
	Converting graphical specifications into block diagrams	Multidimensional compression systems
	Optimizing algebraic specifications with conversion into block diagrams	Analog filter design
<i>Simulation</i>	Models of computation	Multidimensional dataflow
	Cosimulation of diverse models of computation	Mixed signal
	Cosimulation of diverse implementation technologies	DSP core
<i>Synthesis</i>	Partitioning	Hardware/software codesign
	Scheduling	Minimizing data memory in DSP assembly code generation