Execution Models for Dataflow Processes

- Concurrent processes at one per actor
- Static dataflow machines
- Dynamic dataflow machines
- Demand- or data driven interpreters
- Compiled single process
- Compiled concurrent processes

The last two are most useful for real-time signal processing.
Dataflow:

• A *signal* is a sequence of *tokens*.
• An *actor* maps input tokens onto output tokens.
• A set of *firing rules* specify when an actor can fire.
• A firing *consumes* input tokens and *produces* output tokens.
• A sequence of firings is a *dataflow process*.
Kahn Process Networks — The Unifying Model

Network of:

- concurrent sequential processes
- that communicate through one-way FIFO channels,
- where channels have unbounded capacity
- and one producer and one consumer,
- writes to the channels are non-blocking, and
- reads from channels are blocking.

A process in the Kahn model is a mapping from one or more input sequences to one or more output sequences.
A Taxonomy of Discrete-Event Systems

- **Continuous time**
- **Discrete time**
- **Multirate discrete time**

**Totally-ordered discrete events**

- \( E_1 \rightarrow E_2 \rightarrow E_3 \rightarrow E_4 \)
- \( F_1 \rightarrow F_2 \rightarrow F_3 \rightarrow F_4 \)
- \( G_1 \rightarrow G_2 \rightarrow G_3 \rightarrow G_4 \)

**Partially-ordered discrete events**

- \( E_1 \rightarrow E_2 \rightarrow E_3 \rightarrow E_4 \)
- \( F_1 \rightarrow F_2 \rightarrow F_3 \rightarrow F_4 \)
- \( G_1 \rightarrow G_2 \rightarrow G_3 \rightarrow G_4 \)
Domains in Ptolemy

- **Code generation domains**
  - CGC
  - CG56
  - CG96
  - Silage
  - VHDLF
  - VHDLB
  - Sproc
  - CG

- **PTOLEMY KERNEL**
  - SDF
  - BDF
  - DDF
  - PN

- **Process networks**
- **Dynamic dataflow**
- **Boolean dataflow**
- **Synchronous dataflow**

- **MDSDSDF**
  - Multidimensional SDF

- **Thor**
  - Circuit simulation

- **DE**
  - Discrete-event
  - Communicating processes

- **DMM**
  - Design methodology management
Dataflow Models of Computation

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