Announcements

- Reading for this class continue chapter 10

Message Passing Machines (cont.)

- Intel Paragon
  - mesh connected machine (2-d mesh)
  - i860 processors
    - 75 Mflops
    - can issue one multiple and one add per cycle
  - communication
    - 200 MB/sec bandwidth (per link)
    - second i860 used for communication (shares memory)
  - memory
    - 16-128 MB/node
    - OS takes over 1MB/node
      - for 1,000 nodes that a giga-kernel

CM-5

- interconnection network
  - fat tree
  - combining network for data reduction (fast barrier)
  - 20MB/sec local 5MB/sec arbitrary
  - 30usec latency for messages
- processors
  - SPARC processors
  - 4 Vector units per node (128Mflops/node)
  - systems up to 1024 nodes have been delivered

CM-5 (cont.)

- OS
  - can partition the machine (requires a reboot)
  - synchronous time sharing (strictly gang scheduling)
    - need to context switch the network (all fall down)
  - small node kernels (hundreds of KB)
- Software
  - data parallel languages
  - SPMD programming
  - host node runs “server” process
    - communication with outside world
    - central control of SIMD style execution

Message Passing Machines (cont.)

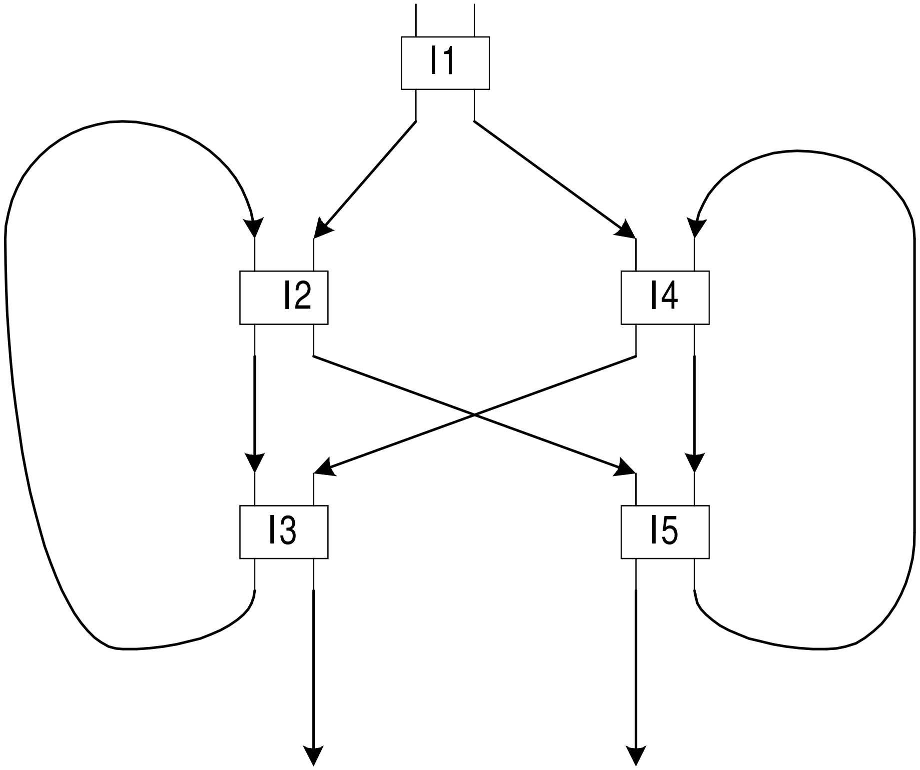
- SP-2
  - processors
    - IBM power II
    - 65Mhz (and up)
    - 125 Mflops per processor
  - Entire UNIX workstation is used
    - each runs a full UNIX operating system
    - POE Environment sits on top to provide parallel access
      - individual nodes can be allocated
  - Network
    - MCA plug in card
    - omega network of 8x8 cross bar switches
    - 40 MB/second

Dataflow Machines

- Execution model
  - data flow graph
    - arcs represent operands
    - nodes are instructions
    - instruction “fire” when all operands have arrived
  - tokens
    - represent operands
    - can be tagged to identify iteration count
  - parallelism
    - pipeline parallelism within a single function unit
    - separate execution among different units

Dataflow Execution

- Execute a dataflow graph
- nodes are instructions
- arcs are tokens (operands)



Dataflow Hardware (Manchester)

- token (96 bits)
  - 37 bits for data (5 for type)
  - 36 bits for tag (activation name, iteration, array index)
  - 22 bits for destination (graph node # and input port)
  - 1 bit marker (how many nodes required for enable)
- memory
  - hold program - as execution graph
  - temporary storage of waiting tokens
    - 20 parallel 64K-tokens
- matching unit
  - match tokens with same tag destined for same insn node
  - simulates associative memory with a hash table
    - if match not found, must store token in memory

Structure of Dataflow Machine