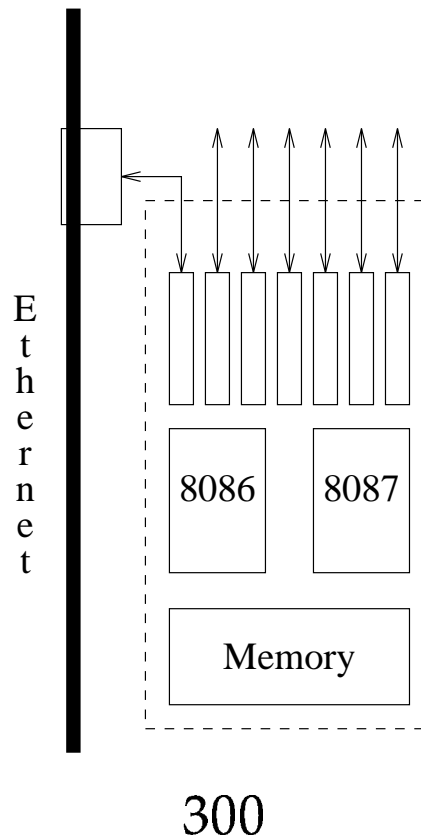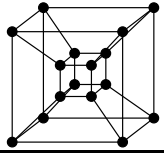# Hypercube Computers

Cosmic Cube

- Developed at CalTech with chips donated by Intel.

300

Hypercube Computers

Cosmic Cube

- Node Architecture:

  - 8086 8-bit microprocessor.
  - 8087 arithmetic co-processor. *-50 kflops*
  - 7 bi-directional communication links @ 2Mbits/s.
    - - One of which is connected to global ethernet.

- System Architecture:

  - $6D$ Hypercube structure (64 nodes). *-Total 3 Mflops*
  - Host controls via ethernet.

- System Software:

  - Each node runs kernel for *multiprocessing* & *message passing*.
 - *Store & forward* packet routing.
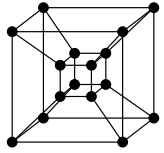
Hypercube Computers

## iPSC/1
Intel Personal SuperComputer

- Built by Intel Scientific Computers (iSC).

- Based on Cosmic Cube.

- Advances:

    - 80286/7 based nodes. *-125 kflops*
    - NX- Node Executive kernel
      Supports *multiprocessing* & *message passing*.
    - Optional extras:
        - - 4.5 Mbytes memory.
        - - VX- Vector eXtension modules 6.6 MFlops.

- Max system 64 VX nodes 6.6 MFlops = 422 MFlops.

302
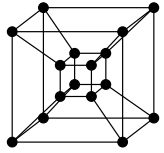
Hypercube Computers

iPSC/2

- Advances:

  - 80386/7 based nodes with optional Wietek 1167 arithmetic accelerator.

  - 8 Mbytes of memory.

  - Direct-Connect Routing Module:

    - - Hardware Routing co-processor
    - - 8 bi-directional links 2.8 Mbytes/s
    - - *Wormhole* routing

- Performance:

  - Max Node performance with VX module is barely changed from iPSC/1.
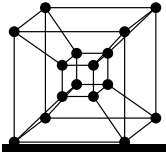
Hypercube Computers

iPSC/860

- Architecture:

  - i860 CPU:

    - - 40 MHz RISC with on chip FPU
    - - Multiple Instructions per cycle with pipelining & instruction caching
    - - 60 Mflops peak! - Only with very careful programming.

  - 8-16 Mbytes of memory.

  - 8 link Direct-Connect Module.

- Major Flaw:

  - Multiple processes per node are not supported by NX/2 kernel.

    Context switching would require pipelines to be flushed - severe performance degradation.