Introduction to Hybrid MPI/Open MP
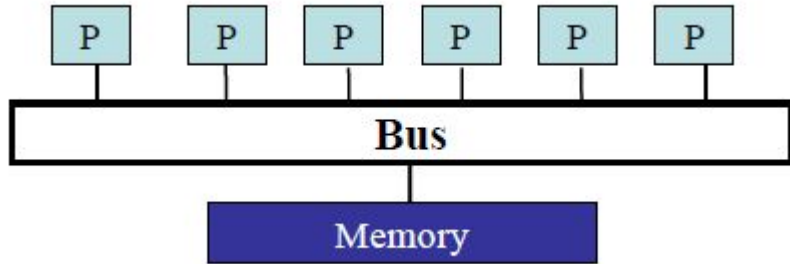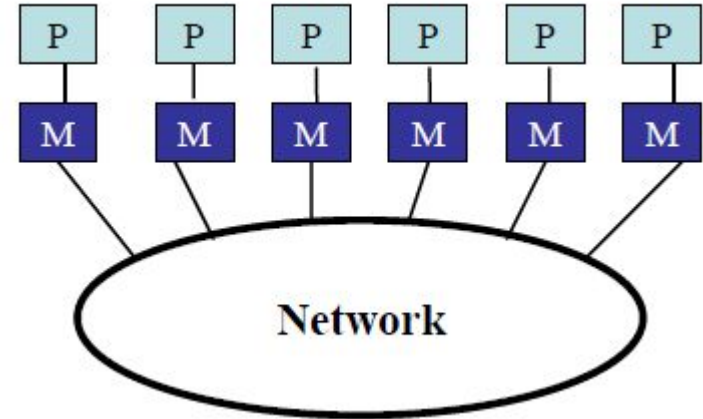
By Prof. Roman Voronov
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Technology

Concept Review: Shared vs Distributed Memory
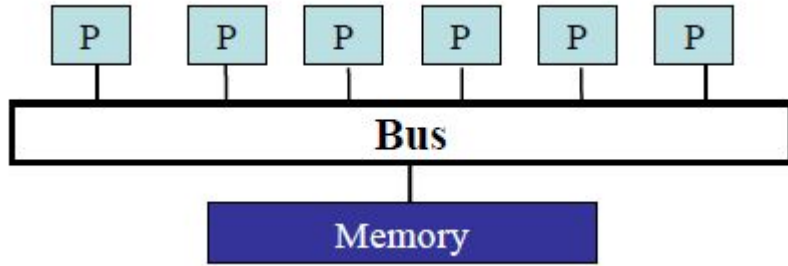

Shared memory:
- Extensions to Fortran, C and C++ for Symmetric MultiProcessor (SMP) Systems
- Each processor can access all memory
- Single address space
- Single OS Image
- Hardware of processor interconnect :
  -Bus
  -Crossbar

Cluster:
- Each processor has its own local memory.
- Uses message passing (MPI) to exchange data between processors.
- Multiple OS Images
- Hardware of processor interconnect:
  -Network Interface Cards & Switch

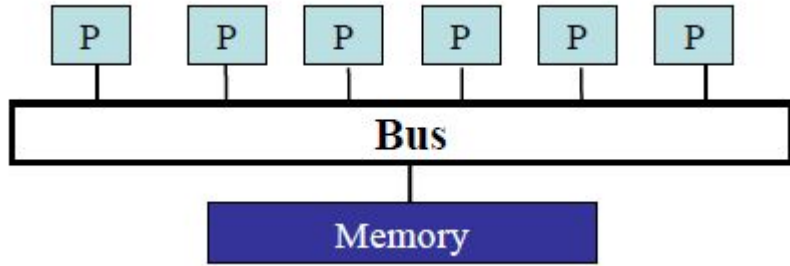# Advantages: Shared vs Distributed Memory

Shared memory:
- Easy to learn and program
- Good price-performance
  (for small numbers of CPUs)
- Uniform Memory Access (UMA)
- Predictable performance
- Parallel code also works for Serial Cases
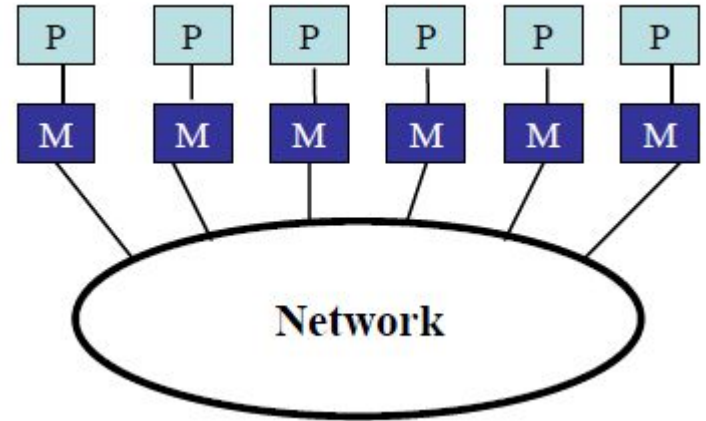 (w/o the need for modifications)
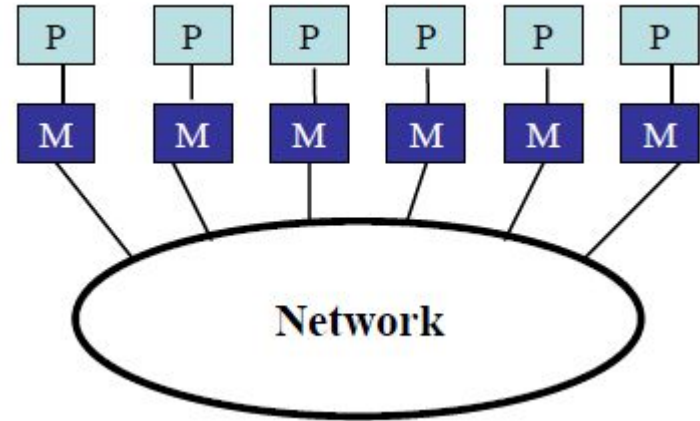
Cluster:
- All data is private
-

Disadvantages: Shared vs Distributed Memory

Shared memory:
- Scalability limited by memory architecture
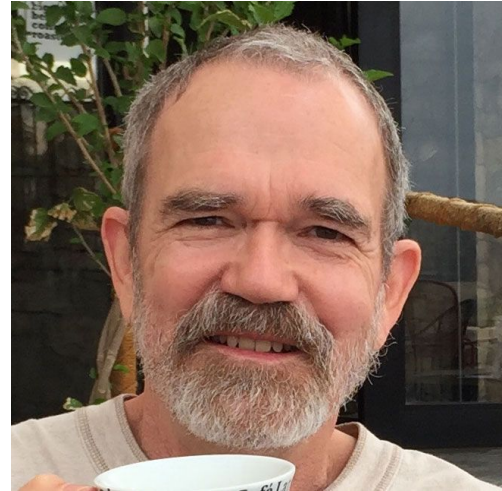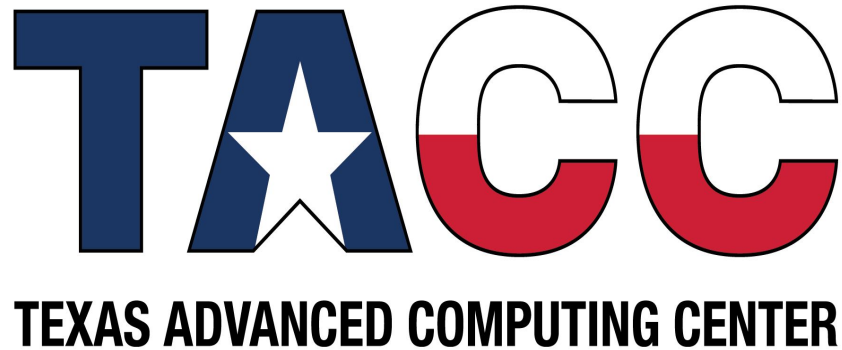- Available on SMP systems only

Cluster:
- Time "cost" per communication is MUCH higher

References:

We graciously thank Profs. Barth and Milfeld of the Texas Advanced Supercomputing Center (TACC) for sharing their supercomputing lecture notes, which were used as a reference for developing these course materials.

Prof. Bill Barth

Prof. Kent Milfeld