

Parallel Computing Toolbox (PCT)

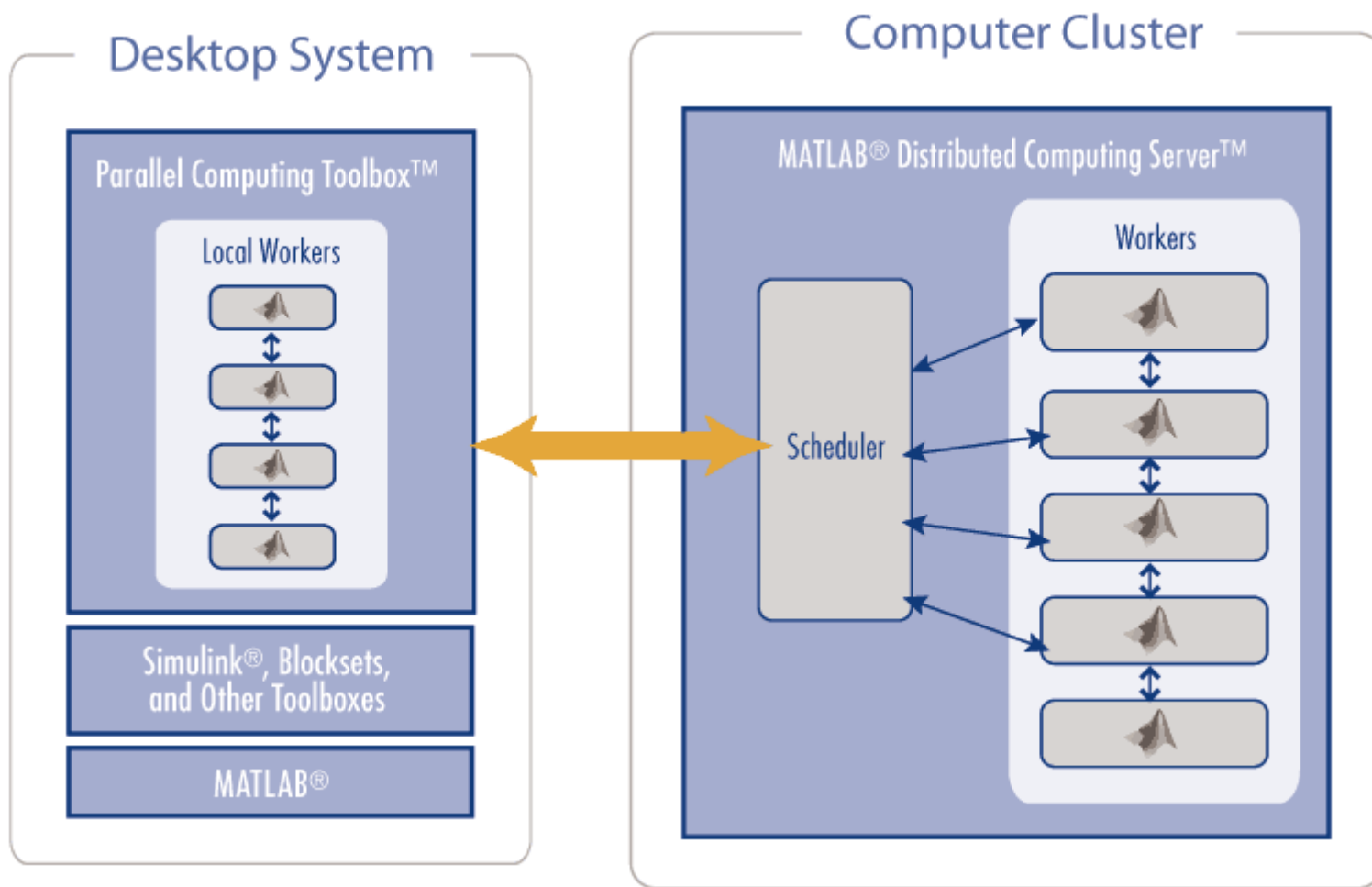
and

Parallel Computing in MATLAB

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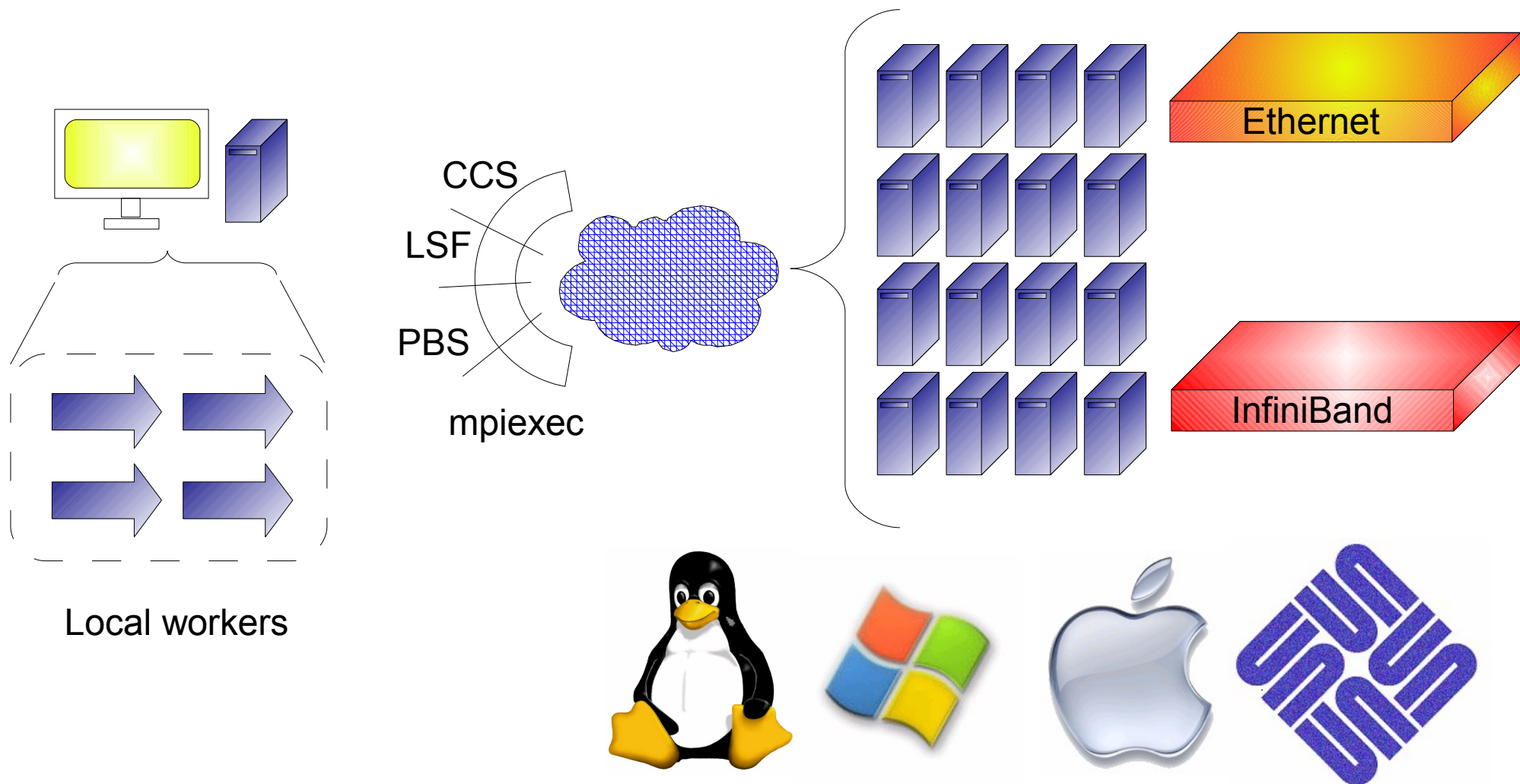
MATLAB, SIMULINK, and PCT



MATLAB Parallelism Types

- Implicit parallelism
 - BLAS
 - LAPACK
 - FFTW
 - ...
- Explicit parallelism
 - PCT
 - MPI
 - Distributed arrays
- Interactive parallelism
 - pmode
- Task parallelism
 - Embarrassingly parallel
 - Independent tasks
 - parfor
- Data parallelism
 - +150 functions for distributed arrays

PCT Components Details



PCT Content

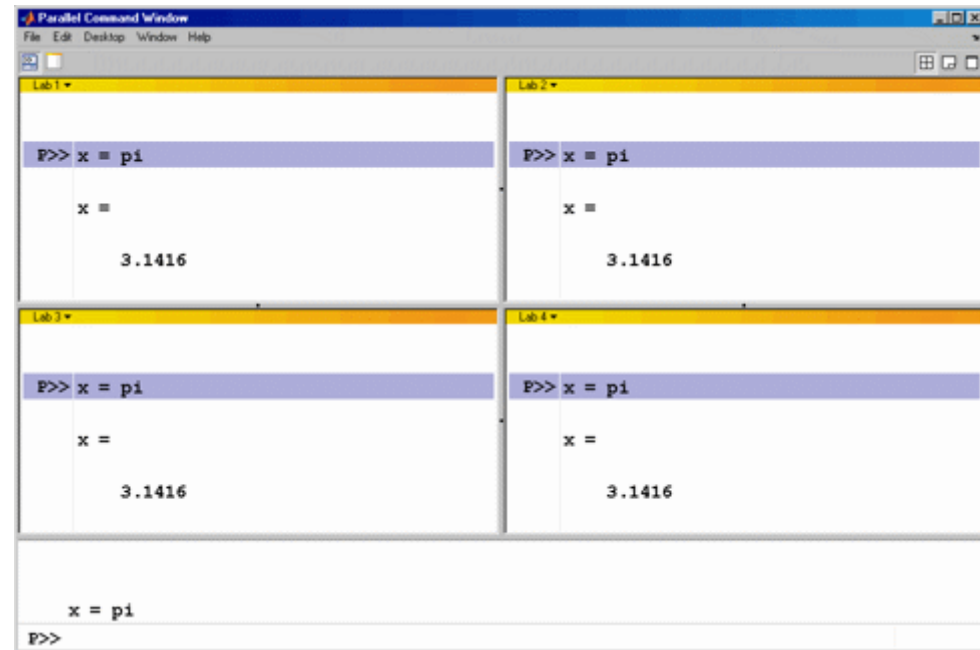
- matlabpool & parfor
- Parallel algorithms
 - Distributed arrays
- Message passing
 - labindex, numlabs
 - labSend, labReceive, labSendReceive
 - labBroadcast, labBarrier
 - labProbe
 - gop
- Schedulers
 - local
 - Job manager
 - mpiexec
 - Batch environment
 - CCS
 - Platform LSF
 - PBS family
 - Sun Grid Engine
- Debugging and profiling
 - Deadlock detection
 - MPI profiler

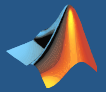
matlabpool and parfor

- Matlabpool
 - Enables parallel language features of the MATLAB language
- Parallel for loop
 - Drop down replacement of for
 - Incremental parallelization
 - Automatic language analysis
 - Reduction operations

Interactive Parallel Environment

- Window components
 - Output windows of each lab
 - Command prompt with history and search
- Local or remote labs
- Deadlock detection





Distributed Arrays in MATLAB

- Data parallelism
 - Large data sets
 - Data distributions
 - “Owner computes”
 - Single Instruction
Multiple Data
 - Message passing hidden
through OO overloading
- Parallel algorithms
 - Standard operators
 - Indexing
 - Linear algebra
 - Custom parallel for loops

Message Passing in MATLAB

- Basic functionality
 - 6 canonical MPI functions
- Additional functionality
 - Lock-free send/receive
 - Broadcasts, barriers
 - Reductions
- Debugging
 - pmode
- Profiling
 - MPI profiler
- Nomenclature
 - Lab vs. process
 - Index vs. rank