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 Advantages: Memory is scalable with number of processors. Increase the number of processors and the size of memory increases proportionately. 			
 Each processor can rapidly access its own memory without interference and without the overhead incurred with trying to maintain cache coherency. 			
 Cost effectiveness: can use commodity, off-the-shelf processors and networking. 			
Disadvantages:			
 The programmer is responsible for many of the details associated with data communication between processors. 			
 It may be difficult to map existing data structures, based on global memory, to this memory organization. 			
 Very different access times for local/non-local memory 			
 Administration and software overhead (essentially N systems vs. 1 SMP) 			
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- MPMD applications typically have multiple executable object files (programs). While the application is being run in parallel, each task can be executing the same or different program as other tasks.
- All tasks may use different data
- Workflow applications, multidisciplinary optimization, combination of different models







































PGAS: Co-Array Fortran			
 Developed in the late 90s (original name was F) Principle idea is language extension to Fortran called <i>co-array</i> Co-array is the mechanism for interprocessor communication ("co" stands for communication) Using square brackets for co-arrays [] indicating how data is distributed over processors 			
X = Y[PE] Y[PE] = X Y[:] = X Y[LIST] = X Z(:) = Y[:] S = MINVAL(Y[:] B(1:M)[1:N] = S	<pre>! get from Y[PE] ! put into Y[PE] ! broadcast X ! broadcast X over subset of PE's in arra ! LIST ! collect all Y ! min (reduce) all Y ! S scalar, promoted to array of shape ! (1:M,1:N)</pre>	ıy	
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Parallel Search

- Parallel search of an extremely large (several thousand elements) integer array. The program finds all occurrences of a certain integer, called the target, and writes all the array indices where the target was found to an output file. In addition, the program reads both the target value and all the array elements from an input file.
- Combine two of the concepts discussed in this lesson: the master-slave notion described in functional decomposition and domain decomposition. The master will be responsible for all input and output and communicating with each of the slaves. The slaves will search different sections of the entire array for the target with their searches occuring in parallel.



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Parallel Search Cont'd

- Each slave processor has a simpler set of tasks:
 - Receive from the master the value for the target.
 - Receive from the master the subarray it is supposed to search.
 - Completely scan through its subarray, sending the locations of the target to the master as it finds them.