

## 4.9.5. All-Reduce



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MPI includes variants of each of the reduce operations where the result is returned to all processes in the group. MPI requires that all processes participating in these operations receive identical results.

**MPI\_ALLREDUCE**( sendbuf, recvbuf, count, datatype, op, comm)

[ IN sendbuf] starting address of send buffer (choice)

[ OUT recvbuf] starting address of receive buffer (choice)

[ IN count] number of elements in send buffer (integer)

[ IN datatype] data type of elements of send buffer (handle)

[ IN op] operation (handle)

[ IN comm] communicator (handle)

```
int MPI_Allreduce(void* sendbuf, void* recvbuf, int count, MPI_Datatype datatype, MPI_Op op,
MPI_Comm comm)
```

```
MPI_ALLREDUCE(SENDBUF, RECVBUF, COUNT, DATATYPE, OP, COMM, IERROR)
<type> SENDBUF(*), RECVBUF(*)
INTEGER COUNT, DATATYPE, OP, COMM, IERROR
```

Same as MPI\_REDUCE except that the result appears in the receive buffer of all the group members.

[ ] *Advice to implementors.*

The all-reduce operations can be implemented as a reduce, followed by a broadcast. However, a direct implementation can lead to better performance. ( *End of advice to implementors.*)

### Example

A routine that computes the product of a vector and an array that are distributed across a group of processes and returns the answer at all nodes (see also Example [Predefined reduce operations](#)).

```
SUBROUTINE PAR_BLAS2(m, n, a, b, c, comm)
REAL a(m), b(m,n)      ! local slice of array
REAL c(n)              ! result
REAL sum(n)
INTEGER n, comm, i, j, ierr

! local sum
DO j= 1, n
  sum(j) = 0.0
  DO i = 1, m
    sum(j) = sum(j) + a(i)*b(i,j)
  END DO
END DO

! global sum
CALL MPI_ALLREDUCE(sum, c, n, MPI_REAL, MPI_SUM, 0, comm, ierr)
```

```
! return result at all nodes  
RETURN
```

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