

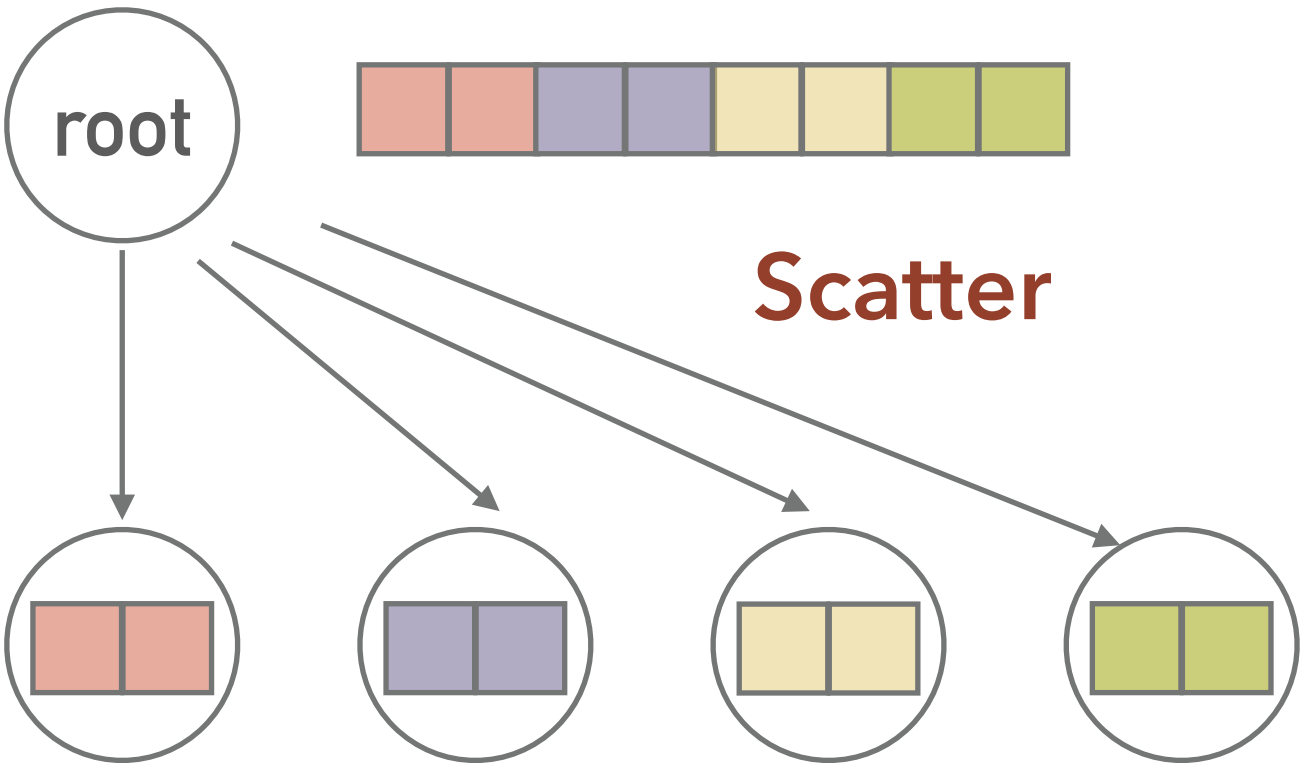
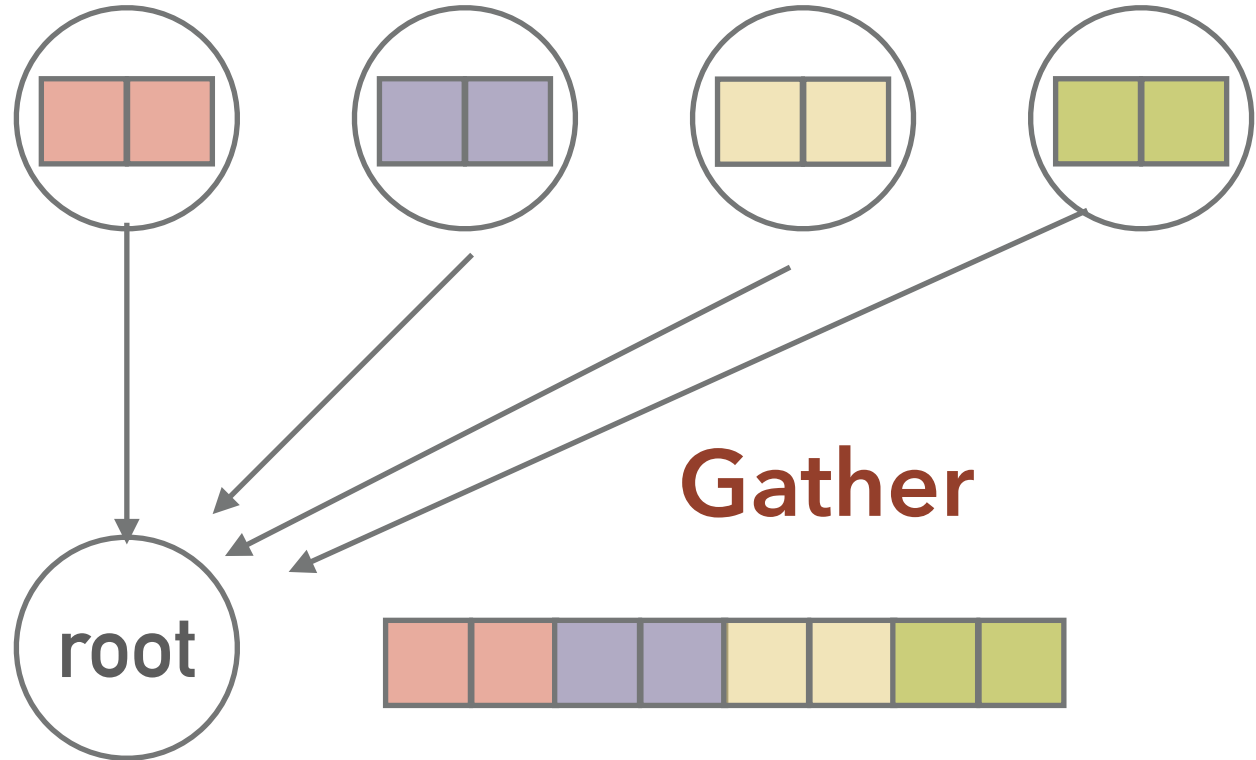
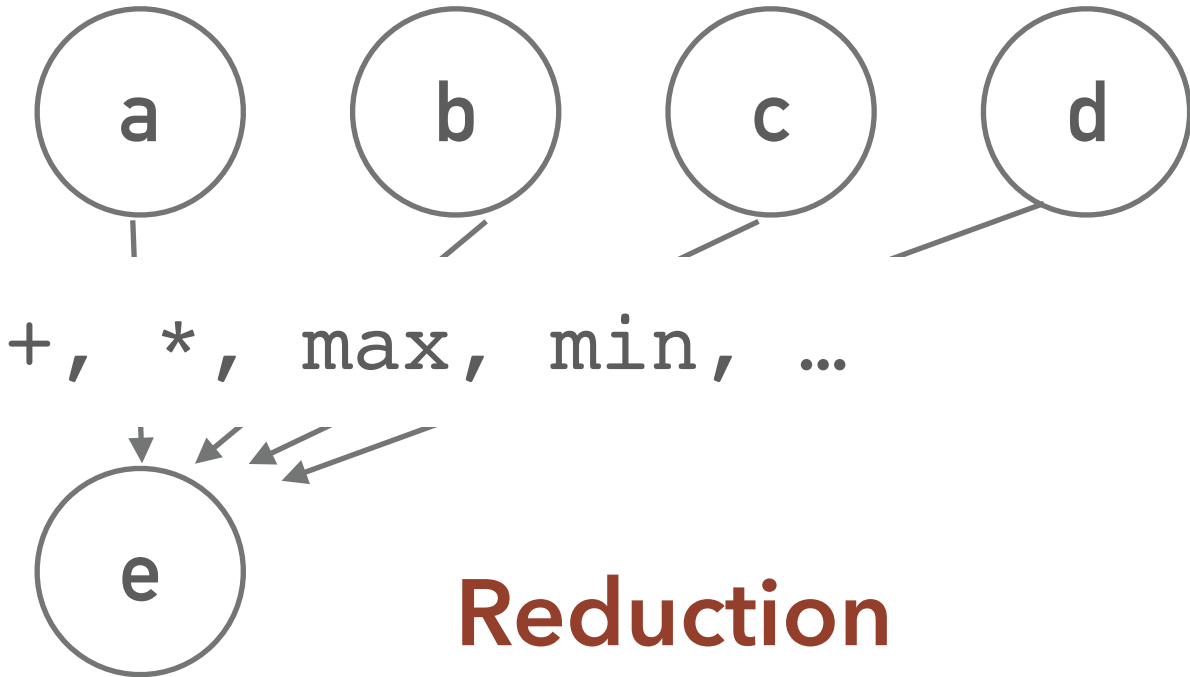
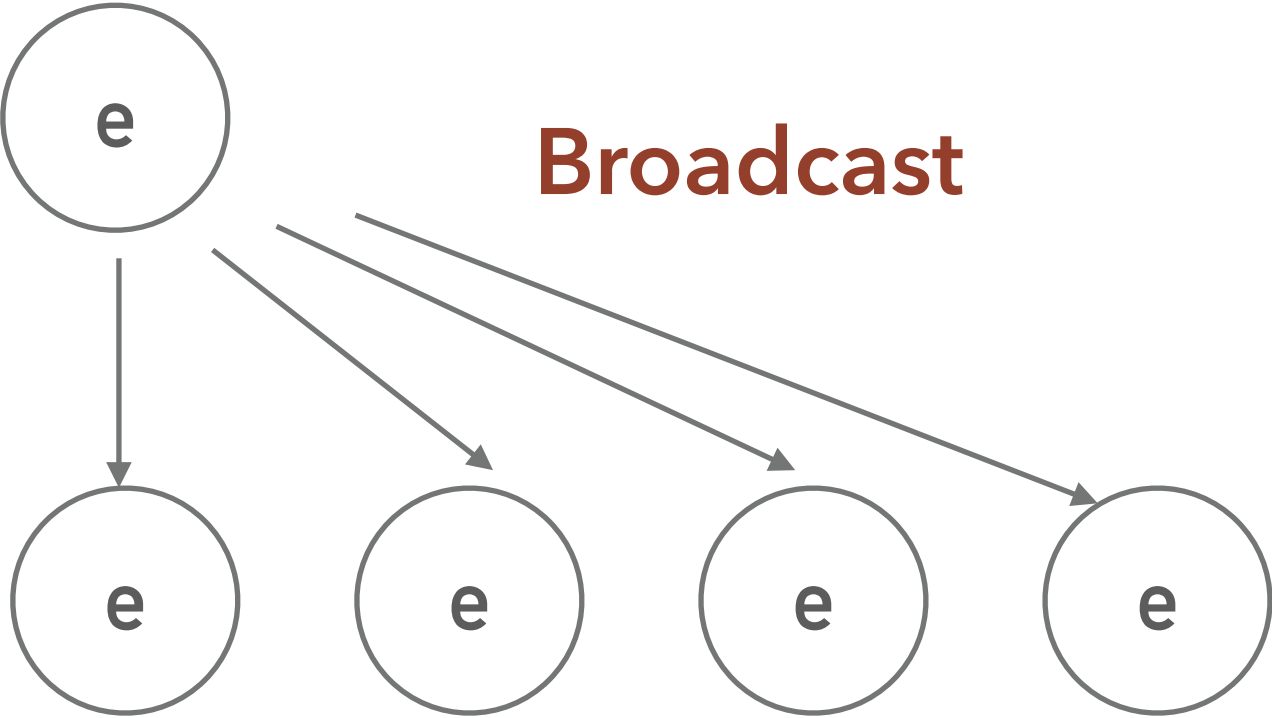


ME 471/571

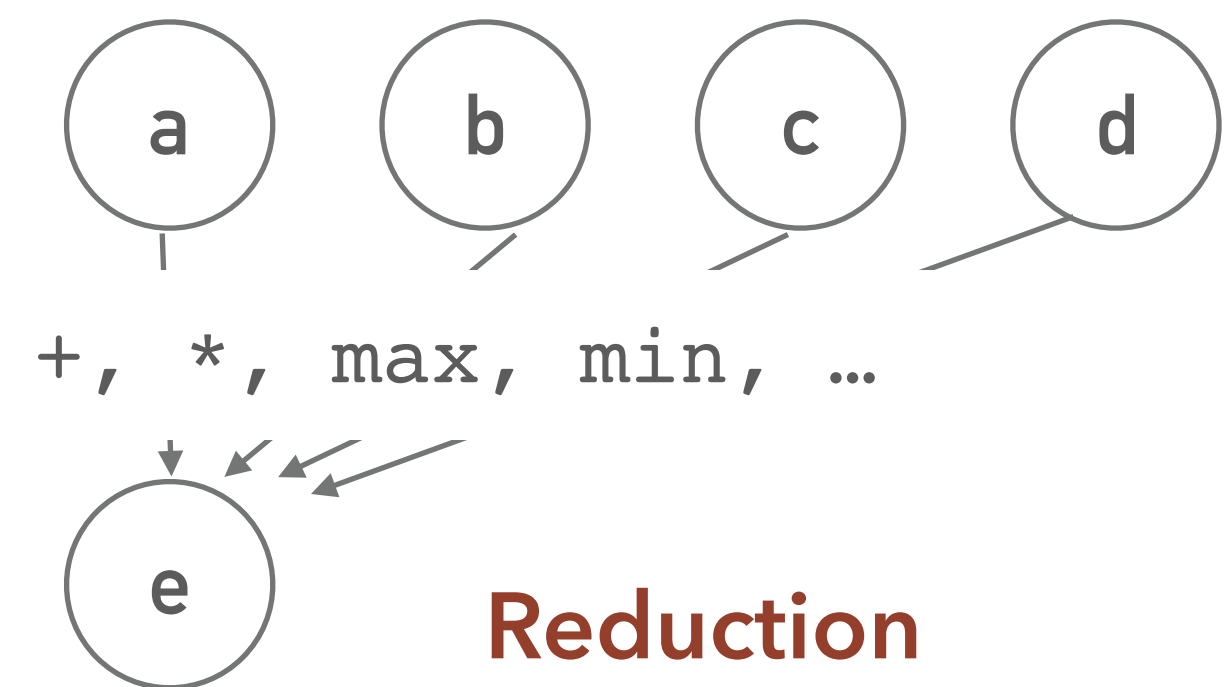
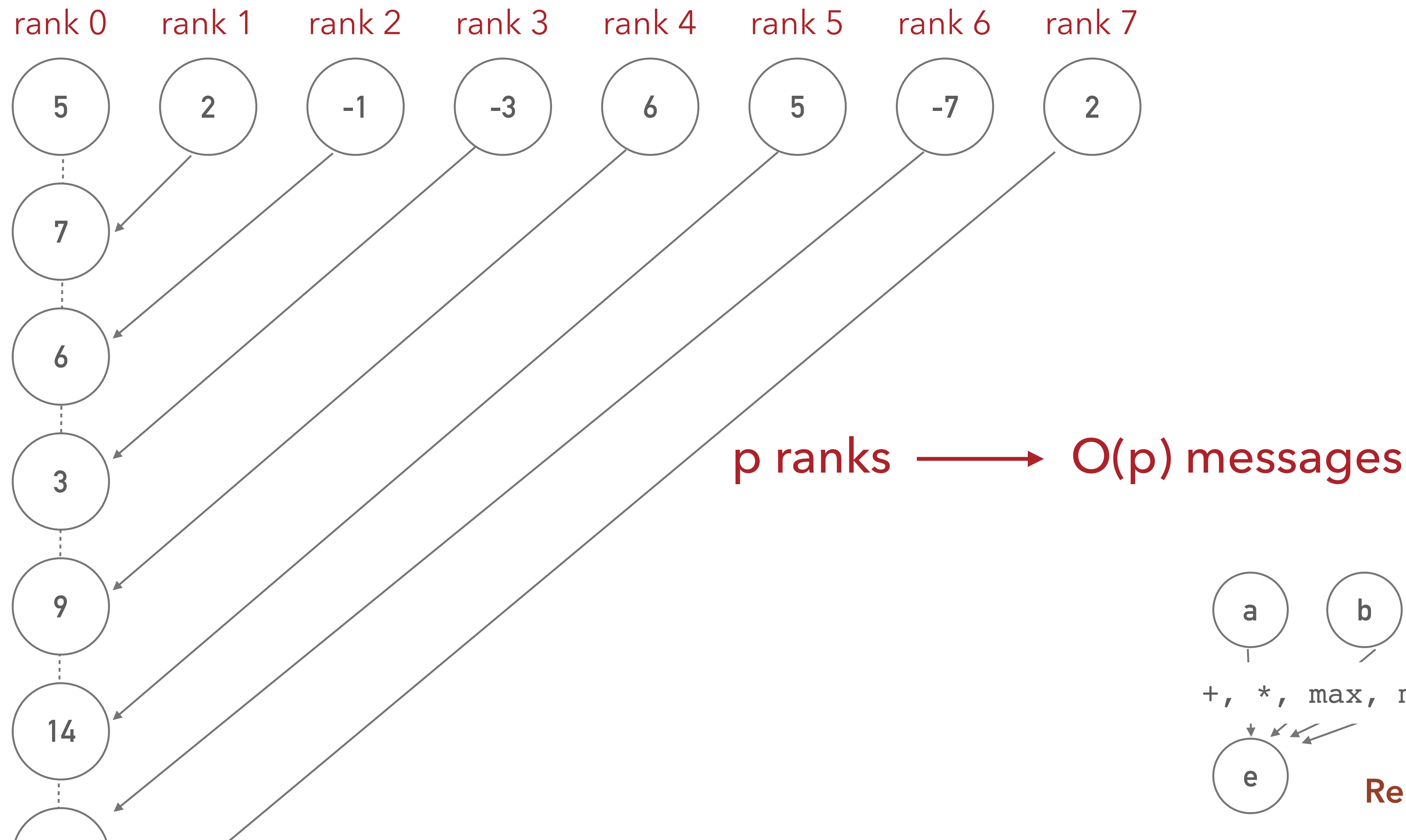
Point-to-point communication



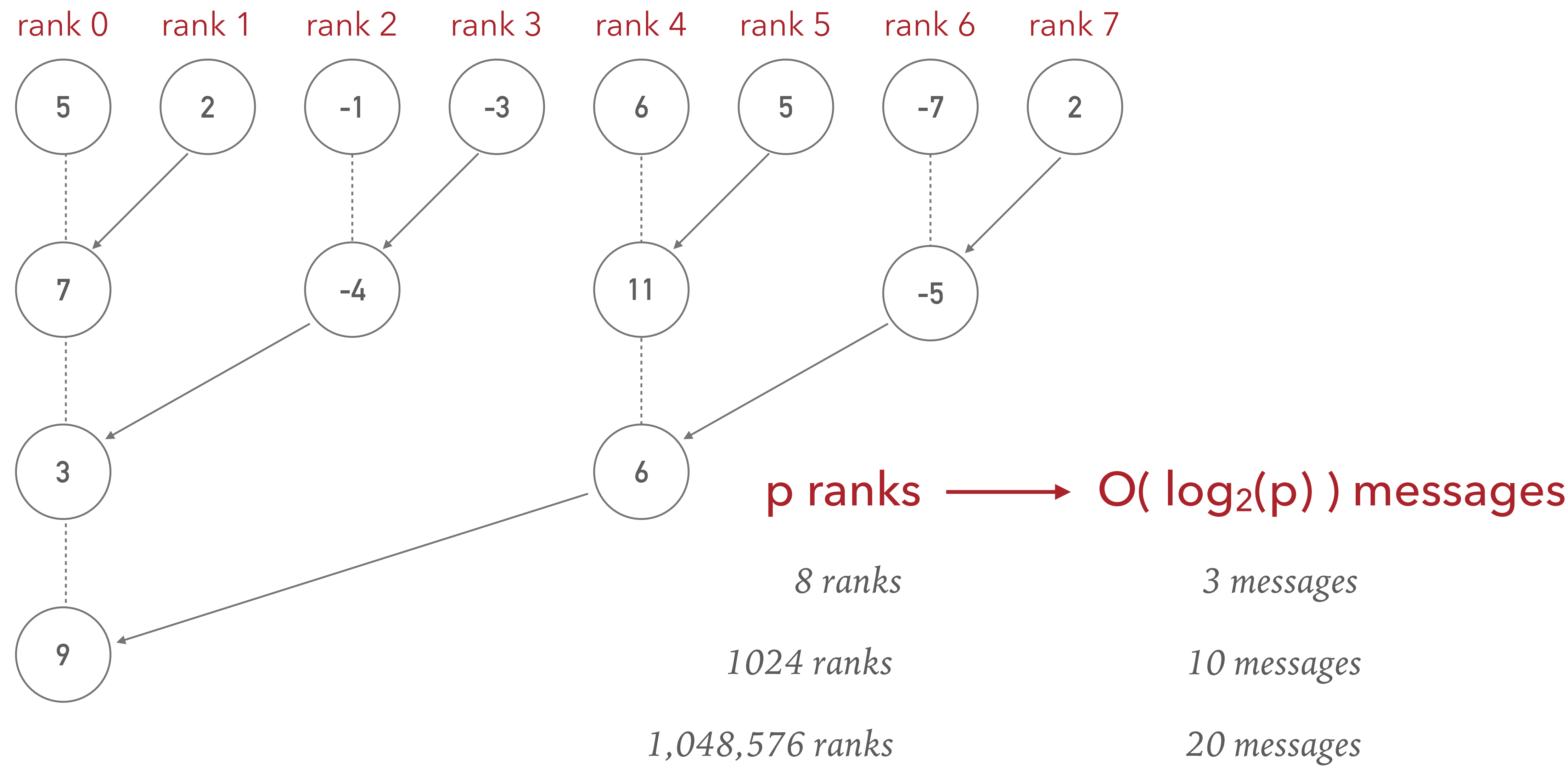
COLLECTIVE COMMUNICATION PATTERNS



SUM REDUCTION



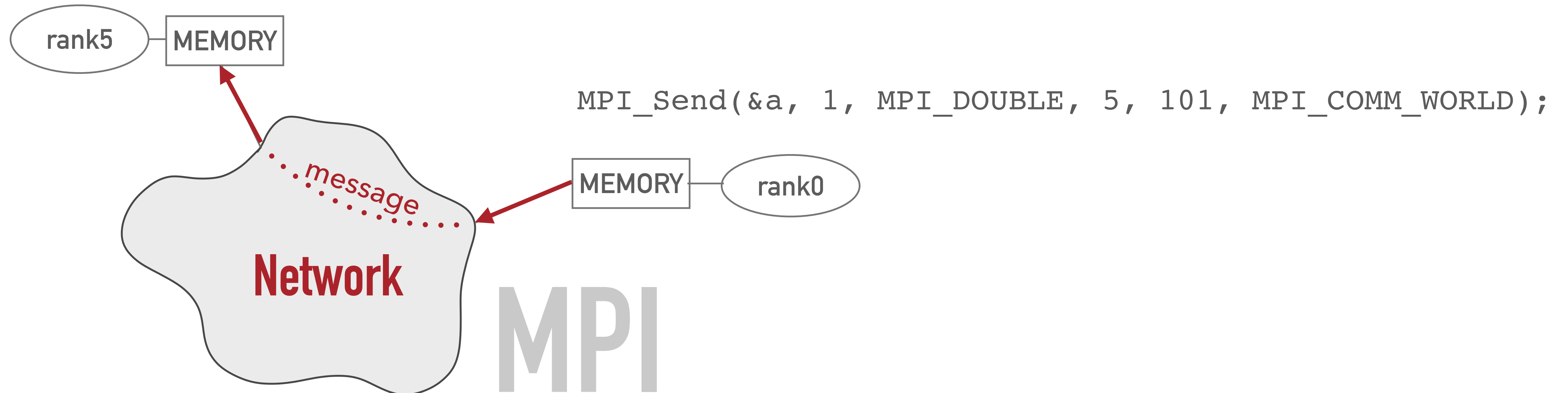
PARALLEL ADDITION IMPROVED



MPI_SEND – SEND A MESSAGE

which data? *how much data?* *what kind of data?* *where?*

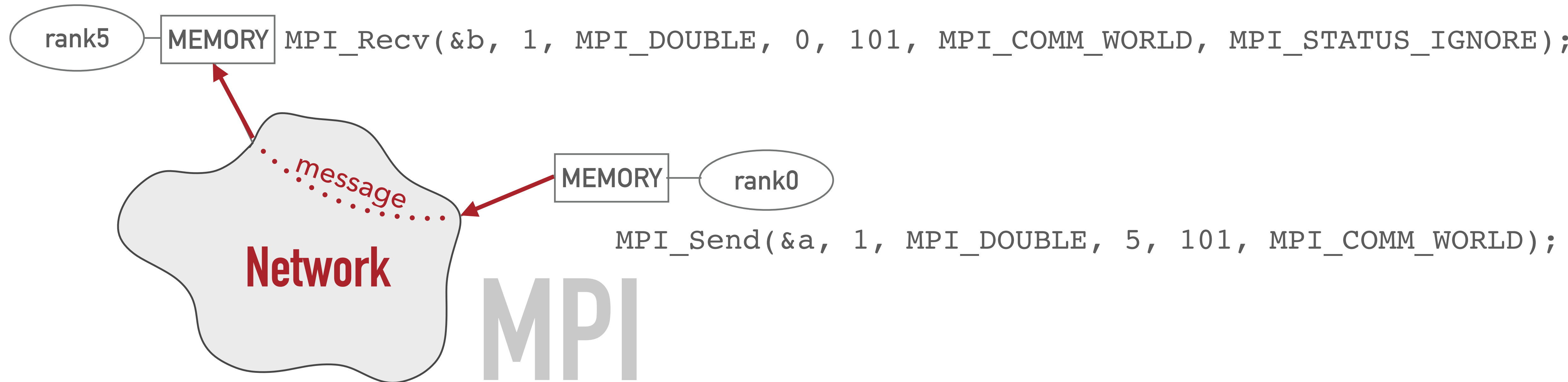
```
MPI_Send(void* data, int count, MPI_Datatype datatype, int destination,...  
        int tag, MPI_Comm communicator)
```



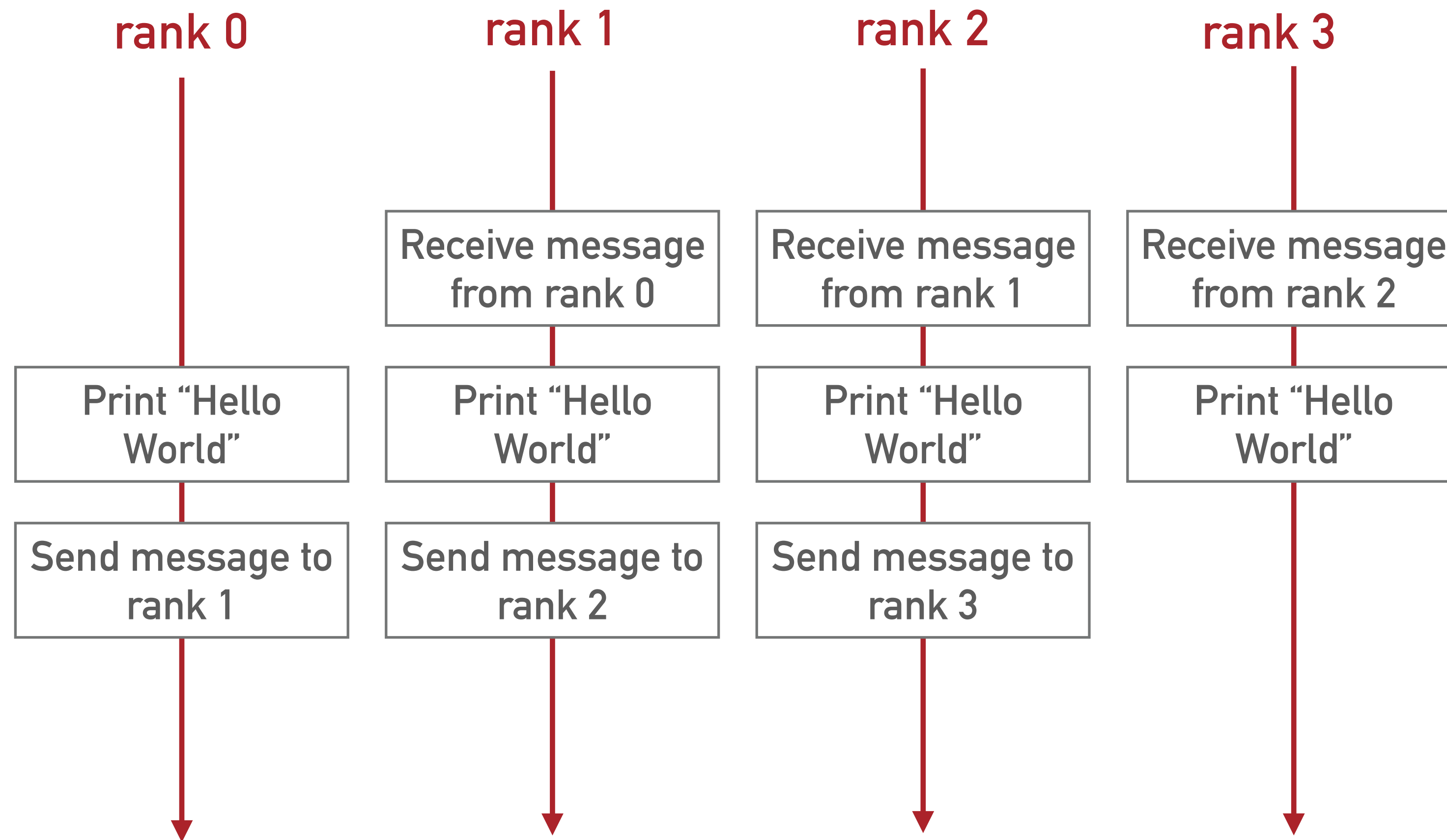
MPI_RECV – RECEIVE A MESSAGE

where to put it? *how much data?* *what kind of data?* *where from?*

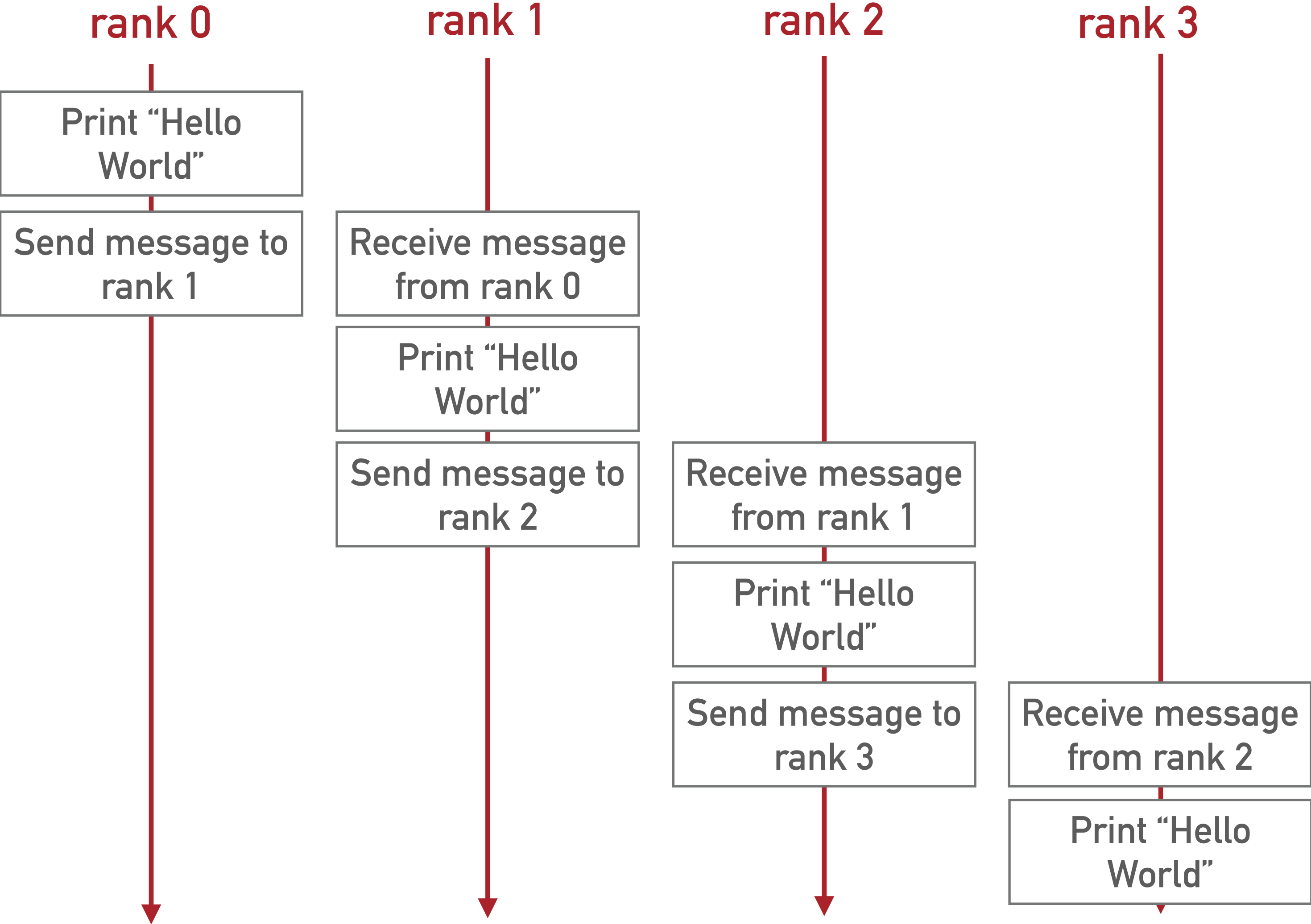
```
MPI_Recv(void* data, int count, MPI_Datatype datatype, int source, ...  
        int tag, MPI_Comm communicator, MPI_Status status)
```



POINT-TO-POINT HELLO WORLD



POINT-TO-POINT HELLO WORLD

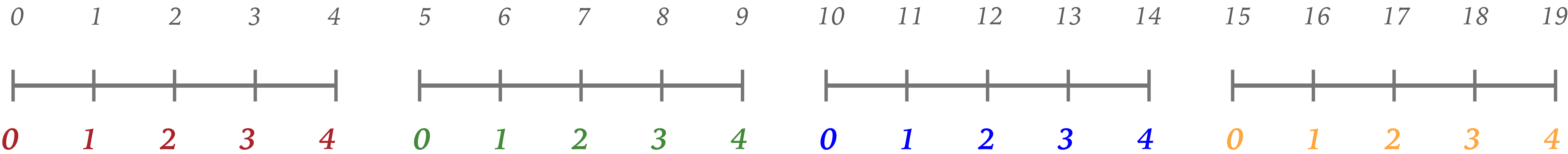


TOWARD SOLVING PDE'S

Consider the finite difference scheme we discussed at the beginning of the course:

$$\frac{\partial u}{\partial x} \approx \frac{u_{i+1} - u_{i-1}}{2\Delta x}$$

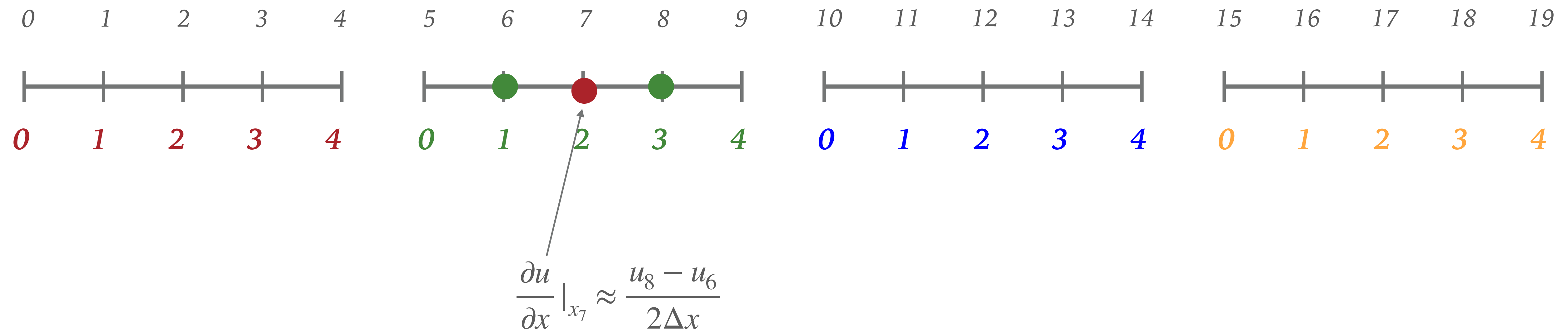
Let's say we have data u which is distributed across processes:



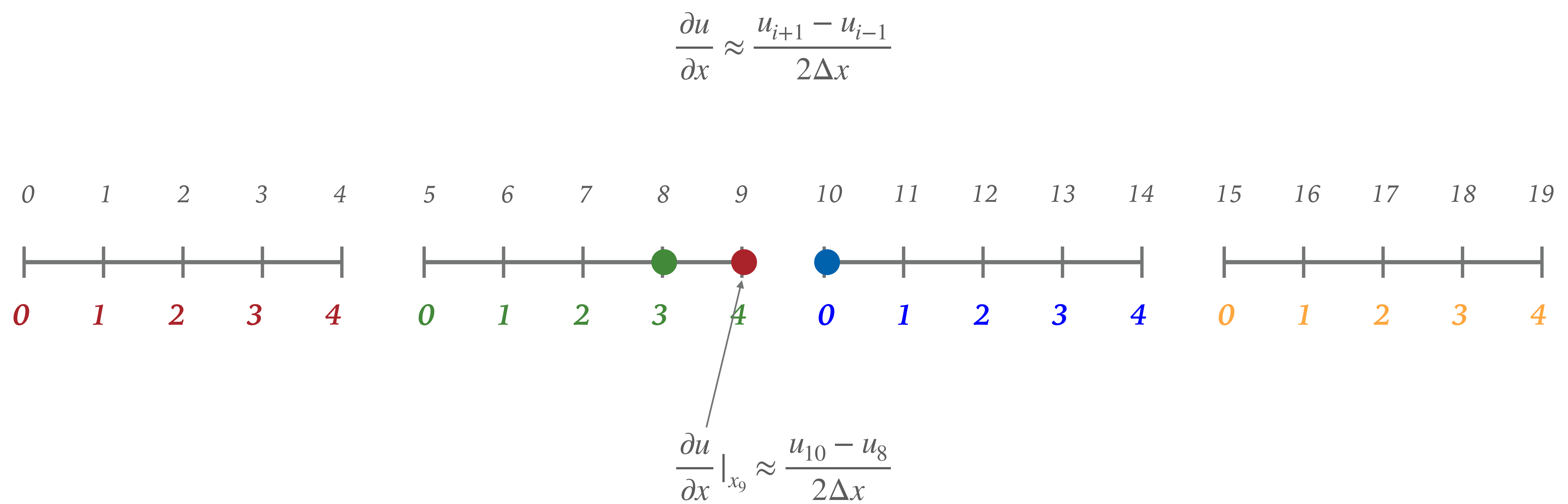
TOWARD SOLVING PDE'S

.....

$$\frac{\partial u}{\partial x} \approx \frac{u_{i+1} - u_{i-1}}{2\Delta x}$$

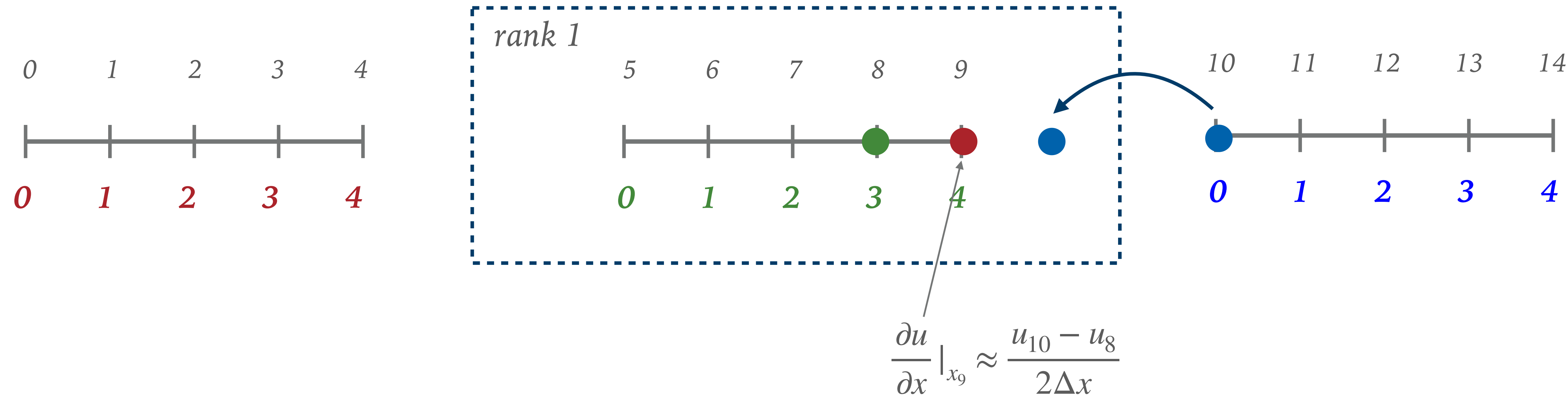


TOWARD SOLVING PDE'S

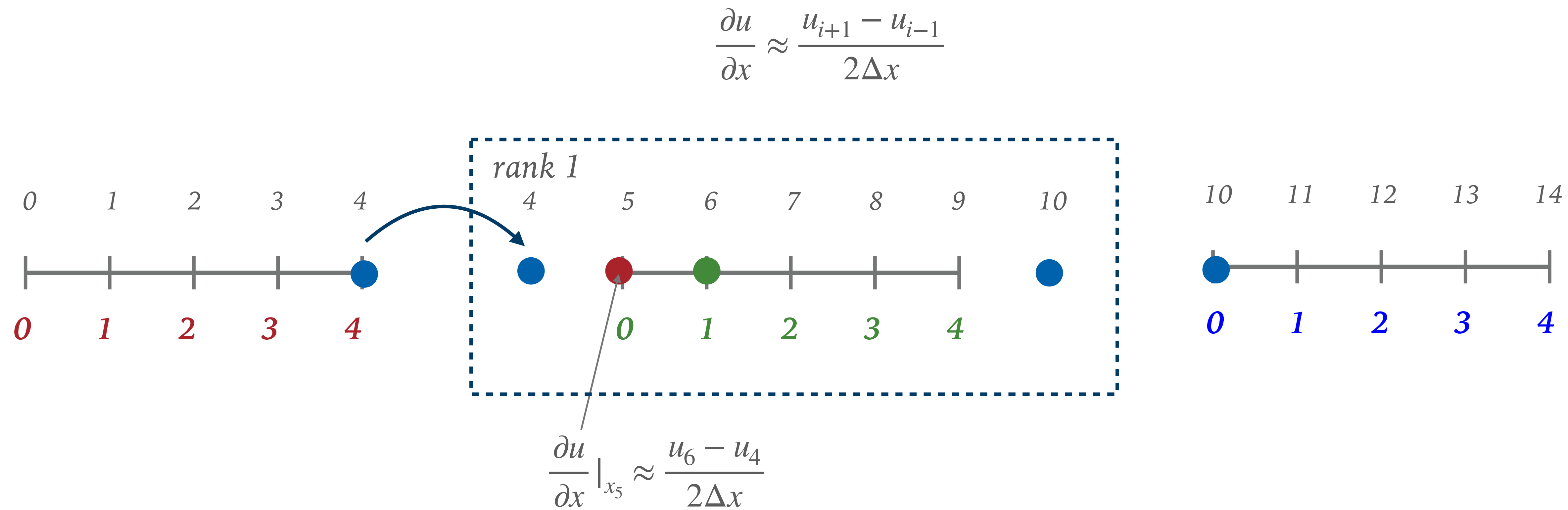


TOWARD SOLVING PDE'S

$$\frac{\partial u}{\partial x} \approx \frac{u_{i+1} - u_{i-1}}{2\Delta x}$$



TOWARD SOLVING PDE'S



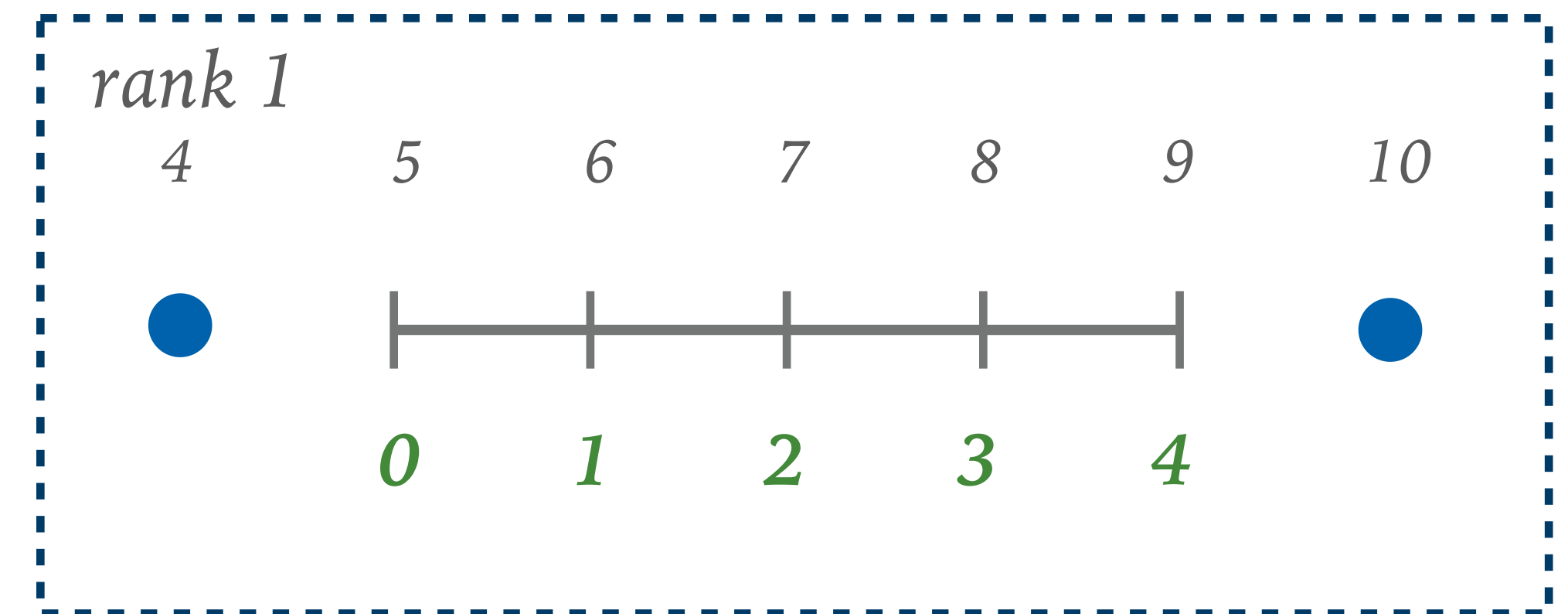
TOWARD SOLVING PDE'S

1) Receive a value of u_4 from irank-1

2) Receive a value of u_{10} from irank+1

3) Compute finite difference using values $u_0, u_1, \dots, u_{N_{loc}-1}$
and two recieved end values

$$\frac{\partial u}{\partial x} \approx \frac{u_{i+1} - u_{i-1}}{2\Delta x}$$



TOWARD SOLVING PDE'S

1) Receive a value of u_4 from irank-1

2) Send a value of u_9 to irank+1

3) Receive a value of u_{10} from irank+1

4) Send a value of u_5 to irank-1

3) Compute finite difference using values $u_0, u_1, \dots, u_{N_{loc}-1}$

and two recieved end values

$$\frac{\partial u}{\partial x} \approx \frac{u_{i+1} - u_{i-1}}{2\Delta x}$$

