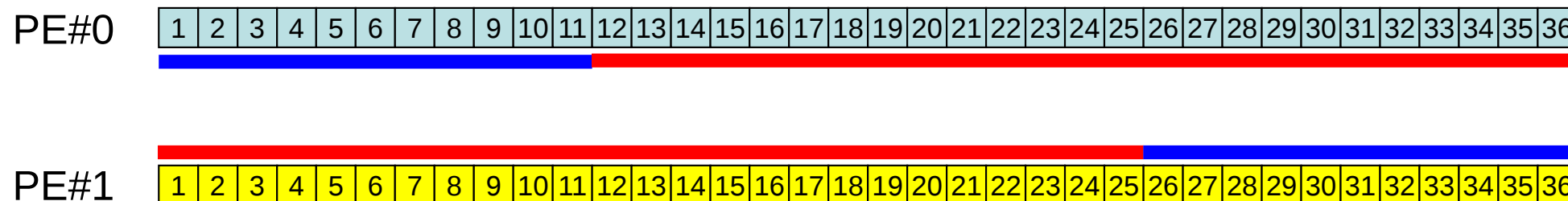


Ex.2: Send-Recv an Array (1/4)

- Exchange VEC (real, 8-byte) between PE#0 & PE#1
- PE#0 to PE#1
 - PE#0: send VEC(1)-VEC(11) (length=11)
 - PE#1: recv. as VEC(26)-VEC(36) (length=11)
- PE#1 to PE#0
 - PE#1: send VEC(1)-VEC(25) (length=25)
 - PE#0: recv. as VEC(12)-VEC(36) (length=25)



Practice: t1

- Initial status of VEC(:):
 - PE#0 VEC(1-36)= 101,102,103,~,135,136
 - PE#1 VEC(1-36)= 201,202,203,~,235,236
- Sample codes are in the following directory.
/work/gt00/z30088/pFEM/answer/t1
- Copy them to <\$O-S2>
/work/gt55/t55XXX/pFEM/mpi/S2

Notice: Send/Recv Arrays

#PE0

send:

VEC(start_send)~
VEC(start_send+length_send-1)

#PE1

send:

VEC(start_send)~
VEC(start_send+length_send-1)

#PE0

recv:

VEC(start_recv)~
VEC(start_recv+length_recv-1)

#PE1

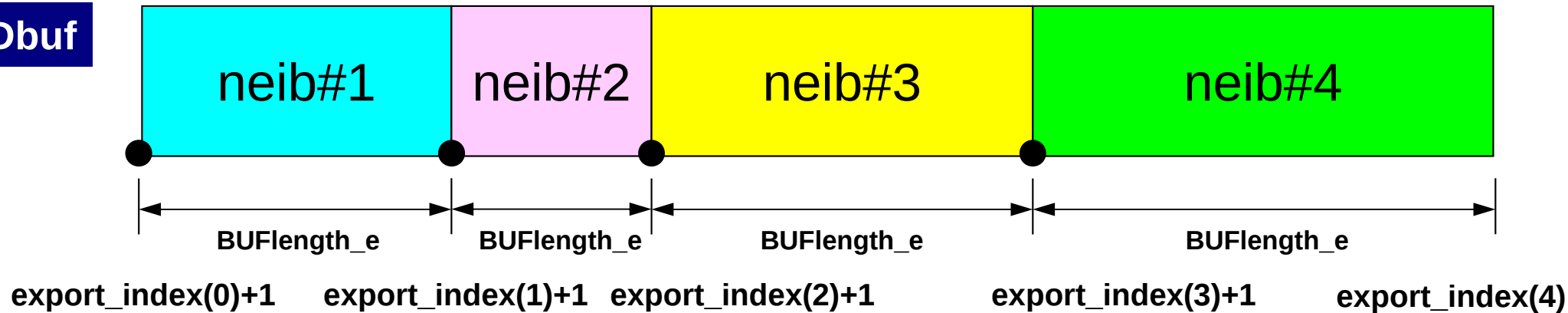
recv:

VEC(start_recv)~
VEC(start_recv+length_recv-1)

- “length_send” of sending process must be equal to “length_recv” of receiving process.
 - PE#0 to PE#1, PE#1 to PE#0
- “sendbuf” and “recvbuf”: different address

SEND: MPI_Isend/Irecv/Waitall

SENDbuf



```
do neib= 1, NEIBPETOT
```

```
  iS_e= export_index(neib-1) + 1
```

```
  iE_e= export_index(neib)
```

```
  BUFlength_e= iE_e + 1 - iS_e
```

```
  call MPI_ISEND
```

```
  &    (SENDbuf(iS_e), BUFlength_e, MPI_INTEGER,
```

```
  &    NEIBPE(neib), 0, MPI_COMM_WORLD,
```

```
  &    request_send(neib), ierr)
```

```
enddo
```

```
call MPI_WAITALL (NEIBPETOT, request_send, stat_recv, ierr)
```

RECV: MPI_Isend/Irecv/Waitall

```
do neib= 1, NEIBPETOT
```

```
  iS_i= import_index(neib-1) + 1
```

```
  iE_i= import_index(neib )
```

```
  BUFlength_i= iE_i + 1 - iS_i
```

```
  call MPI_Irecv
```

```
&      (RECVbuf(iS_i), BUFlength_i, MPI_INTEGER,
```

```
&      &
```

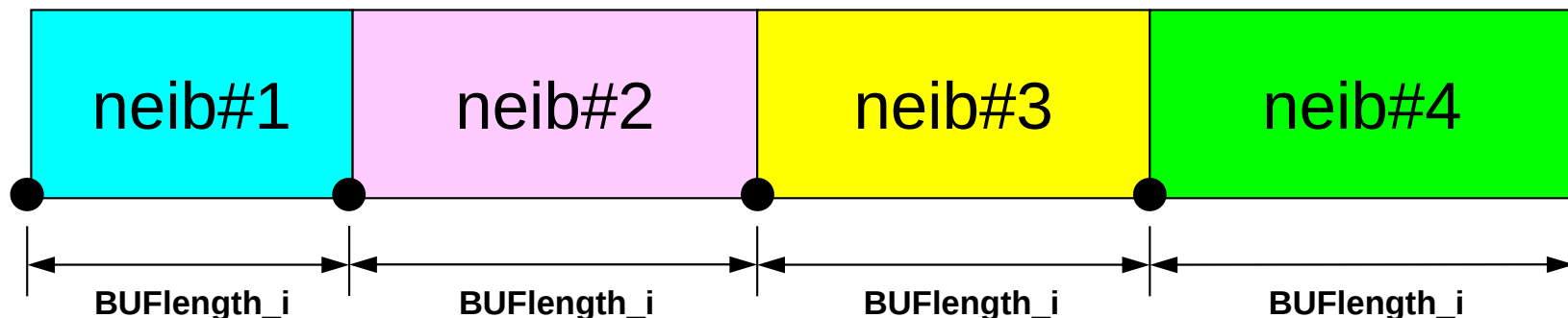
```
      NEIBPE(neib), 0, MPI_COMM_WORLD,
```

```
      request_recv(neib), ierr)
```

```
enddo
```

```
call MPI_WAITALL (NEIBPETOT, request_recv, stat_recv, ierr)
```

RECVbuf



import_index(0)+1 import_index(1)+1 import_index(2)+1 import_index(3)+1 import_index(4)

Example: Fortran (1/3)

Fortran

Isend/Irecv/Waitall

```
$> cd /work/gt55/t55XXX/pFEM/mpi/S2
$> module load fj
$> mpifrtpx -Kfast ex2a.f
$> pjsub go2.sh
```

```
implicit REAL*8 (A-H,O-Z)
include 'mpif.h'

integer(kind=4) :: my_rank, PETOT, NEIB
real (kind=8) :: VEC(36)

integer(kind=4), dimension(MPI_STATUS_SIZE,1) :: stat_send
integer(kind=4), dimension(MPI_STATUS_SIZE,1) :: stat_recv
integer(kind=4), dimension(1) :: request_send
integer(kind=4), dimension(1) :: request_recv

integer(kind=4) :: start_send, length_send
integer(kind=4) :: start_recv, length_recv

call MPI_INIT (ierr)
call MPI_COMM_SIZE (MPI_COMM_WORLD, PETOT, ierr )
call MPI_COMM_RANK (MPI_COMM_WORLD, my_rank, ierr )
```

Example: Fortran (2/3)

Fortran

Isend/Irecv/Waitall

```
if (my_rank.eq.0) then
  NEIB= 1
  start_send= 1
  length_send= 11
  start_recv= length_send + 1
  length_recv= 25
  do i= 1, 36
    VEC(i)= 100 + i
  enddo
endif

if (my_rank.eq.1) then
  NEIB= 0
  start_send= 1
  length_send= 25
  start_recv= length_send + 1
  length_recv= 11
  do i= 1, 36
    VEC(i)= 200 + i
  enddo
endif

do i= 1, 36
  write (*, '(i1,a,i2,f10.0)') my_rank, ' #BEFORE# ', i, VEC(i)
enddo
```

Example: Fortran (3/3)

Fortran

Isend/Irecv/Waitall

```
call MPI_ISEND (VEC(start_send), length_send,      &
&              MPI_DOUBLE_PRECISION, NEIB, 0, MPI_COMM_WORLD, &
&              request_send(1), ierr)
call MPI_Irecv (VEC(start_recv), length_recv,      &
&              MPI_DOUBLE_PRECISION, NEIB, 0, MPI_COMM_WORLD, &
&              request_recv(1), ierr)

call MPI_WAITALL (1, request_recv, stat_recv, ierr)
call MPI_WAITALL (1, request_send, stat_send, ierr)

do i= 1, 36
  write (*,'(i1,a,i2,f10.0)') my_rank, ' #AFTER # ', i,VEC(i)
enddo

call MPI_FINALIZE (ierr)

end
```

- Portability !
- “Data (structure) is everything”... don't you agree with that ?

Results

0	#BEFORE#	1	101.
0	#BEFORE#	2	102.
0	#BEFORE#	3	103.
0	#BEFORE#	4	104.
0	#BEFORE#	5	105.
0	#BEFORE#	6	106.
0	#BEFORE#	7	107.
0	#BEFORE#	8	108.
0	#BEFORE#	9	109.
0	#BEFORE#	10	110.
0	#BEFORE#	11	111.
0	#BEFORE#	12	112.
0	#BEFORE#	13	113.
0	#BEFORE#	14	114.
0	#BEFORE#	15	115.
0	#BEFORE#	16	116.
0	#BEFORE#	17	117.
0	#BEFORE#	18	118.
0	#BEFORE#	19	119.
0	#BEFORE#	20	120.
0	#BEFORE#	21	121.
0	#BEFORE#	22	122.
0	#BEFORE#	23	123.
0	#BEFORE#	24	124.
0	#BEFORE#	25	125.
0	#BEFORE#	26	126.
0	#BEFORE#	27	127.
0	#BEFORE#	28	128.
0	#BEFORE#	29	129.
0	#BEFORE#	30	130.
0	#BEFORE#	31	131.
0	#BEFORE#	32	132.
0	#BEFORE#	33	133.
0	#BEFORE#	34	134.
0	#BEFORE#	35	135.
0	#BEFORE#	36	136.

0	#AFTER #	1	101.
0	#AFTER #	2	102.
0	#AFTER #	3	103.
0	#AFTER #	4	104.
0	#AFTER #	5	105.
0	#AFTER #	6	106.
0	#AFTER #	7	107.
0	#AFTER #	8	108.
0	#AFTER #	9	109.
0	#AFTER #	10	110.
0	#AFTER #	11	111.
0	#AFTER #	12	201.
0	#AFTER #	13	202.
0	#AFTER #	14	203.
0	#AFTER #	15	204.
0	#AFTER #	16	205.
0	#AFTER #	17	206.
0	#AFTER #	18	207.
0	#AFTER #	19	208.
0	#AFTER #	20	209.
0	#AFTER #	21	210.
0	#AFTER #	22	211.
0	#AFTER #	23	212.
0	#AFTER #	24	213.
0	#AFTER #	25	214.
0	#AFTER #	26	215.
0	#AFTER #	27	216.
0	#AFTER #	28	217.
0	#AFTER #	29	218.
0	#AFTER #	30	219.
0	#AFTER #	31	220.
0	#AFTER #	32	221.
0	#AFTER #	33	222.
0	#AFTER #	34	223.
0	#AFTER #	35	224.
0	#AFTER #	36	225.

1	#BEFORE#	1	201.
1	#BEFORE#	2	202.
1	#BEFORE#	3	203.
1	#BEFORE#	4	204.
1	#BEFORE#	5	205.
1	#BEFORE#	6	206.
1	#BEFORE#	7	207.
1	#BEFORE#	8	208.
1	#BEFORE#	9	209.
1	#BEFORE#	10	210.
1	#BEFORE#	11	211.
1	#BEFORE#	12	212.
1	#BEFORE#	13	213.
1	#BEFORE#	14	214.
1	#BEFORE#	15	215.
1	#BEFORE#	16	216.
1	#BEFORE#	17	217.
1	#BEFORE#	18	218.
1	#BEFORE#	19	219.
1	#BEFORE#	20	220.
1	#BEFORE#	21	221.
1	#BEFORE#	22	222.
1	#BEFORE#	23	223.
1	#BEFORE#	24	224.
1	#BEFORE#	25	225.
1	#BEFORE#	26	226.
1	#BEFORE#	27	227.
1	#BEFORE#	28	228.
1	#BEFORE#	29	229.
1	#BEFORE#	30	230.
1	#BEFORE#	31	231.
1	#BEFORE#	32	232.
1	#BEFORE#	33	233.
1	#BEFORE#	34	234.
1	#BEFORE#	35	235.
1	#BEFORE#	36	236.

1	#AFTER #	1	201.
1	#AFTER #	2	202.
1	#AFTER #	3	203.
1	#AFTER #	4	204.
1	#AFTER #	5	205.
1	#AFTER #	6	206.
1	#AFTER #	7	207.
1	#AFTER #	8	208.
1	#AFTER #	9	209.
1	#AFTER #	10	210.
1	#AFTER #	11	211.
1	#AFTER #	12	212.
1	#AFTER #	13	213.
1	#AFTER #	14	214.
1	#AFTER #	15	215.
1	#AFTER #	16	216.
1	#AFTER #	17	217.
1	#AFTER #	18	218.
1	#AFTER #	19	219.
1	#AFTER #	20	220.
1	#AFTER #	21	221.
1	#AFTER #	22	222.
1	#AFTER #	23	223.
1	#AFTER #	24	224.
1	#AFTER #	25	225.
1	#AFTER #	26	101.
1	#AFTER #	27	102.
1	#AFTER #	28	103.
1	#AFTER #	29	104.
1	#AFTER #	30	105.
1	#AFTER #	31	106.
1	#AFTER #	32	107.
1	#AFTER #	33	108.
1	#AFTER #	34	109.
1	#AFTER #	35	110.
1	#AFTER #	36	111.