MPI Parallel Prefix Sum (1A)

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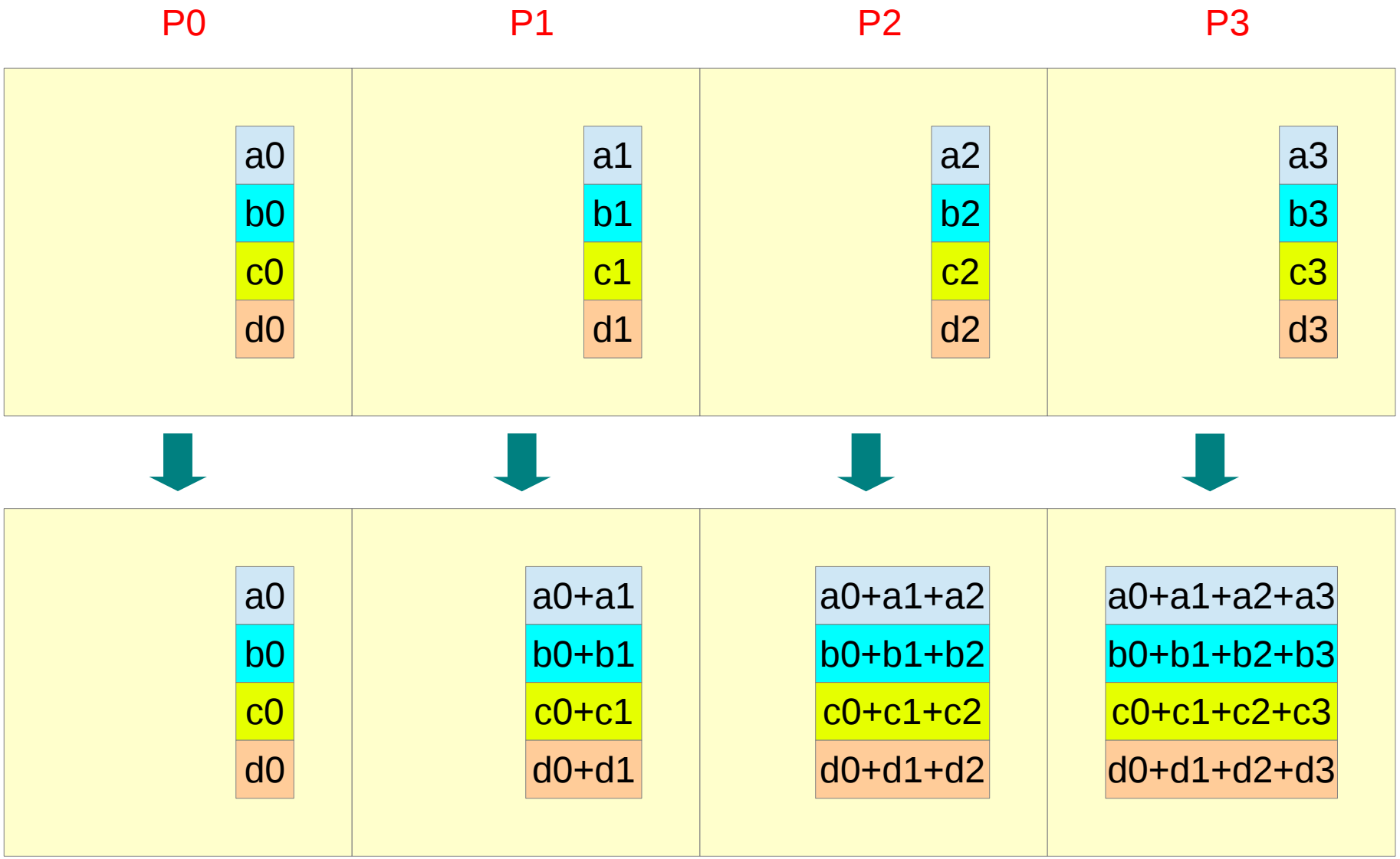
MPI Parallel Prefix – Scan



Parallel Prefix Sum

```
MPI_Scan(   void *sbuf,
            void *rbuf,
            int count,
            MPI_Datatype stype,
            MPI_Op op,
            MPI_Comm comm      )
```

Parallel Prefix Sum

MPI_OP	Operation	C	Fortran
MPI_MAX	maximum		
MPI_MIN	minimum		
MPI_SUM	sum		
MPI_PROD	product		
MPI_LAND	logical and		
MPI_BAND	bit-wise and		
MPI_LOR	logical or		
MPI_BOR	bit-wise or		
MPI_LXOR	logical xor		
MPI_BXOR	bit-wise xor		
MPI_MAXLOC	max val and loc		
MPI_MINLOC	min val and loc		

Parallel Prefix Sum

http://www.mpi-forum.org/docs/mpi-1.1/mpi-11-html/node85.html

```
typedef struct {
    double val;
    int log;
} SegScanPair;

/* the user-defined function */
void segScan
( SegScanPair *in, SegScanPair *inout, int *len, MPI_Datatype *dptr ) {

  int i; SegScanPair c;

  for (i=0; i< *len; ++i) {
    if ( in->log == inout->log ) c.val = in->val + inout->val;
    else c.val = inout->val;

    c.log = inout->log;

    *inout = c;
    in++;
    inout++;
  }
}
```

Parallel Prefix Sum

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```
int i,base;
    SeqScanPair  a, answer;
    MPI_Op       myOp;
    MPI_Datatype type[2] = {MPI_DOUBLE, MPI_INT};
    MPI_Aint     disp[2];
    int          blocklen[2] = { 1, 1};
    MPI_Datatype sspair;

/* explain to MPI how type SegScanPair is defined */
  MPI_Address( a, disp);
  MPI_Address( a.log, disp+1);
  base = disp[0];

  for (i=0; i<2; ++i) disp[i] -= base;

  MPI_Type_struct( 2, blocklen, disp, type, &sspair );
  MPI_Type_commit( &sspair ); /* create the segmented-scan user-op */

  MPI_Op_create( segScan, False, &myOp );
  ...
  MPI_Scan( a, answer, 1, sspair, myOp, root, comm );
```

References

[1] en.wikipedia.org
[2] R. v. Engelen, www.cs.fsu.edu/~engelen/courses/HPC/MessagePassing2.pdf