

Minutes of DPCE Meeting  
6 December 1993

Kona Hilton  
Resolution Room  
Kailua-Kona, Hawaii

## Attendees

Harry Cheng, Frank Farance, Jamie Frankel, Bob Jervis, David Keaton, John Kwan, Tom MacDonald, Linda Stanberry, Fred Tydeman.

The purpose of the meeting was to gather feedback and listen to suggestions for changes to the draft DPCE document.

Kwan suggested that the proposal should include what happens on a single processor system.

Tydeman asked what happens with undefined operations (NaN's, etc.) during execution of a parallel operation.

Farance gave a presentation of:

- An alternative Method of Specifying DPCE features
  - ALO is new aggregate type
- Use ISO 8485 (APL Language) as additional base document for describing:
  - ALO (APL multidimensional arrays)
  - Slicing (APL indexing)
  - Parallel operands (APL scalar function promotions)
  - Shape (APL shape)
  - Reduction (APL reduction)
- Using ISO 8485 as additional base document
  - Has wording for many features we are describing
  - Already reviewed/hardened by Standard's process
  - Over 35 year experience with APL
  - Could improve DPCE process because we're using existing standard's wording--well-known concepts and features
- Other features added independently
  - Layout - storage qualifier - applies to storage NOT execution
  - Contextualization - keep where, everywhere features from DPCE (and C\*)
  - Parallelization - Is available because we're using high-level constructs:  
$$A = B + C \quad /* \text{ unordered, so parallelizable } */$$
- Changes to DPCE Draft:
  - Change basic definitions to use APL definitions (§1.5)
  - Change scalar -> ALO promotion to use APL definition
  - Add APL index methods as slicing mechanism

- Change reduction operators to use APL reduction wording
- ALO declaration (tentative syntax)

```
int x ALO[3][4][5];
int y ALO[3][4][5];
char c[ALO[3][4][5]][6][7];
      -----
      ALO      old-style
                C array
```

```
shapeof(x) == shapeof(y) == shapeof(c)
```

```
shapeof(x) == {3, 4, 5}
```

```
rankof(x) == shapeof(shapeof(x))
```

```
rank 0 -> scalar
```

```
rank 1 -> vector
```

```
rank 2,3,... -> multidimensional array
```

- Array Slicing

```
int x ALO[3][4][5];
```

```
rankof(x[A][B][C]) ==
```

```
rankof(A) + rankof(B) + rankof(C)
```

```
x[1][2][3] = scalar
```

```
rank 0 + 0 + 0 = 0
```

```
x[1 2][2 3][1] = 2x2 array
```

```
rank 1 + 1 + 0 = 2
```

Cheng noted that APL is not parallel, so why not use Fortran 90 which does have parallel concepts.

Frankel noted many problems with Fortran 90: it lacks the ability to express communication costs. There is no requirement to specify layout, and this leads to performance problems, and retrofitting layout directives to fix the problems are not optimal.

Farance will investigate Fortran 90 with respect to the DPCE proposal.

Stanberry's response, as technical editor, to the suggested APL notation change is that it really needs to be worked out in a formal proposal, indicating section by section what the changes will need to be. Note: it is not just an "editorial" change to do this, and we have already encountered numerous problems in getting definitions and semantics consistent across various sections of the document. A formal proposal needs to demonstrate that the APL notation can give a consistent and complete solution.

The rest of the meeting was used to identify major issues and concerns with the current document:



- Farance wants different terminology for shapes, ALO's, etc.
- Jervis is concerned about the specification of contextualization.
  - It is very non-local—implicitly inherited context in non-elemental functions
  - Suggests that we limit scope of contextualization to function boundaries => must accept context as a function argument
  - He will consider submitting a written proposal to that effect.
- MacDonald would like to see separation of layout/distribution specification from parallel operations; want parallel operations on objects that are not necessarily distributed. Jervis noted, however, that shape conformance guarantees layout conformance, which is very important.
- Tydeman would like to see specification for handling errno for math functions; it probably won't be meaningful to use a non-parallel errno; maybe it should be a parallel int.
- MacDonald noted "Look at all these new keywords!" Suggested that we hide them in a header file. Also, he thinks it is confusing to have +=, etc., as both unary and binary ops. Rather than introduce %%, probably should fix C %.

Dates were chosen for the next DPCE meeting:

23-25 March in Pleasanton, CA, hosted by LLNL.

Stanberry will distribute information on the meeting on the dpce email reflector.