## Views on FORTRAN D (Rice)

### Synopsis

- Good abstraction of common distributed memory MIMD programming techniques.
- Not clear if it is useable/useful for porting existing programs by other than the original programmer.
- Not clear how/if DISTRIBUTEions are communicated across procedure boundaries.
- No way for the programmer to specify synchronizations.
- No consideration of providing the same semantics

**in C.**

## Views on FORTRAN D (Rice)

### General Remarks

**Need criteria for evaluating both design and implementations.**

- **Design criteria must include demonstration of real-world codes (e.g., Perfect Club) with embedded Fortran D.**
- **Implementations require comprehensive test suites to define the language."**
- **Note that PCF (X3H5) has provided neither, and FORTRAN 90 has no GSA suite.**
- **CONVEX is willing to participate in test suite**

**development.**

# Views on HPF (Compass)

## Synopsis

- A SIMD view, mostly focused on FORTRAN 90
- CONVEX is interested in the extended array section features of FORTRAN 90, not the full language.
- FORTRAN D is given a cursory one page, almost an afterthought.
- The FORALL has been reduced to array section syntax assignments.
- ALIGN and DISTRIBUTE are static only, putting extra burden on programmers.

## Views on HPF (Thinking Machines)

### Synopsis

- **DISTRIBUTE/REDISTRIBUTE and ALIGN/REALIGN redesign generally better than the original (Rice).**
- **The PROCESSORS statement is acceptable, but only with support for the N$PROCS variable.**
- **Generally a SIMD view, with LOCAL/LOCALLY as an escape to MIMD.**
- **LOCAL/LOCALLY not needed in a true MIMD environment.**
- **Prefix intrinsics only make sense in FORTRAN**

**90 context.**

## Views on FORTRAN D (Rice)

### Useability for Porting

- **Consider the SHALLOW benchmark from NCAR**
  - o CPU-intensive loops entirely data-independent
  - o Very difficult to decide on decomposition

- **Large, real-world codes are much more complicated than SHALLOW.**

## Views on FORTRAN D (Rice)

### Interprocedural DISTRIBUTEion

**"In FORTRAN D the effect of all DISTRIBUTE, ALIGN, and DECOMPOSITION statements are limited to the scope of the enclosing procedure."**

**- FORTRAN D Language Specification, Feb. 28, 1991, sec. 5.2, p.22.**

**"If multiple decompositions reach a procedure, either run-time routines or interprocedural node splitting techniques such as cloning or inlining may be required to handle the code."**

**- Compiler Support for Machine-Independent Parallel Programming in FORTRAN D, March, 1991, sec.**

**4.5, pp.22,23.**

## Views on FORTRAN D (Rice)

### Interprocedural DISTRIBUTEion (cont'd)

- Fundamental conflict between programmer and compiler:

    o If the programmer inserts DECOMPOSITION in a procedure, can an interprocedural compiler override it during inlining/cloning?

- Are 'dope vectors' a possibility?

# Views on FORTRAN D (Rice)

## Explicit Synchronization

- **FORTRAN D is mostly for 'embarassingly parallel' programs.**
- **Data-dependency detection/handling is entirely up to the compiler.**
- **User direction could greatly extend the exploitable parallelism.**
  - o **Explicit synchronization (a'la PCF?);**
  - o **Or perhaps lists of variable names to synchronize (or not) within a given loop.**

## Views on FORTRAN D (Rice)

## FORTRAN D Semantics in C

- **Required for CONVEX market.**
  - o **FORTRAN and C currently receive identical levels of support.**
  - o **Mixed language programs demand it.**
  - o **FORTRAN D for C*(R) 'shapes?'**

## Views on HPF (Compass)

### FORTRAN 90

- CONVEX believes that neither its customers nor the general FORTRAN community are very interested in full FORTRAN 90.
- From the X3J3 meeting, 11-14 Nov 1991:

## Views on HPF (Compass)

### DOD Recommendation against FORTRAN 90

**Henry Katz made the following announcement:**

> **I, working in conjunction with the Center for Standards of the Department of Defense, wish to announce that we are recommending to DOD that the Secretary of Defense reject FORTRAN 90. This is based upon a consensus reached with the major DOD Laboratories and Centers.**
>
> **Our plan is to stay with FORTRAN 77, include all of the bindings being developed for F77 and include MIL STD 1753 and certain other vendor extensions plus some of the neater things in F90. Our view is those who fell in love with FOR-**

**TRAN 90 can use ADA.**

## Views on HPF (Compass)

### FORTRAN D as an afterthought

- Only minimal features of DECOMPOSITION, ALIGN, and DISTRIBUTE are proposed.
- ALIGN and DISTRIBUTE are static only.
  - o Users will be forced to explicitly program all necessary redistributions.
- FORALL has been reduced from a loop to an array section assignment.
- In general, all MIMD aspects of FORTRAN D are removed.

## Views on HPF (Thinking Machines)

## ALIGN/DISTRIBUTE Redesign

- **Separating specification and executable statements is a good idea.**
- **Providing multi-array specifications on a single statement also good.**
- **Elimination of the 'OVERFLOW clause' on ALIGN is a mistake.**
- **Adding the PROCESSORS statement clarifies the distribution, but only in conjunction with the N$PROC variable.**

## Views on HPF (Thinking Machines)

### SIMD vs. MIMD

- **LOCAL subprograms and LOCALLY blocks are unnecessary in a true MIMD system.**
  - o Subprograms invoked in parallel are naturally 'LOCAL'
  - o Likewise, any code invoked in parallel is by definition local to its processor.
- **Prefix intrinsics only make sense in FORTRAN 90 context.**
  - o Array-valued functions are not possible in FORTRAN 77.