Introduction

- Reading
  - Papers
- Questions about project #1
Earth Simulator – The Building
Earth Simulator

The Earth Simulator Center
Earth Simulator - Processor

**Vector Unit: 8 sets**
- 6 different type of vector pipelines
- 72 vector registers (256 vector elements)
- 17 mask registers (256 bits)

**Scalar Unit**
- 4-way super scalar
- 64KB instruction cache
- 64KB data cache
- 128 general purpose register
Earth Simulator

Interconnection Network

Interconnection Network (IN)

128 units, 64 cabinets

640 x 130 = 83,200 Electric Cables

Processing Node

640 nodes, 320 cabinets

Control Unit
Data Switch Unit
Data Switch Unit
Data Switch Unit
Data Switch Unit
Data Switch Unit
Data Switch Unit
Data Switch Unit

PN PN PN PN PN PN PN PN
IMPACT-3D

- **HPF Code**
  - Uses data distribution in one dimension

- **Vector Code**
  - Uses inner most array dimension

- **Achieves 14.9 Tflops (45% of peak)**

- **Got 39% of peak using traditional HPF**
  - 45 lines of directives
  - 1,334 lines of executable code
Sisal

- **Functional Language**
- **Uses Do-access style parallelism**
  - Has software for remote access to global variables

```plaintext
type OneDim = array [ real 1;
type TwoDim = array [ OneDim 1;
function generate( n : integer
  returns TwoDim, TwoDim )
for i in 1, n cross j in 1, n
  t1 := real(i) * real(j);
  t2 := real(i) / real(j)
  returns array of t1
  array of t2
end for
end function % generate
```
Sisal Performance Study

- Very Few Nodes
- No Absolute Performance
- No Comparison with other languages