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# Stanford Streaming Supercomputer (SSS) Progress Review

Ian Buck  
Computer Systems Laboratory  
Stanford University

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# Agenda

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- Review Goals
- Progress Status
  - Language
  - Applications
  - Metacompilation
  - Strawman Arch.

# Project Goals for Fall Quarter AY2001-2002

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- Map two applications to the stream model
  - Fluid flow (TFLO), and molecular dynamics candidates
- Define a high-level stream programming language
  - Generalize stream access without destroying locality
- Draft strawman SSS architecture and identify key issues

# Brook Progress

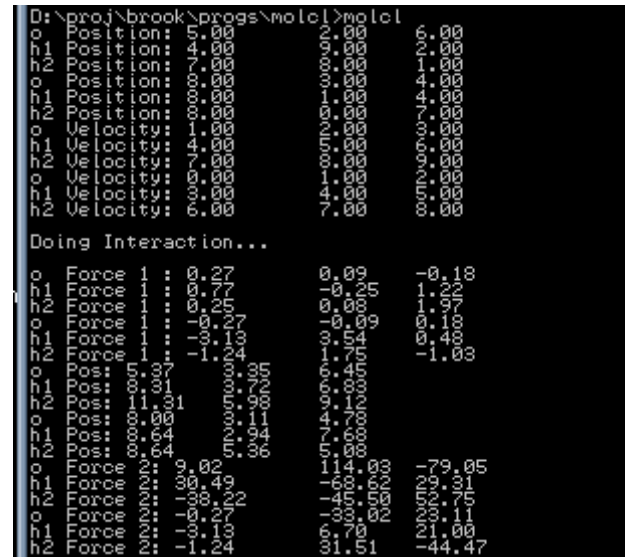
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- Full Spec
  - Two drafts written, third on the way
- Quikspec is now available
  - [http://graphics.stanford.edu/streamlang/quikspec\\_v0.1.pdf](http://graphics.stanford.edu/streamlang/quikspec_v0.1.pdf)
- Sample perl metacompiler: BPL
  - Used to compile example code only
  - Very helpful for verification
- Basic runtime library: BRT
  - Not parallel, single threaded execution
  - Target for metacompiler

# Molecular Dynamics

- Basic kernel code compiling and running.
- Grid optimized version is spec'd out.
- Helpful in defining stream operators

```
MolclLoad ("posdata.txt", pos);
FieldLoad ("velocdata.txt", veloc);
FieldLoad ("forcedata.txt", force);
MolclPrint(pos, "Position");
FieldPrint(veloc, "Velocity");
/* zero forces */
ZeroField(force);
printf ("\nDoing Interaction...\n\n");
/* Computation of forces */
/* Compute long ranged forces at time t */
MolclInteractions (pos, pos, force, force);
FieldPrint(force, "Force 1 ");
/* Compute bond forces at time t */
MolclSpringForces (pos, force);
/* Computation of forces is now complete. */
/* update velocity from t-dt/2 to t+dt/2 */
/* v(t+dt/2) = v(t-dt/2) + dt * Force(t) */
VelocUpdate (force, veloc);
/* Update position using */
/* pos(t+dt) = pos(t) + dt * veloc(t+dt/2) */
PostnUpdate (veloc, pos);
MolclPrint(pos, "Pos");
FieldPrint(force, "Force 2");
```

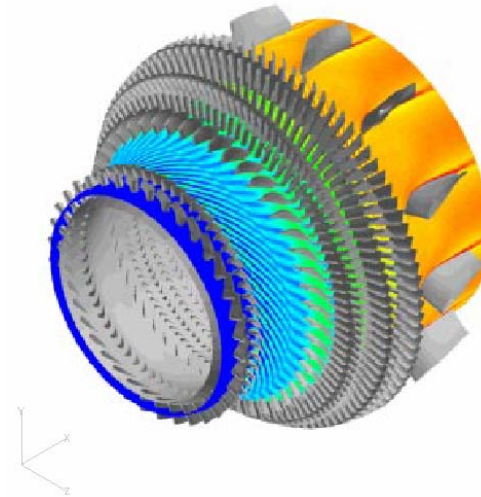
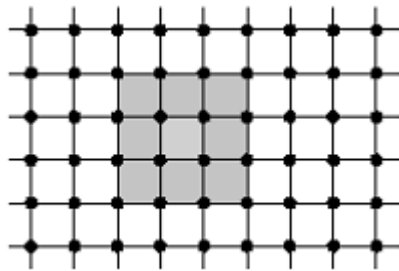


```
D:\book\prog\molcl>molcl
Doing Interaction...
Force 1
Pos
Force 2
```

# TFLO code

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- Euler Flux calculations have been coded up in Brook
- Complete single block code being ported.



# MetaCompilation

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- Metacompilation work started.
- Simple examples are compiling.
- Demo

# Strawman

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- Mattan, Ben S.

# Brook Next Steps

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- Iterate on the Quikspec.
- Finish draft 3 of full spec
- Update BPL metcompiler and BRT library to spec
- Handoff BRT to SVM team (F. and M.)
- Banded matrix solver example

# Winter Qtr. Goals

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- Brook (previous slide) (Ian)
- Arch. (Mattan, Ben S., Tim)
  - Identify analysis necessary
  - Running simulation of example program.
  - Experiment with numbers in Strawman.
  - Cost Model
  - Define global mechanisms.
  - Evaluate conditional alternatives.
- Applications
  - Working Aps with real data
  - Micro-benchmarks/Stress Tests (Ian)
    - FFT
    - Sorting
    - PCA aps (corner turns)
    - Ax=b
  - Complete Molcd gridding
  - TFLO block code
  - Implicit fluid flow
  - RayTracing (Tim P.)
  - UMT2000 Purple Benchmark (Ian)
- Metacompiler
  - Match Brook spec with compiler capabilities. (Ben C.)
- Identify analysis in compiling for SSS.
  - How to compile well to SSS arch (Mattan)
- SVM Spec (Francois)
- SVM Targets
  - Workstation (Francois)
  - MPI library
  - StreamC/KernelC

# Winter Qtr. Meetings

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- Start in Tuesday, Jan 15th 11:00-12:00
- Numerical Systems (Ron)
- Define SVM (Francois)
- Languages and Hardware (Alan)
- Brook to Hardware discussion
- Parallel Languages (Pat)
- Analysis and Optimization (Mattan)
- Goal Reviews
- Goal Reviews

# Plan for AY2001-2002

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## From Oct 9th:

