

NASA SBIR/STTR Technologies

HPC Benchmark Suite NMx

PI: Sendil Rangaswamy

Firm: Intelligent Automation, Inc. - Rockville, MD 20855

Proposal No.: 08-1 T5.01-9935



Identification and Significance of Innovation

The key innovation in this effort is development of an comprehensive numerical test suite for benchmarking current and future high performance computing activities.

The developed HPC benchmark suite (*HPC benchmark suite NMx*) will include:

- dense and unsymmetrical matrix problems faced in space aviation and problems in thermally driven structural response and radiation exchange
- implicit solution algorithms with production models and benchmarks for indefinite matrices and pathological cases
- configurations scaling for large systems (64, 256, 512, 1024 distributed high performance system) in shared, distributed and mixed memory condition

Expected TRL Range at the end of Phase I (1-9): : 5

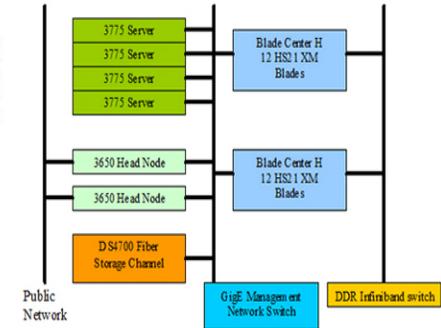
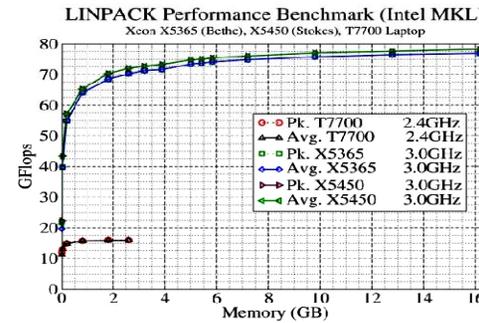


Fig: LINPACK Performance Benchmark test on STOKES and its hardware configuration is shown in the right

Technical Objectives and Work Plan

- Selection of models with analytical solutions and implicit solution algorithms with indefinite and large dense matrix conditions
- Selection of problems with precision and round-off studies on serial and parallel machines
- Test implementation and demonstration of the problem set on selected cluster architectures and study wall clock performance with respect to the number of processors
- Comparison of solutions on serial and parallel hardware in different architectures
- Analyze and document the strengths, weaknesses, and limitations of the toolkits used together with recommendations

Tasks	Contract Months					
	1&2	3&4	5&6	7&8	9&10	11&12
1. Define Benchmark requirement	x					
2. Explore toolkits from public domain	x	x	x			
3. Explore implicit solution algorithms with production models	x	x	x	x	x	
4. Precision and round-off studies for serial and parallel		x	x	x	x	
5. Analyze and document the strengths, weaknesses, and limitations			x	x	x	x
6. Select and recommend a set of problem sets						x

NASA and Non-NASA Applications

The most promising commercial applications are:

- heat transfer problems in structures in avionics, diagnostic of structures in space exploration and exploration of structure formation and problems in geology
- thermal and structural problems in industry, manufacturing sectors and military.
- Other applications include diagnostics and health monitoring applications.

Firm Contacts

Sendil Rangaswamy
 sendilr@i-a-i.com
 Tel: 301-294-4756

NON-PROPRIETARY DATA