

The Center for Cyber Defenders

Expanding computer security knowledge



Exploring the Performance of a Graph Hitting Time Algorithm Implemented Using Chapel

Edwin Lu, Purdue University

Project Mentor: Richard Barrett (05689)

Problem Statement:

- High performance computing can significantly reduce the time needed to analyze large scale data.
- Effective use of high performance computing (HPC) requires expert understanding of parallel computing.
- Domain researchers with some programming knowledge want to be able to construct or modify programs for use on HPC machines.
- Chapel is a programming language designed specifically to address these issues.
- Does Chapel provide sufficient performance while also hiding the complexities involved with HPC programming?

Objective:

- Understand Chapel's performance capabilities in a diverse set of HPC environments.
- Understand Chapel's ability to provide HPC capabilities to domain scientists.

Approach:

- Modify a Chapel program that performs analysis on undirected graphs to also operate on directed graphs.
- This requires solving a non-symmetric sparse linear system of equations, using the BiCGStab algorithm.
- Analyze the performance of this program on at least two HPC systems.

Results:

- Produce a report describing the performance of this "graph hitting time" program.
- Produce a report describing a novice programmer's ability to implement a meaningful program using Chapel.

Impact and Benefits:

- Direct feedback to the Chapel development team regarding its performance capabilities and characteristics.
- Help determine if Chapel is a suitable high performant programming language for domain scientists.