

# Hardening Distributed Volunteer Computations

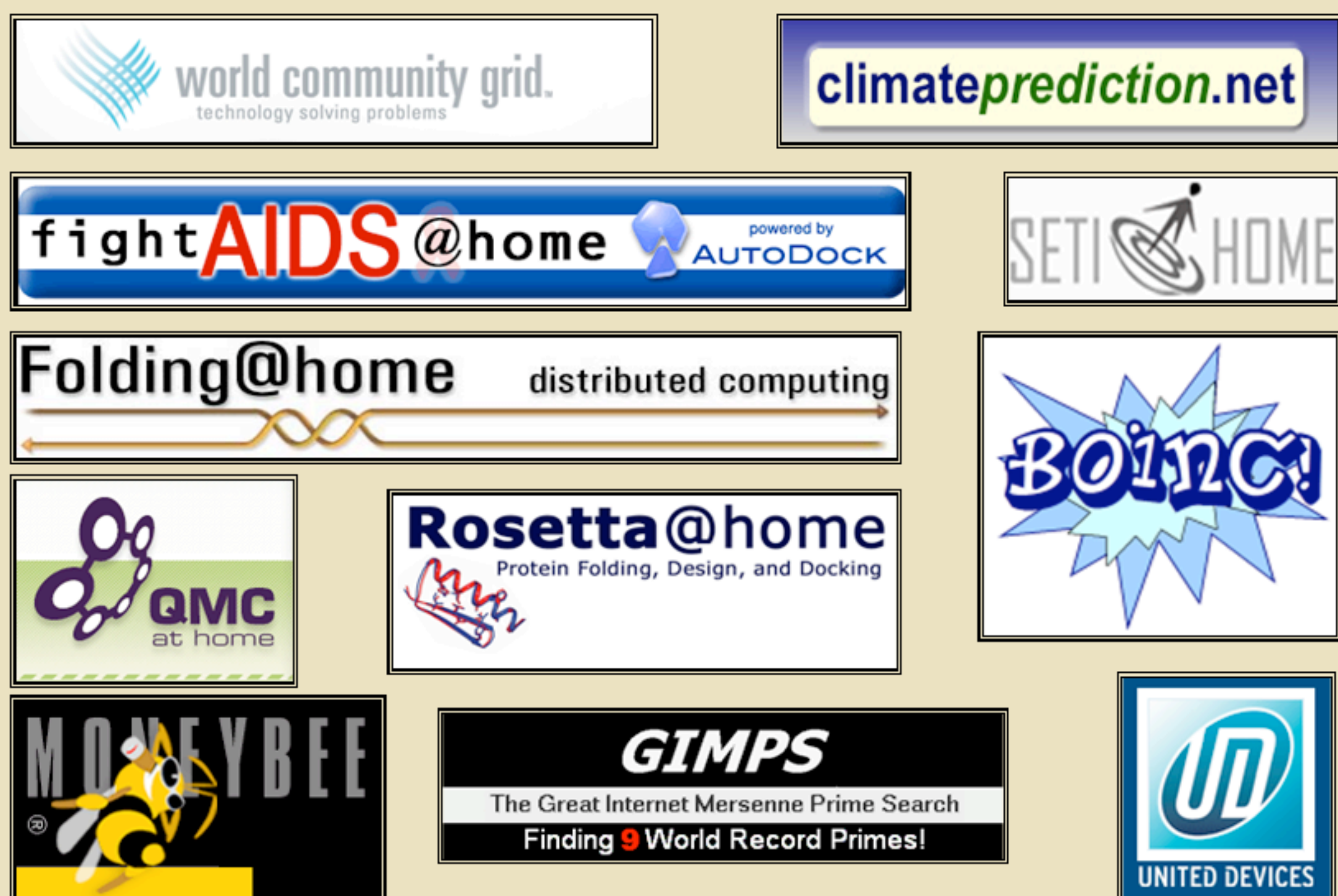
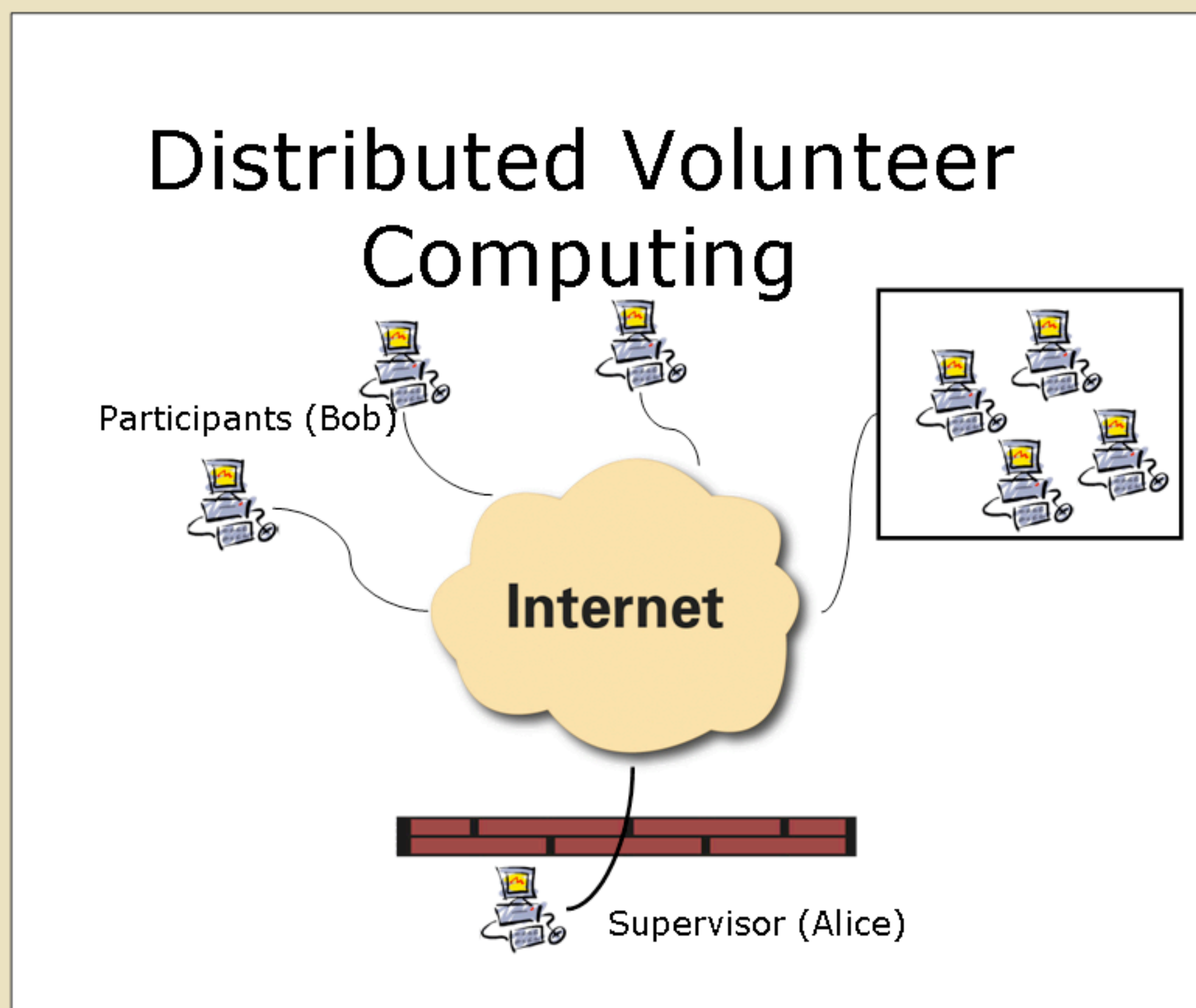
<http://dvc.richmond.edu>

Welcome to the Internet, my friend. How can I help you?



## The Setting

This research investigates the protection of computation integrity and enhancement of data privacy for applications executed on distributed computing platforms that utilize the spare processor cycles of computers connected to the Internet. The goal of the project is to provide computation supervisors with quantifiable protection and privacy mechanisms tailored to application and platform specific constraints. The project considers existing platforms, which prohibit participating computers ("participants") from communicating with other participants, as well as potential future hierarchical platforms that permit communication among participants and allow dynamic variation of platform topology.



The approach to the problem of computation integrity consists of probabilistic verification and novel application of artificial intelligence mechanisms for detecting anomalous behavior. The approach to data privacy is based on obscuring data values while maintaining sufficient output information for identifying specific important data from among a vast data set. Access to more secure distributed volunteer computing platforms will potentially benefit researchers from a variety of disciplines, including biology, chemistry, math, finance, medicine, climatology, and evolutionary theory.

## Approach

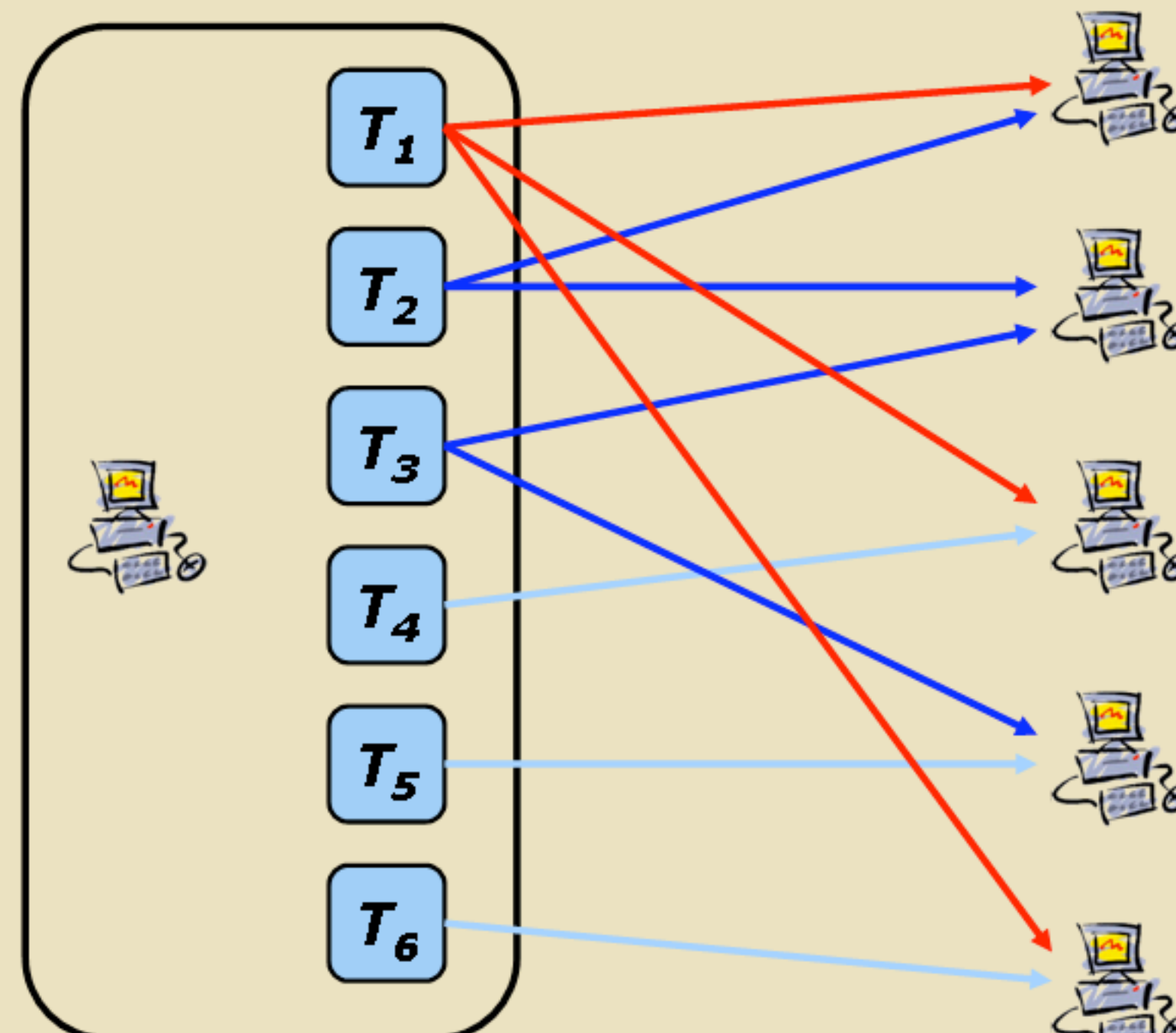
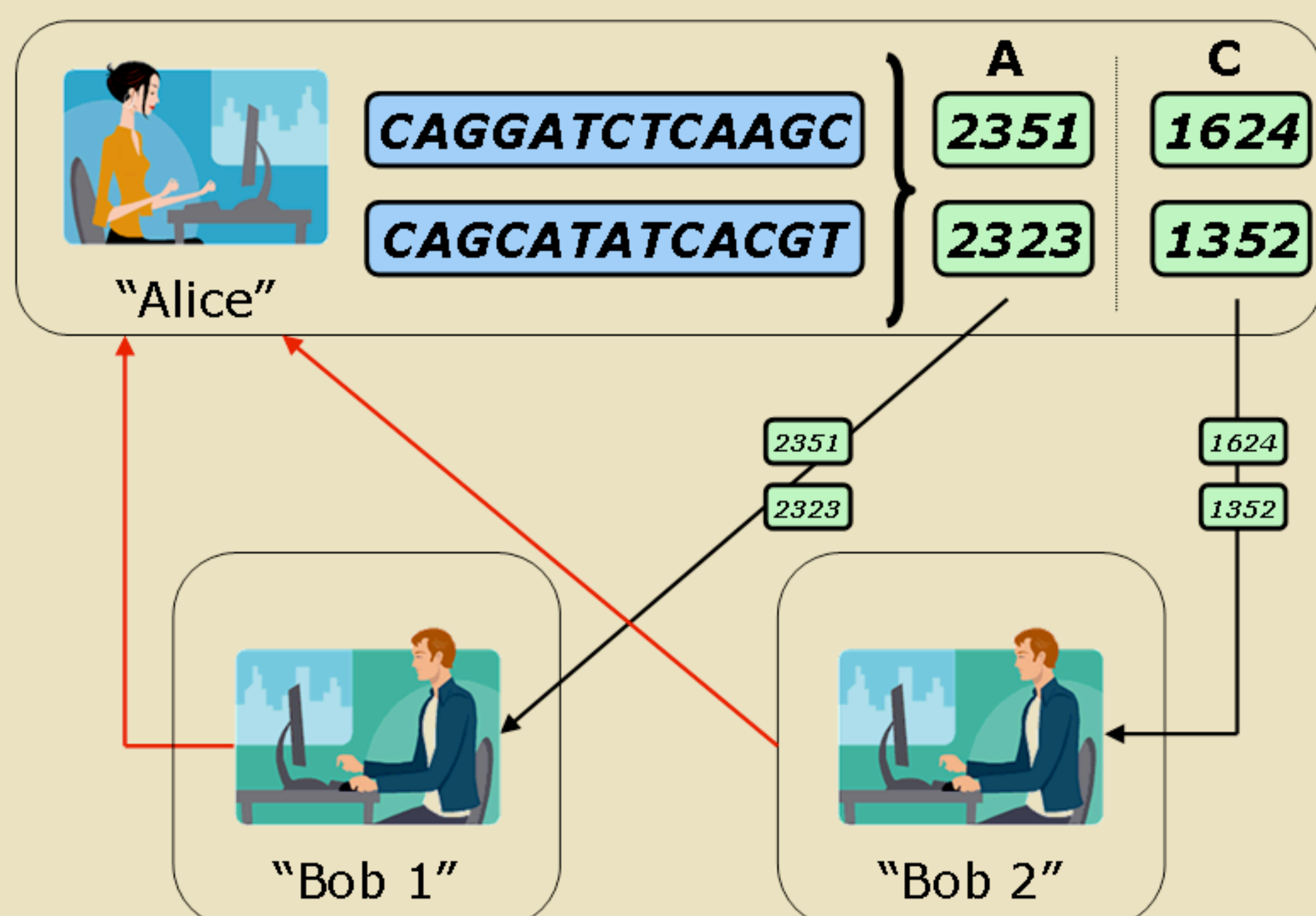
Enhanced Platforms and Protection Measures:

- Hierarchical Topology: Communication Among Participants
- Dynamic Topology
- Heterogeneous Tasks

- AI Methods for Detecting Malicious Activity
- Enhanced Privacy Via Obscured Data Values
- Application and Platform Specific Security Taxonomy

Genetic Sequence Privacy Example: Participants Compare "Offsets"

Improved Collusion Resistance, Fewer Tasks:



## People

PIs  
**Barry Lawson**  
**Jason Owen**  
**Doug Szajda (PI)**

Students  
**Matt King**  
**Mike Pohl**  
**Andy White**  
**Brittany Williams**

NSF Award IIS-0524239:  
*Ensuring Computation Integrity in Distributed Volunteer Computing Platforms*