Design efficient algorithms for scalable security

Finding fast and low-overhead security solutions to problems dealing with scalable clients in distributed environments.

### Distributed Grid Computing

Use peer-to-peer technology to unlock the potential of using up to millions of computers across the Internet to solve massive problems.

### Authenticated Data Structures

Data structure outsourced by a trusted source to untrusted responders, which provide proofs of answers to queries posed by users.

### Approach and Impact

**New approach**
- P2P search structures
- IP traceback
- Grid security

**Research Impact**
- Data content authentication
- Uncheatable grid computing
- Rainbow skip-graphs

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#### P2P Secure Search Problem

**Given:**
- \( n \) hosts with one \((key, value)\) pair each
- Routing layer supporting message passing
- \( send(message, destination\_address) \)
- Adversary can kill hosts at random using a virus

**Support neighbor queries on keys**
- Return value of key nearest a given key

**Application:**
- Medical information sharing (e-Health networks)
- Approximate matching is important

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Our Solution: The Rainbow Skip Graph