

## Simulating Disaster Scenarios and Geographically-Correlated Resilient Overlay Networks

### Introduction

The Community Seismic Network, created by a team at Caltech, uses small inexpensive accelerometers attached to computers, or built-in in the case of some laptops and mobile devices, to monitor seismic activity and report possible events to central server(s) for processing. This network aims to help quickly and accurately detect and categorize earthquakes at a finer granularity than is possible with the traditional (more expensive) infrastructure of seismographs.

However, during powerful earthquakes, the communications and power infrastructures may be damaged, negatively impacting the ability of the network to deliver this data. In this work, we aim to address this issue by using *Resilient Overlay Networks* (RONs) to route around failures in the underlying routing infrastructure, without directly manipulating these routers. We aim to expand previous work on RONs by introducing the locations of the nodes as a criteria for choosing overlay paths. This is based off the intuition that the failures in such a scenario are geographically-correlated (constrained to the area affected by the earthquake).

### Overview

Currently, I have a simulation environment, built in the ns-3 network simulator, that builds a wired network topology (taken from those built in the Rocketfuel project), installs client and server applications on chosen nodes and runs a scenario in which each client sensor within the specified disaster region contact the server. If they fail the initial contact attempt, they will contact other clients to act as overlays, using one of a few different heuristics currently implemented.

In the scope of this quarter project, I intend to expand the existing simulation environment to be more realistic and representative of a large disaster scenario. Specifically, I intend to include the following additional features:

- Using the BRITE topology generator, instead of Rocketfuel, in order to have more diverse location information and facilitate integrating multiple Autonomous Systems and BGP routing
- Developing a new method for assigning regions to hosts based on their location within some bounding box (geo-cells)
- Developing and testing additional heuristics for finding overlay paths, including multi-hop
- Modifying the way clients contact overlays: contacting multiple overlay nodes at once

### Time-line

**Week 3:** project proposal

**Week 4:** BRITE integration

**Week 5:** region assignment

**Week 6:** ideal shortest path (full topology knowledge) heuristic

**Week 7:** angular path heuristic (modification of existing orthogonal path heuristic)

**Week 8:** multi-hop rectangular heuristic

**Week 9:** contacting multiple overlays at once

**Week 10:** catch-up, experiments, and report