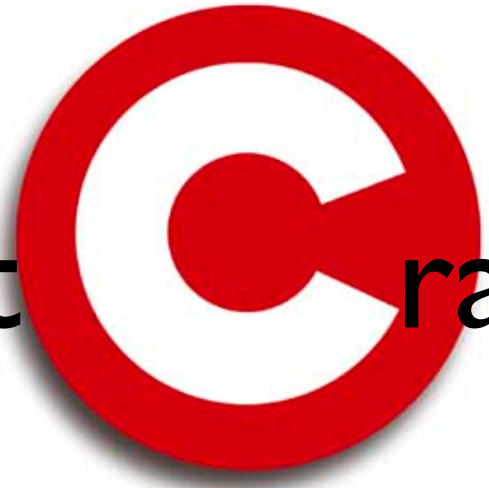
Transport  rash!

Traffic and cascading information

Drew, Gio, Griff, Kang, Leif, Sam, Tracey

Outline

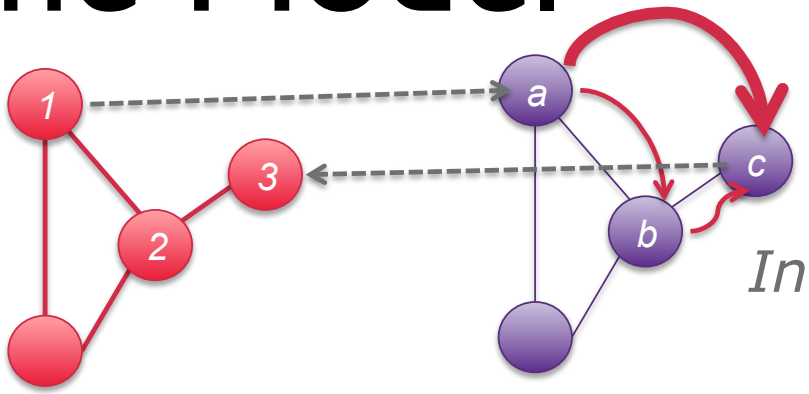
- The Idea
- The Model
- Questions and Results
- Future work
- Applause

The Idea

- There are many traffic control strategies:
  - Choice of scale required!
    - Local or Global mechanisms
- Can we avoid choosing a scale?
  - YES WE CAN!
  - Let the system choose it.

The Model

Physical Layer



Information Layer

Links/Roads — Cars navigate and queue on them. They have a capacity.

Nodes — The junctions. They are responsible for propagating information.

Agents — The cars. They navigate following to a shortest path modified according to the information.

Signal iff [(Population + neighbours' signals) > Signaling Threshold]

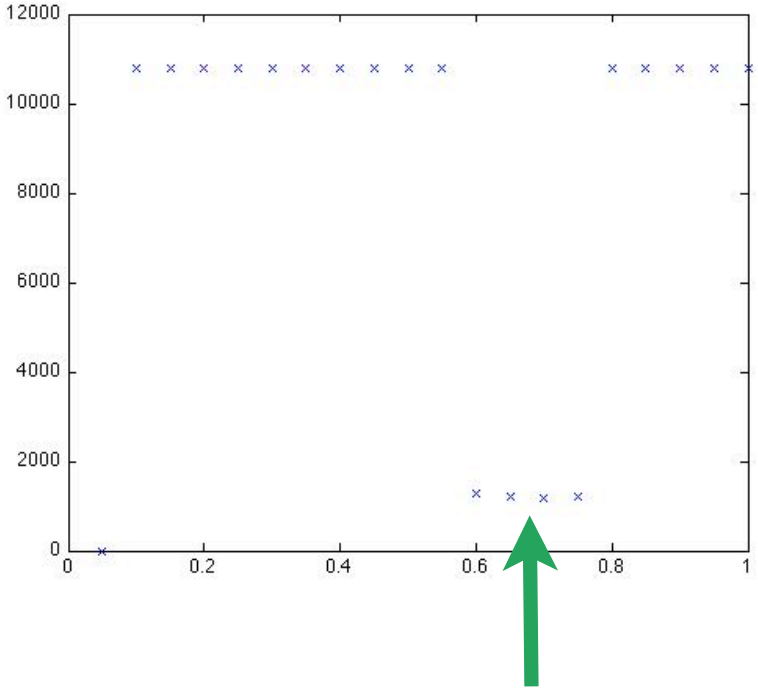
The signal can cascade to other nodes

Question 1

Does it do anything?

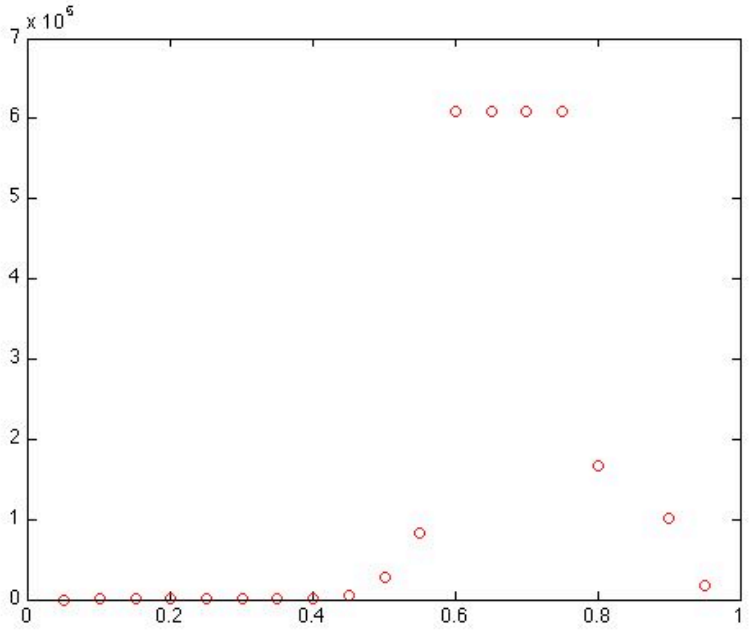
We observe the system over a time window near the congestion transition without information.

Final Population vs Signaling threshold



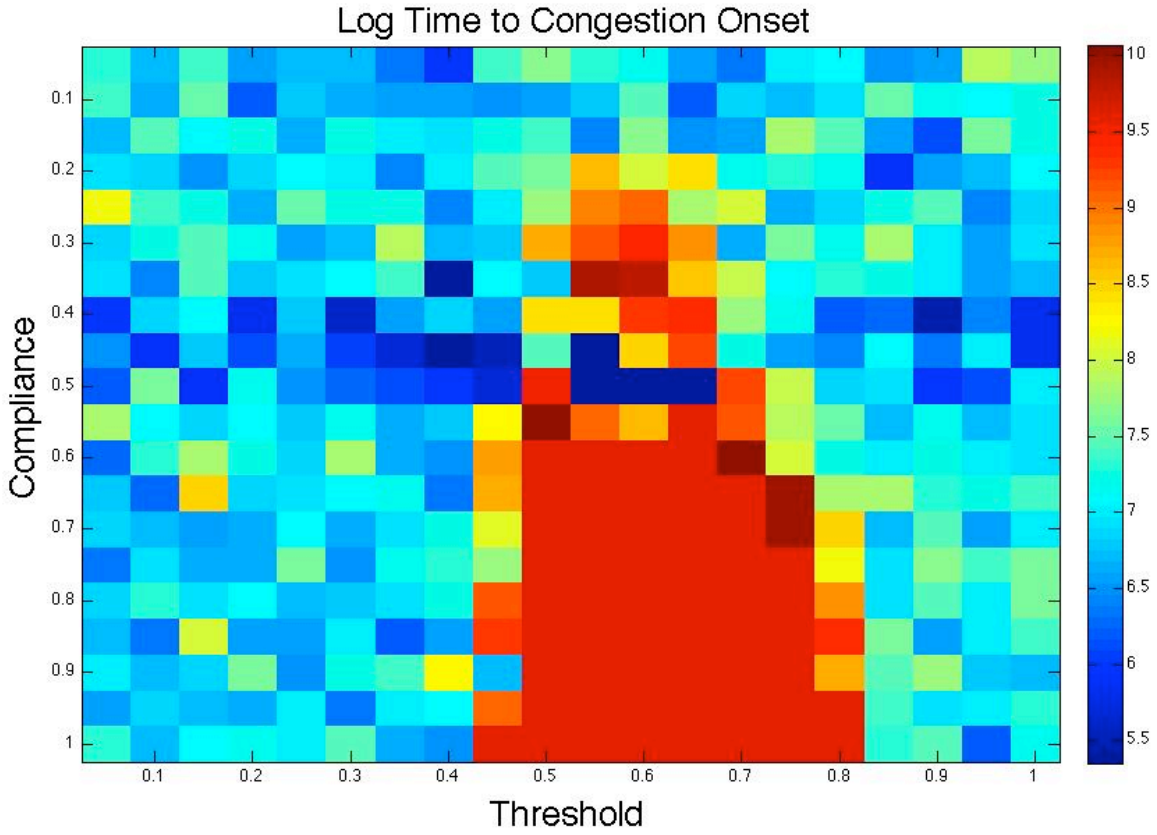
No congestion!!!

delivered cars vs Signaling threshold



Question 11

Is compliance important?



Red = GOOD!
(no congestion)

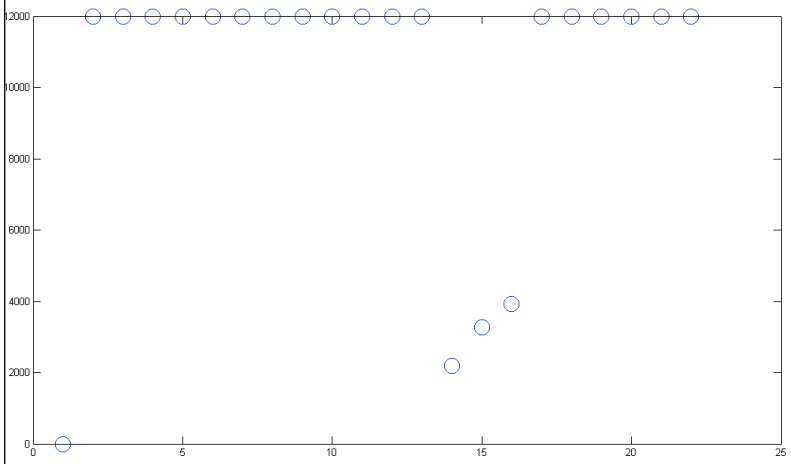
Blue = BAD!
(quick congestion)

Question III

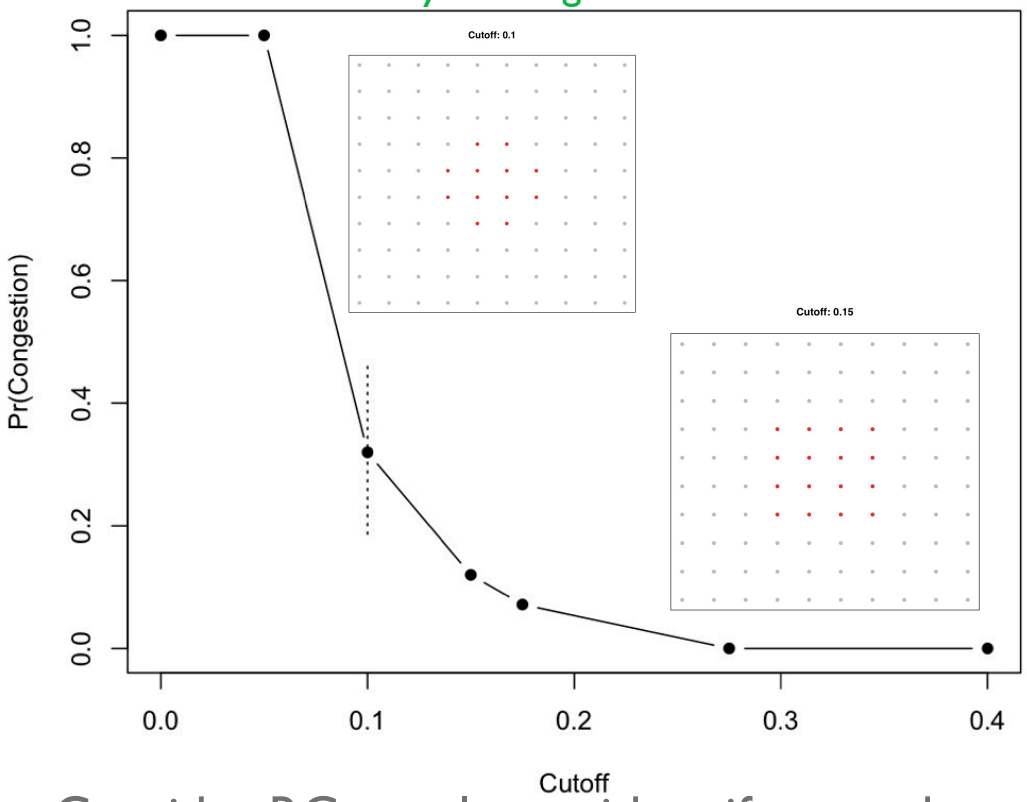
How robust is it?

Turn off signaling in increasing order of centrality

System is still functional when most nodes are off! (Caveat)



Probability of congestion onset



Consider RG topology with uniform and preferential origin-destinations

Perturbation of topology does not change qualitative results.

Outlook

- EMERGENT Information scale
- ROBUST!
- STABLE

- FUTURE WORK
  - Wider range of topologies and traffic patterns
  - Real-world maps (Los Alamos FTW!)
  - Cost of compliance VS non-compliance
  - Description of congestion transition and "metric" analysis

That's it.

Thanks.

Put your hands together please.

Drew Levin, Samuel Scarpino, Tracey McDole, Kang Zhao, Leif Karlstrom, Griffith Rees.
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