Recall: Paxos
Recall: Paxos

Client requests service (e.g., $X = \pm 5$)
Recall: Paxos

(I want to propose $X = 5$)
Recall: Paxos

(I want to propose $X = 5$)

Promise $N=1$, [Accepted value, if they have one]
Recall: Paxos

(I want to propose $X = 5$)

Accept $N=1$, $[X = 5]$
Recall: Paxos

Inform client.

Accepted N=1, [X=5]
Byzantine Failure

Client requests service (e.g., $X = \pm 5$)
Byzantine Failure

(I want to lie about X’s value)

Prepare N=1
Byzantine Failure

(I want to lie about X’s value)

Promise N=1, [Accepted value, if they have one]
Byzantine Failure

(I want to lie about X’s value)

Accept N=1, [X = 10]

Accept N=1, [X = 5]
Byzantine Failure

(I want to lie about X’s value)

Accepted N=1, [X = 10]

Accepted N=1, [X = 5]

Evil node can now wreck havoc.

Intuition as to why?
CS 91: Cloud Systems & Datacenter Networks
Course Wrap-Up
Interesting & Hard Problems

• Virtualization
• Datacenter Networking
• Consistency
• Failures & Replication
• Data Storage & Retrieval
• Security

• (+ Technical paper reading)
Trends

• Commodity hardware: Scale *out*, not *up*

• Software defined networking

• NoSQL storage options

• Perfect storm: Cloud computing & Datacenters
Workloads

• Design your system to handle *your* workload

• Dynamo, Memcached, Spanner
Locality

• Taking advantage of locality is (usually) the best way to improve performance

• (Can’t fit all the papers here.)
The *Right* Abstraction

- The right abstraction can be game-changing

- Virtualization, MapReduce, OpenFlow, Replicated State Machine, Spanner
Final Exam: Friday 9:00 AM, SCI 181

• Similar format to midterm
  – You can still bring the papers with you
  – Significantly more time

• Q&A Review session?
  – Wednesday, late afternoon
  – Wednesday, evening
  – Thursday, evening
Upcoming Related Courses

• Spring 2015: Databases

• Fall 2015: Networking

• Spring 2016: Parallel & Distributed Systems
Questions?