EVE: verifying correct execution of cloud-hosted web applications

Suman Jana
Vitaly Shmatikov
The University of Texas at Austin
Running interactive web-apps in the cloud
Running interactive web-apps in the cloud
Running interactive web-apps in the cloud
Low visibility in the cloud

Last year we recognized that our processes were far too complex.

So we put them into the cloud.
Availability is not correctness

“Google will make commercially reasonable efforts to keep the App Engine service **operational and available** to customer at least 99.95% of the time in a monthly billing cycle”
Availability is not correctness

“Google will make commercially reasonable efforts to keep the App Engine service operational and available to customer at least 99.95% of the time in a monthly billing cycle”
Errors can be transient
Errors can be transient
Errors can be transient

inconsistent tax records!!
continuously monitor correctness of cloud execution
verifying correct execution of an arbitrary application is hard!
What kind of apps run on cloud?

What is common between these web-apps?
What kind of apps run on cloud?

- web clients
- data-store

thin and stateless

web-app logic
Correctness of web-app ops

Thou shalt always think of web-app operations in terms of data-store operations!
Consistency of data-store ops

Thou shalt always think of web-app operations in terms of data-store operations!
Web app ops as data-store ops
Web app ops as data-store ops
Web app ops as data-store ops

all faults appear as consistency violations
EVE: collaborative verification
EVE: collaborative verification
EVE: collaborative verification
EVE: collaborative verification
EVE: collaborative verification

streaming consistency verification algorithm

error?
EVE: different use cases

- Ensure that a web-app is running correctly in a particular cloud
- Check how well a web-app scales in a particular cloud
- Compare quality of service (QoS) from different cloud providers
Questions

suman@cs.utexas.edu
Auto generate data-store ops
Auto generate data-store ops
Auto generate data-store ops

web-app logic

generic SQL-like interface

data-store
Auto generate data-store ops
Auto generate data-store ops

- web-app logic
- log generating wrappers
- data-store
- verifier