The Super Secret File System

CS851 – Web Application Security Seminar

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Shhh!
TOP SECRET!

Overview

Automatic Image Selection from Video

Used Tor to further protect users

Implemented CovertFS on top of FUSE

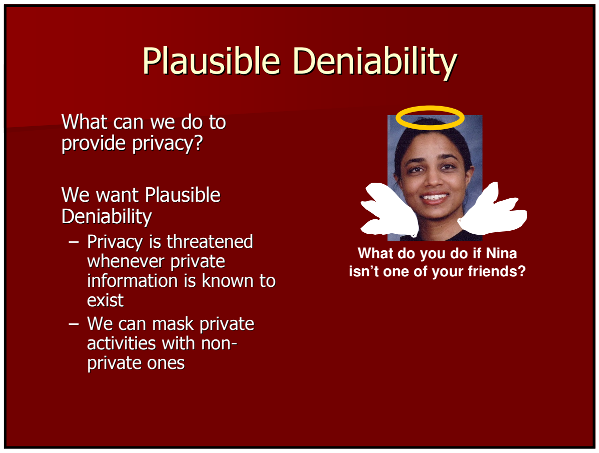
OLYMPUS
tor.eff.org
Antras
spy phone
Your Coins: 24940

Motivation

We have the right and the desire for privacy

We only trust our friends

DO NOT DISTURB



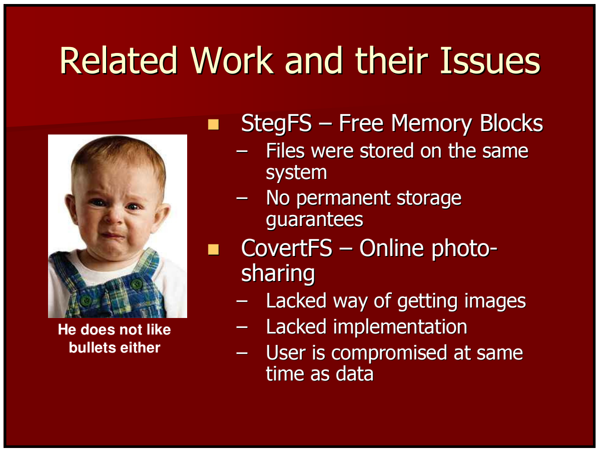
Plausible Deniability

What can we do to provide privacy?

We want Plausible Deniability

- Privacy is threatened whenever private information is known to exist
- We can mask private activities with non-private ones

What do you do if Nina isn't one of your friends?



Related Work and their Issues

- StegFS – Free Memory Blocks
  - Files were stored on the same system
  - No permanent storage guarantees
- CovertFS – Online photo-sharing
  - Lacked way of getting images
  - Lacked implementation
  - User is compromised at same time as data

He does not like bullets either

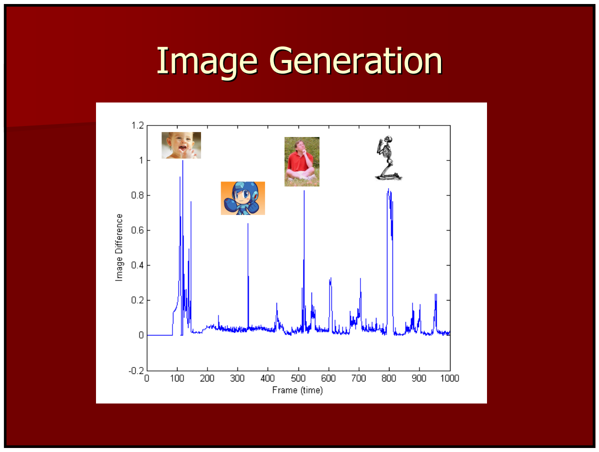
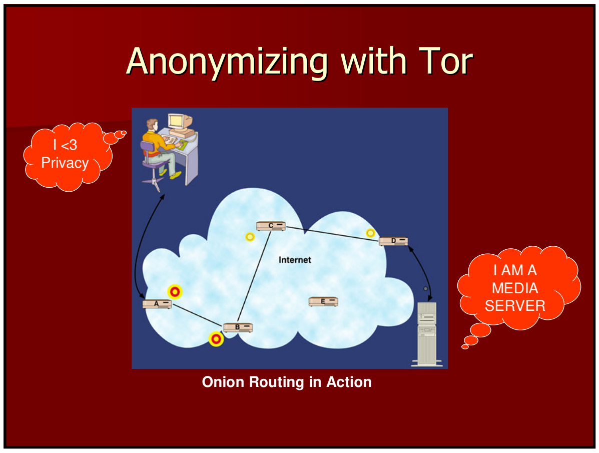


Image Generation



Anonymizing with Tor

Onion Routing in Action

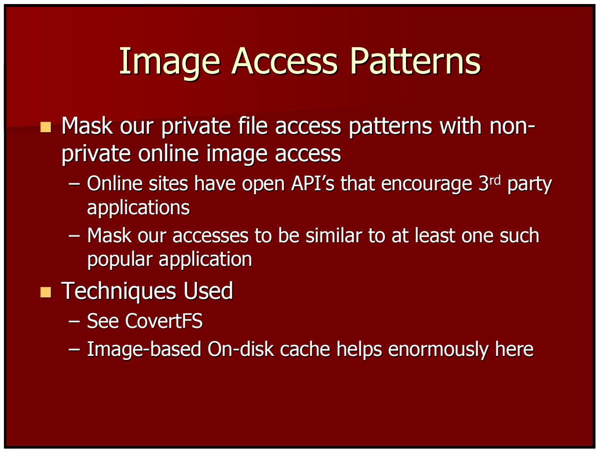
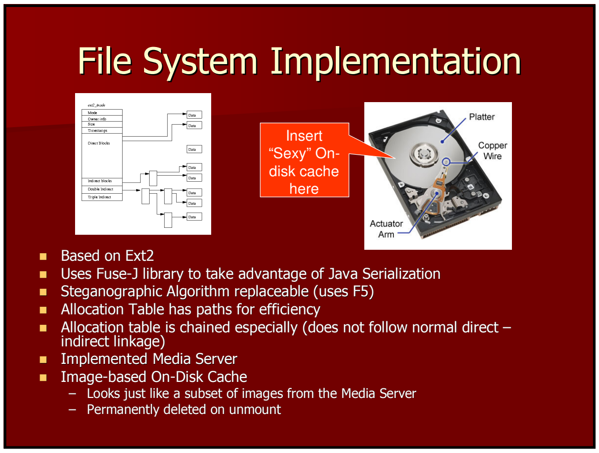


Image Access Patterns

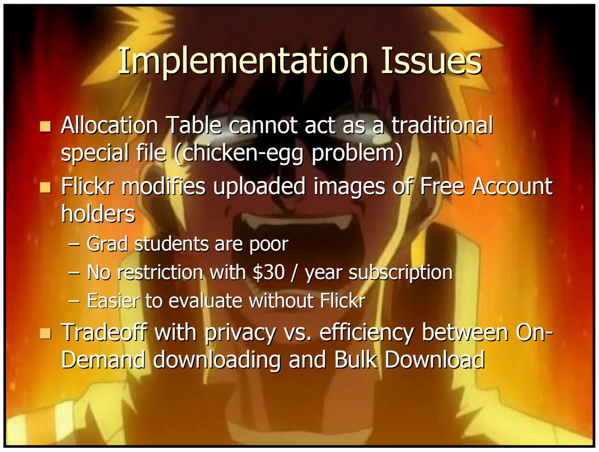
- Mask our private file access patterns with non-private online image access
  - Online sites have open API's that encourage 3rd party applications
  - Mask our accesses to be similar to at least one such popular application
- Techniques Used
  - See CovertFS
  - Image-based On-disk cache helps enormously here



File System Implementation

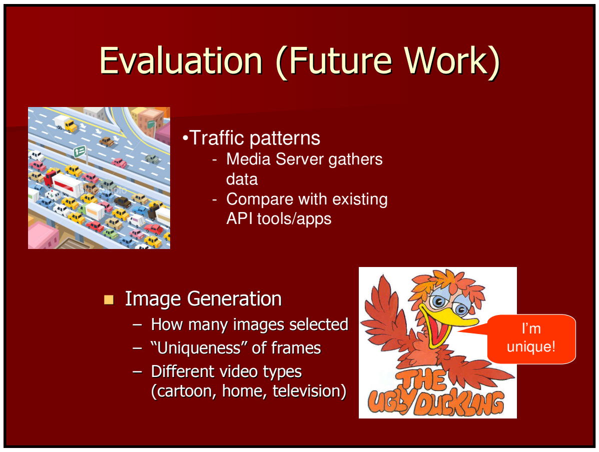
Insert "Sexy" On-disk cache here
Platter
Copper Wire
Actuator Arm

- Based on Ext2
- Uses Fuse-J library to take advantage of Java Serialization
- Steganographic Algorithm replaceable (uses F5)
- Allocation Table has paths for efficiency
- Allocation table is chained especially (does not follow normal direct – indirect linkage)
- Implemented Media Server
- Image-based On-Disk Cache
  - Looks just like a subset of images from the Media Server
  - Permanently deleted on unmount



Implementation Issues

- Allocation Table cannot act as a traditional special file (chicken-egg problem)
- Flickr modifies uploaded images of Free Account holders
  - Grad students are poor
  - No restriction with $30 / year subscription
  - Easier to evaluate without Flickr
- Tradeoff with privacy vs. efficiency between On-Demand downloading and Bulk Download

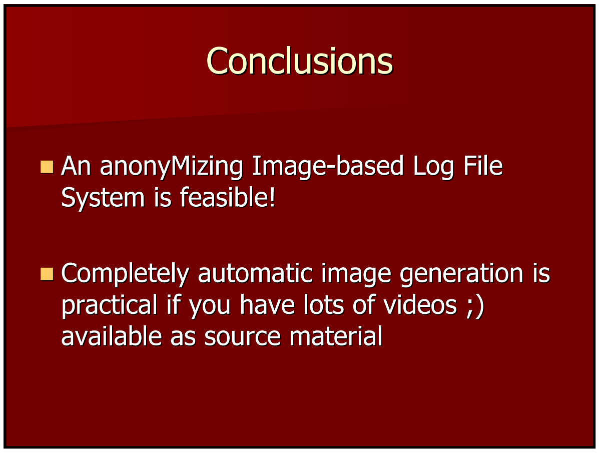


Evaluation (Future Work)

- Traffic patterns
  - Media Server gathers data
  - Compare with existing API tools/apps
- Image Generation
  - How many images selected
  - "Uniqueness" of frames
  - Different video types (cartoon, home, television)

I'm unique!
THE UGLY DUCKLING

Demo



Conclusions

- An anonyMizing Image-based Log File System is feasible!
- Completely automatic image generation is practical if you have lots of videos ;) available as source material

Questions?