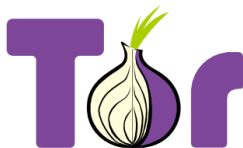


NCMEC Tor Overview

Andrew Lewman
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January 19, 2011



TorProject.org

What are we talking about?

- Crash course on anonymous communications
- Quick overview of Tor
- Quick overview of Tor Hidden Services
- Future directions

The Tor Project, Inc.

501(c)(3) non-profit organization dedicated to the research and development of technologies for online anonymity and privacy

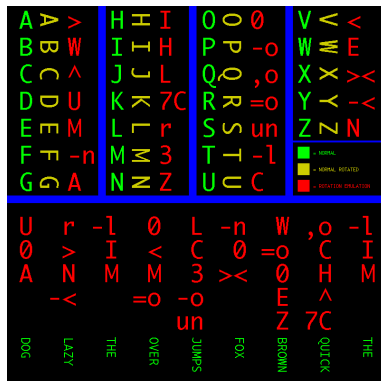


What is anonymity?



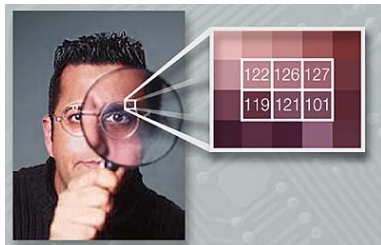
Anonymity isn't cryptography

- Cryptography protects the contents in transit
- You still know who is talking to whom, how often, and how much data is sent.



Anonymity isn't steganography

Attacker can tell Alice is talking to someone, how often, and how much data is sent.



Anonymity isn't just wishful thinking...

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- "I didn't write my name on it!"

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- "Isn't the Internet already anonymous?"

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- *"I didn't write my name on it!"* Not what we're talking about.
- *"Isn't the Internet already anonymous?"* Nope!

Anonymous communication

- People have to hide in a crowd of other people (“anonymity loves company”)
- The goal of the system is to make all users look as similar as possible, to give a bigger crowd
- Hide who is communicating with whom
- Layered encryption and random delays hide correlation between input traffic and output traffic

Low versus High-latency anonymous communication systems

- Tor is not the first system; ZKS, mixmaster, single-hop proxies, Crowds, Java Anon Proxy.
- Low-latency systems are vulnerable to end-to-end correlation attacks.
- High-latency systems are more resistant to end-to-end correlation attacks, but by definition, less interactive.

Low-latency systems are generally more attractive to today's user

- Interactive apps: web, instant messaging, VOIP, ssh, X11, cifs/nfs, video streaming (millions of users)
- Multi-hour delays: email, nntp, blog posting? (tens of thousands of users?)

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- Multi-hour delays: email, nntp, blog posting? (tens of thousands of users?)
 - And if anonymity loves company...

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- open source, freely available (3-clause BSD license)

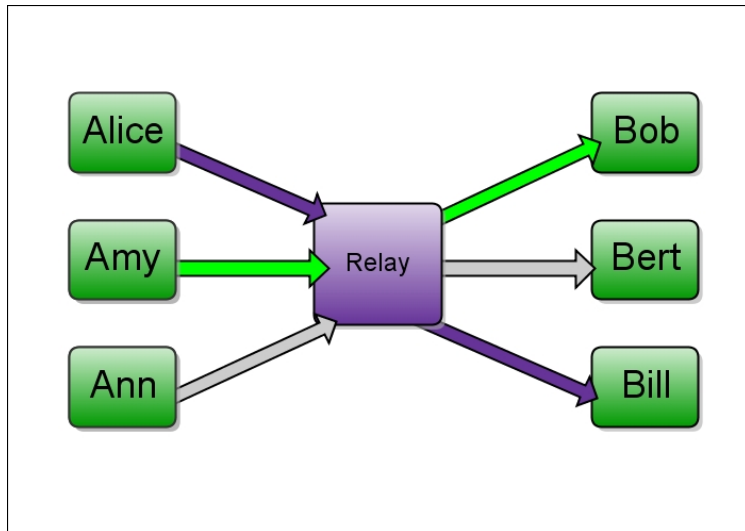
What is Tor?

- online anonymity software and network
- open source, freely available (3-clause BSD license)
- active research environment:
Rice, UMN, NSF, NRL, Drexel, Waterloo, Cambridge UK, Bamberg
Germany, Boston Univ, Harvard, MIT, RPI, Georgia Tech

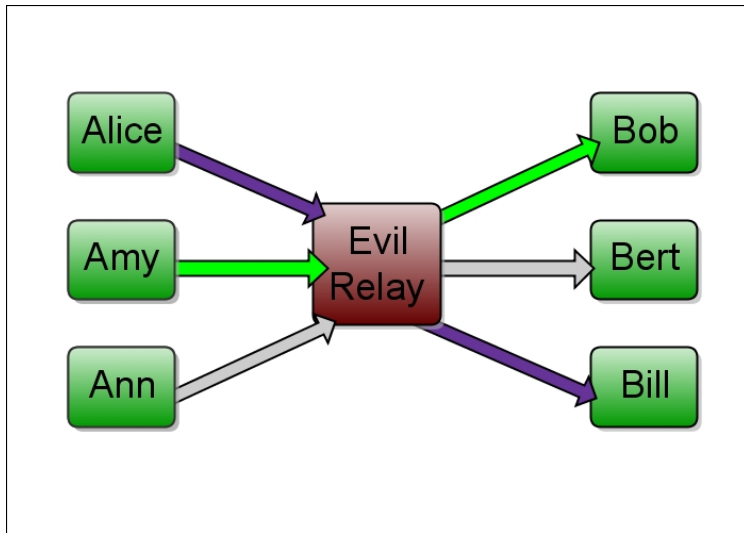
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Rice, UMN, NSF, NRL, Drexel, Waterloo, Cambridge UK, Bamberg
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- increasingly diverse toolset:
Tor, Torbutton, Tor Browser Bundle, TA(I)LS LiveCD, Tor Weather,
Tor auto-responder, Secure Updater, Orbot, Torora, Tor Check, Arm,
Nymble, Tor Control, Tor Wall, TorVM

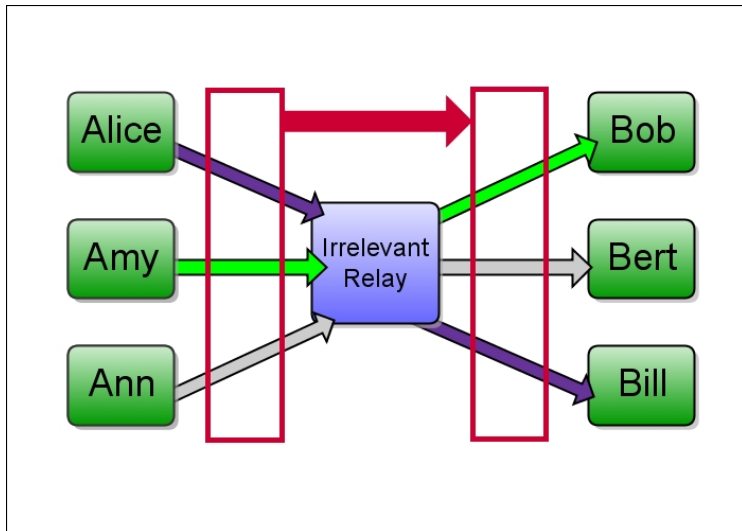
How is Tor different from other systems?



How is Tor different from other systems?



How is Tor different from other systems?



Iran Protests: Twitter, the Medium of the Movement

By LEV GROSSMAN Wednesday, Jun. 17, 2009

Related

Photos



Behind the Scenes with Mousavi

Stories

- In Iran, Rival Regime Factions Play a High-Stakes Game of Chicken
- Latest Tweets on Fallout from Iran's



Share The U.S. State Department doesn't usually take an interest in the maintenance schedules of dotcom start-ups. But over the weekend, officials there reached out to Twitter and asked them to delay a network upgrade that was scheduled for Monday night. The reason? To protect the interests of

FBI Raids Queens Home in G20 Protest Twitter Crackdown



AP Photo/Matt Rourke

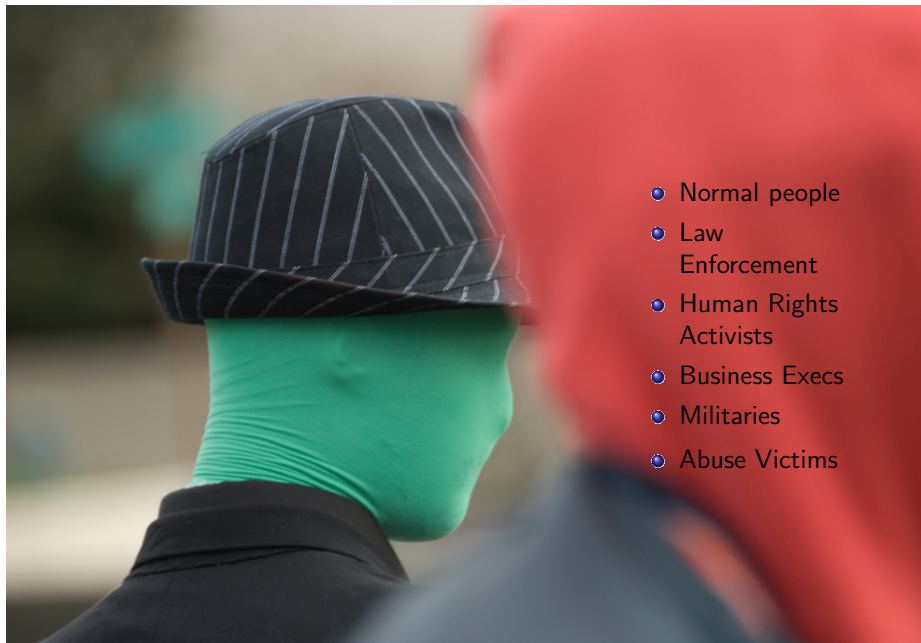
That's right, a Twitter crackdown. A lawyer for Jackson Heights social worker Elliot Madison, 41, says that the feds searched his client's house for 16 hours on Thursday after Madison was arrested on September 24th at a Pittsburgh hotel room with another man. What were they up to? Sitting at laptops sending Twitter messages advising [G20 demonstrators](#) about riot police activity in the streets. And yet *real* Twitter threats like [Lindsay Lohan](#) and [Courtney Love](#) remain at large.

Madison, a self-described anarchist, was in Pittsburgh volunteering for the [Tin Can Comms Collective](#), a group that uses Twitter to send mass text messages during protests describing events observed on the streets or over police scanners; stuff like "SWAT teams rolling down 5th Ave." Tin Can was active during the [St. Paul RNC protests](#), and the authorities are now on to them. Madison was charged with hindering apprehension or prosecution, criminal use of a communication facility and possession of instruments

of crime; he's currently out on bail.

from http://gothamist.com/2009/10/05/fbi_raids_queens_home_in_g20_protes.php

Who uses Tor?



- Normal people
- Law Enforcement
- Human Rights Activists
- Business Execs
- Militaries
- Abuse Victims

estimated 300k to 800k daily users



Tor hides communication patterns by relaying data through volunteer servers

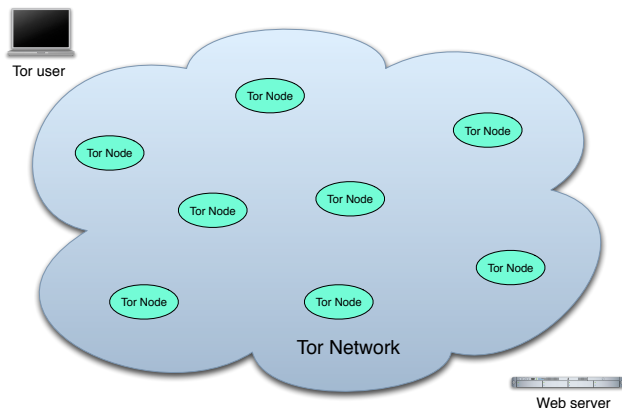


Diagram: Robert Watson

Tor hides communication patterns by relaying data through volunteer servers

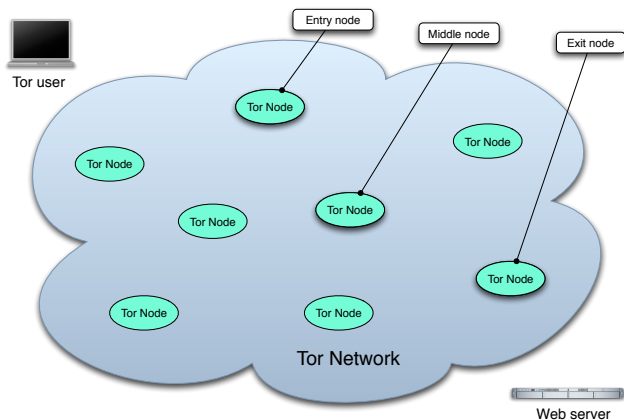


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Tor hides communication patterns by relaying data through volunteer servers

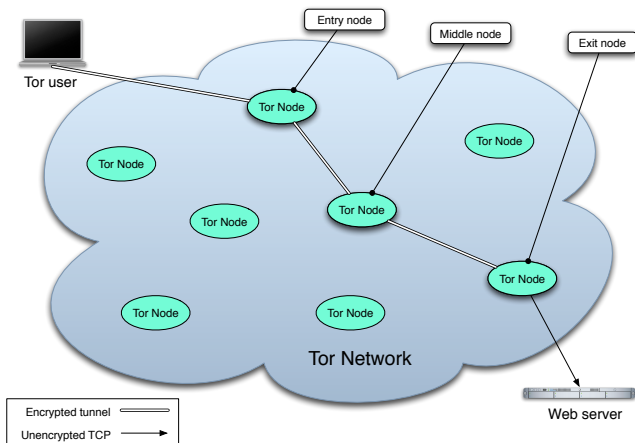


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Tor hides communication patterns by relaying data through volunteer servers

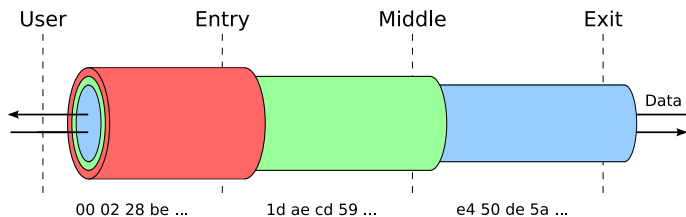


Diagram: Robert Watson

Vidalia Network Map

Tor Network Map

Refresh Zoom In Zoom Out Zoom To Fit Help Close

Relay

- blutmagie3
- blutmagie
- blutmagie4
- blutmagie2
- torserversNet3
- torserversNet4
- torserversNet2
- fejki4
- trusted
- williamhaines
- gatereloaded
- wiretrip
- Roo8Peik
- kyra
- Lifuka
- Tonga
- myrnaloy
- dizum
- pansenserver
- gotrootmeuk1
- Pandora
- st0nerhenge
- faktor
- dannenber
- Unnamed
- agate
- BarkerJrParis1a
- SEC
- hottuna
- jibjabroni
- Pandora27
- Pandora34
- Pandora33
- BostonUCom...
- Azad1
- SwedishBikini...
- PPrivCom052

Connection	Status
...voldo,kouvadaki,d0wnt1me	Open
...voldo,trusted,ArikaYumemiya	Open
...voldo,QuantumSevero,hasselb...	Open
...necrid,d0wnt1me,blutmagie	Open
...voldo,myrnaloy,MopperSmurf	Open
...necrid,wildnl,ZobrakDotNet	Open
...voldo,kyra,sandvine	Open
...voldo,worldstre0fS71,Quantum...	Open
...voldo,0000000000myTOR,Unna...	Open
...necrid,0x0080,exit3foertel,Pan...	Open

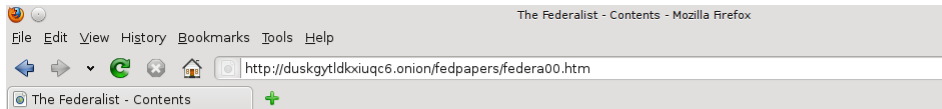
0x0080 (Online)
Location: Netherlands
IP Address: 62.212.66.193
Platform: Tor 0.2.1.26 on FreeBSD i386
Bandwidth: 2.33 MB/s
Uptime: 93 days 6 hours 25 mins 22 secs
Last Updated: 2010-12-10 17:04:35 GMT

exit3foertel (Online)
Location: United Kingdom

Metrics

- Measuring metrics anonymously
- NSF grant to find out
- Archive of hourly consensus, ExoneraTor, VisiTor
- Metrics portal:
<https://metrics.torproject.org/>

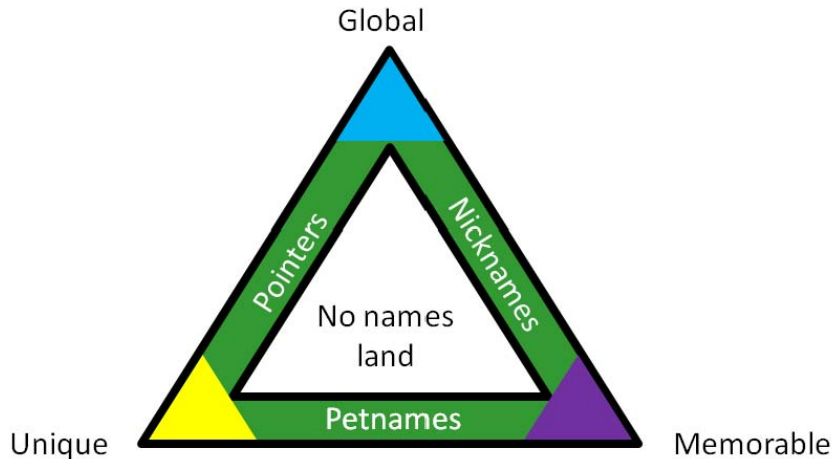
Tor hidden services allow privacy enhanced hosting of services



The Federalist

The text of this version is primarily taken from the first collected 1788 "McLean edition", but spelling and punctuation some glaring errors -- mainly printer's lapses -- have been corrected. The main heads have also been taken from except where the head was something like "The Same Subject Continued" we have repeated the previous head that each document can better stand alone. We have been guided by the excellent edition by Jacob E. Cooke, footnotes are those of the authors, except where the original edition used a variety of special typographical symbols and numerals. Editors's footnotes are indicated by being preceded by the letter "E". The original typography used

dot onion you say?



Hidden services, in text

- Distributed Hash Table (DHT) Directory

Hidden services, in text

- Distributed Hash Table (DHT) Directory
- Rendezvous points

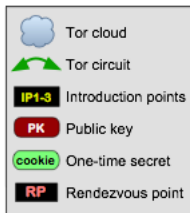
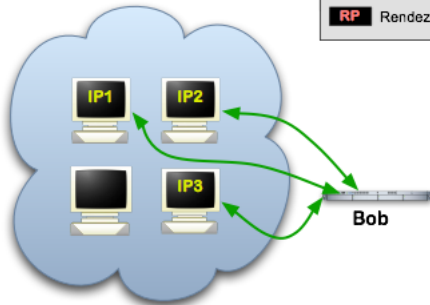
Hidden services, in text

- Distributed Hash Table (DHT) Directory
- Rendezvous points
- Anonymity for both the server and client

Hidden Services, in graphics

Tor Hidden Services: 1

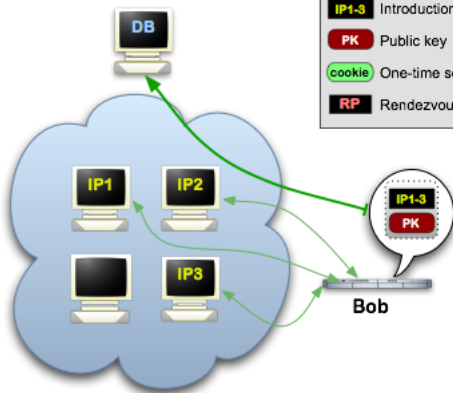
Step 1: Bob picks some introduction points and builds circuits to them.



Hidden Services, in graphics

Tor Hidden Services: 2

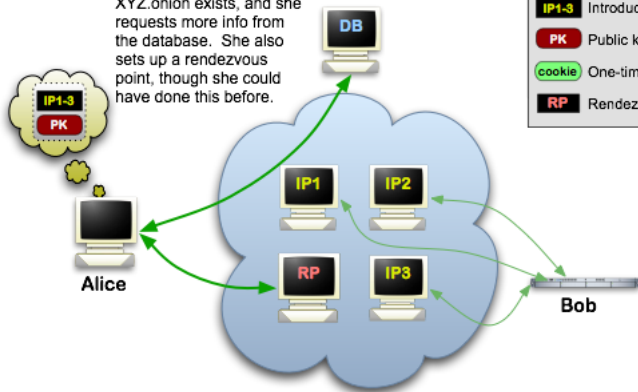
Step 2: Bob advertises his hidden service -- XYZ.onion -- at the database.



Hidden Services, in graphics

Tor Hidden Services: 3

Step 3: Alice hears that XYZ.onion exists, and she requests more info from the database. She also sets up a rendezvous point, though she could have done this before.



Hidden Services, in graphics

Tor Hidden Services: 4

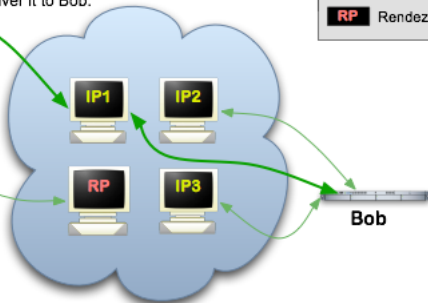
Step 4: Alice writes a message to Bob (encrypted to PK) listing the rendezvous point and a one-time secret, and asks an introduction point to deliver it to Bob.



Alice



DB



Tor cloud



Tor circuit



IP1-3 Introduction points



PK Public key



cookie One-time secret



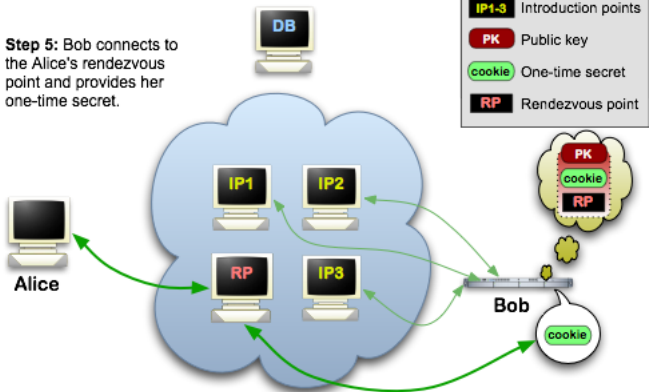
RP Rendezvous point

Bob

Hidden Services, in graphics

Tor Hidden Services: 5

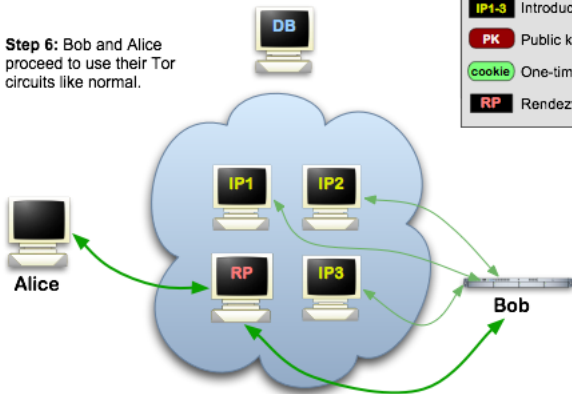
Step 5: Bob connects to the Alice's rendezvous point and provides her one-time secret.



Hidden Services, in graphics

Tor Hidden Services: 6

Step 6: Bob and Alice proceed to use their Tor circuits like normal.



Operating Systems leak info like a sieve



- Applications, network stacks, plugins, oh my....

Operating Systems leak info like a sieve



- Applications, network stacks, plugins, oh my.... some call this "sharing"

Operating Systems leak info like a sieve



- Applications, network stacks, plugins, oh my.... some call this "sharing"
- Did you know Microsoft Word and OpenOffice Writer are browsers?

Operating Systems leak info like a sieve



- Applications, network stacks, plugins, oh my.... some call this "sharing"
- Did you know Microsoft Word and OpenOffice Writer are browsers?
- www.decloak.net is a fine test

Mobile Operating Systems

- Entirely new set of challenges for something designed to know where you are at all times.
- Orbot: Tor on Android. <https://guardianproject.info/apps/>
- Tor on iPhone, Maemo/Meego, Symbian, etc
- Tor on Windows CE, <http://www.gsmk.de> as an example.
- Guardian Project, <https://guardianproject.info/>

Next steps

Visit <https://www.torproject.org/> for more information, links, and ideas.

Credits & Thanks

- who uses tor?
<http://www.flickr.com/photos/mattw/2336507468/siz>, Matt Westervelt, CC-BY-SA.
- danger!, <http://flickr.com/photos/hmvh/58185411/sizes/o/>, hmvh, CC-BY-SA.
- 500k, <http://www.flickr.com/photos/lukaskracic/334850378/sizes/l/>, Luka Skracic, used with permission.