



(TS//SI//REL) Peeling Back the Layers of TOR with

EGOTISTICALGIRAFFE



Derived From: NSA/CSSM 1-52

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Declassify On: 20371101



Overall Classification



This briefing is classified
TOP SECRET//COMINT//REL USA, FVEY



(U) Overview



- (U) What is TOR?
- (S//SI//REL) The TOR Problem
- (TS//SI//REL) EGOTISTICALGOAT
- (TS//SI//REL) EGOTISTICALGIRAFFE
- (U) Future Development



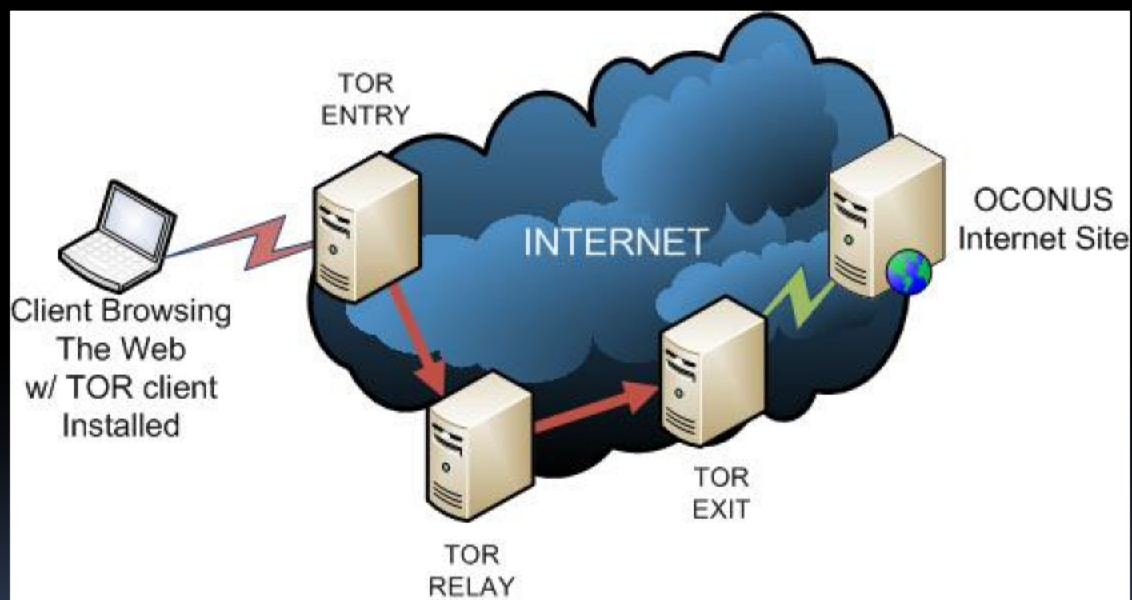
(U) What is TOR?



- (U) “The Onion Router”
- (U) Enables anonymous internet activity
 - General privacy
 - Non-attribution
 - Circumvention of nation state internet policies
- (U) Hundreds of thousands of users
 - Dissidents (Iran, China, etc)
 - (S//SI//REL) **Terrorists!**
 - (S//SI//REL) Other targets too!

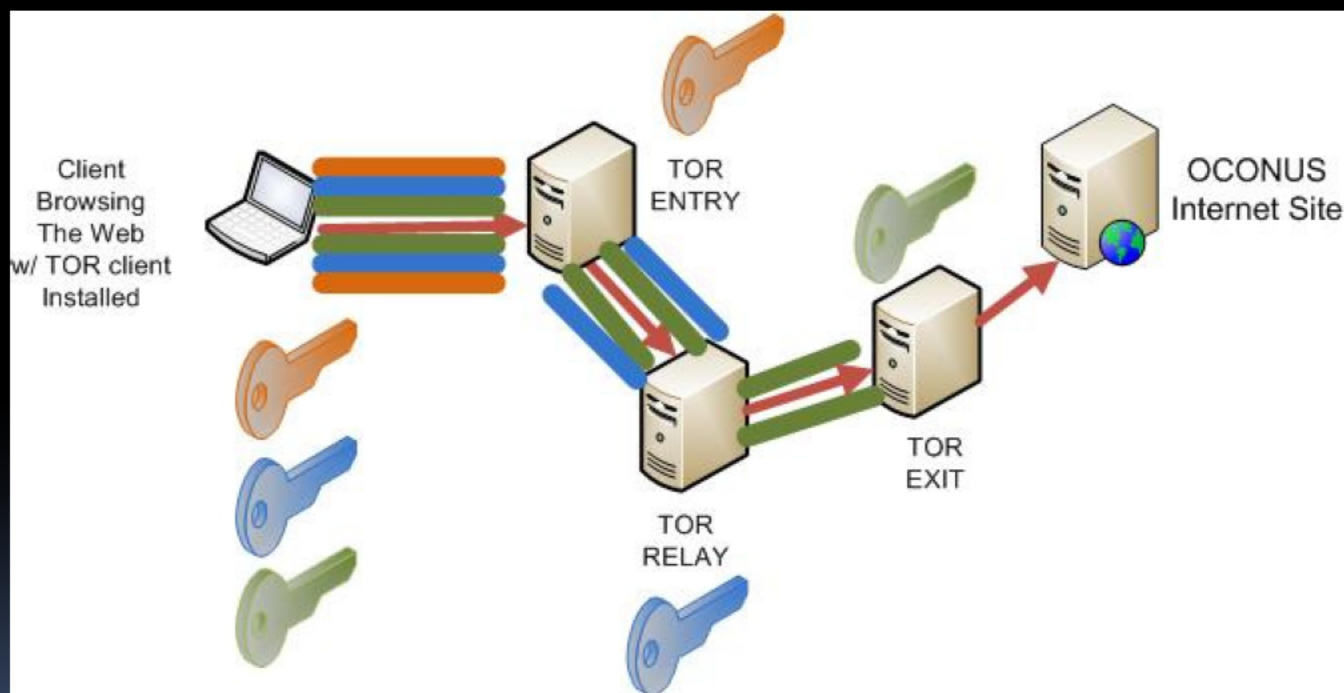


(U) What is TOR?





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(U) What is TOR?



- (U) TOR Browser Bundle
 - Portable Firefox 10 ESR (tbb-firefox.exe)
 - Vidalia
 - Polipo
 - TorButton
 - TOR
 - “Idiot-proof”



(S//SI//REL) The TOR Problem



- (TS//SI//REL) Fingerprinting TOR
- (TS//SI//REL) Exploiting TOR
- (TS//SI//REL) Callbacks from TOR



(TS//SI//REL) Fingerprinting TOR



Windows XP

Firefox 10.0.5 ESR?

- 32-bit Windows 7
- Firefox/10.0

64-bit Mac OS X

Firefox 10.0.4 ESR?

- 32-bit Windows 7
- Firefox/10.0

Ubuntu 11.10

Firefox 10.0.7 ESR?

- 32-bit Windows 7
- Firefox/10.0

64-bit Windows 7

Firefox 10.0.10 ESR?

- 32-bit Windows 7
- Firefox/10.0

Windows 7

Firefox 10.0, not running TOR?

- 32-bit Windows 7
- Firefox/10.0



(TS//SI//REL) Fingerprinting TOR



(TS//SI//REL) BuildID gives a timestamp for when the Firefox release was built

20121024073032

Year

Month

Day

Hour

Min

Sec

(TS//SI//REL) tbb-firefox's BuildID:

0



(TS//SI//REL) Fingerprinting TOR



- (TS//SI//REL) TorButton cares about TOR users being indistinguishable from TOR users
- (TS//SI//REL) We only care about TOR users versus non-TOR users
- (TS//SI//REL) Thanks to TorButton, it's easy!



(S//SI//REL) The TOR Problem



- ~~(TS//SI//REL) Fingerprinting TOR~~
- (TS//SI//REL) Exploiting TOR
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(TS//SI//REL) Exploiting TOR

- (TS//SI//REL) tbb-firefox is barebones
 - Flash is a no-no
 - NoScript addon pre-installed...
...but not enabled by default!
 - TOR explicitly advises against using any addons or extensions other than TorButton and NoScript
- (TS//SI//REL) Need a native Firefox exploit



(TS//SI//REL) Exploiting TOR

- (TS//SI//REL) ERRONEOUSINGENUITY
 - Commonly known as ERIN
 - First native Firefox exploit in a long time
 - Only works against 13.0-16.0.2
- (TS//SI//REL) EGOTISTICALGOAT
 - Commonly known as EGGO
 - Configured for 11.0-16.0.2...
...but the vulnerability also exists in 10.0!



(U) EGOTISTICALGOAT



- (TS//SI//REL) Type confusion vulnerability in E₄X
- (TS//SI//REL) Enables arbitrary read/write access to the process memory
- (TS//SI//REL) Remote code execution via the CTypes module



(S//SI//REL) The TOR Problem



- ~~(TS//SI//REL) Fingerprinting TOR~~
- ~~(TS//SI//REL) Exploiting TOR~~
- (TS//SI//REL) Callbacks from TOR



(TS//SI//REL) Callbacks from TOR



- (TS//SI//REL) Tests on Firefox 10 ESR worked
- (TS//SI//REL) Tests on tbb-firefox did not
 - Gained execution
 - Didn't receive FINKDIFFERENT
- (TS//SI//REL) Defeated by Prefilter Hash!
 - Requests EGGI: Hash(tor_exit_ip || session_id)
 - Requests FIDI: Hash(target_ip || session_id)



(TS//SI//REL) Callbacks from TOR



- (TS//SI//REL) Easy fix
 - Turn off prefilter hashing
 - FUNNELOUT
- (TS//SI//REL) OPSEC Concerns
 - Pre-play attacks
 - PSPs
 - Adversarial Actors
 - Targets worth it?



(S//SI//REL) The TOR Problem



- ~~(TS//SI//REL) Fingerprinting TOR~~
- ~~(TS//SI//REL) Exploiting TOR~~
- ~~(TS//SI//REL) Callbacks from TOR~~



(U) Success



- (TS//SI//REL) 24 targets successfully implanted with Validator during first weekend of release
- (TS//SI//REL) _____
 - └ _____
 - Inspire Magazine
 - Finally exploited after eight months