Tor Hidden Services
How Hidden is 'Hidden'?

– ICTR Network Exploitation

APPLIED RESEARCH

What is Tor?

- Tor is an implementation of 2nd generation onion routing

- Originally sponsored by the US Naval Research Laboratory

- Later became an Electronic Frontier Foundation project

- Helps to prevent network traffic analysis & surveillance

- Open network with over 2000 nodes

- Anonymity tool

- Uses multiple layers of encryption

- Multi-hop proxy

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RESEARCH

What I have done on Tor

- General Tor research

- HOMING TROLL
  - Bridge discovery capability

- Hidden Services

- Helped with a few deanonymisation techniques

- Worked with JTRIG & MCR (Maths & Crypt research)
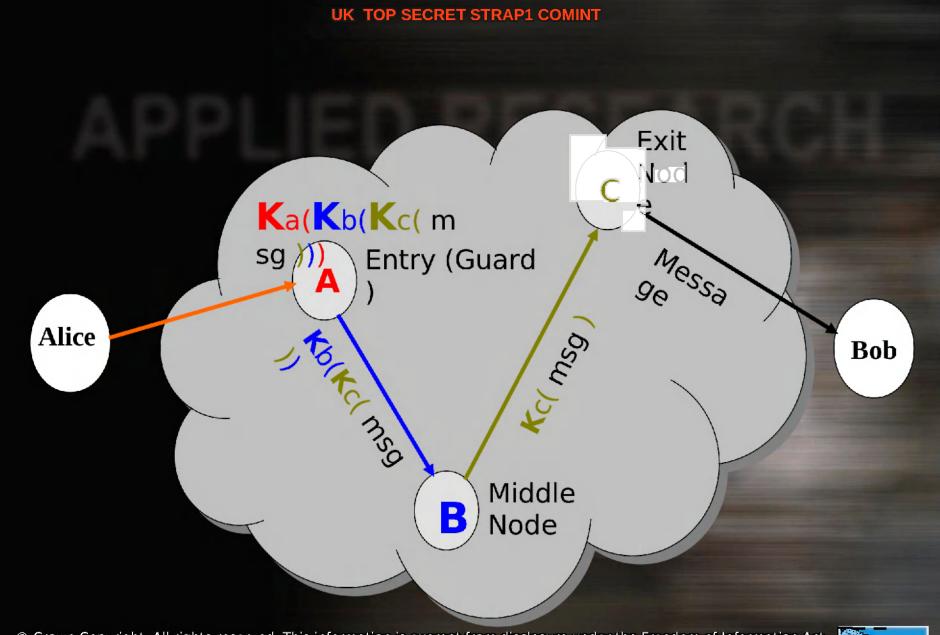
- Provided support to OP SUPERIORITY

APPLIED RESEARCH

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What is it used for?

- ## The Good
  - People living in oppressive countries (circumvent firewalls)
  - Access to free media instead of state propaganda
  - People can say what they want without it being linked to their public profile

- ## The Bad
  - Bot herders use Tor to give instructions to their bots
  - Allows paedophiles access content without linking themselves to it
  - State actors can launch attacks without being attributable
  - "Anonymous" & LULZSec

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What do we see?

- Any traffic between the client & tor is heavily encrypted.

- We can only really see traffic from an exit node to a website
  - But we don't know where this traffic originated from

- Still could link up aliases though
  - 'Somebody' could still visit a dodgy forum and log in with an alias, or even send an email using a known target email address (Assuming they don't use SSL).

- Phew… at least there is some intelligence gain…. Right?

Hidden Services

- Hides the IP address of a web service

- Protects content providers by anonymously hosting content

- Publication of undesirable content

- Both client and server are anonymous to an observer and to each other

Normal Tor

User   Website

?   ⟷   Naughty Site

Clear text

Hidden Services

User   Website

?   ⟷   ?

Encrypted

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So what do we see now?

- Not much…

- All Hidden Service traffic is heavily encrypted.

- Most we can gather is that one Tor node talks to another (IP level)

- Hiding in the crowd at its best!

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RESEARCH

The dot ~~com~~ onion BOOM

- What's this .onion business?
  - TLD Tor uses to initiate a connection to a hidden service

- Example onion domain
  - 16 characters in base32 (few characters are actually missing)
  - oqznfi3tdo6nwg3f.onion

- DNS?
  - Tor uses something similar to DNS to resolve an onion domain
  - Onion domains 'resolve' to 3+ IP addresses called Introduction Points (IPT)

APPLIED RESEARCH

Pieces of the Jig-Saw

- ## The actual Hidden Service (HS)
  - Where the service actually originates from

- ## User
  - The user who wishes to access the Hidden Service

- ## Hidden Service Directory (HSDir)
  - A directory server that hold information on a Hidden Service

- ## Introduction Point (IPT)
  - Hidden Service's 'front door' / relay

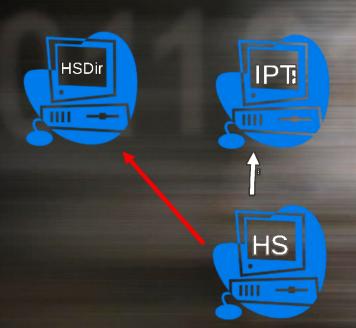- ## Rendezvous Point (RP)
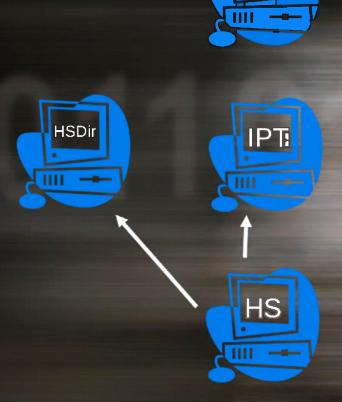 - Client's 'front door' / relay

Fitting it together

1. HS selects *random* IPTs

2. HS uploads descriptor to HSDir

3. Client finds out about HS

4. Client requests descriptor from HSDir

5. Client selects a random RP

6. Client contacts one IPT

7. HS replies to RP

8. RP relays between client and HS

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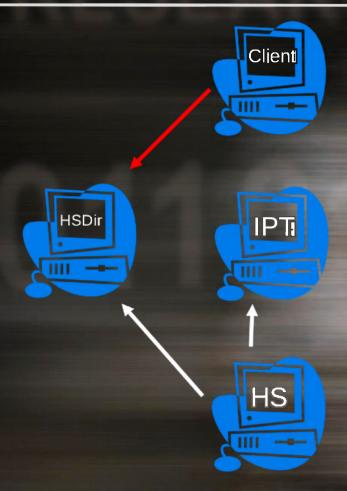
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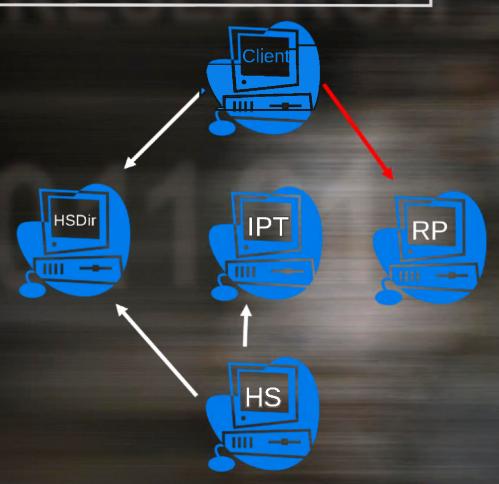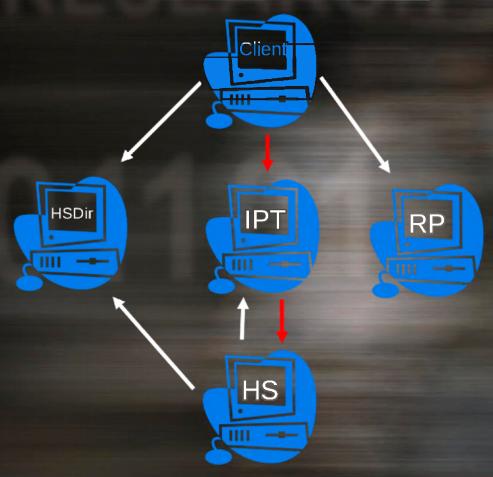7. HS replies to RP

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Client

HSDir

IPTi

HS

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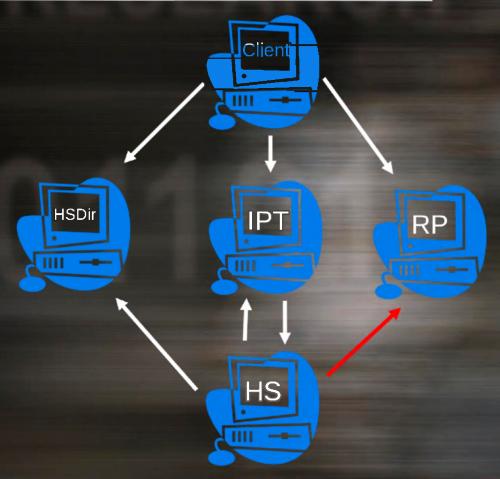
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HSDir

IPT

RP

HS

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APPLIED RESEARCH

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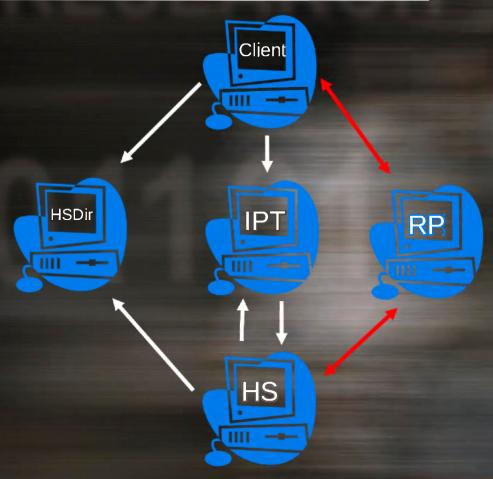
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HSDir

IPT

RP

HS

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Client

HSDir

IPT

RP

HS

APPLIED RESEARCH

Possible Exploits?

- ## Rendezvous Point (RP)

  - What if we owned the RP?

  - Traffic still encrypted, although only a single layer of encryption

  - Still only content, don't know who the user is or where the HS is located

  - Clients randomly select their RP so unlikely to be picked anyway
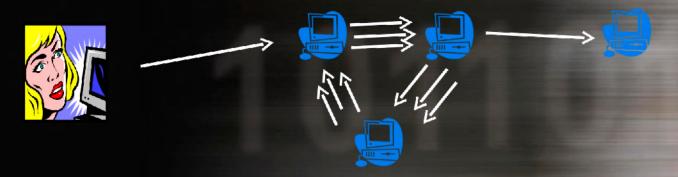
- ## Hidden Service Directory (HSDir)

  - If we take a HSDir down, there are still many left

  - Could potentially collect onion domains if we acted as a HSDir

- ## Client

  - No real way to distinguish between a Tor user accessing the web or a HS

- Introduction Points (IPT)
  - All Hidden Service IPTs are listed on its descriptor (the thing that's stored on a HSDir)
  - Potential for an attack on IPTs to stop them accepting connections for the HS
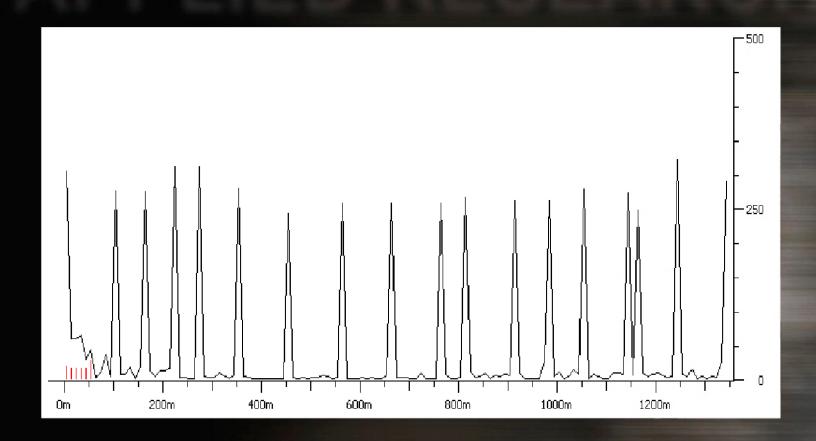 - This could be done using a 'Coil Attack'

  - Doesn't stop a HS selecting another set of IPTs
  - HS can encrypt their IPTs in their descriptor (but not many do)

- Hidden Service (HS)
  - What about exploiting the HS directly?

  - Potential to identify the IP addresses hidden services
    - But cant really say which one

  - Identified a beaconing pattern from HS

  - Dependant on collection posture
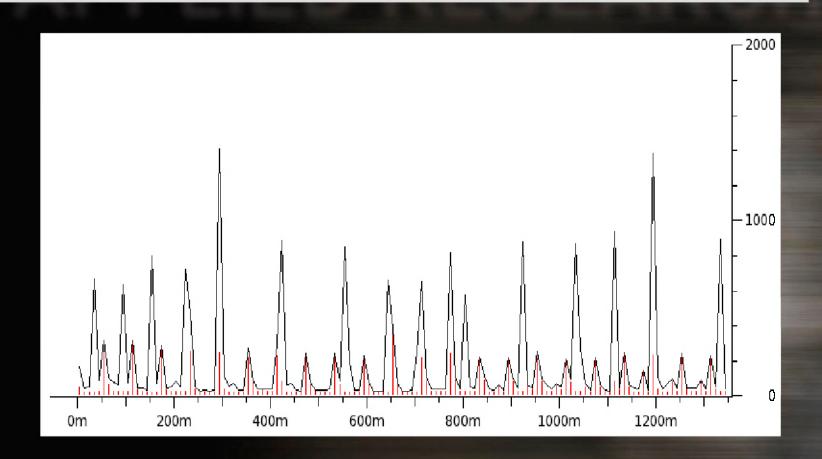
  - Great for PRESTON

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Idle Client Beacons

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Idle HS Beacons

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Summary

- Tor helps people become anonymous

- Very naughty people use Tor

- Hidden Services hide the fact web content even exits!

- Near impossible to figure out who is talking to who

- Its complicated

- Some areas for further research

- Until then… Doesn't stop us from using them

APPLIED RESEARCH

Questions?