Securing P2P Systems with Social Networks

Matt Wright
UT Arlington
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THE UNIVERSITY OF TEXAS AT ARLINGTON
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P2P
BitTorrent tracker identifies the swarm and helps the client software trade pieces of the file you want with other computers.

Computer with BitTorrent client software receives and sends multiple pieces of the file simultaneously.

Source: http://www.howstuffworks.com
How Tor Works: 2

Step 2: Alice’s Tor client picks a random path to destination server. Green links are encrypted, red links are in the clear.

Source: http://www.torproject.org
Outline

• Sybil Attacks

• Social Networks

• Pisces (anonymity)

• Persea (file sharing +)
Sybil
Attacks
Sybil Attacks in P2P

Defeating Sybils
Defeating Sybils
Defeating Sybils

PUZZLE SAID 2-4 YEARS

ONLY TOOK ONE

Trollpicz.com
Social Networks
Online Social Networks
Social Networks
Of course she’s looking to date..

All her friends are “accidents” ..oh, really?
How Sybils Attach

Slide by Prateek Mittal: SybillInfer
Finding Sybils

Honest Nodes

Attack edges

Sybils
Pisces
Distributed Anonymity
How Tor Works: 1

Alice

Step 1: Alice’s Tor client obtains a list of Tor nodes from a directory server.

Bob

Jane

Dave

Source: http://www.torproject.org
Tor’s Quadratic Growth

ShadowWalker

- Structured P2P
ShadowWalker

• Shadows

ShadowWalker

- Secure Random Walk

http://www.astro.sunysb.edu/mzingale/software/astro/random_walk.avi
Pisces

- *un*-structured topology
- Reciprocal Neighbor Policy (RNP)
- “Public” friends
Benefit of Pisces

Honest Nodes → Attack edges → Sybils

Slide by Prateek Mittal: SybillInfer
Benefit of Pisces

Entropy

Attack Edges

Pisces

ShadowWalker
Persea
P2P File-sharing
Persea Idea

• Your social network is your ID

• Build this into the system
Bootstrap Trees

A (ID: 0)

A's chunk

a₁ (ID: 1)  a₂ (ID: 58)

1  57  58  114 ... 457  511

a₁'s chunk  a₂'s chunk  Yet not assigned

b₁ (ID: 513)

b₁'s chunk  Yet not assigned

b₁₁ (ID: 514)

514  526

b₁₁'s chunk

B (ID: 512)

B's chunk

Yet not assigned

Yet not assigned
Redundant Lookup

ID: 13

ID: 781

ID: 525

ID: 269
Benefits

• No interface with Facebook

• No reliance on fast mixing

• Attacker’s effect is limited

• No reliance on low clustering
Whanau, X-Vine

Lookup Success Rate (%)

- ham (0.08)
- flic (0.17)
- wiki (0.21)
- epin (0.23)
- cat (0.43)
- astro (0.63)

1 attack edge per user
Conclusions