Red IRIS

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Aretusa
Reputation system for BitTorrent

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OUTLINE

- Introduction: free-riding
- Why BitTorrent?
- How to solve the problem?
- How does it work?
- The implementation
- Final considerations

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INTRODUCTION: FREE-RIDING

- What's free-riding?
- Basically: cheating.
- Formally: abuse a peer to peer network to download a file without uploading a single byte, if possible at the maximum rate.

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INTRODUCTION: FREE-RIDING

- Is that possible?
- Basically: yes.
- Formally: the “optimistic unchoke” mechanism of BitTorrent allows a client to free-ride.
- Demonstration: BitThief.

http://dcg.ethz.ch/projects/bitthief

INTRODUCTION: FREE-RIDING

- What's “optimistic unchoke”?
- Part of the incentive system of BT.
- When you want to share with someone, you “unchoke” him.
- Otherwise, you “choke” the peer.
- Periodically, you have to randomly “unchoke” peers to allow them bootstrap.


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INTRODUCTION: FREE-RIDING

- Does BitThief work?
- Absolutely!
- It is **always** able to download torrents.
- Much more faster than the official client when using “seeders”.
- Slower when using only “leechers”, but it still works.

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WHY BITTORRENT?

- It is strongly vulnerable to free-riding.
- Other p2p architectures have mechanisms to alleviate free-riding.
- It's efficient.
- It's quick.
- It's widespread.
- It's fashionable.

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HOW TO SOLVE THE PROBLEM?

- It's not possible
- But it can minimized.
- Two requirements:
  - Identify peers univocally.
  - Keep track of their behaviour in the network.

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HOW TO SOLVE THE PROBLEM?

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HOW TO SOLVE THE PROBLEM?

- Identify peers univocally:
  - Unique identity all over any BT network.
  - This means a BT network must behave as a federation.
  - eduGAIN's automated client profile fits perfectly here.

HOW TO SOLVE THE PROBLEM?

- Keep the reputation of the peers:
  - Peers must notify their experience when interacting with other peers.
  - The reputation must be stored somewhere: trackers.
  - Each peer will have one and only one responsible tracker.

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HOW DOES IT WORK?

- Peers verify the identity of everyone willing to connect.
- Once you know who is a peer, check its reputation.
- What to do with that info? Up to you!
- You **should** choke peers with bad reputation, but you have to define what is a bad or a good reputation.

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HOW DOES IT WORK?

- The gory details:
  - When a peer to peer connection starts, each of them exchange their certificates.
  - They validate their partner's certificate against its responsible tracker: that's the **federation** .
  - This way peers can **move** .

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HOW DOES IT WORK?

- More gory details:
  - The peers ask the tracker for the reputation of the other peer: **eduGAIN attribute request** .
  - The same way they notify the reputation when they have some experience interacting with the other peer.

HOW DOES IT WORK?

- More gory details:
  - The tracker responsible of a peer can be discovered thanks to metadata service (**eduGAIN MDS**) and Subject Alternative Name extension present in the certificates.
  - A PKI is needed.

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THE IMPLEMENTATION

- Java, as eduGAIN.
- Azureus based: client + tracker.
- Peer's protocol: extension over Azureus Messaging Protocol.
- eduGAIN: automated client profile + web redirections.
- Extension to the tracker to support authentication + reputation management.

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FINAL CONSIDERATIONS

- Easy to deploy.
  - Users: request a certificate and install.
  - Organizations: setup an Aretusa tracker and seeder.
  - Up and working, start using it!
- Privacy: no need to exchange personal data.

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FINAL CONSIDERATIONS

- But, wait a moment...
  - **WORK IN PROGRESS!**

Questions?