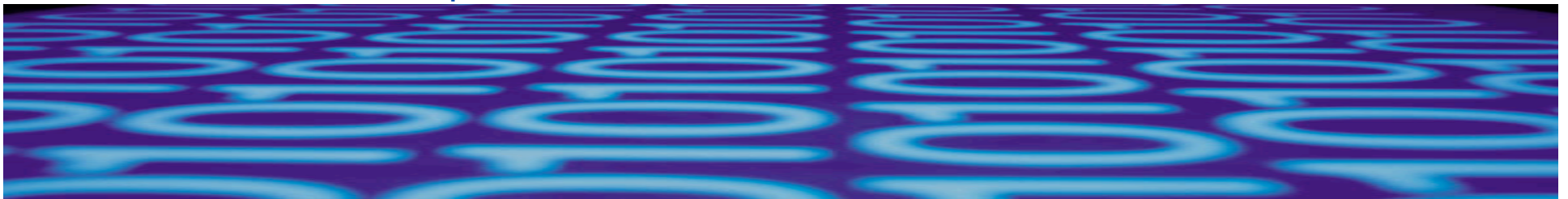# Comparing BitTorrent Clients in the Wild: The Case of Download Speed

Marios Iliofotou
University of California, Riverside

Georgos Siganos, Xiaoyuan Yang, and Pablo Rodriguez
Telefonica Research, Barcelona

Motivation

■ **BitTorrent (BT) is the most popular P2P file-sharing protocol**

   — 20 million daily users in Pirate Bay alone

■ **Today, there exist many BT clients**

   — How much do we know about them?

Vuze   **uTorrent**   **Transmission**   **etc.**

**Question: Are there differences between these clients?**

Contributions

- Large scale measurement study of real BT clients

  — 10 million users over one month

  — From 6,000 ISP

- **Observation 1: uTorrent** achieves on average **16%** higher download speeds compared to **Vuze**

- **Observation 2:** We indentify four implementation differences

  — Neighborhood management

  — Opening of new connections

  — Termination of connections

  — Upload bandwidth distribution

Telefónica

Outline

- Introduction

- **Dataset collection**

- Part A: Speed comparison

- Part B: Implementation differences

- Conclusions and future work

Telefónica

Download speed inference using Apollo

~ 7.5 minutes ~

Difference = 3 pieces
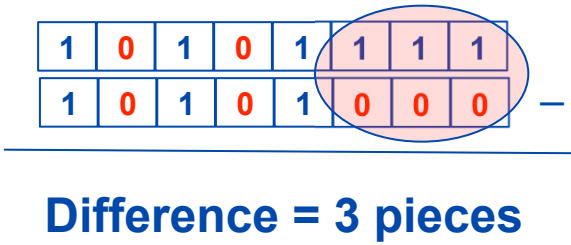
$$Estimated - Speed = \frac{\# \, Pieces \times Size}{Time}$$

Dataset description

- **Collection process**

  — Apollo connects to the top 600 torrents from Pirate Bay (every hour)

  — It connects multiple times with as many BT hosts possible

- **BT Clients used: Vuze and uTorrent**

  — 75% of all BT hosts use these clients (Pirate Bay)

- **Summary statistics**

  — Data cover 1 month (a representative week is used in the paper)

  — 10 millions BT hosts

  — 6,000 ISPs

Telefónica

Fair comparison between Vuze and uTorrent

- External factors that can effect download speed

  — **The torrent:** A local torrent can be faster (e.g., a Spanish film)

  — **The ISP:** An ISP can be faster than others

- **Solution:** Select same # hosts from each {torrent, ASN} pair

- Data after processing

  — Overall equal number of Vuze and uTorrent samples

  — 10K up to 80K samples per ASN for each client
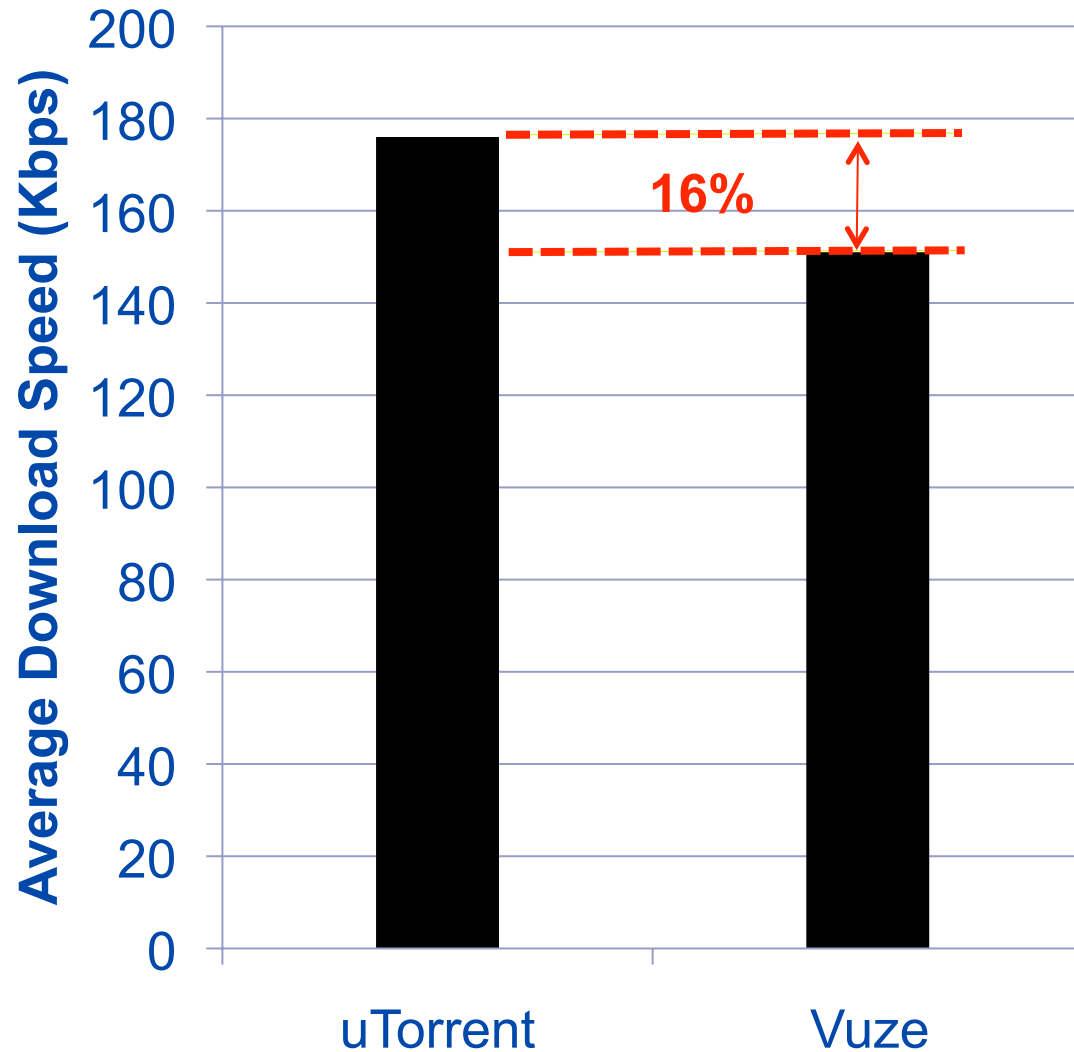
Telefónica

Outline

- Introduction

- Dataset collection

- **Part A: Speed comparison**

- Part B: Implementation differences

- Conclusions and future work
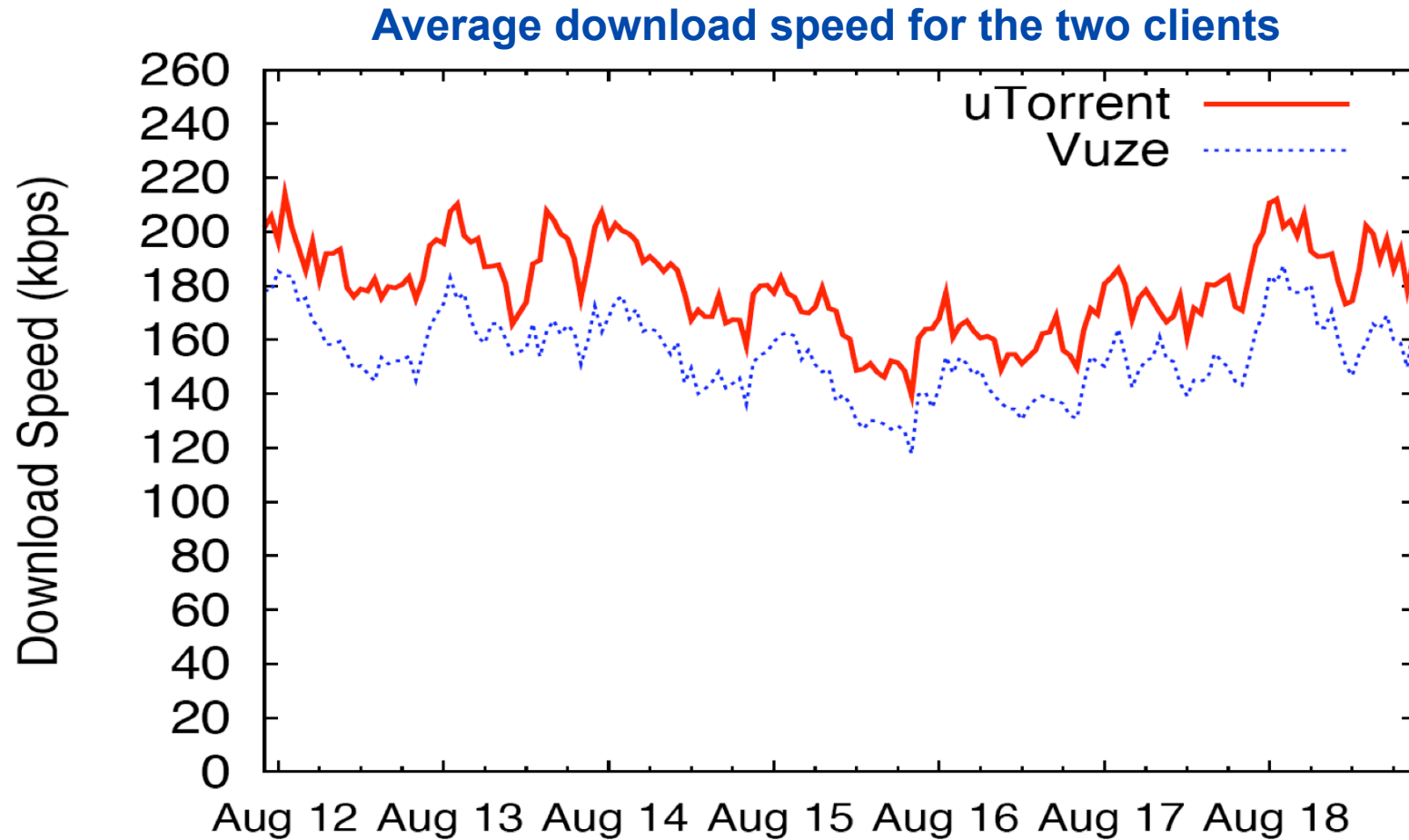
7

Overall speed differences

Perc.	uT (Kbps)	Vuze (Kbps)	Ratio
30th	65	61	1.07
50th	90	81	1.11
60th	119	106	1.12
70th	165	147	1.13

Two main observations:
- uTorrent faster by 16%
- uTorrent is faster for the higher percentiles

16%

Average Download Speed (Kbps)

uTorrent   Vuze

Consistent behavior over time

Average download speed for the two clients

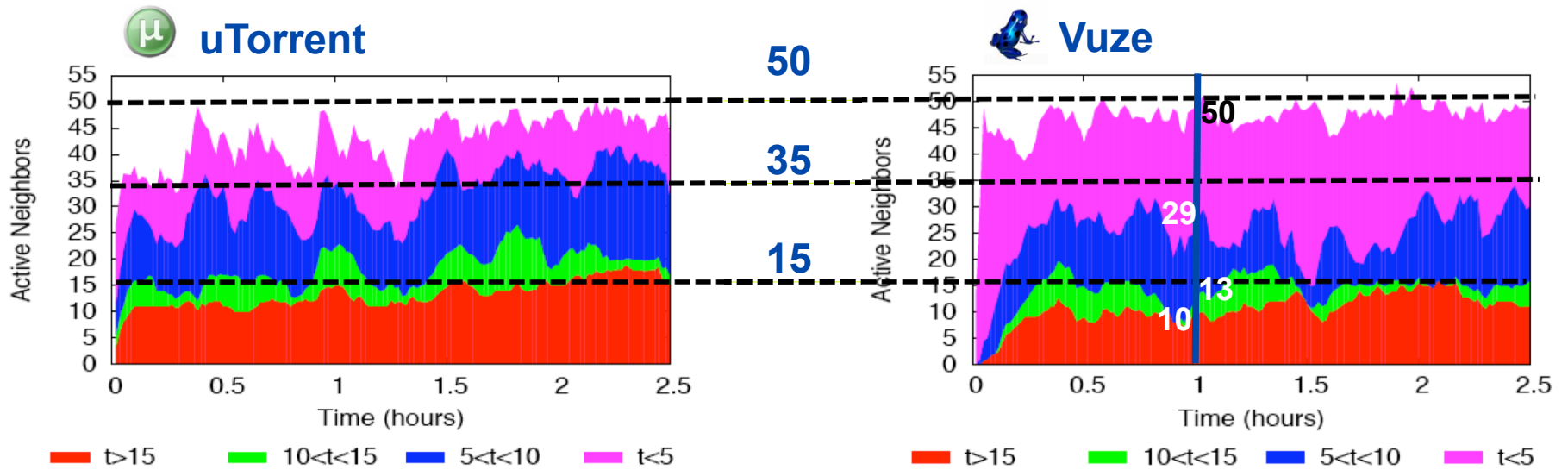# Comparing speeds for different ISPs
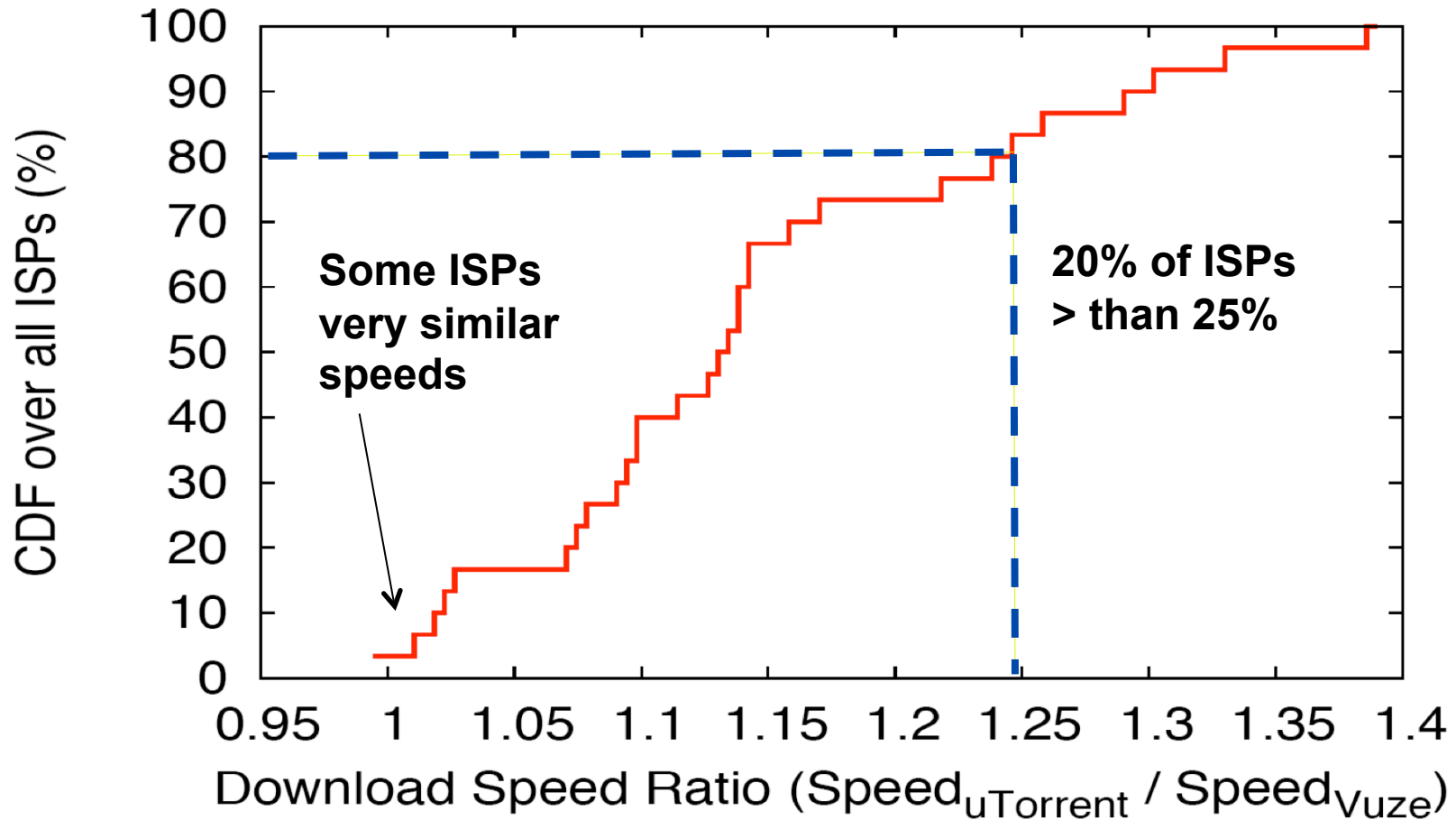
Outline

- Introduction

- Dataset collection

- Part A: Speed comparison

- **Part B: Implementation differences**

    - Neighborhood management

    - Opening of new connections

    - Termination of connections

    - Upload bandwidth distribution

- Conclusions and future work

Data collection

- **Trace driven reconstruction of internal state**

  — Keep track of active connections

  — Estimate upload and download rate of each connection

- **Why this approach?**

  — It can be applied to any client (open or close source)

  — We have the same measurement methodology (no biases)

- **Dataset**

  — Experiments ranged over two months

  — Different times of the days, weekdays and weekends

  — Always downloading a popular torrent (top 20 in Pirate Bay)

Neighborhood set over time

- **Both clients are set to have 50 open connections**
  - Vuze follows this closely
  - uTorrent shows higher variability
- **Vuze has more ephemeral connections (open for less than 5 mins)**

Upload bandwidth distribution
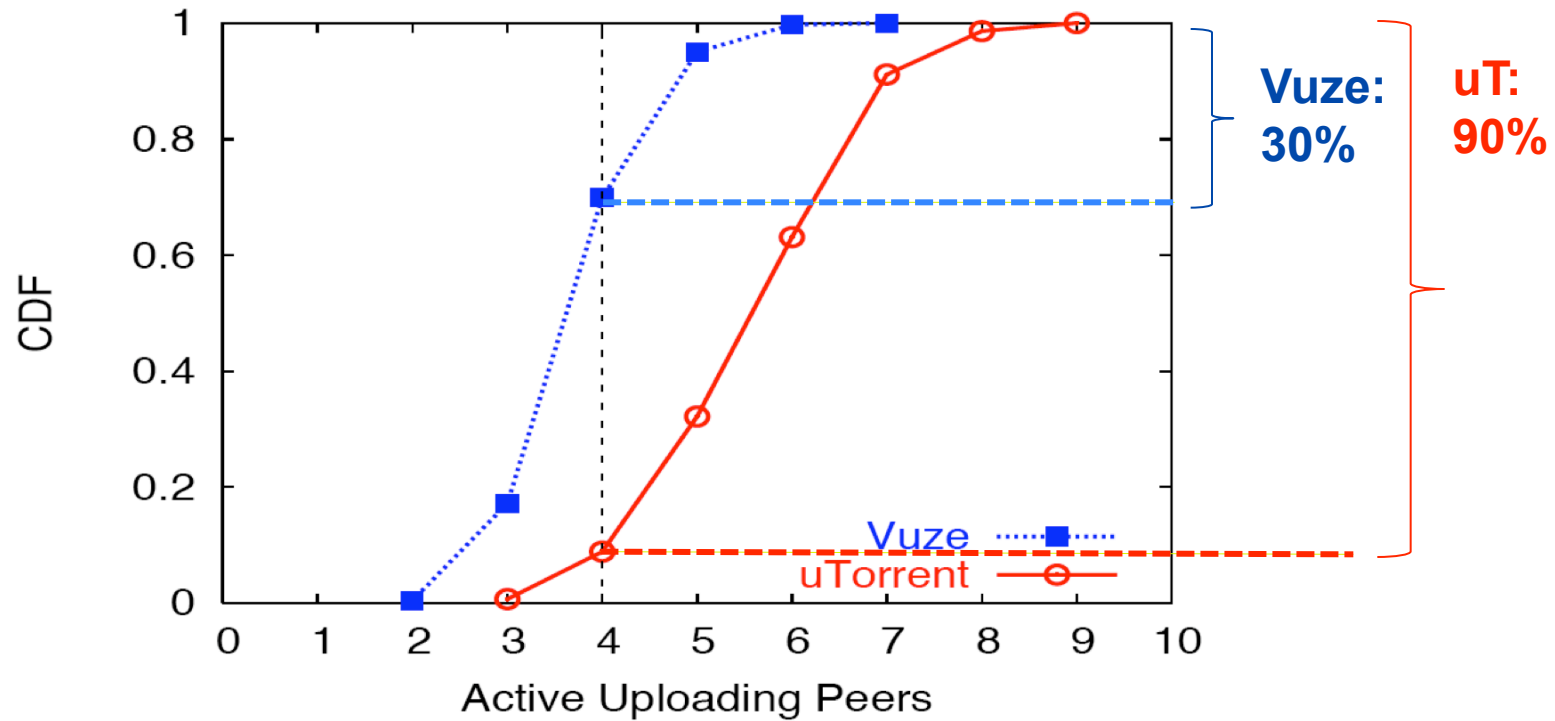
- **uTorrent simultaneously uploads to more peers**
  - uTorrent 90% of the time uploads to more than 4
  - Vuze only 30% of the time uploads to more than 4

Telefónica

Outline

- Introduction

- Dataset collection

- Part A: Speed comparison

- Part B: Implementation differences

- **Conclusions and future work**

Telefónica

Conclusions

- **BT is popular, but how much do really we know about it?**
  - Our measurements open many interesting questions

- **Our goal is to bring to the attention of BT designers that**
  - Some design choices can have a significant effect in performance
  - More effort should be added in evaluating design choices

- **We don't claim that uTorrent is the way to go**
  - We see our work opening the door for new research efforts to measure and evaluate real BT clients in the wild

Telefónica

Future work

- **Compare more BT clients**
  - E.g., transmission, bitcommet, etc.

- **Test different implementation choices in a controlled environment**
  - Testbed
  - Planetlab

- **Study the effect of the ISP and their offered services to the performance of different clients**

Telefónica

Thank You!
Questions/Discussion?

Telefónica