BitTyrant

A Strategic BitTorrent Client

15-441: Computer Networks

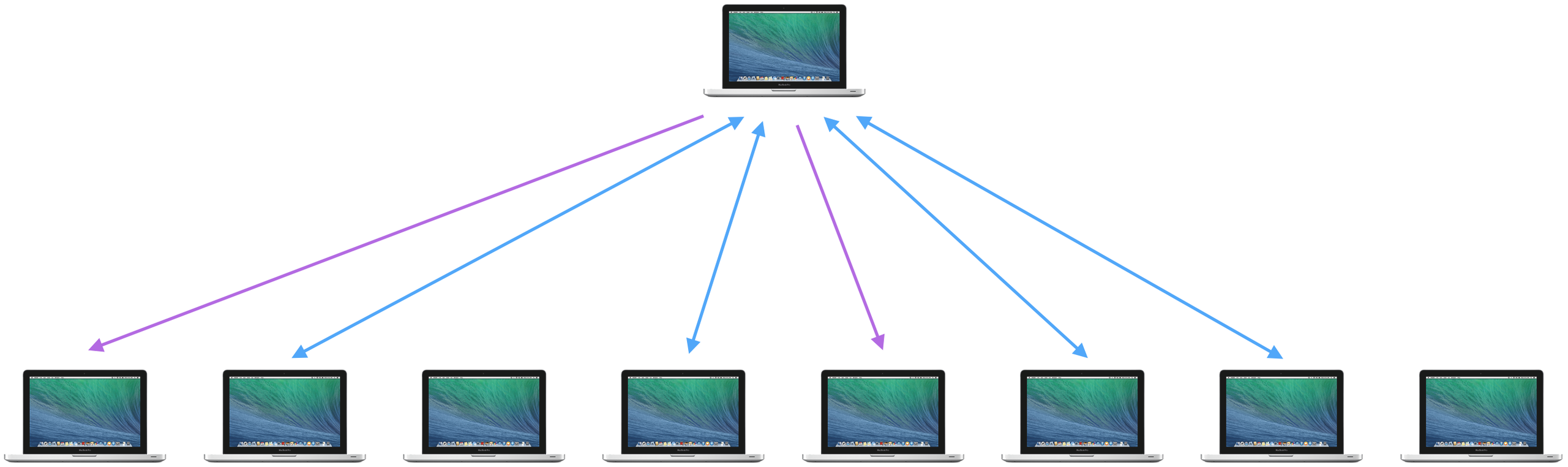
Matt Mukerjee
David Naylor
Ben Wasserman

BitTorrent

BitTorrent

Swarm: Set of peers exchanging a particular file

BitTorrent



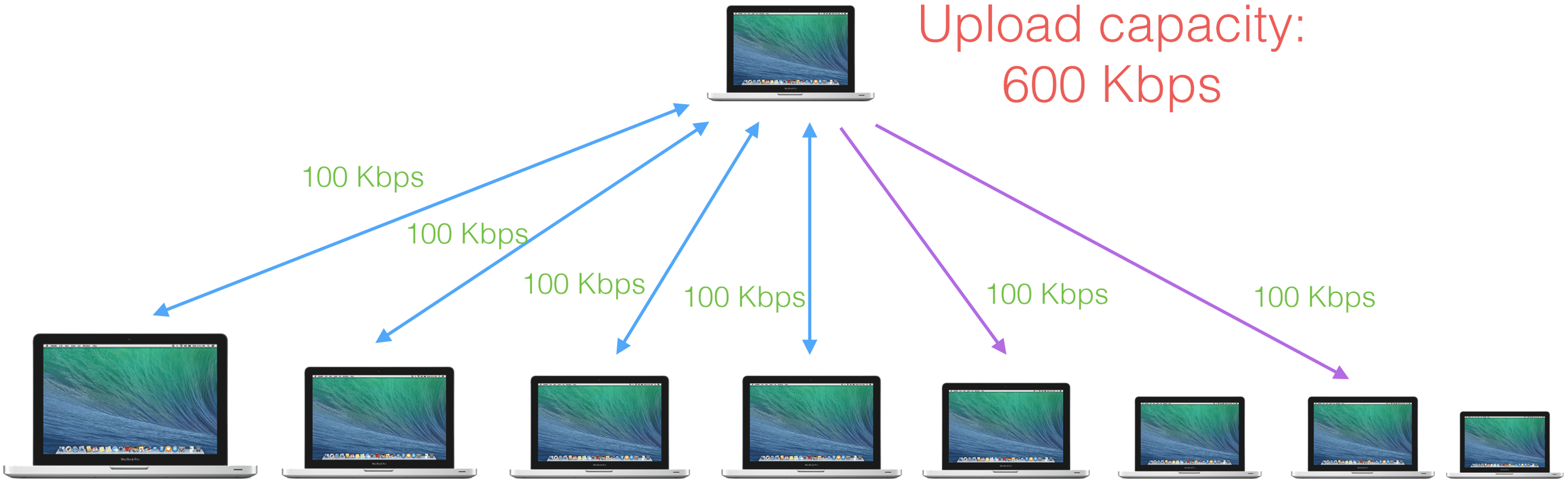
Tit-For-Tat: I'll upload to you if you upload to me.

Active Set: The peers with which a peer is exchanging data.

Optimistic Unchoking: Uploading to peers who aren't uploading to you to "feel them out"

BitTorrent

BitTorrent



Peers divide upload bandwidth evenly among all the peers in their active set + optimistic unchokes.

Equal Split Rate: The upload rate you give each peer.

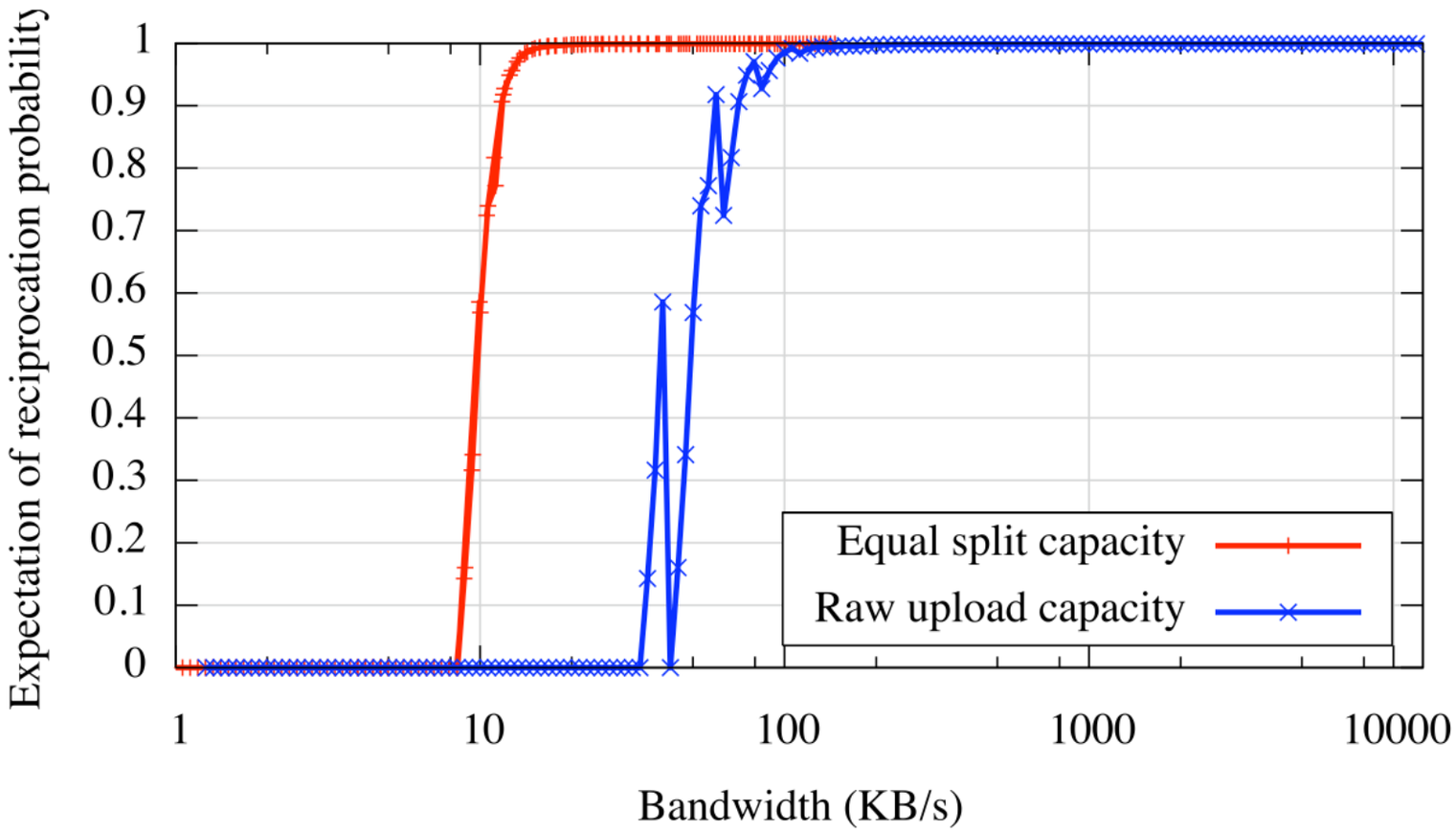
Can we cheat?

Feasible?

- How much **altruism** is present in BitTorrent?
  (We can exploit altruism…)

- **Measurement study** to determine upload bandwidth distribution

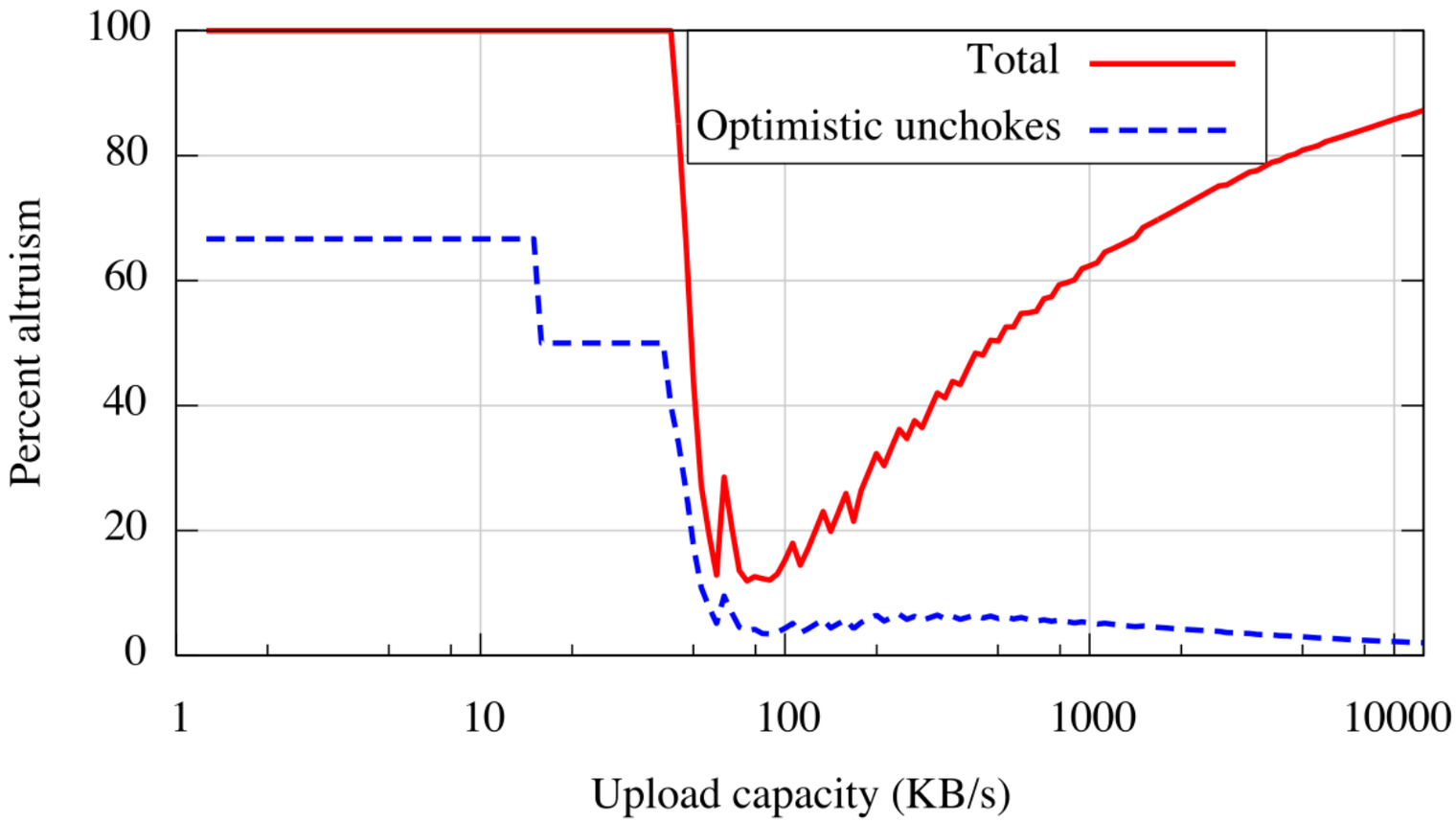
Reciprocation Probability



After a point (~14KB/s), reciprocation is **almost guaranteed**.
Any further contribution is **altruistic**.

Expected Altruism

Percentage of upload capacity not resulting in direct reciprocation.



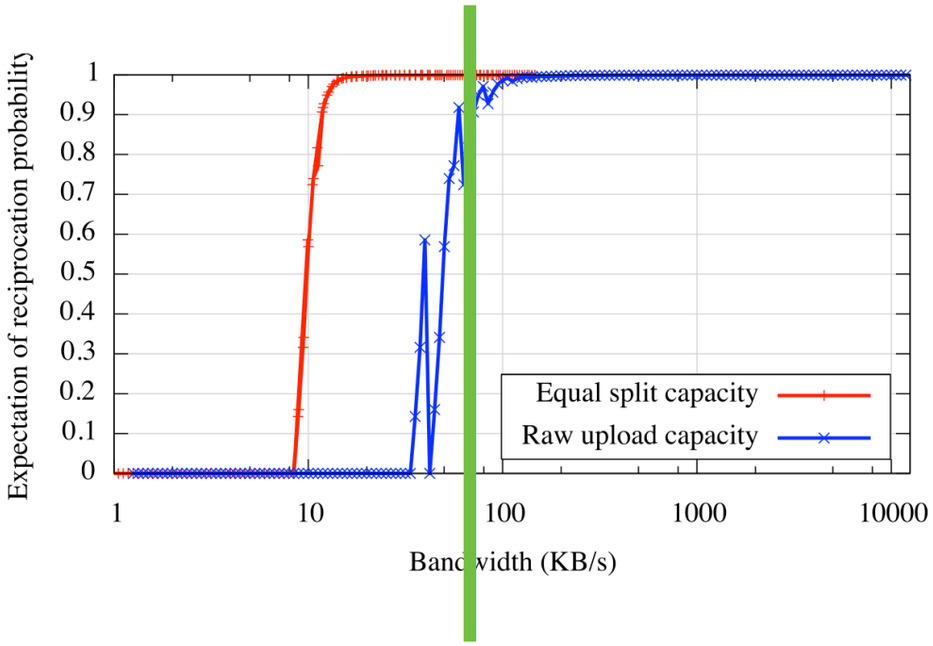
All peers make altruistic contributions.

High BW: Fixed active set size -> equal split rate higher than necessary.

Low BW: Freeload on optimistic unchokes.

Active Set Sizing

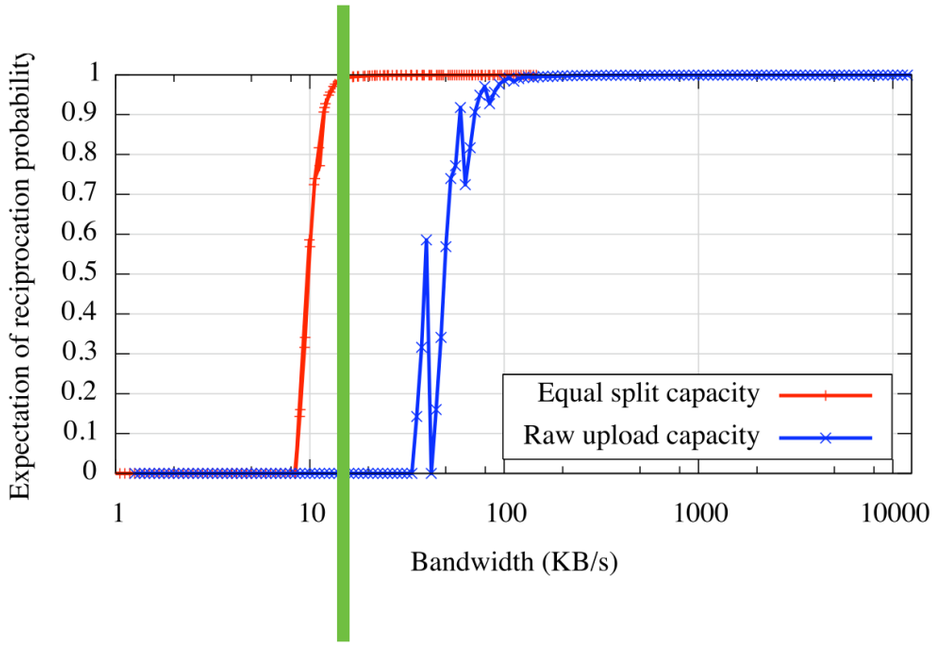
Strategy 1: Increase active set size until equal split rate is too low for reciprocation.



Upload capacity: 300 KB/s

Active set size: 4

Equal split rate: 75 KB/s



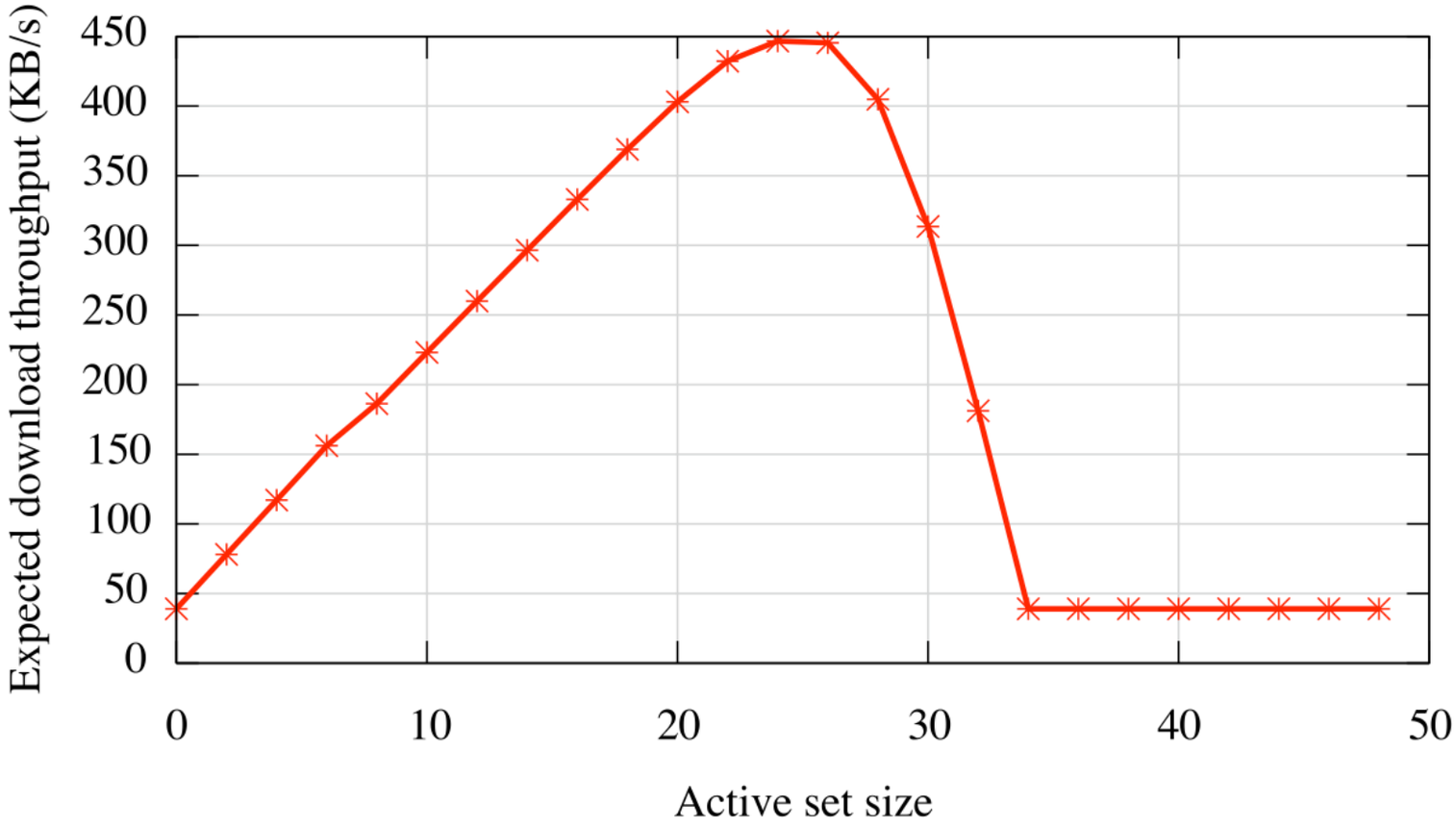
Upload capacity: 300 KB/s

Active set size: 20

Equal split rate: 15 KB/s

More peers, but no drop in reciprocation probability!

Active Set Sizing



Expected download tput vs active set size
for peer w/ 300 KB/s upload capacity

Problem: If you overshoot, you get nothing!

Reciprocation “Density”

Strategy 2: Rank peers by the ratio of download BW to required upload BW for reciprocation.

For each peer *p*, track:

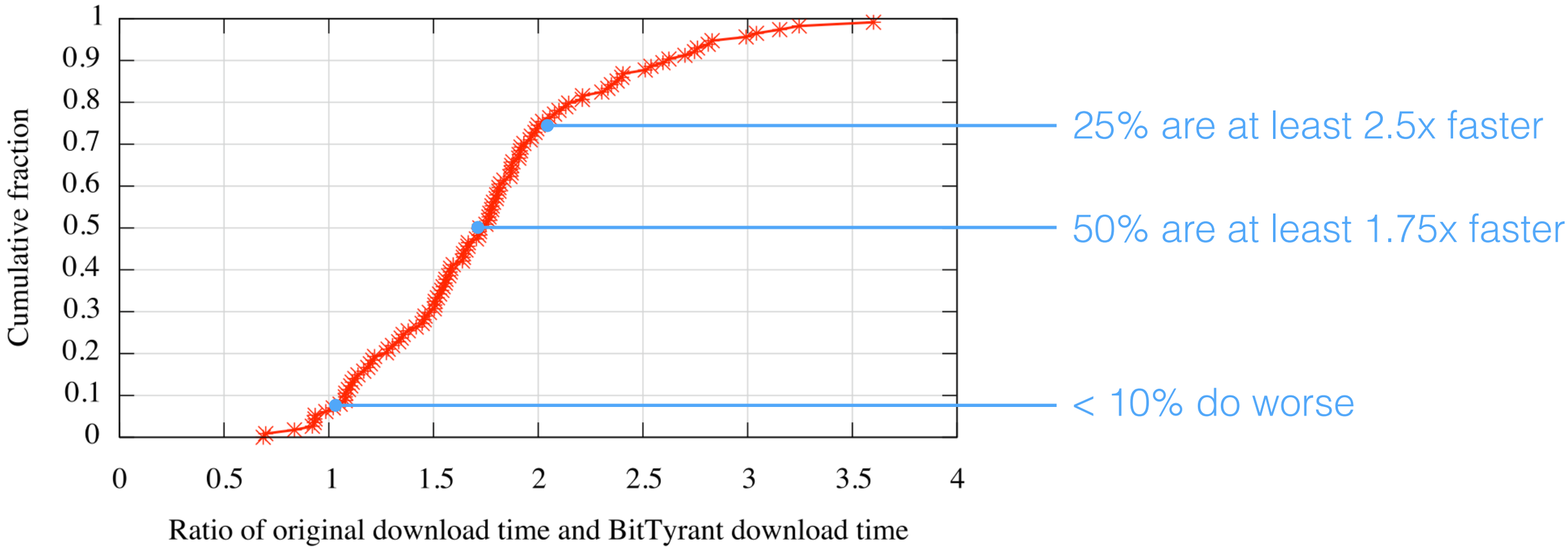
u_p: upload rate required for reciprocation

d_p: download rate received when *p* reciprocates

Rank peers by d_p/u_p.

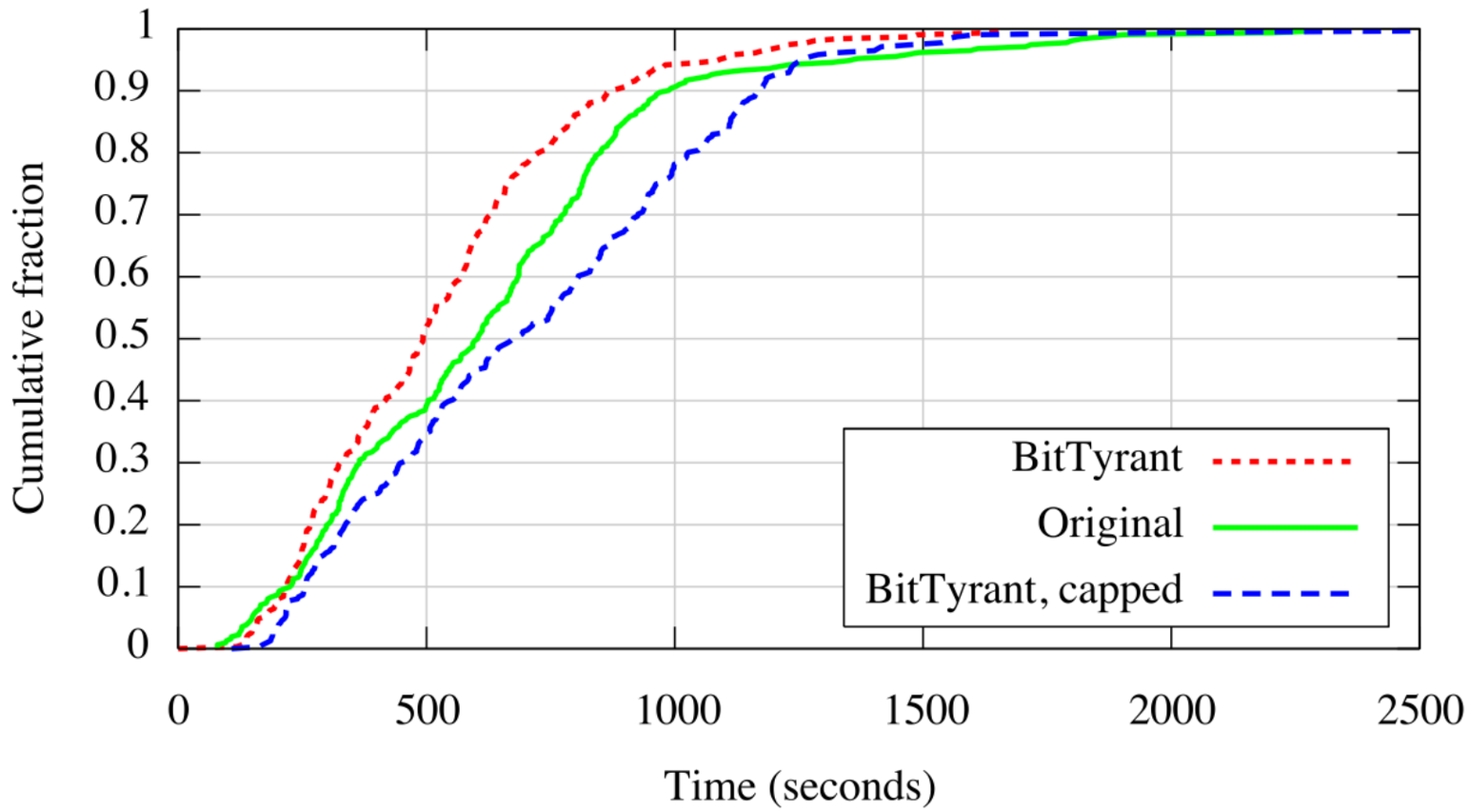
Add to active set until sum of u_p terms exceeds upload capacity.

How Well Does it Work?



Ratio of Azureus (Vuze) download time to BitTyrant download time on 114 real life swarms

What if Everyone Uses BitTyrant?



Strategic BitTyrant: Uses entire upload capacity.

Improves overall performance!

Selfish BitTyrant: Stops when “knapsack” is full.

Degrades overall performance.

You Can Try It!

bittyrant.cs.washington.edu

Mac • Windows • Linux • Source

BitTyrant

A Strategic BitTorrent Client

15-441: Computer Networks

Matt Mukerjee
David Naylor
Ben Wasserman