



Equity in TCP

bluesheet

Pass The Salt 2023

TLDR Introduction

- bluesheet@Synacktiv, intern (we are hiring !)
- Student at IP Paris
- This topic = Research Project part of my master
- Thanks to O. Paul & O. Levillain, my supervisors during this project

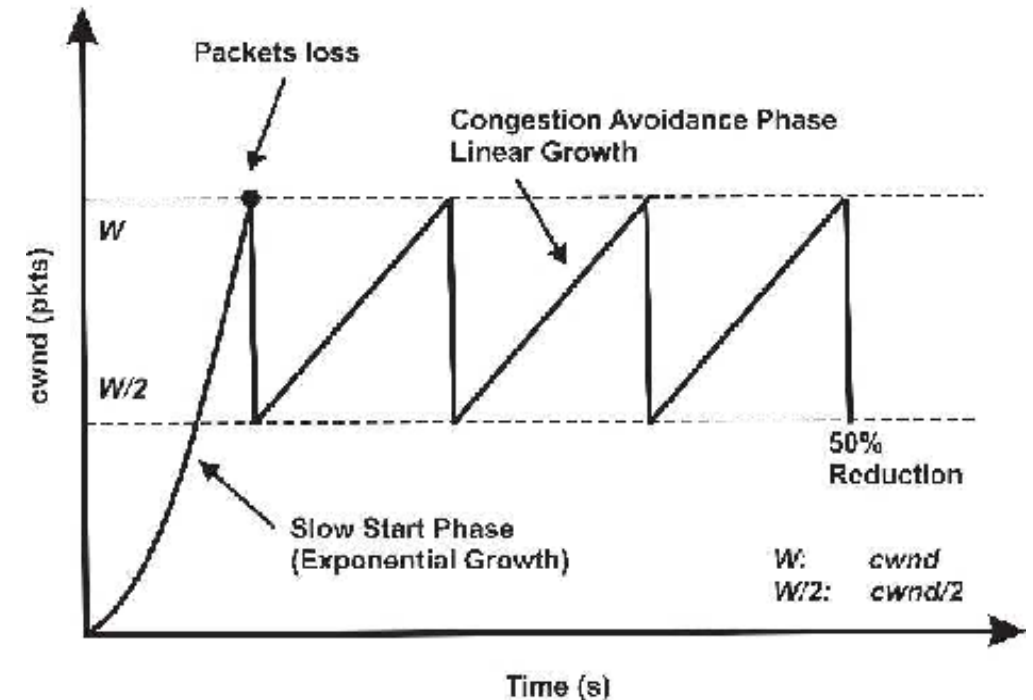
Summary

- **TCP** (and congestion control)
- **Equity**
- **NO Equity**
- **Profit**

- 3 way handshake:
 - SYN
 - SYN+ACK
 - SYN+ACK+TIV (jk, just ACK, but did I tell you that we are hiring ?)
- Packets ACKed = loss detection, RTT measurement, ...

TCP Congestion Control

- Basically 2 phases:
 - Discovery
 - Send small amount and wait until ACK
 - Repeat with more and more data until no more ACK (loss)
 - Cruise: send around the max of discovery
 - If no loss then send a bit more
 - If loss then halve your sending rate



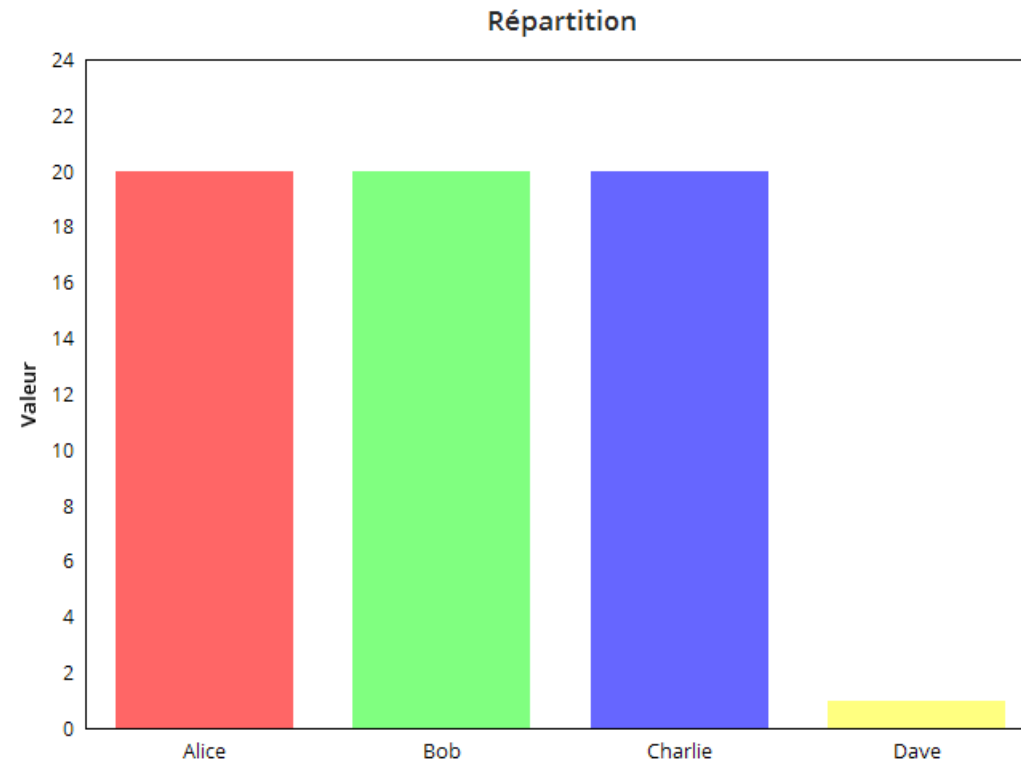
TCP Congestion Control

- In Linux, CC algorithm = Kernel module
- Which ones are available right now on your laptop ?

```
$ cat /proc/sys/net/ipv4/tcp_available_congestion_control  
reno cubic
```

- Customizable system-wide / per-program / per-socket
- Wanna benchmark ? **iperf3**

Equity ?



Fair ?

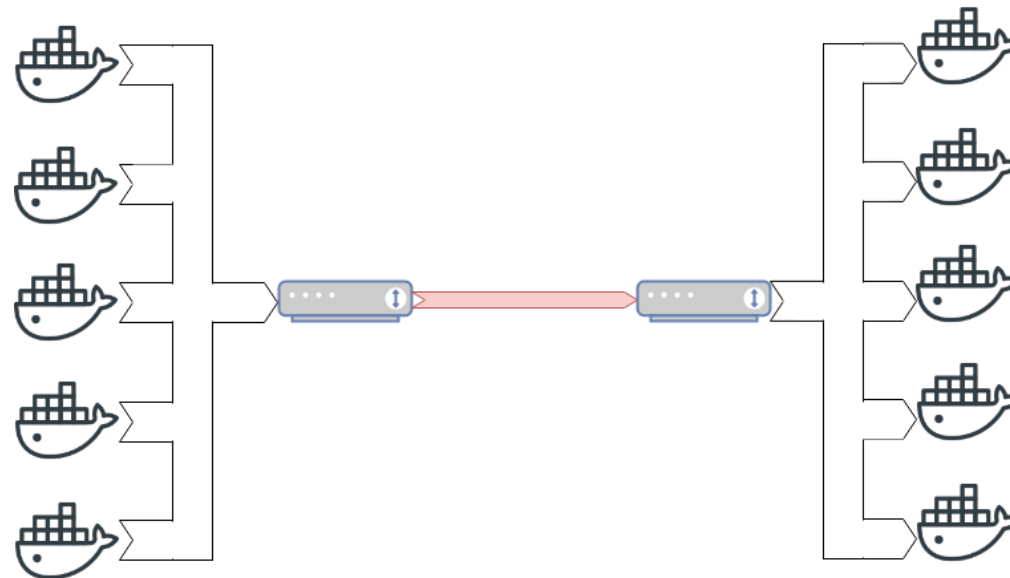
To hell with Equity

```
● ● ●  
  
#include <net/tcp.h>  
  
static u32 max_cwnd = 0x000fffff;  
  
static void infinitytcp_init(struct sock *sk)  
{  
    struct tcp_sock *tp = tcp_sk(sk);  
    tcp_snd_cwnd_set(tp, max_cwnd);  
}
```

TCP Infinity

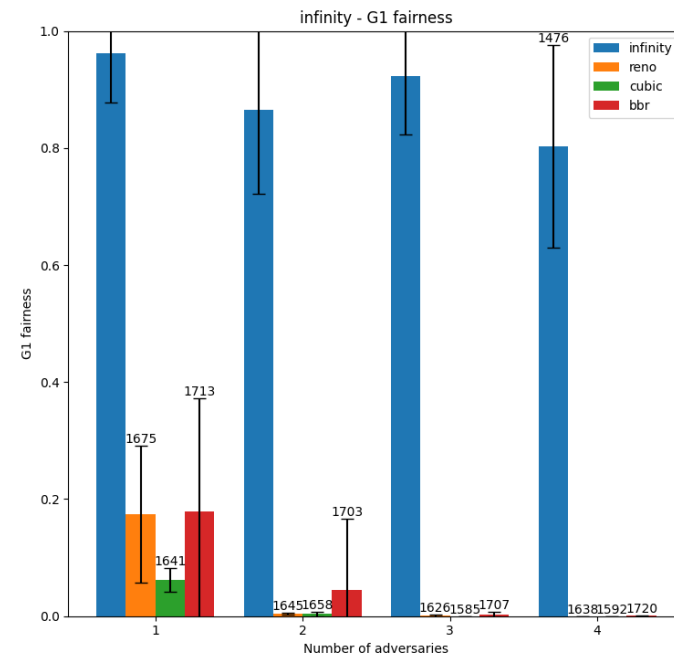
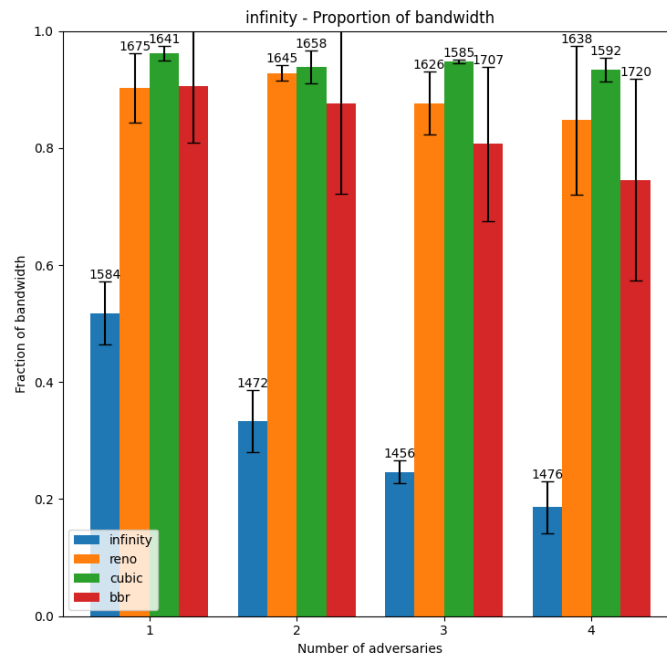
The test bench

- Docker clients & servers running iperf3
- Different CCAs, different interconnections, ...



The (Local) Profit

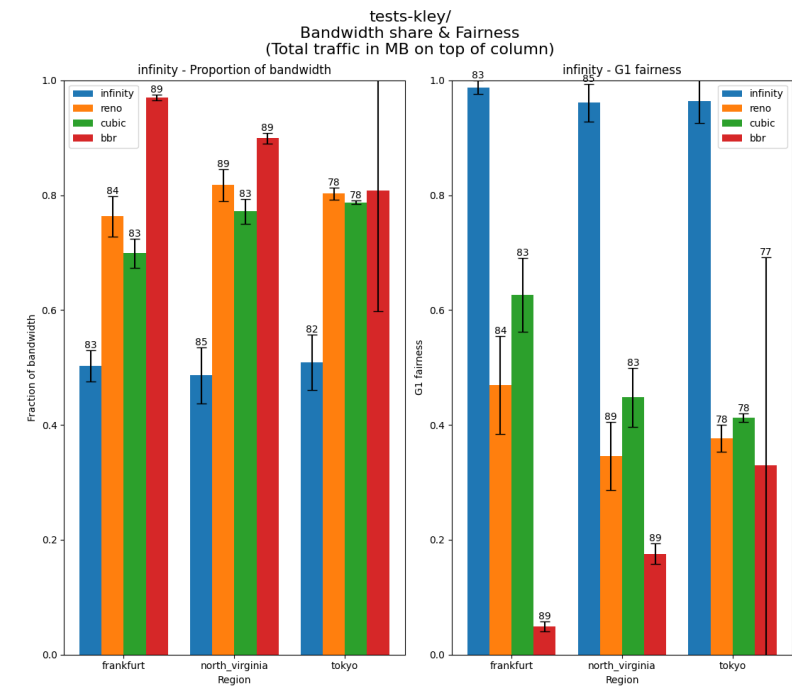
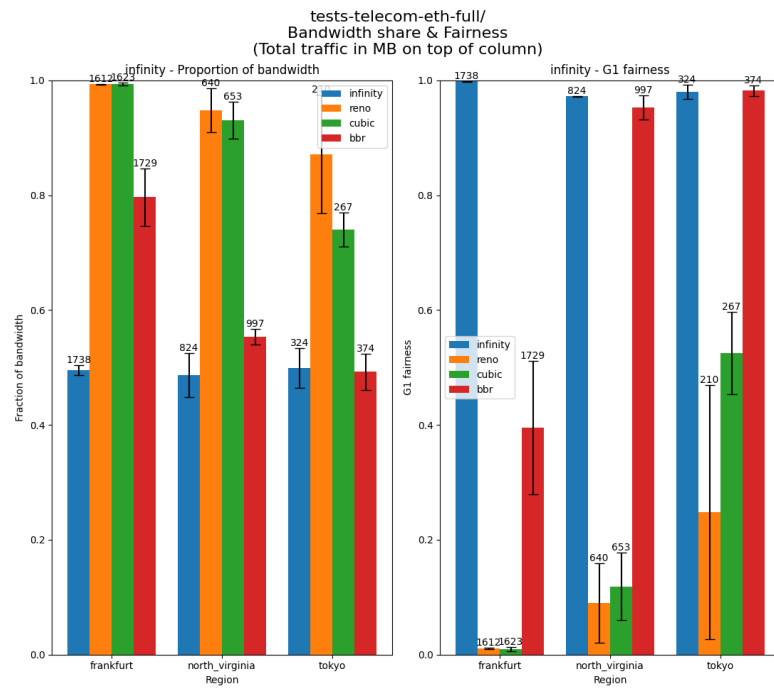
tests-local/
Bandwidth share & Fairness
(Total traffic in MB on top of column)



The Remote Profit all over the world

Over Ethernet

Over Wifi



Too Complicated; Didn't Read

- **Infinity > ~all**
 - Except sometimes over wifi
 - Except sometimes with high latency
- **Please don't, we are not in the 1980's anymore**

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