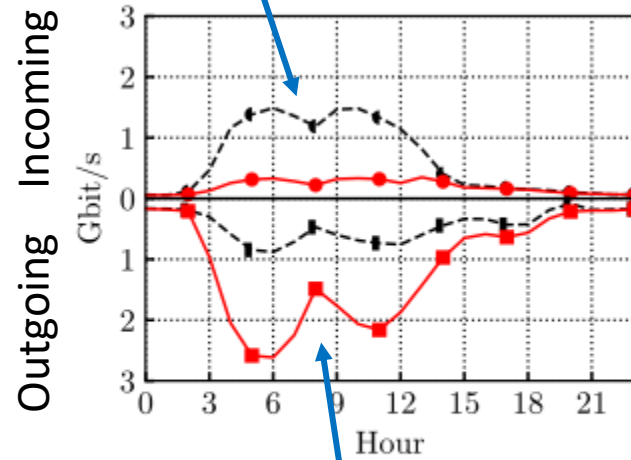# Campus traffic and e-Learning during COVID-19 pandemic

Thomas Favale, Francesca Soro, Martino Trevisan,
Idilio Drago, Marco Mellia
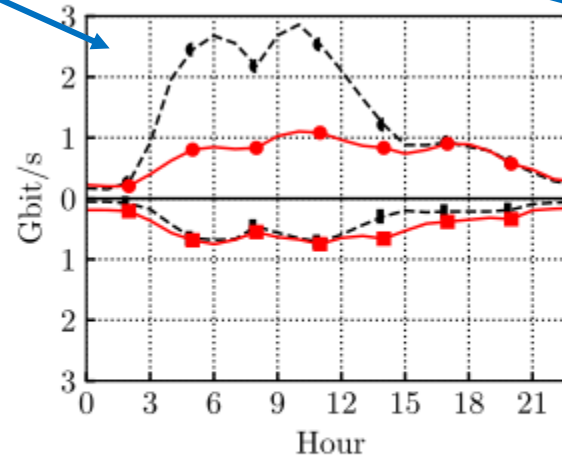
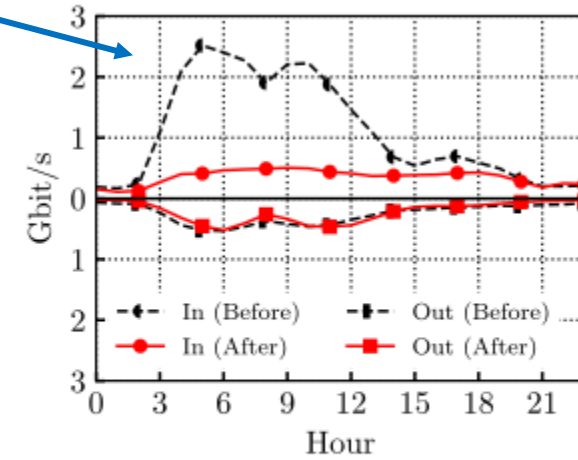# The traffic from 3 large Italian universities

Universities are closed during the lockdown:
-> Incoming traffic drops

(a) Politecnico di Torino. (b) Politecnico di Milano. (c) Università di Torino.

PoliTO is peculiar: has an **in-house remote teaching infrastructure**
-> The outgoing traffic explodes

How traffic changed at PoliTO

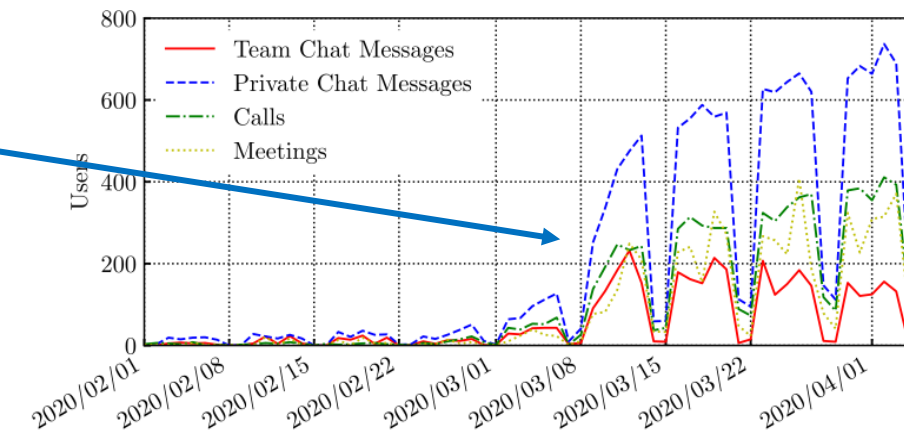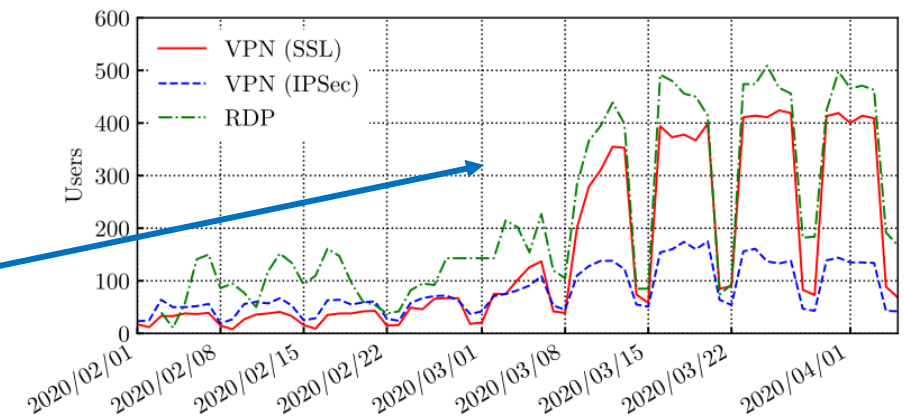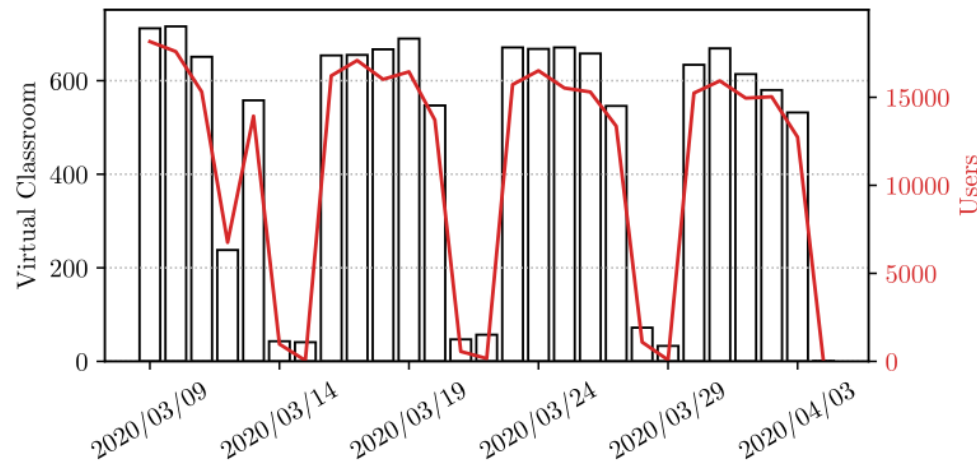**Remote access** (VPN, remote desktop) exploded

Employees and students started using (heavily) **Microsoft Teams** (cloud-based)

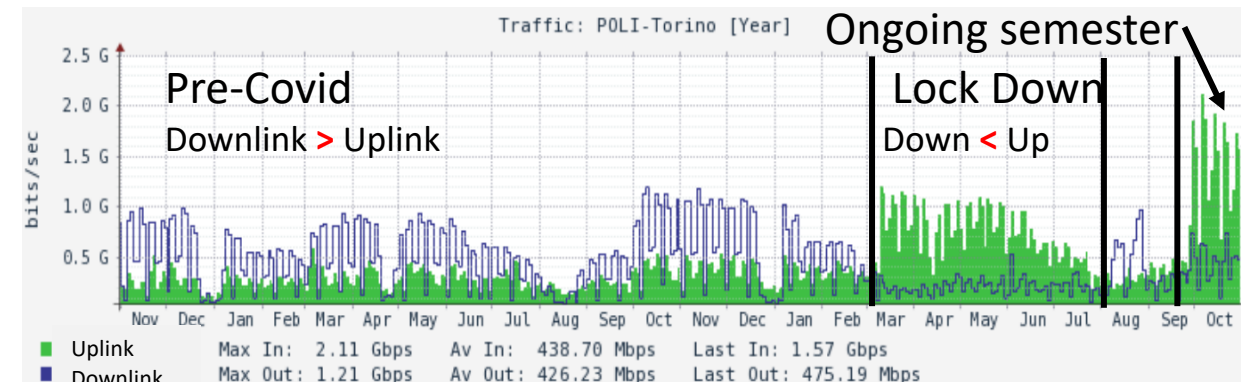PoliTO launched an in-house platform for **remote learning**, based on BBB (open-source)
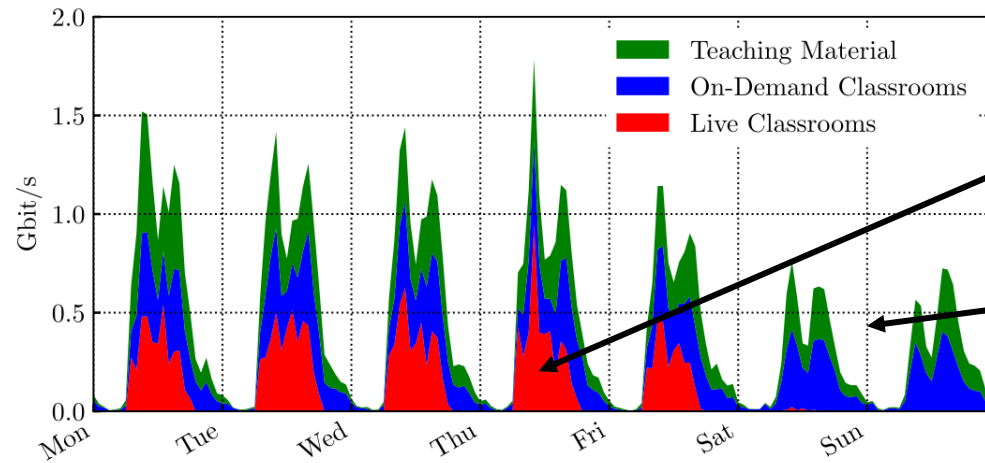-> 15 k studets and 700 lectures daily
-> Large impact on the Campus' traffic
-> Uplink traffic explodes!

The pattern changes are **persistent**

Ongoing semester

Pre-Covid
Downlink **>** Uplink

Lock Down
Down **<** Up

Remote Teaching: We observe new traffic patterns

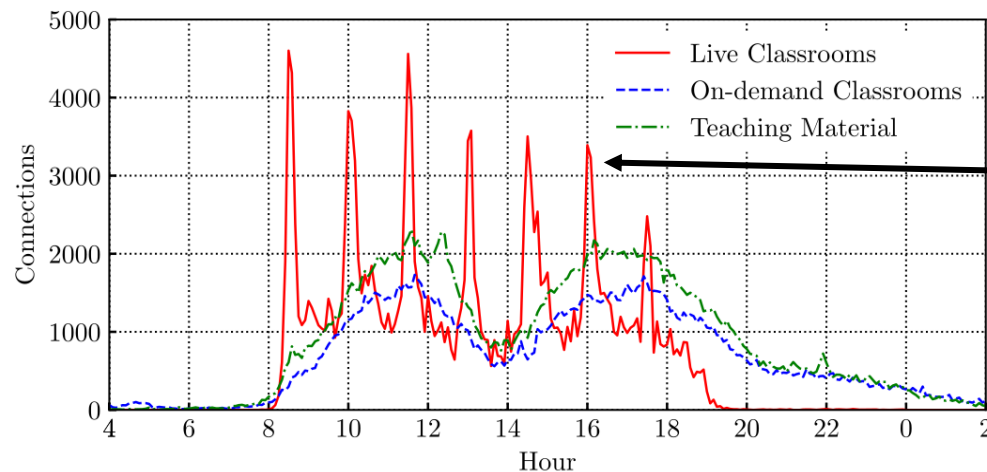The **live virtual classrooms** are scheduled only on weekdays
-> Up 0.5 Gbit/s from 8:30 to 19:00
-> RTP (UDP) traffic – clients are based on WebRTC

Students download on-demand classrooms and **teaching material** all the week long
-> Peaks of 1.5 Gbit/s during the weekend
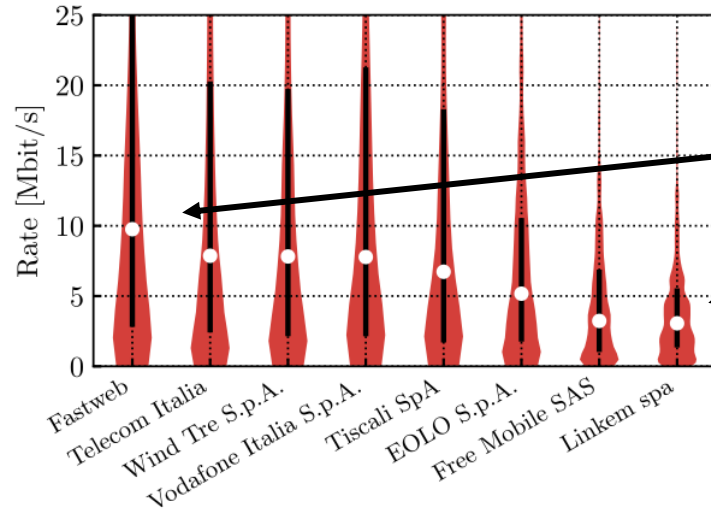-> HTTPS (TCP) traffic

Lectures are scheduled to start every 90 minutes
-> Massive new TCP/UDP flows are born coordinately
-> Clear peaks at the beginning of lectures

How is the students' network performance

Bitrate for on-demand teaching material (over HTTPS)
Some differences across operators
-> FTTH-based operators are faster :)
-> Mobile and low cost operators are slower :(

Less differences across Italian regions
-> Median bitrate in 5-10 Mbit/s

Live Virtual Classrooms (over RTP UDP)
We did not observe any severe network issue during the lockdown, neither students reported impairments
-> The required bitrate is not very high (less than 0.5 MBit/s)