

Network Performance Monitoring Trial



Eric Franke (cnlab)

SWITCH

Stéphane Racine (SWITCH)

Schaffhausen, 22.01.2020

Agenda

- Introduction
- Ongoing Trial: first Results and Findings (cnlab)
- Discussion

Eric Franke / cnlab

- Eric Franke
 - Network Performance Engineer und Data Analyst at cnlab (Performance Team) since 2012
 - Develops software components for the Speedtest and Performance Backend Systems.
 - Responsible for data analysis and reporting.
- cnlab
 - Swiss company based in Rapperswil, known for the «cnlab Speedtest» which allows Internet users to check the quality of their Internet connection.
 - <https://www.cnlab.ch/speedtest/>
 - Prof. Dr. Peter Heinzmann
 - Co-Founder of cnlab
 - (retired) Professor for Information Security and Computer Networks at HSR (University of Applied Sciences in Rapperswil)

Current joint activities cnlab / SWITCH

- Hardware Probes (part of the Trial)
 - Installation of Backbone Probe (IBB - Internet Backbone Benchmarking) at SWITCH
 - Installation of Access Probe (CAB - Controlled Accessnet Benchmarking) at HSR
- Speedtest
 - Installation of 10G Reference System
 - Testing of 10G Speedtest for Customers (OS App)

Goals of the Trial

- Get to know the cnlab Performance Measurement System
- Get independent opinion on how SWITCHlan performs generally and compared to other ISPs
- Get suggestions for improvements
- Build a basis for discussions (internally and with our customers)
 - Benefits for our customers?
 - Use cases for SWITCH as a NREN?

Intro IBB – Hardware

IBB: Internet Backbone Benchmarking

→ «Backbone Probe»

- Shuttle PC
 - Intel Core i5
 - Integrated Intel Graphic
 - Linux Operating System
 - Gigabit Ethernet
- Use of this probe in case of web site measurements which need a graphic card.



- Other cnlab probe hardware is based on Odroid C2 Hardware

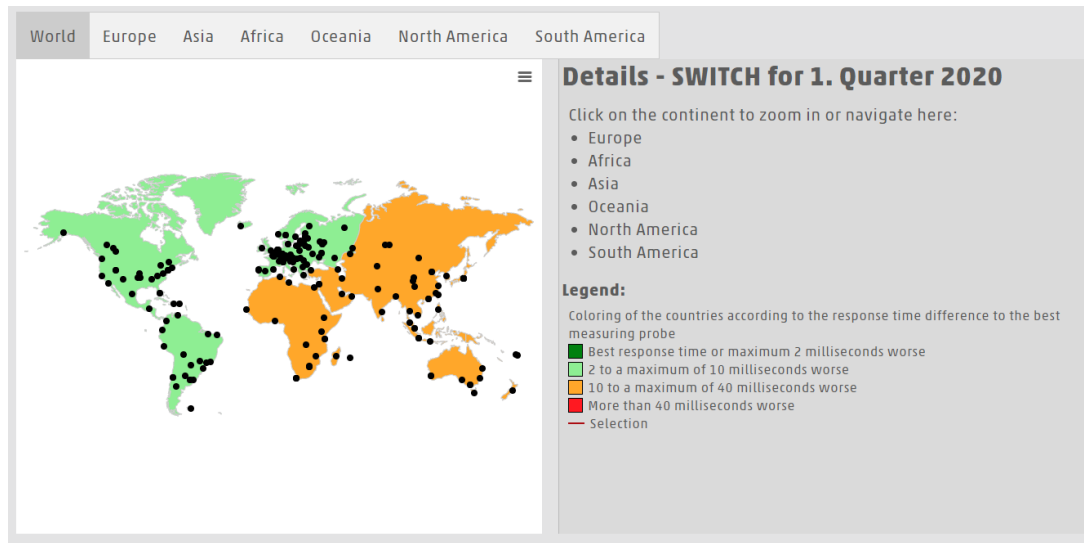


Intro IBB – Measurement Setup (general)

- cnlab has six IBB probes in different swiss ISP backbones deployed
- Every probe is using a dedicated 1 Gbit/s line near the backbone router
- Extract of checkpoints and measured metrics
 - All probes running continuously measurements to different checkpoints
 - 210 checkpoints for response time measurements (98 Europe, 41 America, 17 Africa, 38 Asia, 15 Oceania)
 - 90 checkpoints for download measurements (58 Europe, 11 America, 2 Africa, 17 Asia, 2 Oceania)
 - Measured metrics
 - ICMP and TCP response time
 - Download and Upload data rate
 - Website measurements (Page-Load-Time/Visually-Complete)
 - Availability of Internet Access based on ICMP tests every 12 seconds
 - DNS response time (first and second response)

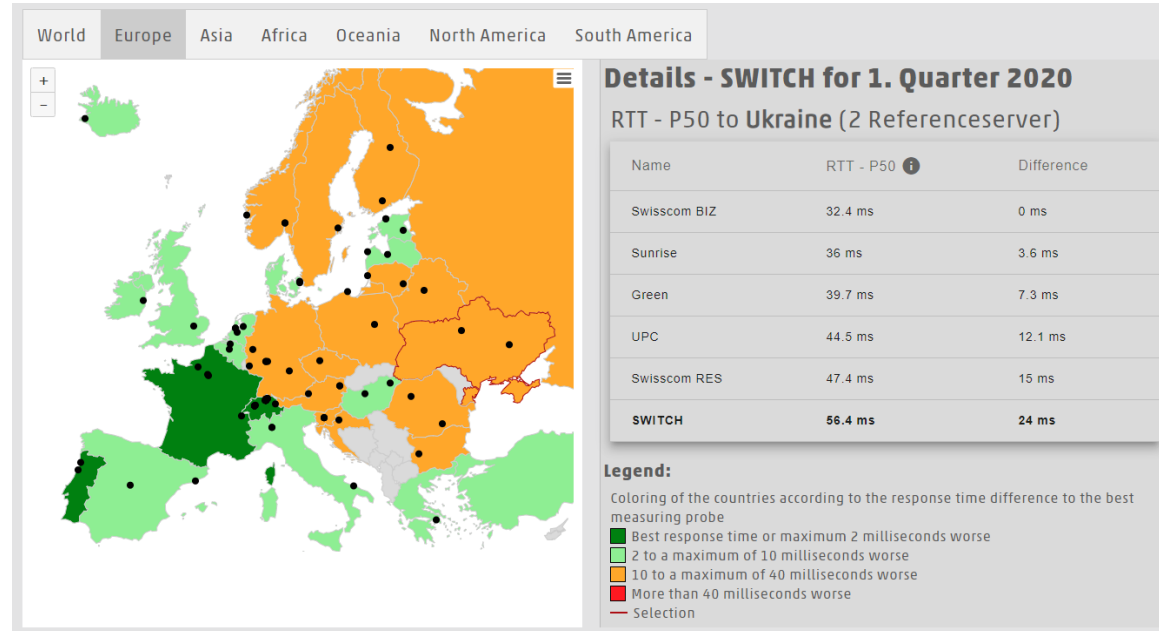
Intro IBB – Backbone Results

- Parts of the results are published on the cnlab web site without the ISP name
→ <https://ux.cnlab.ch/benchmarking/backbonelanding>
- The maps are showing the internal view of the benchmarking portal with ISP names
- The focus is on the ICMP response time for the SWITCH probe to 210 checkpoints in the first quarter of 2020
- Response Times (ICMP and TCP) to checkpoints in Europe and America are good and comparable to other Swiss Backbone ISPs
- Response times to other regions (Africa, Asia, Oceania) are slower



First Results for SWITCH – Response Time Europe

- Response Times (ICMP and TCP) to checkpoints in Europe are good and comparable to other Swiss Backbone ISPs
- Marked is Ukraine with 58 ms for the SWITCH probe with a difference of up to 24 ms in comparison to other ISPs
- Why?
- Slower values to checkpoints in east Europe are resulting from the routing over Amsterdam



First Results for SWITCH – Response Time Europe

– Example: Response time difference to Ukraine

- SWITCH is using the path over Amsterdam

```

cnlab@80ee739f2910:~$ mtr --report-wide st.telemost.dp.ua
Start: Fri Jan 17 16:13:40 2020
HOST: 80ee739f2910
  Loss%  Snt  Last  Avg  Best  Wrst  StDev
1. |-- swiEZ1-G1-1.switch.ch      0.0%   10   6.7   2.3   0.3   6.7   2.9
2. |-- swiEZ3-B3.switch.ch       0.0%   10   7.3   2.7   0.6   7.3   3.0
3. |-- swiZH3-100GE-0-0-0-0.switch.ch 0.0%   10   6.2   2.5   0.5   7.1   2.9
4. |-- swiLS1-100GE-0-0-0-2.switch.ch 0.0%   10   9.9   5.6   3.5  10.0   3.0
5. |-- swiCE4-100GE-0-0-0-1.switch.ch 0.0%   10  10.9   6.8   4.9  11.1   2.8
6. |-- swiCE1-100GE-0-3-0-0.switch.ch 0.0%   10  12.5   7.4   4.8  14.0   3.5
7. |-- 80.249.211.143             0.0%   10  60.4  54.0  51.2  60.4   3.4
8. |-- 185.23.164.130            0.0%   10  57.1  53.9  51.2  59.8   3.3
9. |-- 212.115.254.238          0.0%   10  65.2  61.1  58.9  65.2   2.7
10. |-- 193.200.32.22            0.0%   10  64.9  61.3  58.8  65.1   3.1

```

← Amsterdam

- Swisscom via Peering with Digital Telecom IX LLC (Ukraine)

```

cnlab@80ee73b98735:~$ mtr --report-wide st.telemost.dp.ua
Start: Fri Jan 17 16:10:23 2020
HOST: 80ee73b98735
  Loss%  Snt  Last  Avg  Best  Wrst  StDev
1. |-- i79zhh-051-gig0-0-0-14.bb.ip-plus.net 0.0%   10   0.7   0.8   0.7   1.0   0.0
2. |-- i79zhh-005-bun4.bb.ip-plus.net      0.0%   10   1.0   0.9   0.6   1.0   0.0
3. |-- i00wie-005-ae0.bb.ip-plus.net       0.0%   10  10.1  10.2  10.0  10.3   0.0
4. |-- i00iev-005-xxx0-0-0x1.bb.ip-plus.net 0.0%   10  11.6  10.6  10.1  12.8   0.9
5. |-- dtel-ix.fregat.net                 0.0%   10  27.6  27.7  27.6  28.0   0.0
6. |-- 212.115.254.222                0.0%   10  34.5  36.3  34.5  51.6   5.4
7. |-- 193.200.32.22                  0.0%   10  35.3  35.4  35.2  35.7   0.0

```

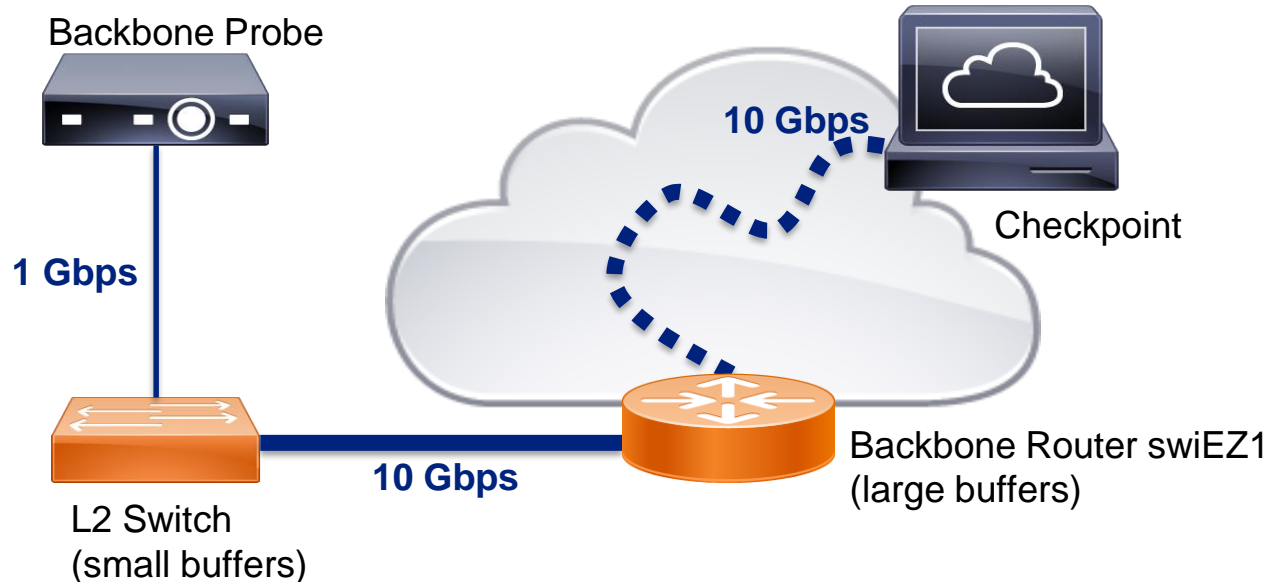
← Kiev

First Results for SWITCH – Download Data Rate

Download data rate to all checkpoints (28.11.2019 – 09.01.2020)

- Nearly all checkpoints had a significant slower data rate as other Swiss ISPs
- Also the probe measured a lot more packet loss as expected

Setup at Switch



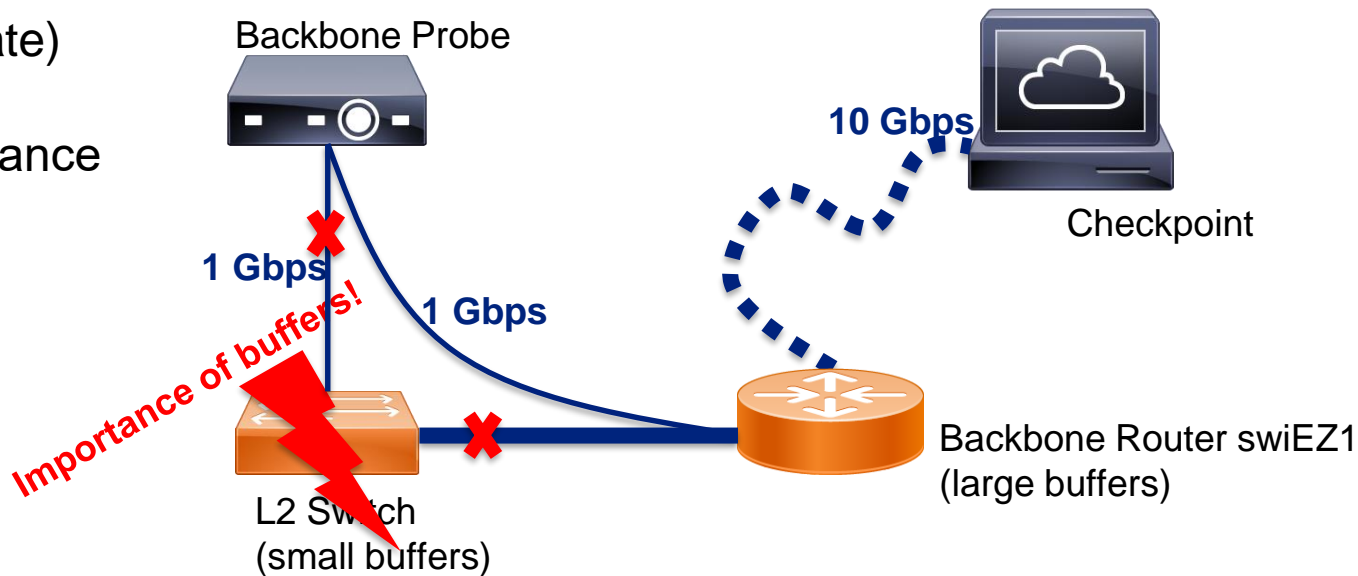
First Results for SWITCH – Download Data Rate

Download data rate to all checkpoints (since 09.01.2020)

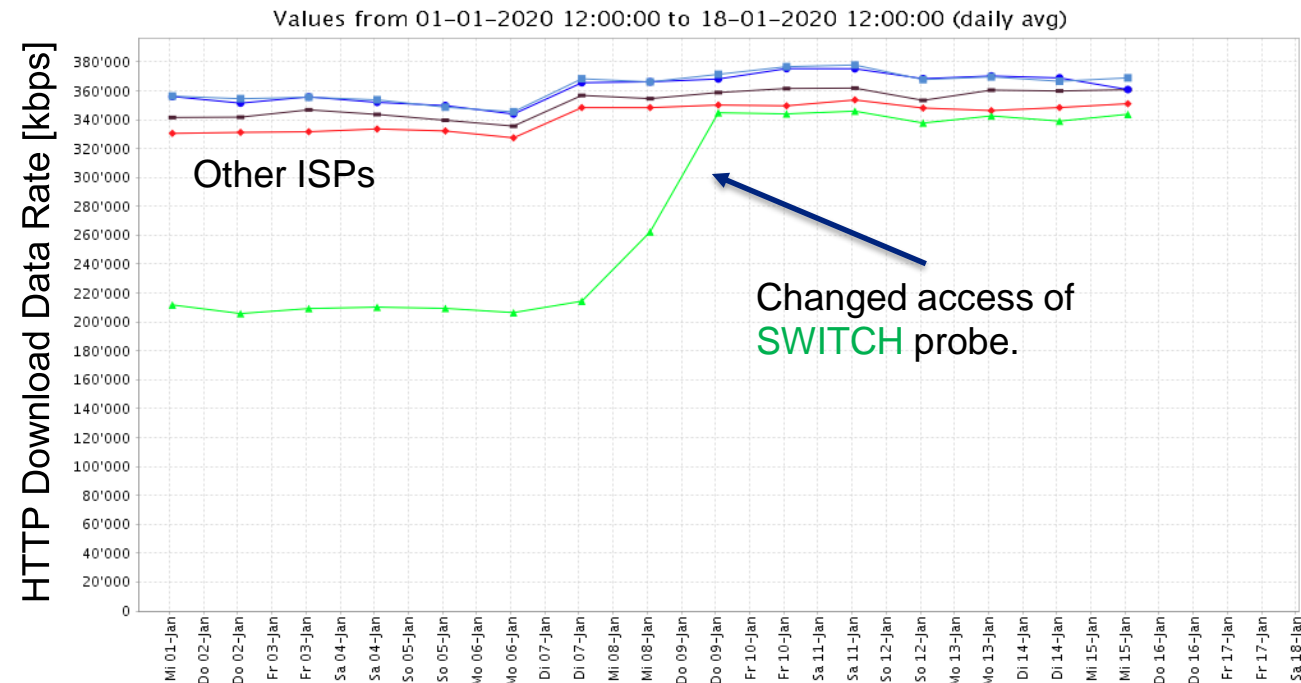
- SWITCH removed the used L2 Switch, which had a very small buffer, and connected the probe directly to the backbone router

Setup at Switch (update)

→ Significant performance improvement



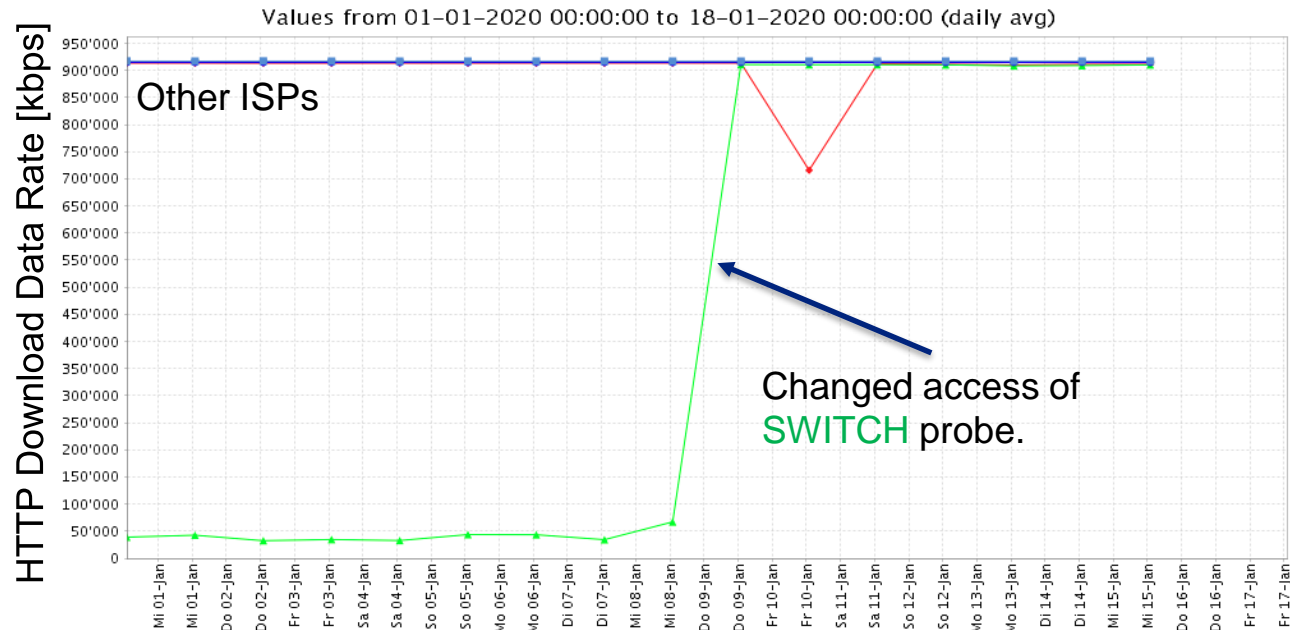
First Results for SWITCH – Download Data Rate



Daily average download data rate of IBB probes to all 90 checkpoints over the world with enabled data rate measurement since 1st January.

After the access change, the data rate is comparable to the other ISPs.

First Results for SWITCH – Download Data Rate

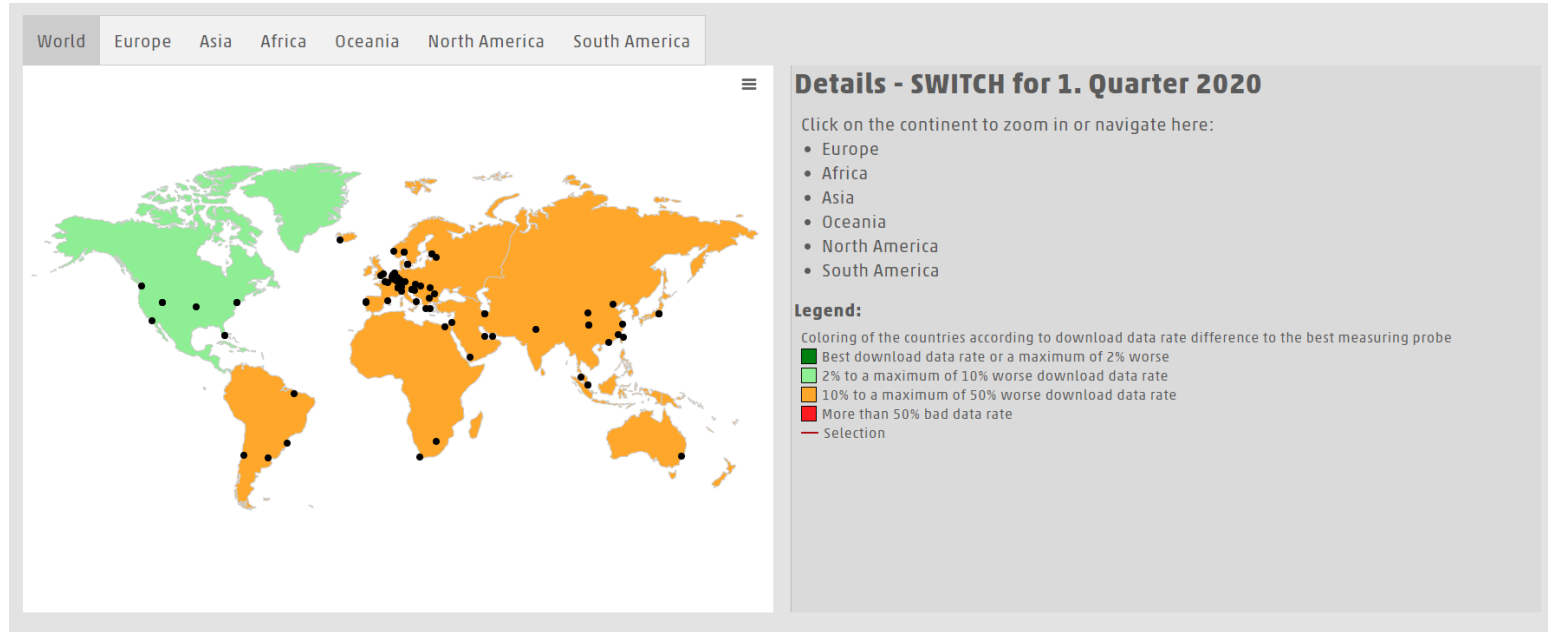


Daily average download data rate of IBB probes to checkpoint “apache.belnet.be” since the 1st January.

After the access change, the data rate is on max. line speed.

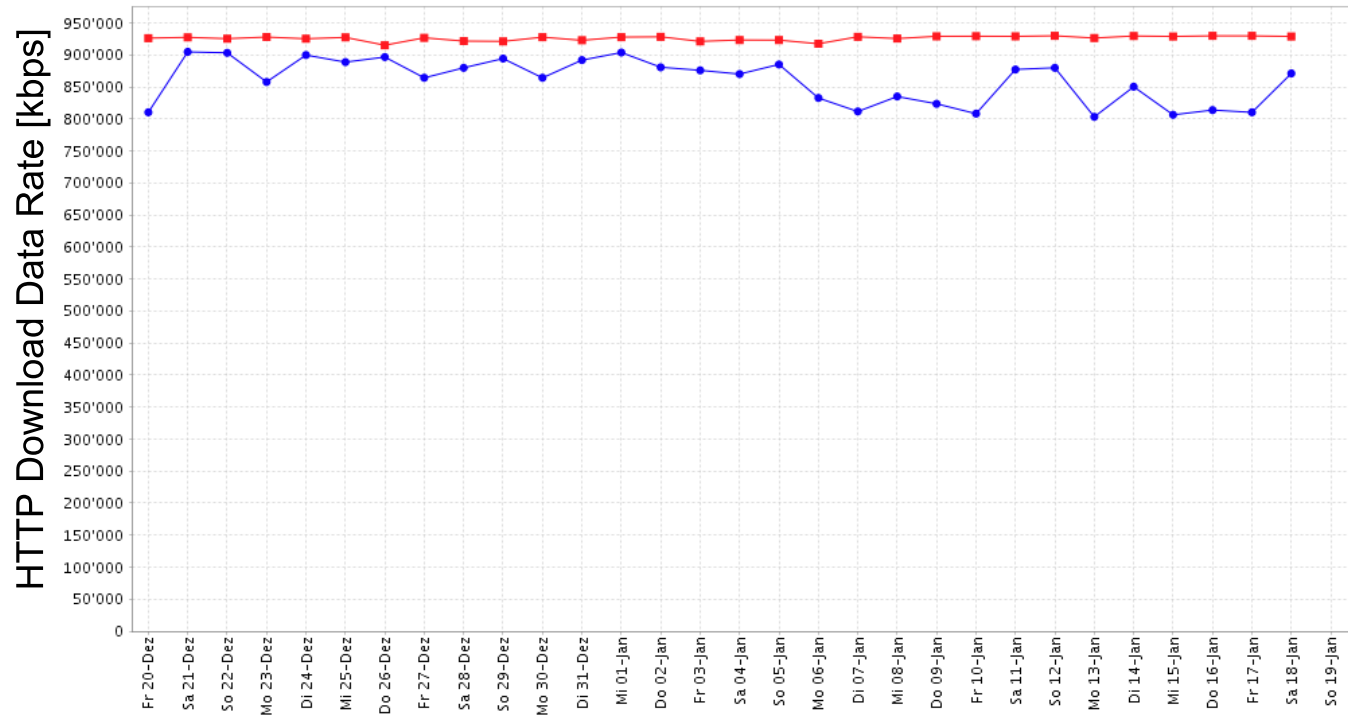
First Results for SWITCH – Download Data Rate

- Because of the buffer issue, the shown values on the cnlab benchmarking platform do not turn up “green”. This will improve in the second quarter 2020!



First Results for HSR (SWITCH Access) – Download Data Rate

Values from 19-12-2019 13:51:23 to 19-01-2020 13:51:23 (daily avg)

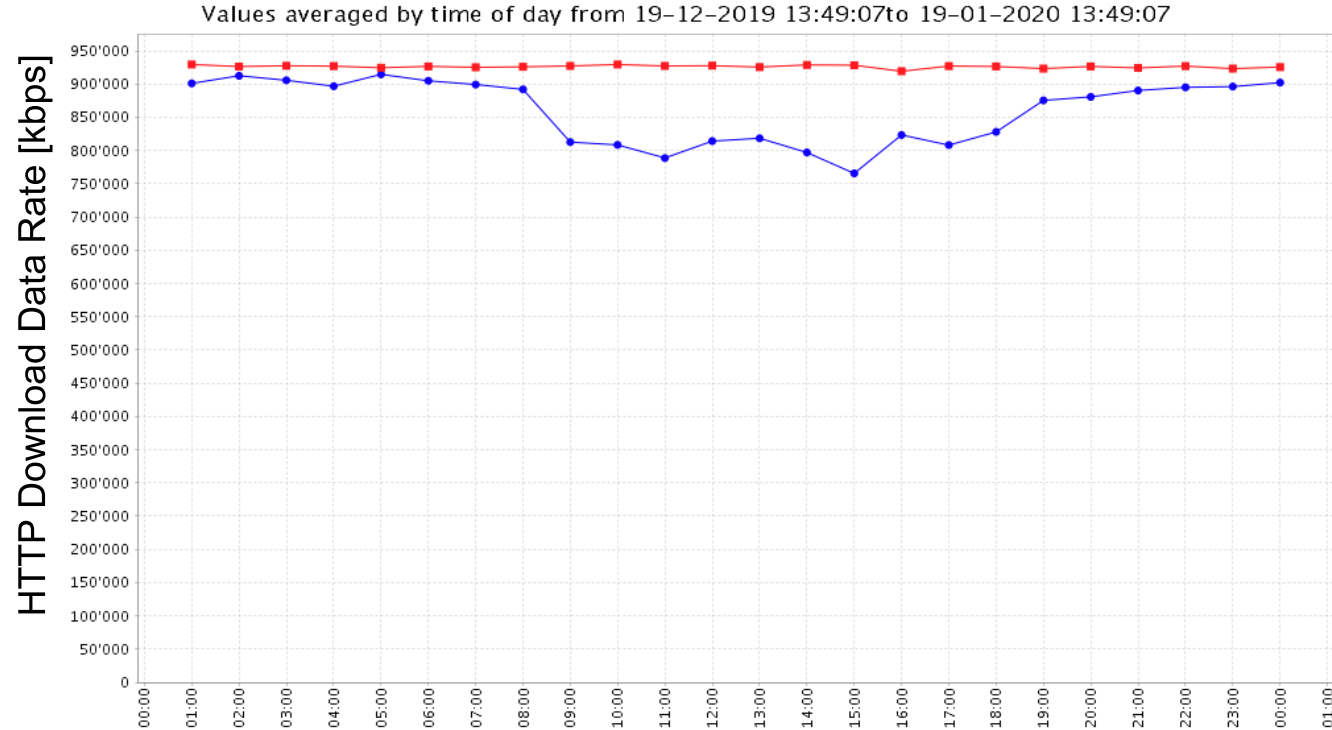


Daily average download data rate of the SWITCH IBB probe and the HSR CAB probe to a cnlab reference system.

The access probe (CAB) on the HSR shows nearly the same performance as the SWITCH Backbone probe over the last month.

* HSR access bandwidth:
1Gbps

First Results for HSR (SWITCH Access) – Download Data Rate (by time of day)

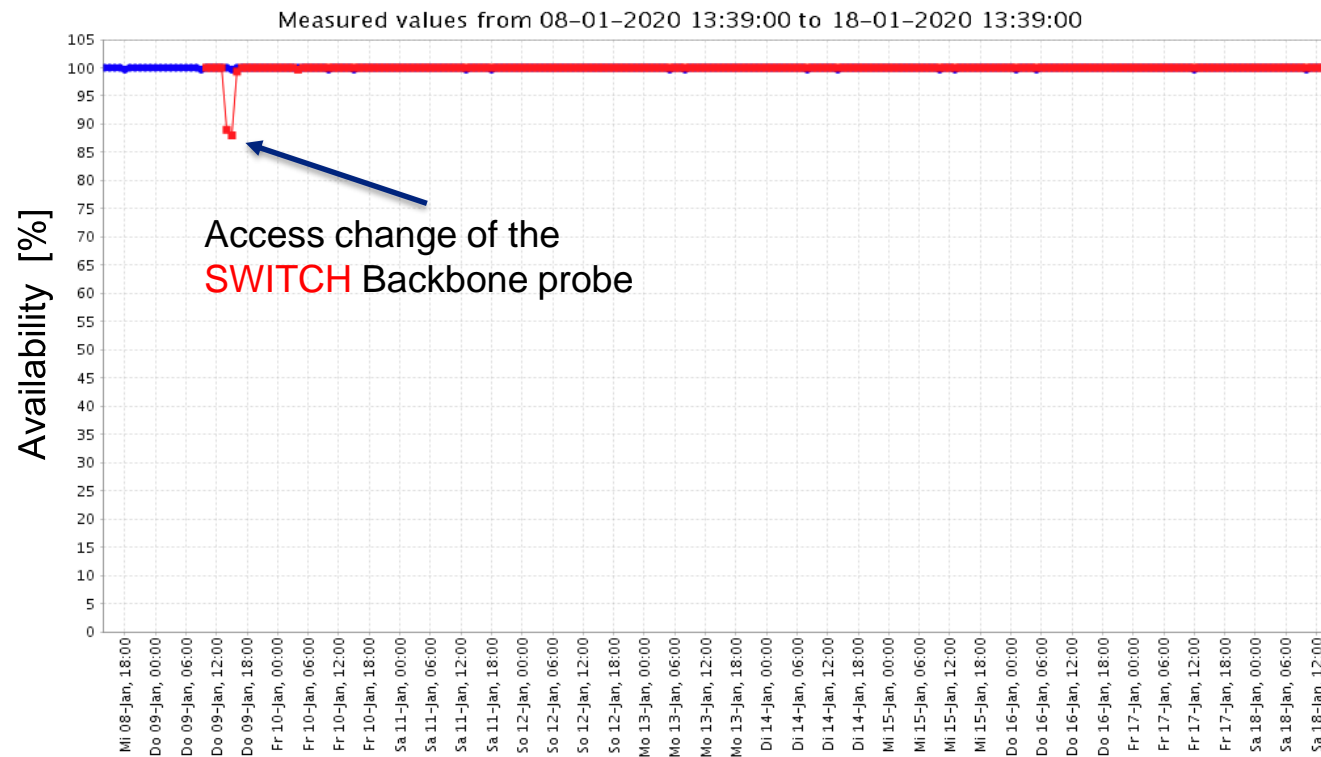


Download data rate averaged by time of day for the SWITCH IBB probe and the HSR CAB probe to a cnlab reference system.

The HSR probe shows the daily traffic load on the HSR network.

* HSR access bandwidth: 1Gbps

First Results for HSR/SWITCH – Availability



The graph shows the availability of the HSR CAB and SWITCH Backbone probe since the 8th January. (including the access change of the backbone probe)

HSR: 99.98 %

SWITCH: 99.89%

Next steps

- Finalize the trial
 - Spend more time for proper measurement and detailed analysis
 - Take time to understand the reasons for the differences compared to other ISPs
- Discuss the value / benefit of such a measurement system and possible use case (for SWITCH and/or customers)
- Please do not hesitate to contact our SWITCHpert team
 - The PERT service (Performance Enhancement Response Team) is part of your SWITCHlan IP Access

Discussion

- Which Checkpoints are important to you?
- What are your experiences with (other) performance measurement system (e.g. RIPE, PerfSonar, ...)?
- Which measurement parameters are relevant to you?
- ...



SWITCH

Working for a better digital world