Fixed Broadband QoE Benchmarking

MedUX Insights:

Detailed Report – Albania - November 2024

Measurement campaign: Albania Q42024

[CONFIDENTIAL]

ALL COPYRIGHTS AND TRADEMARKS RESERVED. This article or report has been prepared for the exclusive use and benefit of press media and solely for non-commercial purposes. Press media members are authorized to partially disseminate, refer, quote, copy, reproduce, distribute, publish and transfer the report and its findings (including all intellectual property rights, data, content graphs and analysis) for information purposes with express attribution to MedUX. Use of the report and its findings, entirely or partially, in any form or by any means, by any other third party or for any other purposes (including, commercial or marketing purposes), without the prior written consent of MedUX, is strictly prohibited. Operators can make a request to MedUX for a license to use quality or certification seals, as well as marketing rights to quote the findings. Non-authorized use will be considered a violation of copyright and trademarks laws.

Fixed Broadband Benchmark

in Europe with TRUE QoE KPIs

MedUX Insights:

Detailed Report Albania, Q42024

At MedUX we have conducted a first of its kind **Fixed Quality of Experience (QoE) Benchmark in Europe**. The study unveils a clear frontrunner, an Excellent winner in Albania, followed by a strong competitor.

We have leveraged our autonomous and cost-effective in-home testing solution to benchmark, monitor and improve fixed networks. It aims at improving customer satisfaction by delivering an honest, **independent review that enhances service quality** from the viewpoint of the people who matter most – the users.

CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Key findings

MedUX Fixed Broadband QoE benchmark conducted in Albania in Q4 2024 shows an excellent winner, and one very good contender.

Vodafone shines on the Albania Fixed QoE Benchmarking campaign, winning most of the Experience Awards except for the Value for Speed (“Matching the promise”) and Streaming experience awards that go to One.

Vodafone shows the Best and Most Reliable Experience, leading in Data & OTT and Accessibility too

Best Network responsiveness (Accessibility) with the lowest avg. latency of 19.57 ms

Best Gaming, Web Browsing, Social Media, HTTP DL/UL and Cloud Storage experience

Best avg. Gaming latency and reliability with 50.36ms and 99.64% respectively

QoE scoring: 4.26 out of 5

99.84% avg. service reliability

One shows the Highest Matching-the-promise score and the Best Streaming Experience

Highest average Speed compliance (vs advertised) with 97.24%

90% of Streaming score

99.84% streaming reliability

CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Benchmarking Methodology

With the goal of providing an independent and international benchmarking tool, MedUX developed its own QoE ScoreCard to determine and certify the best provider or operator with respect of the services accessed via fixed broadband networks.

This goal is achieved by executing benchmarking tests that represent a major part of the services used by final customers of fixed broadband networks. The results collected are individually and collectively weighted and aggregated into an overall score.

The service category scoring model and its drill-down capabilities makes it exploitable by different stakeholders, from executive management (CxOs) to more technical departments (engineering and optimization). Thus, providers or operators can improve their networks and services offering a better experience to their customers.

To give transparency and a clear interpretation of the benchmarking results, MedUX publishes a description of the scoring methodology, in line with the current state of the ETSI TR 103 559 V1.2.1

In this context we introduce the following terms, Quality of Service (QoS) and Quality of Experience (QoE):

- QoS: “Totality of characteristics of a telecommunications service that bear on its ability to satisfy stated and implied needs of the user of the service.”

- QoE: “Degree of delight of the user of a service. In the context of communication services, it is influenced by content, network, device, application, user expectations and goals, and context of use.”

MedUX proposes a model where technical measurements are transformed into perceptive indicators taking into account the human response to fixed broadband service’s events, improvements and degradations.

For further details about the methodology used please visit our blog “Assessing User QoE with MedUX's Fixed Broadband Benchmarking Methodology”

CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Quality of Experience – Ranking approach

MedUX Fixed Broadband benchmarking approach, based on our MedOS (MedUX Opinion Score) and QoE Scorecard, assesses network performance and end-user experience. We revisit criteria and thresholds once a year to consider best practices but also to reflect technology and industry development.

At MedUX we use the concept of Mean opinion score (MOS) for most of the rankings, which ratings are algorithmically estimated based on test results and KPIs, in line with the current state of the ETSI TR 103 559 V1.2.1 and ITU Recommendation ITU-T P.800.1.

- **Top Awards:**
  - **Overall QoE Score** – A combination of availability, accessibility, speed, streaming, and data and OTT experience results.
  - **Reliability** – how consistent a network performs. Particularly in fixed networks it measures how consistent the network performs across all testing categories considering the success rate (%) of all tests and services above. A test is considered as not successful if it fails or if does not meet minimum service thresholds

- **Experience Awards:**
  - **Accessibility** (network responsiveness) – how long it takes to access the network. Particularly in fixed networks it measures how long takes to access the network across all testing categories while taking latency and network responsiveness results into account.
  - **Matching the promise** (throughput) - Measures the actual data transfer rate relative to the advertised speed. This is especially relevant in fixed networks, where it evaluates the network's true capacity under load conditions. It uses our patented Cloud Speed Test, which applies a multi-threaded, multi-server stress test to fully assess line performance.
  - **Video Streaming experience** - it measures the average video experience for each operator while taking picture quality, video loading time, and stall rate into account.
  - **Data and OTT experience** - a combination of gaming, web browsing, social networks, HTTP Data transfer and cloud services experiences.

CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Fixed Broadband Experience Awards

Our Fixed Broadband QoE measurement campaigns aim to test and shape the future of fixed broadband experience. Awards are granted to the best performing operators in each attribute or category we test. If two or more operators record statistically indistinguishable results, each operator earns an Experience Award while sharing the highest rank in that category.

Vodafone shines on the Albania Fixed QoE Benchmarking campaign, winning most of the Experience Awards except for the Value for Speed ("Matching the promise") and Streaming experience awards that go to One.

	Top Awards		Experience Awards			
	Best Experience	Reliability	Data & OTT	Streaming Experience	Value for Speed	Accessibility
Albania	🏆	🏆	🥇	🥇	🥇	🥇

MedOs:

- 5% - Accessibility
- 20% - Value for Speed
- 20% - Streaming Experience
- 55% - Data & OTT

Reliability (part of MedOs):

- 5% - Accessibility*
- 20% - Value for Speed*
- 20% - Streaming Experience*
- 55% - Data & OTT*

*SuccessMOS

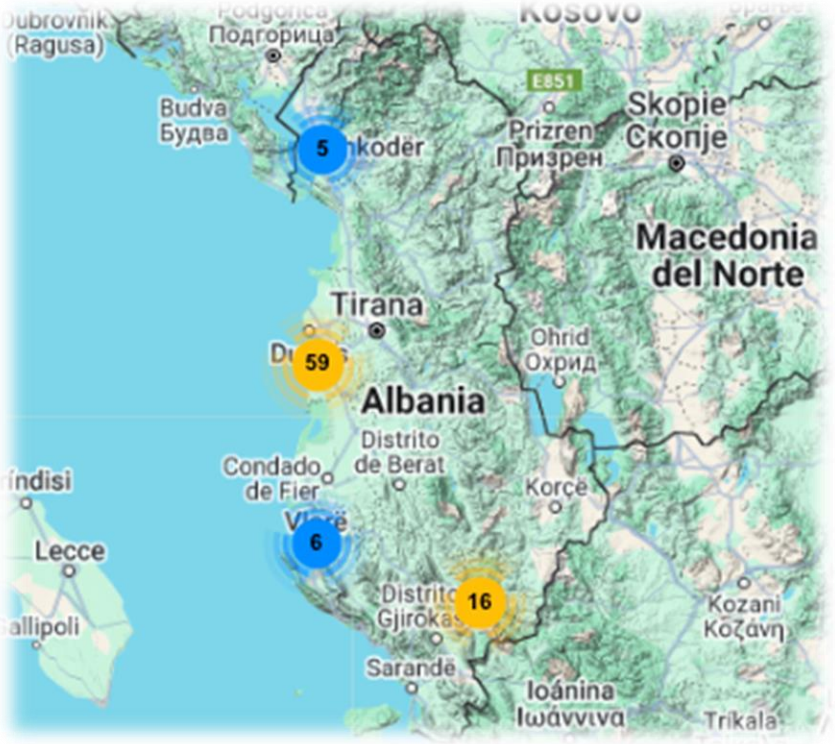
ALL RIGHTS RESERVED. This information and document were prepared by MedUX (part of Case On IT) for the sole use of the addressee. No part of it may be copied, reproduced or made available in any way to third parties without MedUX prior written consent. Operators can obtain a license to use the seals, as well as marketing rights to use the benchmarking results through MedUX.

CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Fixed QoE Campaign Overview

The campaign consisted of in-home performance measurements from the end-user perspective during Q3-Q4 2024 in Albania, with almost 3 million inhabitants.

The campaign covered 8 of the most populated regions across the country to understand how fixed broadband operators perform.



Measurement Scope

Technology: Ethernet
- xDSL, HFC and FTTH lines, see Panel Description
- Wired mode

Devices: MedUX Home
- MiniPC-based probes

Sampling:
- Tests: approx. 500K samples

Complete Test protocol
- Network Responsiveness targets: Youtube.com, Shqiptarja.com, Facebook.com
- Web Browsing and Social Media Targets: Google.com, Youtube.com, Facebook.com
- Gaming Targets: Epic, Valve
- HTTP DL/UL Target: Datapacket Server
- Speed Test Targets: Public CDNs
- Cloud service: Dropbox

Reference Period: Sep. – Oct. 2024

CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Panel Description

Overview

Population: 2,8 Mio. Est 2022

Fixed Internet subscribers: 500K

Source: AKEP

We deploy our robots in customer premises at a national level and collect statistically reliable information for business intelligence and optimization purposes

Approximately 45 Panelists per universe, delivering national average measurements.

Line profile distribution

FTTH/xDSL:

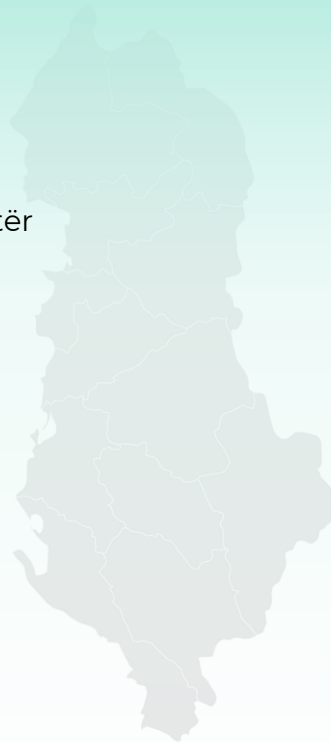
- Basic Connections (less than 30 Mbps): 13%
- Fast Connections (30 Mbps to less than 100 Mbps): 28%
- Ultra-fast Connections (100 Mbps or more): 59%

FTTH/HFC:

- Ultra-fast Connections (100 Mbps or more): 100%

Observation points (%) by Connection category according to AKEP

Geographical distribution



Durrës	5%
Elbasan	3%
Fier	8%
Gjirokastër	4%
Korçë	8%
Shkodër	8%
Tirane	62%
Vlorë	4%

Over 80 observation points

More than **500 thousand monthly tests**

Tests suite

MedUX evaluates mobile networks experience by ranking the performance of typical consumer use cases such as web browsing popular websites, downloading/uploading content, using data storage services, accessing gaming servers and streaming video content, among other.

Cloud DL	Multi-thread download speed test based on public CDNs.
Latency	Echo request to a specific URL based on ICMP.
HTTP DL	Single-thread download speed test based on dedicated servers (10 seconds Burst)
HTTP UL	Single-thread upload speed test based on dedicated servers (10 seconds Burst)

Streaming	Youtube Video playback based on a Android multimedia player.
Dropbox	Single-thread download from a file hosted in Dropbox.
Gaming	Echo request to gaming servers based on ICMP.
Web Browsing	Navigation of any website based on Chrome browser.

CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Campaign Setup – Tests performed

For service performance purposes, a total of around 120K data samples were collected by week. All in all, resulting in a total of around 500K samples and 250K tests per operator.

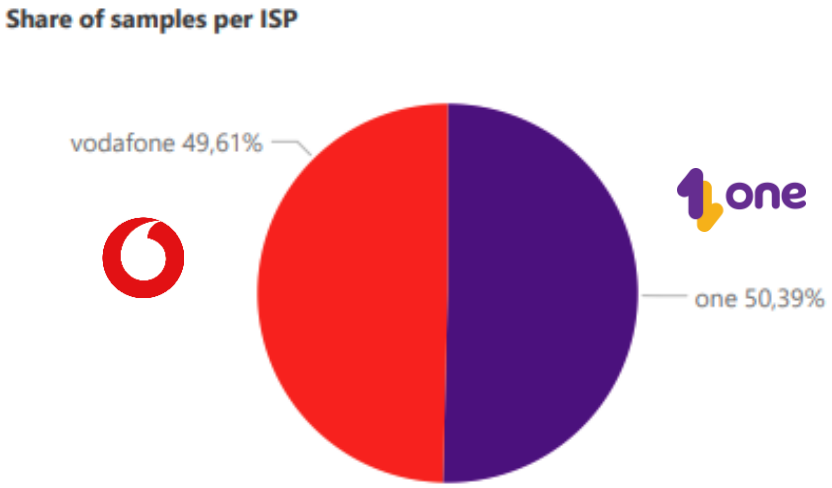
Scope

2 ISPs

9 Test Types

4 Weeks of data

87 Households



516.250

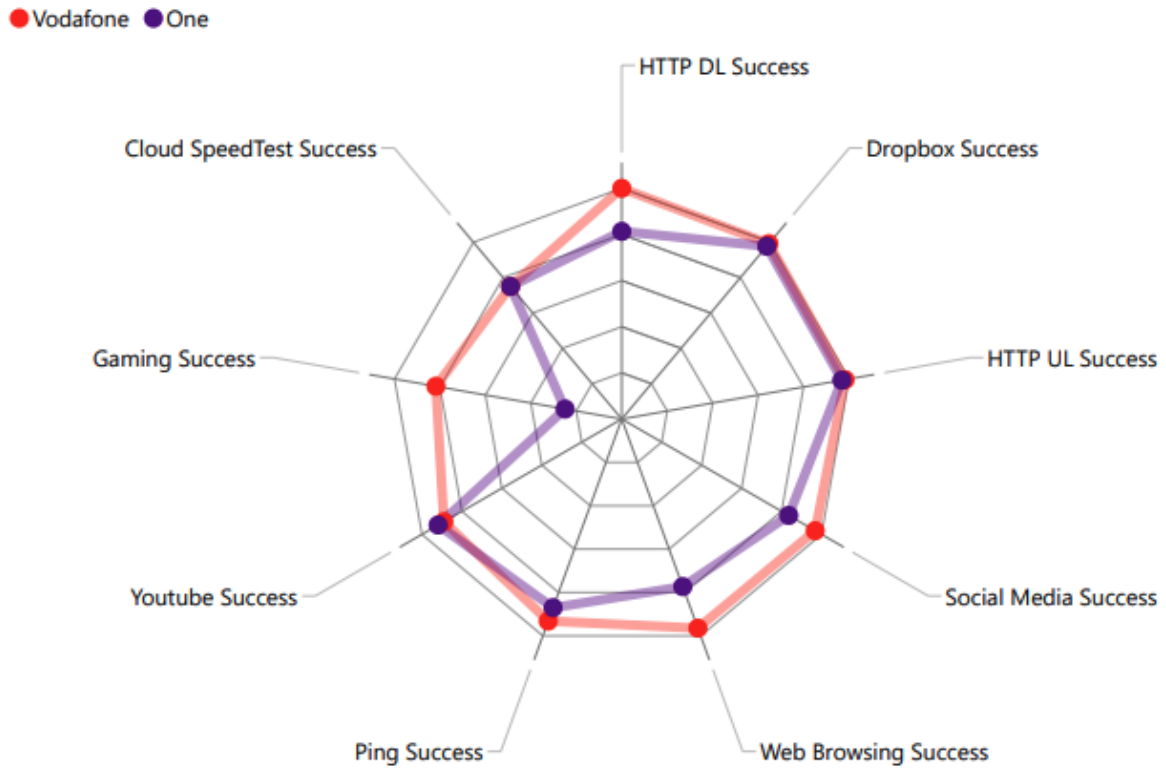
Tests Performed

Test-Service	AL One	AL Vodafone	Total
Cloud Speed Test DL	9.174	10.752	19.926
Dropbox	18.170	17.810	35.980
Gaming	30.723	30.034	60.757
HTTP DL	10.772	10.587	21.359
HTTP UL	15.345	15.009	30.354
Network Responsiveness	86.606	84.398	171.004
Social Media	18.281	17.965	36.246
Web Browsing	54.845	53.930	108.775
YouTube	16.212	15.637	31.849
Total	**260.128**	**256.122**	**516.250**

For further details about the test cases covered in the campaign scope please see “Tests Suite” or “Testing and KPI details ” below.

CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Benchmarking Reliability – Consistent performance



Test-Service	one	vodafone
Cloud Speed Test DL	100,00	100,00
Dropbox	99,89	99,96
Gaming	97,58	99,64
HTTP DL	99,63	100,00
HTTP UL	99,94	99,97
Network Responsiveness	99,35	99,66
Social Media	99,13	99,83
Web Browsing	98,80	99,81
YouTube	99,84	99,78

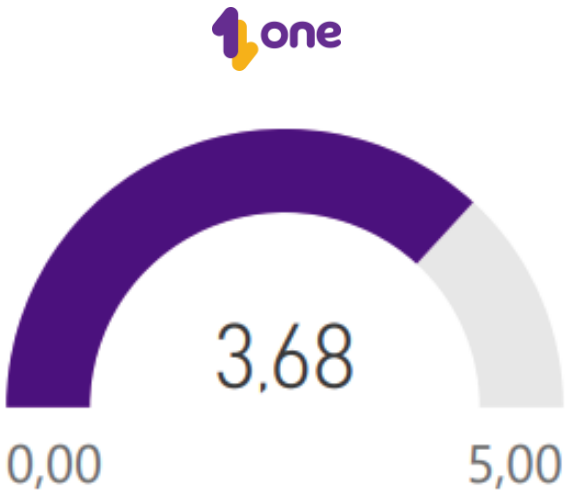
*A test is considered as not successful if it fails or if it does not meet minimum service levels

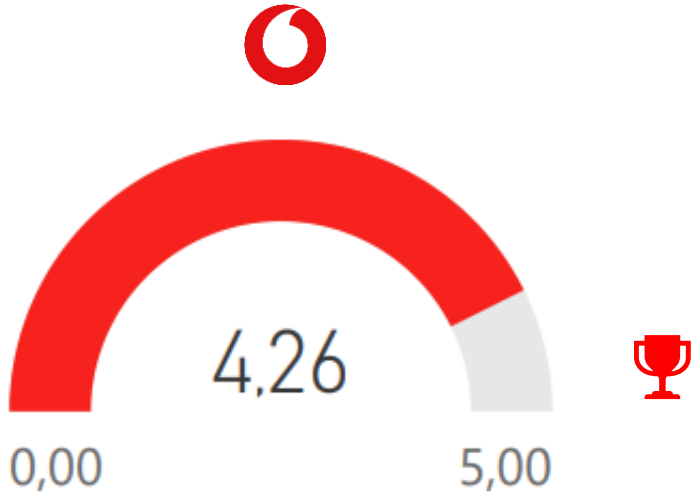
MOS Part	AL One	AL Vodafone
Cloud SpeedTest Success	3,75	3,75
Dropbox Success	4,89	4,96
Gaming Success	1,25	4,09
HTTP DL Success	4,07	5,00
HTTP UL Success	4,84	4,91
Ping Success	4,35	4,66
Social Media Success	4,18	4,84
Web Browsing Success	3,87	4,82
Youtube Success	4,59	4,45

CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Benchmarking Experience - Best QoE

Vodafone achieved the best overall ranking result. Out of 5 possible points, Vodafone scored with 4.26, closely followed by One with 0.58 points less (-13%).

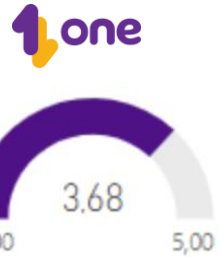


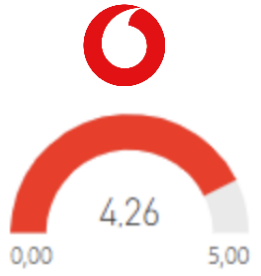


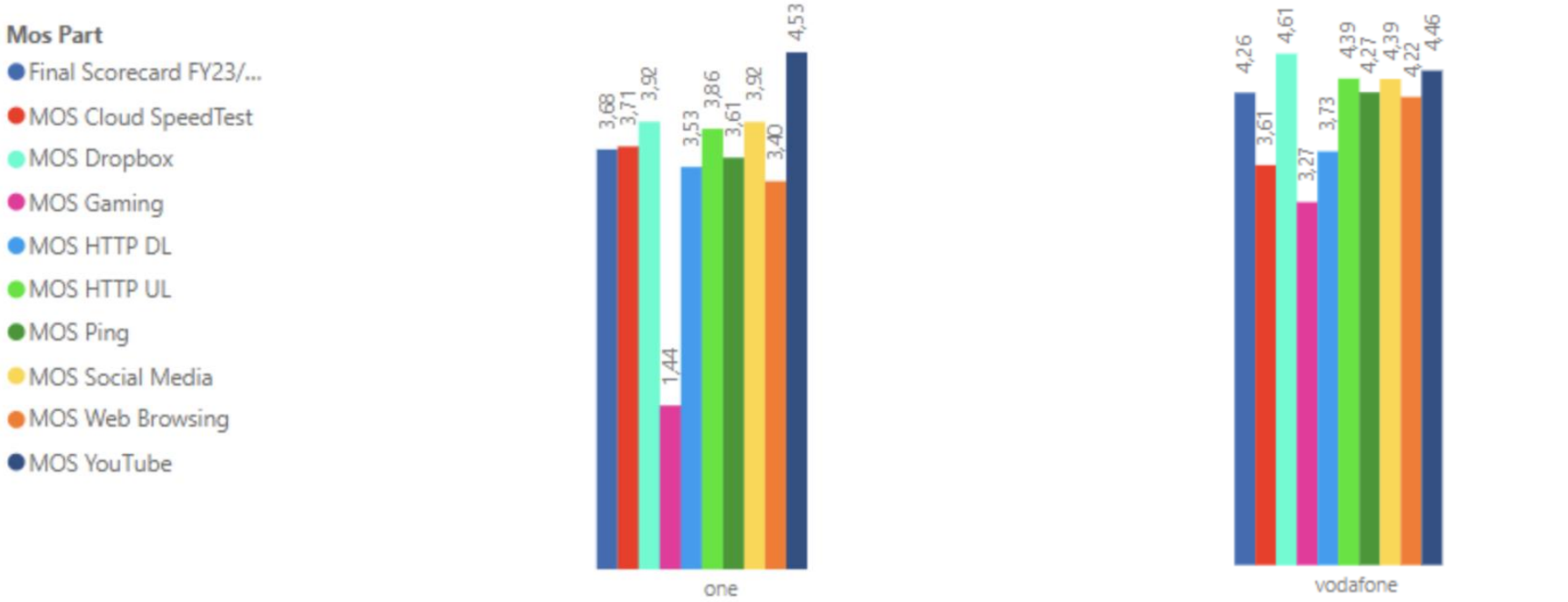
- Vodafone provides the finest experience, coupled with the most reliable network, leading in Accessibility and Data and OTT
- One shows the best performance in Matching the Promise and Streaming

CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Benchmarking Experience – Results per category



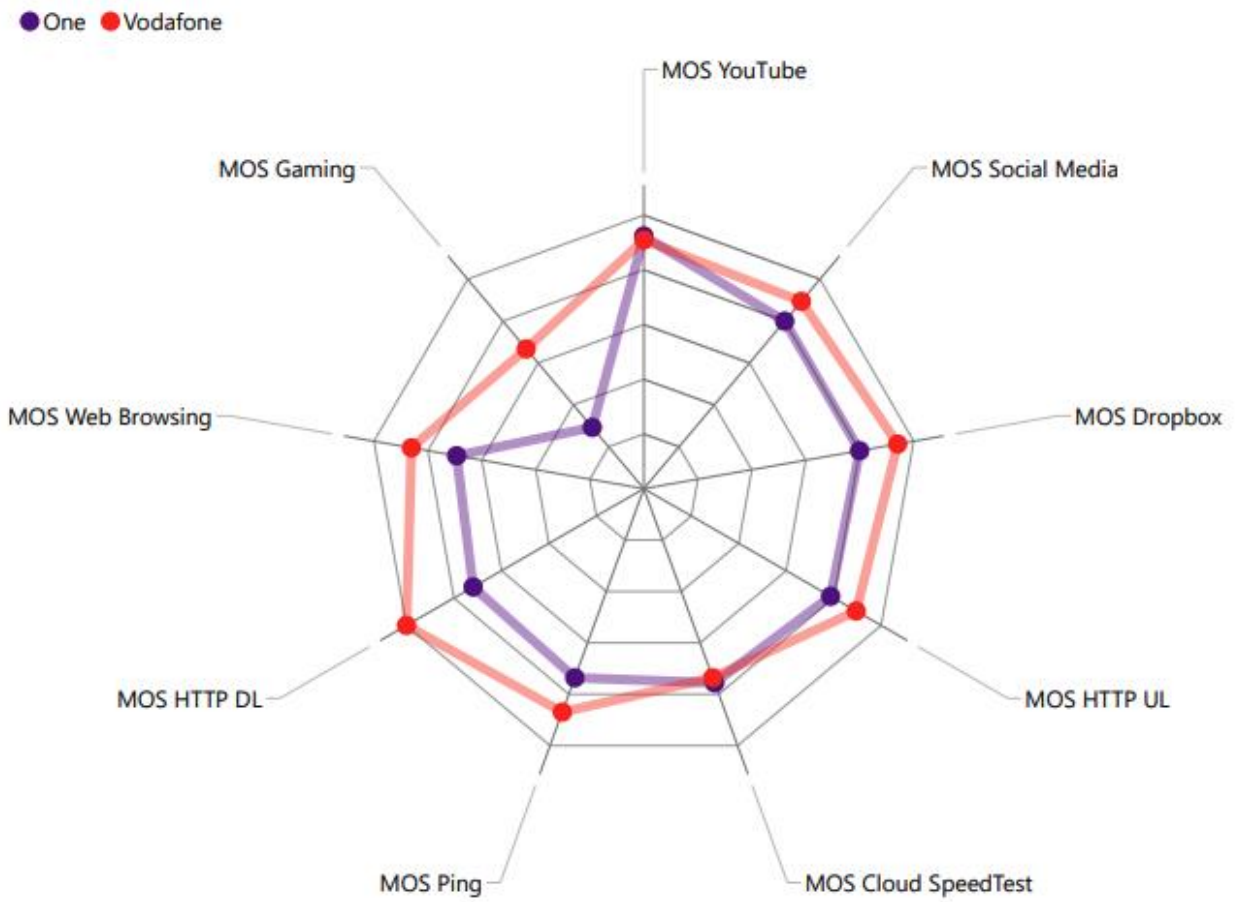




CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

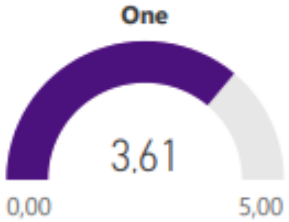
Benchmarking Experience – Results per category

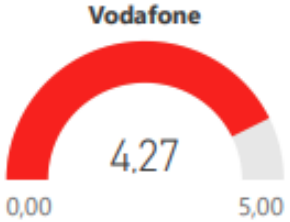
Service Group	AL One	AL Vodafone
Accessibility	**0,180**	**0,213**
Network Responsiveness	0,180	0,213
Data and OTT	**1,854**	**2,435**
Dropbox	0,196	0,231
Gaming	0,072	0,164
HTTP DL	0,706	0,981
HTTP UL	0,193	0,220
Social Media	0,131	0,146
Web Browsing	0,557	0,694
Matching the promise	**0,741**	**0,722**
Cloud Speed Test DL	0,741	0,722
Streaming	**0,907**	**0,892**
YouTube	0,907	0,892
Total	**3,682**	**4,263**



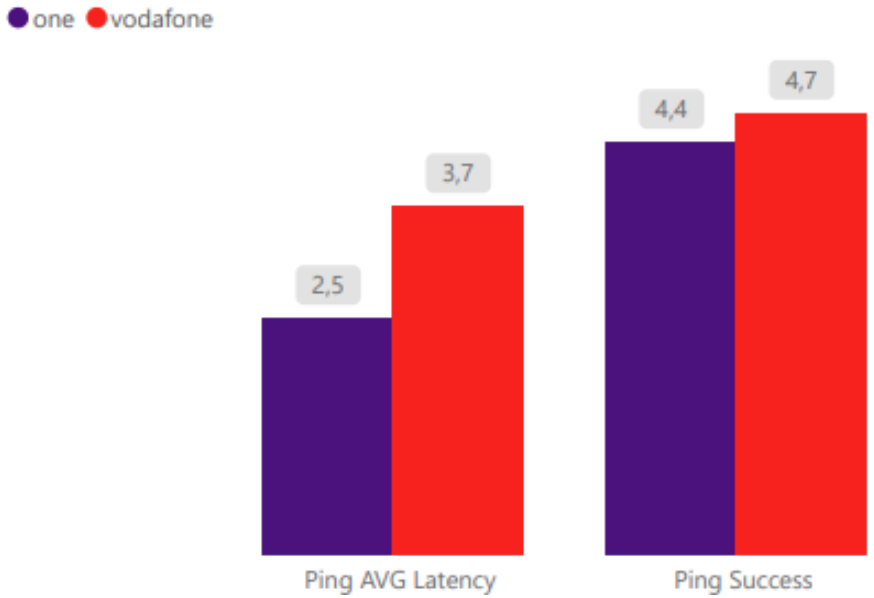
CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

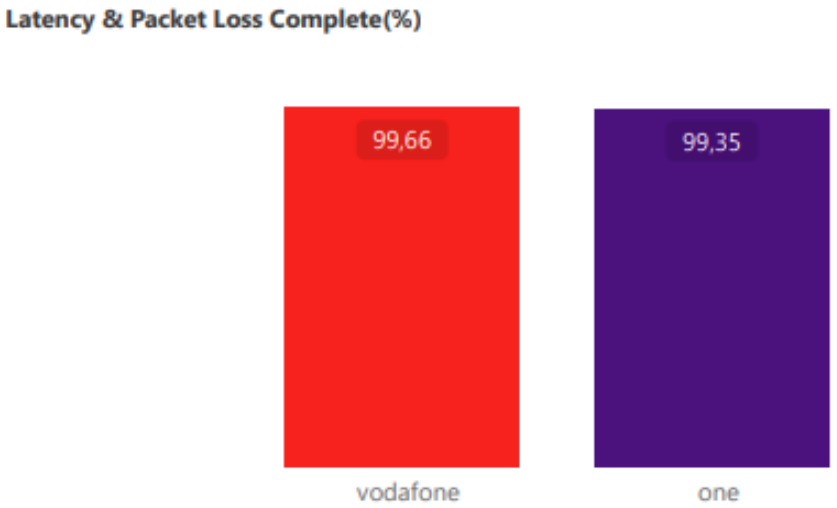
Benchmarking Network Responsiveness

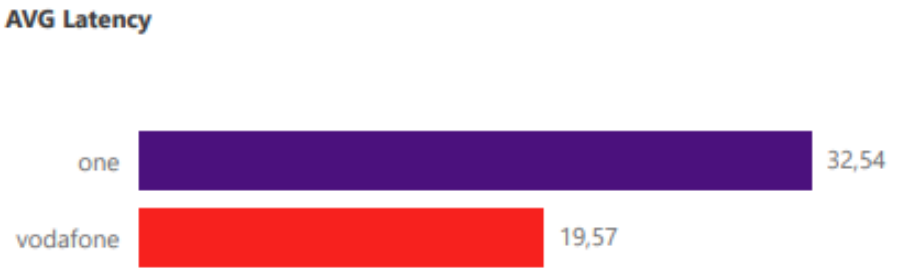




KPI Name	one	vodafone
AVG Latency	32,54	19,57
Success Rate (%)	99,35	99,66

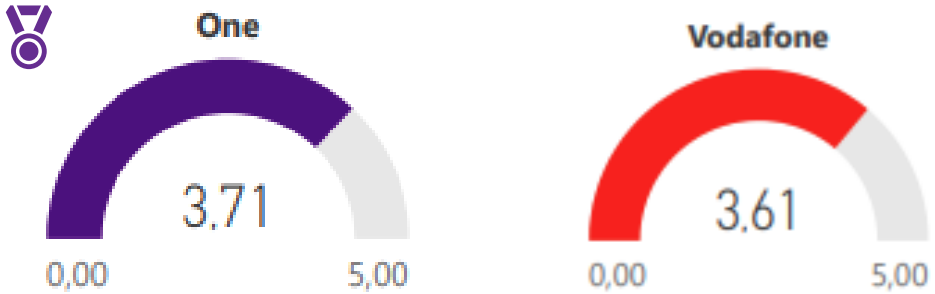




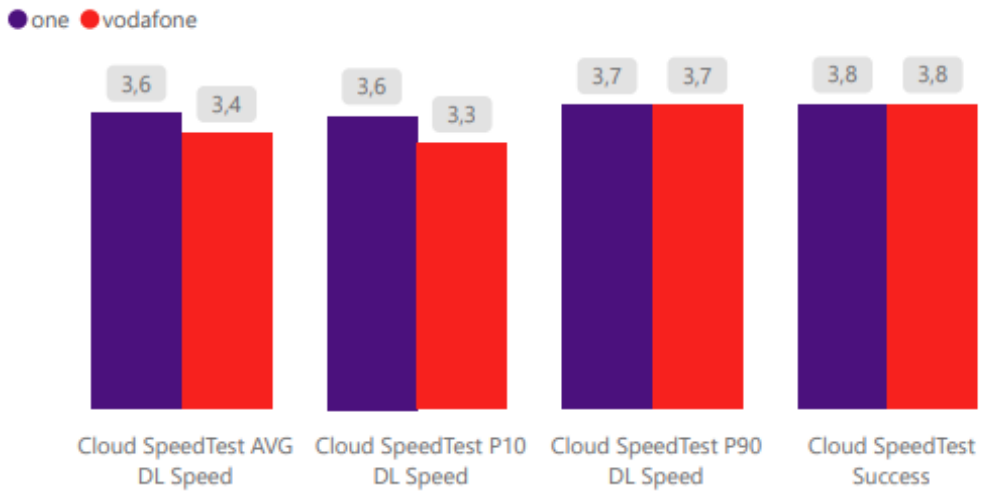


CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Benchmarking Matching the promise – DL (multi-thread)

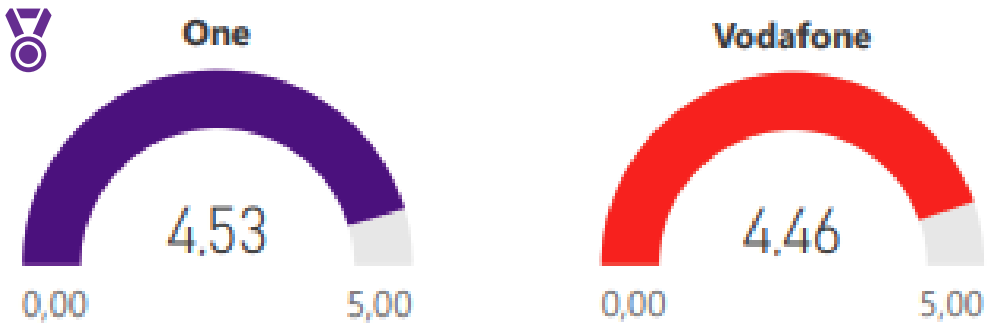


KPI Name	one	vodafone
AVG DL Speed vs Advertised	97,24	91,02
P10 DL Speed vs Advertised	92,81	76,99
P90 DL Speed vs Advertised	99,92	100,00
Success Rate (%)	100,00	100,00

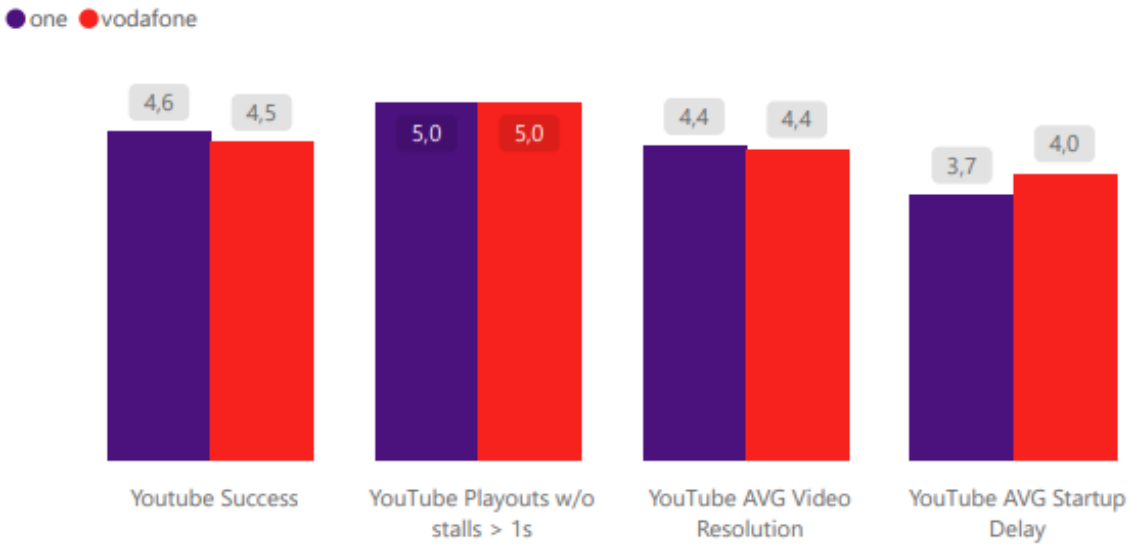


CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Benchmarking Streaming Experience

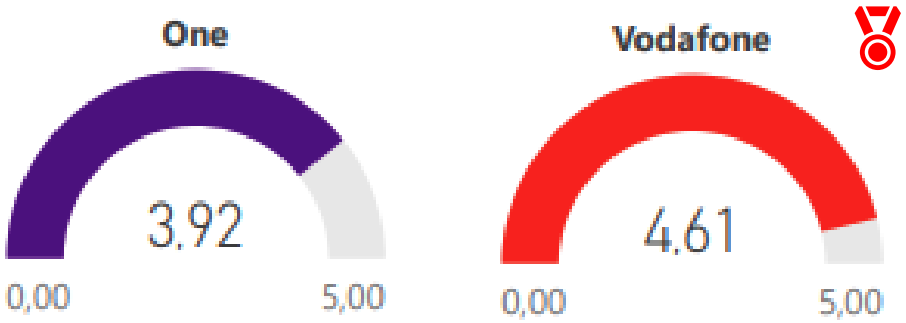


KPI Name	one	vodafone
% of Youtube Playout w/o Max stall duration > 1000 ms	100,00	100,00
AVG Startup Delay	4.447,95	4.428,46
AVG Youtube Video Resolution	1.042,80	1.043,59
Success Rate (%)	99,84	99,78

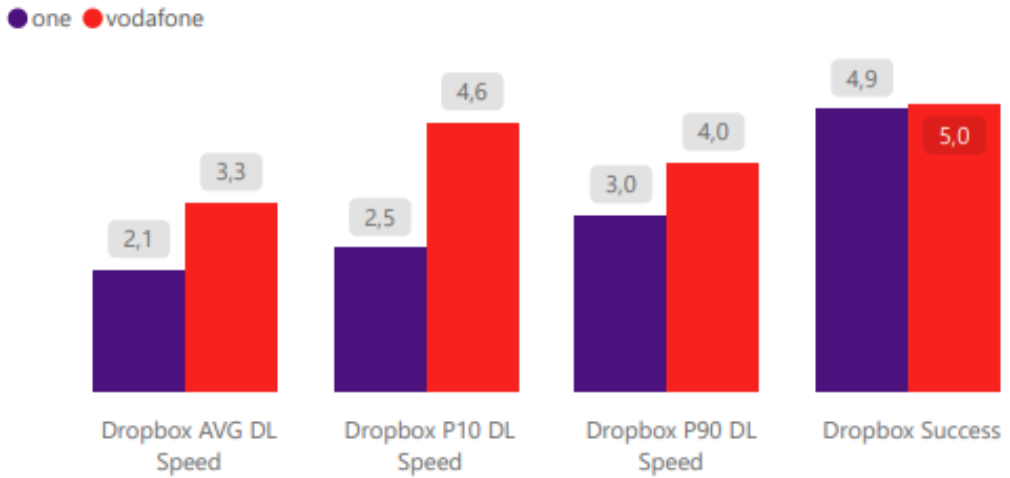


CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Benchmarking Cloud Service Experience



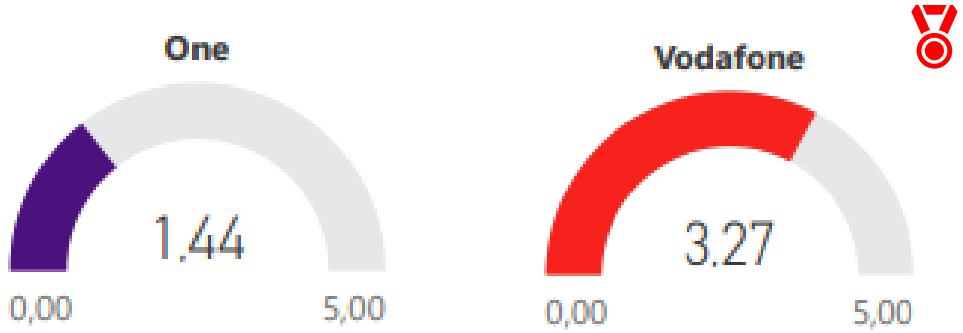
KPI Name	one	vodafone
AVG DL Speed	42,30	59,77
P10 DL Speed	17,68	37,47
P90 DL Speed	62,25	77,51
Success Rate (%)	99,89	99,96

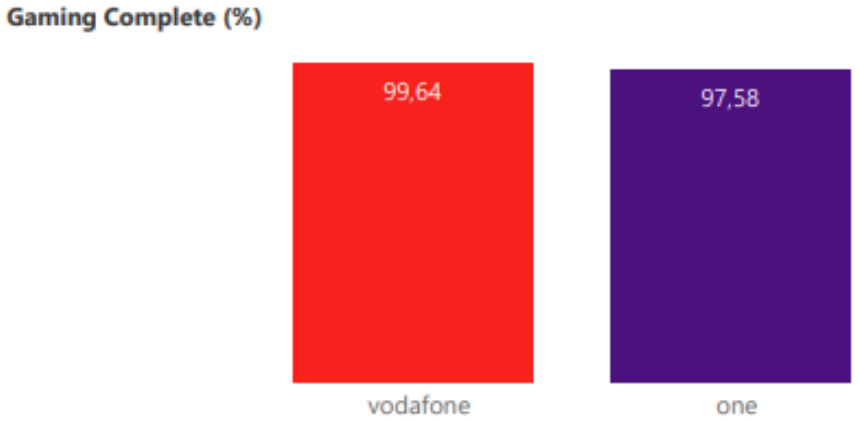


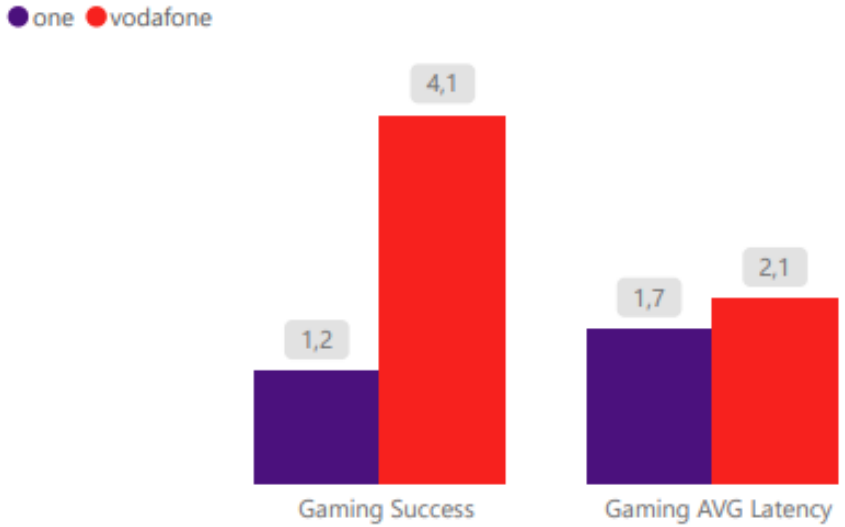
CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

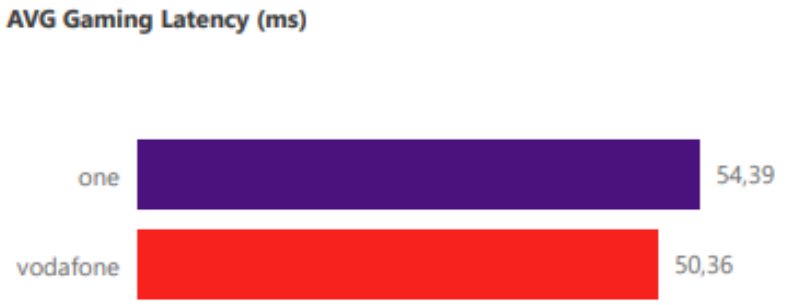
Benchmarking Gaming Experience

KPI Name	one	vodafone
AVG Gaming Latency	54,39	50,36
Success Rate (%)	97,58	99,64



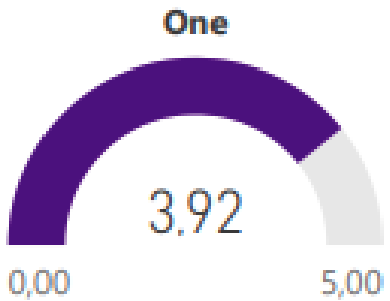


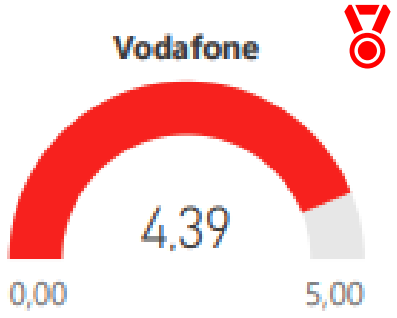




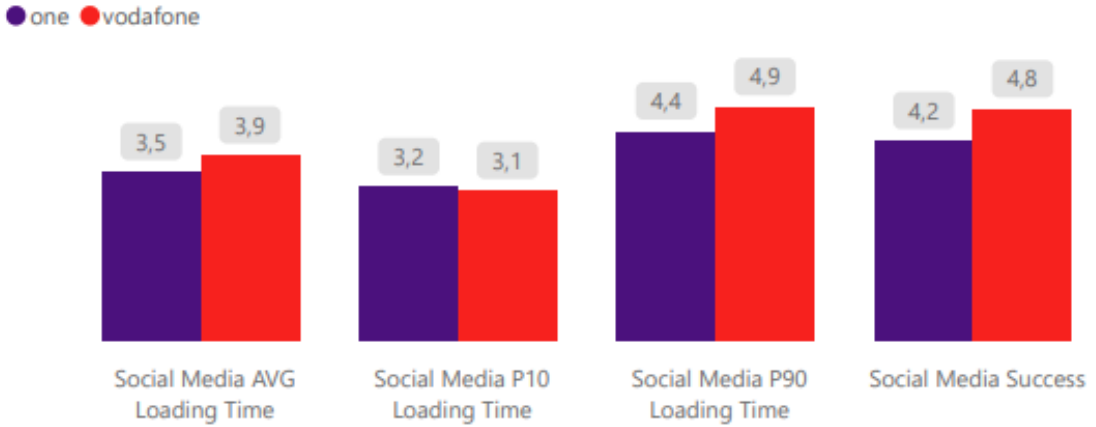
CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Benchmarking Social Media Experience





KPI Name	one	vodafone
AVG WBT	1.809,87	1.757,99
P10 WBT	471,80	477,79
P90 WBT	3.002,36	2.852,41
Success Rate (%)	99,13	99,83

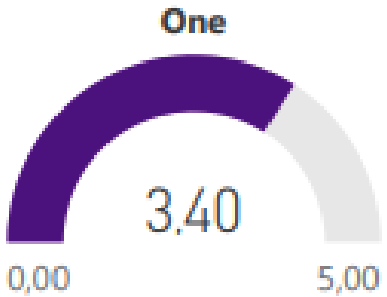


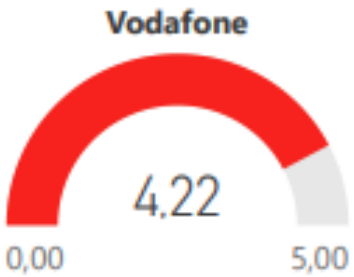
Loading Time P10 (ms)

Loading Time P90 (ms)

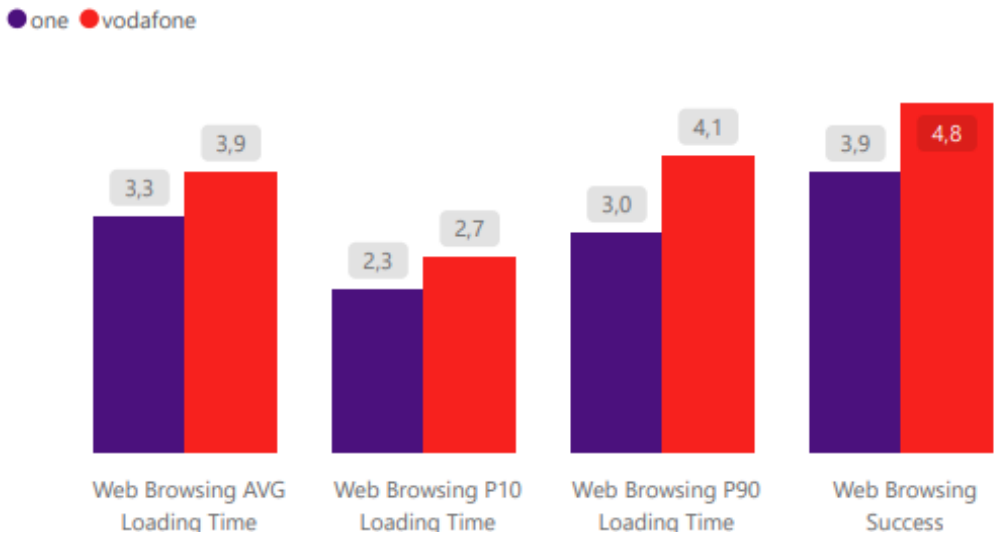
CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Benchmarking Web Browsing Experience





KPI Name	one	vodafone
AVG WBT	1.264,46	1.140,01
P10 WBT	888,74	863,29
P90 WBT	1.811,87	1.576,66
Success Rate (%)	98,80	99,81
Total	**1.015.97**	**919.94**

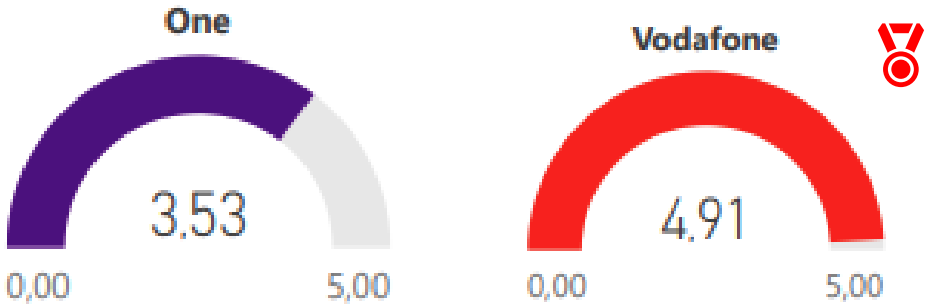


Web Browsing P10

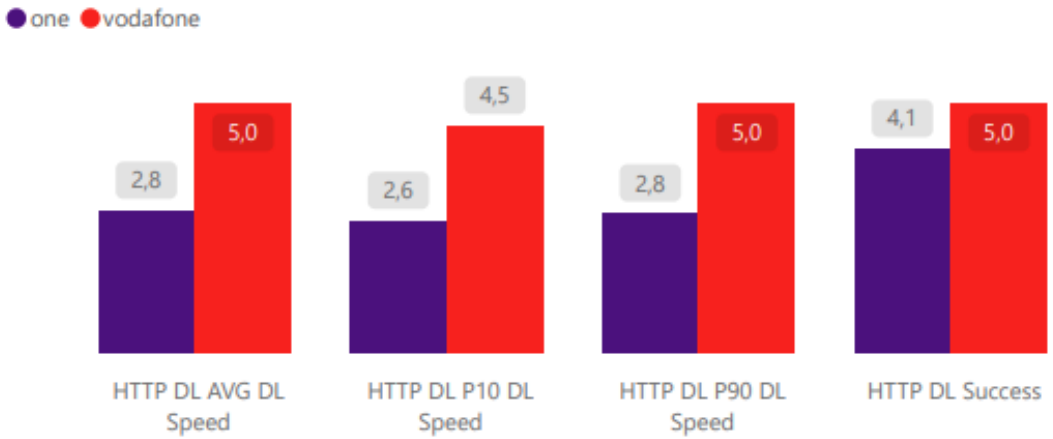
Web Browsing P90

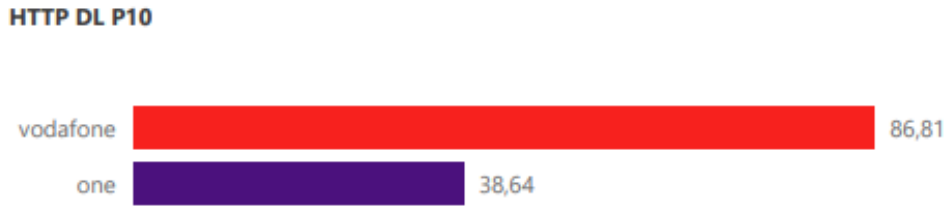
CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Benchmarking HTTP DL Speed (mono-thread)



KPI Name	one	vodafone
AVG DL Speed	102,34	581,42
P10 DL Speed	38,64	86,81
P90 DL Speed	238,39	871,97
Success Rate (%)	99,63	100,00

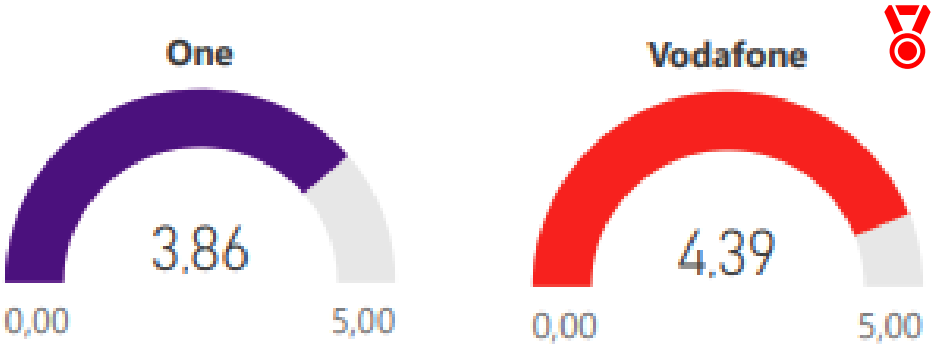


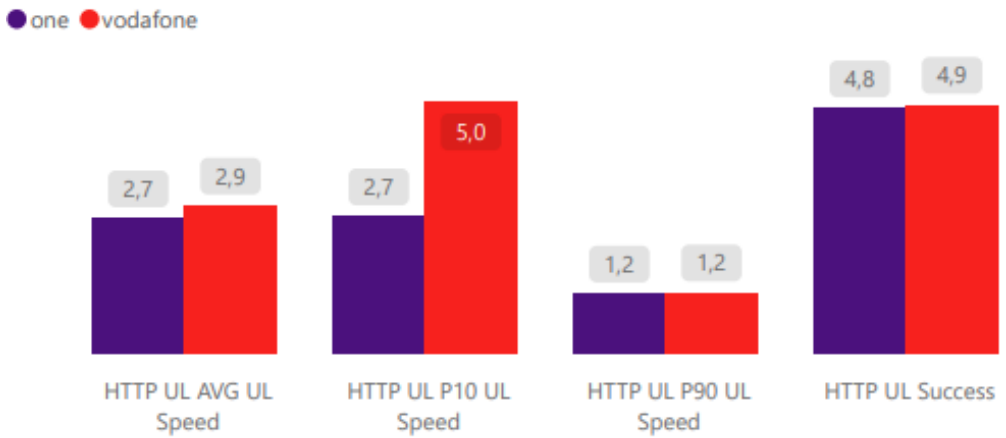


CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Benchmarking HTTP UL Speed (mono-thread)

KPI Name	one	vodafone
AVG UL Speed	30,45	36,49
P10 UL Speed	3,90	20,06
P90 UL Speed	45,40	47,04
Success Rate (%)	99,94	99,97





CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Detailed Benchmarking Results

KPIs HTTP DL&UL / Medux Cloud SpeedTest / DropBox

Test-Service	KPI Name	one	vodafone
Cloud Speed Test DL	AVG DL Speed vs Advertised	97,24	91,02
	P10 DL Speed vs Advertised	92,81	76,99
	P90 DL Speed vs Advertised	99,92	100,00
	Success Rate (%)	100,00	100,00
Dropbox	AVG DL Speed	42,30	59,77
	P10 DL Speed	17,68	37,47
	P90 DL Speed	62,25	77,51
	Success Rate (%)	99,89	99,96
HTTP DL	AVG DL Speed	102,34	581,42
	P10 DL Speed	38,64	86,81
	P90 DL Speed	238,39	871,97
	Success Rate (%)	99,63	100,00
HTTP UL	AVG UL Speed	30,45	36,49
	P10 UL Speed	3,90	20,06
	P90 UL Speed	45,40	47,04
	Success Rate (%)	99,94	99,97

Social Media / Web Browsing / YouTube Test

Test-Service	KPI Name	one	vodafone
Social Media	AVG WBT	1.809,87	1.757,99
	P10 WBT	471,80	477,79
	P90 WBT	3.002,36	2.852,41
	Success Rate (%)	99,13	99,83
Web Browsing	AVG WBT	1.264,46	1.140,01
	P10 WBT	888,74	863,29
	P90 WBT	1.811,87	1.576,66
	Success Rate (%)	98,80	99,81
YouTube	% of Youtube Playout w/o Max stall duration > 1000 ms	100,00	100,00
	AVG Startup Delay	4.447,95	4.428,46
	AVG Youtube Video Resolution	1.042,80	1.043,59
	Success Rate (%)	99,84	99,78

Gaming / Network Responsiveness

Test-Service	KPI Name	one	vodafone
Gaming	AVG Gaming Latency	54,39	50,36
	Success Rate (%)	97,58	99,64
Network Responsiveness	AVG Latency	32,54	19,57
	Success Rate (%)	99,35	99,66

CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Testing and KPI details (1/2)

Test Name	KPI Name	KPI Details
• Latency-Ping	• Average Latency (ms) • Completed Tests (%) • Jitter (ms) • Packet Loss (%)	• Average latency obtained during the test execution • % of total tests performed that have successfully completed • Variance in time delay between data packets over the network • % of packet loss during test execution
• HTTP Down (Burst)	• Average Speed (Mbps) • Completed Tests (%)	• Download Speed (Mbps) • % of total tests performed that have successfully downloaded bytes during requested time
• HTTP Up (Burst)	• Average Speed (Mbps) • Completed Tests (%)	• Upload Speed (Mbps) • % of total tests performed that have successfully uploaded bytes during requested time
• Cloud Speed test DL	• Average DL Speed (Mbps) • Completed Tests (%) • Cloud Speed test - P50 DL Speed (Mbps) • Cloud Speed test - P90 DL Speed (Mbps)	• Download Speed (Mbps) • % of total tests performed that have successfully completed • Avg of P50 of the partial values obtained in cloud Speed test • Avg of P90 of the partial values obtained in cloud Speed test

CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

Testing and KPI details (2/2)

Test Name	KPI Name	KPI Details
• Web Browsing	• Average DNS Lookup Time (ms) • Completed tests (%) • Loading time (ms)	• Average DNS lookup by resource • % of total tests performed that have completely loaded requestest URL • Time to completely browse the website
• Streaming (YouTube)	• Average Speed (kBps) • Startup Time (ms) • Completed Tests (%)	• Download Speed (kbps) • Time to begin playing the video (Player Loading Time + Time to Play) • % of total tests performed that have successfully played requested video
• Gaming	• Average Latency (ms) • Completed Tests (%) • Jitter (ms)	• Average latency obtained during the test execution • % of total tests performed that have successfully completed • Variance in time delay between data packets over the network
• Dropbox Download	• Average Speed (kbps) • Completed Tests (%)	• Download Speed (kbps) • % of total tests performed that have successfully downloaded requested file
• Social Media	• Average DNS Lookup Time (ms) • Completed tests (%) • Loading time (ms)	• Average DNS lookup by resource • % of total tests performed that have completely loaded requestest URL • Time to completely browse the website

CONFIDENTIAL - ALL COPYRIGHTS AND TRADEMARKS RESERVED

QoE Everywhere in the Digital Era

Join MedUX in the #QoERevolution

MedUX, the internet QoE testing and monitoring company

www.medux.com

Rafael González
CMO
rafa@medux.com

Jaime González
Product & Marketing Mgr
jaime@medux.com

About MedUX

The internet Quality of Experience testing and monitoring company.

QoE Everywhere in the digital Era.

Why MedUX

With MedUX, you get a unique ecosystem that provides a one-stop-shop QoE suite for all your needs.

We integrate robots and agents, our full-stack technology and advanced analytics to deliver comprehensive multi-play testing and grand scale monitoring.

Our solutions

1

5G

Benchmarking

Wholesale control

2

Regulatory compliance

Anomaly Detection

3

Grand scale QoE monitoring

Massive field-data monitoring

4

In-Home performance

CPE performance

Our clients

Communication service Providers

Telecom Regulators

Digital Enterprise

Multiplatform QoE Suite

Mobile & Home Robots

Mobile network monitoring and In-Home QoE measurements from real end-user perspective.

Agent App

Available on iOS, Android and Harmony; supports various QoE measurements.

SDK & Crowdsourcing

QoE insights from real world end users. Collects information on the mobile network.

Advanced Analytics

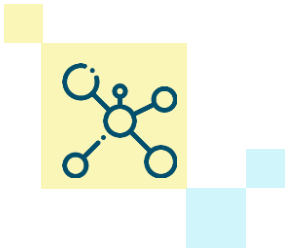
Offers Agile tools for monitoring network services and discovering insights in real time.

QoE Revolution.

Since 2014, MedUX has been revolutionizing networks and services testing from the **customer perspective**. Our figures have not stopped growing.

16.500
Robots

Active testing devices all over the world.



+20 Billion
Samples

Analyzed in real time, without integration and 100% operated by us.

+500M
People

Covered by MedUX deployments.

+3M
Agents

SDK Agents and APPs collecting insights from any device.

Global Trusted Partner.

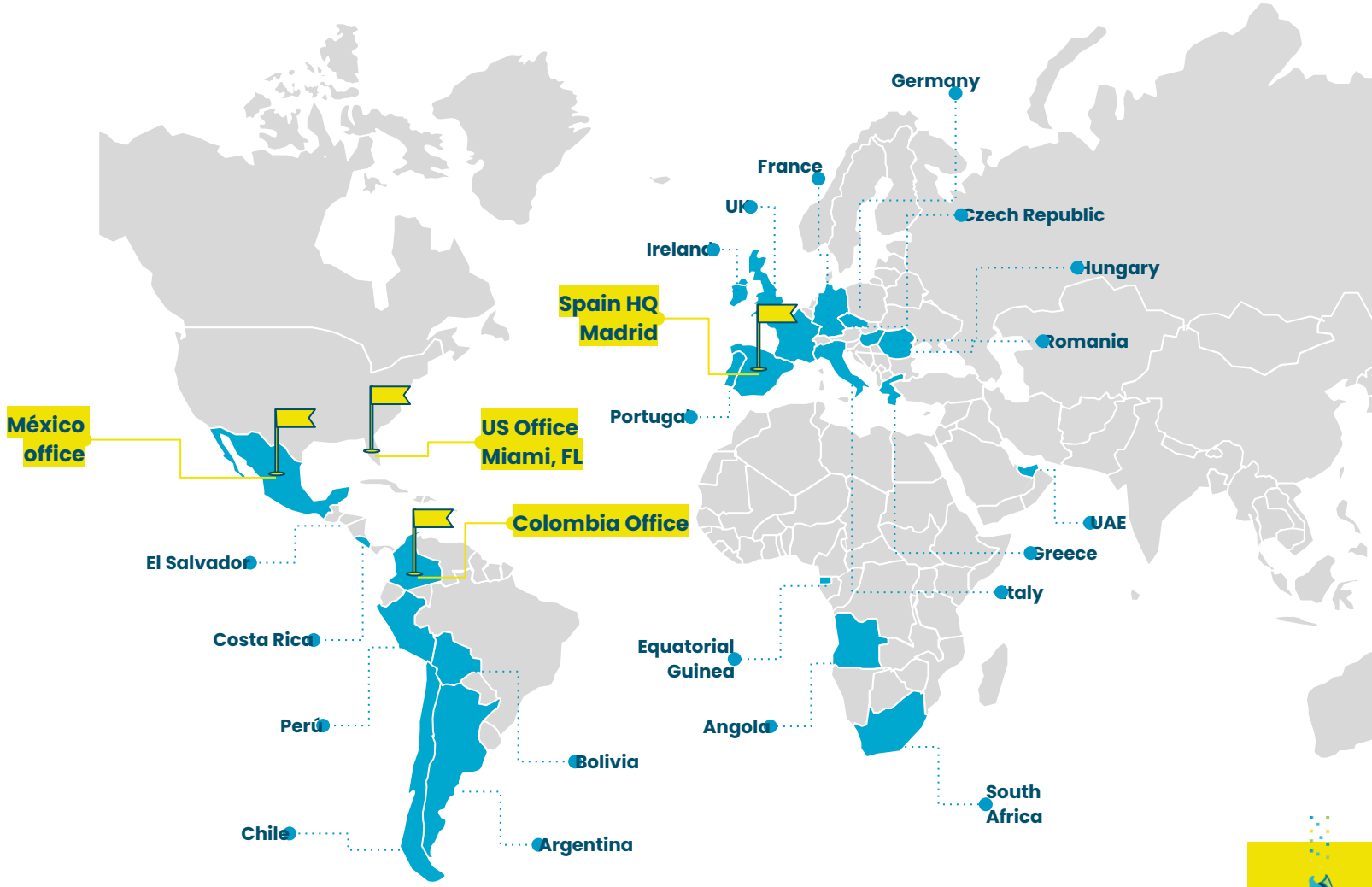
+ 25 Countries

International presence.

Global presence.
Centers of excellence throughout the world.

Projects

Offices



Success stories.

Global TELCOs

vodafone
orange
at&t
Claro
MILLICOM
Telefónica

Governments

GOBIERNO DE ESPAÑA
sutel
COMISIÓN DE REGULACIÓN DE COMUNICACIONES
TDRA
SUPERINTENDENCIA GENERAL DE ELECTRICIDAD Y TELECOMUNICACIONES
MINTIC
ortel
Ajuntament de Barcelona
Generalitat de Catalunya Centre de Telecomunicacions i Tecnologies de la Informació

Other Carriers

MÁSMÓVIL
O2
bouygues
DIRECTV
telecable
eTb
NOS
andorra telecom
ALTAN REDES
DIGI
WOM
FASTWEB
zap
AVATEL TELECOM
entel
gtd