

Audit Report.

Czech Republic, 2024





Foreword



umlaut has tested the quality of the Mobile Networks in the Czech Republic and took a detailed look into the mobile data performance of each operator.

The company is headquartered in Aachen, Germany and is a world leader in mobile network testing and benchmarking.



Intro

umlaut tested and measured the performance of its data services on smartphones in comparison to other 5G/LTE mobile radio networks in metropolitan and rural areas of Czech Republic.

The audit was done as a performance benchmark performed by umlaut between 26.01.2024 and 15.02.2024 in cities and towns as well as on connection roads.

Dedicated measurements have been executed as drive tests outdoors using a Samsung Galaxy S23+.

All data measurements have been performed in 5G preferred mode.

The following pages provide a comparative overview about the performance results observed for the different tested service types.



Measurement setup

| Drivetest | Data | Conversational apps |
|--------------------------|--|--|
| Device | Samsung Galaxy S23+ | Samsung Galaxy S23+ |
| Test Cases | Data 5G preferred HTTP DL datastream 7s HTTP UL datastream 7s HTTP 10MB DL fixed file transfer HTTP 5MB UL fixed file transfer Web Browsing – Kepler ETSI Ref. Page 8 Live web pages 2 YouTube videos ~ 45s (Full HD and Live Full HD) Interactivity eGaming | Mobile-to-Mobile Side1 (VoLTE, 5G pref.) to Side2 (VoLTE, 5G pref.) 105 sec call window 70 sec call duration 15 sec call setup timeout |
| Mobility and Route Types | Mobility: Drive test (Cities, towns and roads) and Walk test (only Cities AOIs) Drivetest (~49% in Cities, ~28% in Towns and ~23% on Roads) Walk test (100% Cities AOIs) | |
| Samples | ~ 81,704 per Operator | |
| Dates | 18 measurement days 26.01.2024 – 15.02.2024 | |



Testing area

Drive route



 **6,422 km**
measuring distance

 **34 %**
of population measured



Methodology

The leader in mobile benchmarking, umlaut, has analyzed the mobile networks of Czech Republic with regards to mobile network performance. We measure smartphone data performance based on extensive drivetests – from major metropolitan areas to smaller cities and connection roads. We objectively define the routes and test methodology and publish the results through certificates or public benchmark reports.

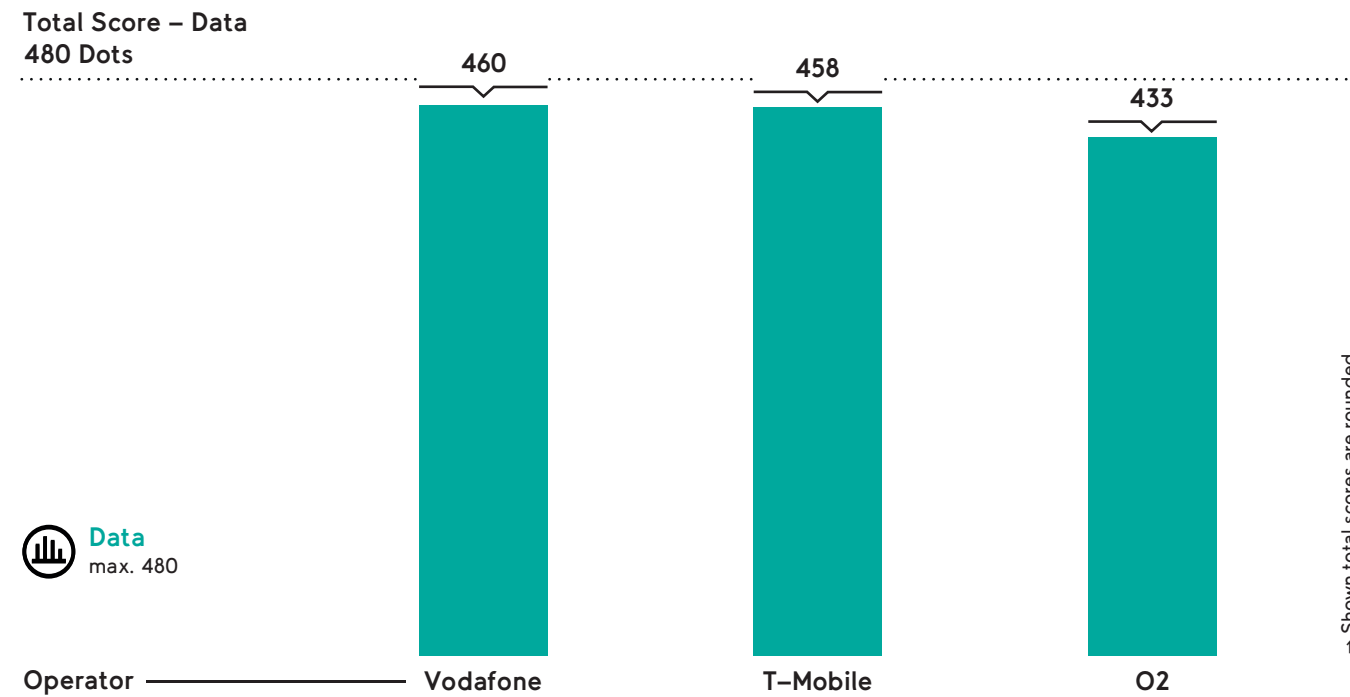
As the de-facto industry standard, our benchmarking methodology focuses on customer-experienced network quality and covers a wide range of mobile services.

Today, more than 200 mobile networks in more than 120 countries are being evaluated by our unique scoring methodology. It allows a technical analysis that is unprecedented in its level of detail and enables comparisons between the network performance and capability of each mobile network. Our public benchmarks as well as the certificate benchmarks help network operators to demonstrate how well they are delivering wireless connections to consumers, business users and enterprises and reveals the areas of improvement.



Score and breakdown

Vodafone achieved the highest overall data score among competitors with 460 dots out of 480.



Overall data score.

Total score

| | | Vodafone | T-Mobile | O2 |
|------------------|------------|------------|------------|------------|
| Data | max. | | | |
| Cities Drivetest | 216 | 97% | 96% | 91% |
| Cities Walktest | 72 | 97% | 96% | 90% |
| Towns Drivetest | 96 | 96% | 95% | 90% |
| Roads Drivetest | 96 | 93% | 93% | 90% |
| Total | 480 | 460 | 458 | 433 |

Shown scores are rounded.



Achieved percentage of the maximum score in each of the different data services.

| Data | Service Group | Max | Vodafone | T-Mobile | O2 |
|------------------|---------------|------|----------|----------|-----|
| Cities Drivetest | Web Browsing | 48,6 | 99% | 98% | 97% |
| | File Download | 48,6 | 92% | 94% | 84% |
| | File Upload | 48,6 | 99% | 98% | 92% |
| | YouTube | 48,6 | 97% | 96% | 92% |
| | OTT | 21,6 | 95% | 94% | 87% |
| Cities Walktest | Web Browsing | 16,2 | 99% | 98% | 93% |
| | File Download | 16,2 | 95% | 92% | 86% |
| | File Upload | 16,2 | 99% | 99% | 90% |
| | YouTube | 16,2 | 97% | 96% | 90% |
| | OTT | 7,2 | 96% | 97% | 92% |
| Towns Drivetest | Web Browsing | 21,6 | 99% | 98% | 96% |
| | File Download | 21,6 | 91% | 91% | 83% |
| | File Upload | 21,6 | 99% | 97% | 91% |
| | YouTube | 21,6 | 95% | 96% | 88% |
| | OTT | 9,6 | 95% | 92% | 92% |
| Roads Drivetest | Web Browsing | 21,6 | 96% | 97% | 96% |
| | File Download | 21,6 | 88% | 87% | 81% |
| | File Upload | 21,6 | 95% | 96% | 93% |
| | YouTube | 21,6 | 91% | 95% | 89% |
| | OTT | 9,6 | 94% | 90% | 85% |





Data Services KPI overview

Achieved values of all networks under test in each of the relevant Data Key Performance Indicators (KPIs) for the geographical category "Cities Drivetest".

| Data Cities Drivetest | KPI Name | Unit | Vodafone | T-Mobile | O2 |
|-----------------------------|------------------------|-----------|----------|----------|--------|
| HTTP Web Page DL Smartphone | Qualifier | [%] | 100,0 | 99,9 | 99,6 |
| | Overall Session Time | [s] | 1,1 | 1,2 | 1,2 |
| HTTP 10MB DL Smartphone | Qualifier | [%] | 99,9 | 99,8 | 99,6 |
| | Overall Session Time | [s] | 1,6 | 1,4 | 2,3 |
| | 90% faster than | [Mbit/s] | 32,8 | 40,7 | 21,8 |
| | 10% faster than | [Mbit/s] | 192,5 | 164,6 | 226,6 |
| HTTP 5MB UL Smartphone | Qualifier | [%] | 100,0 | 99,9 | 99,9 |
| | Average Session Time | [s] | 1,2 | 1,3 | 2,0 |
| | 90% faster than | [Mbit/s] | 25,0 | 28,2 | 16,5 |
| HTTP DL FDTT | 10% faster than | [Mbit/s] | 80,4 | 70,1 | 81,3 |
| | Qualifier | [%] | 100,0 | 99,9 | 97,8 |
| | 10% faster than | [Mbit/s] | 271,5 | 326,4 | 397,1 |
| HTTP UL FDTT | faster than 20 Mbit/s | [%] | 97,2 | 98,7 | 94,1 |
| | faster than 100 Mbit/s | [%] | 62,8 | 71,5 | 68,5 |
| | Qualifier | [%] | 100,0 | 100,0 | 98,6 |
| YouTube | 10% faster than | [Mbit/s] | 135,8 | 119,9 | 113,3 |
| | faster than 2 Mbit/s | [%] | 100,0 | 99,9 | 99,7 |
| | faster than 5 Mbit/s | [%] | 99,9 | 99,8 | 98,8 |
| | Qualifier | [%] | 99,9 | 99,8 | 99,1 |
| YouTube Live Smartphone | Start Time | [s] | 1,7 | 1,8 | 1,8 |
| | AVG Resolution | [p] | 1078,9 | 1079,0 | 1078,5 |
| | Qualifier | [%] | 99,9 | 99,7 | 98,9 |
| Interactivity | Start Time | [s] | 2,1 | 2,2 | 2,2 |
| | AVG Resolution | [p] | 1079,2 | 1079,6 | 1079,1 |
| | Qualifier | [%] | 98,1 | 97,5 | 86,7 |
| Conversational App | Interactivity egaming | [%] | 71,8 | 79,8 | 68,7 |
| | Qualifier | [%] | 99,9 | 100,0 | 99,9 |
| Speech Quality (P10) | Speech Quality (P10) | [MOS-LQO] | 3,6 | 3,3 | 3,4 |



Achieved values of all networks under test in each of the relevant Data Key Performance Indicators (KPIs) for the geographical category "Cities Walktest".

| Data Cities Walktest | KPI Name | Unit | Vodafone | T-Mobile | O2 |
|-----------------------------|------------------------|-----------|----------|----------|--------|
| HTTP Web Page DL Smartphone | Qualifier | [%] | 99,9 | 99,8 | 98,9 |
| | Overall Session Time | [s] | 1,0 | 1,2 | 1,1 |
| HTTP 10MB DL Smartphone | Qualifier | [%] | 100,0 | 100,0 | 100,0 |
| | Overall Session Time | [s] | 1,4 | 1,6 | 1,8 |
| | 90% faster than | [Mbit/s] | 48,3 | 35,2 | 39,0 |
| | 10% faster than | [Mbit/s] | 196,1 | 148,0 | 277,4 |
| HTTP 5MB UL Smartphone | Qualifier | [%] | 100,0 | 100,0 | 99,5 |
| | Average Session Time | [s] | 1,2 | 1,3 | 1,8 |
| | 90% faster than | [Mbit/s] | 28,0 | 25,4 | 24,2 |
| HTTP DL FDTT | 10% faster than | [Mbit/s] | 83,5 | 69,9 | 83,5 |
| | Qualifier | [%] | 100,0 | 100,0 | 97,4 |
| | 10% faster than | [Mbit/s] | 291,8 | 316,1 | 601,3 |
| HTTP UL FDTT | faster than 20 Mbit/s | [%] | 98,5 | 98,5 | 96,9 |
| | faster than 100 Mbit/s | [%] | 74,8 | 55,7 | 60,2 |
| | Qualifier | [%] | 100,0 | 100,0 | 97,9 |
| YouTube | 10% faster than | [Mbit/s] | 142,5 | 131,7 | 127,4 |
| | faster than 2 Mbit/s | [%] | 100,0 | 100,0 | 99,5 |
| | faster than 5 Mbit/s | [%] | 100,0 | 99,0 | 98,4 |
| | Qualifier | [%] | 99,5 | 99,5 | 97,5 |
| YouTube Live Smartphone | Start Time | [s] | 1,6 | 1,7 | 1,7 |
| | AVG Resolution | [p] | 1079,0 | 1078,8 | 1078,6 |
| | Qualifier | [%] | 100,0 | 100,0 | 99,5 |
| Interactivity | Start Time | [s] | 2,0 | 2,2 | 2,0 |
| | AVG Resolution | [p] | 1079,8 | 1079,8 | 1079,8 |
| | Qualifier | [%] | 98,0 | 99,5 | 87,8 |
| Conversational App | Interactivity egaming | [%] | 76,4 | 79,4 | 75,0 |
| | Qualifier | [%] | 100,0 | 100,0 | 100,0 |
| Speech Quality (P10) | Speech Quality (P10) | [MOS-LQO] | 4,1 | 4,1 | 4,1 |



Data Services KPI overview

Achieved values of all networks under test in each of the relevant Data Key Performance Indicators (KPIs) for the geographical category "Towns".

| Data Towns | KPI Name | Unit | Vodafone | T-Mobile | O2 |
|-----------------------------|------------------------|-----------|----------|----------|--------|
| HTTP Web Page DL Smartphone | Qualifier | [%] | 99,9 | 99,8 | 99,5 |
| | Overall Session Time | [s] | 1,1 | 1,2 | 1,2 |
| HTTP 10MB DL Smartphone | Qualifier | [%] | 100,0 | 100,0 | 99,6 |
| | Overall Session Time | [s] | 1,7 | 1,9 | 2,8 |
| | 90% faster than | [Mbit/s] | 28,1 | 28,1 | 17,2 |
| | 10% faster than | [Mbit/s] | 193,5 | 152,7 | 173,8 |
| HTTP 5MB UL Smartphone | Qualifier | [%] | 100,0 | 100,0 | 99,8 |
| | Average Session Time | [s] | 1,3 | 1,7 | 1,8 |
| | 90% faster than | [Mbit/s] | 24,7 | 16,7 | 15,4 |
| HTTP DL FDTT | 10% faster than | [Mbit/s] | 78,6 | 66,1 | 72,4 |
| | Qualifier | [%] | 99,8 | 100,0 | 99,4 |
| | 10% faster than | [Mbit/s] | 283,6 | 357,5 | 372,9 |
| HTTP UL FDTT | faster than 20 Mbit/s | [%] | 94,2 | 95,1 | 88,3 |
| | faster than 100 Mbit/s | [%] | 63,7 | 61,3 | 56,1 |
| | Qualifier | [%] | 100,0 | 99,8 | 98,7 |
| YouTube | 10% faster than | [Mbit/s] | 135,0 | 115,3 | 106,6 |
| | faster than 2 Mbit/s | [%] | 100,0 | 100,0 | 99,2 |
| | faster than 5 Mbit/s | [%] | 99,4 | 100,0 | 98,1 |
| YouTube Live Smartphone | Qualifier | [%] | 99,8 | 100,0 | 98,7 |
| | Start Time | [s] | 1,7 | 1,8 | 1,9 |
| | AVG Resolution | [p] | 1079,0 | 1078,2 | 1076,2 |
| Interactivity | Qualifier | [%] | 99,2 | 99,6 | 98,6 |
| | Start Time | [s] | 2,1 | 2,3 | 2,4 |
| | AVG Resolution | [p] | 1079,2 | 1079,3 | 1076,7 |
| Conversational App | Qualifier | [%] | 97,6 | 97,0 | 94,6 |
| | Interactivity egaming | [%] | 71,3 | 75,4 | 68,9 |
| Conversational App | Qualifier | [%] | 99,9 | 100,0 | 99,9 |
| | Speech Quality (P10) | [MOS-LQO] | 3,7 | 3,2 | 3,4 |



Achieved values of all networks under test in each of the relevant Data Key Performance Indicators (KPIs) for the geographical category "Roads".

| Data Roads | KPI Name | Unit | Vodafone | T-Mobile | O2 |
|-----------------------------|------------------------|-----------|----------|----------|--------|
| HTTP Web Page DL Smartphone | Qualifier | [%] | 99,3 | 99,6 | 99,6 |
| | Overall Session Time | [s] | 1,2 | 1,3 | 1,4 |
| HTTP 10MB DL Smartphone | Qualifier | [%] | 100,0 | 100,0 | 100,0 |
| | Overall Session Time | [s] | 3,4 | 3,4 | 4,0 |
| | 90% faster than | [Mbit/s] | 11,5 | 9,5 | 9,5 |
| | 10% faster than | [Mbit/s] | 176,4 | 135,5 | 118,9 |
| HTTP 5MB UL Smartphone | Qualifier | [%] | 100,0 | 100,0 | 100,0 |
| | Average Session Time | [s] | 2,8 | 2,2 | 2,7 |
| | 90% faster than | [Mbit/s] | 8,9 | 11,5 | 9,1 |
| HTTP DL FDTT | 10% faster than | [Mbit/s] | 65,3 | 60,6 | 58,6 |
| | Qualifier | [%] | 100,0 | 99,3 | 98,3 |
| | 10% faster than | [Mbit/s] | 219,8 | 221,3 | 172,8 |
| HTTP UL FDTT | faster than 20 Mbit/s | [%] | 82,1 | 85,9 | 78,6 |
| | faster than 100 Mbit/s | [%] | 37,7 | 39,1 | 30,9 |
| | Qualifier | [%] | 100,0 | 99,8 | 98,8 |
| YouTube | 10% faster than | [Mbit/s] | 89,6 | 98,6 | 88,5 |
| | faster than 2 Mbit/s | [%] | 99,3 | 99,0 | 99,3 |
| | faster than 5 Mbit/s | [%] | 94,4 | 97,1 | 97,8 |
| YouTube Live Smartphone | Qualifier | [%] | 98,8 | 99,5 | 97,5 |
| | Start Time | [s] | 1,8 | 1,9 | 2,0 |
| | AVG Resolution | [p] | 1076,1 | 1078,0 | 1074,2 |
| Interactivity | Qualifier | [%] | 98,3 | 99,3 | 99,0 |
| | Start Time | [s] | 2,4 | 2,3 | 2,5 |
| | AVG Resolution | [p] | 1071,6 | 1072,1 | 1073,1 |
| Conversational App | Qualifier | [%] | 97,5 | 98,3 | 88,0 |
| | Interactivity egaming | [%] | 71,4 | 76,5 | 65,8 |
| Conversational App | Qualifier | [%] | 99,6 | 99,0 | 99,7 |
| | Speech Quality (P10) | [MOS-LQO] | 3,7 | 3,1 | 3,3 |



Key takeaways

- ☰ Vodafone achieves the highest data performance showing the highest score with 460 points out of 480, followed by T-Mobile with 458 points and O2 with 433 points.
- ☰ Vodafone achieves the highest overall data performance in cities and towns.
- ☰ On roads, Vodafone and T-Mobile showing the highest mobile data performance.





umlaut – Part of Accenture

umlaut communications GmbH

Am Kraftversorgungsturm 3 · 52070 Aachen · Germany

Hakan Ekmen · Global Networks Lead, Comms Industry

cell +49 151 571 33 235 · hakan.ekmen@accenture.com

www.umlaut.com