

**Assessment of mobile
network experience
11 March – 21 April 2024
in Denmark**



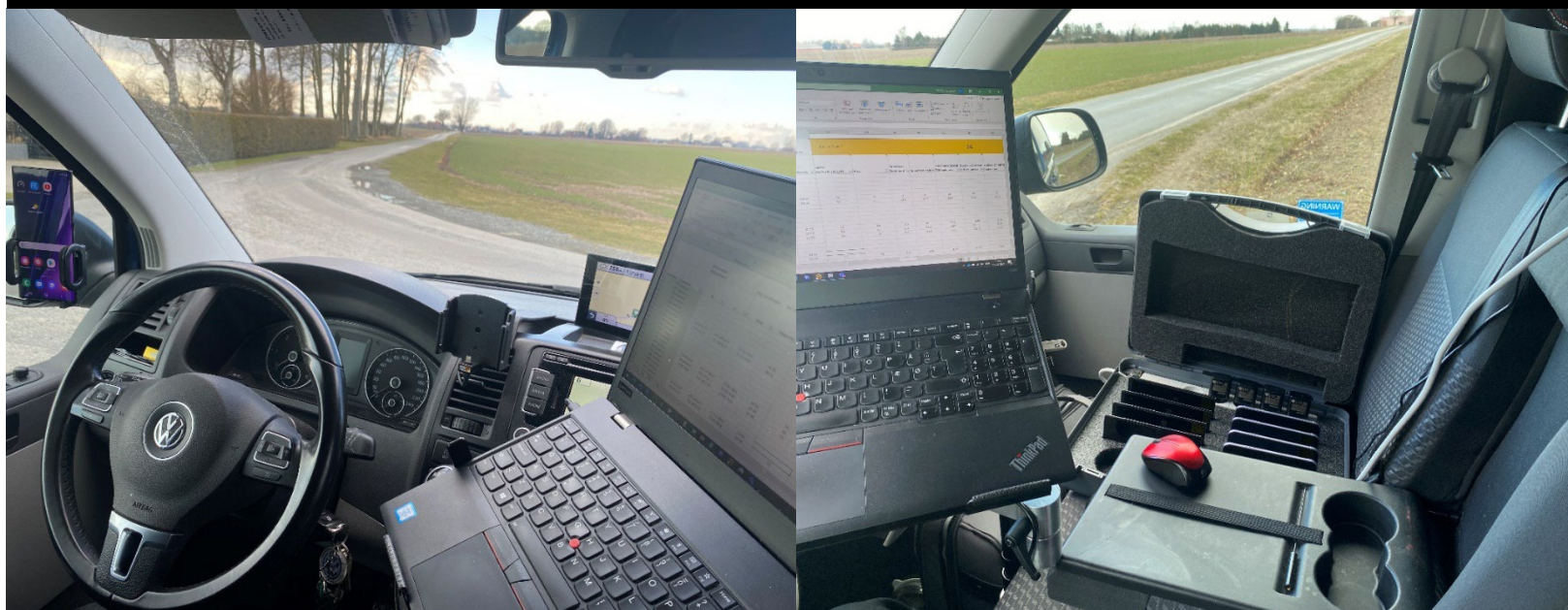
A van from Danish Technological Institute at one of the randomly selected test locations – here Skaven Beach at Ringkøbing Fjord



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Measurements carried out in van





Extent and test method

- TDC NET commissioned and paid for the assignment. It was carried out in the same way as the surveys in 2014, 2015, 2016, 2017, 2018, 2019, 2021, 2022, and 2023. The assignment had **a large geographical spread with stationary measurements** of the mobile network experience throughout Denmark with one of the most popular mobile phones: **iPhone 15 - 5G**
- TDC NET defines a **good mobile network experience as:**
 - **A 30 sec. error-free mobile phone conversation** (where you can hear the recipient) is defined as approved. In case of error, one redial is made. If the redial is successful, then the phone call is approved.
 - **30 MB download within 15 sec.** TDC NET considers 90 sec. or more as useless mobile coverage.
 - **30 MB upload within 30 sec.** TDC NET considers 90 sec. or more as useless mobile coverage
 - **60 sec. DR TV news on an app without buffering waiting time.** In previous surveys, the same YouTube video was streamed, but to avoid possible caches from test to test, DR TV was chosen instead. A buffering waiting time of 0.1-10 sec. is categorised as defective. TDC NET compares a buffering waiting time of more than 10 sec. with video streaming not being possible.

To reduce the uncertainty of measurement of download and upload speeds (due to more or less traffic on the server) three downloads and three uploads were carried out in each test location, and then the mean value was used.



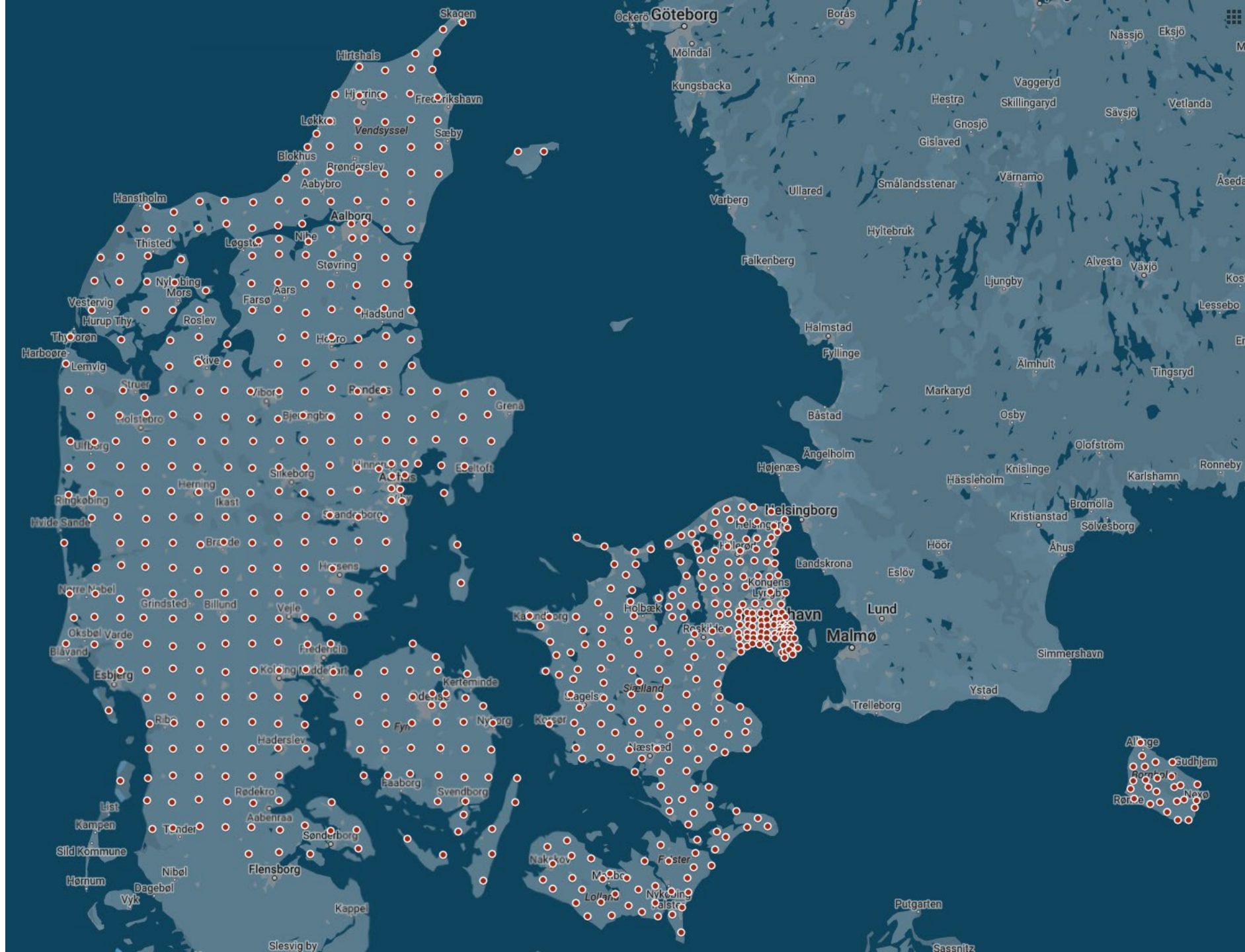
Extent and test method

- The 691 test locations were evenly distributed in 10x10 km squares **throughout** Denmark. They comprised the countryside, towns, islands, forests, and beaches – and always in places where it was possible to park the van. See map on the next page.
- The density of the measurements was doubled in larger towns, as large buildings can affect the coverage locally. **The number of measurements was increased in the Capital Region of Denmark, Region Zealand, and the North Jutland Region to ensure adequate statistic validity.**
- Test locations were selected by Danish Technological Institute without knowledge of/ consideration for antenna locations – and always in places where it was possible to park the van. The test locations were typically moved 1.5-2.5 km compared to the 2023 survey. TDC NET was informed about the GPS coordinates of the test locations **AFTER** the measurements had been carried out.
- The stationary measurements were carried out in a van with the telephone in a holder.
- An iPhone 15 5G was used. TDC NET supplied the cell phones in unopened packaging to Danish Technological Institute. Danish Technological Institute bought SIM cards from the four network providers. The SIM cards were inserted at random in the supplied cell phones.
- Before the test started, Danish Technological Institute informed Telenor, Telia, and 3 that a mobile phone coverage survey would be conducted for an anonymous client; i.e., the four network providers were put on an equal footing.

The 691 selected test point locations 2024



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Summary of results 2024

- Nationally and regionally, TDC NET has a much better total mobile network experience* than Telenor, 3, and Telia.
- Nationally, TDC NET has an 88% error-free mobile network experience*. Nationally, Telia has 74%, Telenor has 73%, and 3 has an 71% error-free mobile network experience*.
- Nationally and regionally, TDC NET has much faster and more error-free downloads and uploads than Telenor, Telia, and 3.
- Ordinary mobile phone conversations are error-free. It is the first time that mobile telephone conversations are error-free. Compared to previous years, differences may be due to statistical coincidences.
- TDC NET has 99.7% error-free video streaming with a 5G mobile phone. Telia has 99.4%, Telenor 99.3%, and 3 has 99% error-free video streaming. A substantial explanation of the minor spread between the network providers is that the app adjusts the picture quality in relation to the available download speeds.
- TDC NET has 99.9% access to 5G. 3 has 99.1%, Telenor has 97.5%, and Telia has 97.1% access to 5G. For Telenor and Telia access to 5G has increased substantially since the 2023 survey.

*TDC NET defined a good mobile network experience as: 30 sec. error-free mobile phone conversation - 30 MB download within 15 sec. - 30 MB upload within 30 sec. - 60 sec. DR TV without buffering waiting time.



Comments to results 2024

- The results in this report are national and regional results and therefore AVERAGE FIGURES.
- The regional results have considerable statistical uncertainty, which appears from the specifications of the statistical confidence interval.
- **Coverage where you currently are using your mobile phone might give a different result than the average figures of the region.**
- The mobile data traffic continues to increase considerably, but not as quickly as in previous years. From the first 6 months of 2022 to the first 6 months of 2023, the mobile data traffic (up- and downloads) increased by 13.6%. From the first 6 months of 2021 to the first six months of 2022, the mobile data traffic increased by 18.9%.
- Although Telenor and Telia share masts and frequencies, their results differ. That is due to only in-part joint ownership of the underlying transmission technology.



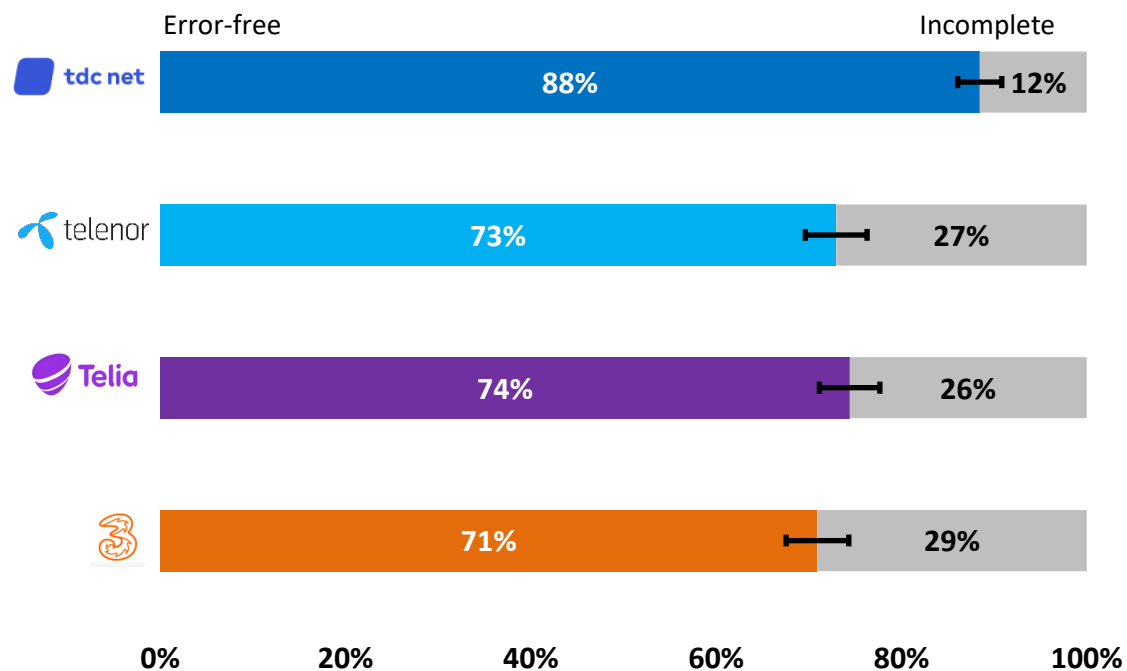
A van from Danish Technological Institute at one of the randomly selected test locations - here at Kammerslusen (lock) west of Ribe

National result of mobile network experience in 2024 with a 5G phone

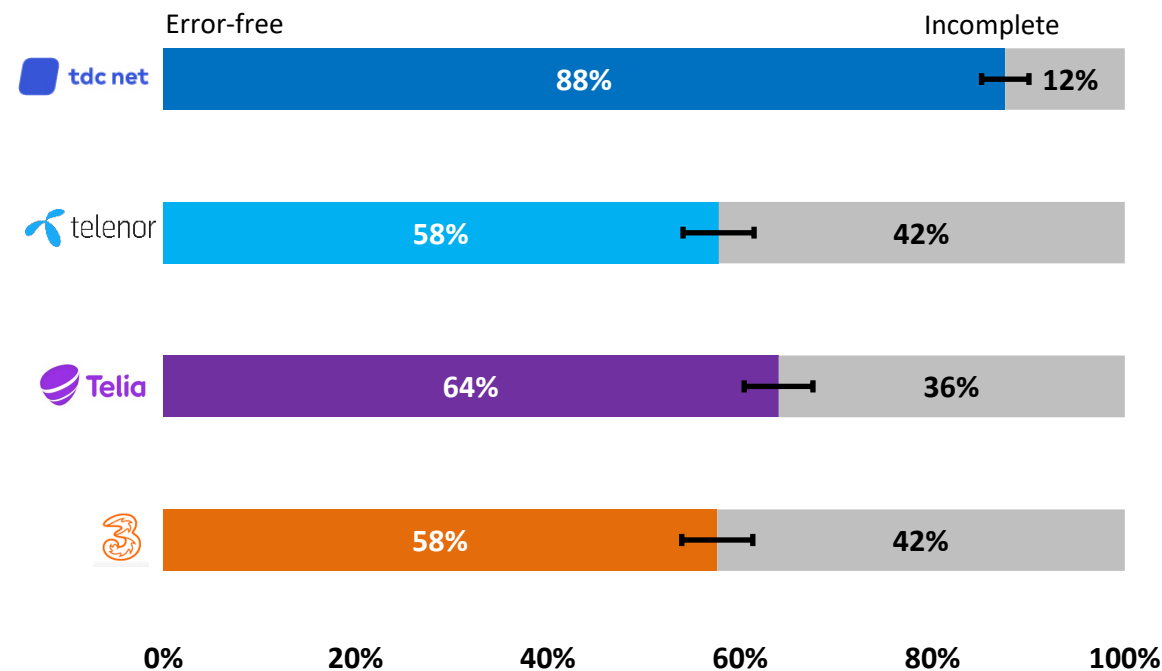


TDC NET has a much better total mobile network experience* than Telenor, Telia, and 3.

2024 THROUGHOUT DENMARK: 5G PHONE
THE GOOD MOBILE NETWORK EXPERIENCE (%)

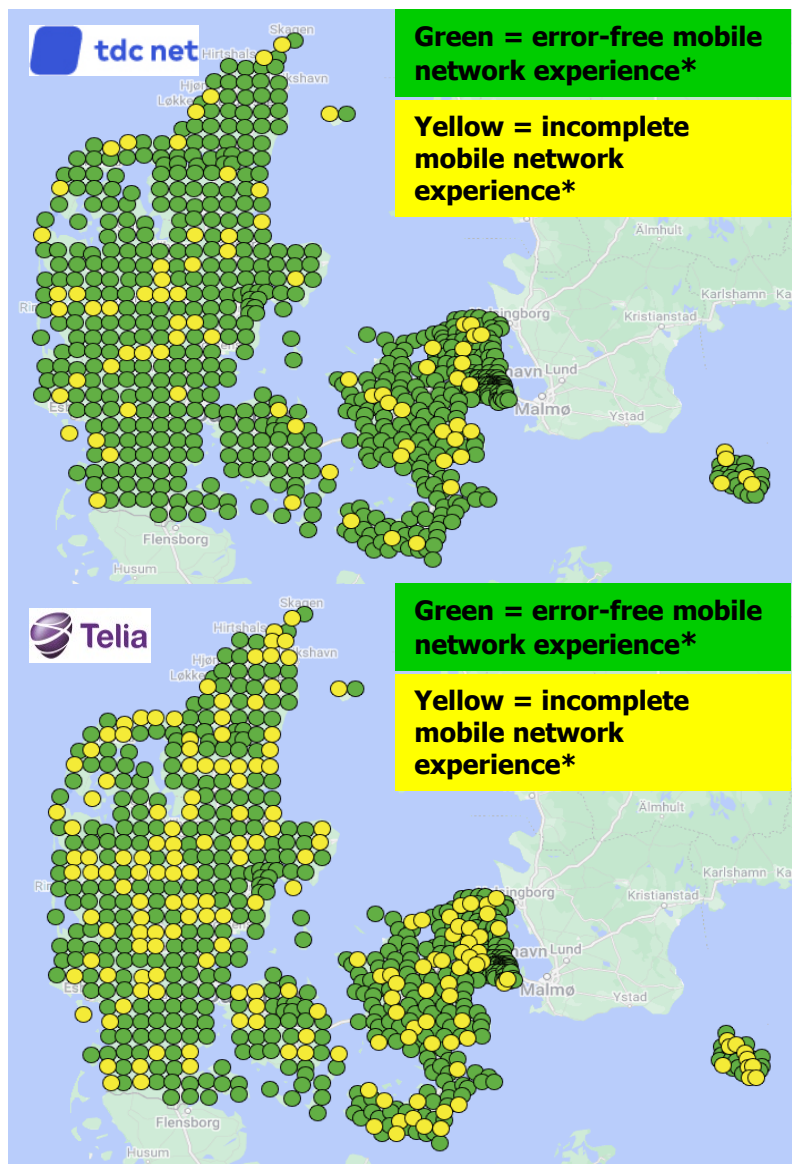


2023 THROUGHOUT DENMARK: 5G PHONE
THE GOOD MOBILE NETWORK EXPERIENCE (%)



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Mobile network experience in 2024 with a 5G phone



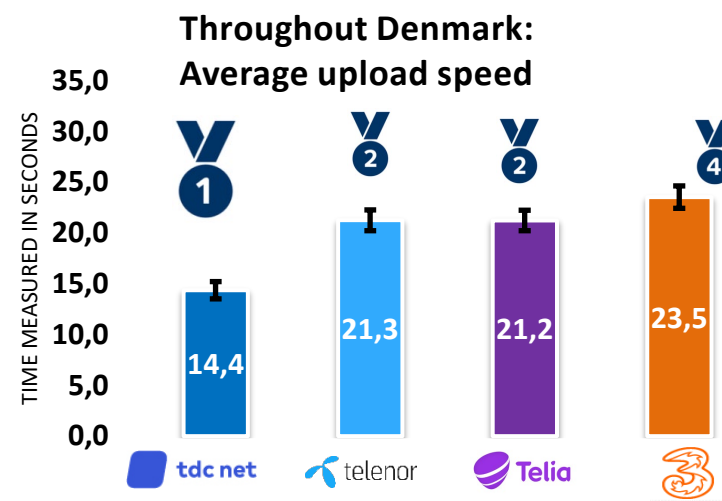
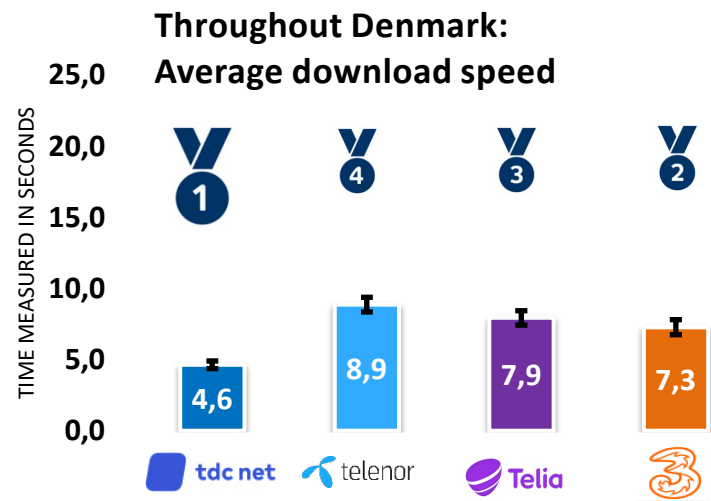
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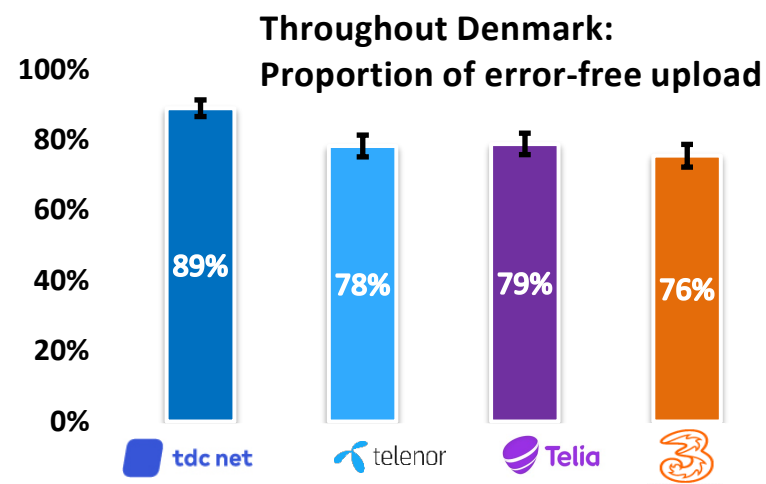
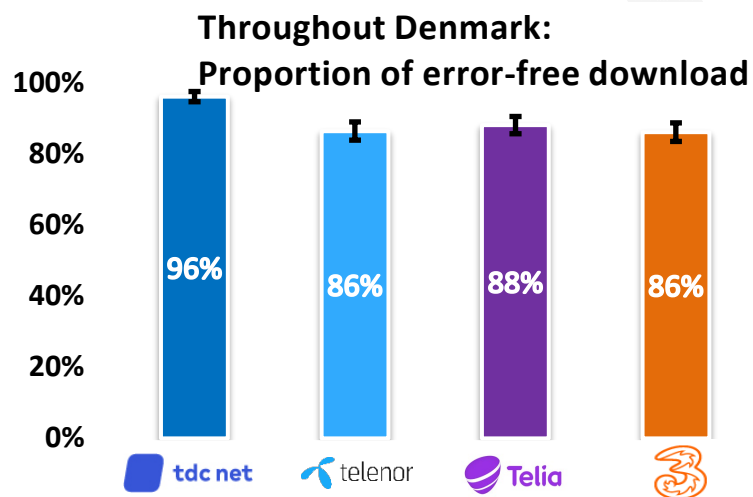
A van from Danish Technological Institute at one of the randomly selected test locations - here at Amalienborg Castle

National result of download and upload speeds in 2024 with a 5G phone

TDC NET has much faster and far more error-free downloads and uploads than Telenor, Telia, and 3.



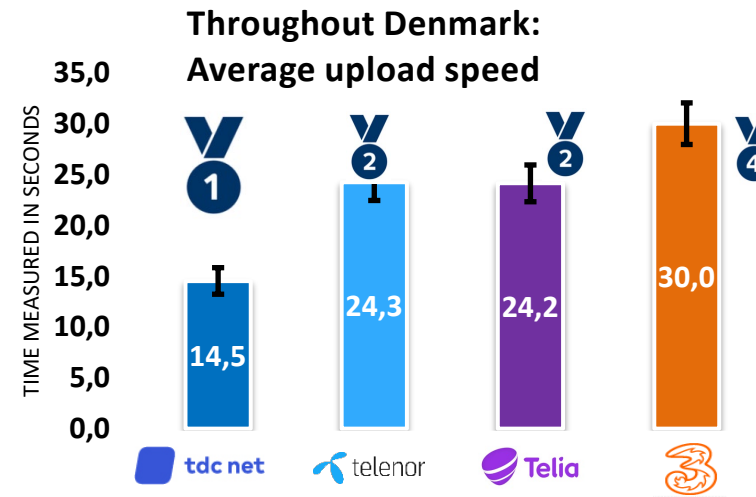
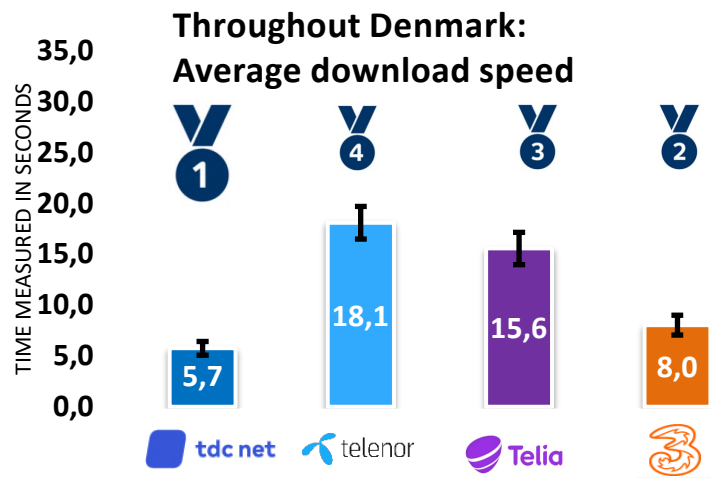
Medals for total assessment of average speed and error-free application



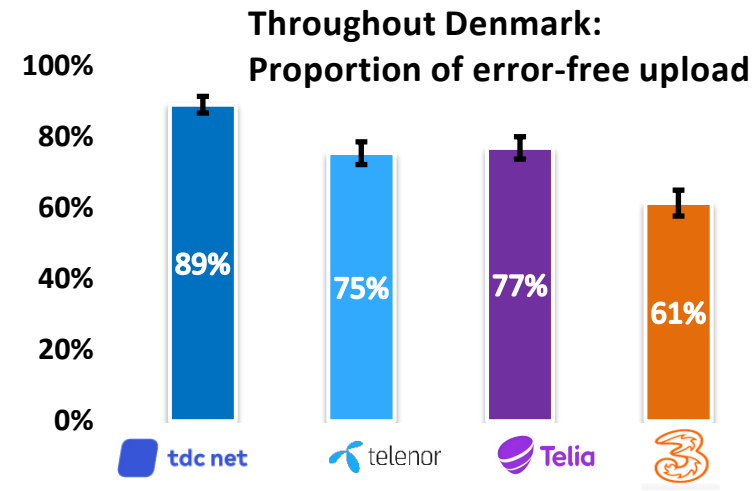
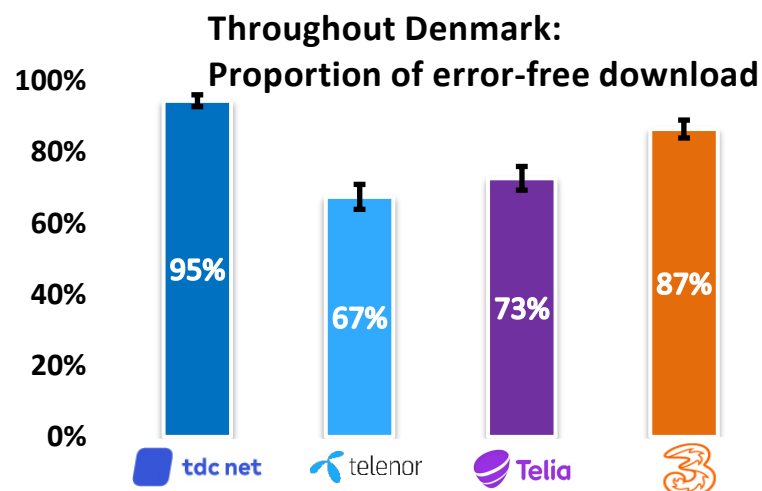
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National result of download and upload speeds in 2023 with a 5G phone

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Medals for total assessment of average speed and error-free application



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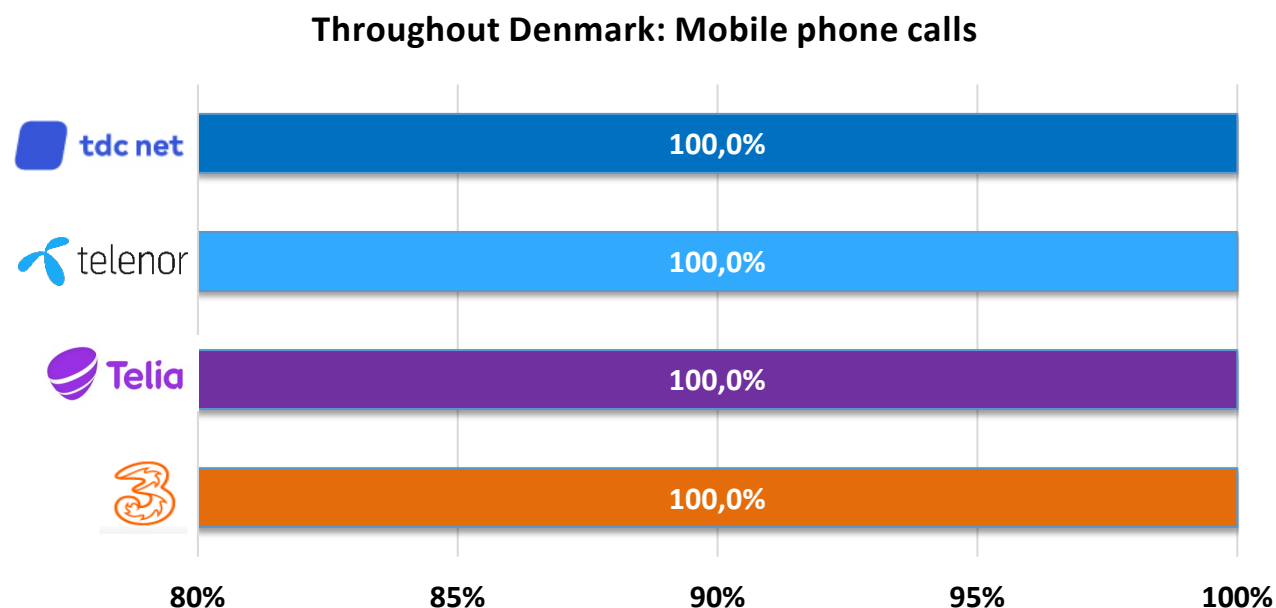


A van from Danish Technological Institute at one of the randomly selected test locations – here on the island of Rømø at Hotel Lakolk with a car from Google Maps to the right

National result of ordinary mobile phone conversations in 2024 with a 5G phone

All calls were successful.

For ordinary mobile phone calls* there were no significant differences between TDC NET, Telenor, Telia, and 3.

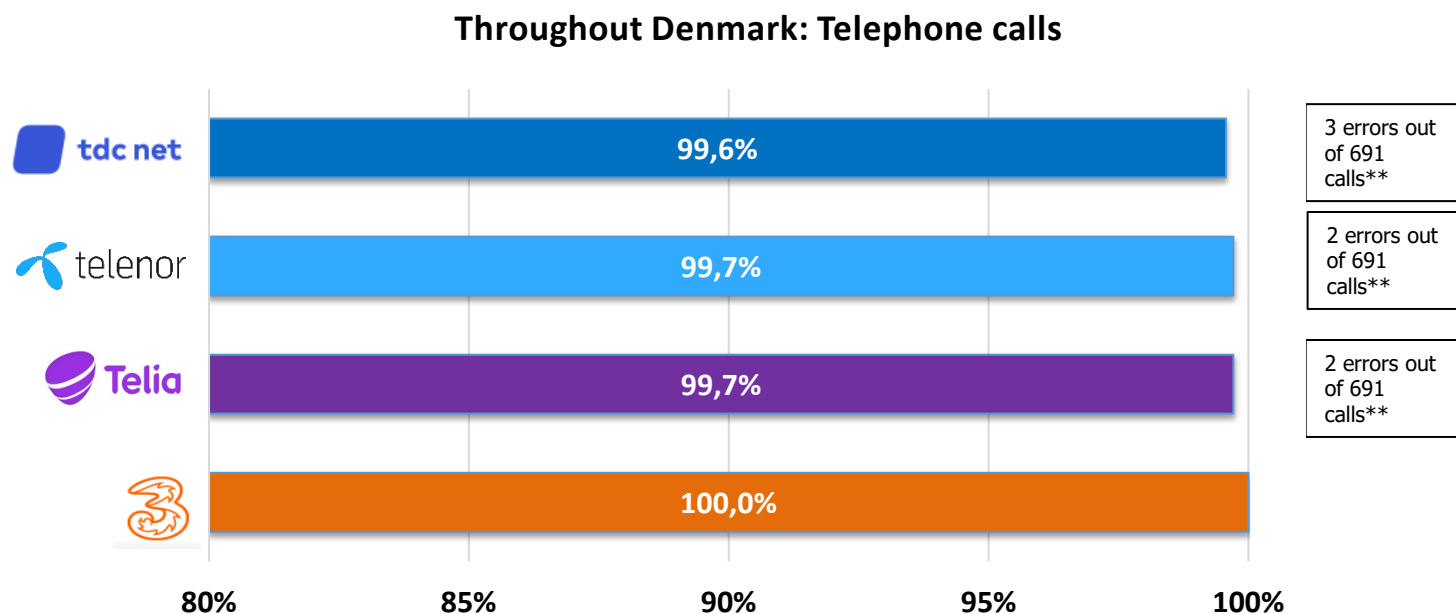


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In case of error, one redial is made. If the redial is successful, then the phone call is approved.



National result of ordinary mobile phone conversations in 2023 with a 5G phone

For ordinary mobile phone calls* there were no significant differences between TDC NET, Telenor, Telia, and 3.



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** In case of error, one redial is made. If the redial is successful, then the phone call is approved.



A van from Danish Technological Institute at one of the randomly selected test locations - here at Vejle Ådal (river valley)

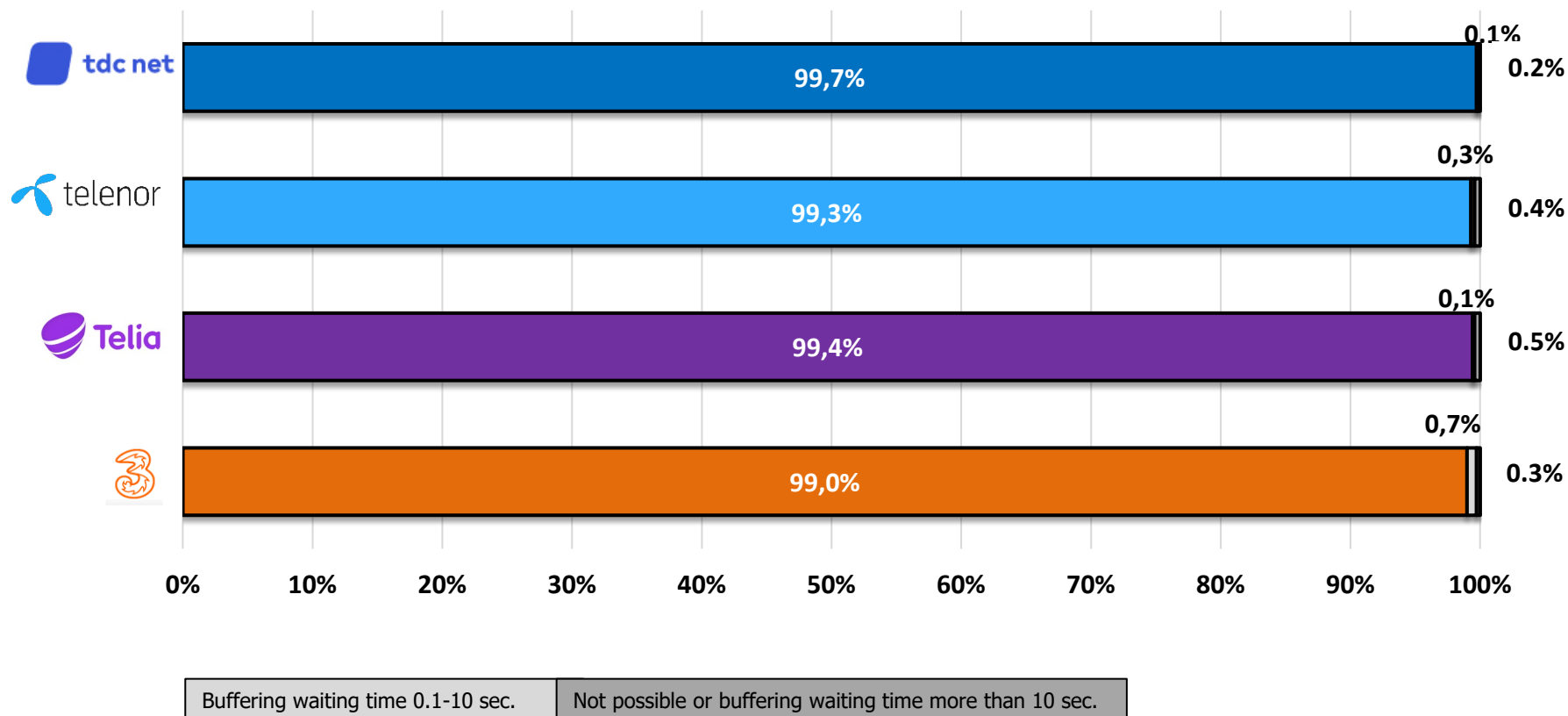
National result of video streaming in 2024 with a 5G phone



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Nationally, video streaming is almost error-free. There are only minor differences between the individual network providers.

Streaming, throughout Denmark

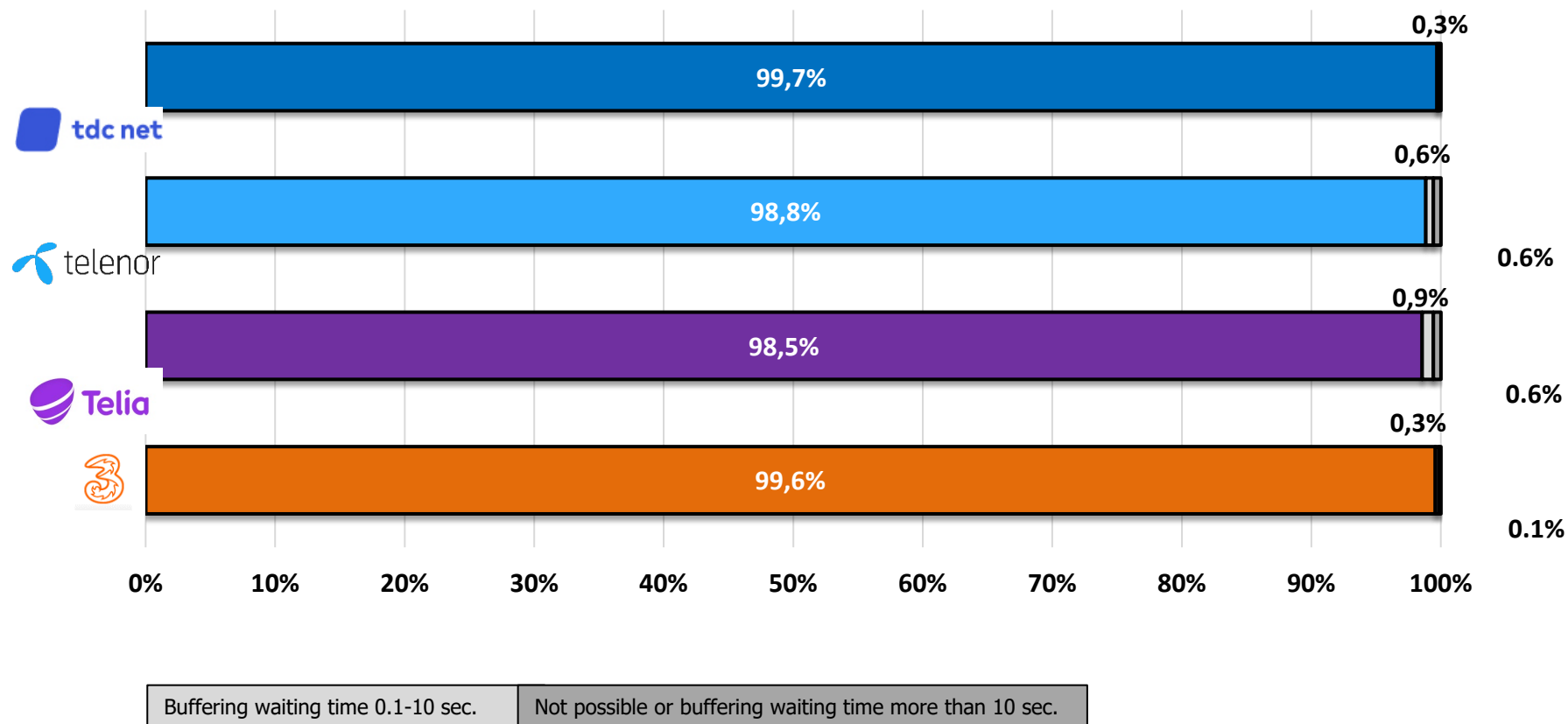


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National result of video streaming in 2023 with a 5G phone

Nationally, video streaming is almost error-free. There are only minor differences between the individual network providers.

Streaming, throughout Denmark

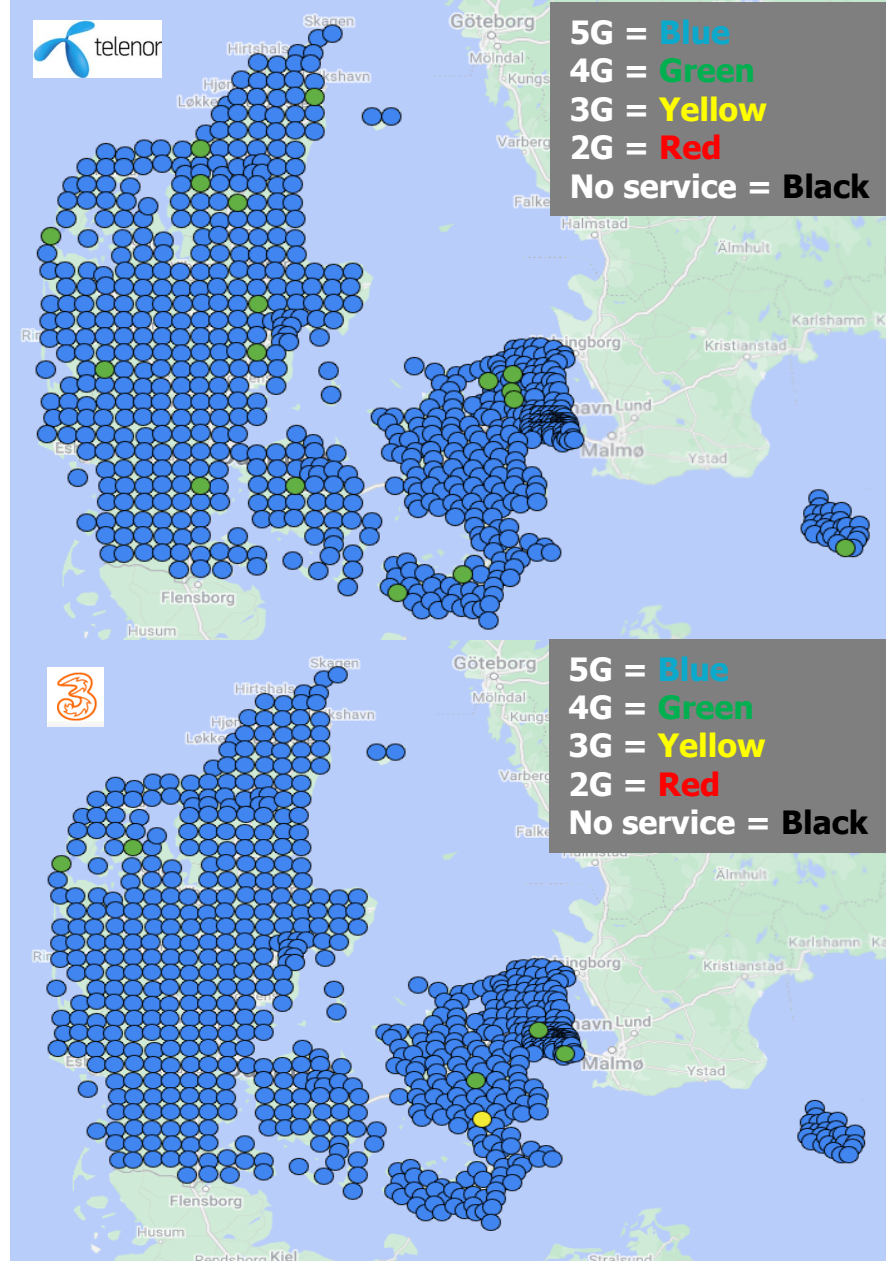
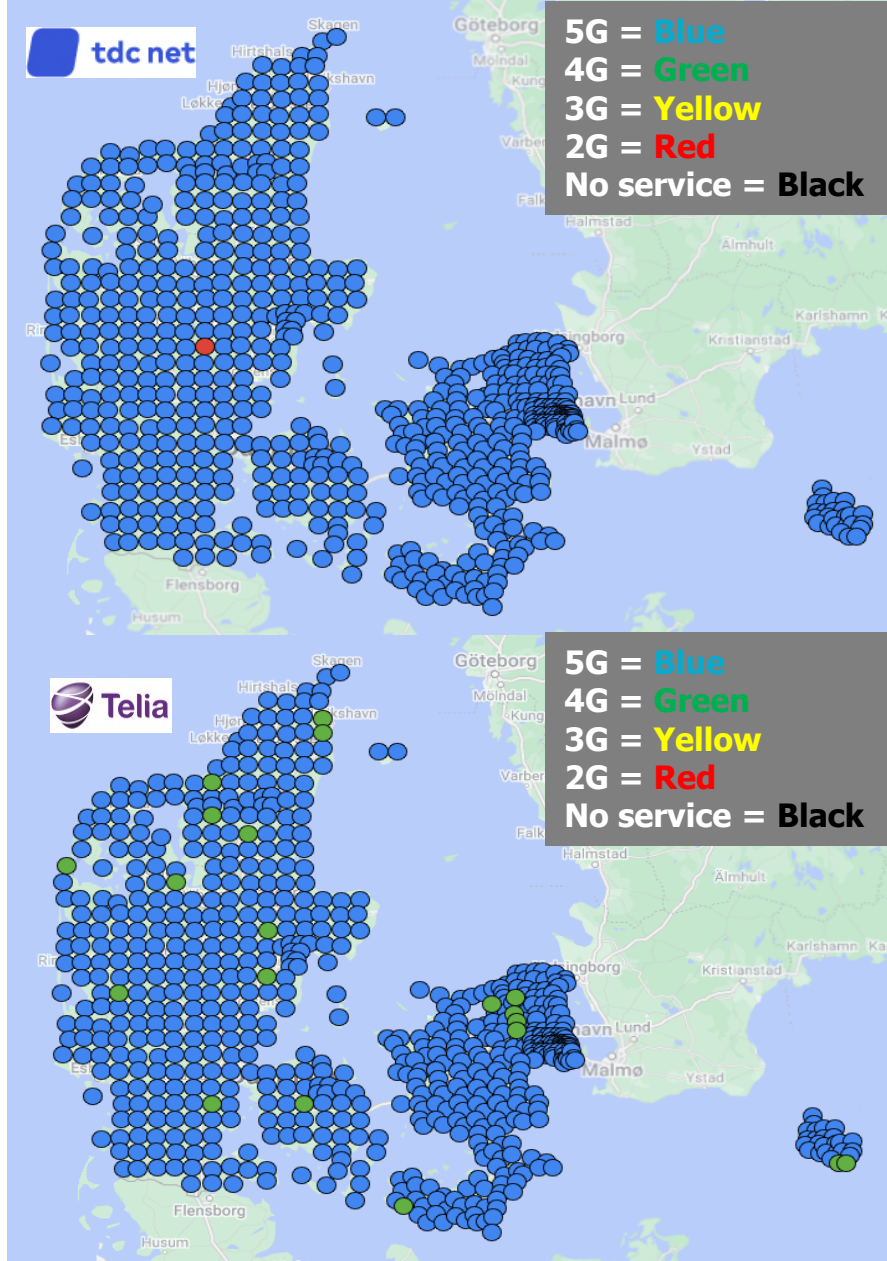


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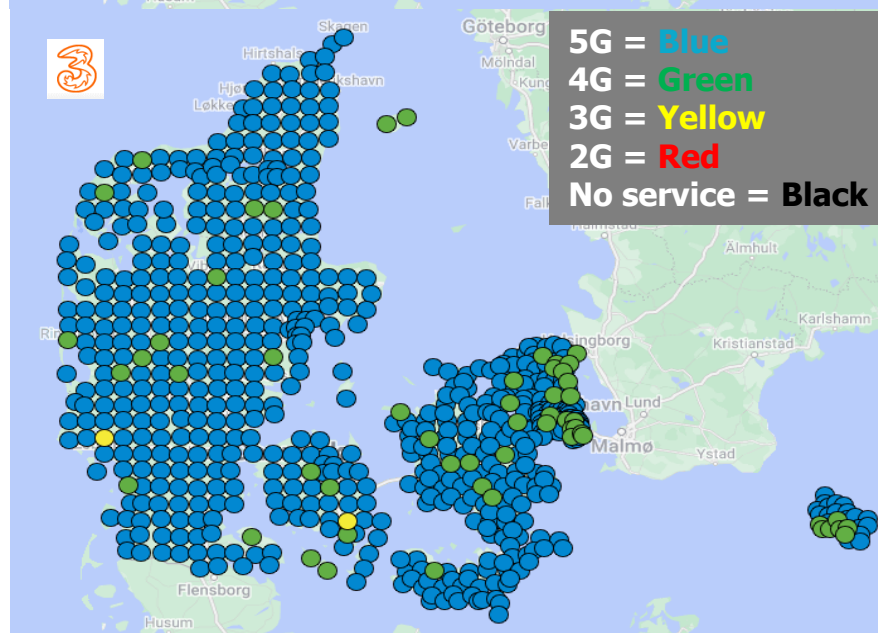
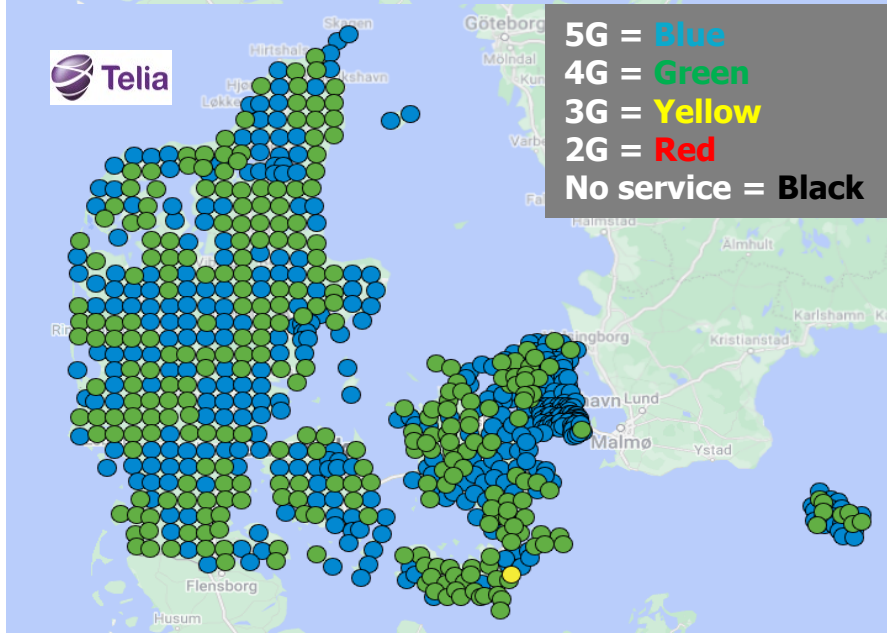
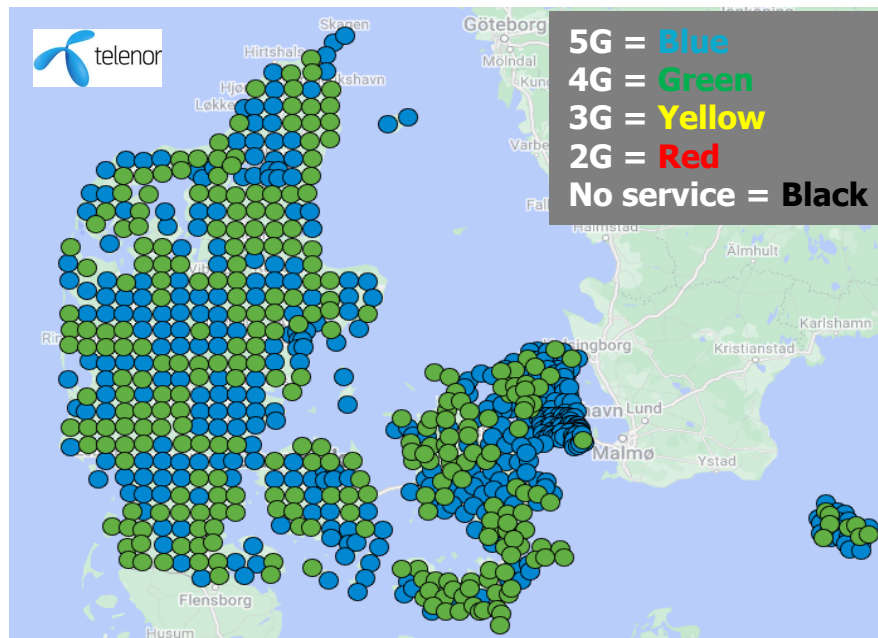
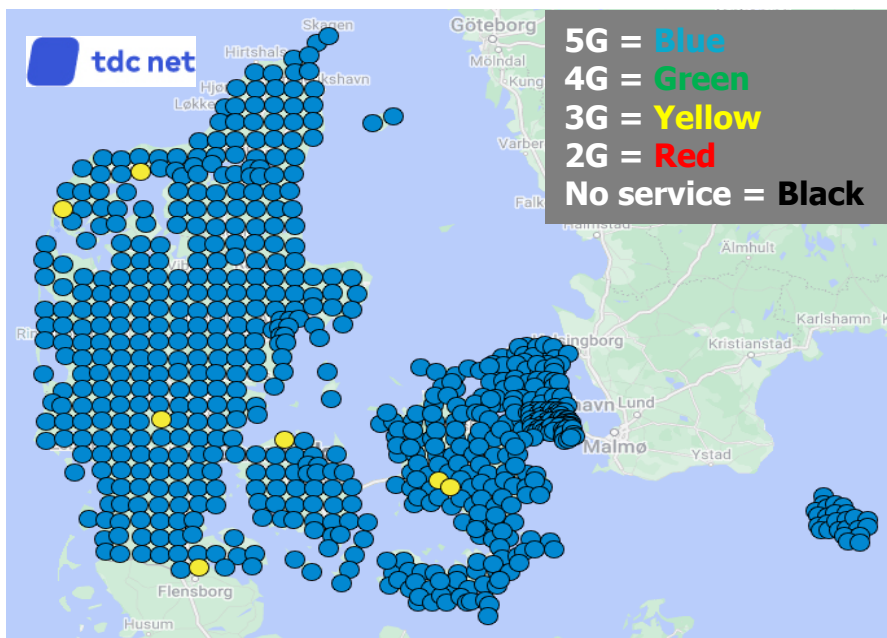


A van from Danish Technological Institute at one of the randomly selected test points – here at Nationalbanken (the central bank of Denmark)

2024: Access to 5G, 4G, 3G, and 2G with a 5G phone



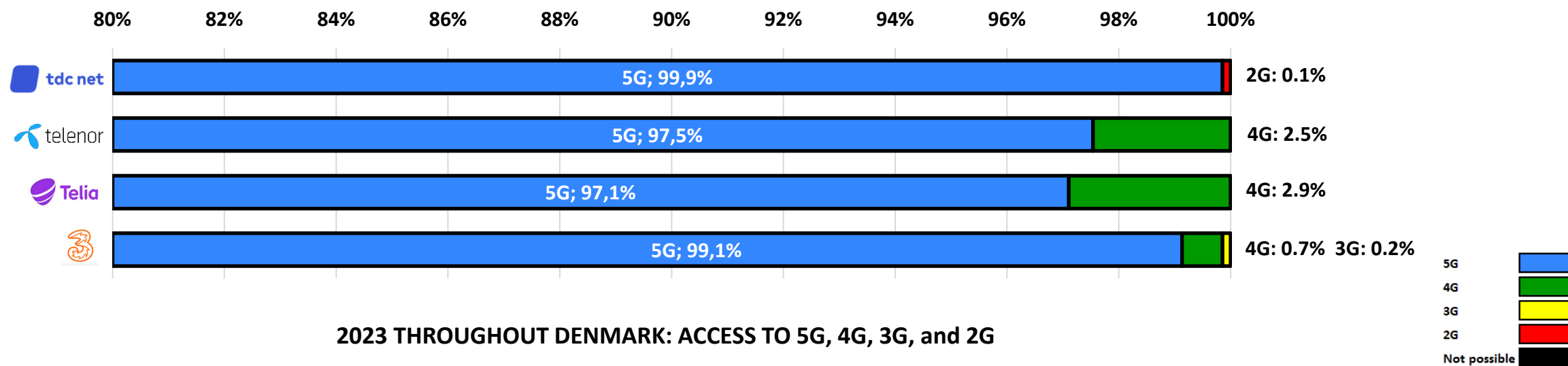
2023: Access to 5G, 4G, 3G, and 2G with a 5G phone



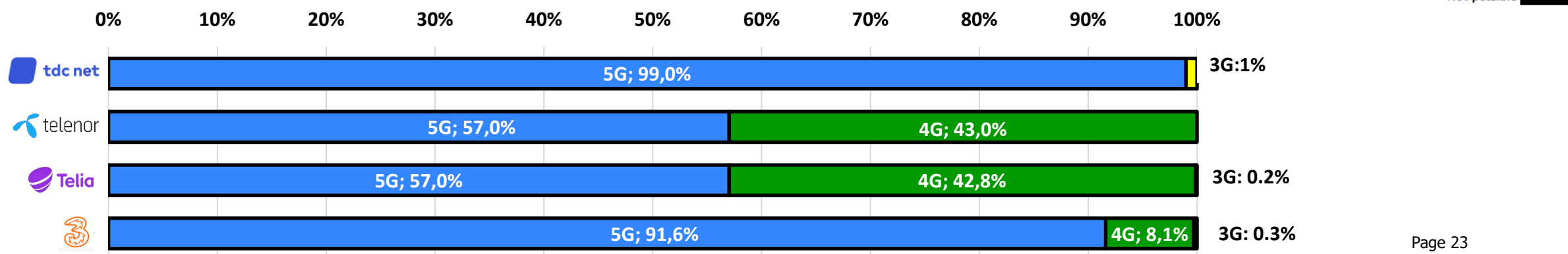
National result of access to 5G and 4G in 2024 and 2023 with a 5G phone

TDC NET has 99.9% access to 5G. 3 has 99.1%, Telenor 97.5%, and Telia has 97.1% access to 5G.

2024 THROUGHOUT DENMARK: ACCESS TO 5G, 4G, 3G, and 2G



2023 THROUGHOUT DENMARK: ACCESS TO 5G, 4G, 3G, and 2G





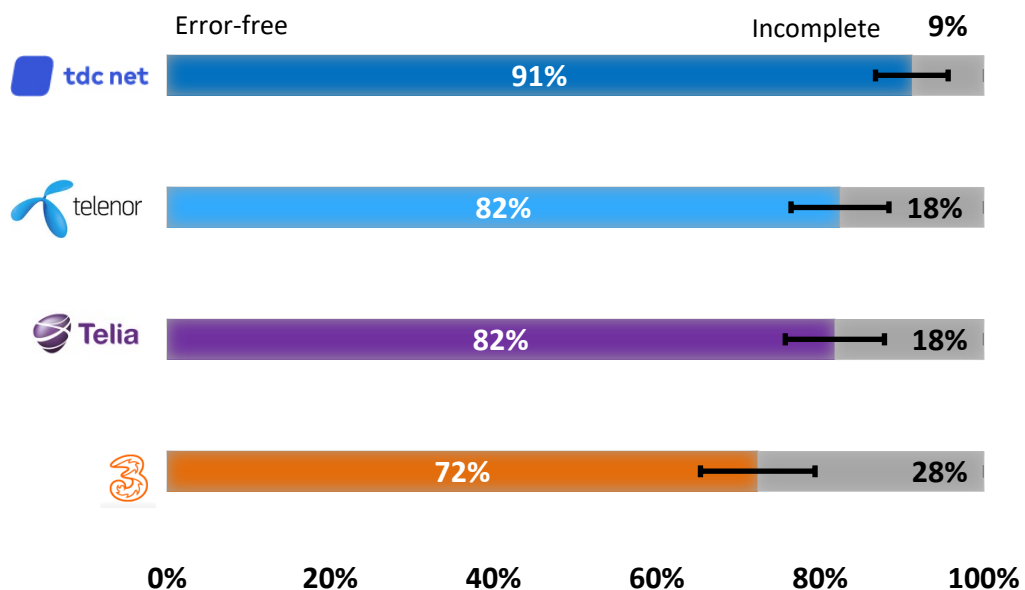
A van from Danish Technological Institute at one of the randomly selected test locations - here at nature park Åmosen at Jyderup on Western Zealand



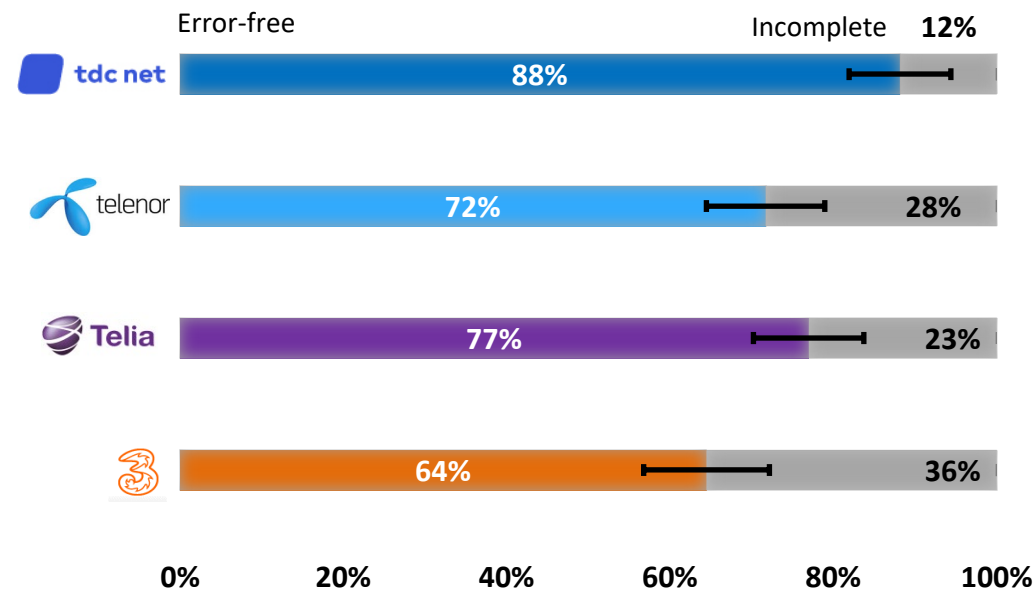
Regional results of mobile network experience in 2024 with a 5G phone

TDC NET has a much better total mobile network experience* in the Capital Region of Denmark and Region Zealand. Telenor and Telia come in second in the Capital Region of Denmark. Telia comes in second in Region Zealand.

CAPITAL REGION OF DENMARK: %
THE GOOD MOBILE NETWORK EXPERIENCE



REGION ZEALAND: %
THE GOOD MOBILE NETWORK EXPERIENCE



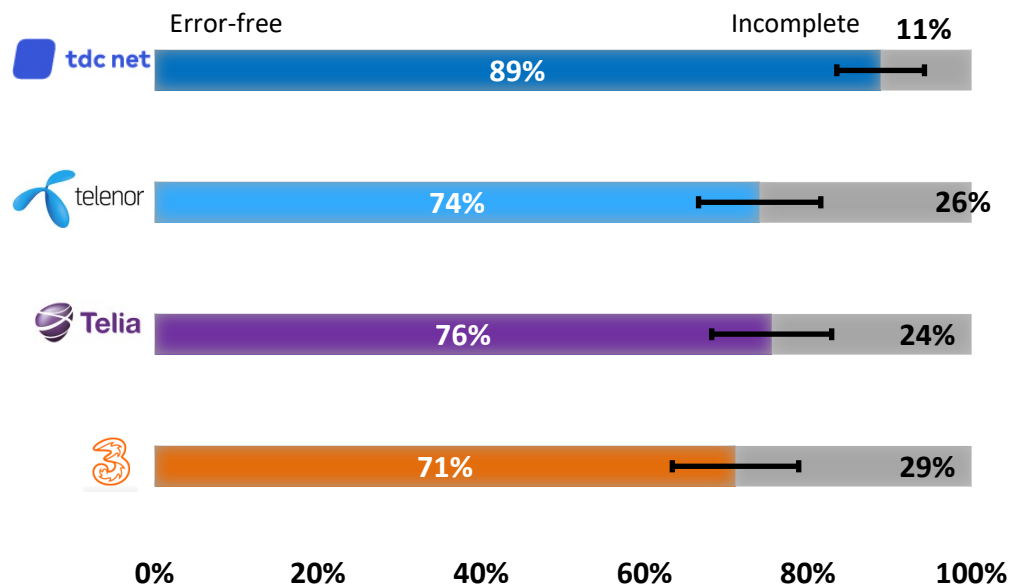
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Regional results of mobile network experience in 2024 with a 5G phone

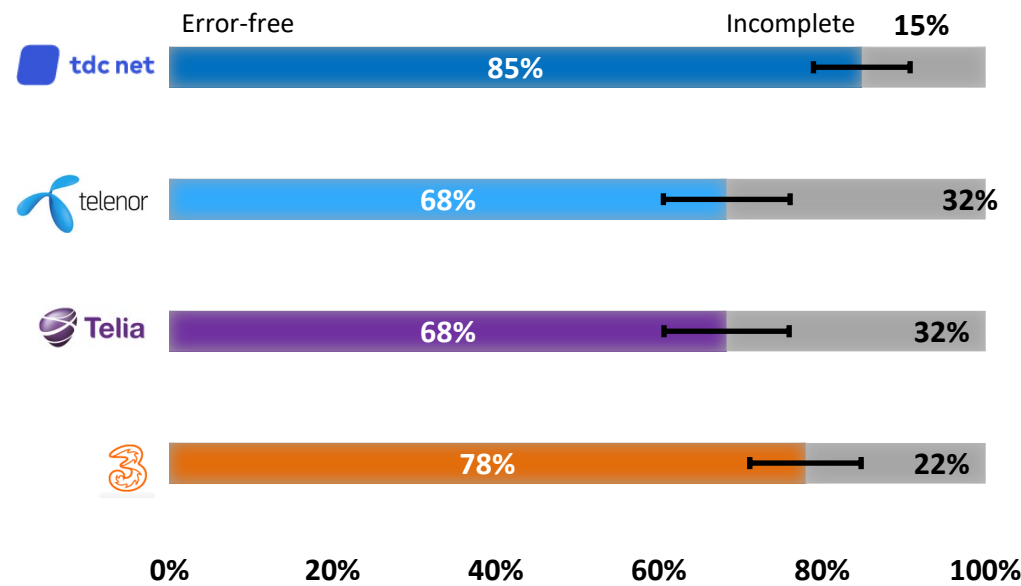
TDC NET has a much better total mobile network experience* than Telenor, Telia, and 3 in the Region of Southern Denmark and Central Denmark Region.

Telenor and Telia come in second in the Region of Southern Denmark. 3 comes in second in Central Denmark Region.

REGION OF SOUTHERN DENMARK: %
THE GOOD MOBILE NETWORK EXPERIENCE



CENTRAL DENMARK REGION: %
THE GOOD MOBILE NETWORK EXPERIENCE

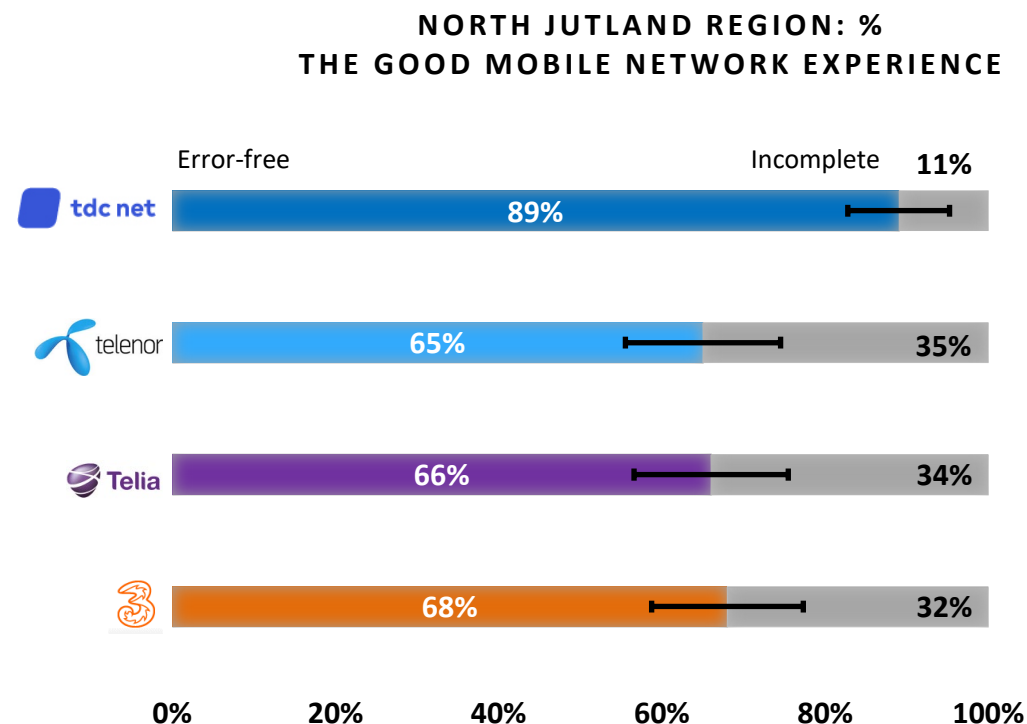


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Regional results of mobile network experience in 2024 with a 5G phone

TDC NET has a much better total mobile network experience* than Telenor, Telia, and 3 in the North Jutland Region.

3, Telia, and Telenor have a shared second place.



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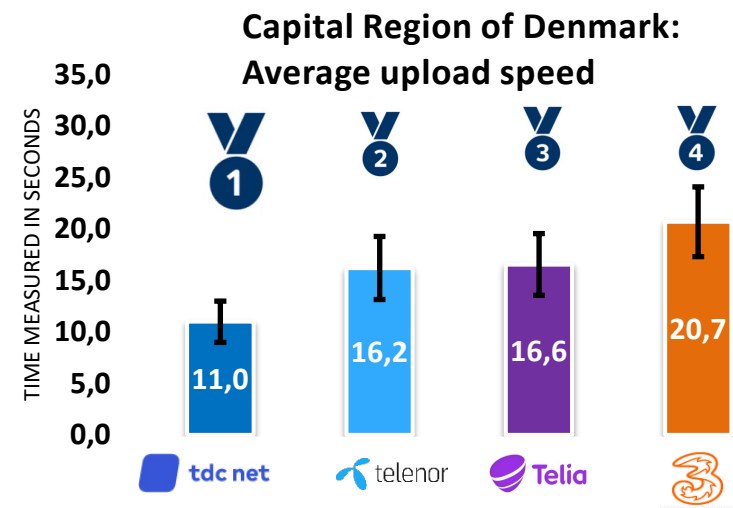
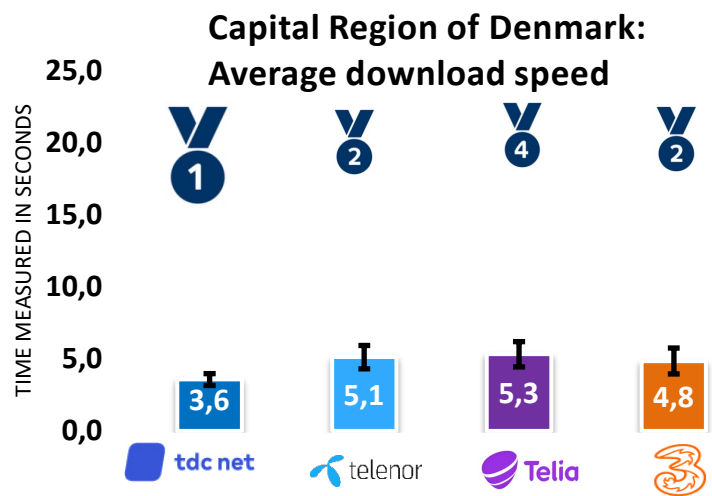


A van from Danish Technological Institute at one of the randomly selected test locations – here at the airport in Sønderborg

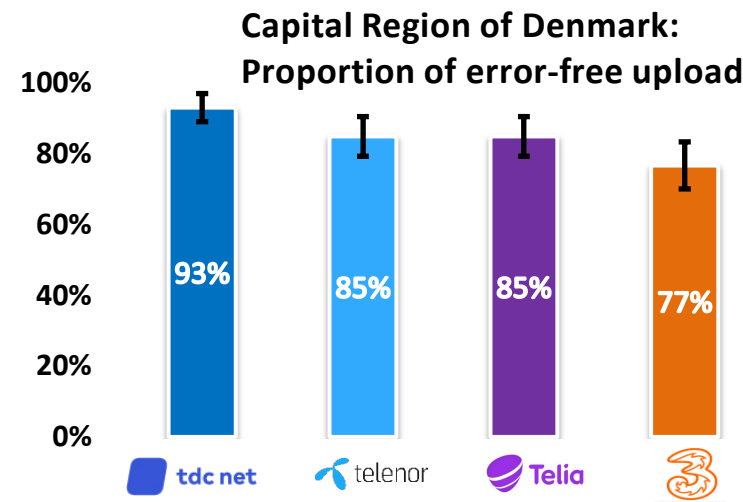
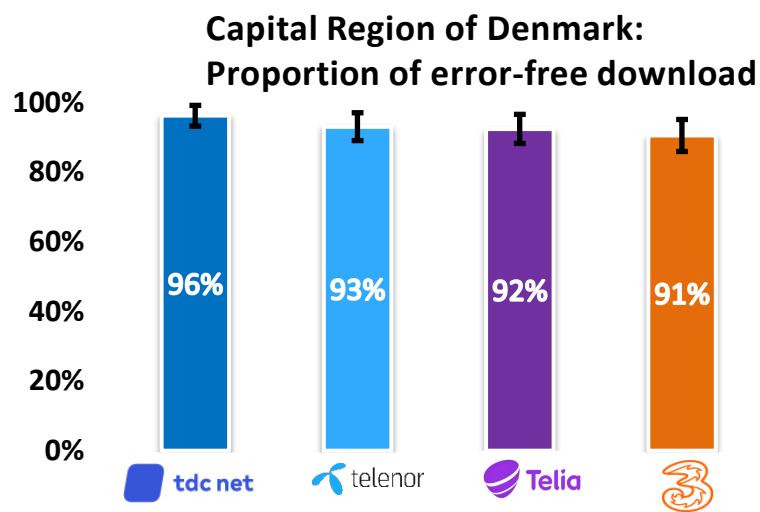


Regional results of download and upload speeds in 2024 with a 5G phone

TDC NET has much faster, more error-free downloads and far more error-free uploads than Telenor, Telia, and 3 in the Capital Region of Denmark.



Medals for total assessment of average speed and error-free application

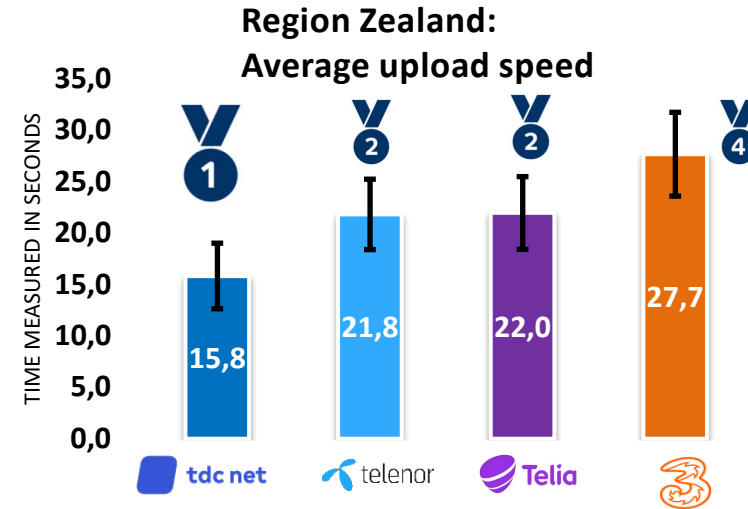
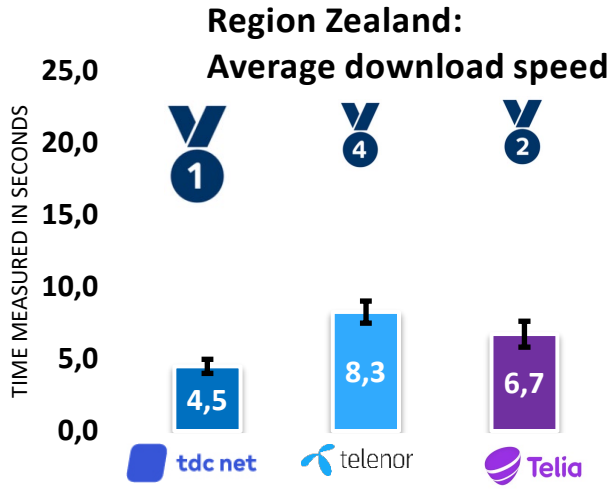


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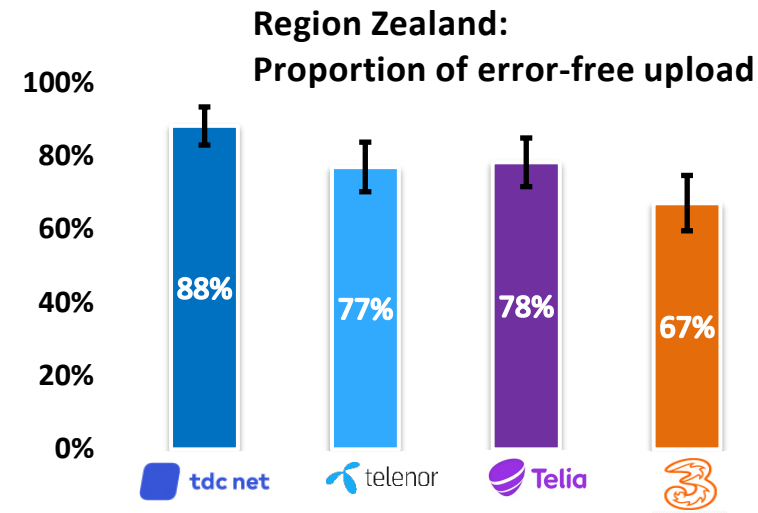
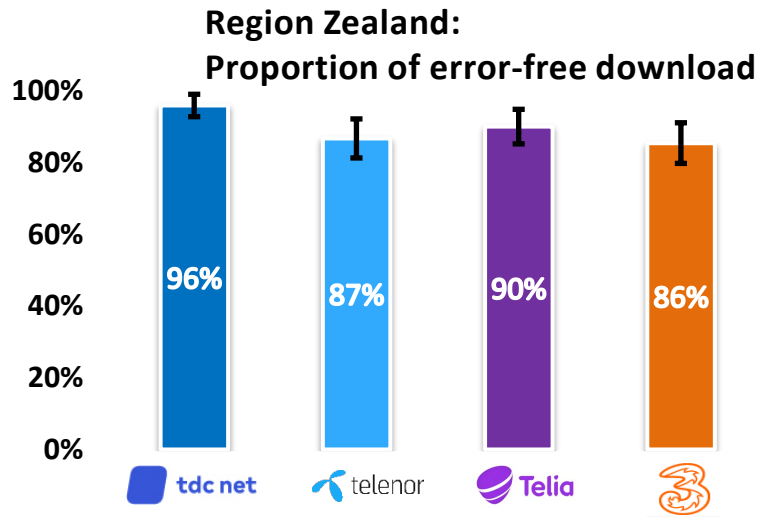


Regional results of download and upload speeds in 2024 with a 5G phone

TDC NET has much faster and far more error-free downloads and uploads * than Telenor, Telia, and 3 in Region Zealand.



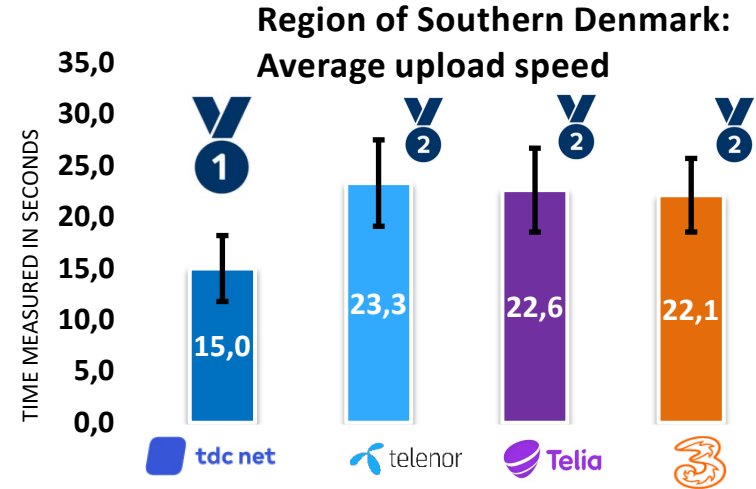
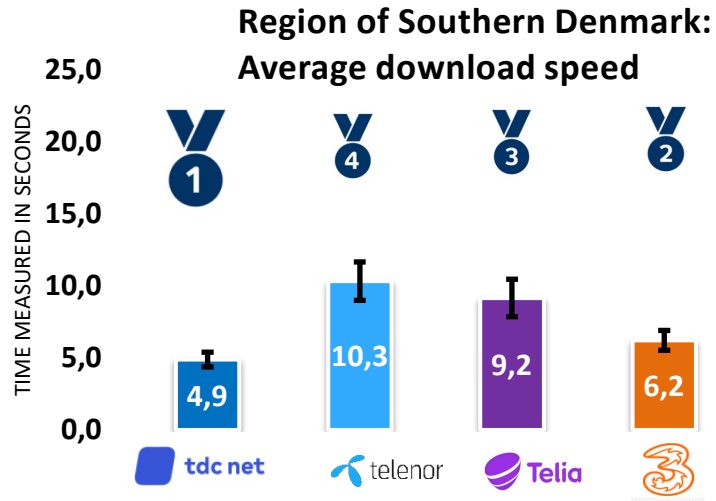
Medals for total assessment of average speed and error-free application



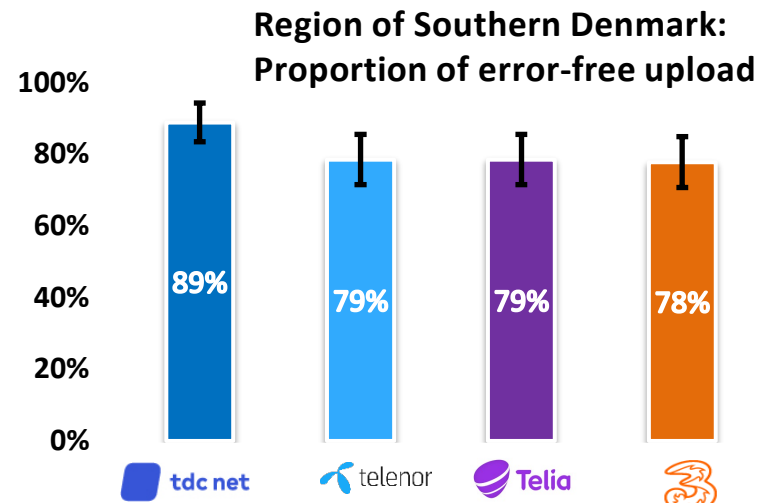
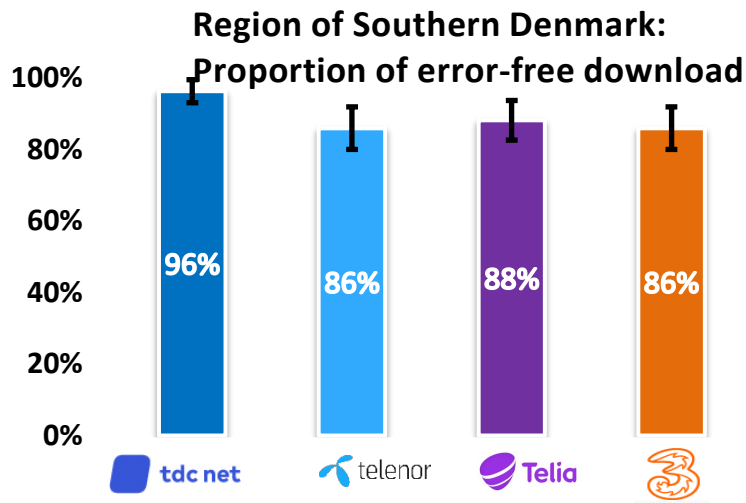
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Regional results of download and upload speeds in 2024 with a 5G phone

TDC NET has much faster and far more error-free* downloads and uploads than Telenor, Telia, and 3 in the Region of Southern Denmark.



Medals for total assessment of average speed and error-free application



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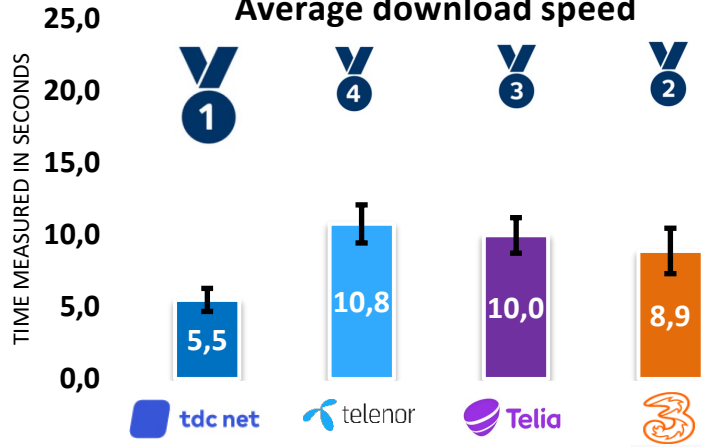


Regional results of download and upload speeds in 2024

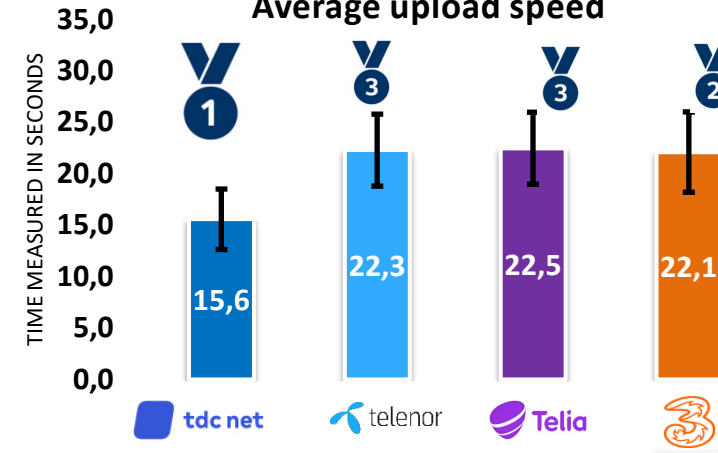
with a 5G phone

TDC NET has much faster and far more error-free* downloads and uploads than Telenor, Telia, and 3 in the Central Denmark Region.

Central Denmark Region: Average download speed

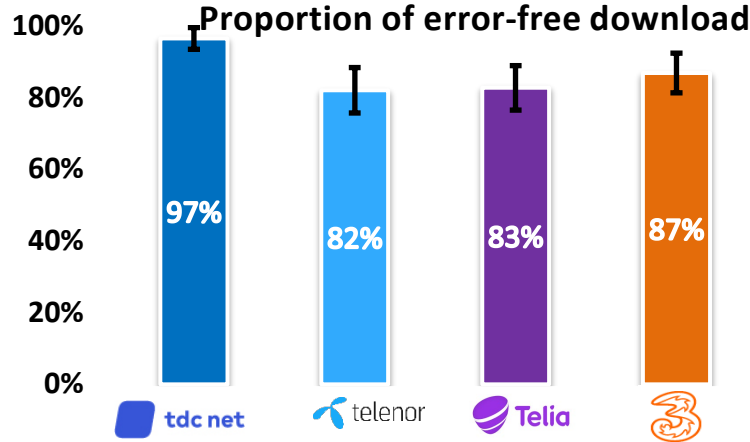


Central Denmark Region: Average upload speed

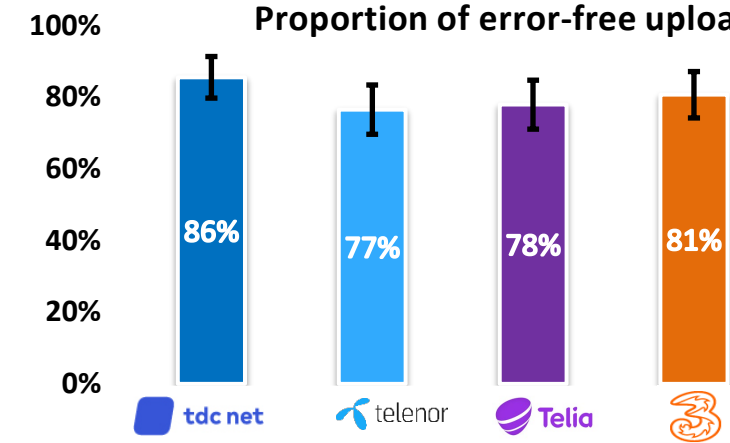


Medals for total assessment of average speed and error-free application

Central Denmark Region: Proportion of error-free download



Central Denmark Region: Proportion of error-free upload

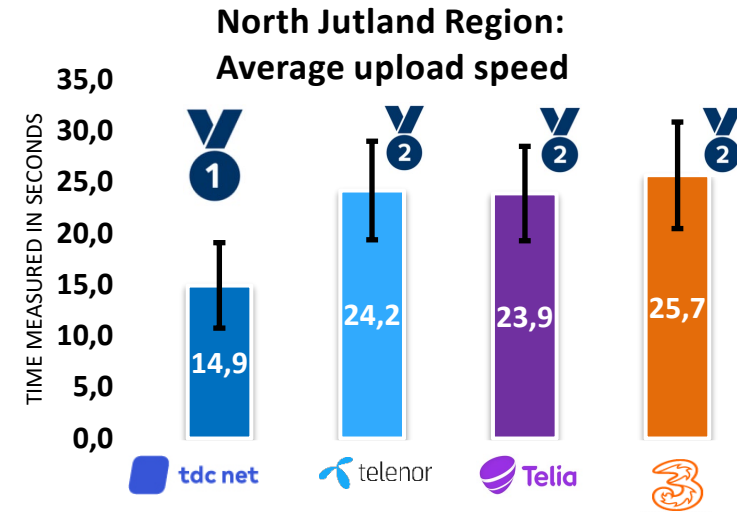
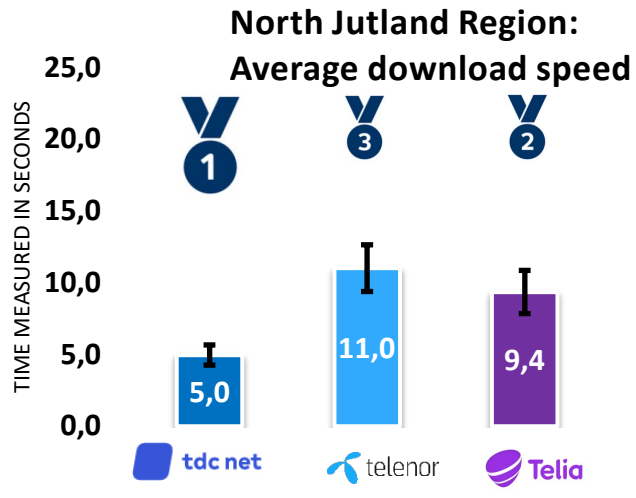


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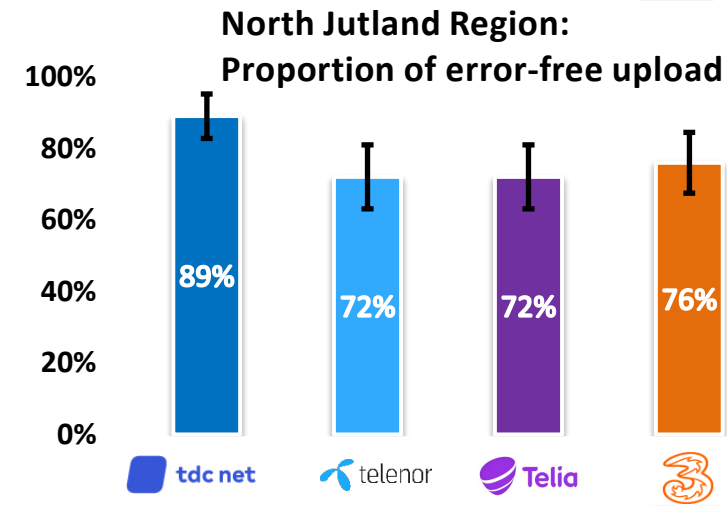
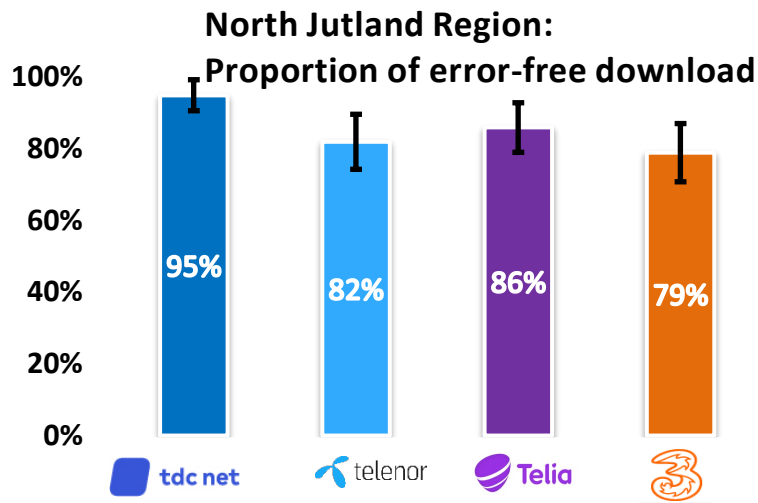


Regional results of download and upload speeds in 2024 with a 5G phone

TDC NET has much faster and far more error-free* downloads and uploads than Telenor, Telia, and 3 in the North Jutland Region.



Medals for total assessment of average speed and error-free application



*TDC NET defined a good mobile network experience as: 30 sec. error-free mobile phone conversation - 30 MB download within 15 sec. - 30 MB upload within 30 sec. - 60 sec. DR TV without buffering waiting time. Vertical black lines indicate a 95% statistical confidence interval.



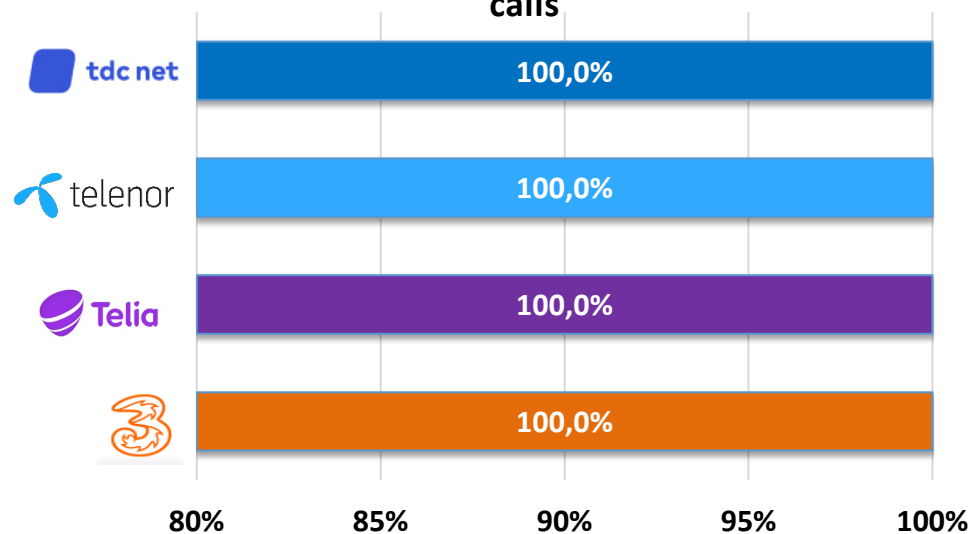
A van from Danish Technological Institute at one of the randomly selected test points - here at Jesperhus Holiday Centre on Mors

Regional results of ordinary mobile phone conversations in 2024 with a 5G phone

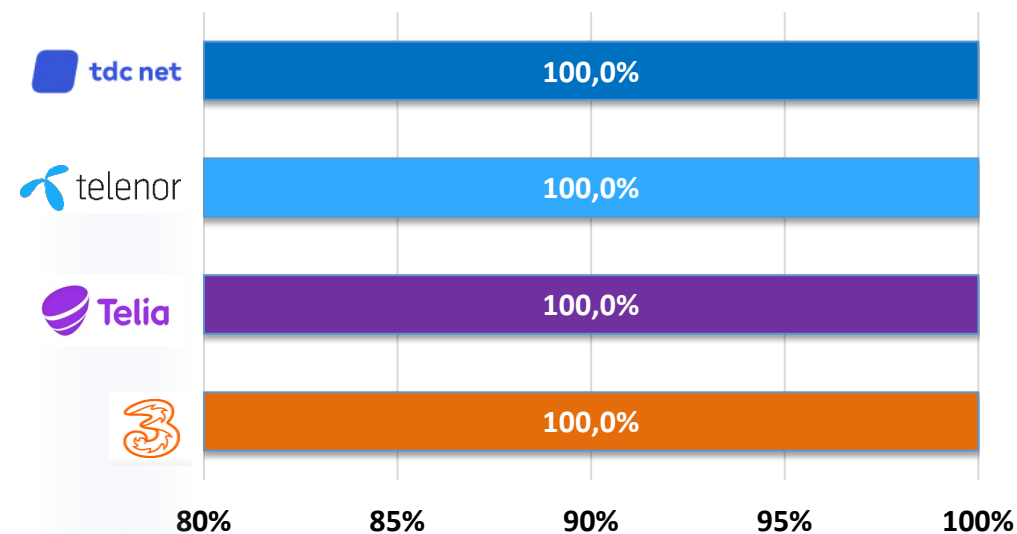
All phone calls were successful.

For ordinary mobile phone conversations* there are no significant differences between TDC NET, Telenor, Telia, and 3.

Capital Region of Denmark: Mobile phone calls



Region Zealand: Mobile phone calls

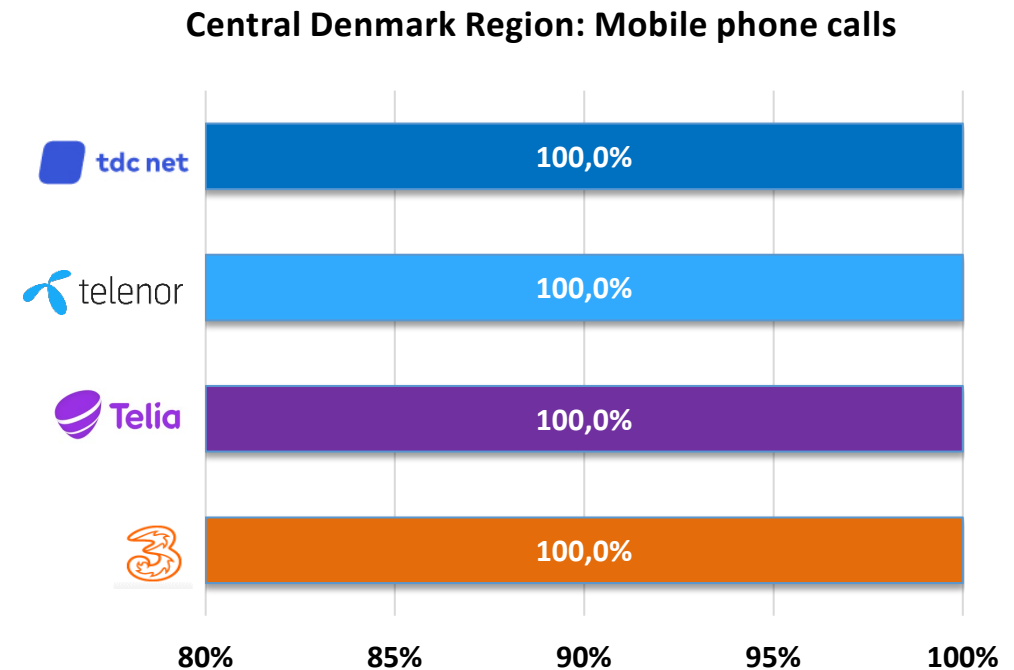
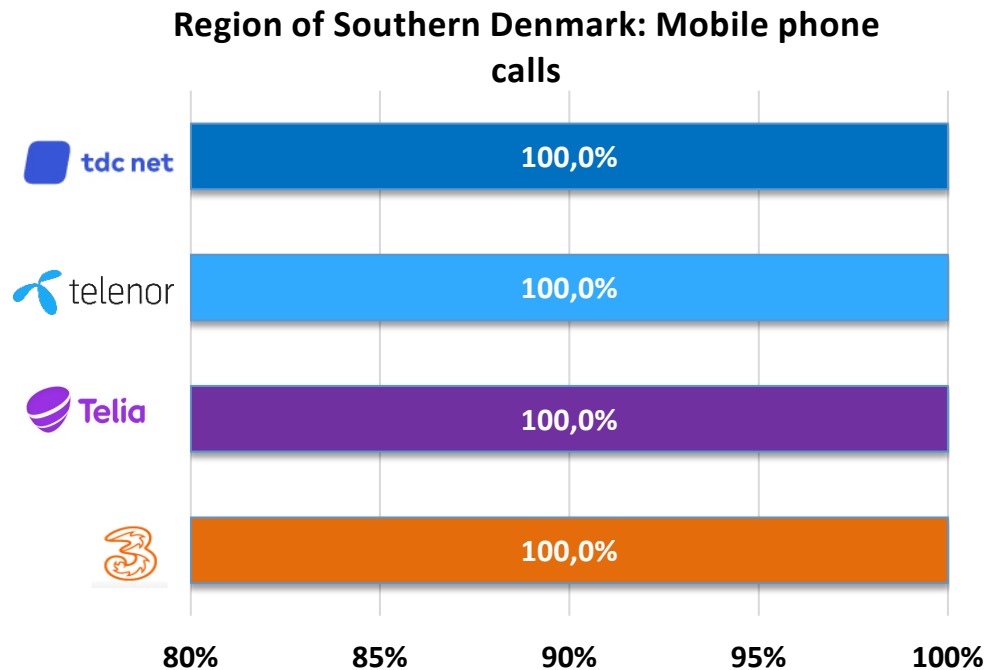


*TDC NET defined a good mobile network experience as: 30 sec. error-free mobile phone conversation - 30 MB download within 15 sec. - 30 MB upload within 30 sec. - 60 sec. DR TV without buffering waiting time.

Regional results of ordinary mobile phone conversations in 2024 with a 5G phone

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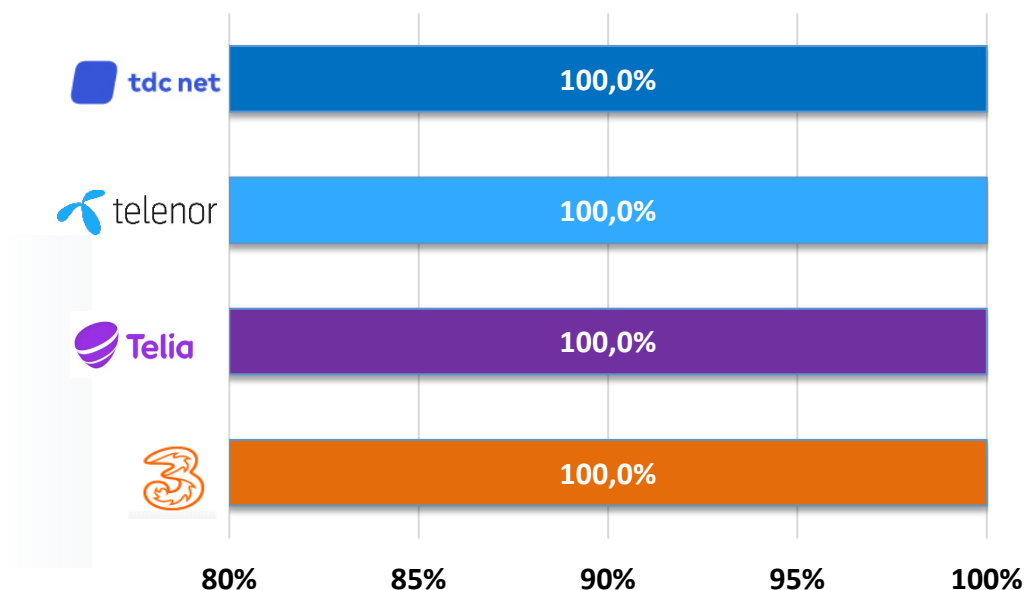
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Regional results of ordinary mobile phone conversations in 2024 with a 5G phone

All phone calls were successful.

For ordinary mobile phone conversations* there are no significant differences between TDC NET, Telenor, Telia, and 3.

The North Jutland Region: Mobile phone calls



*TDC NET defined a good mobile network experience as: 30 sec. error-free mobile phone conversation - 30 MB download within 15 sec. - 30 MB upload within 30 sec. - 60 sec. DR TV without buffering waiting time.



A van from Danish Technological Institute at one of the randomly selected test points - here at Reersø Bryghus between Slagelse and Kalundborg

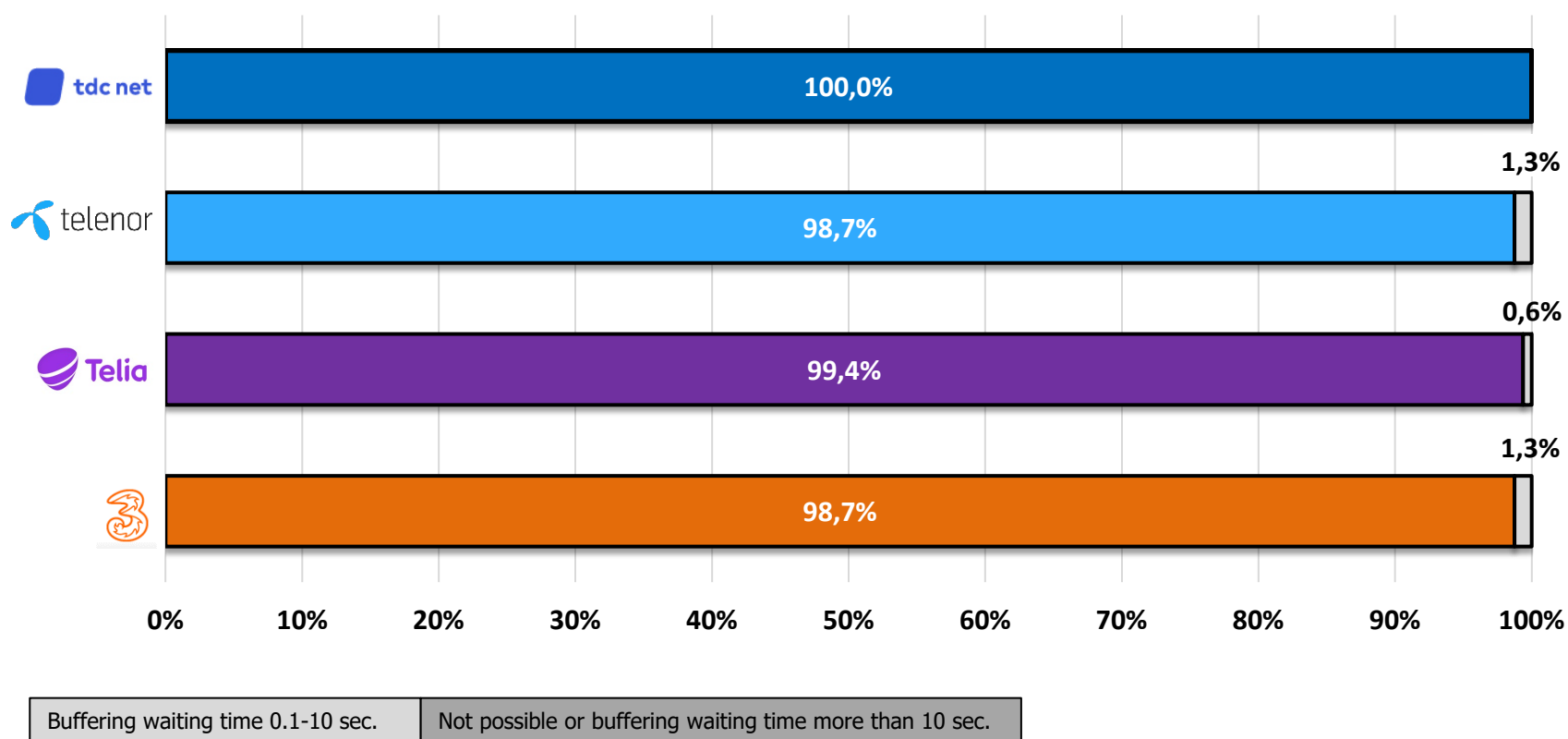


Regional results of video streaming in 2024 with a 5G phone

TDC NET has completely error-free video streaming in the Capital Region of Denmark.

Telenor, Telia, and 3 have almost error-free video streaming in the Capital Region of Denmark.

Streaming, Capital Region of Denmark



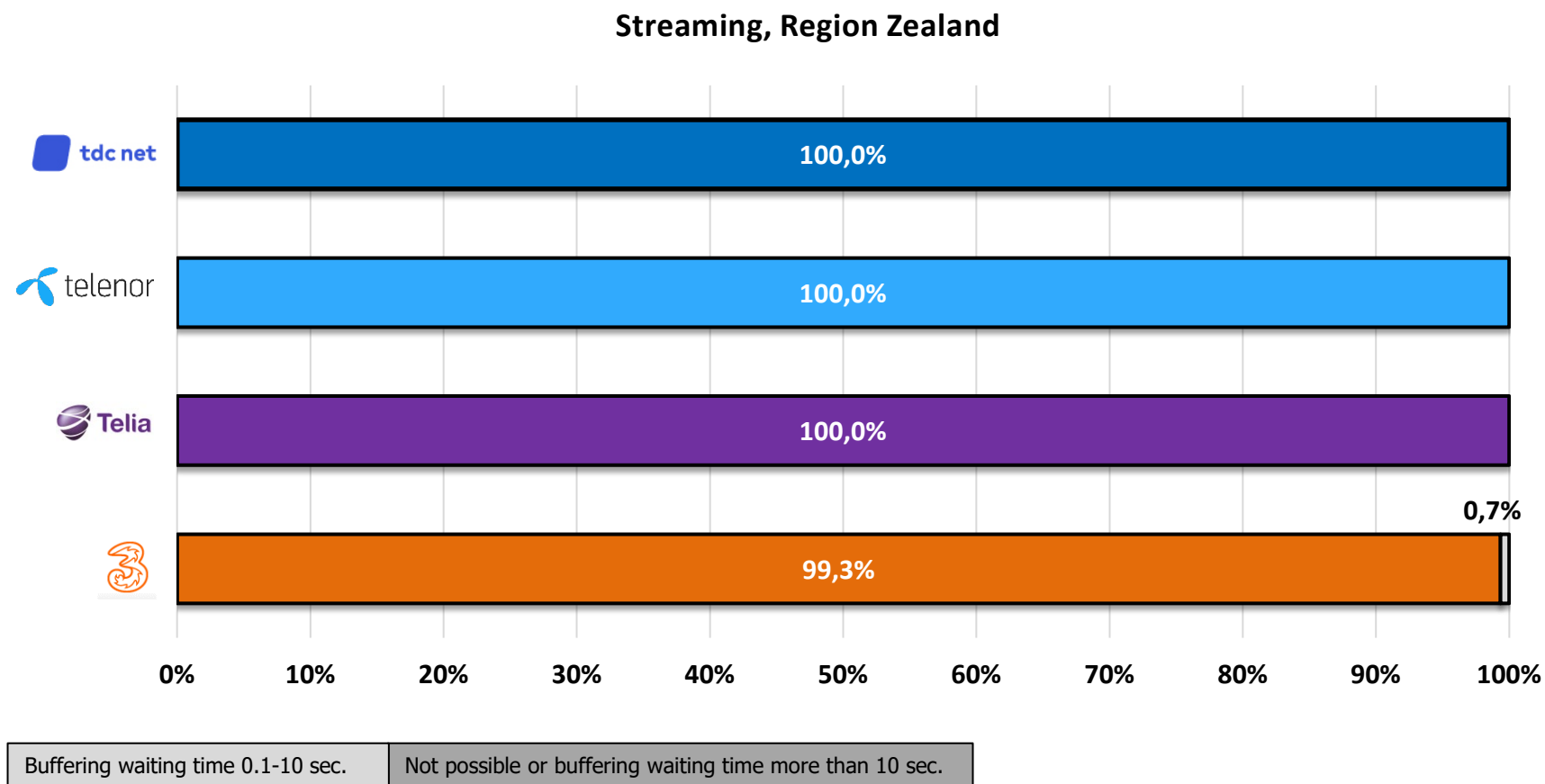
*TDC NET defined a good mobile network experience as: 30 sec. error-free mobile phone conversation - 30 MB download within 15 sec. - 30 MB upload within 30 sec. - 60 sec. DR TV without buffering waiting time.



Regional results of video streaming in 2024 with a 5G phone

TDC NET, Telenor, and Telia have completely error-free video streaming in Region Zealand.

3 has almost error-free video streaming in Region Zealand.



*TDC NET defined a good mobile network experience as: 30 sec. error-free mobile phone conversation - 30 MB download within 15 sec. - 30 MB upload within 30 sec. - 60 sec. DR TV without buffering waiting time.

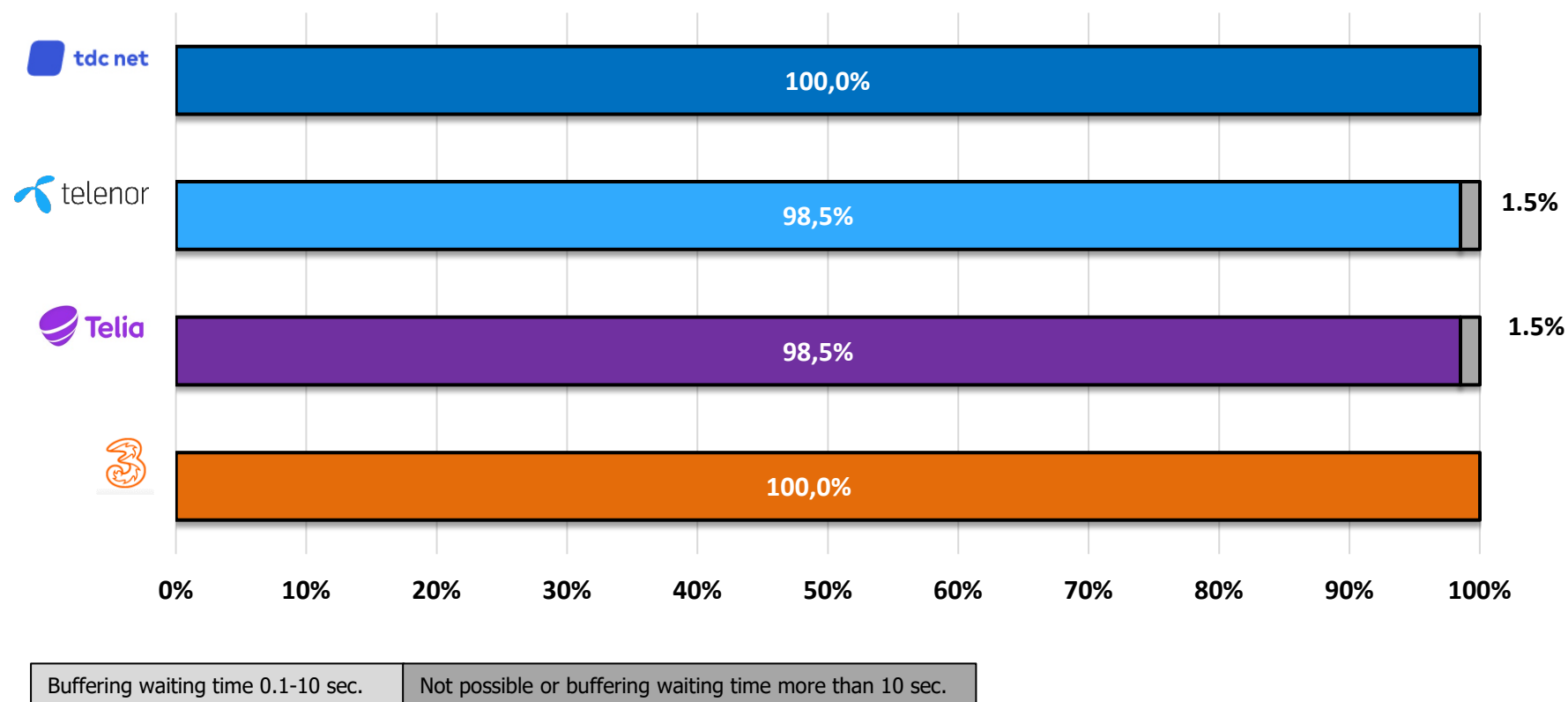


Regional results of video streaming in 2024 with a 5G phone

TDC NET and 3 have completely error-free video streaming in the Region of Southern Denmark.

Telenor and Telia have almost error-free video streaming in the Region of Southern Denmark.

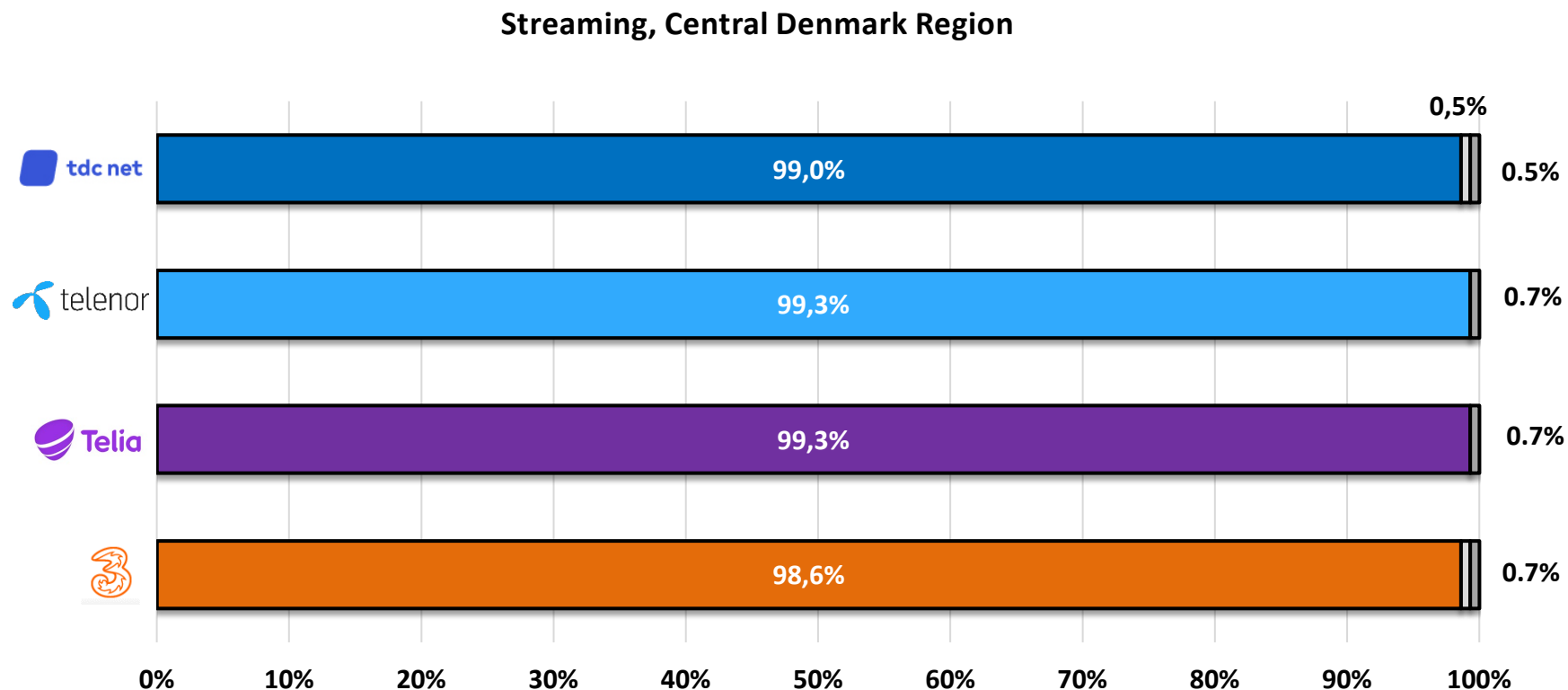
Streaming, Region of Southern Denmark



*TDC NET defined a good mobile network experience as: 30 sec. error-free mobile phone conversation - 30 MB download within 15 sec. - 30 MB upload within 30 sec. - 60 sec. DR TV without buffering waiting time.

Regional results of video streaming in 2024 with a 5G phone

TDC NET, Telenor, Telia, and 3 have almost error-free video streaming in Central Denmark Region.



Buffering waiting time 0.1-10 sec.

Not possible or buffering waiting time more than 10 sec.

*TDC NET defined a good mobile network experience as: 30 sec. error-free mobile phone conversation - 30 MB download within 15 sec. - 30 MB upload within 30 sec. - 60 sec. DR TV without buffering waiting time.

Regional results of video streaming in 2024 with a 5G phone

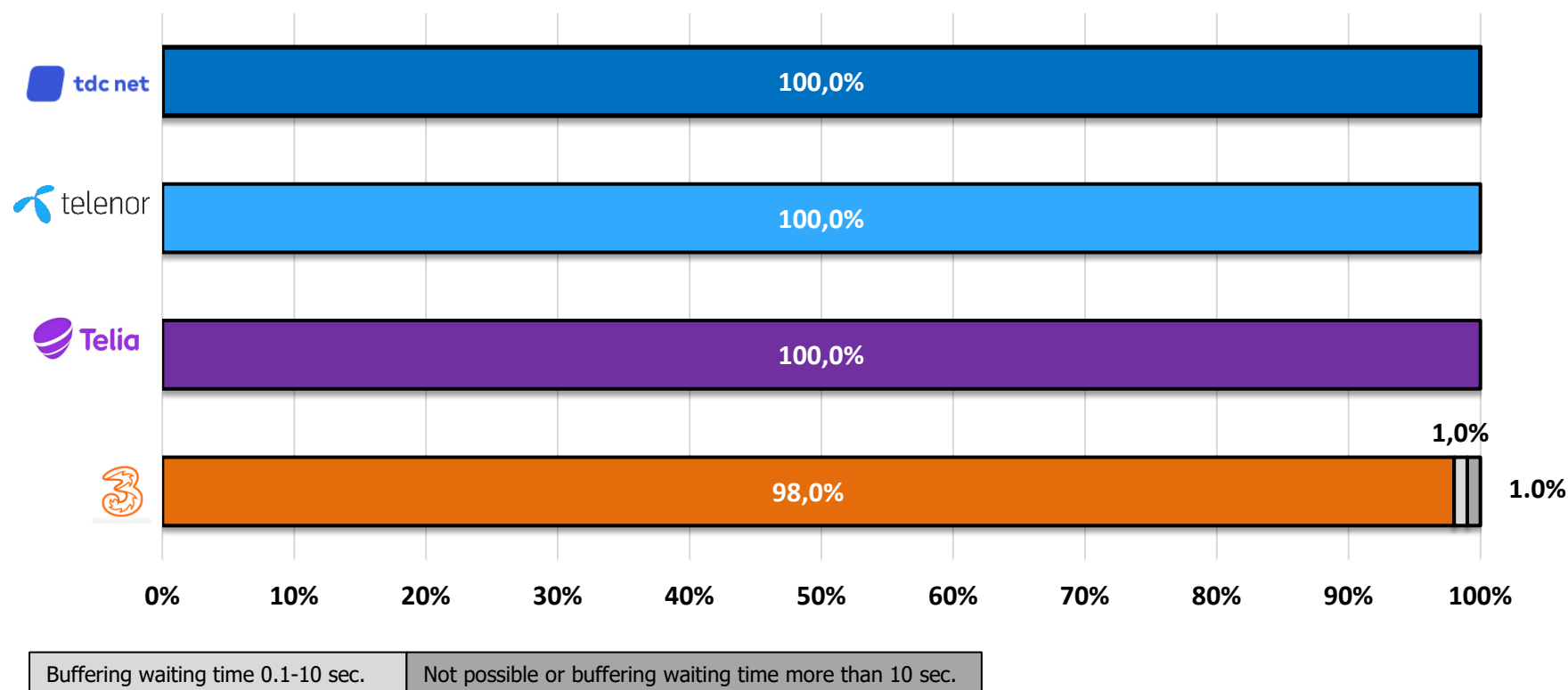
TDC NET, Telenor, and Telia have almost error-free video streaming in the North Jutland Region.

3 has almost error-free video streaming in the North Jutland Region.



DANISH
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INSTITUTE

Streaming, the North Jutland Region



*TDC NET defined a good mobile network experience as: 30 sec. error-free mobile phone conversation - 30 MB download within 15 sec. - 30 MB upload within 30 sec. - 60 sec. DR TV without buffering waiting time.



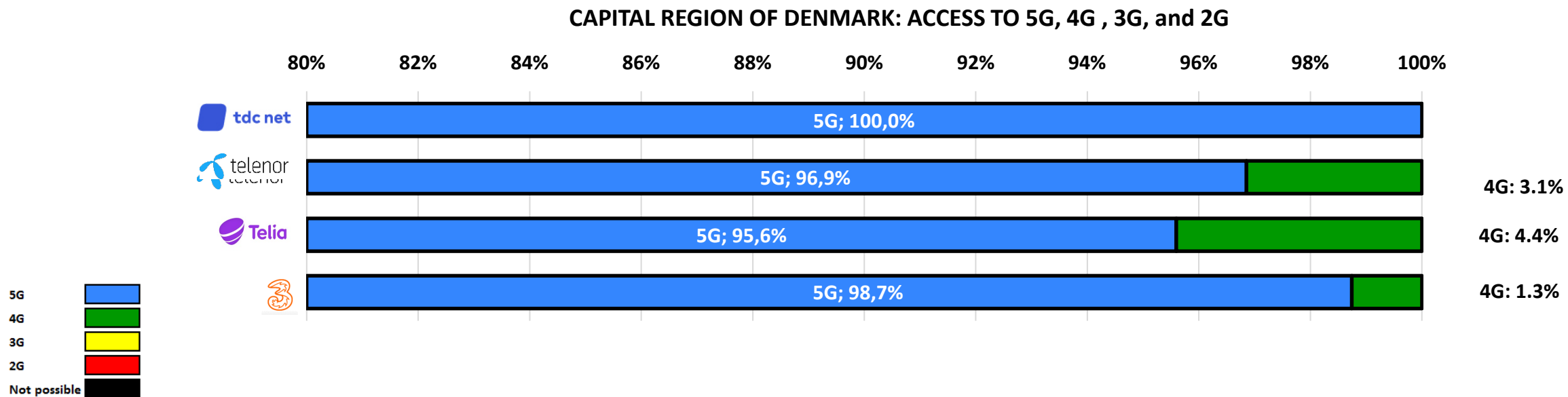
A van from Danish Technological Institute at one of the randomly selected test points – here at the top of a dike at Vester Vedsted at the North Sea

Regional results of access to 5G and 4G in 2024 with a 5G phone



In the Capital Region of Denmark, TDC NET has 100% access to 5G.

3 has 98.7%, Telenor 96.9%, and Telia has 95.6% access to 5G in the Capital Region of Denmark.



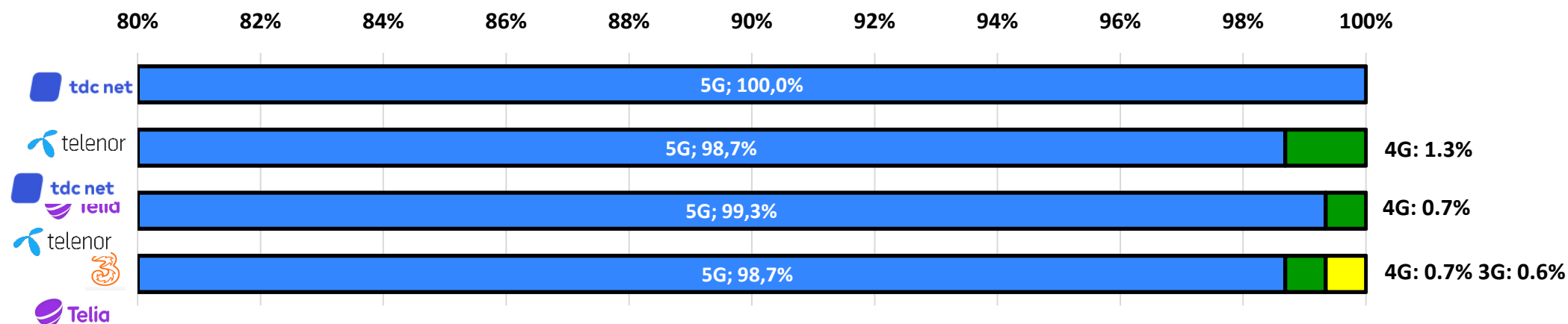
Regional results of access to 5G and 4G in 2024 with a 5G phone



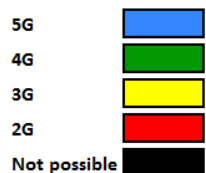
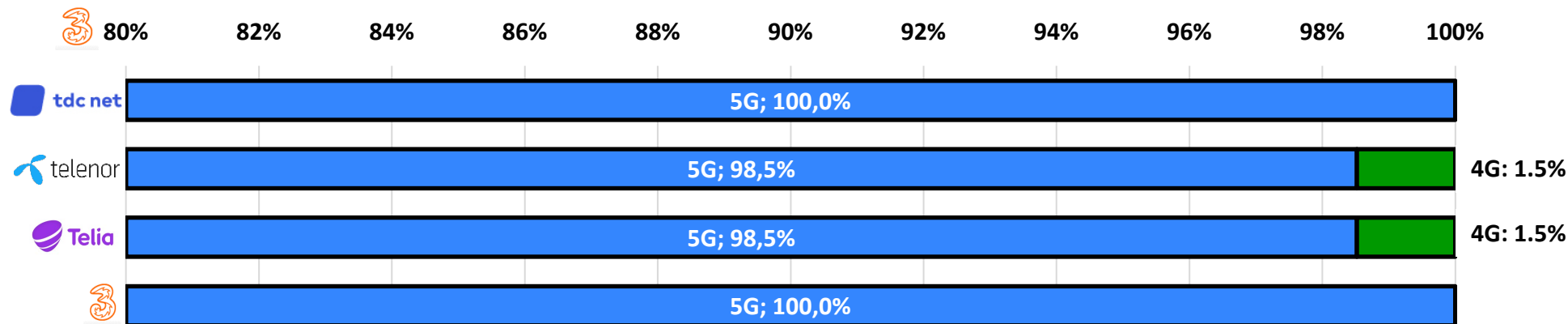
In Region Zealand, TDC NET has 100% access to 5G. Telenor, Telia, and 3 have around 99% access to 5G.

In the Region of Southern Denmark, TDC NET and 3 have 100% access to 5G. Telenor and Telia have 98.5% access to 5G.

REGION ZEALAND: ACCESS TO 5G, 4G, 3G, and 2G



REGION OF SOUTHERN DENMARK: ACCESS TO 5G, 4G, 3G, and 2G



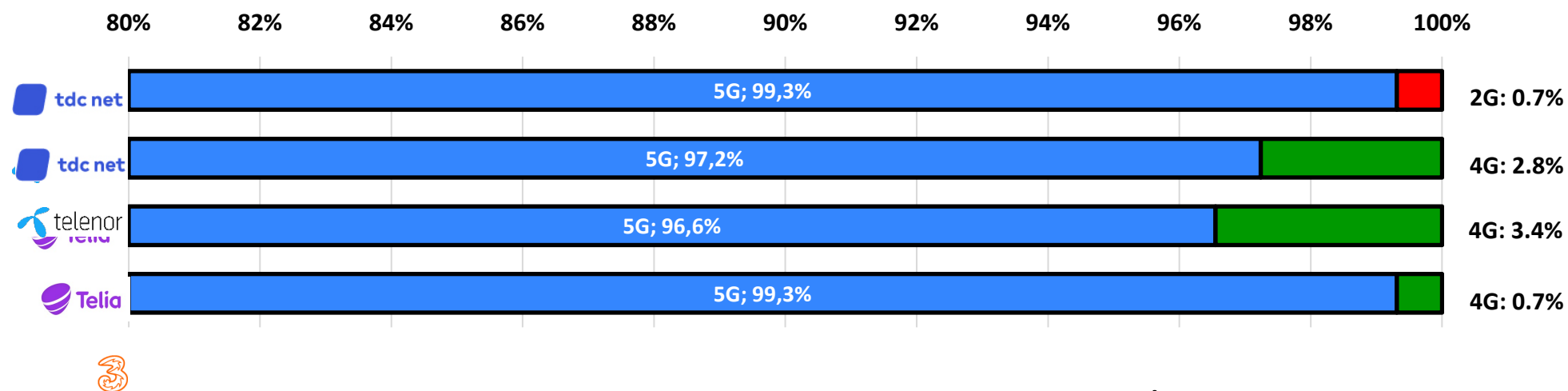
Regional results of access to 5G and 4G in 2024 with a 5G phone



In the Central Denmark Region, TDC NET and 3 have 99.3% access to 5G. Telenor and Telia have around 97% access to 5G.

In the North Jutland Region, TDC NET has 100% access to 5G. 3 has 99%, Telenor 96%, and Telia has 95% access to 5G.

CENTRAL DENMARK REGION: ACCESS TO 5G, 4G, 3G, and 2G



THE NORTH JUTLAND REGION: ACCESS TO 5G, 4G, 3G, and 2G

