

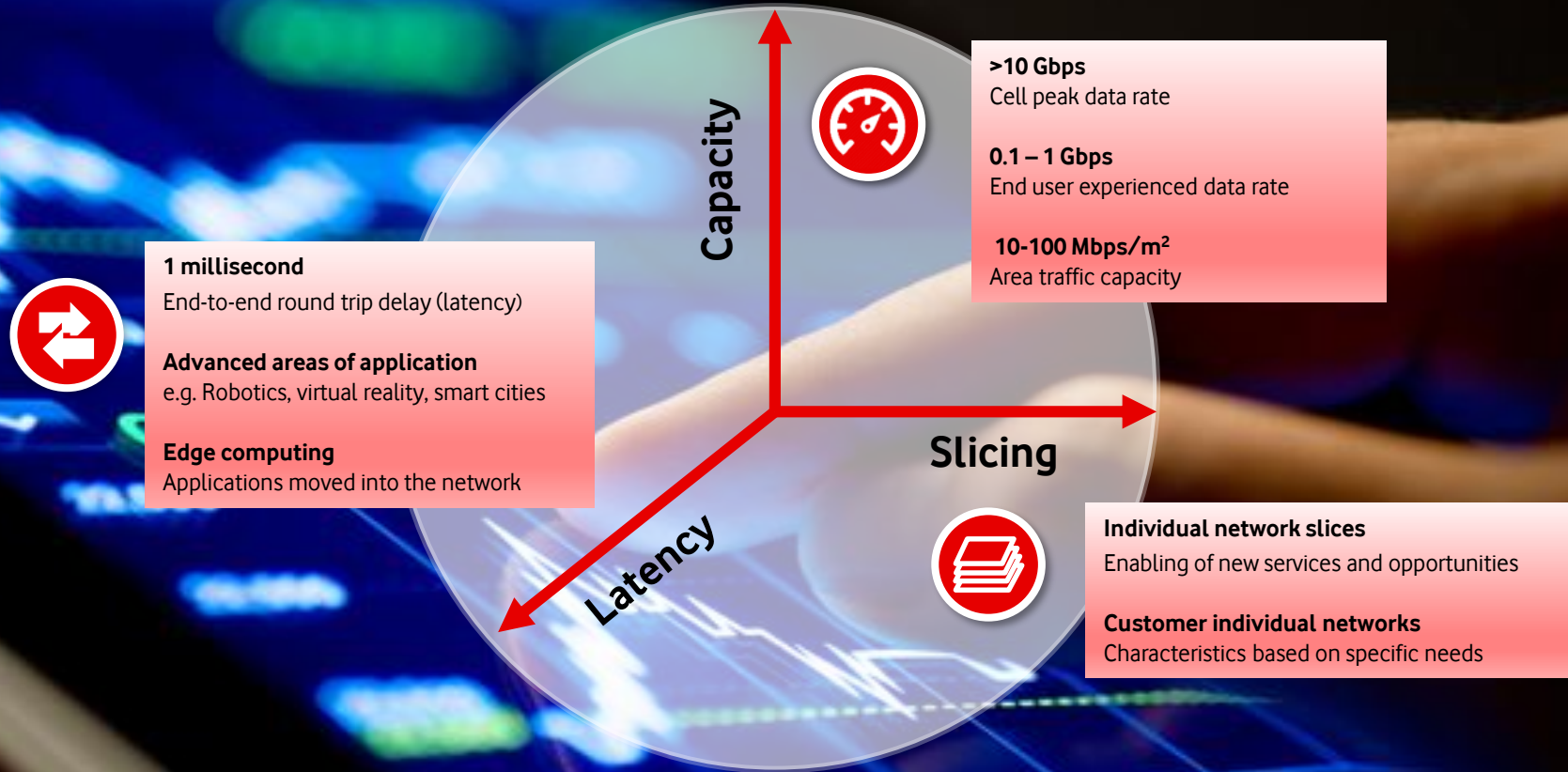
## 5G – It's (not) Magic, it's real-time

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Head of Enterprise Network  
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# 5G technology stands for huge capacity, ultra low latency as well as reliability by network slicing



# Quiz Time

**Which top speed are we offering our customers with 4G | LTE?**

**A) 100 Mbps**

**B) 250 Mbit/s**

**C) 500 Mbit/s**

**D) 1.000 Mbit/s**





# Quiz Time

**Which top speed are we offering our customers with 4G | LTE?**

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# 1 Gigabit per second in mobile is already launched

Launched  
Oct. 2017

1

Gigabit



- 4-carrier aggregation
- 256 QAM
- 4x4 MIMO



500  
Mbps

- 3-carrier aggregation
- 256 QAM

375  
Mbps

- 3-carrier aggregation

225  
Mbps

- 2-carrier aggregation

100  
Mbps





# Quiz Time

**Which top speed will we offer our customers with 5G | NR?**

**A) 1.000 Mbps**

**B) 2.500 Mbit/s**

**C) 5.000 Mbit/s**

**D) 10.000 Mbit/s**



# Quiz Time

**Which top speed will we offer our customers with 5G | NR?**

**A) 1.000 Mbps**

**B) 2.500 Mbit/s**

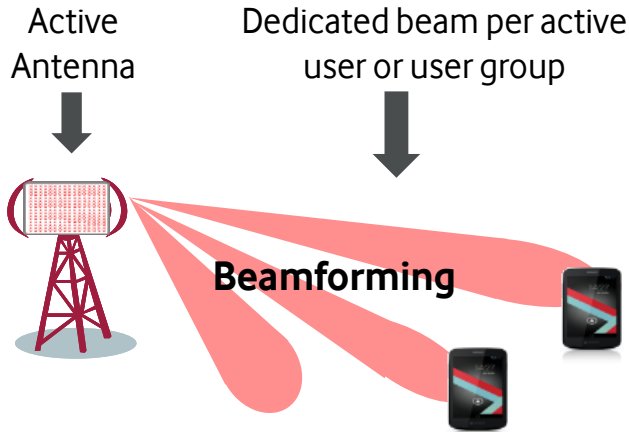
**C) 5.000 Mbit/s**

**D) 10.000 Mbit/s**



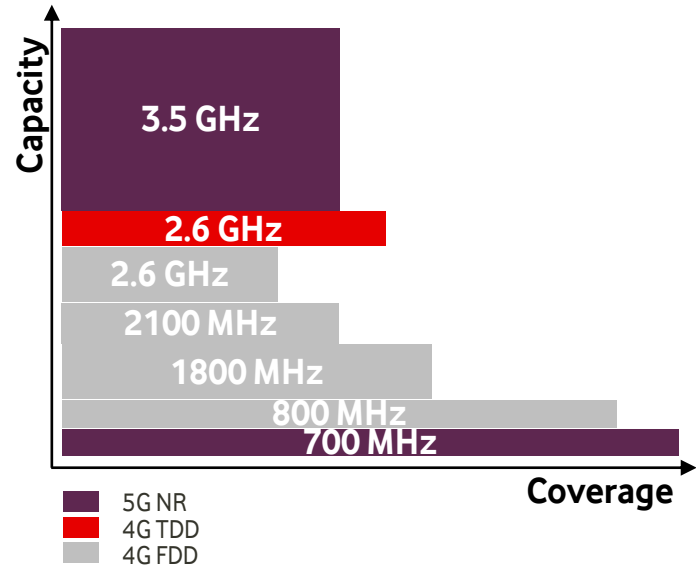
# 5G capacity gains driven by combination of beamforming & huge amount of spectrum

## Beamforming / Massive MIMO



## Spectrum

Total capacity with 5G NR on top of a 4G site

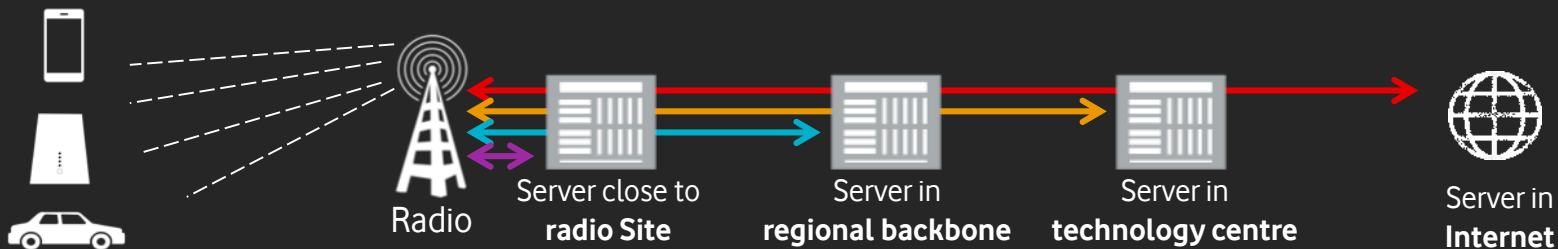


<https://youtu.be/zEnwtc6S4Lk>





## Ultra-low latency applications require an evolution on both, radio and transport network



	Air interface Evolution	Transport Evolution*	Total latency*
4G	LTE   15-20 ms	+ $\varnothing$ 30-35 ms	= 45-55 ms
4G Evo	LTE Advanced   1-8 ms	+ $\varnothing$ 30-35 ms	= 31-43 ms
		+ <10ms	= 11-18 ms
5G	New Radio   1-2 ms.	+ 3-4ms	= 11-12ms
		+ 0 ms	= 4-6 ms
		+ 0 ms	= 1-2 ms

\* Transport latency for 5G are estimations





# Teleoperated Driving

<https://youtu.be/2z0lWXFol6c>

# Network Slicing enables separate virtual network slices tailor-made to the needs of specific use cases

## 5G Slice

### Mobile Broadband

Well-Known-Business  
Hardware and Connectivity



### Massive IoT

Internet of Everything  
(e.g. low cost asset tracking)



### Critical IoT

Ultra low latency with  
mobile edge cloud

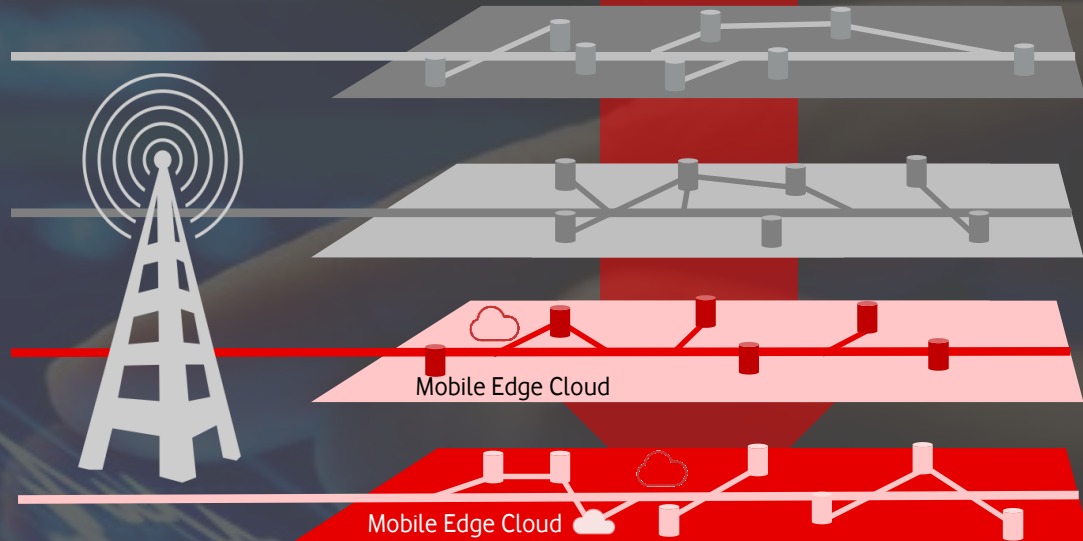


### Customized IoT

Customer individual slice with  
individual network parameters



Taylor-made network slices with different  
selection function based on client needs





# With Narrowband (NB) IoT we are offering network slicing already in our 4G network

Beginning of 2019



End of 2019



# Our 5G Mobility Lab







**TESTCENTER ALDENHOVEN**  
**30. AUGUST 2017**

**5G MOBILITY LAB**  
**ERÖFFNUNG**

[https://youtu.be/CW\\_TVBenTHk](https://youtu.be/CW_TVBenTHk)



**„We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run.“**

Roy Charles Amara

