

# 5G NR

## Az új rádióhálózat



HTE Infokom 2018

# Performance boost in 8 dimensions



<p><b>20 Gb/s</b> Peak rate downstream to users</p>	<p><b>1 ms</b> Latency</p>	<p><b>500 km/h</b> Mobility</p>	<p><b>1M/km<sup>2</sup></b> Device connection density</p>
<p><b>10 Gb/s</b> Peak rate upstream from users</p>	<p><b>1 m</b> Position accuracy</p>	<p><b>99.999%</b> Availability and reliability</p>	<p><b>10 years</b> Battery life</p>

Source: Ericsson This is 5G, February 2018

# 5G spectrum fundamentals



Sub 1 GHz in  
≤10MHz carrier  
bandwidth

1-2.6 GHz in  
≤20MHz carrier  
bandwidth

3.5-6 GHz in  
<50MHz carrier  
bandwidth

24-48 GHz in  
>100MHz carrier  
bandwidth



**Low Band**  
reach everywhere



**Mid Band I**  
take you far



**Mid Band II**  
for precision in  
suburban areas

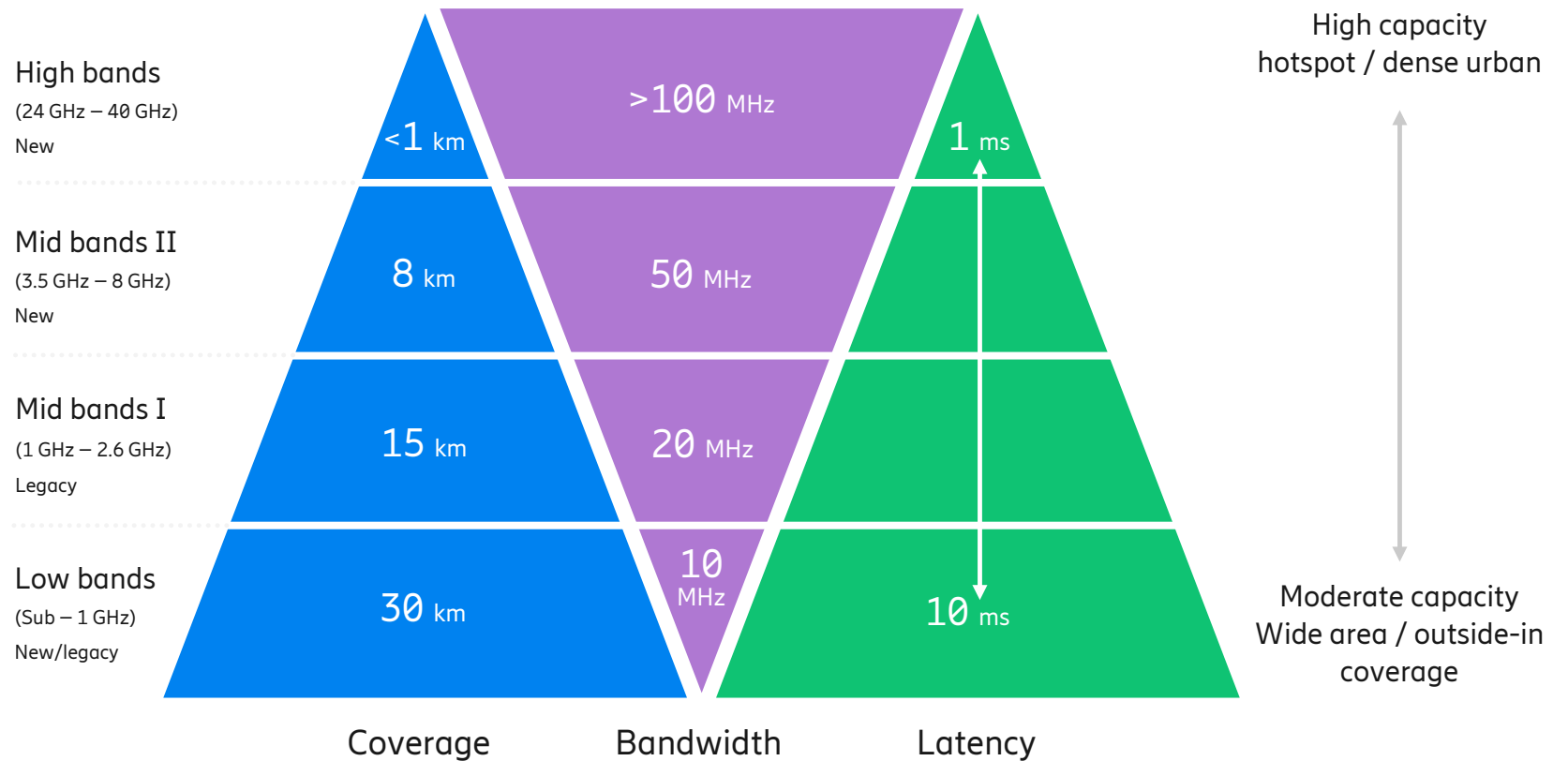


**High Band**  
seal the deal in  
dense urban areas

# Spectrum trade-off



“There are major fundamental trade-offs between capacity, coverage, latency, reliability and spectral efficiency in a wireless network. Due to these fundamental limits, if one metric is optimized for improvement, this may result in degradation of another metric.”



Source: IEEE – A survey on Low latency towards 5G RAN, Core network and Caching solutions.

# LTE / NR Spectrum sharing

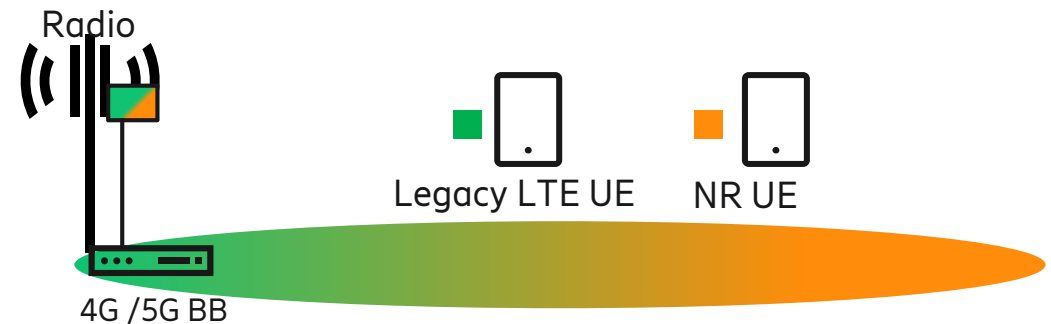
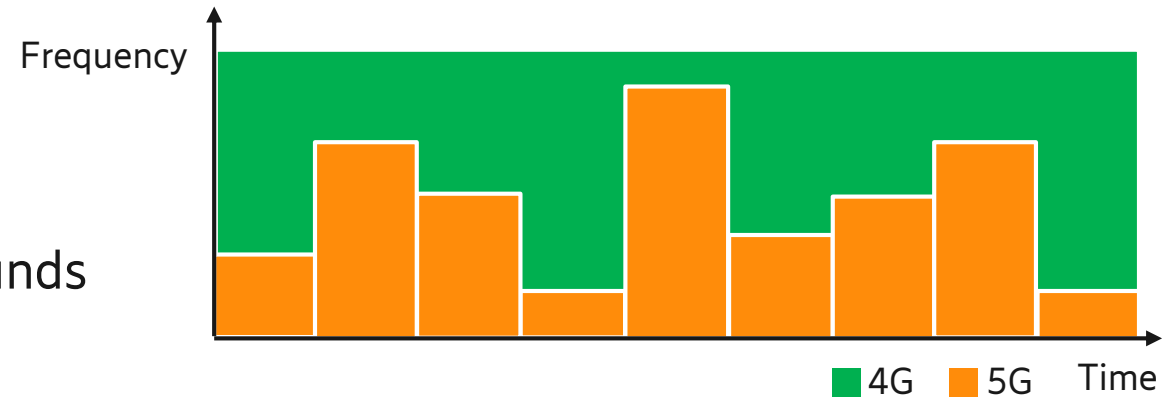


5G NR introduction with lowest TCO  
Shared spectrum, same Hardware

5G NR wide area coverage on existing LTE bands  
Minimum impact on LTE performance

Extend coverage of 3.5 GHz NR band  
5G NR low band extends higher bands with CA

Ready for wide area 5G use-cases  
Add spectrum based on capacity needs



Nationwide NR with software activation  
Enabled by Spectrum Sharing

[Ericsson Press-Release](#)

# 5G Spectrum and Deployment strategy



## Step #1: NR launch + MBB capacity

Add NR at mid band (3.4-3.8GHz)

Option 3, Non Stand Alone with LTE Anchor (e.g. 800MHz)

## Step #2: Extend NR coverage

Add NR at low band (e.g. 700 MHz)

NSA, Ericsson Spectrum Sharing + NR CA

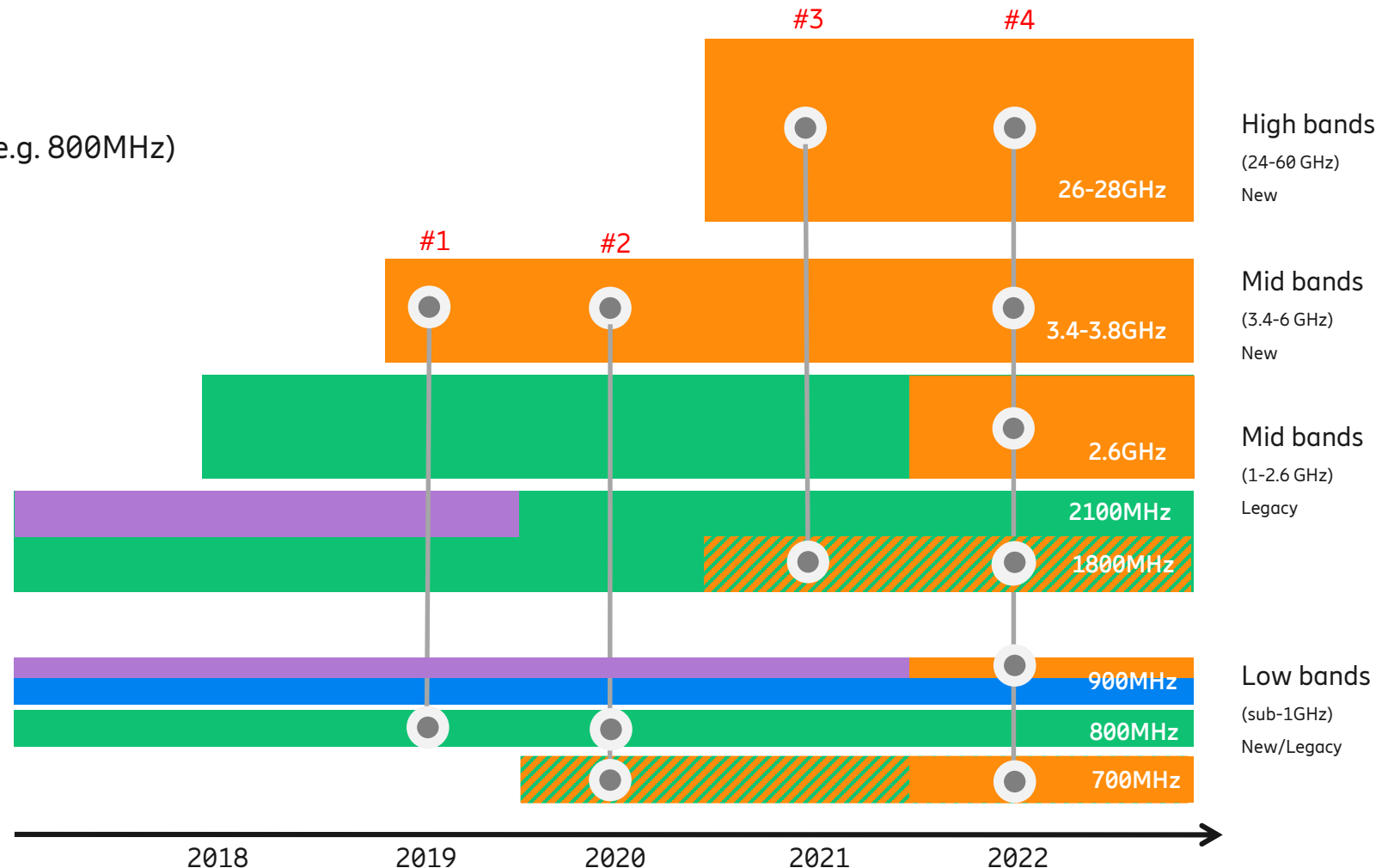
## Step #3: Hot Spot capacity + Industrial IoT

Add NR at high band (e.g. 26/28GHz)

Option 2, Stand-Alone, NR CA

## Step #4: legacy sunset + Critical IoT

Additional NR Refarming

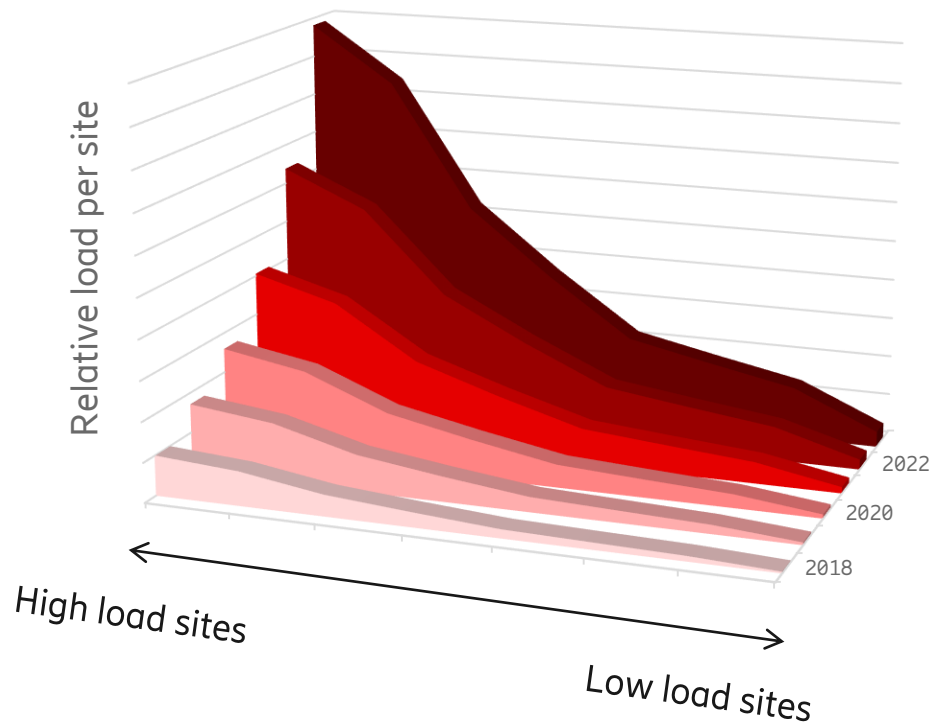


# Leading European operator example

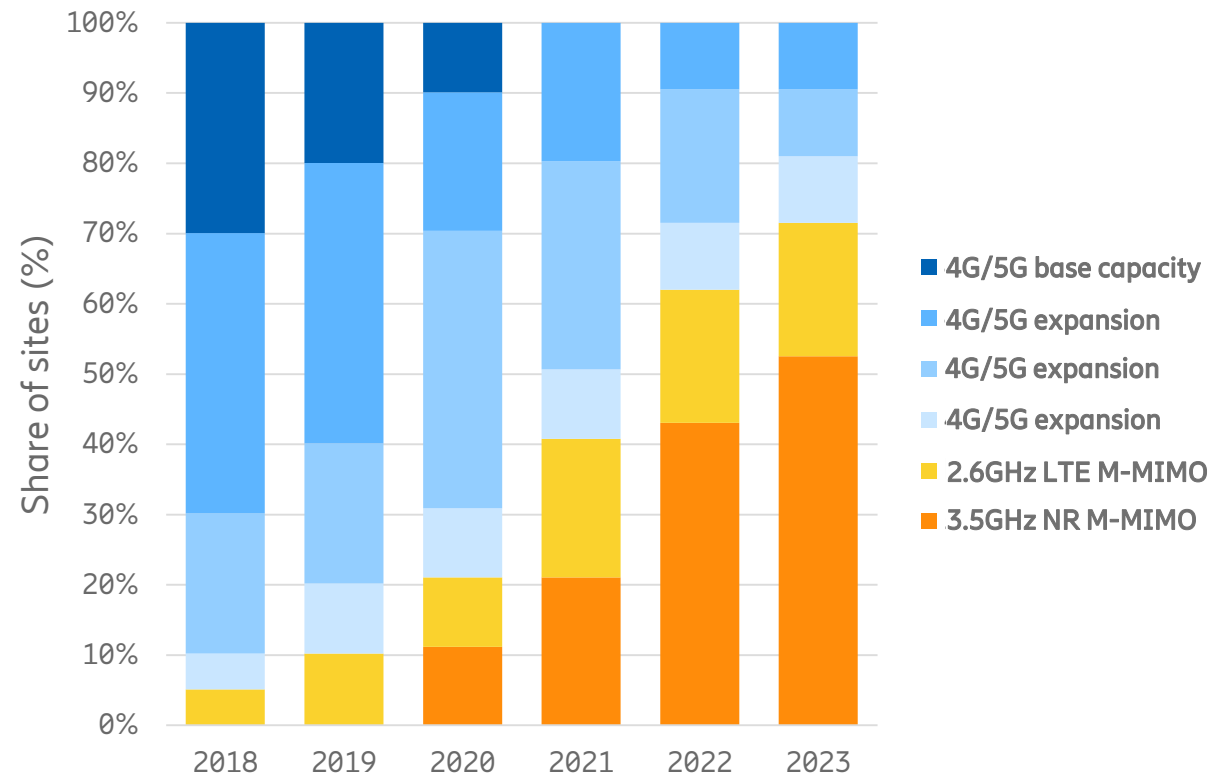
## Dense urban capacity expansion



Load per site - based on existing grid

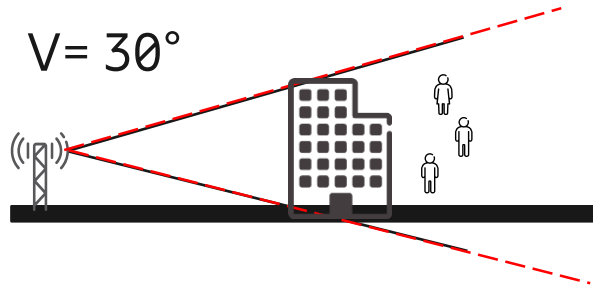


Network evolution: 4G+5G

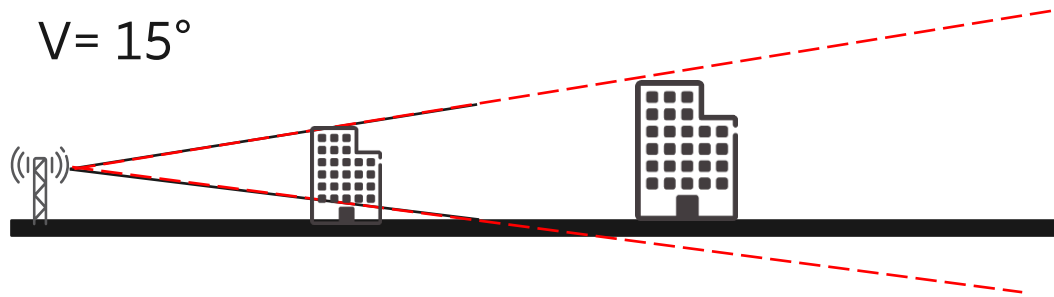
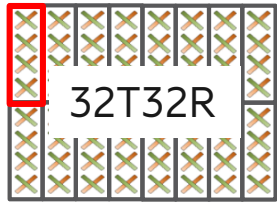


# Antenna configuration

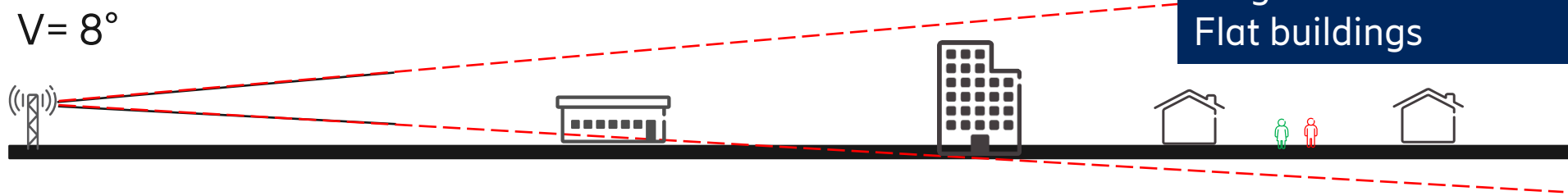
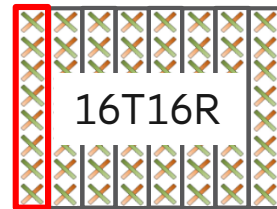
## Product positioning



Short ISD ~200-500m  
High rise buildings



Mid ISD ~500-1000m  
Mid rise buildings



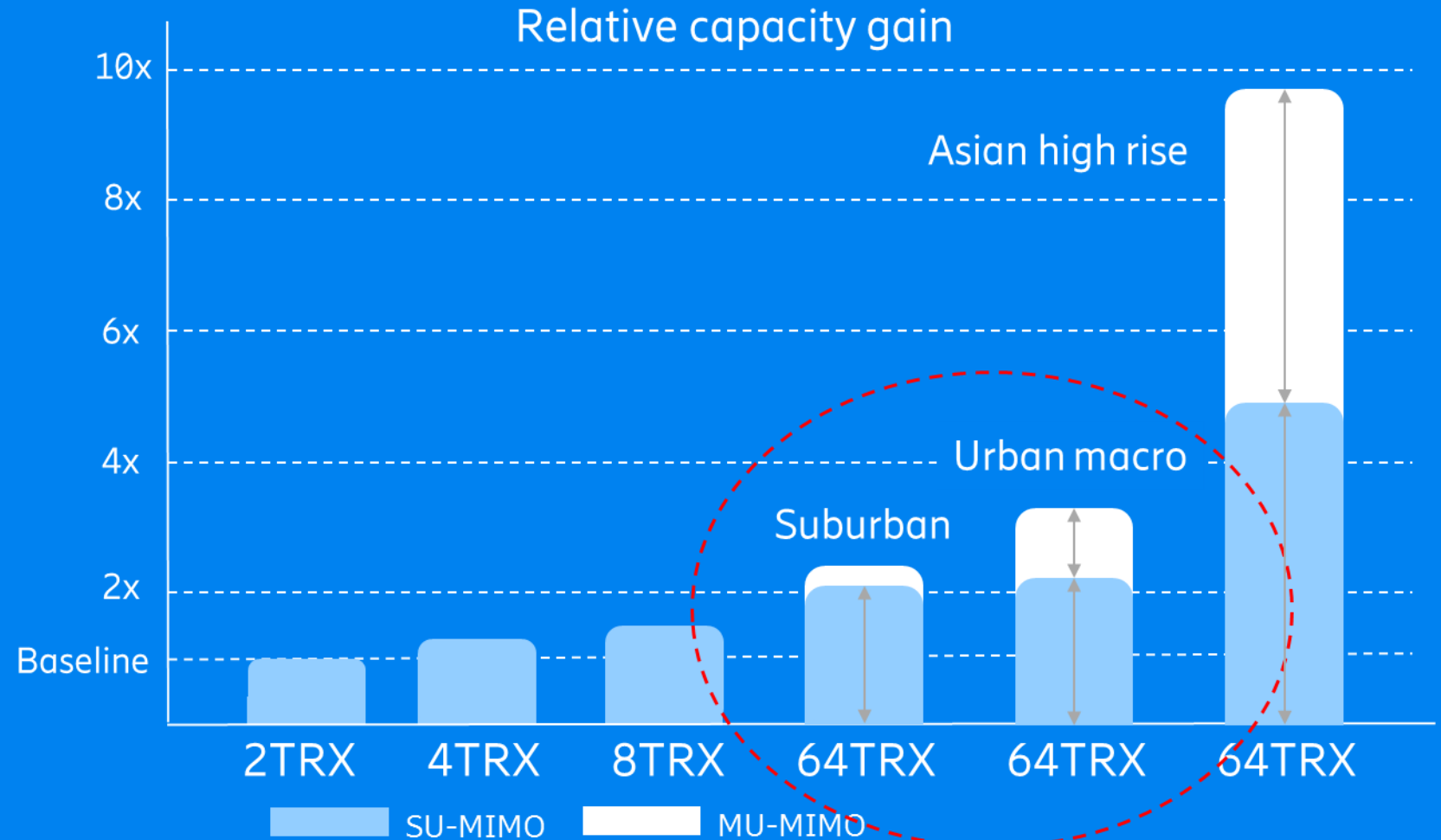
Large ISD >1000m  
Flat buildings



# Simulation of capacity gains of 64 TRX TDD in different scenarios

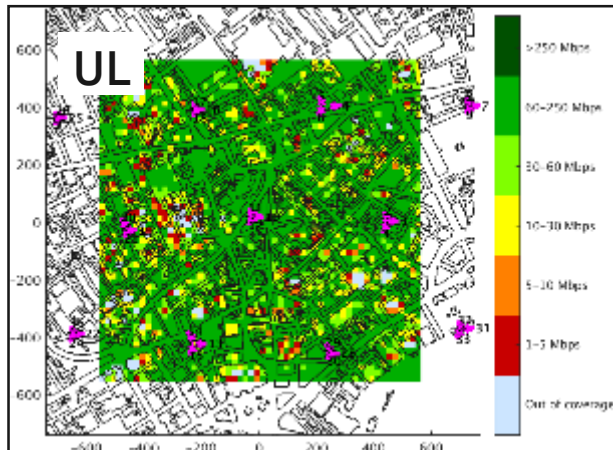
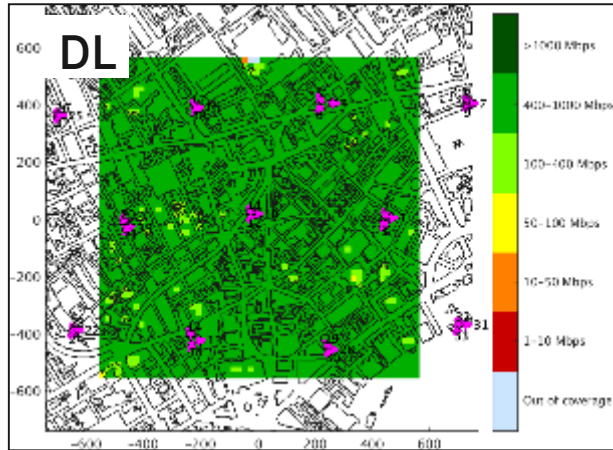


- Asian high rise: ISD=200
- Urban macro: ISD=500
- Suburban: ISD=1000 m
  
- Large gain in dense urban high rise scenario
- Smaller gain in suburban scenario
  
- Actual gains in real deployments is dependent on traffic profile and deployment scenario

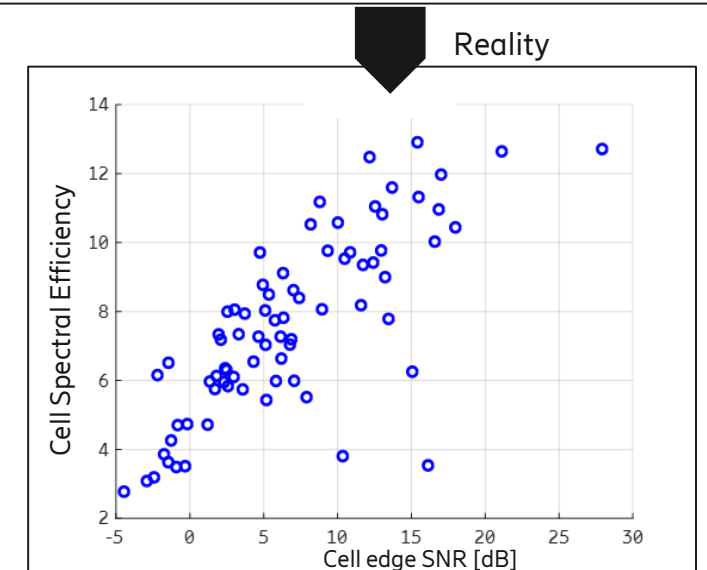
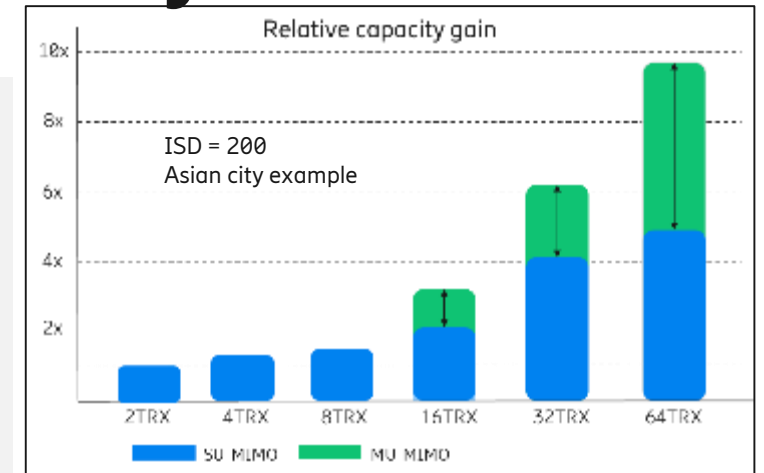


# How to utilize mid-band?

- Coverage is prerequisite for high capacity

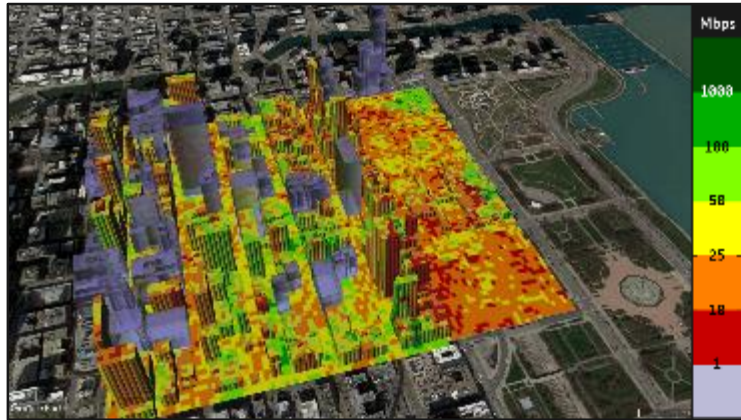


- Mid-band is very valuable on existing grids, especially together with lower bands
  - DL/UL Decoupling, DL Carrier Aggregation
- Significant capacity increase thanks to larger BW and massive MIMO.
- Coverage is the key to realize capacity gain!

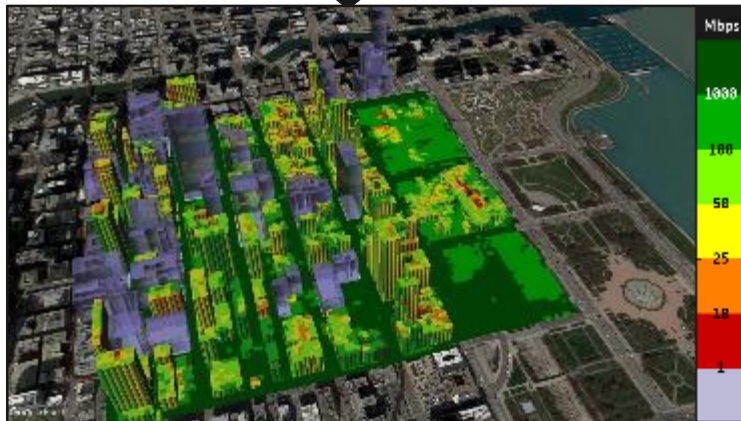


# How to utilize mmWave?

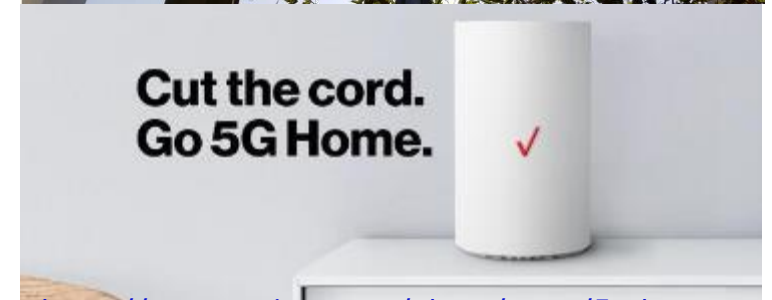
## – From theory to deployment



Adding 28GHz



- Mmwave deployment is not limited to LoS conditions
- Mmwave is not limited to FWA use cases.
  - Initial 5G deployments focus on enhanced MBB
- Mmwave deployment is not limited to small cells.
  - Existing site grid can be utilized
- Ericsson have a strong e2e mmwave portfolio and service offerings



<https://www.verizon.com/about/news/5g-here>



# 5G live in Korea



Set up a 5G trial in central Seoul

- Ericsson, Korea Telecom and Intel conducted a 5G automotive trial in down town Seoul
- Stable network connection in the challenging propagation conditions using the 28 GHz band
- Downlink throughput of more than 900 Mbps while simultaneously having more than an impressive 600 Mbps uplink catered for high quality infotainment

Showing how 5G will transform the in-car infotainment experience

[Play trial case video](#)

# Telia and Ericsson to make 5G real in Europe



## Use Case 1:

### 5G remote controlled excavator

- Remote chair and joysticks
- 360 camera inside the excavator cabin transmitting live video with low latency into remote controllers VR headset



Sweden's Prime Minister Stefan Löfvén



Finland's Prime Minister Juha Sipilä

## Use Case 2:

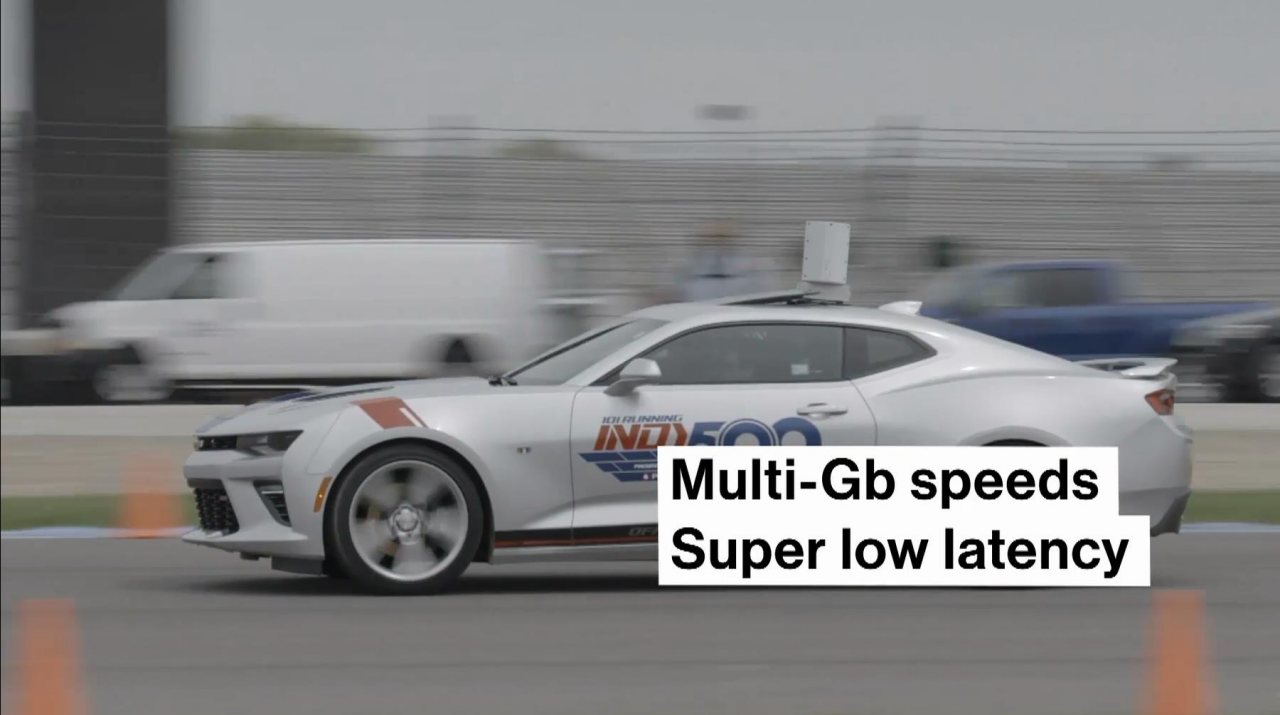
### 5G ferry backhaul

- 5G as internal WiFi backhaul while in harbor
- 5G radio prototype at shore, UEs on the ship

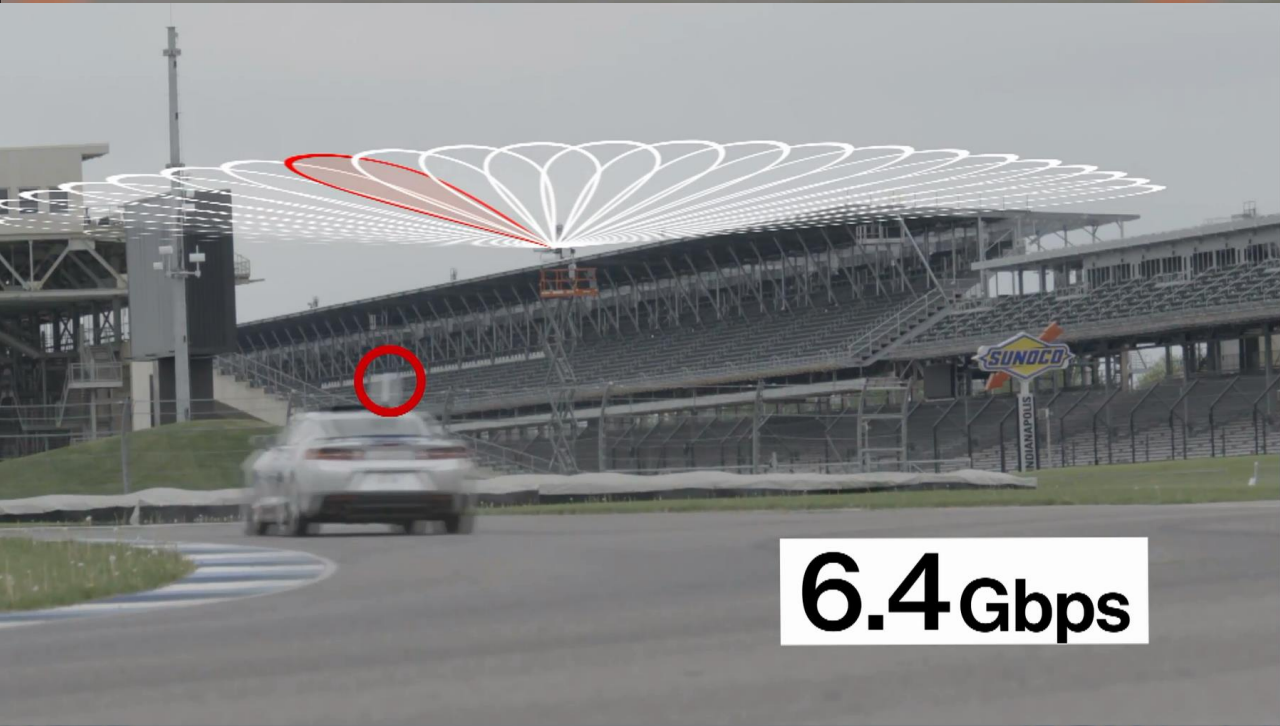


[Play use case video](#)





**Multi-Gb speeds**  
**Super low latency**



**6.4Gbps**

# The 5G race is on



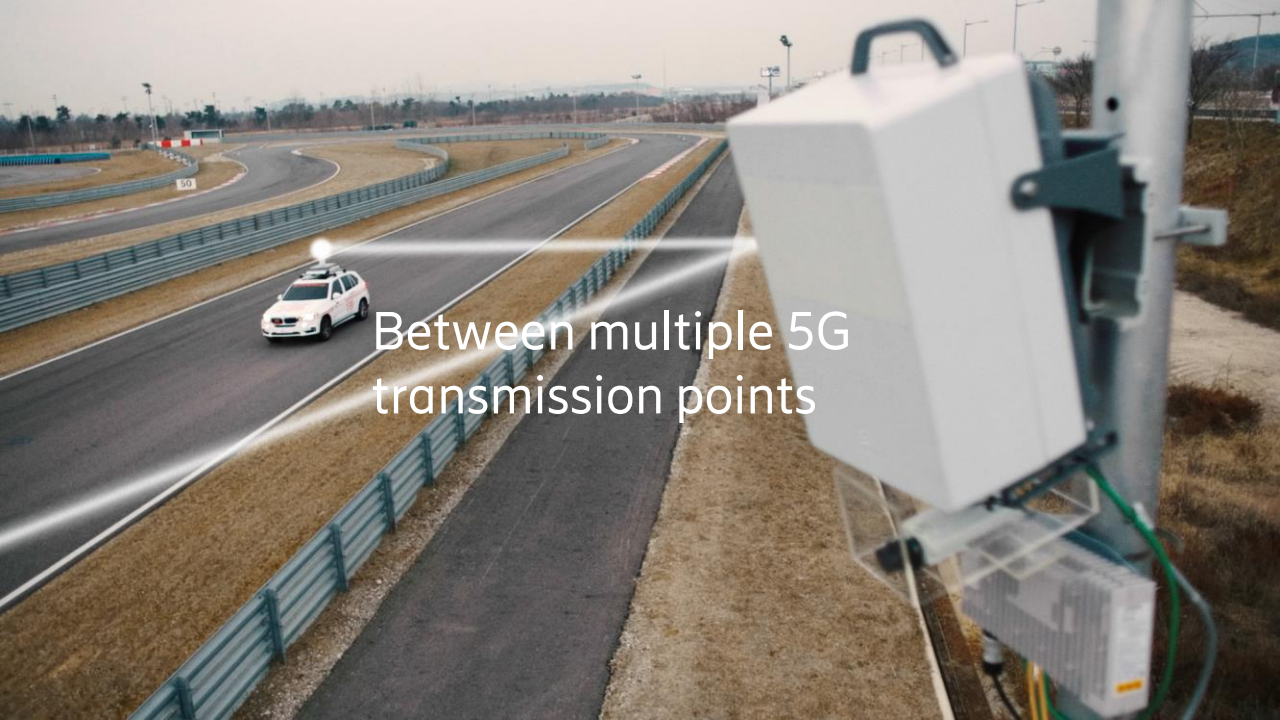
- Ericsson and Verizon tested a 5G network at the historic Indianapolis Motor Speedway
- The tests prove what's possible when you combine super low-latency with download speeds that exceed 6Gbps.

[Watch Ericsson and Verizon test the limits of 5G](#)

[Press release - Verizon and Ericsson test 5G technology in a home in the shadow of Indianapolis Motor Speedway](#)



Ericsson, SK Telecom and BMW Korea



Between multiple 5G transmission points

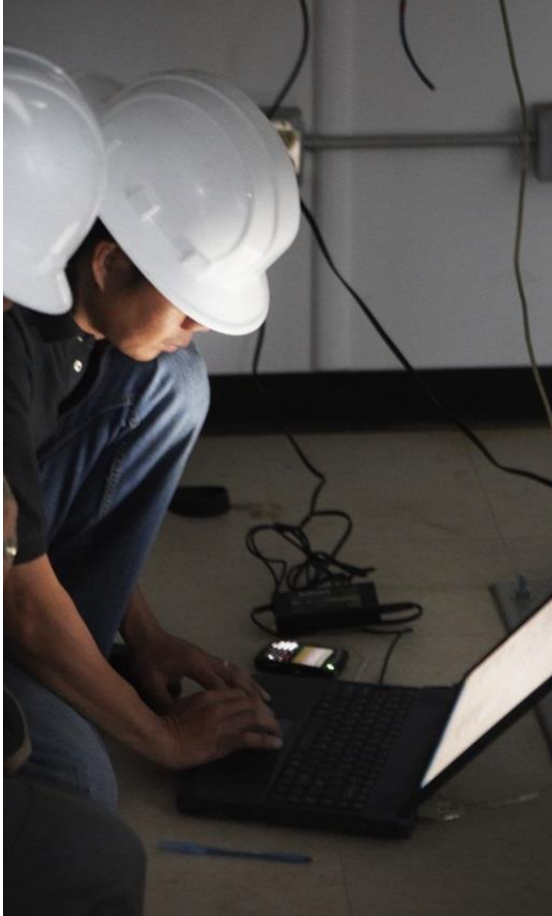
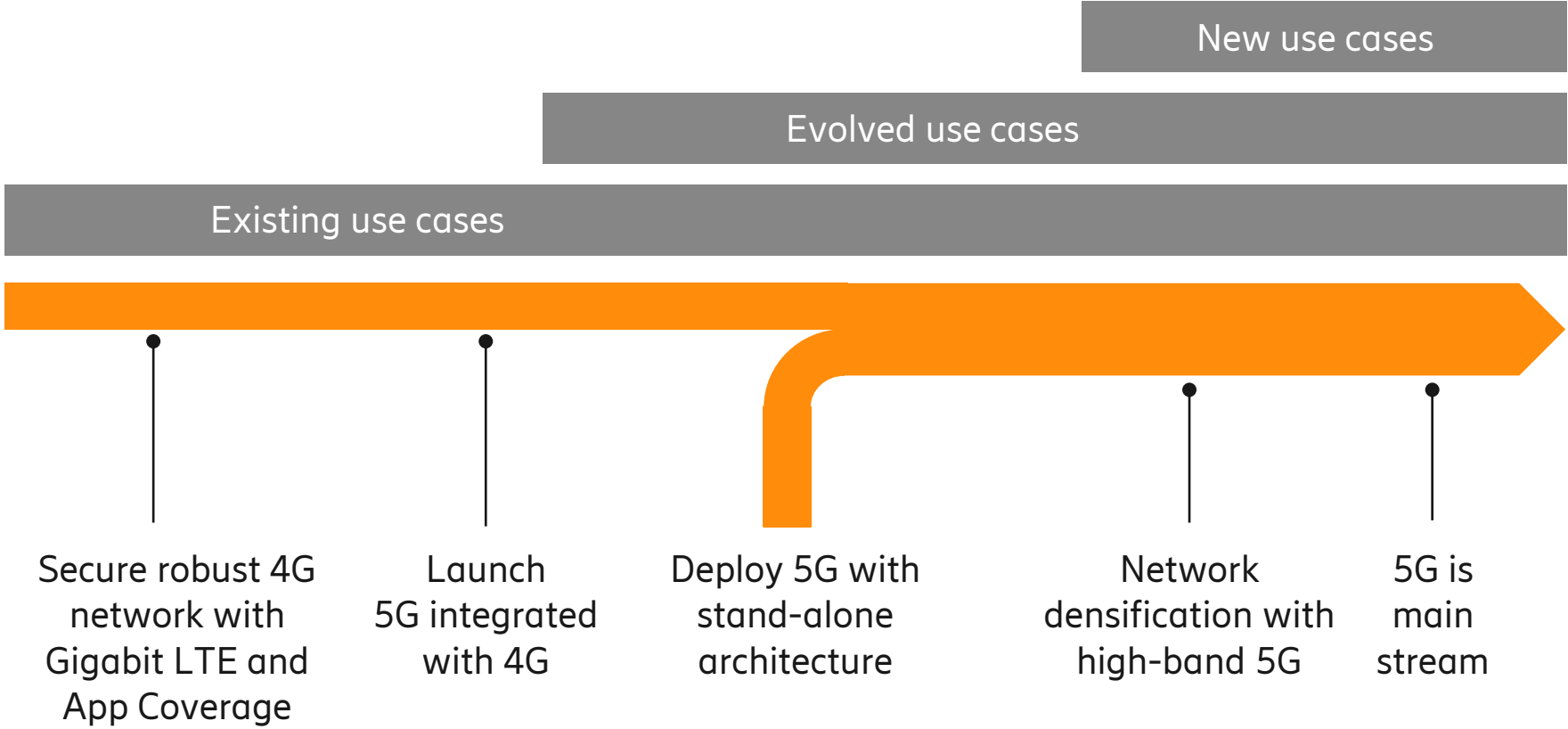
# Record-breaking 5G speed



- Ericsson and SKT conducted the most advanced outdoor 5G field trial ever
- Recording-breaking 3.6 Gbps at 170 kmph using beamforming, beam tracking and beam mobility
- 4 transmission points, 2 UEs/cars

[Read about Ericsson, SK Telecom and BMW Group Korea reach new world record speed with 5G](#)

# A 5G journey in multiple steps





# Summary



5G is here  
and operators are preparing!

A complete 5G network  
requires low,  
mid and high band

## Further information

- [This is 5G](#)
- [The advantages of combining 5G NR with LTE](#)
- [5G deployment considerations](#)
- [5G consumer business: ready when you are](#)

Coverage is the prerequisite  
to achieve high capacity  
from mid/high bands

To unleash the full potential of  
5G both NR and 5G Core are  
needed



[ericsson.com/5G](https://ericsson.com/5G)