

# Dynamic Spectrum Sharing



Dr. Sibel Tombaz  
Head of 5G High-band and Active Antenna Systems  
Ericsson

# Key building blocks to realize 5G vision

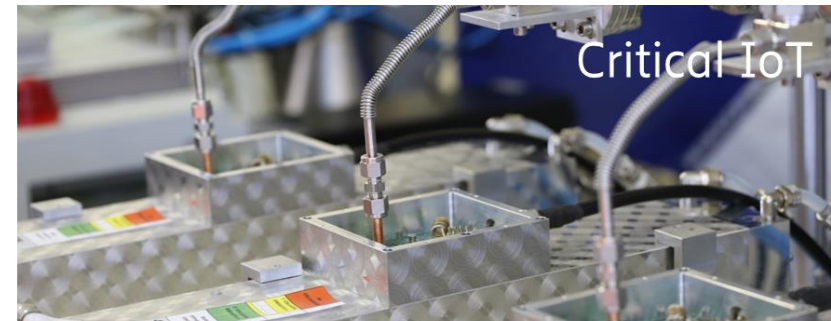
“One network for multiple use cases & industries”



Capacity  
& peak speeds

Latency  
& network slicing

Coverage



New spectrum bands



Standalone 5G



Low band 5G

# A complete 5G RAN network



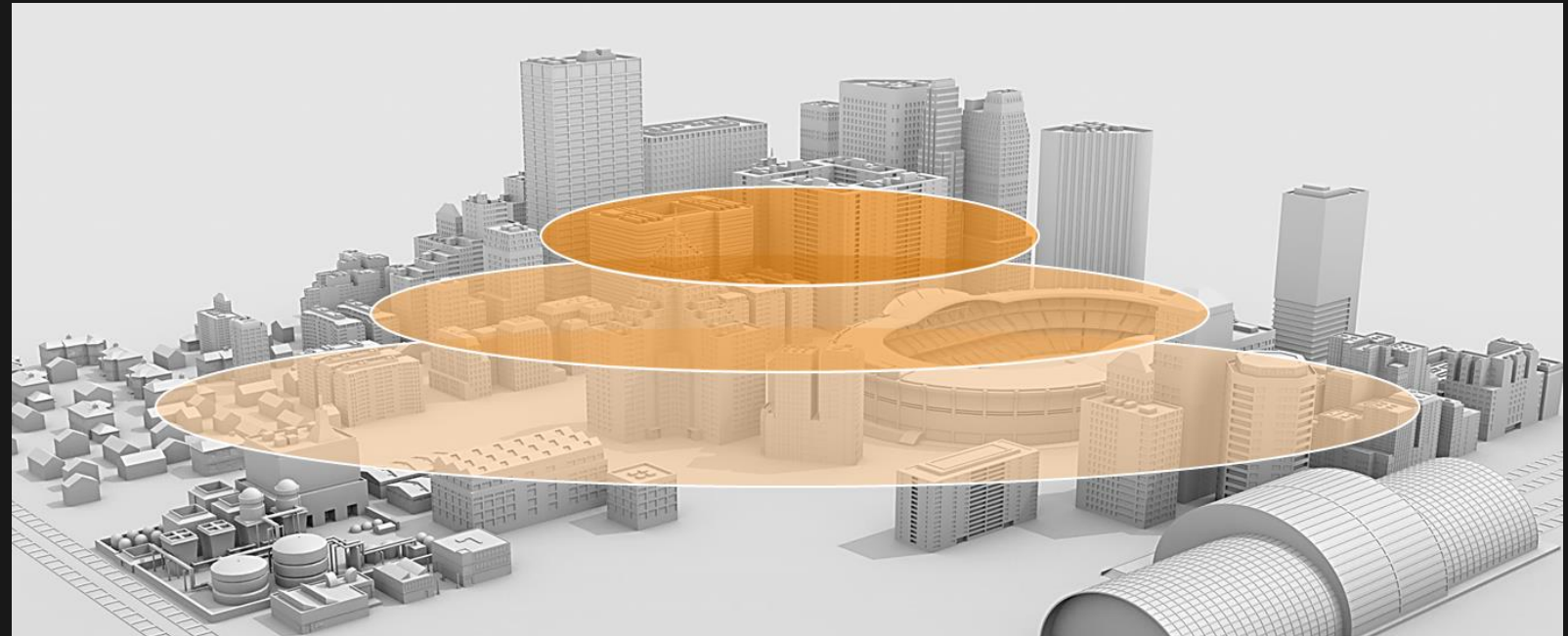
An integrated high -performance network for all uses cases including MBB, FWA and Enterprise

5G Stand Alone plus...

1. **Low-band** for nationwide coverage & indoor penetration
2. **Mid-band** for coverage & capacity in metro areas
3. **mmW** for targeted high capacity areas & services

All connected to a next gen 5G

**Core with full automation,  
exposure and service assurance  
capability**



1 Low-band nationwide

2 Mid-band metro

3 mmW dense urban

Fully coordinated multi-layer network for best performance and best flexibility to secure service differentiation

# NR low band provides more than "nation-wide 5G coverage"



**Race to Nation-wide NR Coverage**

Software update → wide area coverage

**NR vs. LTE: Spectral Efficiency & RAN Latency**

Bandwidth	LTE Peak Data Rate (Mbps)	NR Peak Data Rate (Mbps)	NR Spectral Efficiency Gain (%)
10 MHz	78	88	~14%
20 MHz	150	182	~17%
40 MHz	312	374	~20%

- Higher Spectrum Utilization
- More Flexible Overhead (CCH, RS)
- Lower Latency

**Boost mid and high band coverage with Carrier Aggregation**

Mid-band

Low FDD bands with ESS

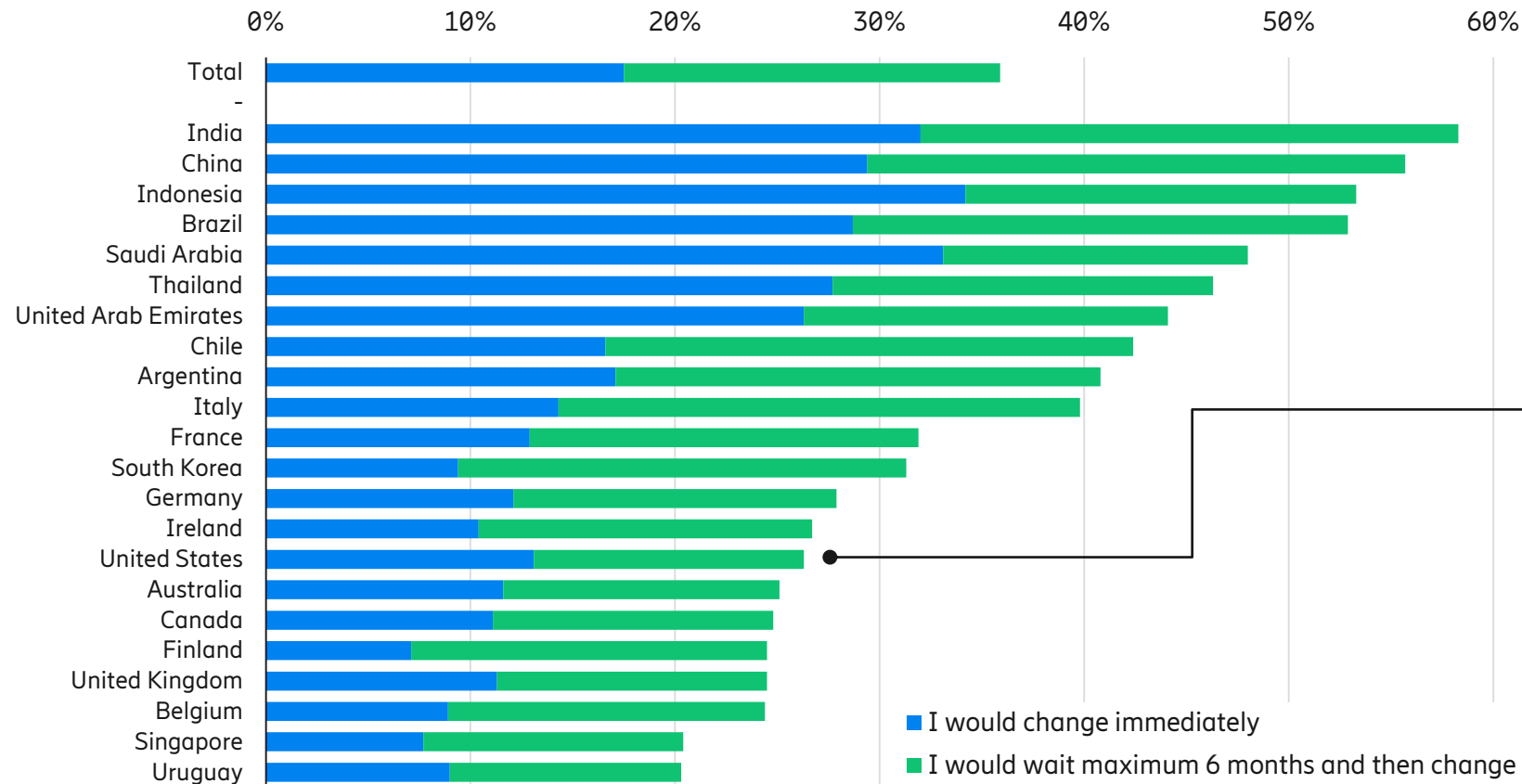
**Stand-alone coverage secured with 5G FDD bands Reduced network complexity**

- Low latency and network slicing
- Explore new use cases
- Voice over NR on FDD bands

# 1 in 4 people in United States will switch for 5G



Share who would switch operator if their own operator does not switch on 5G and somebody else does in the market



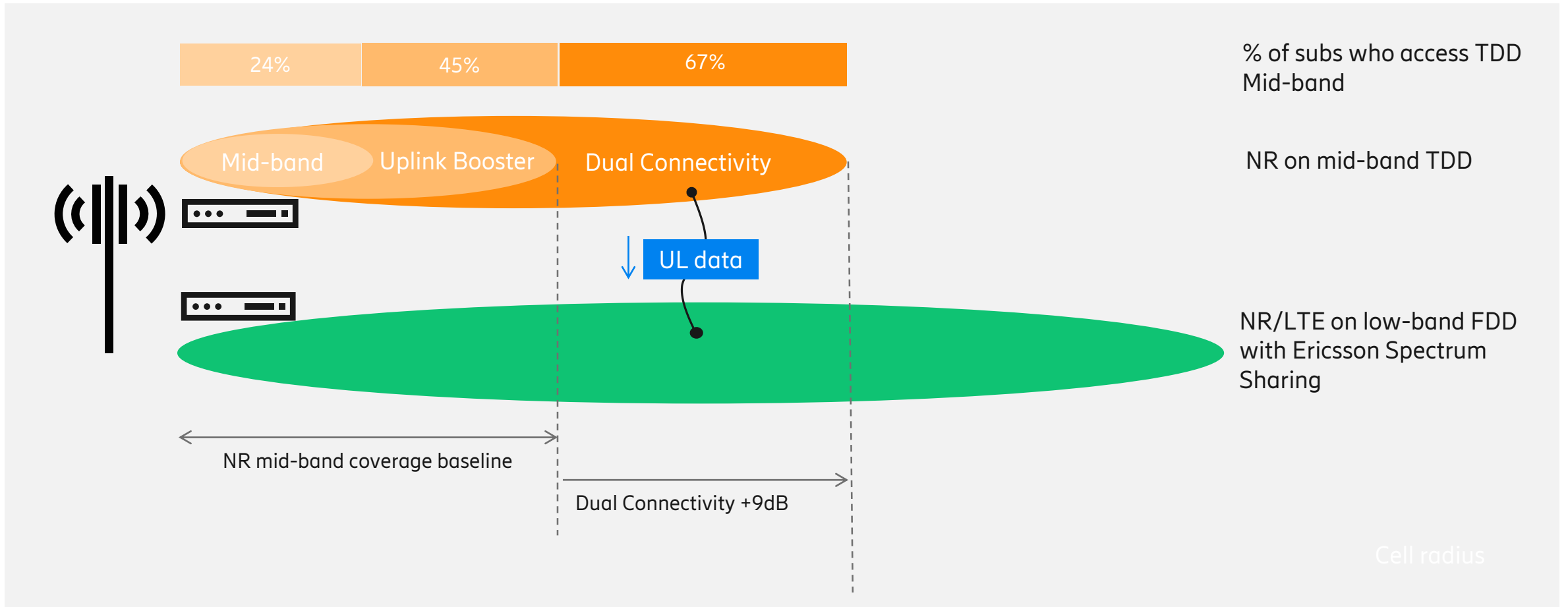
**1 in 4**  
In United States would switch mobile broadband provider **within 6 months** if their own operator didn't offer 5G.

**1 in 10**  
would change immediately

Base: Smartphone users aged 15-69  
Source: Ericsson ConsumerLab 5G Potential Study, May 2019

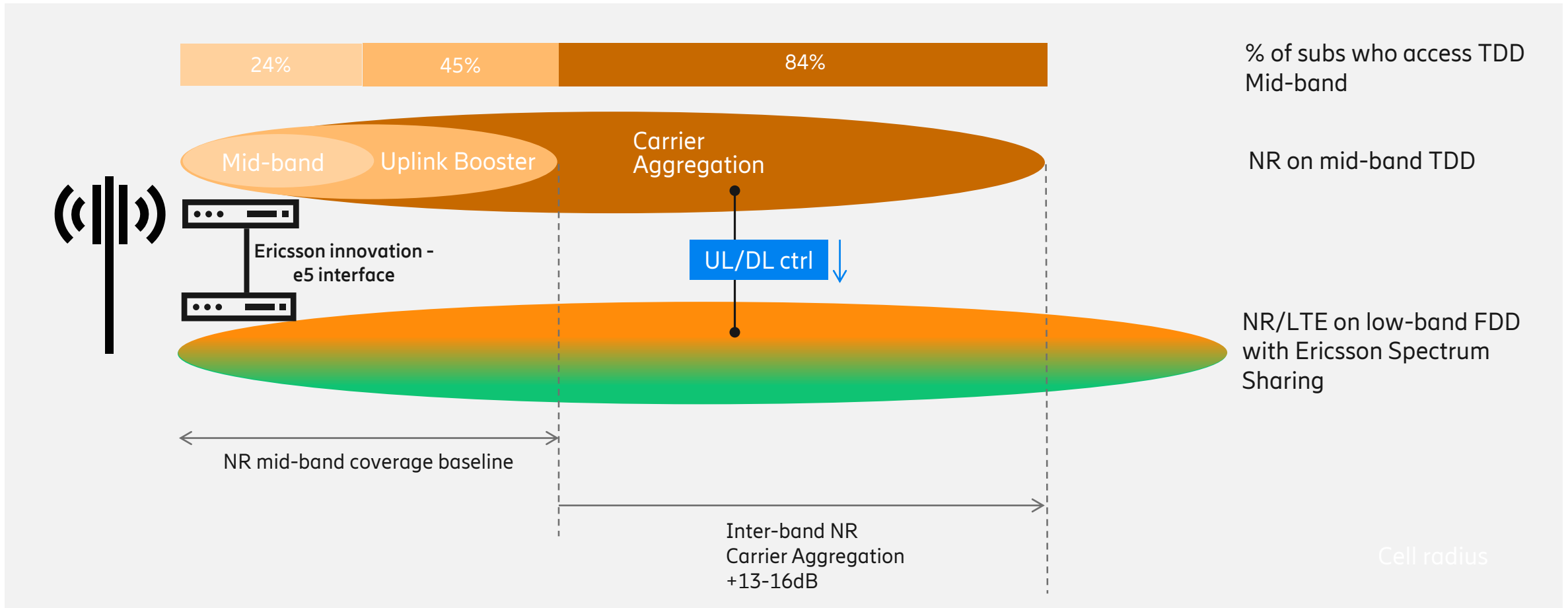
# Migration to Stand-Alone

Maximize network spectrum efficiency with Dynamic Spectrum Sharing



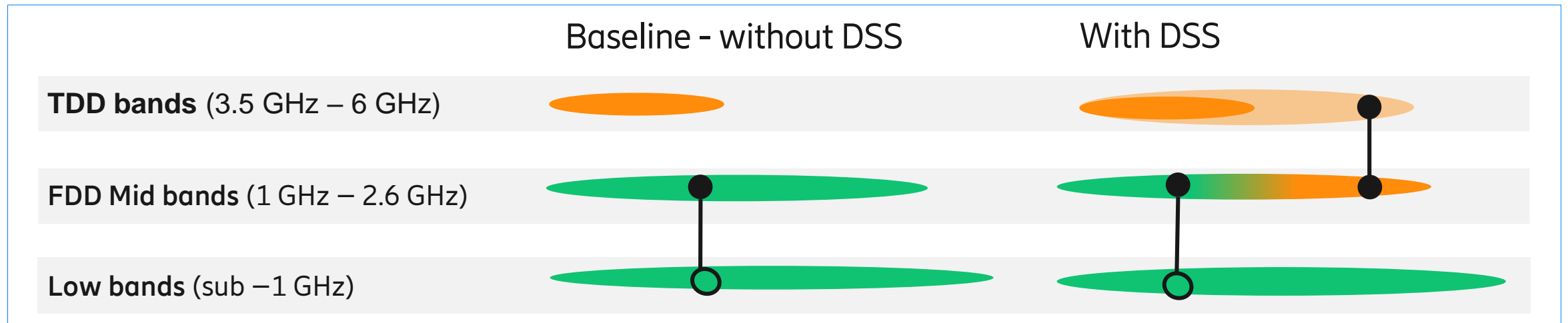
# Migration to Stand-Alone

Maximize network spectrum efficiency with Dynamic Spectrum Sharing



# Migration to Stand-Alone

Maximize network spectrum efficiency with Dynamic Spectrum Spectrum Sharing



**3.5GHz Extended Coverage**

Thanks to CA with FDD bands

**Nationwide 5G coverage**

Switch on 5G with SW upgrade

**Higher DL User Throughput**

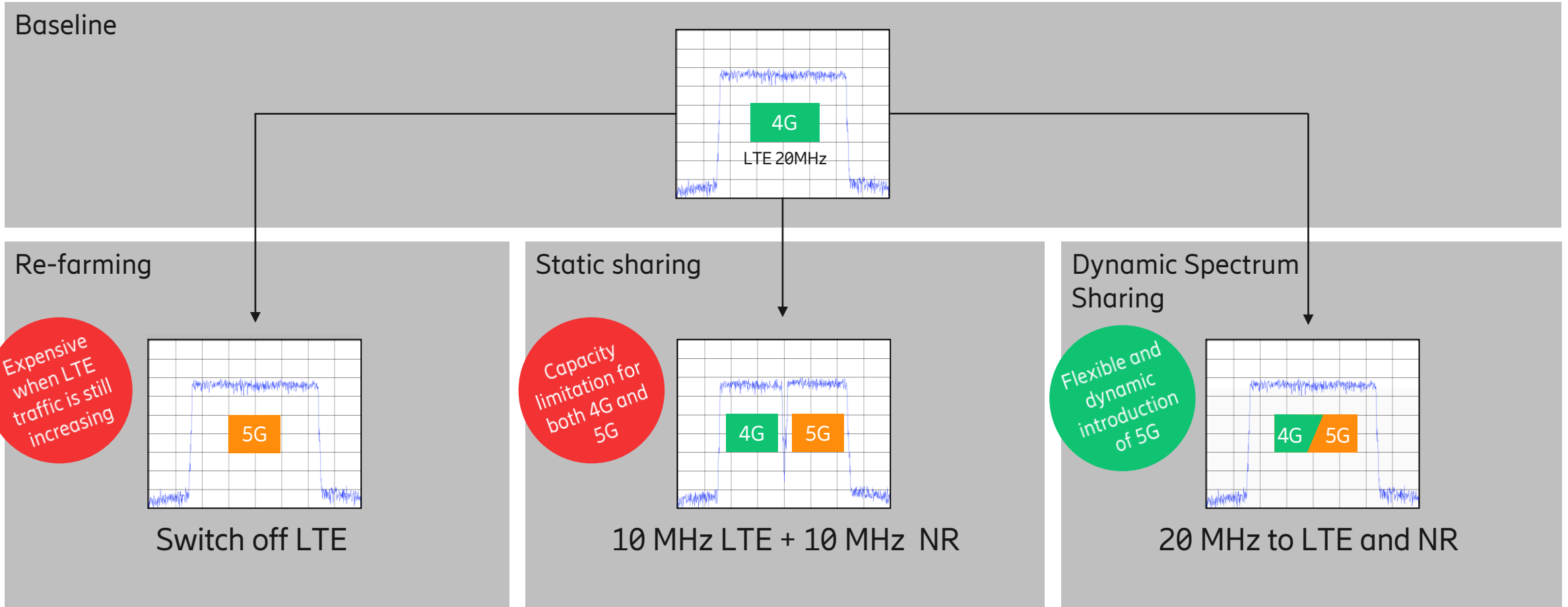
3.5GHz BW available to more UE's

**Standalone Ready**

SA low latency via SW upgrade



# Ways to enable 5G on FDD

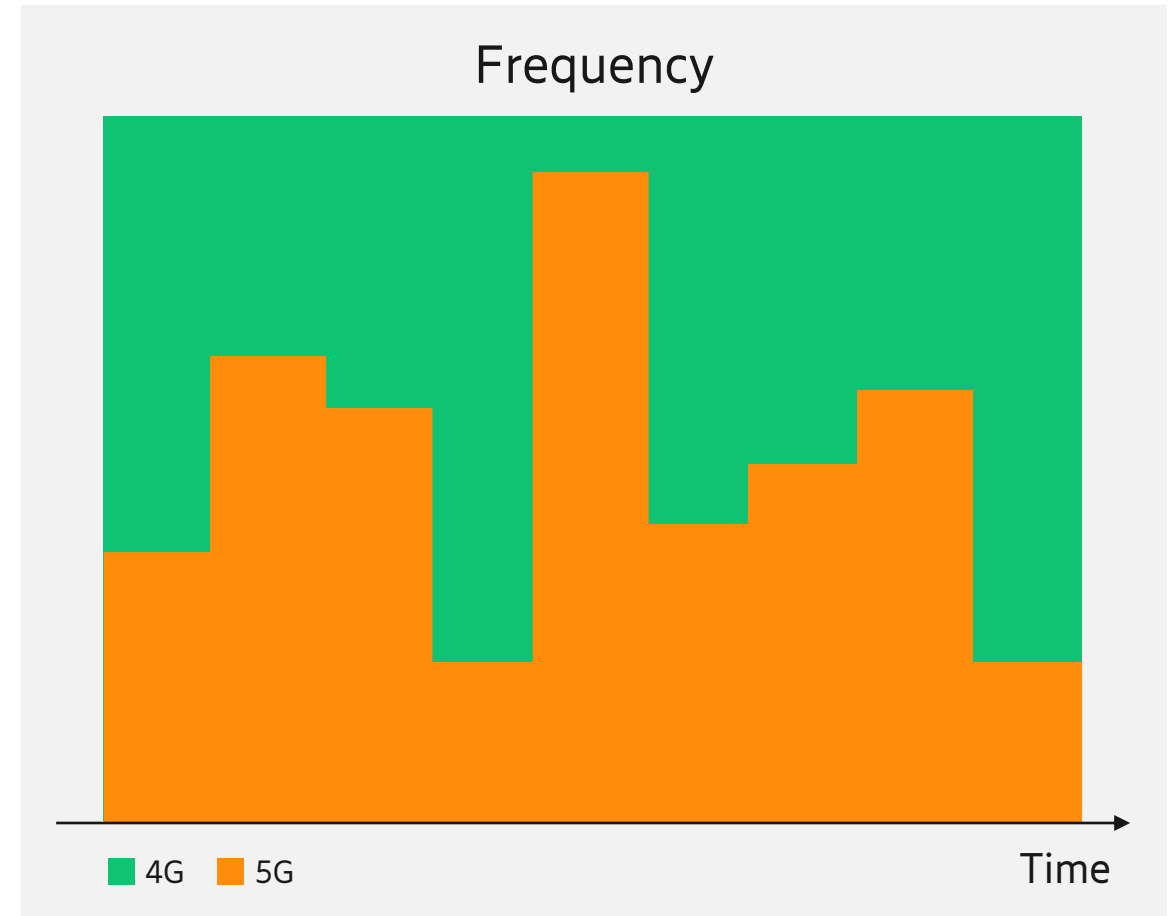


# Dynamic Spectrum Sharing



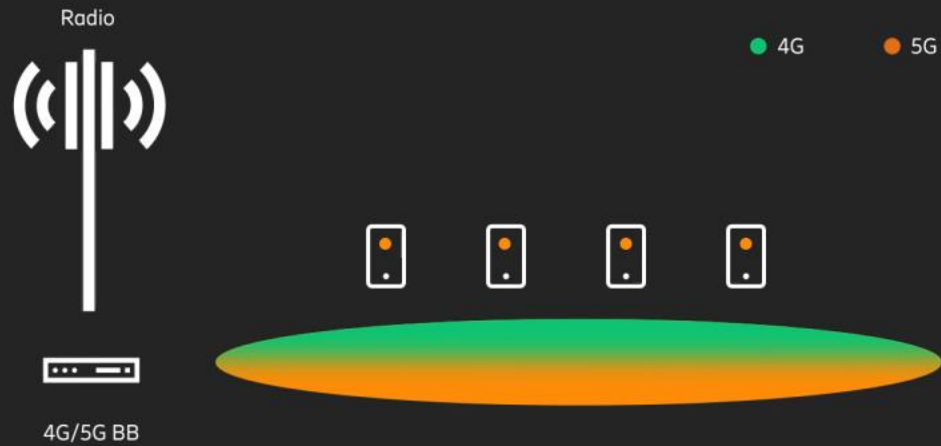
## What is Dynamic Spectrum Sharing

- Introduce 5G in existing 4G bands without **hard/static** refarming spectrum
- **Smooth and fast** migration
- **Lowest** TCO for 5G introduction
- **Shared** infrastructure+ Spectrum

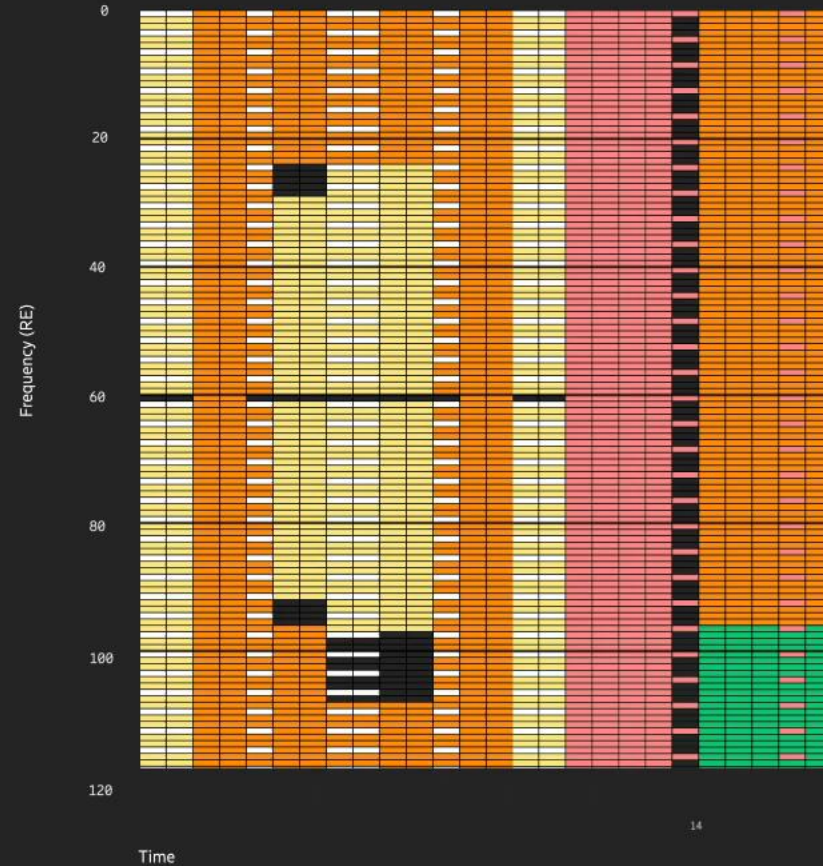


# Dynamic Spectrum Sharing

How does it work



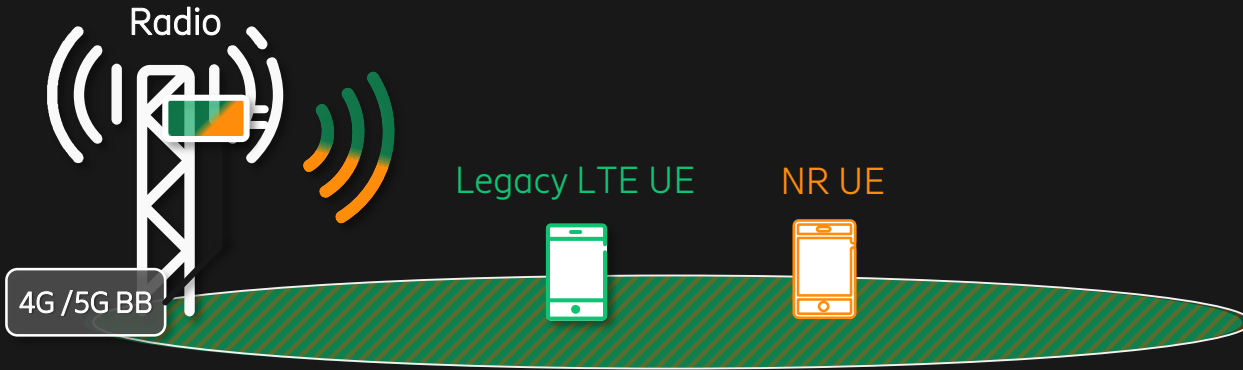
Ericsson Spectrum Sharing dynamically allocates spectrum allocation to 4G and 5G based on instantaneous traffic in the cell



ESS

# Dynamic Spectrum Sharing

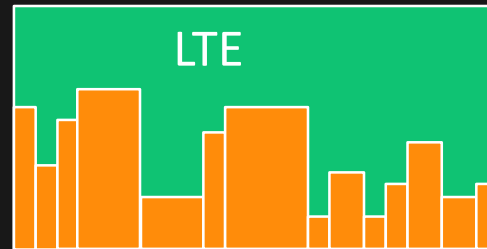
## Spectral Efficiency Gain



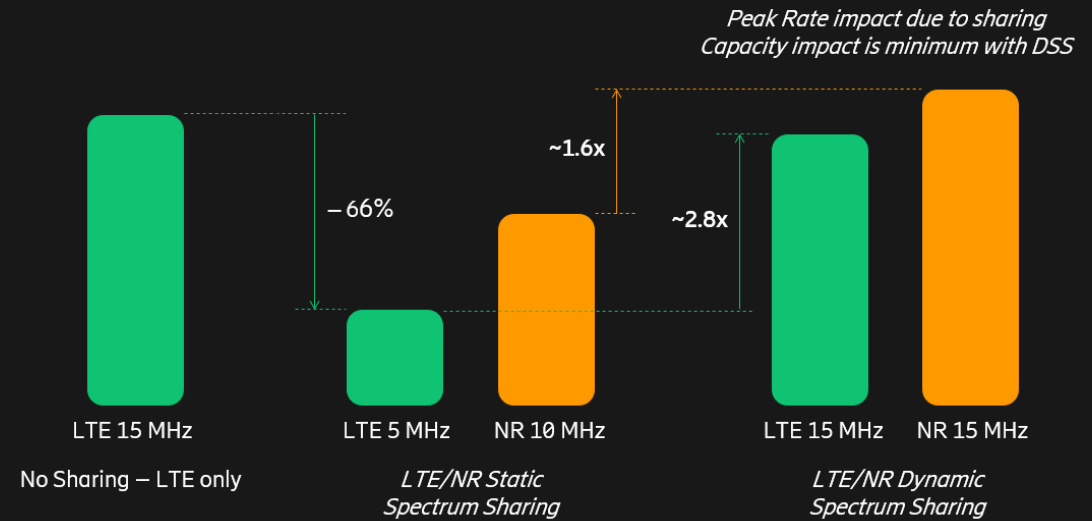
Static Sharing



Instant Sharing



### Impact of static versus dynamic spectrum sharing



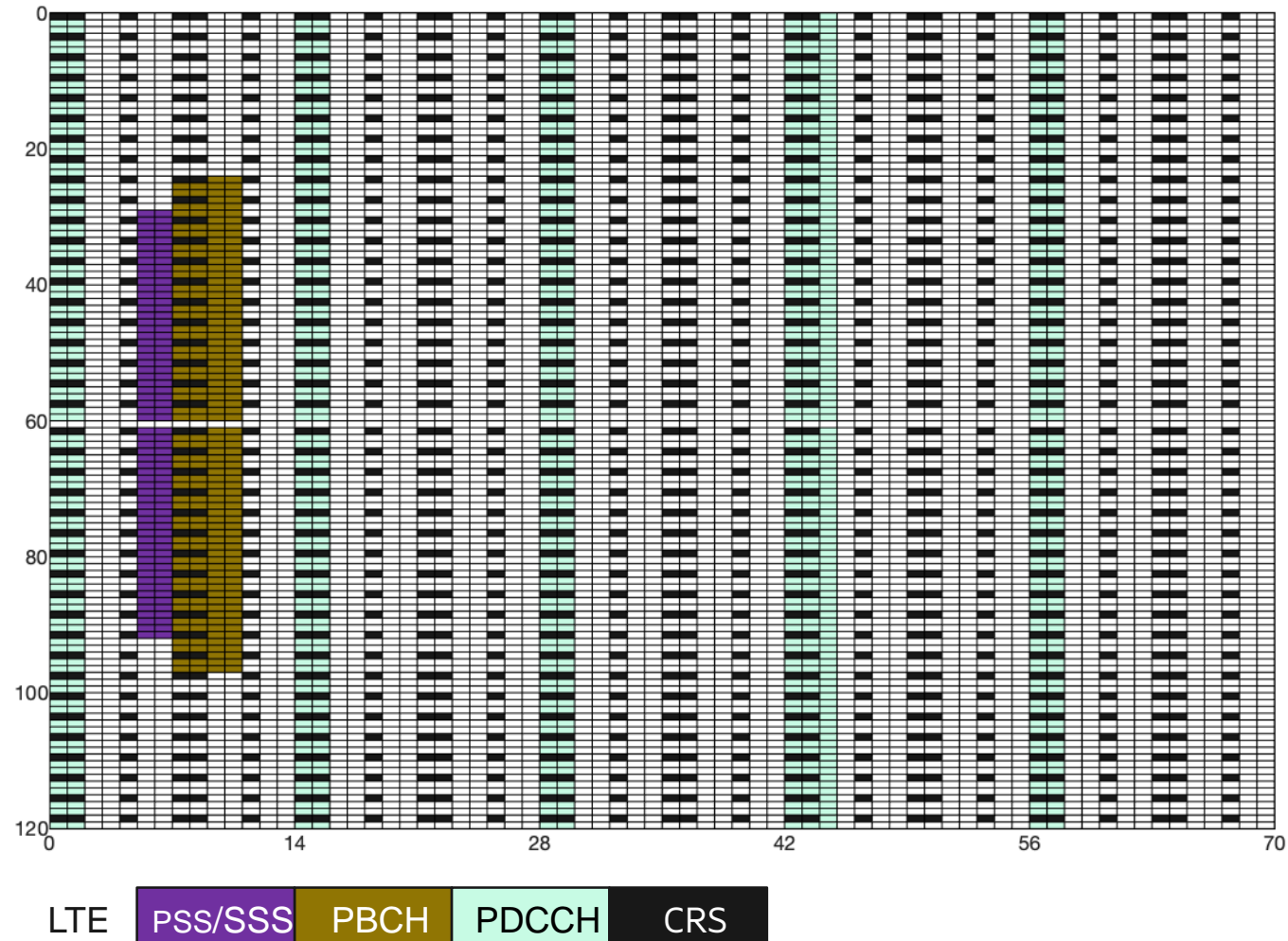
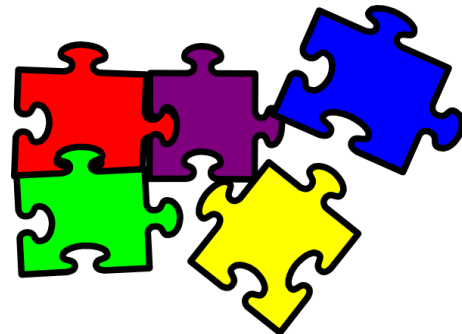
Dynamic Spectrum Sharing will allow "soft" re-farming to NR with minimal impact to LTE performance

# Dynamic Spectrum Sharing

## Step1: Solve the puzzle



- In LTE-NR spectrum sharing two RATs share the same spectrum
- An "empty" LTE cell (an LTE cell without user data) is not really empty
- NR provides some tools to solve this "LTE-NR signal puzzle" but does not give the "recipe"
- Ericsson spectrum sharing provides tools and configurations to avoid collisions between LTE and NR signals.

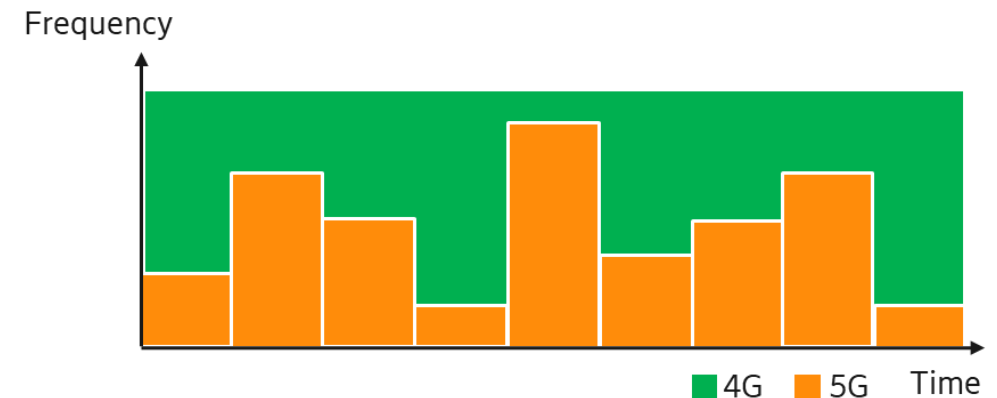
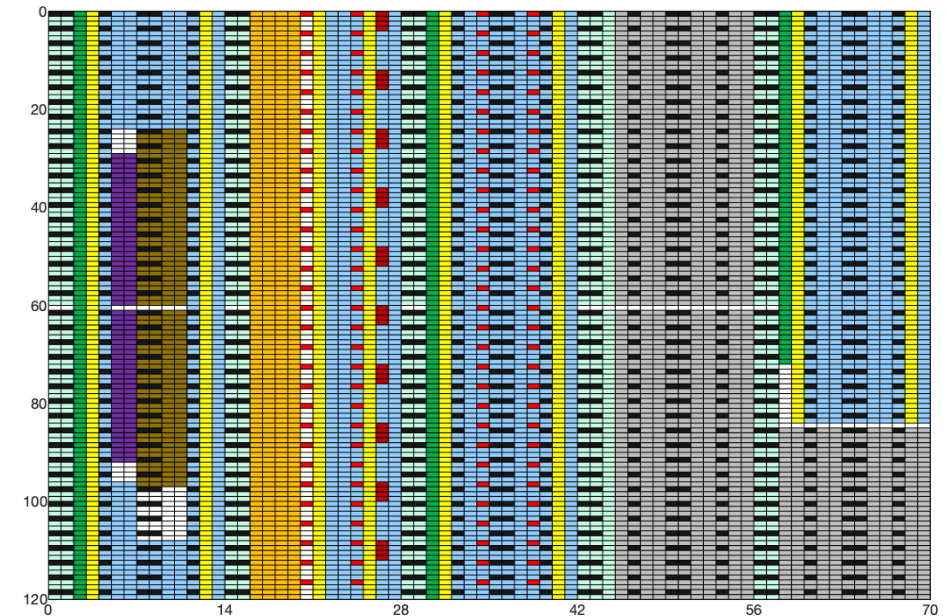
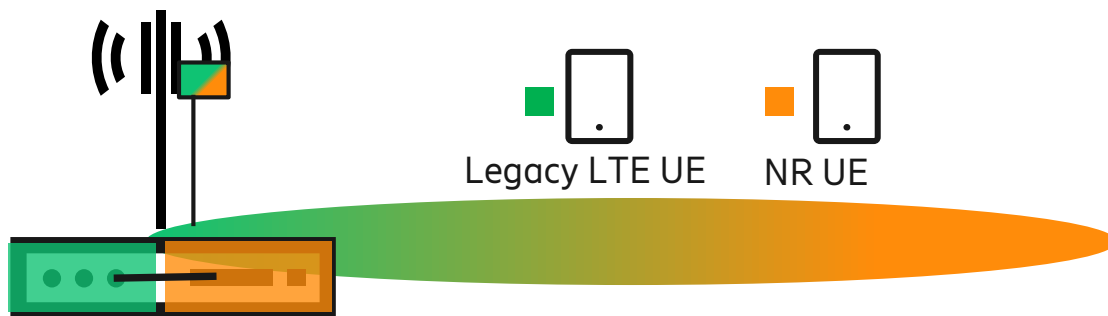


10 RBs x 5 subframes, only LTE common signals

# Dynamic Spectrum Sharing

## Step2: Dynamically allocate the remaining PRBs to LTE and NR User

- In mixed-mode baseband configuration, Ericsson unique interface will be used to ensure coordination between LTE and NR schedulers
- Objective
  - To maintain inter-RAT fairness, compare scheduler or RB priorities
  - Could follow all rules of both RATs and produce best possible outcome



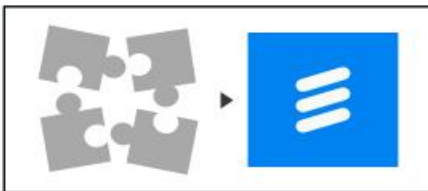


# Ericsson Spectrum Sharing will revolutionize how operators deploy new technologies starting from 5G!



## Swisscom Taps Ericsson Spectrum Sharing Software to Achieve Nationwide 5G Coverage

4 MONTHS AGO | BY SHARMA | 1.6 MIN READ | CORNARO



### Blog: Why is operator interest in DSS on the rise?

06 AUG 2019 | AUTHOR

Ericsson's dynamic spectrum sharing capabilities in our view give it a competitive advantage. We see this functionality as allowing telcos to save substantially on costs related to spectrum usage. This helps telcos manage the transition to full 5G in a cost effective manner, given that they do not have to buy new spectrum bands right away to make use of 5G ready equipment, but rather can leverage bands that might otherwise have been used for 4G. *Goldman Sachs*

## FierceWireless

WIRELESS TECH 5G IOT

Wireless

### Marek's Take: Dynamic spectrum sharing may change the 5G deployment game

2020-03-17 | ESS Overview | Commercial In Confidence | Page 15

# World's first ESS call is achieved! Big breakthrough for wireless communication!

## Breakthrough 5G data call using dynamic spectrum sharing to accelerate nationwide 5G deployments

Cost-effective and efficient solutions that enable a smooth transition from 4G to 5G have been part of Ericsson and Qualcomm Technologies' pioneering 5G approach from day one. With Ericsson Spectrum Sharing and Qualcomm® Snapdragon™ 5G Mobile Platforms, service providers can tap spectrum currently used for 4G to launch nationwide 5G coverage with a simple network software upgrade.

NEWS | SEP-04, 2019

5G Networks #dynamicspectrumsharing #nationwide5G

<https://www.ericsson.com/en/news/2019/9/ericsson-spectrum-sharing>



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# DSS a "Game Changer"

QUALCOMM 5G SUMMIT 2019

## Qualcomm's Dean Brenner explains 5G spectrum and the 'game changer' DSS



Qualcomm president speaks about Dynamic Spectrum Sharing: [https://ericsson.sharepoint.com/sites/PDU\\_LTE\\_PLM\\_Collaboration/compentencecells/documents/5G/oneNote/5G-NR%20-%20Linked%20Files/VID\\_QualcommSummit\\_DSS\\_Demo\\_20191015.mpd](https://ericsson.sharepoint.com/sites/PDU_LTE_PLM_Collaboration/compentencecells/documents/5G/oneNote/5G-NR%20-%20Linked%20Files/VID_QualcommSummit_DSS_Demo_20191015.mpd)

## Qualcomm president calls for 5G coverage push



LIVE FROM QUALCOMM 5G SUMMIT 2019, BARCELONA: Cristiano Amico (@cristiano) issued a rallying cry for the industry to focus on and 5G users to share the same spectrum band, as a key driver of coverage expansion.

"We never had this in any transition of wireless and this will allow rapid transition of coverage. It's going to be the most important feature we are going to see for the scale of 5G in 2020."

# Swisscom - 1<sup>st</sup> nationwide 5G coverage with 2100MHz (B1/n1) ESS

## First over-the-air ESS data call, Oct-31



### Key milestone for 5G nationwide with Swisscom

- Shared NR and LTE 2100MHz FDD carrier
- Qualcomm Snapdragon X55 IODT device
- Ericsson Dynamic Spectrum Sharing SW

Industry-unique, Ericsson/Swisscom innovation and partnership for technology and performance leadership

2020-03-17 | ESS Overview | Commercial In Confidence | Page 16

## First intercontinental ESS data call, Nov-29



### ESS connects 5G networks and devices from 2 continents

- Connects 5G data call between Bern, Switzerland & Gold Coast, Australia
- A step closer to commercial Dynamic Spectrum Sharing SW deployment in the end of 2019

Partnership between Ericsson and industry leaders OPPO, Qualcomm Technologies, Swisscom and Telstra

# GLOMO awards 2020

## CTO Award & Best Mobile Technology Breakthrough Award for ESS

- Ericsson solution won the Overall Mobile Technology Award, also known as the CTO Award as well as Best Mobile Technology Breakthrough Award for this innovation due to large contribution to the wireless industry

“What I love about it is that it will allow us to transition from one technology to another utilizing the same spectrum band. This has not been achievable until now,”

“This is a powerful enabler that will help accelerate the rollout of 5G by maximizing the re-use of existing hardware, thus saving costs while avoiding disruption to customer service, and helping to speed time to revenue for both telcos and customers.”





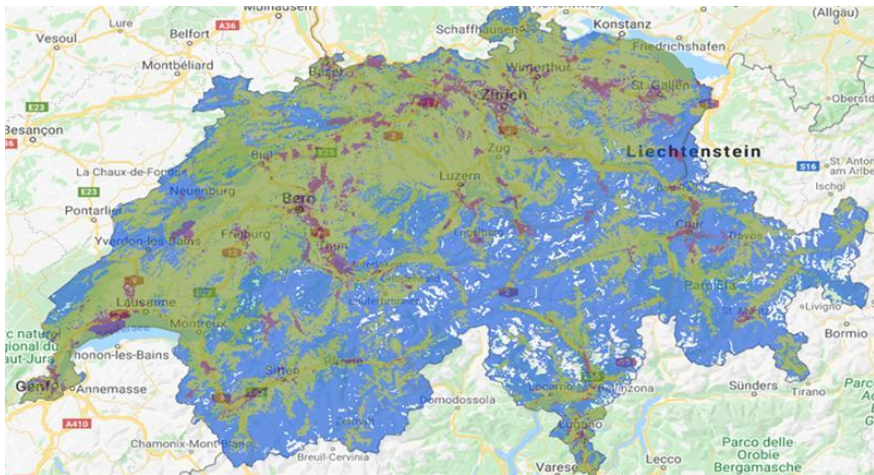
# Dynamic Spectrum Sharing

## The power of "5G Switch"



### Swisscom

90% pop coverage is achieved,  
Dec. 2019



"ESS is key for a fast adoption of 5G. It's a win-win approach for customers and operators. Customers benefit from 5G in no time and operators use their precious spectrum in the most efficient manner. We are proud to have been part of the ESS journey from the very beginning. In the meantime, we already reached nationwide coverage with 90 percent of the population with 5G." Christoph Aeschlimann, CTO of *Swisscom*.

### Vodafone Ziggo

80% pop coverage is achieved,  
April 2020

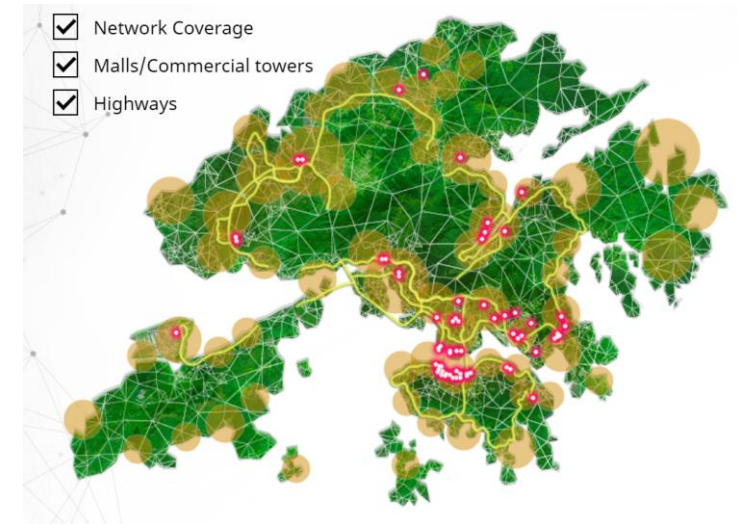


"We are introducing 5G via 'spectrum sharing' in our GigaNet. For example, customers in the Netherlands can already experience the latest mobile generation, because 5G is an evolution that opens doors to new possibilities"

*Jeroen Hoencamp CEO of VodafoneZiggo.*

### SmarTone

70% pop coverage is achieved,  
May 2020



"Riding on its powerful LTE network and Ericsson's industry-leading Dynamic Spectrum Technology (DSS), SmarTone's 5G network features a speedy rollout with the widest coverage across Hong Kong and a seamless transition between 4G and 5G. This can ensure a stable and smooth user experience and longer smartphone battery performance" SmarTone news release

# Sharing for the best performance



## Dynamic Spectrum Sharing

## A better way to build 5G

- Re-use of spectrum
- Re-use of installed base
- Re-use of sites

## Realize 5G vision

- Highest spectrum efficiency
- Fastest – 1ms 5G/4G spectrum sharing
- Full eco-system support

## Take the full advantage

- 5G wide area coverage
- Boost coverage and capacity with CA
- Smooth migration to standalone 5G



