



2020 AND BEYOND BUSINESS PRESSURES AND OPPORTUNITIES

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HOW WILL 5G IMPACT THE NETWORK OPERATOR'S BUSINESS?

BROADBAND

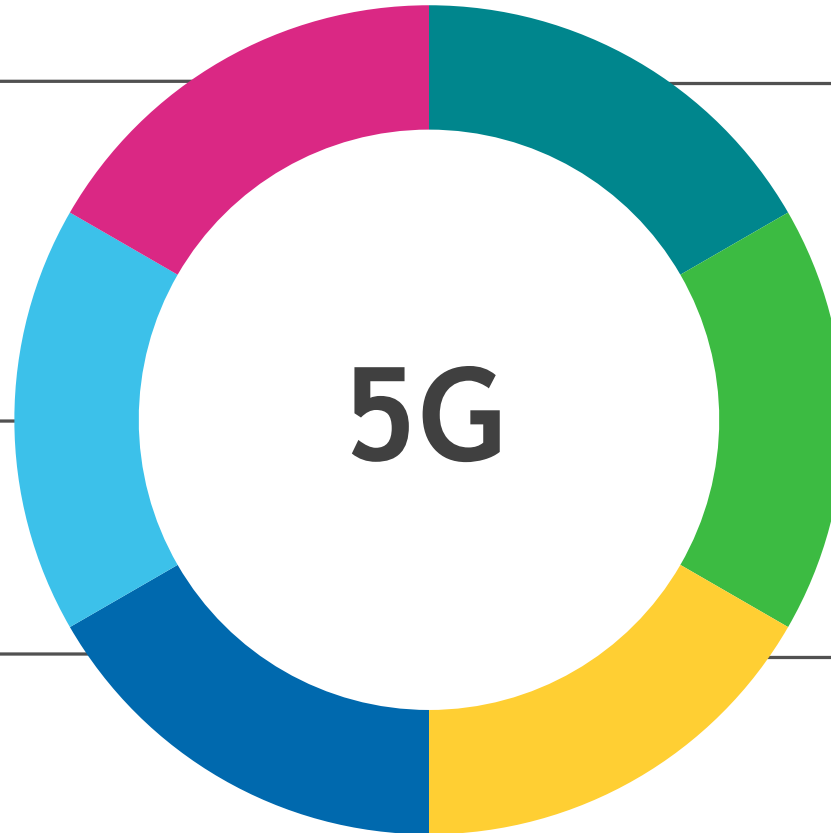
Massive traffic capacity
Reduce Cost
Spectrum efficiency
Access new spectrum

INNOVATIVE SERVICES

Flexible bearer design
3rd party policy

CROWD

Massive user density
User content
Correlated behavior



MISSION CRITICAL

Latency
Reliability
Availability
Security

BATTERY LIFE

Signaling reduction
Energy optimization

NON TRADITIONAL DEVICES

Short packet
Sporadic access
More devices
More device types

IT REQUIRES THAT THE REMAINING ISSUES WITH MOBILE NETWORKS BE SOLVED

WHAT WILL 5G LOOK LIKE?

BUILT ON THE FOUNDATION TECHNOLOGIES INTRODUCED BY 4.5G

- Radio features

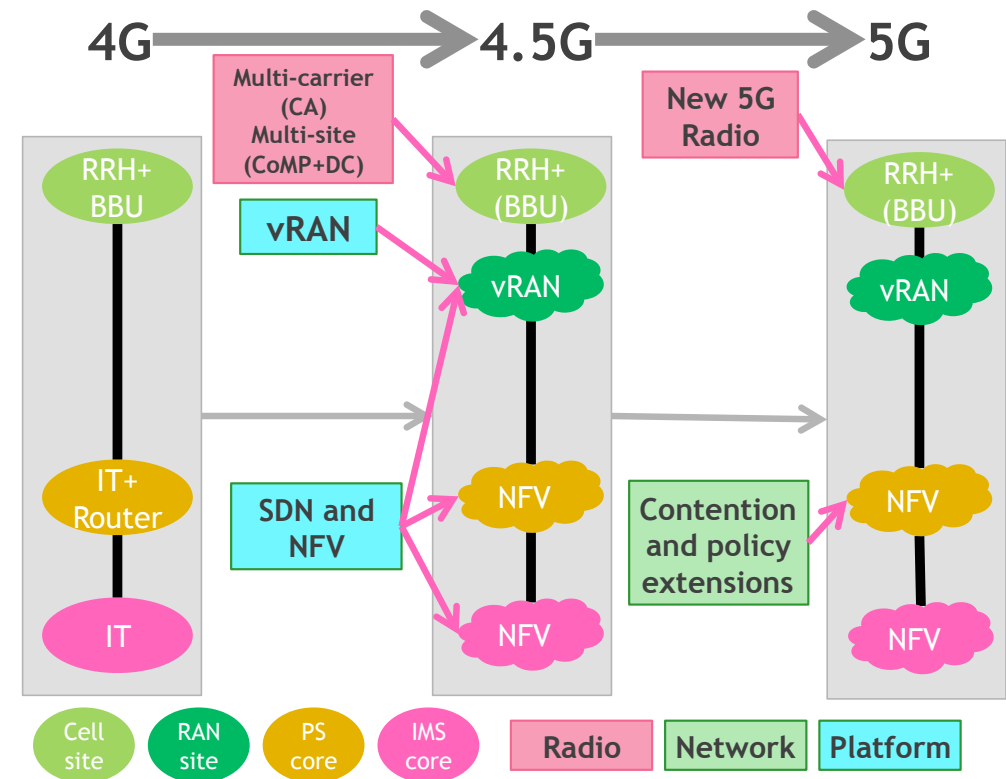
- Combining carriers: Carrier Aggregation:
- Combining sites: Dual-Connectivity and CoMP
- Combining cellular and WLAN: RAN based interworking

- Network features

- Voice and multimedia with VoLTE and WebRTC
- Combining cellular and WLAN: SaMOG/ePDG
- Policy based networking: ANDSF and PRCF

- Platform features

- Virtualizing cell site processing: vRAN
- Virtualizing network: NFV and SDNs

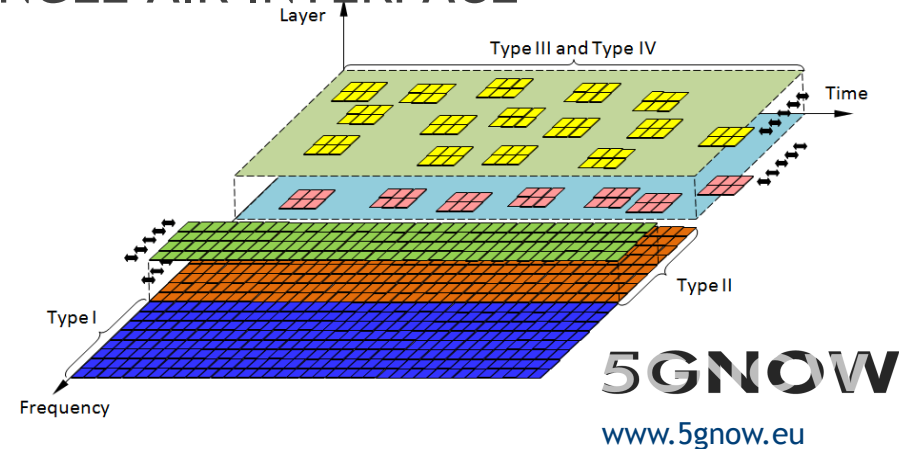




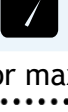

4.5G HAS ALREADY STARTED AND IS LAYING DOWN THE FOUNDATION TECHNOLOGIES FOR 5G

WHAT WILL 5G LOOK LIKE?

5G RADIO: ADDING MULTI-SERVICE ON SINGLE AIR INTERFACE

- Challenge:
 - Combine broadband and small packet traffic
 - Be resource efficient (energy, spectrum, network)
 - Low overhead , low complexity, simple terminals
 - Offer high reliability & low latency options
 - Add contention mode for bursty traffic
- May not be achievable via direct LTE evolution

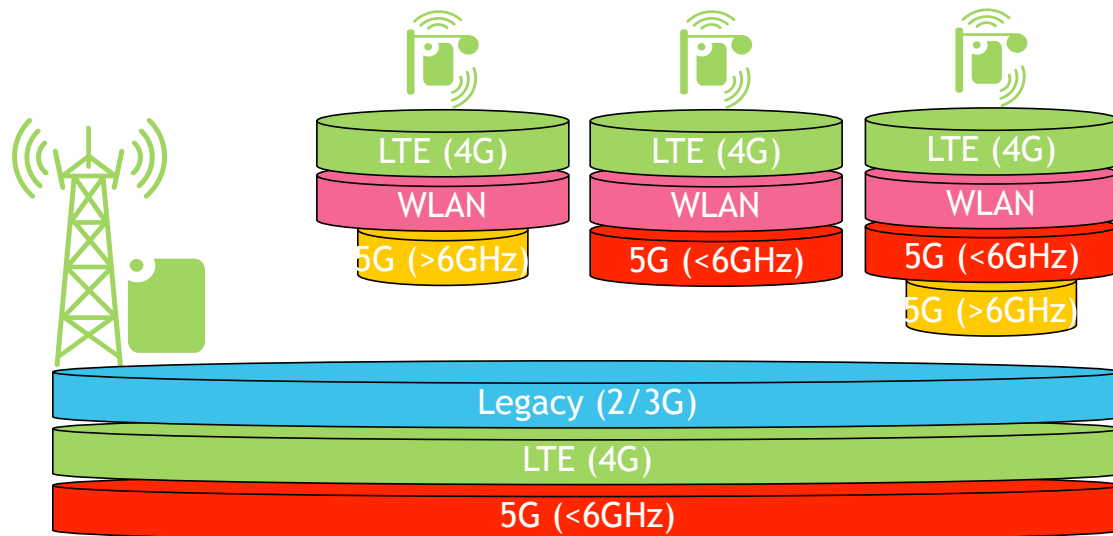


Traffic Type	Synch?	Access Type	Properties
I 	closed-loop	scheduled	classic high volume data services
II 	open-loop	scheduled	HetNet and/or cell edge multi-layered high data traffic
III 	open-loop	sporadic, contention-based	few bits, supporting low latency, e.g. <i>smartphone apps</i>
IV 	open-loop/none*	contention-based	energy-efficient, high latency, few bits

*: none for maximal energy savings at Tx, open-loop for reduced complexity at Rx

5G DEPLOYMENT MODEL

NEW 5G CARRIERS COMPLEMENT 4G CARRIERS AND WLAN



MULTIPLE CARRIERS AND SITES
 COMBINED WITH CA AND DC
 LTE COMBINED WITH 5G CARRIERS

NEW CARRIER <6 GHZ AT MACRO SITES

- Contention services
- Primary carrier for 5G control plane
- Fallback user plane

NEW CARRIER < 6GHZ AT SMALL CELL SITES

- Secondary carrier user plane
- Primary carrier for indoor coverage

NEW CARRIER >6GHZ AT SMALL CELL

- Secondary carrier user plane
- Unlikely to match lower band coverage

SO WHAT IS 5G?

IT'S **NOT**
ABOUT SPEED

IT'S **NOT**
JUST A NEW
5G AIR
INTERFACE

IT'S **NOT**
JUST ABOUT
ENABLING
M2M

IT **IS** ABOUT
IMPROVING THE
PERFORMANCE
FOR THE CONSUMER

IT **IS** ABOUT
ENABLING
NEW TYPES OF
APPLICATIONS
AND TERMINALS

IT **IS** ABOUT
MAKING THE
NETWORK
MORE AGILE
AND OPTIMUM FOR
EACH APPLICATION

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