

A world map showing 4G LTE coverage with red dots and lines. The map is set against a dark blue background with a subtle grid of red dots. Red lines radiate from the edges of the map, suggesting global connectivity.

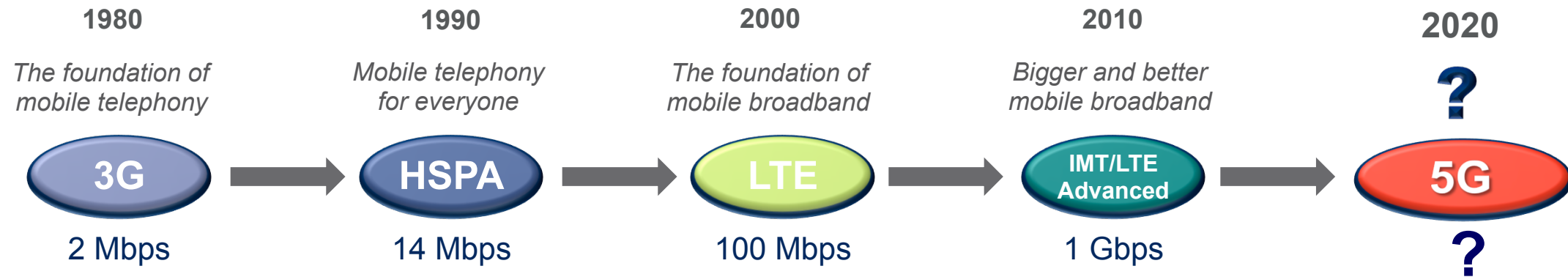
4G Mobil-szélessáv: Hogyan jutunk 4-ről az 5-re

Novák Csaba
Ericsson Magyarország

LTE Subscriptions

1H 2014 298 012 134

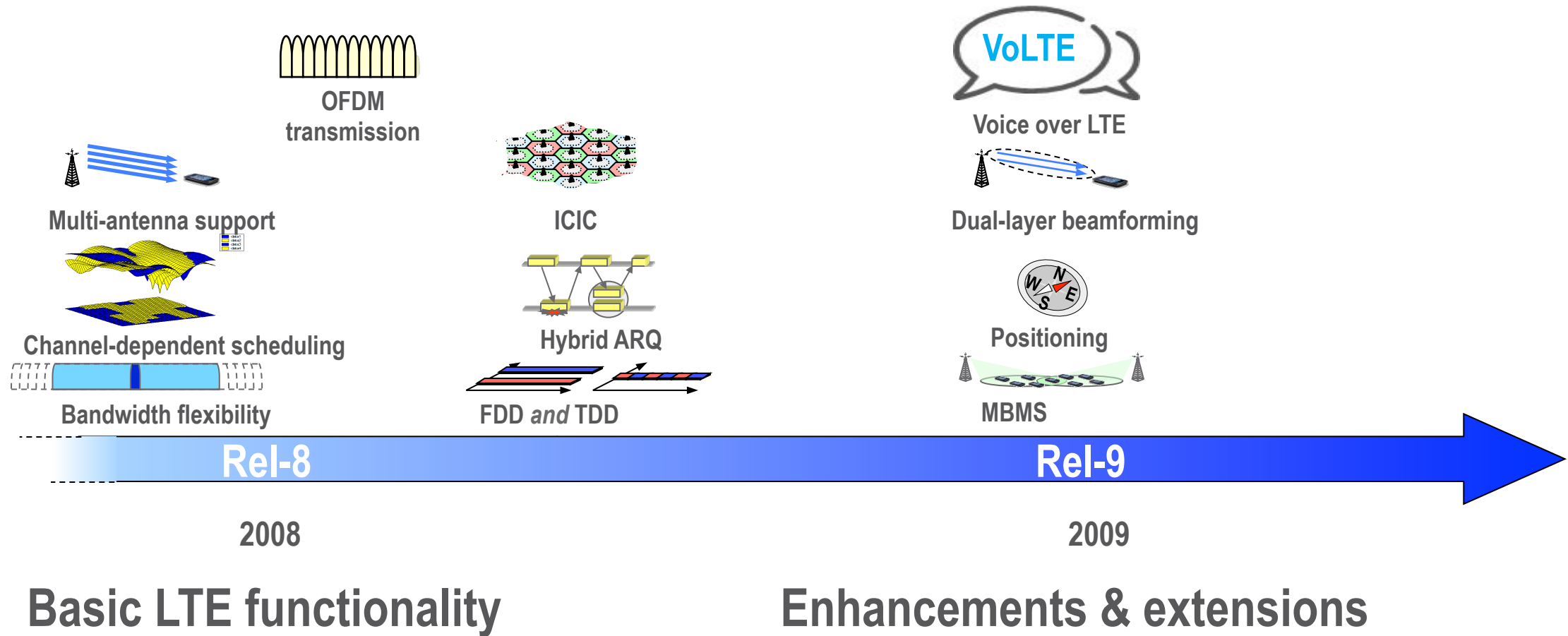
Wireless-access generations



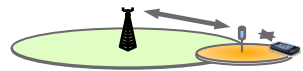
In the future

- › More than 10 Gbps in specific scenarios
- › 100s of Mbps generally available in urban/suburban scenarios
- › Multi-Mbps connectivity essentially everywhere

LTE Evolution - Today



LTE Evolution



Relaying
(Backhaul using LTE spectrum)



Improved UE requirements
(IRC receivers)



Heterogeneous Deployments
(Range expansion for co-channel)



Device-to-Device Communication



Local-Area Access
(Dual Connectivity, WiFi Intergration, ...)



Latency Reductions



License-Assisted Access
(Exploiting unlicensed spectrum)



MIMO enhancements
(Paradigm shift, CRS→DM-RS)



CoMP
(Multi-point CSI feedback, QCL)



Multi-antenna Enhancements
(3D beamforming, massive MIMO, ...)



Multi-antenna Enhancements
(3D beamforming, massive MIMO, ...)



Carrier Aggregation



Carrier Aggregation Enhancements



FDD+TDD aggregation



Licensed Shared Access

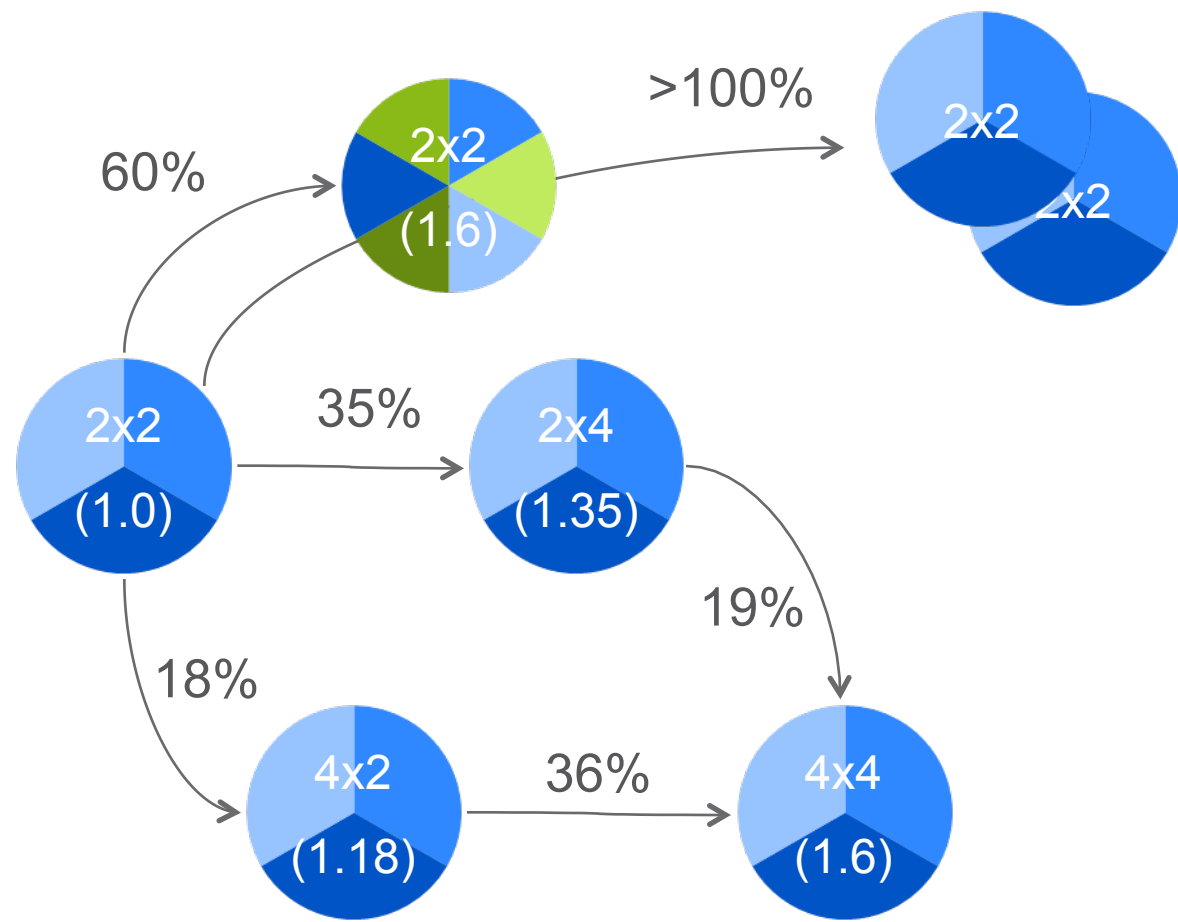
Rel-10
Finalized 2010

Rel-11
Finalized 2012

Rel-12
Finalized 2014

Rel-13
To be started

Macro cell capacity



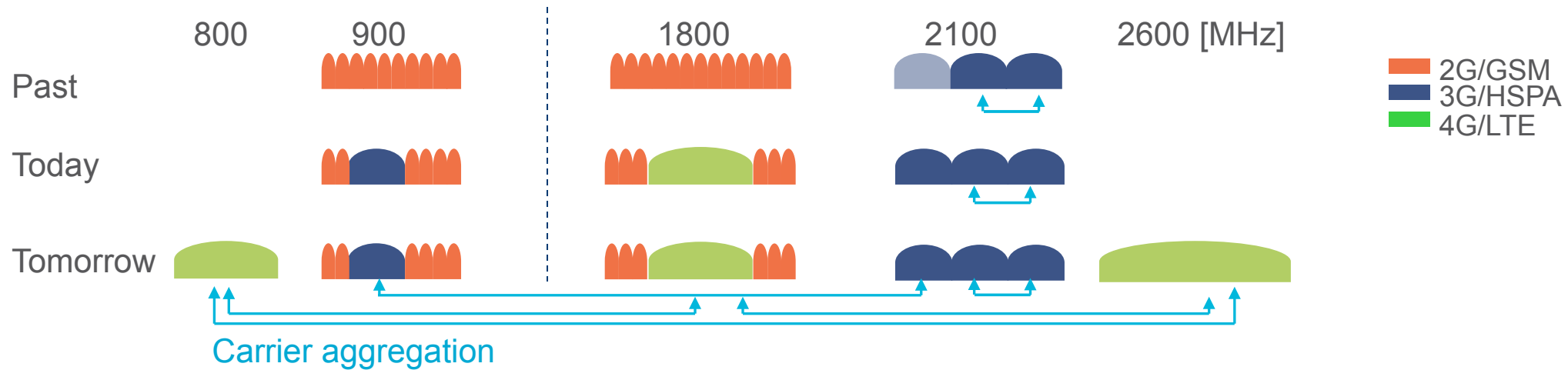
ement



- Add Spectrum
- Sectorization
- 4-Way Receive
- 4x2 MIMO
- 4x4 MIMO

Cell Throughput

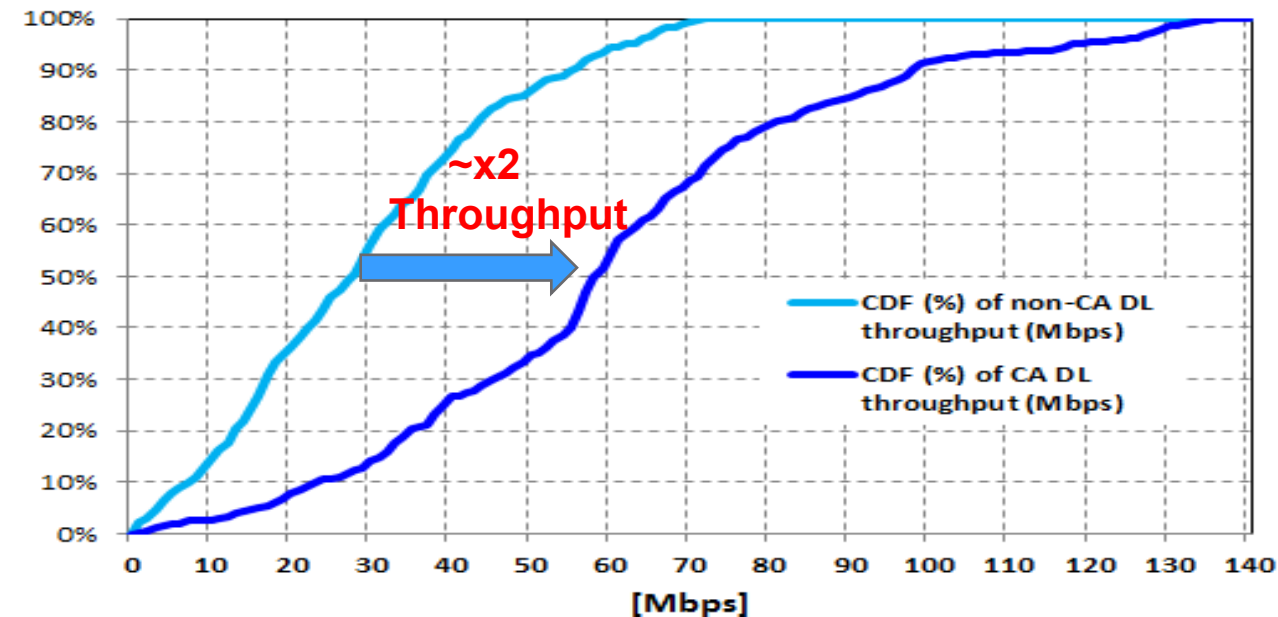
Carrier Aggregation



3GPP defined combinations
(Relevant for European bands):

- › 800 + 1800 → 10+20 MHz max
- › 800 + 2600 → 10+20 MHz max
- › 1800 + 2600 → 20+20 MHz max
- › 1800 + 1800 → 20+20 MHz max
- › 2600 + 2600 → 20+20 MHz max

Ericsson LTE-A, Carrier Aggregation, Korea July 2013



Ericsson leads in LTE advanced - CA



› Commercial service powered by Ericsson

- › SKT: 1800[3]+850[5] (10+10MHz) - June, 2013 (**world first**)
- › SKT: 1800[3]+850[5] (20+10MHz) - June, 2014 (**world first**)
- › LGU+: 2100[1]+850[5] (10+10MHz) - July, 2013
- › SingTel: 1800[3]+2600[7] (20+20MHz) - May, 2014
- › Vimpelcom: 800[20]+2600[7] (5+10 MHz) – July 31, 2014

› Live demos and trials

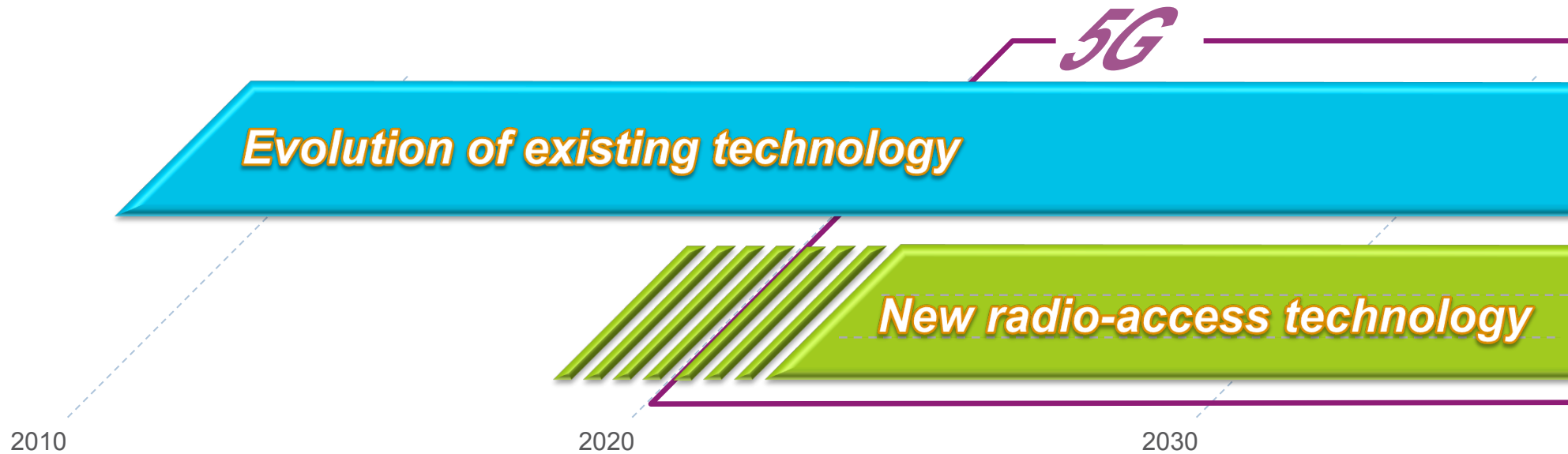
- › Telstra: 1800[3]+900[8] (10+5MHz) - July, 2013 (**world first**)
- › Telstra: 1800[3]+2600[7] (20+20 MHz) - Dec, 2013
- › Telstra: 1800[3]+2600[7]+ 2600[7] (20+20+20MHz) - May, 2014 (**world first 3 Carrier Aggregation**)
- › SKT: 1800[3]+900[8] (20+20 MHz) - Nov, 2013
- › Vodafone Portugal: 1800[3]+2600[7] (20+20 MHz) - Dec, 2013
- › Unitel Angola: 1800[3]+900[8] (10+10 MHz) – Jan 14, 2014
- › Magyar Telekom: 1800[3]+2600[7] (15+20 MHz) - Apr, 2014
- › MTS in Russia: 1800[3]+2600[7] (20+10 MHz) - Sep 10, 2014
- › Smart: 2100[1]+850 [5] (10+10MHz) – Sept, 2014
- › Slovak Telekom: 2600[7]+2600[7] (20+20MHz) – Sept 19, 2014 (**world first Intra-band Carrier Aggregation**)

World's first 450Mbps live demo with Telstra



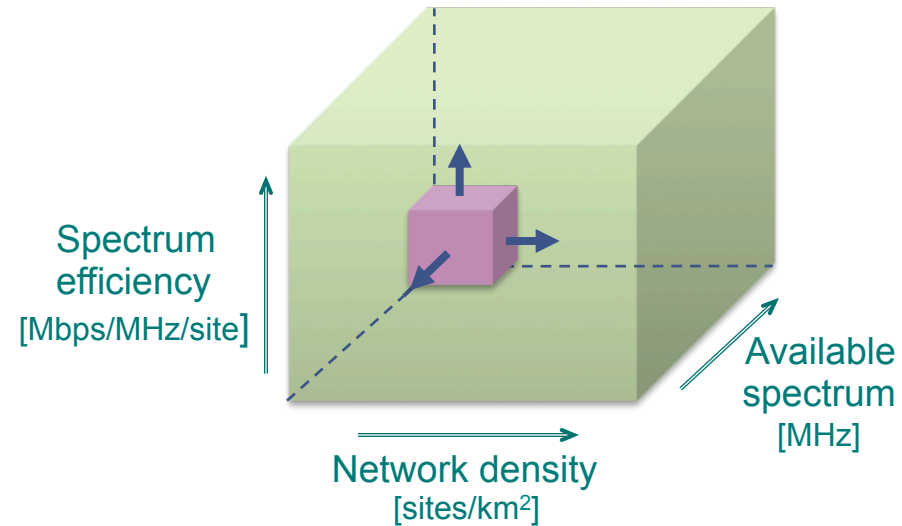
Supported by Ericsson's
commercial hardware and software

Future Wireless Access – “5G”



Evolution of existing technology + new radio-access technology

Traffic capacity



- › More dense networks – adding more infra-structure
- › More spectrum – extending into higher frequency bands
- › Enhanced technology

What does 5G bring?

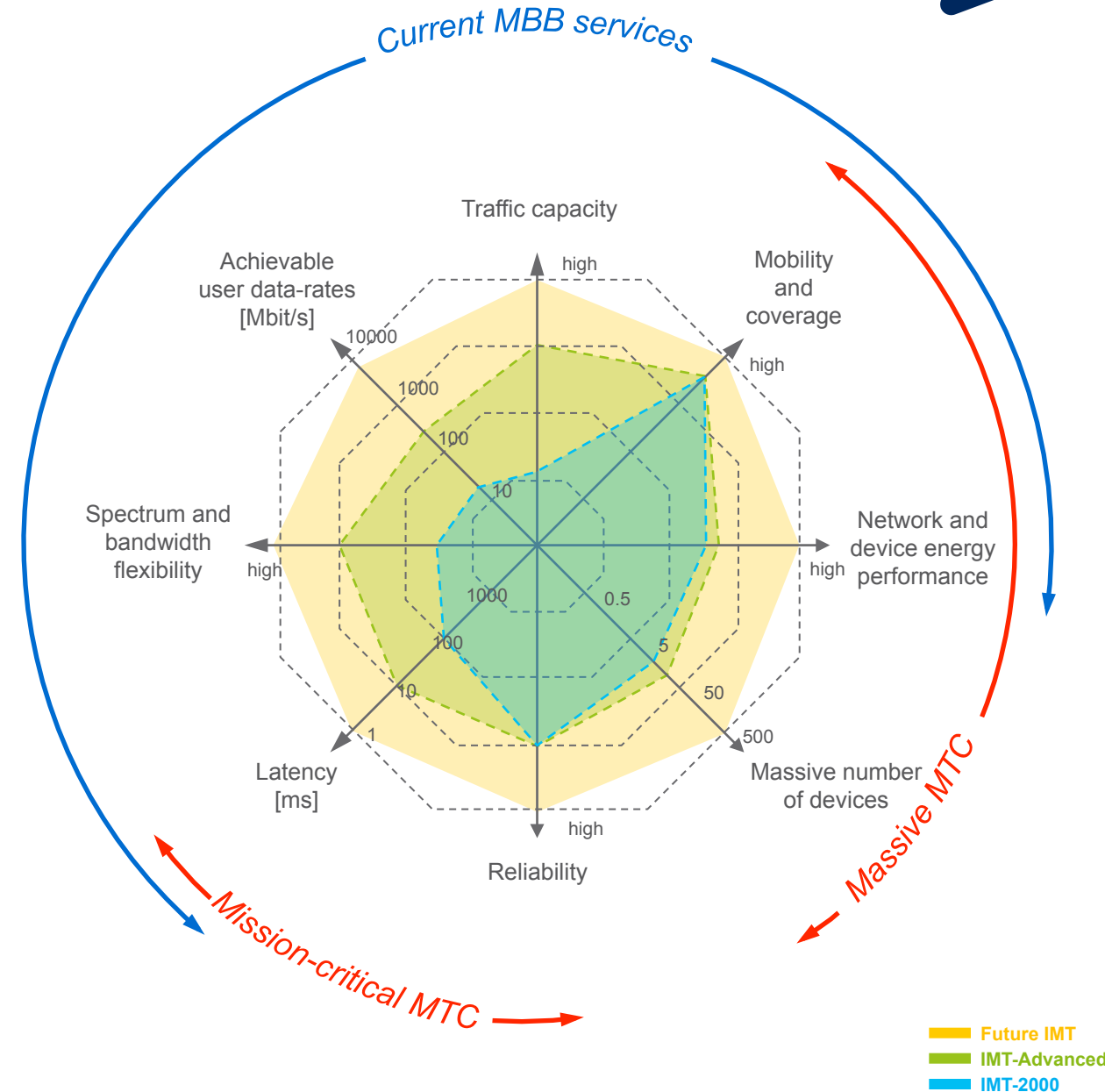


› Enhancing current Mobile Broadband Services

- Massive capacity, very high end-user data rates, low latency, improved energy performance, ...

› New use cases – “Machine-Type Communication”

- Massive MTC, Mission-critical MTC, ...

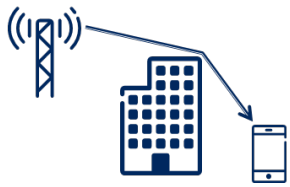


Extension to Higher frequencies



Propagation

Diffraction



Outdoor/indoor penetration



Rain/atmospheric attenuation



Body loss



Regulation

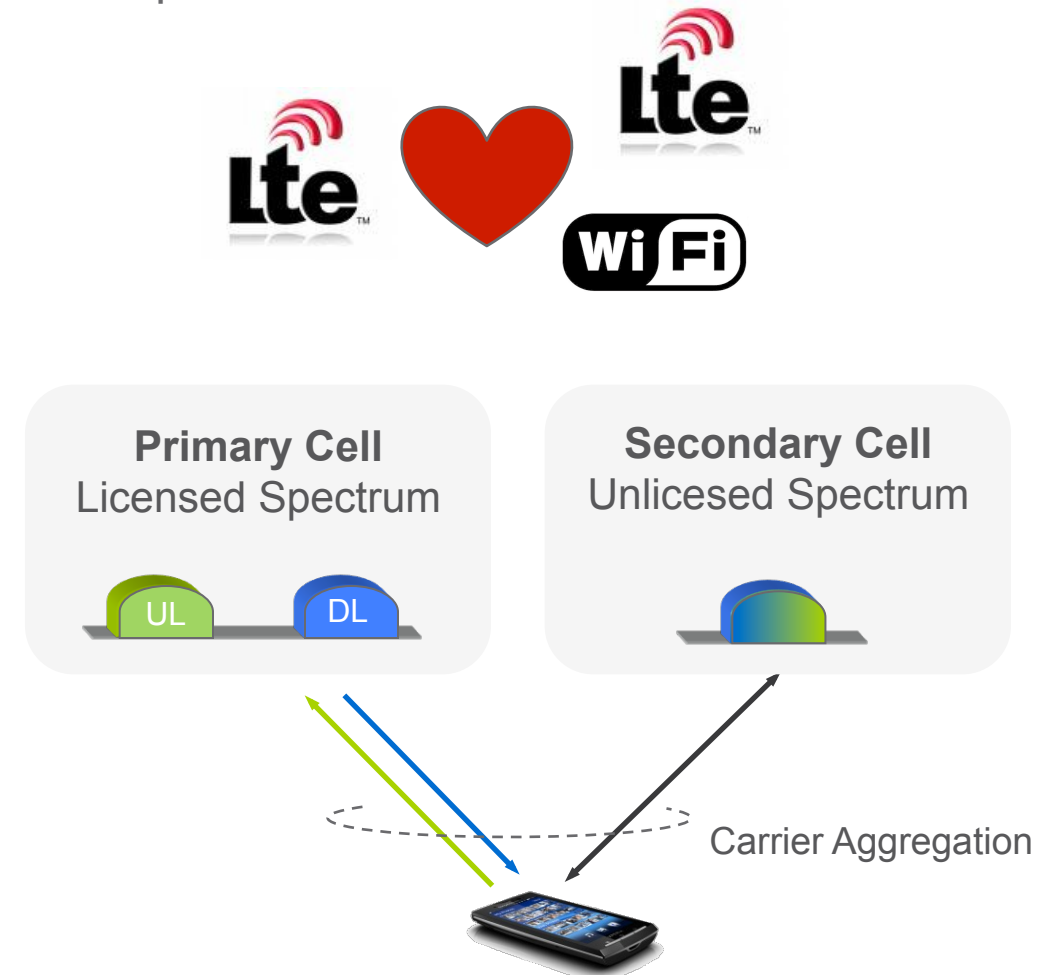


Additional Tx power limitations above 6 GHz

Licensed-Assisted Access



- › Unlicensed spectrum used as *performance booster* in *operator-deployed small cells*
 - Always accompanied by a licensed carrier – no focus on stand-alone operation
- › Primary carrier uses *licensed* spectrum (FDD or TDD)
 - Control signaling, mobility, user data
- › Secondary carrier(s) use *unlicensed* spectrum
 - Best-effort user data (DL and potentially UL)

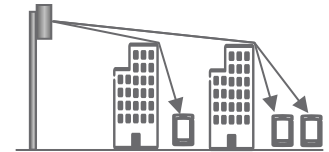


Multi-Antenna

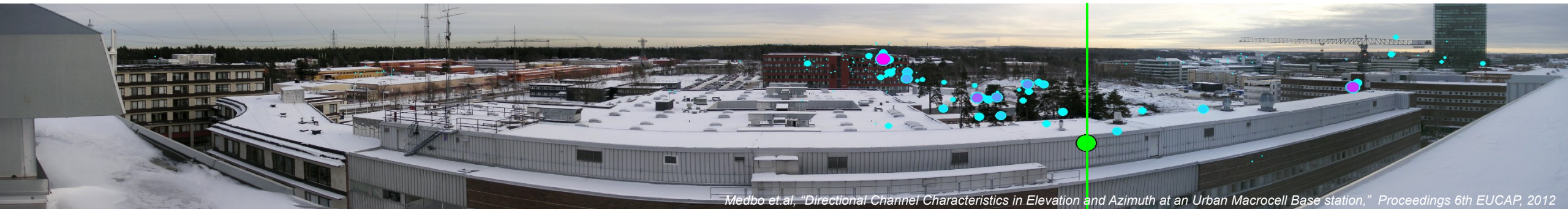
3D and CoMP (RAN1, RAN3)



- › Coordinated multipoint (CoMP) enhancements
 - CoMP also for non-ideal backhaul
- › 3D channel modeling
 - Include elevation domain, for studies of 3D MIMO
- › 3D MIMO
 - Elevation beam forming
 - Massive MIMO (up to 64 basestation antenna ports)



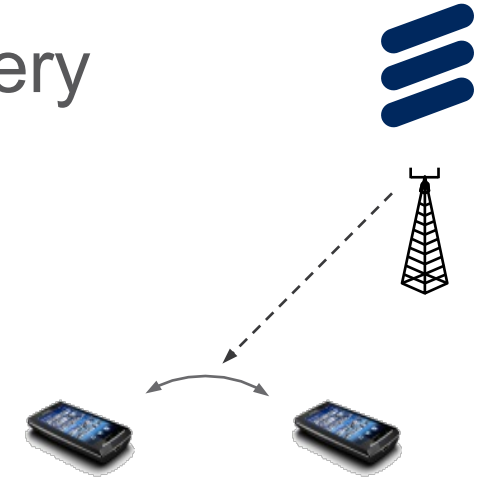
} Not part of Rel-12 → Rel-13



Device-to-Device Communication and Discovery (RAN1)

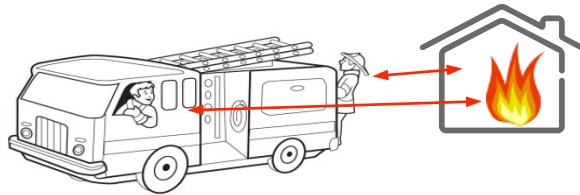
› New RAN Work Item for

- Broadcast communication targeting NSPS use case
- Discovery targeting commercial use case



› NSPS

- Direct communication important
- Focus on "out of NW coverage"
- Relaying from D2D towards LTE EPC

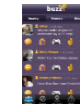


› Commercial

- Proximity detection important
- Focus on "In network coverage"
- Operators request authentication and authorization

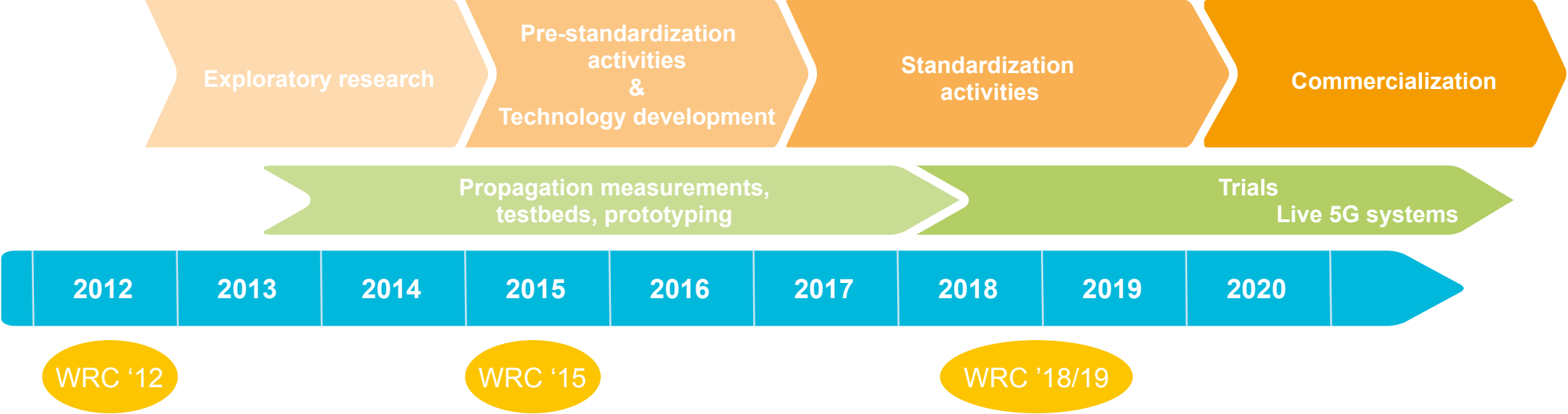


Proximity based
social networking



Proximity-enabled
communication

5G time schedule



5G introduction expected around 2020

Supersonic LTE

Taking LTE to new heights



- › Video streaming at supersonic speed
 - Device travelling @ 1634 km/h (Mach 1.33)
 - Max altitude reached: 5522 m
 - Live video stream transmitted from rocket via standard LTE smartphone
- › Ericsson Commercial LTE network
 - Síminn - Iceland
 - Rocket launch: Thursday May 15th, 2014
- › The “Mjölur” project was carried out by Reykjavík University in 2014

Link to recorded video stream:

<https://www.youtube.com/watch?v=zJ3UW8yhSgc&feature=youtu.be>

Ericsson 5G trials



PRESS RELEASE
JULY 1, 2014



ERICSSON 5G DELIVERS 5 GBPS SPEEDS

- Live, over-the-air demonstration of Ericsson pre-standard 5G technology achieves 5 Gbps throughput in the 15 GHz frequency band
- NTT DOCOMO and SK Telecom senior management witness Ericsson's achievement that employs innovative radio interface and advanced MIMO technology
- 5G performance will enable new machine-to-machine applications that benefit both consumers and enterprises

5G implementation in commercial mobile networks is expected in 2020, but Ericsson (NASDAQ:ERIC) has already achieved speeds of 5 Gbps in live, over-the-air demonstrations of the company's pre-standard 5G network technology. This proven performance will be critical to addressing both the relentless growth in mobile data demand and enabling the next-generation machine-to-machine applications. NTT DOCOMO and SK Telecom senior management witnessed Ericsson's achievement at Ericsson lab in Kista, Sweden.



- 15 GHz band
- 400 MHz bandwidth
- 5/10 Gbps



ERICSSON