

Network Energy Performance of 5G Systems

Dr. Ylva Jading
Senior Specialist
Ericsson Research

NETWORK ENERGY PERFORMANCE TARGETING REDUCED ENERGY CONSUMPTION



ECONOMY



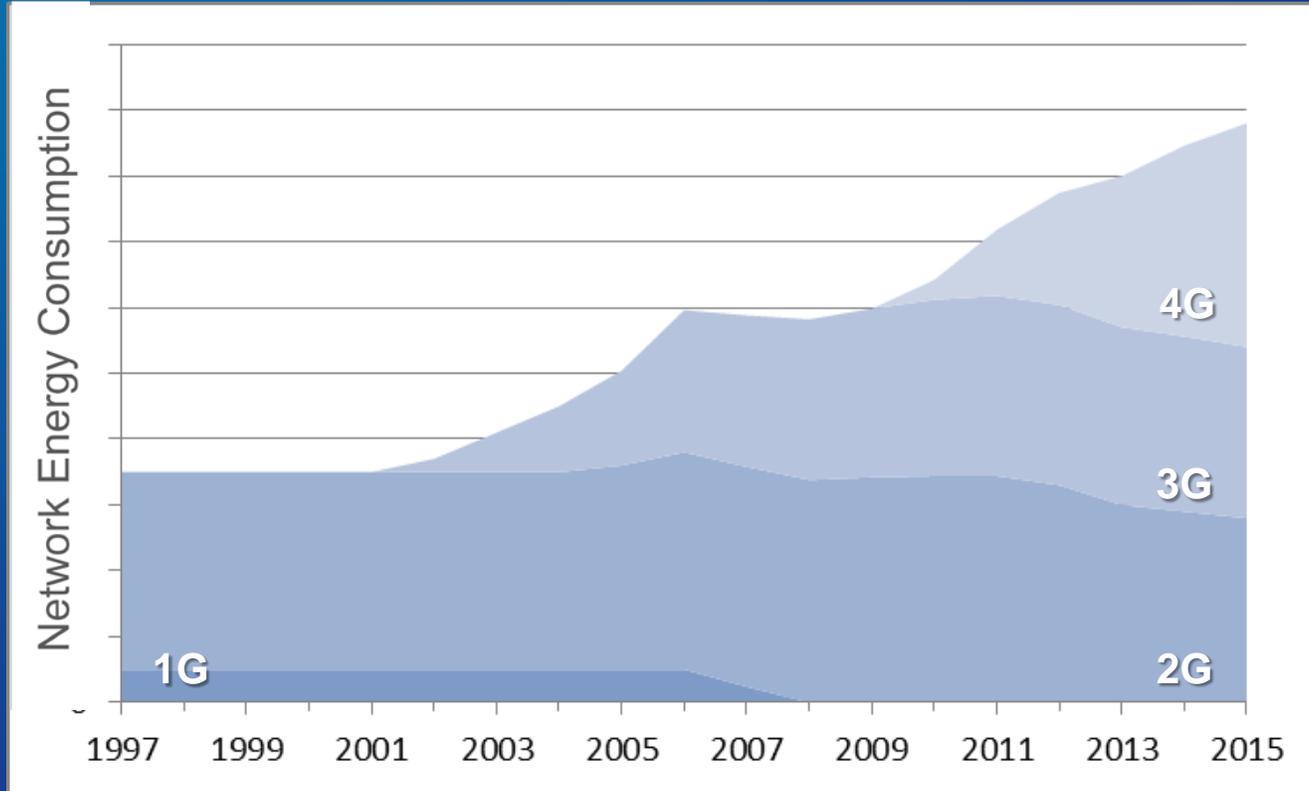
ECOLOGY



ENGINEERING

THE BIG PICTURE

NETWORK ENERGY CONSUMPTION

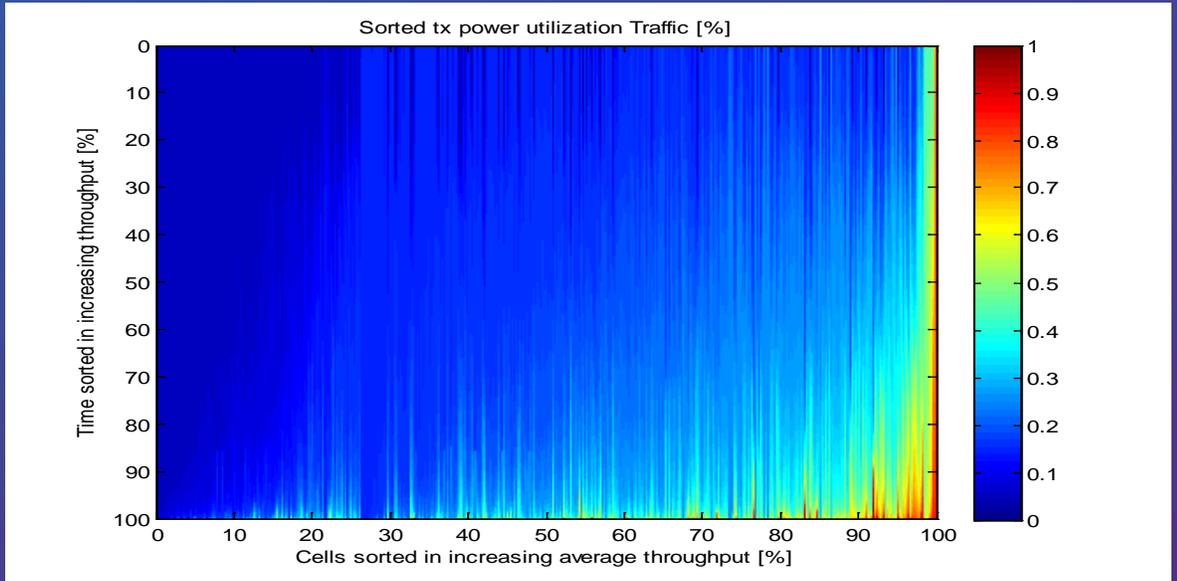


CURRENT AND FUTURE TRAFFIC

THE CHALLENGE FOR MOBILE COMMUNICATION



- Low average traffic
- Large variations
- Peak dimensioning

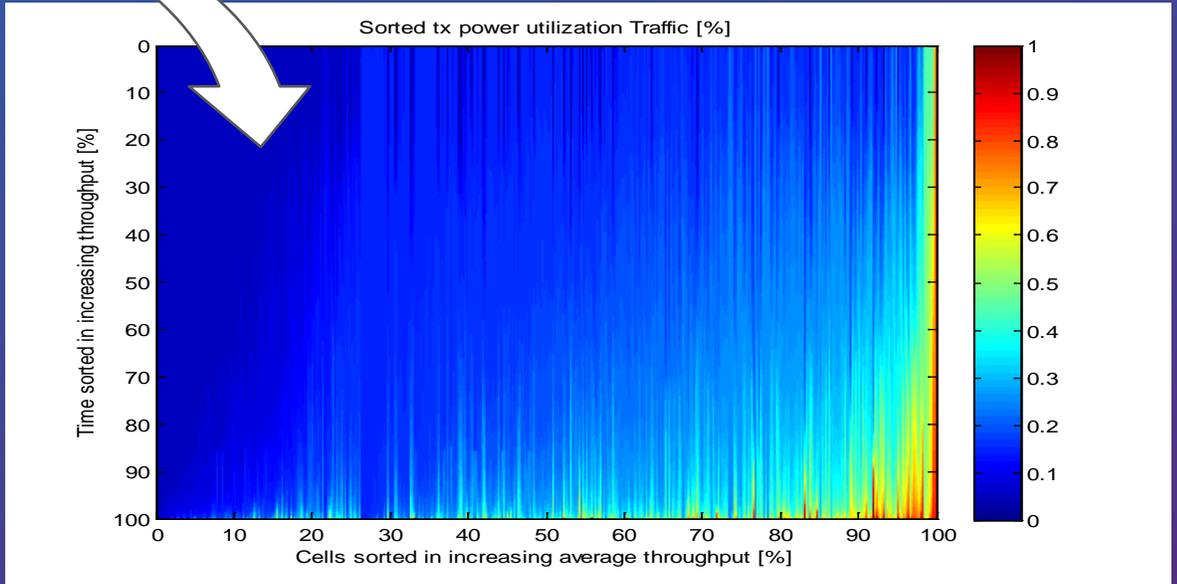


SOME TWO WEEKS OF METROPOLITAN TRAFFIC

CURRENT AND FUTURE TRAFFIC

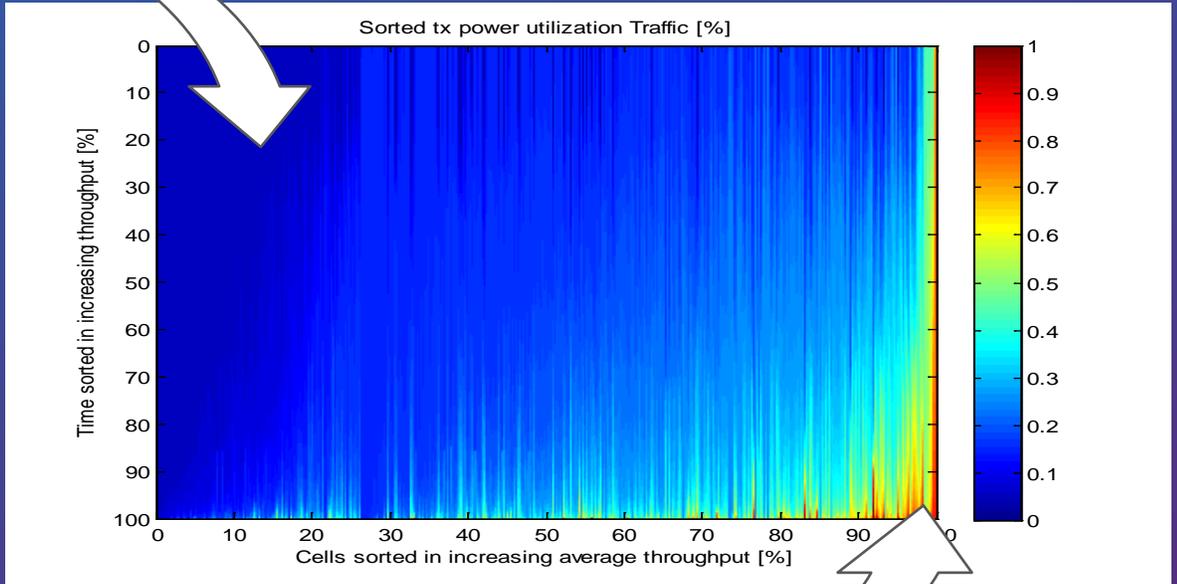


“Most parking spaces are unused most of the time”



LARGE VARIATIONS AND LOW AVERAGE TRAFFIC

CURRENT AND FUTURE TRAFFIC



“But not the one I want to use when I want to use it”

EVALUATION MODEL – EARTH E³F

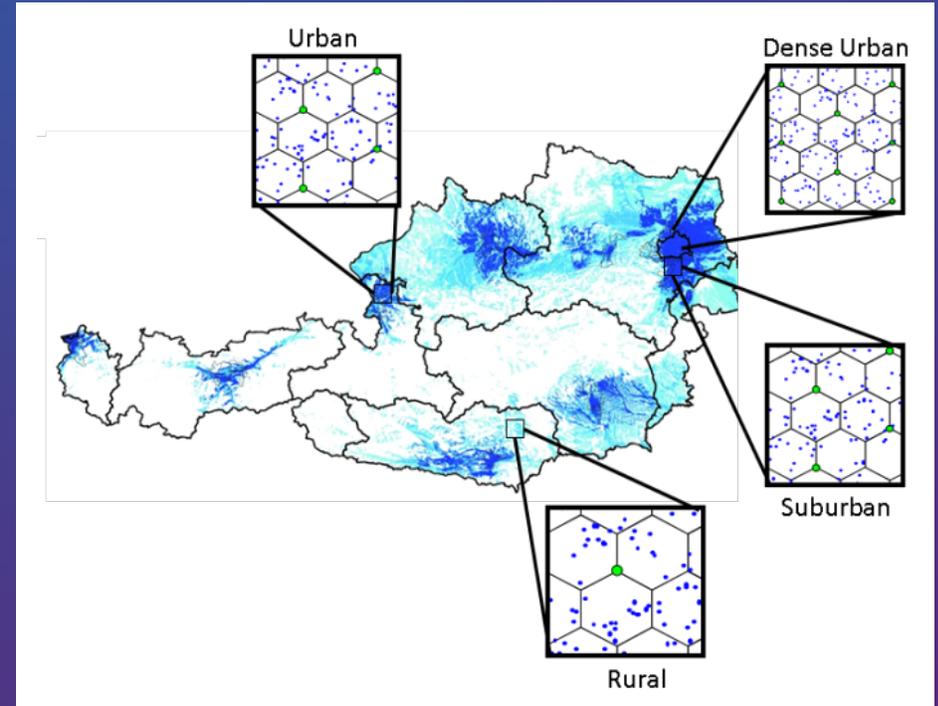
ENERGY-EFFICIENCY EVALUATION FRAMEWORK



Framework contains:

- Deployment scenarios
- Traffic scenarios
- Power models
- 24h traffic profile

➔ INCREASED FOCUS
ON LOW LOAD



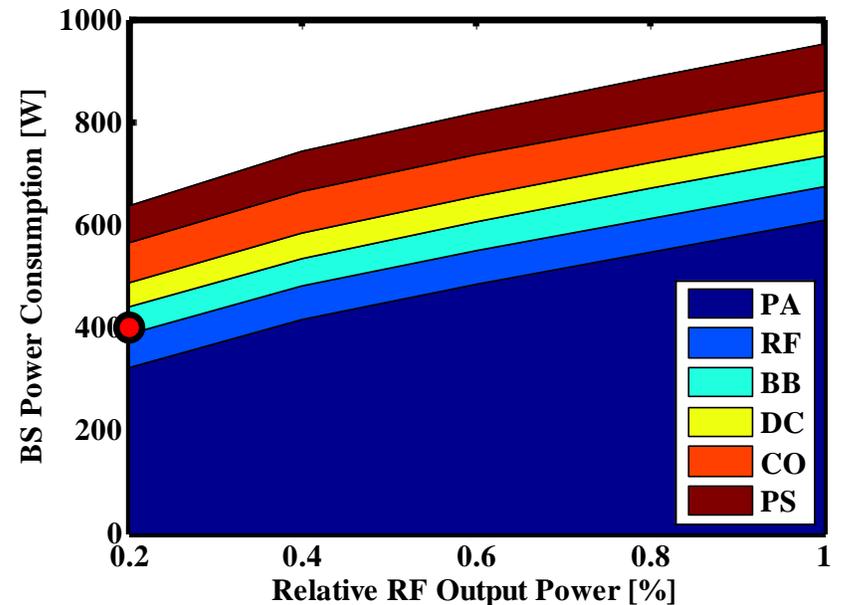
EARTH MACRO BS POWER MODEL

MAPS RF OUTPUT POWER TO BS POWER USAGE



Breakdown per component :

- Power amplifier (PA)
- Radio Frequency (RF)
- Base band processing (BB)
- DC-DC conversion (DC)
- Cooling (CO)
- Main power supply (PS)



➔ MACRO BS COMPARABLY LOAD DEPENDENT

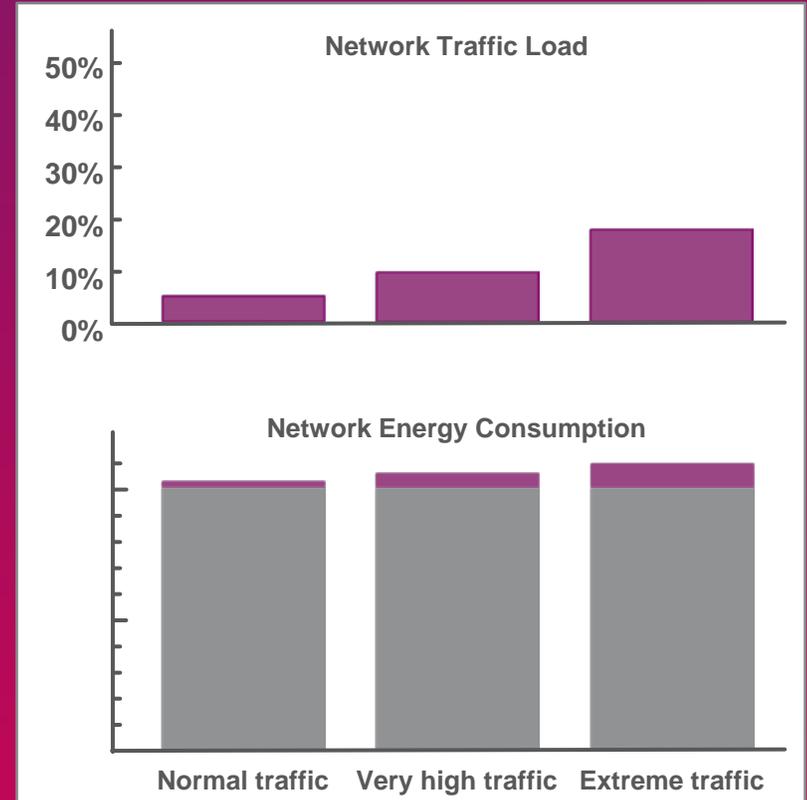
TRAFFIC VS ENERGY CONSUMPTION

THE CHALLENGE FOR MOBILE COMMUNICATION

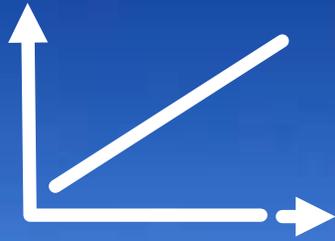


- Low average traffic and large variations
- Networks dimensioned for peak demand
- Considerable static energy consumption

➔ IMPROVE LOAD DEPENDENCE



5G ENERGY PERFORMANCE



**Load adaptive
energy consumption**



**Only active when and
where needed**



**One network
many use cases**

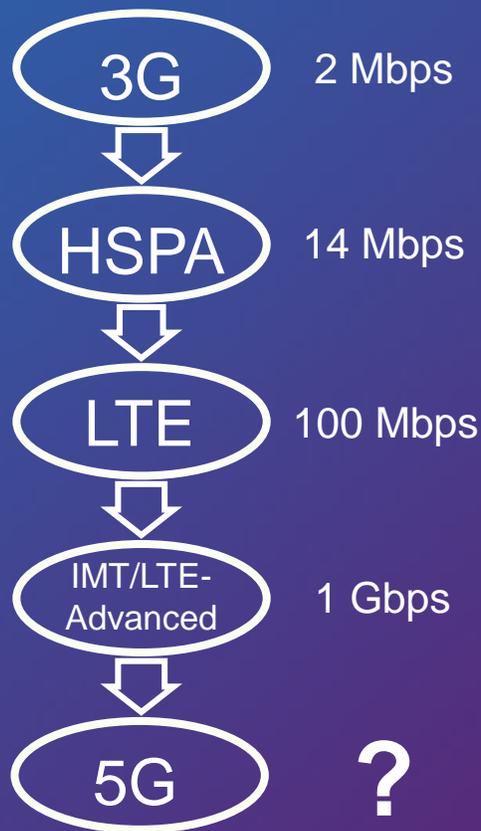
5G WIRELESS ACCESS



A wide range of
requirements and capabilities

- High data rates everywhere
- Very high traffic capacity
- Massive number of devices
- Very low device cost
- Very low device energy consumption
- Very low latency
- Ultra-high reliability and availability
- Very high network energy performance
- ...

DATA RATES



- More than 10 Gbps in specific scenarios
- Several 100 Mbps generally available in urban/suburban scenarios
- Tens of Mbps essentially everywhere

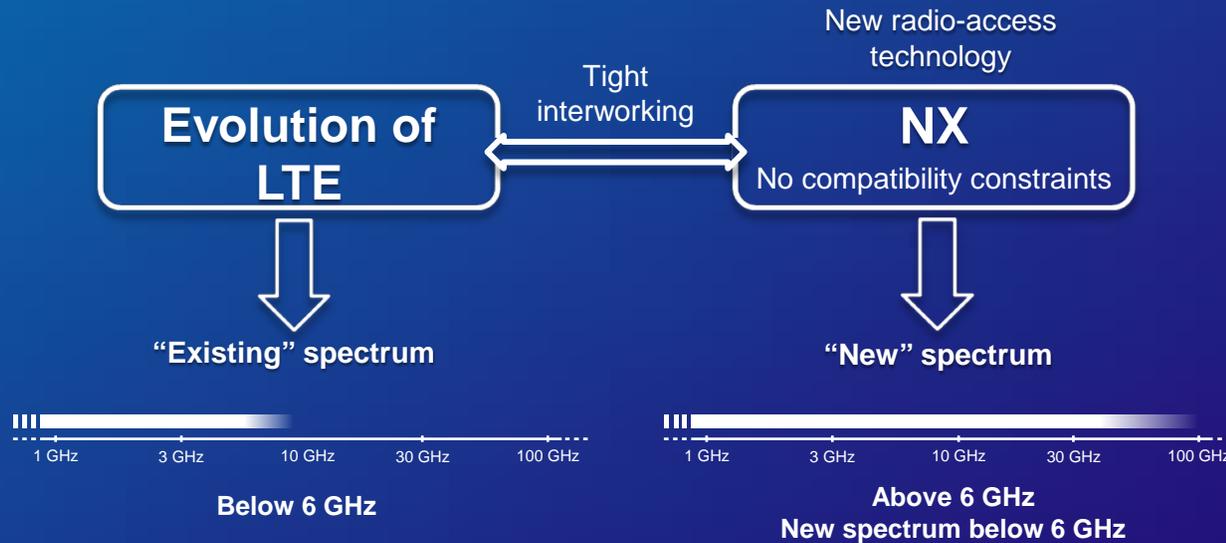


High data rates everywhere

5G RADIO ACCESS

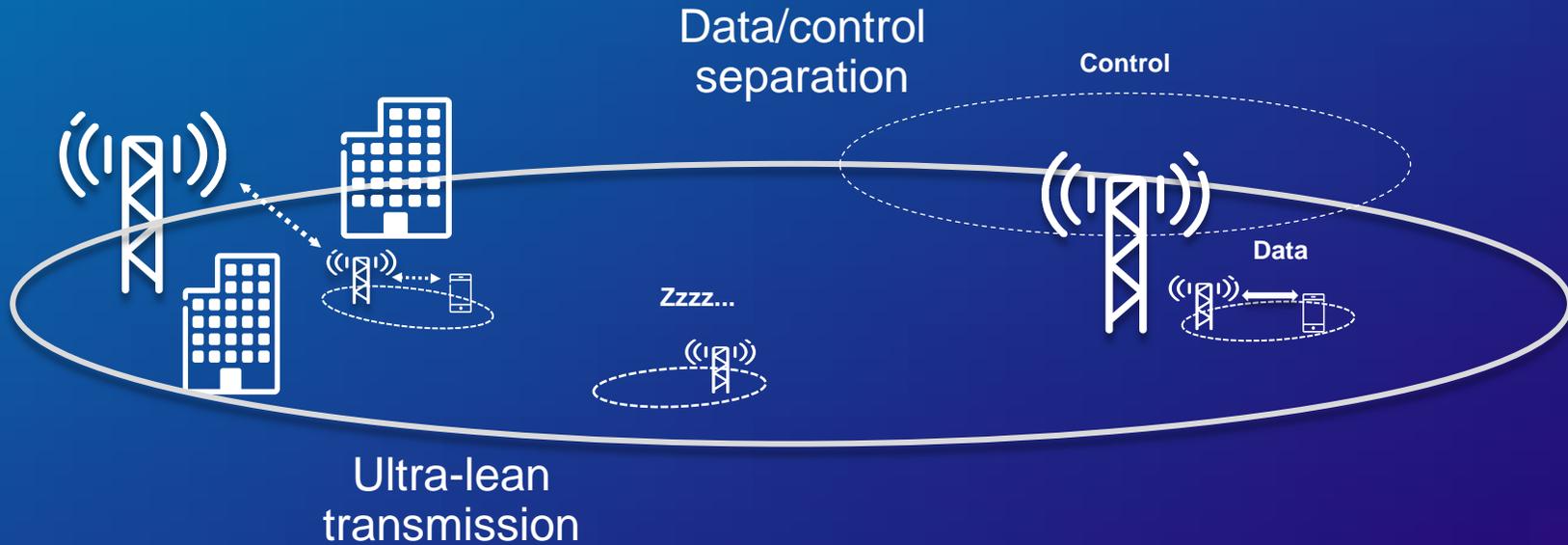


Evolution of existing technology + new radio-access technology



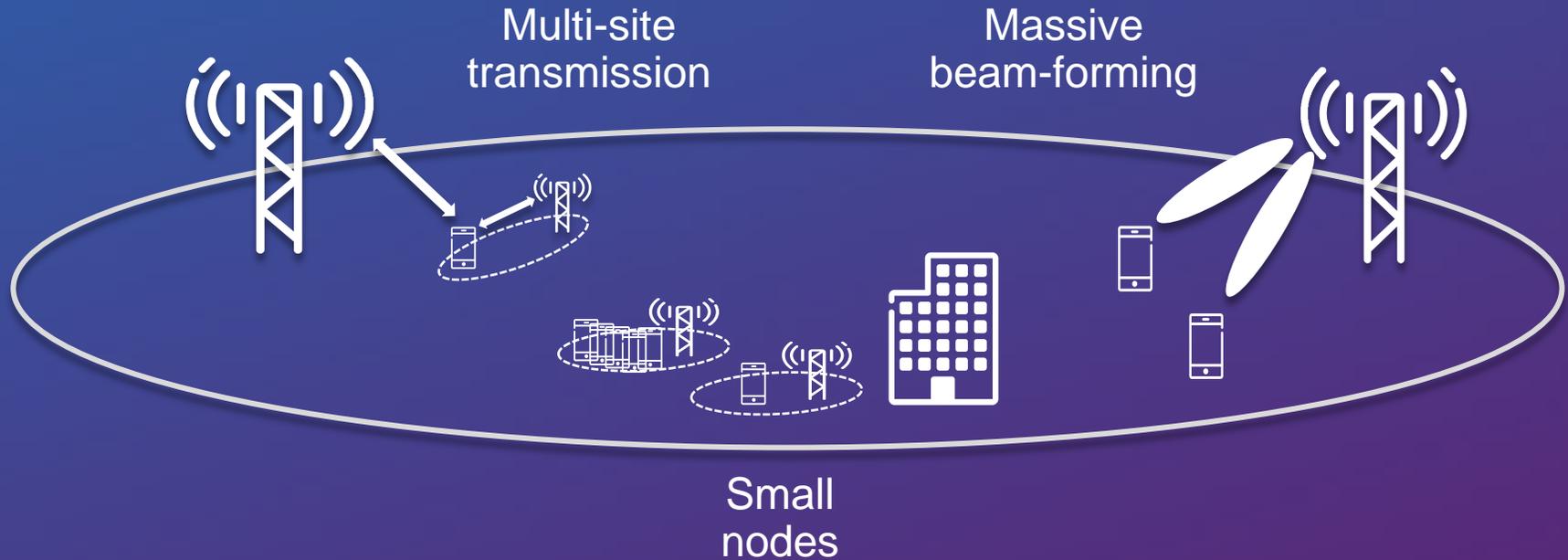
ONLY TRANSMIT WHEN NEEDED

5G RADIO ACCESS



ONLY TRANSMIT WHERE NEEDED

5G RADIO ACCESS



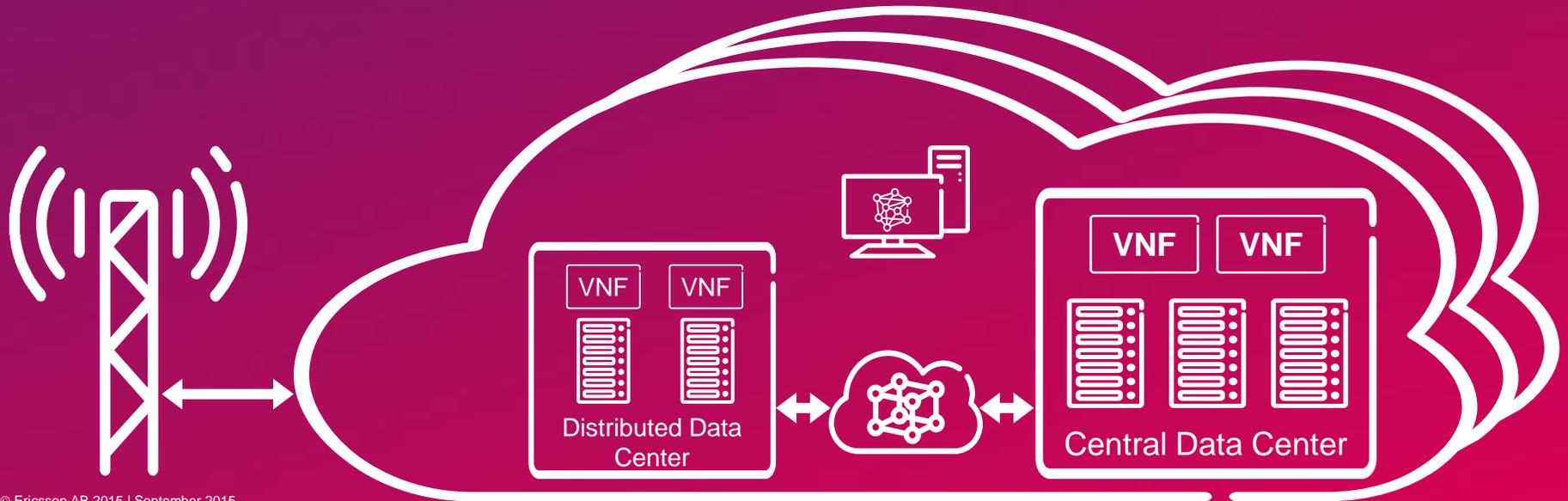
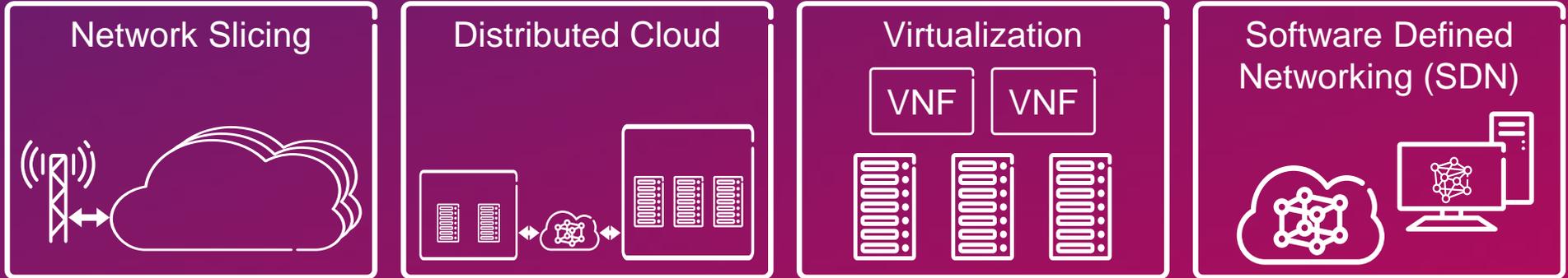
ONE NETWORK – MULTIPLE INDUSTRIES



A common network platform with
dynamic and secure Network Slices



NETWORK ARCHITECTURE – CORE/IP



SUMMARY

ENERGY PERFORMANCE



Typically low load dependence of network-energy consumption today

Evaluation methodology available for energy performance

- EARTH Energy-Efficiency Evaluation Framework (E³F)

Design principles for high network-energy performance

- Only be active and transmit *when* needed
- Only be active and transmit *where* needed

Ericsson white paper available:

5G Energy Performance – Key Technologies and Design Principles



ERICSSON WHITE PAPER
Doc:204-210-2045 | April 2015



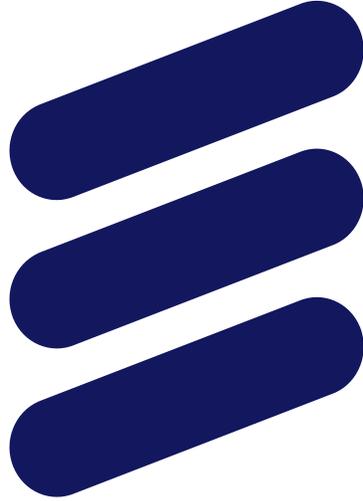
5G ENERGY PERFORMANCE

KEY TECHNOLOGIES AND DESIGN PRINCIPLES

High energy performance targeting reduced network energy consumption is a critical requirement of 5G. It enables reduced total cost of ownership, facilitates the extension of network connectivity to remote areas, and provides network access in a sustainable and more resource-efficient way.

Key technologies to achieve this include ultra lean design, advanced beamforming techniques, and separation of user data and the system control plane on the radio interface, as well as virtualized network functionality and cloud technologies. This paper also defines two design principles on which 5G systems with high energy performance should be built.

THANK YOU!
ANY QUESTIONS?



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