5G AND STANDARDS: MANAGING COMPLEXITY, ENSURING INTEROPERABILITY

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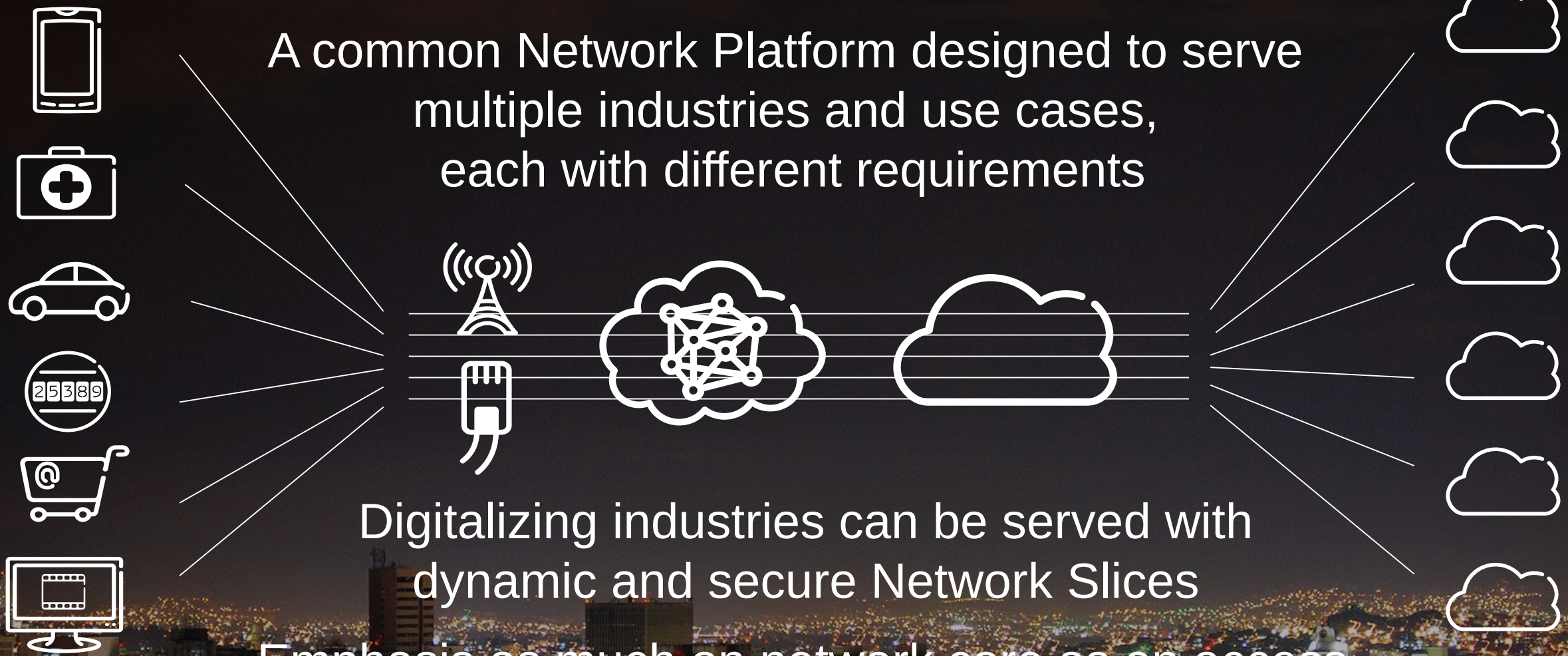
MOBILE GENERATIONS ACROSS TIME

Historically, higher peak data rates, denser infrastructure and more bandwidth have been the hallmark of each mobile technology generation!

Access technologies & new air-interfaces have been the center of attention

5G IS DIFFERENT: IT'S A NETWORK PLATFORM

A common Network Platform designed to serve
multiple industries and use cases,
each with different requirements



Digitalizing industries can be served with
dynamic and secure Network Slices

Emphasis as much on network core as on access

5G: THE NETWORK AS A PLATFORM

Moving away from dedicated physical networks and resources for different applications

To a “Network Factory” where new networks and architectures are “manufactured by SW”

Network slices

Service n

Health

Robotic communication

Media

MBB Basic

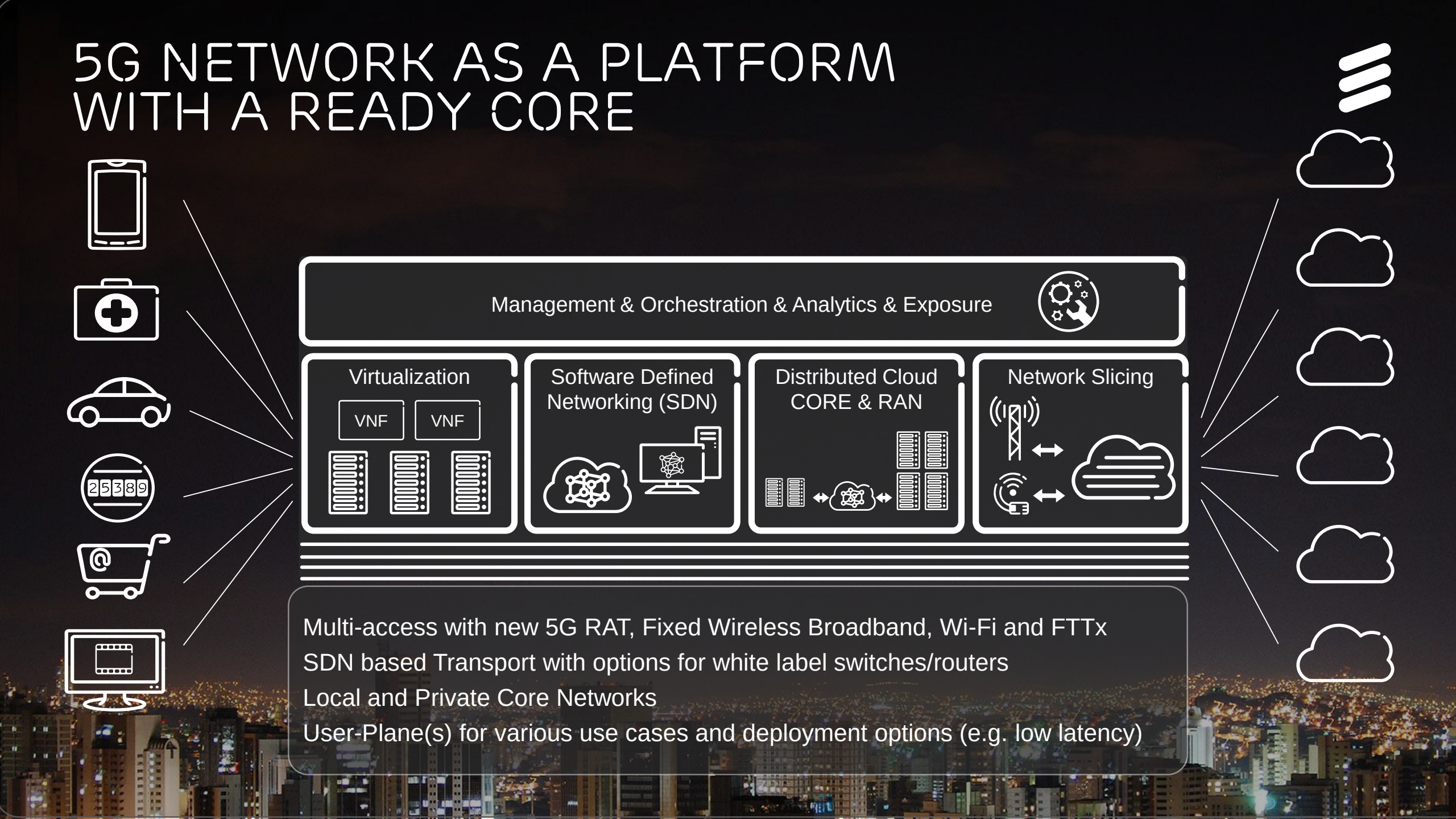
Physical Resources
(Access, Connectivity, Computing, Storage, ..)

NETWORK SLICING: THE BASIS
WIDE SPAN OF REQUIREMENTS AND CUSTOMER SEGMENTS

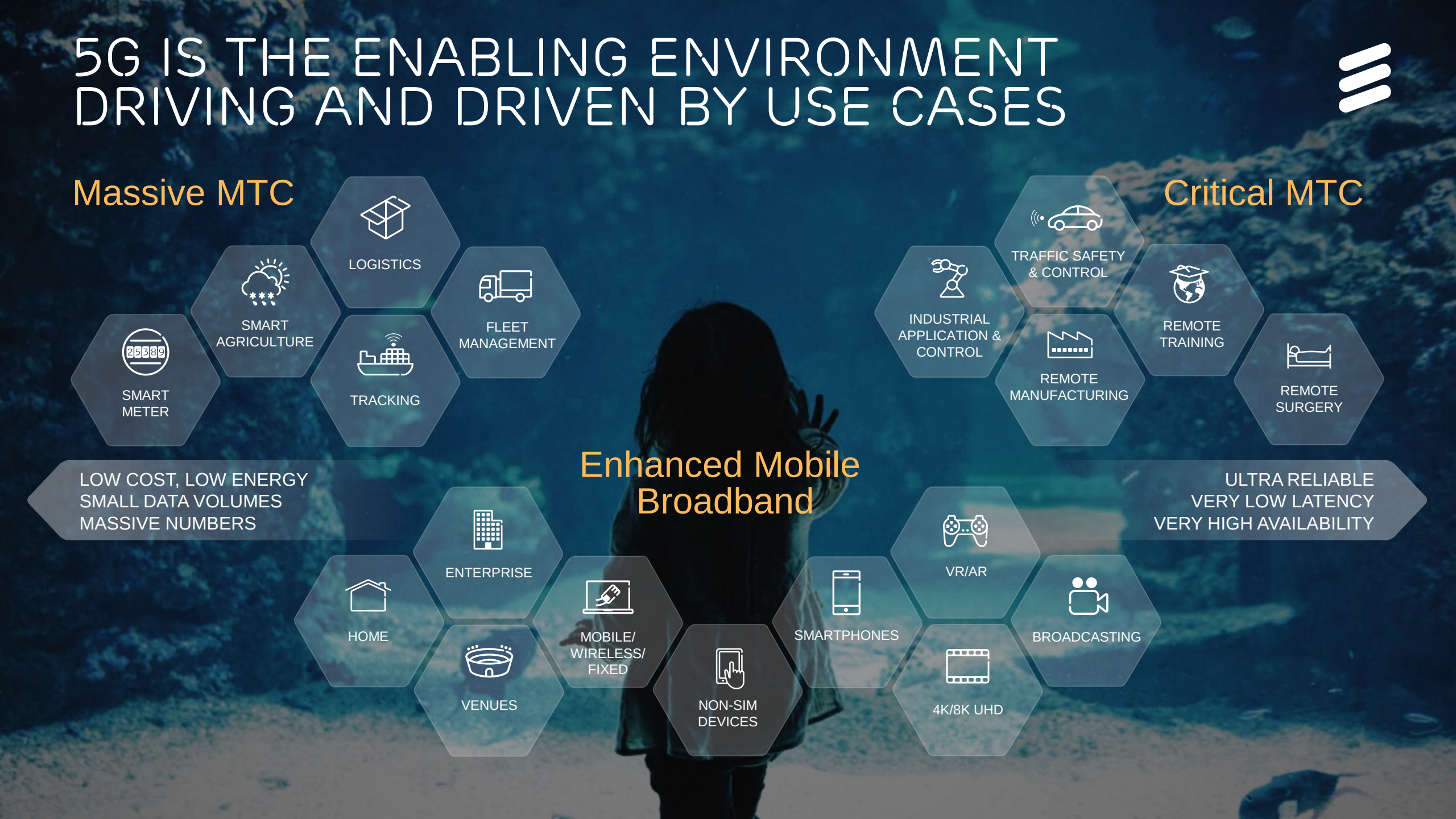
Drivers:

- Improved TTM/TTC
- Reduced risk
- Flexibility/Agility
- Separation of concerns
- Per service/customer optimization

5G NETWORK AS A PLATFORM WITH A READY CORE

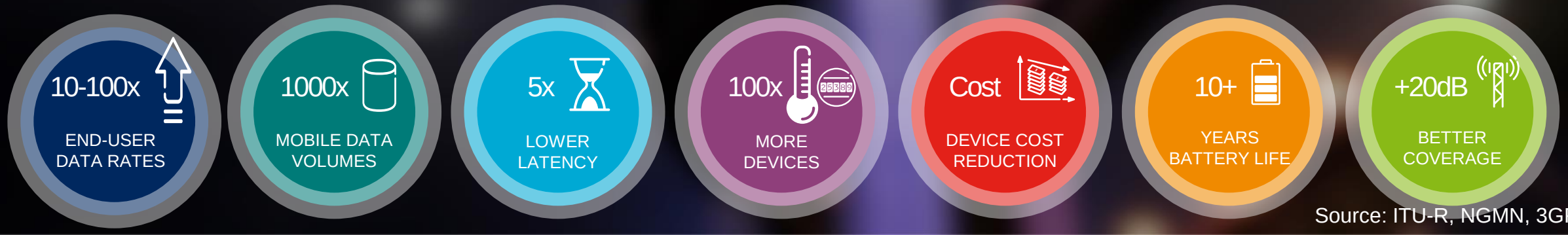


5G IS THE ENABLING ENVIRONMENT DRIVING AND DRIVEN BY USE CASES



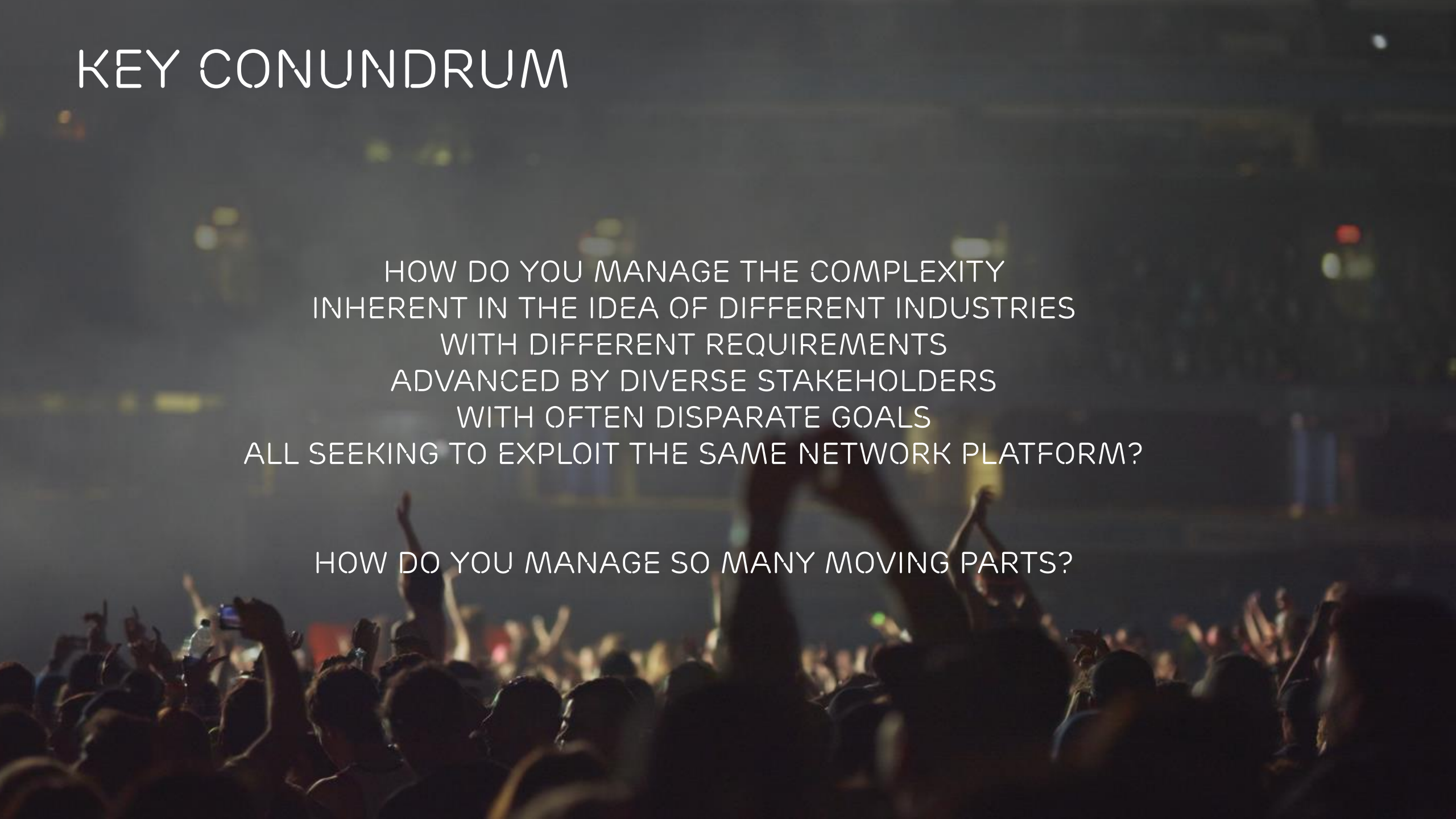
TECHNICAL EXPECTATIONS, REQUIREMENTS

Peak Data Rate	1 - 20 Gbps	Connection Density	10k - 1m devices / km^2	Reliability	99.999% (of packets)
User Experienced Data Rate	10 - 100 Mbps	Network Energy Efficiency	× 1 - × 100	Latency	1 - 10 ms
Spectral Efficiency	× 1 - × 3	Area Traffic Capacity	0.1 - 10 Mbps / m^2	Security	Strong subscriber authentication, user privacy and network security
Mobility	350 - 500 km/h	Availability	99.999% (of time)	Battery life	10 years*



Source: ITU-R, NGMN, 3GPP

KEY CONUNDRUM



HOW DO YOU MANAGE THE COMPLEXITY
INHERENT IN THE IDEA OF DIFFERENT INDUSTRIES
WITH DIFFERENT REQUIREMENTS
ADVANCED BY DIVERSE STAKEHOLDERS
WITH OFTEN DISPARATE GOALS
ALL SEEKING TO EXPLOIT THE SAME NETWORK PLATFORM?

HOW DO YOU MANAGE SO MANY MOVING PARTS?

STANDARDS & THEIR VALUE

‘A standard is a document, established by a consensus of subject matter experts and approved by a recognized body that provides guidance on the design, use or performance of materials, products, processes, services, systems or persons.’

International Standards Organization

TECHNICAL COORDINATION

REDUCTION OF TRANSACTION COSTS

PREDICTABILITY

INTEROPERABILITY

SCALABILITY

CONSISTENT IMPLEMENTATION

SAFETY OF PRODUCTS AND SERVICES

QUALITY OF PRODUCTS AND SERVICES

USABILITY

INVITING GROWTH OF ECOSYSTEMS

INNOVATION

THE KEY RADIO COMPONENTS

Flexible and scalable design

Spectrum

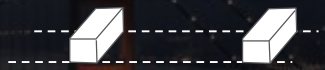
Deployment

Use cases

Extension to higher frequencies

Licensed and unlicensed spectrum

Ultra-lean design



Minimize network transmissions
not directly related to user data delivery

Multi-antenna transmission

Multi-site connectivity

Flexible PHY

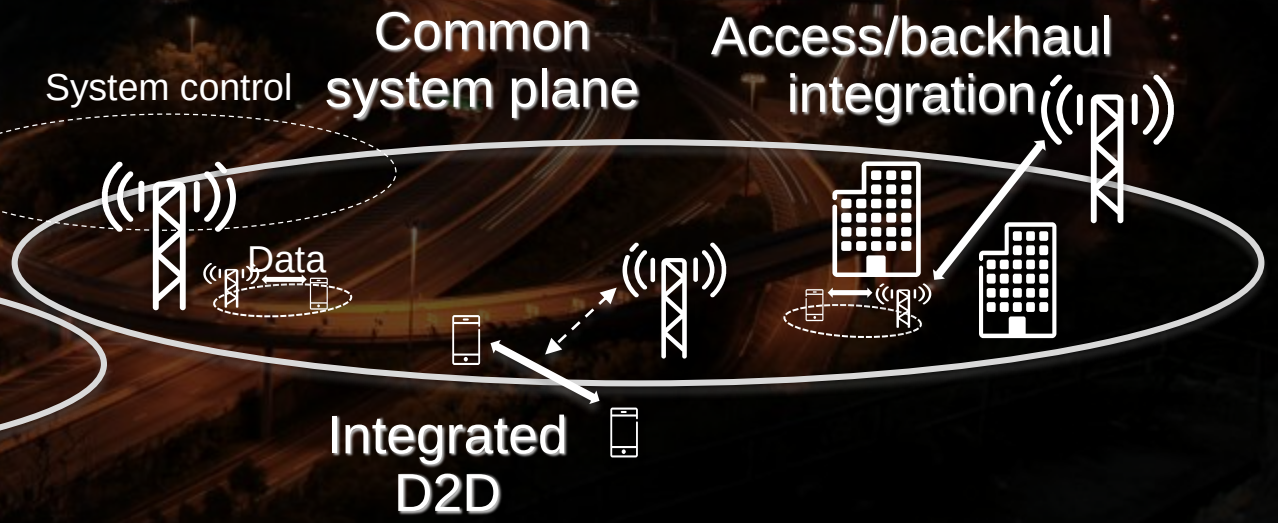
System control

Common system plane

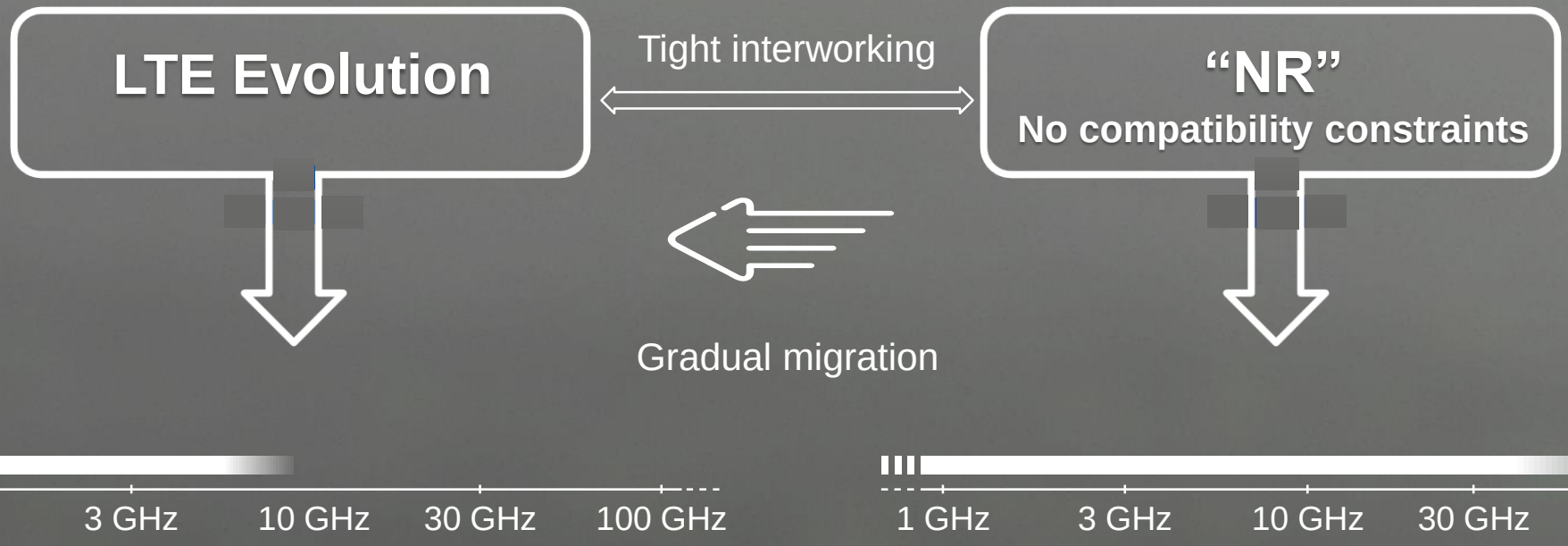
Data

Access/backhaul integration

Integrated D2D



5G RADIO ACCESS



Spectrum flexibility

Flexible duplex

FDD and TDD

Dynamic TDD

Full Duplex

Spectrum sharing

Unlicensed
Shared licensed

Complementing dedicated licensed spectrum

5G NR

- Designed for new use cases
  - eMBB, mMTC, cMTC, FWA …and future use
- Comes in 2 flavors
  - Non-standalone – standardized Dec. 2017
  - Standalone – target June 2018
- New Radio is a superior air interface
  - Support for low and high carrier frequencies
  - High performance w.r.t data rate, capacity, latency, energy consumption
  - Flexible and future proof

3GPP RAN 5G TIMEPLAN

ITU

IMT-2020

Requirements | **Proposals** | **Specifications**

SI: Channel mod.

Evaluation

SI: Requirements

3GPP

NR SIs Phase 2 | **NR WIs Phase 2**

NR Study Item | **NR WI Phase 1**

LTE evo | **LTE evo** | **LTE evo**

Rel-14 | **Rel-15** | **Rel-16**

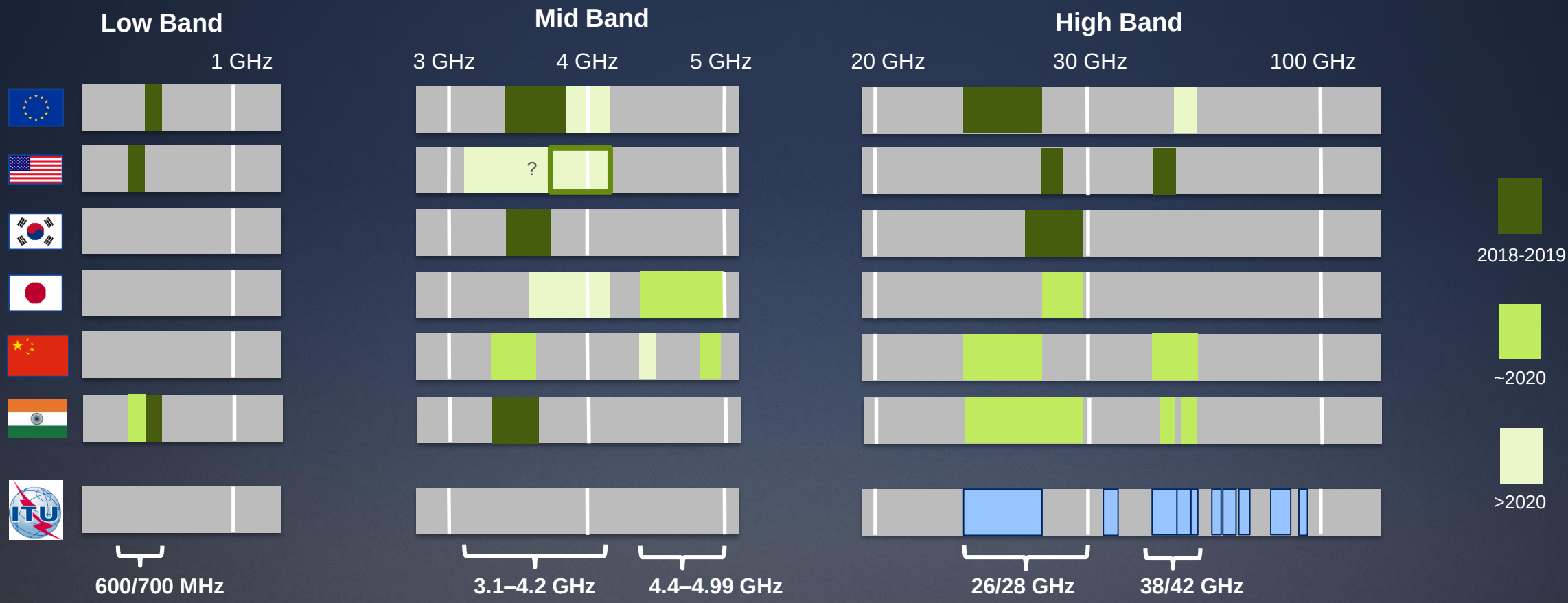
2015 | **2016** | **2017** | **2018** | **2019** | **2020**

non standalone

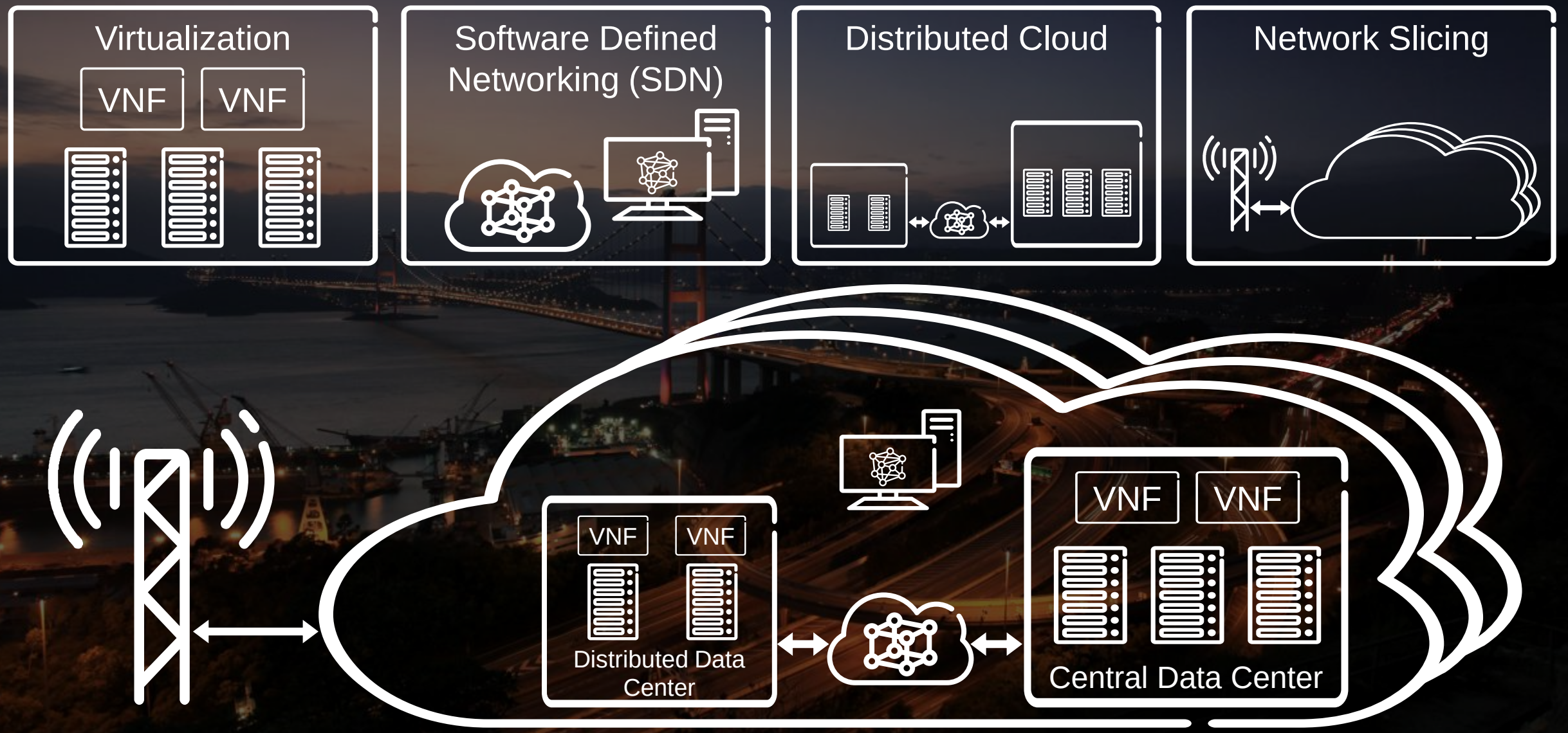
standalone

Full IMT2020

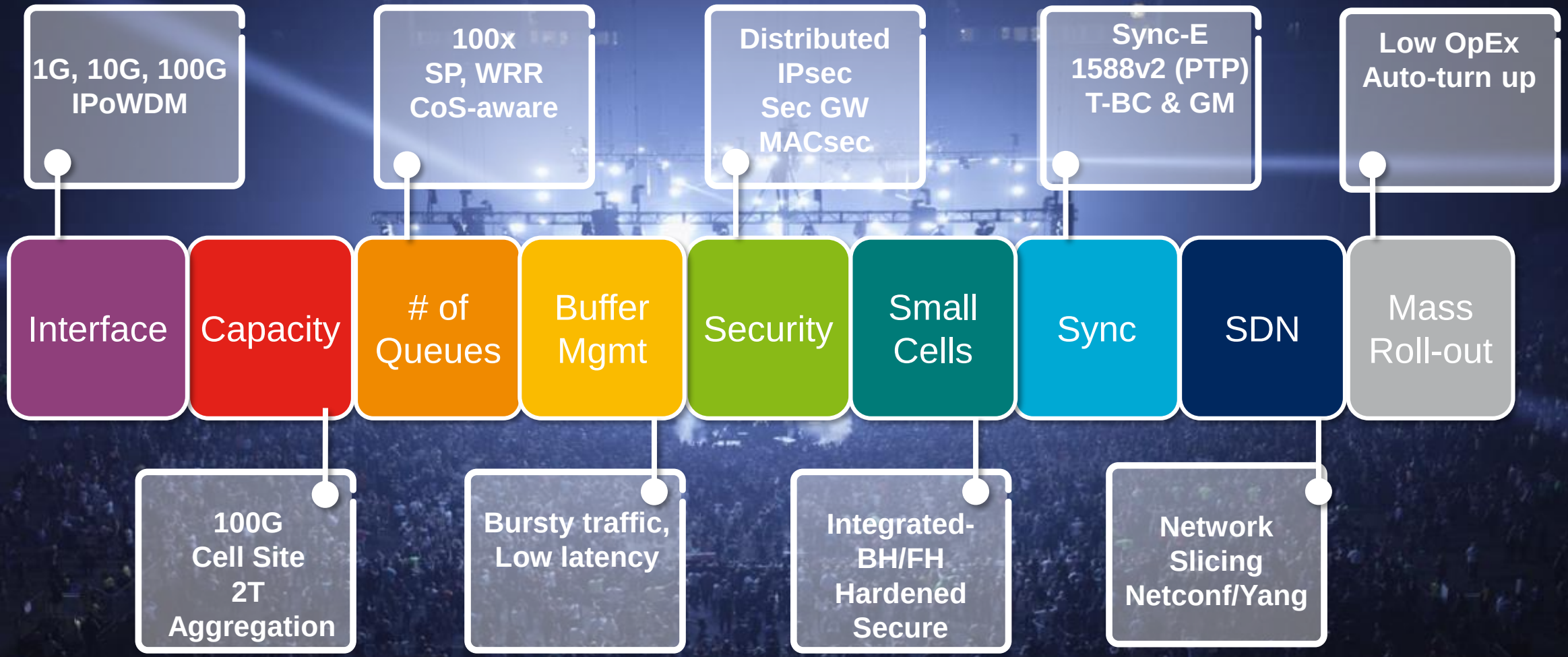
POTENTIAL NEW 5G SPECTRUM LANDSCAPE



THE KEY CORE COMPONENTS



5G READY TRANSPORT FEATURES



PARTING THOUGHT

THE COST OF COORDINATION IS ALMOST ALWAYS PAID IN THE CURRENCY OF TIME

STANDARDS DEVELOPMENT IS GENERALLY A FRUSTRATINGLY SLOW PROCESS, BECAUSE IT IS ANCHORED IN SERIOUS REFLECTION AND CONSENSUS

IT IS ALSO OFTEN A FIERCELY CONTENTIOUS PROCESS, ANCHORED IN CONFLICTING VISIONS OF THE FUTURE, AND DIFFERING STRATEGIC INTERESTS OF STAKEHOLDERS

BUT THE PAIN IS ALMOST ALWAYS WORTH IT BECAUSE BENEFITS FAR OUTWEIGH COSTS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