

Why is 6G important now, and how should industry prepare?

The complex roadmap to a 6G world

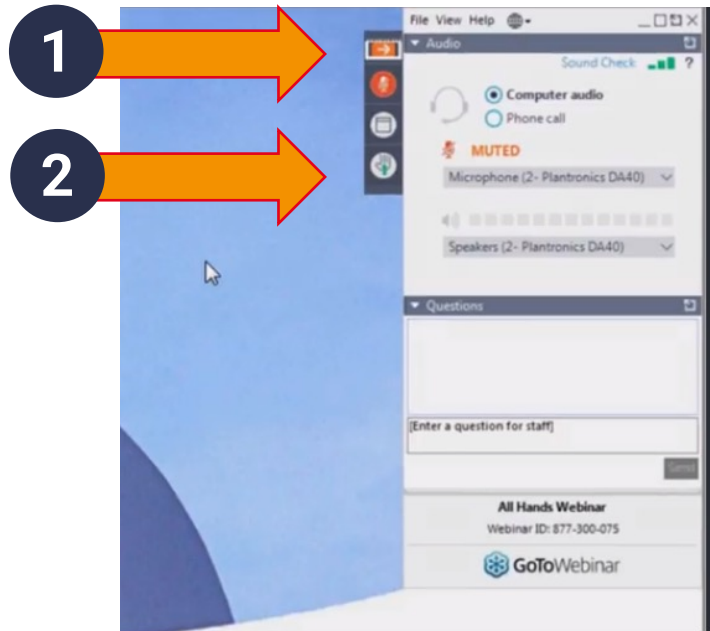
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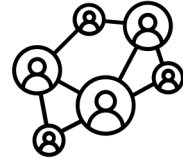
Agenda

1	What is 6G and why care?	Dean Bubley	16:00 – 16:15
2	External market factors for 6G	Dean Bubley	16:15 – 16:25
3	6G products and services	Charlotte Patrick	16:25 – 16:35
4	Concluding thoughts	Charlotte Patrick	16:35 – 16:40
5	Q & A	Andrew Collinson	16:40 – 17:00

What is 6G (or IMT2030)?



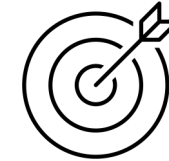
Headline numbers for uplink / downlink performance will be 10x better than 5G



AI-native and probably linked to standardised variant of disaggregated and open architecture



Designed for a wide variety of use cases and deployment models

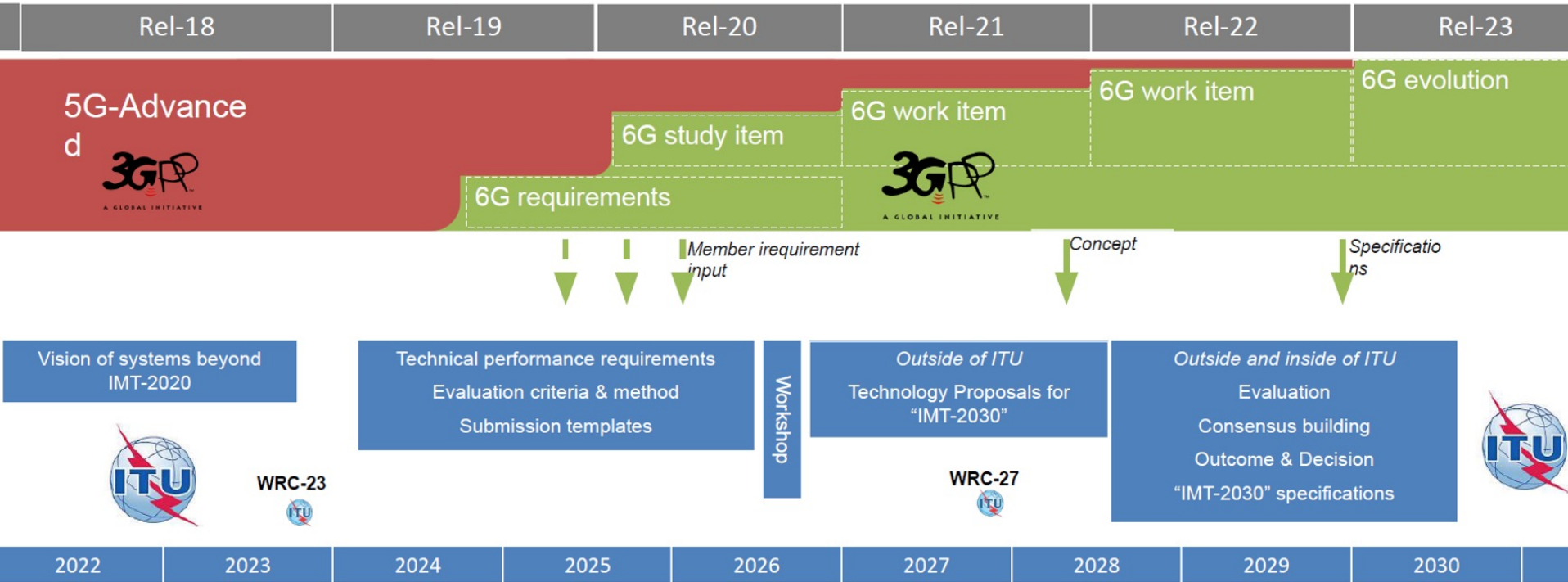


Enhanced targets for security, privacy and cost/energy efficiency

6G priorities, concepts & enablers are still being determined. Certainty is only likely around 2025+
It is likely to exist in multiple versions – or perhaps completely separate candidate technologies

Figure 1

Possible ITU-R and 3GPP Timelines



Why are we talking about 6G now? Isn't 5G enough?

10-year R&D + investment cadence built-in to system

New tech enablers not available in 5G era

Frictions, disappointments & limits of 5G

New patterns of demand, applications & industry structure

Changing external factors beyond the mobile industry

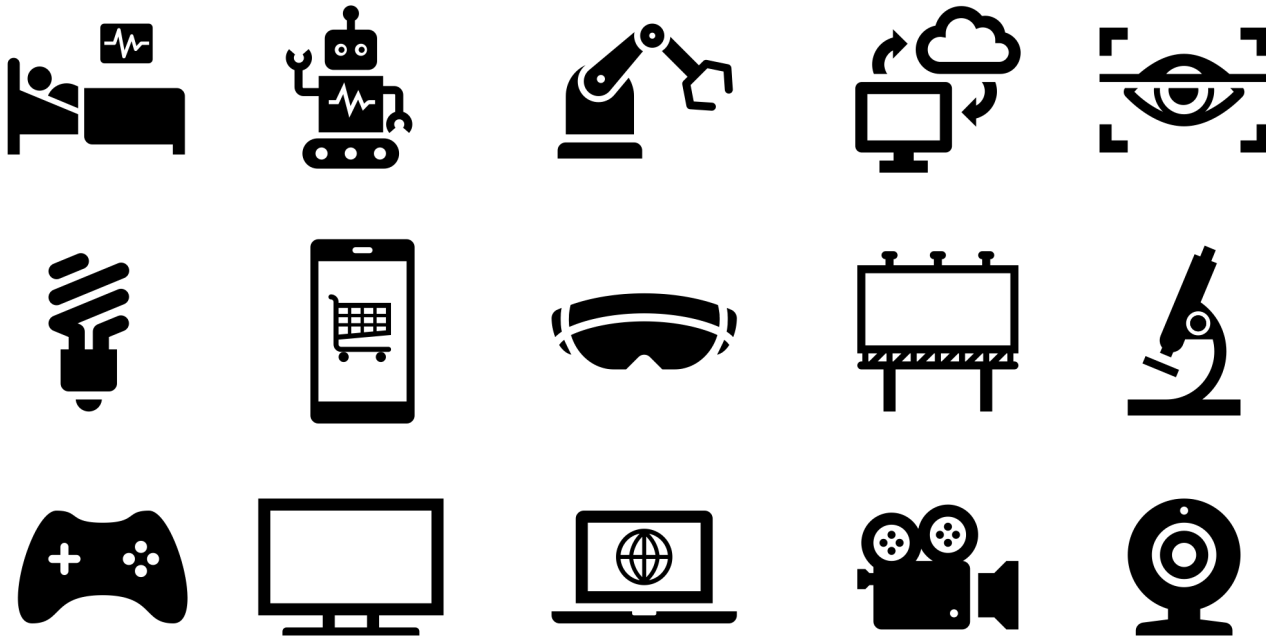
Demand characteristics for 6G



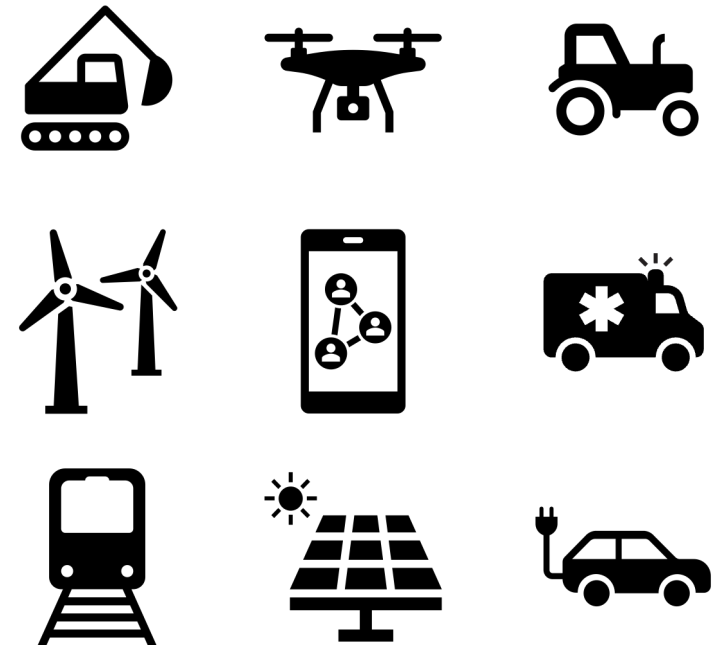
- Improved speed & latency
- Greater capacity density
- Better indoor coverage
- Support for remote coverage
- Improved locational accuracy
- Native sensing functions
- Energy optimization
- Interconnection with Internet / cloud
- In-built support for network sharing
- Support for diverse models and owners

The elephant in the 5G room

Indoor



Outdoor



Source: Disruptive Analysis

6G needs to be designed with indoor use – and shared/neutral models – as primary

Expected “Enabling” Technologies for 6G

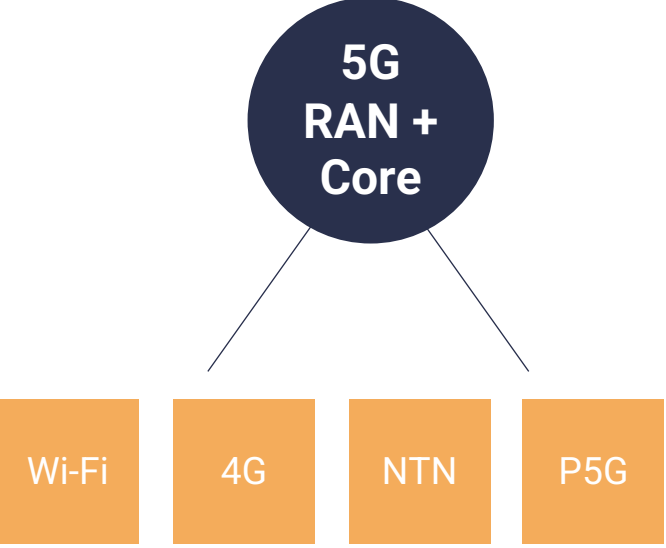
	Achievable and necessary	More challenging or less necessary	Next 6G phase
Ultra high data rate/ ultra low latency	<ul style="list-style-type: none"> User experienced data rate of $\geq 1\text{Gbps}$ (outdoors) User experienced data rate of $\geq 1\text{Gbps}$ (indoors) Sub-millisecond latency for over-the-air lag Uplink $\geq 1\text{Gbps}$* 	<ul style="list-style-type: none"> User experienced data rate of $\geq 500\text{Gbps}$ (outdoor and indoor) Uplink $\geq 10\text{Gbps}$ 	<ul style="list-style-type: none"> Peak data rate of 1Tbps 1 microsecond latency
New frequencies + network interconnection	<ul style="list-style-type: none"> mmWave up to 100GHz range* Support for 7-24GHz range between FR1 / FR2* 	<ul style="list-style-type: none"> Integration with non-terrestrial networks Standardised spectrum-sharing mechanisms* 	<ul style="list-style-type: none"> Use of near-THz (300GHz+*) Use of visible light
Ultra-massive MIMO + ultra-flexible physical and control layers	<ul style="list-style-type: none"> Distributed and much larger antenna arrays 3D coverage Enhanced duplex flexibility (up vs. downlink) Programmable networks Increased network capacity Sidelink (device to device or D2D) 	<ul style="list-style-type: none"> Intelligent surfaces Cell-less architecture Other new radio coding, modulation and control technologies Locally flexible uplink/downlink duplex ratios* 	
High-resolution location	<ul style="list-style-type: none"> Improvements in accuracy to, say, 10 cm-level – both outdoor and indoor 3D positioning 	<ul style="list-style-type: none"> 1 cm-level accuracy 	
Improved sensing capabilities	<ul style="list-style-type: none"> Integrated sensing and communications (ISAC) 	<ul style="list-style-type: none"> Faster sampling rates 	
General network concepts	<ul style="list-style-type: none"> Distributed autonomous network 	<ul style="list-style-type: none"> Computing-aware network Deterministic networking Micro-networks Network of networks 	

**Delivered under 5G Advanced*

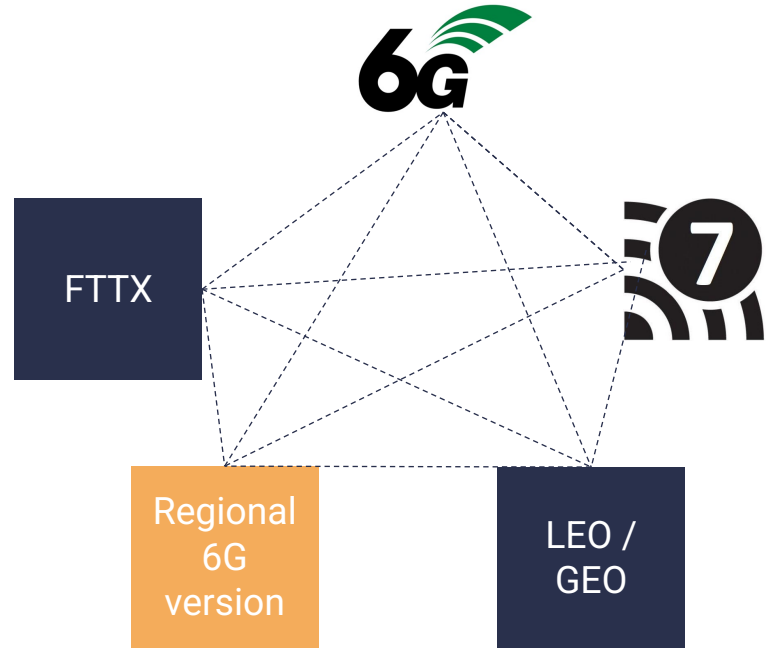
6G pathways: external factors & dynamics



6G in the context of “advanced connectivity”



5G era assumption of “cellular-primary” with 3GPP anchor



6G era reality of multiple networks often loosely coupled

6G touches a huge set of policy & regulatory themes

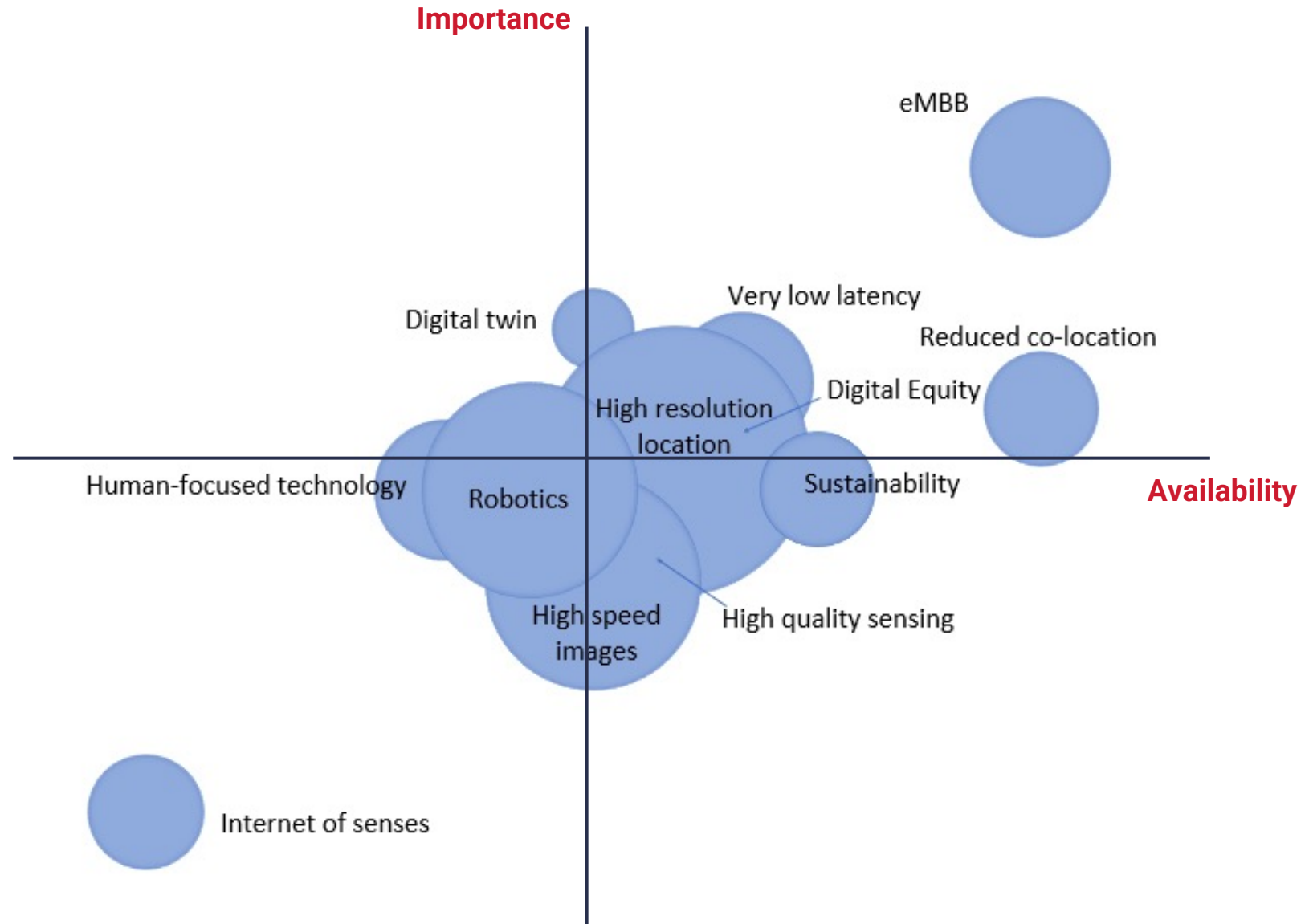
- Techno-politics of Open RAN & network disaggregation / supply chain diversity
- Patents & technologies vs. trade barriers & sanctions
- Government / supra-governmental funding, subsidies, testbeds & internal use
- National drivers for spectrum bands / rules (eg military or satellite use)
- Different governance regimes for AI, personal data, encryption etc..
- 5G / 6G use cases related to critical infrastructure,
- Affiliation of key individuals (committee chairs or secretariat) of industry bodies
- Trade-offs between inclusivity (eg low cost) and export potential
- Dependency on cloud platforms controlled by international providers
- Links made between network standards and UN development goals / Net Zero

Potential for regional/national divergence on 6G standards, development & ecosystem by 2030

6G products and services



Potential 6G products/services



Categories of 6G use cases

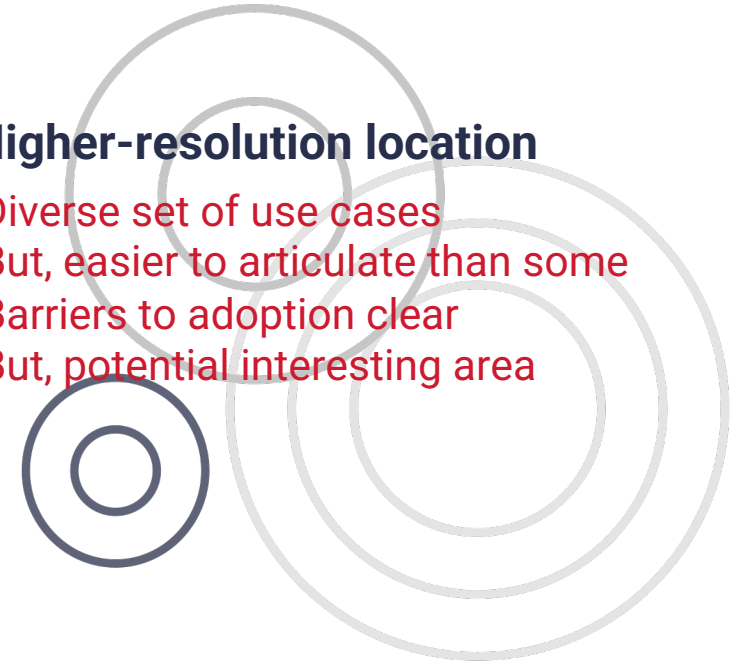
Sustainability

High-level priority
Easy to articulate general areas of benefit
But hard to see how 6G is specifically going to help



Higher-resolution location

Diverse set of use cases
But, easier to articulate than some
Barriers to adoption clear
But, potential interesting area



Human-focused technologies

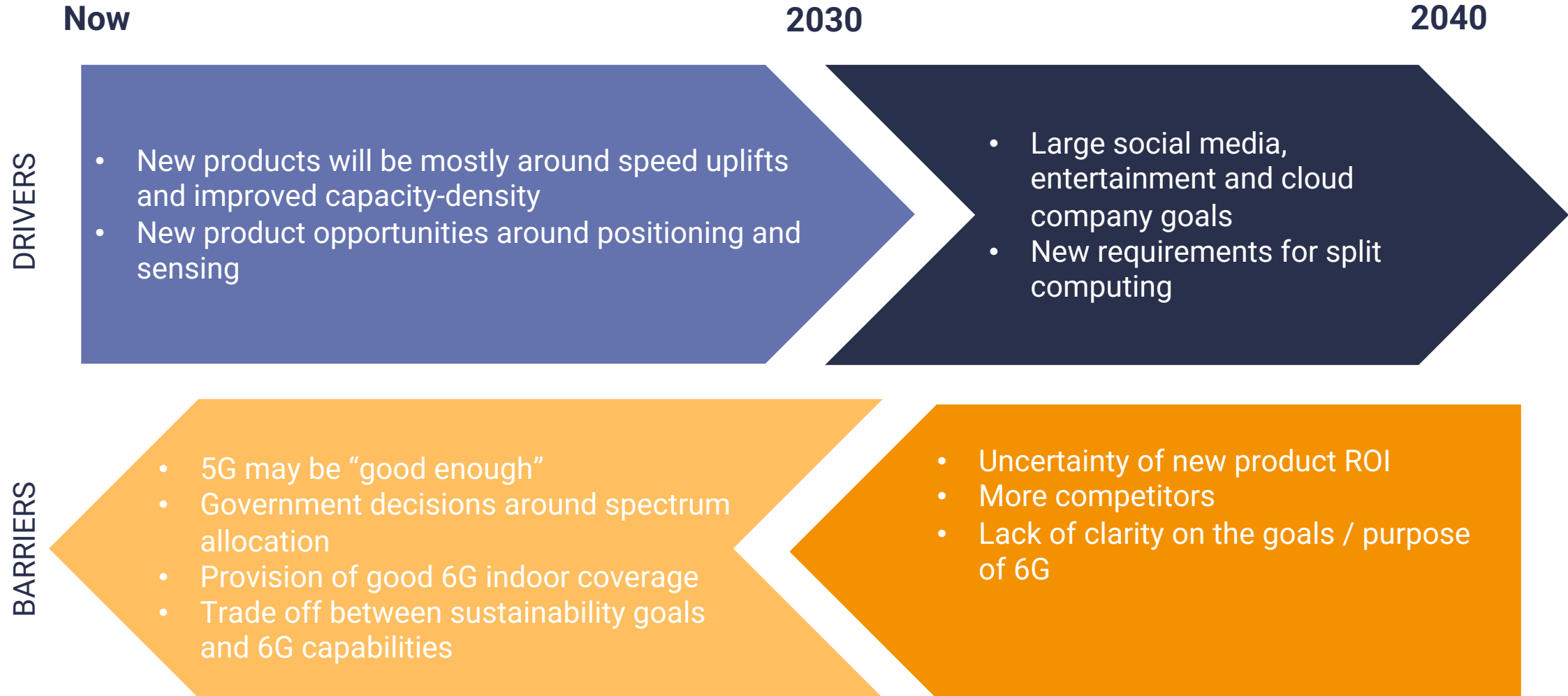
Loosely affiliated group of technologies
Diverse and conceptual and complicated
Unclear what 6G will be needed for
Could be the next big thing?



In conclusion



Drivers and Barriers for 6G



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Thank you!

Any questions?

