

The Next-G Challenge

Vision for the next era of wireless

India's path towards a successful leadership in 6G (IMT-2030)

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Coverage
To deliver ubiquitous multi-Gbps connectivity



Capacity
To fuel next-generation wireless at scale



Quality of Service
To enable fiber-like user experiences



Deployment Economics
To cost-efficiently introduce new technologies

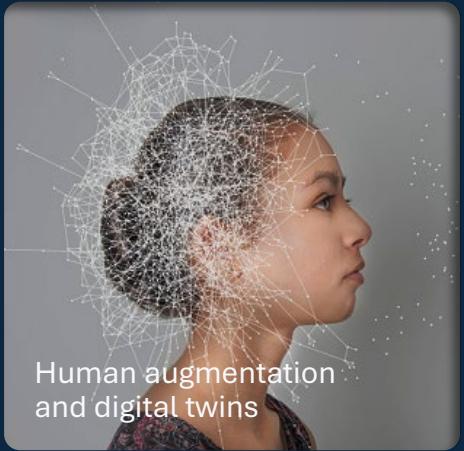
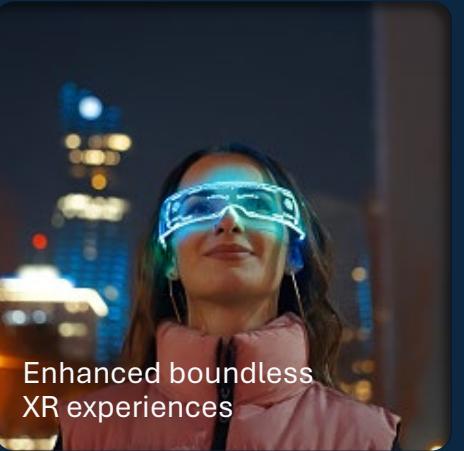


Universal Challenges for Wireless that the research community needs to address beyond 6G

With 6G/7G, Wi-Fi 9/10, and other emerging wireless technologies



Sustainability
To optimize energy & equipment use efficiency



The capacity and quality of service challenges (affordability)

Commercial innovation, with Harmonized global standards for scale – followed by building societal innovation above commoditized technologies

The sustainability challenge

Contributing to sustained economic, societal, and environmental goals



Spectrum sharing



Equipment sharing



Higher cell density

And more...



Lower spectrum cost
and higher usage



Improved cost, energy efficiency,
and quicker deployment



Energy saving with lower
transmit power

Evolving towards a more dynamic energy-efficient wireless system

On-device energy savings

INDEPENDENTLY AT THE DEVICE



On-device power savings by optimizing existing functions

Rel-16 introduced techniques such as wakeup signal (WUS) and enhanced carrier aggregation

Rel-17 optimized paging operations in idle mode and reduced PDCCH monitoring time in connected mode

Network energy savings

COORDINATED BETWEEN DEVICE AND NETWORK



Shifting focus to network-side savings and continuing to optimize device power consumption

Rel-18 further enhanced device energy efficiency for XR and RedCap; Rel-19 may further enhance low-complexity IoT with WUS/WUR

Rel-18/19 focuses on new network energy saving techniques in the time/freq/power/spatial domains

Native E2E energy savings

AT ALL DEVICE AND NETWORK LAYERS



Device and network energy optimization across all protocols and layers

Continuing to improve and balance end-to-end system performance/energy efficiency tradeoffs (e.g., MIMO, mobility, power amplifier efficiency, distributed topology, and others), as well as deployment complexity and performance

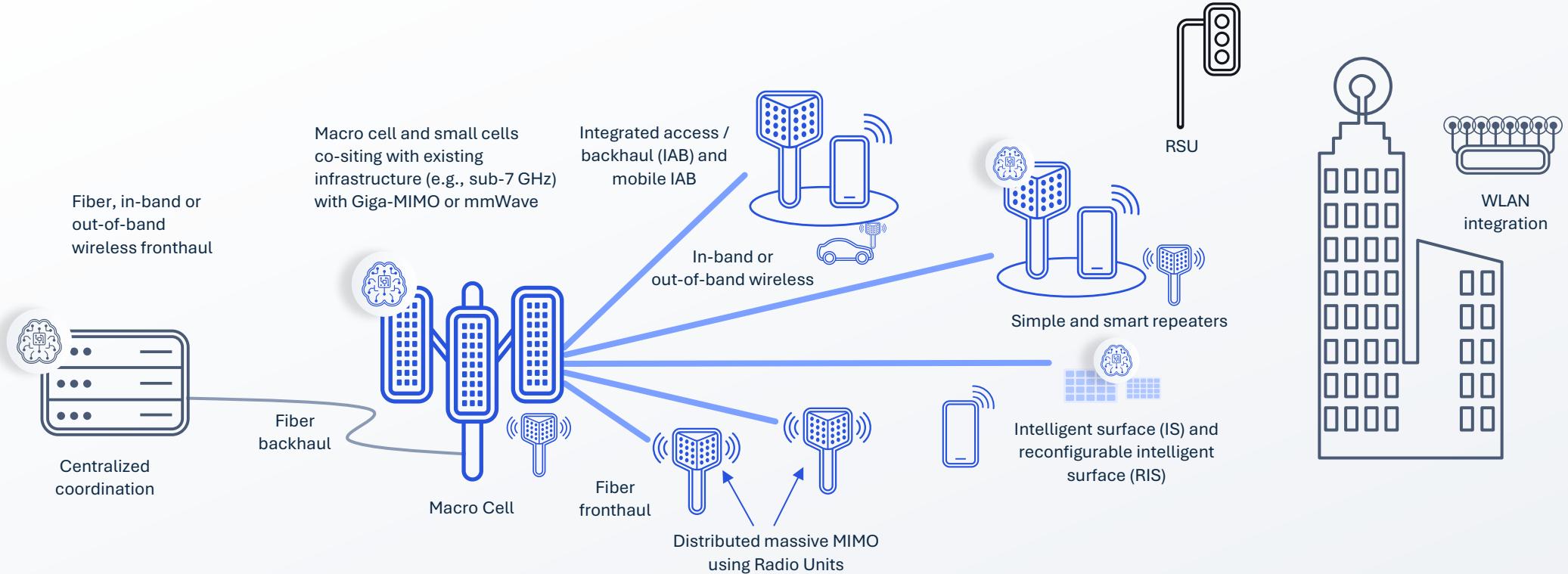
5G

5G
ADVANCED

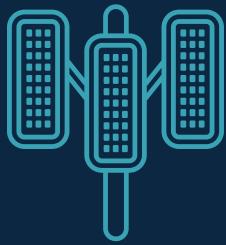
6G

The deployment challenge (towards ubiquity)

Expanding topology options to optimize cost and ease of expanding coverage



A scalable and distributed network architecture can meet diverse coverage, capacity, and other performance requirements



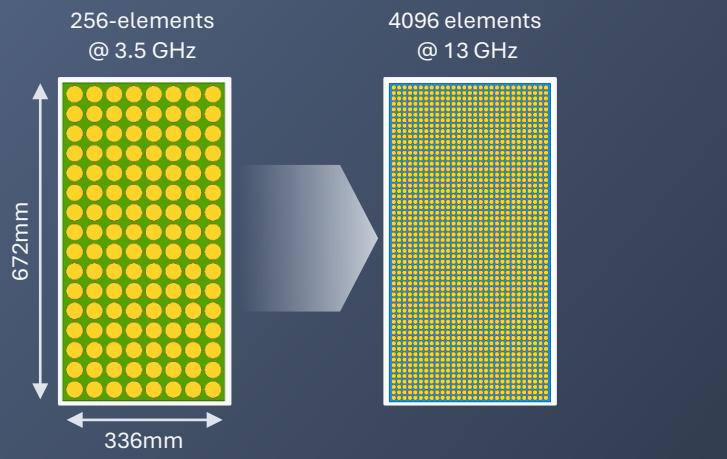
The coverage challenge

Enabling new wide-area bandwidth, for example, in the **6-15 GHz bands**

Giga MIMO with wide bandwidth and large number of antenna elements (e.g., 4k elements)

More antenna elements in the same aperture, 3-4x wavelength reduction → 9-16x elements, compared to 3.5GHz

Building on 5G sub-6 GHz and mm-Wave technologies and approaches



For supporting wide-area use cases in upper mid-band (e.g., 6-15 GHz)

Global spectrum discussions underway

Experimental licenses e.g., 8.5-9 GHz, 12.75-13.25 GHz

Regional and ITU discussions ongoing for longer term refarming



Same coverage in Qualcomm Morehouse campus in the two bands with co-sited, same aperture antenna panels

Targeting new bandwidth opportunities

GHz bandwidth —10x more capacity than existing massive MIMO systems

Comparable wide-area coverage to massive MIMO in 3.5 GHz range

Higher positioning, radar, and RF sensing resolutions

Further evolving cellular for non-terrestrial communication

That complements terrestrial communication

5G Rel-15

Study Item focused on deployment scenarios and channel models

5G Rel-17

Work Item focused on supporting satellites and HAPS for eMBB and IoT1 with enhancements to synchronization, scheduling, HARQ, mobility, and more

6G

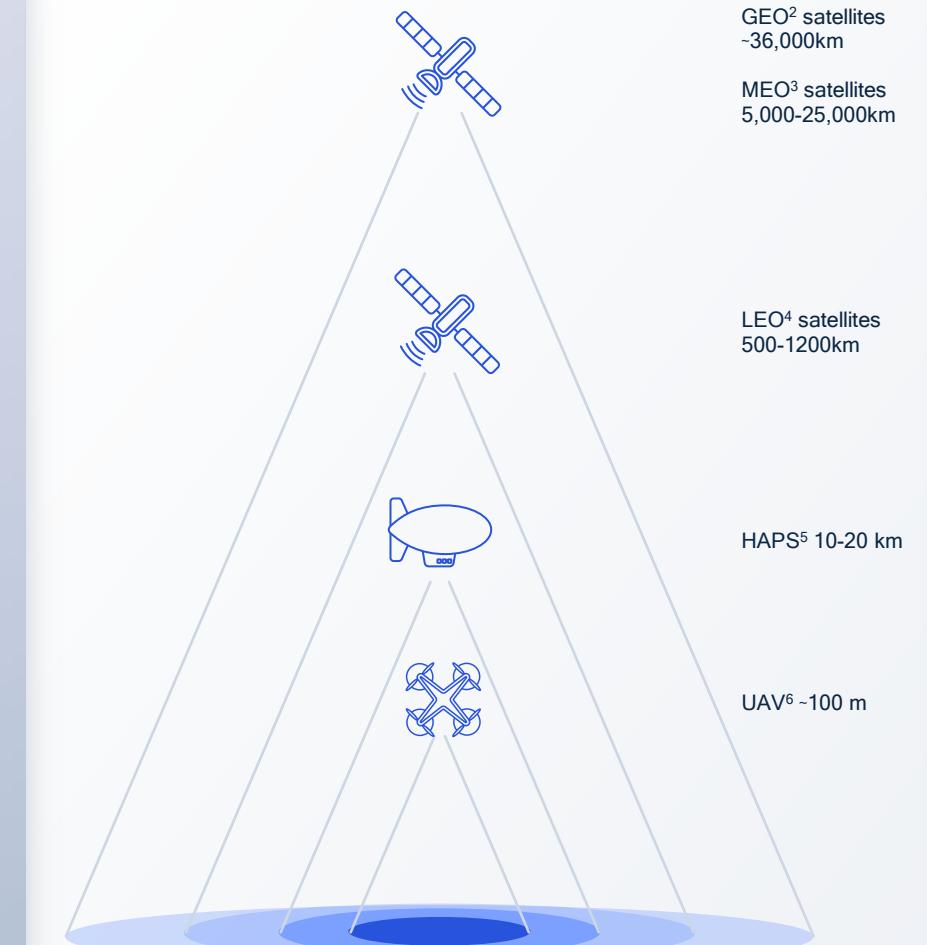
Potential focus on delivering an integrated 3D heterogeneous network, where terrestrial infrastructure can be complemented by non-terrestrial ones

5G Rel-16

Study Item focused on solutions for adapting 5G NR to support NTN

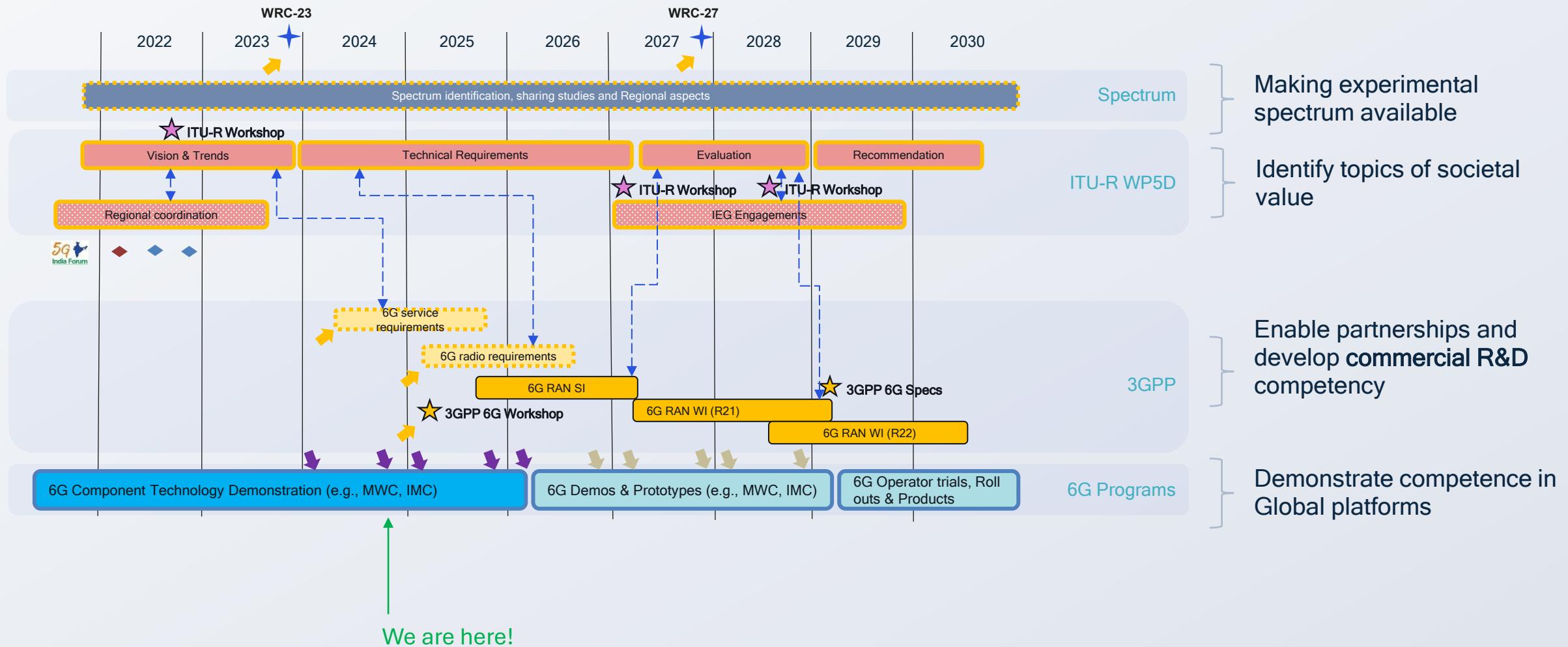
5G Rel-18+

Expected to further enhance communications for UAV, HAPS, and satellites



A timeline for India!

6G networks should evolve G-agnostic and support future evolving use cases



Thank you



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