

Qualcomm

Qualcomm 6G Usecases and discussion on 3GPP Release 20 SA1 6G Study

3GPP TSG-SA WG1 Meeting #106 Jeju,
Korea, 27-31 May 2024, S1-241087

Use Cases



Holographic Telepresence



Backhaul for Wireless Data Centers



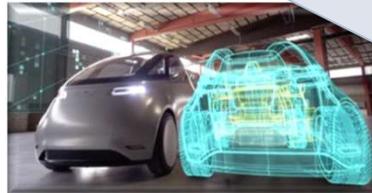
Global Coverage and connectivity



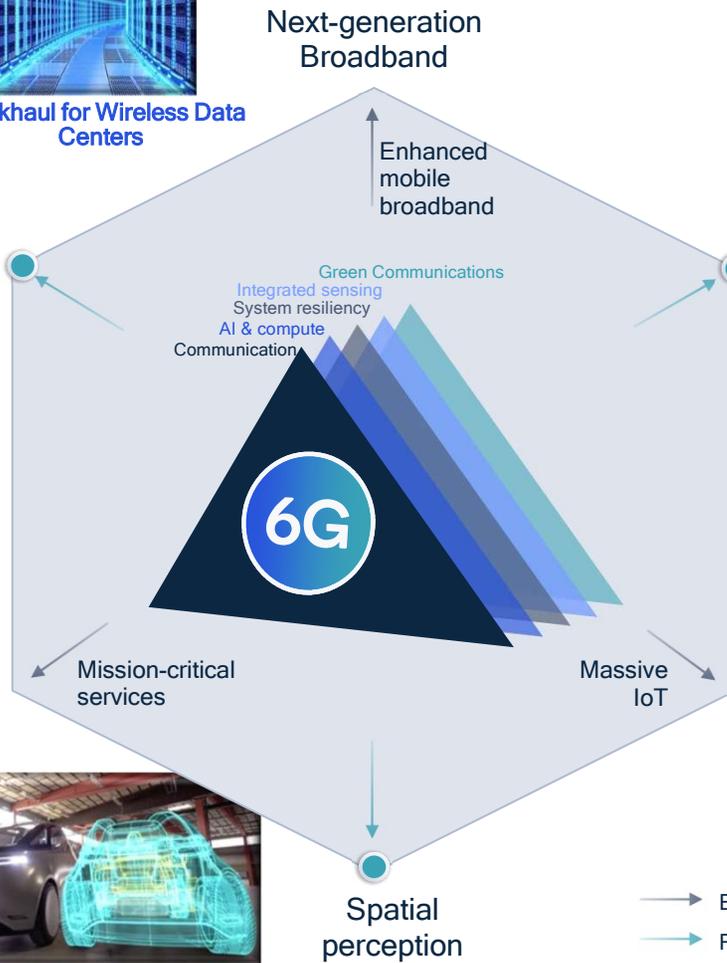
Asset management with Ambient IoT devices



Collaborative Industrial Robots



Digital Twins



→ Evolutionary dimension
→ Revolutionary dimension

A smarter wireless platform to support new use cases categories

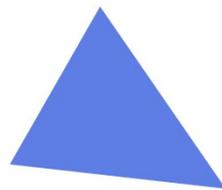
Note: 6G will support new use cases as well as existing services supported by prior G's (i.e., 5G, 4G and 3G).

Overarching Aspects Mapping to QC Capabilities

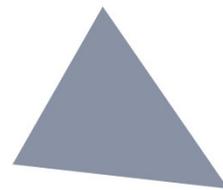
6G Capabilities



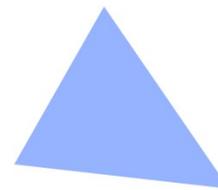
Communication



AI & compute



System resiliency



Integrated sensing



Green communications

6G Technologies

Large scale MIMO
Terahertz frequencies
Active and Passive
Meta Surfaces for
coverage
...

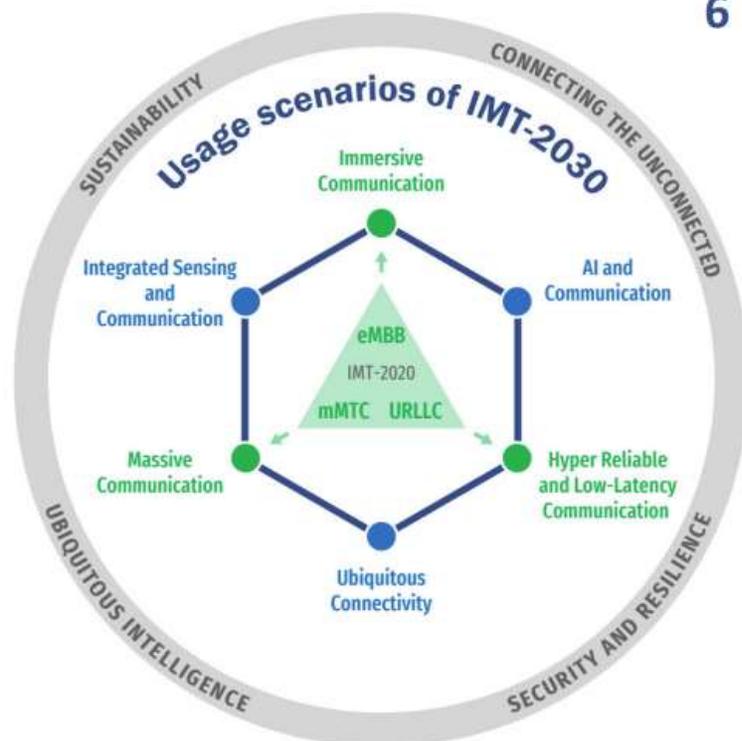
End-to-End AI Native across
device/network/cloud
Cloud Native Scalability
Distributed Compute
Joint Communication and
Compute powered by AI
...

Native security
Post-Quantum Security
Data Security and privacy
Robust trust
...

Integrated Communication
and Sensing
Sensor fusion across
RF and non-RF sensors
TN and NTN Sensors
Higher precision
positioning and localization
...

End-to-end "green"
communication service
System-wide energy
optimization
Energy-harvesting devices
Passive infrastructure and
network elements
...

ITU-R IMT 2030 Usage Scenarios



So called "Wheel diagram"
Source: Document 5/131 and edited in SG 5

6 Usage scenarios

Extension from IMT-2020 (5G)

eMBB → Immersive Communication

mMTC → Massive Communication

URLLC → HURLLC (Hyper Reliable & Low-Latency Communication)

New

Ubiquitous Connectivity

AI and Communication

Integrated Sensing and Communication

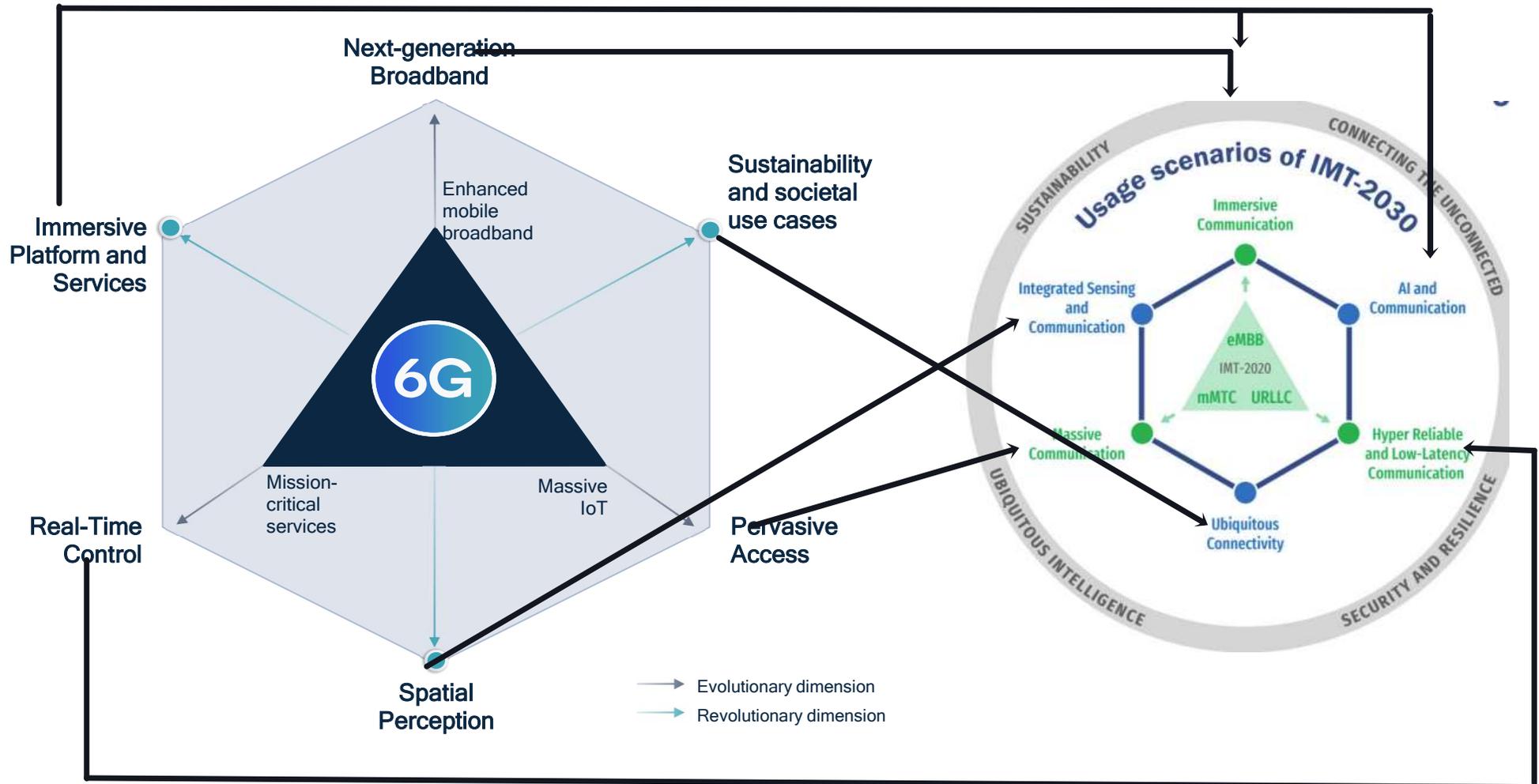
4 Overarching aspects:

act as design principles commonly applicable to all usage scenarios

Sustainability, Connecting the unconnected,
Ubiquitous intelligence, Security/resilience

- Many presentations during the 3GPP SA1 Workshops referenced the ITU-R usage scenarios and overarching aspects as a useful framework for categorizing the 6G use cases.

Mapping between QC Use cases to ITU-R Usage Scenarios



Perspective on Release 20 6G Study

High-level Goals for Rel. 20 6G Study

- It is important for Release 20 6G to address some of these objectives:
 1. defining appropriate 6G scope to capture the needs of the wireless ecosystem stakeholders for 2030 and beyond. Some of needs discussed during the 3GPP SA1 workshop include:
 - providing new services to meet demands of consumers and enterprise customers.
 - enabling CAPEX and OPEX reduction for operators and enabling monetization of new services
 - addressing societal and environment challenges.
 - delivering reliable and secure features for various verticals.
 2. providing 6G use cases and requirements to downstream 3GPP working groups.
- With these goals in mind, the 6G Study should have sufficient scope for meaningful work to be completed within the allotted time (3GPP SA1 meeting #106 to #113)
- Therefore, careful consideration is required in selecting an appropriate 6G Study approach.
- In the next slide, we present a few options.

Some Options for 3GPP SA1 Release 20 6G Study

• Option 1: Umbrella approach

Step 1: Umbrella Study with 6G use cases (with little to no organization)

Step 2: Consolidate requirements.

Note: Building Blocks would come in later SI/ WI

Pros: Gives enough time (6 SA1 meetings) for 6G scoping.

Cons: Only high-level Inputs would be available at the end of study to be used by downstream groups.

• Option 2: Building Block Approach

Step 1: Start study with building blocks. e.g. using ITU-R IMT2030 framework.

Step 2: Collect use cases and requirements for each of the building blocks and consolidate the requirements.

Pros: Enough time to develop detailed inputs for each building block.

Cons: Scoping and Building block selection might be rushed.

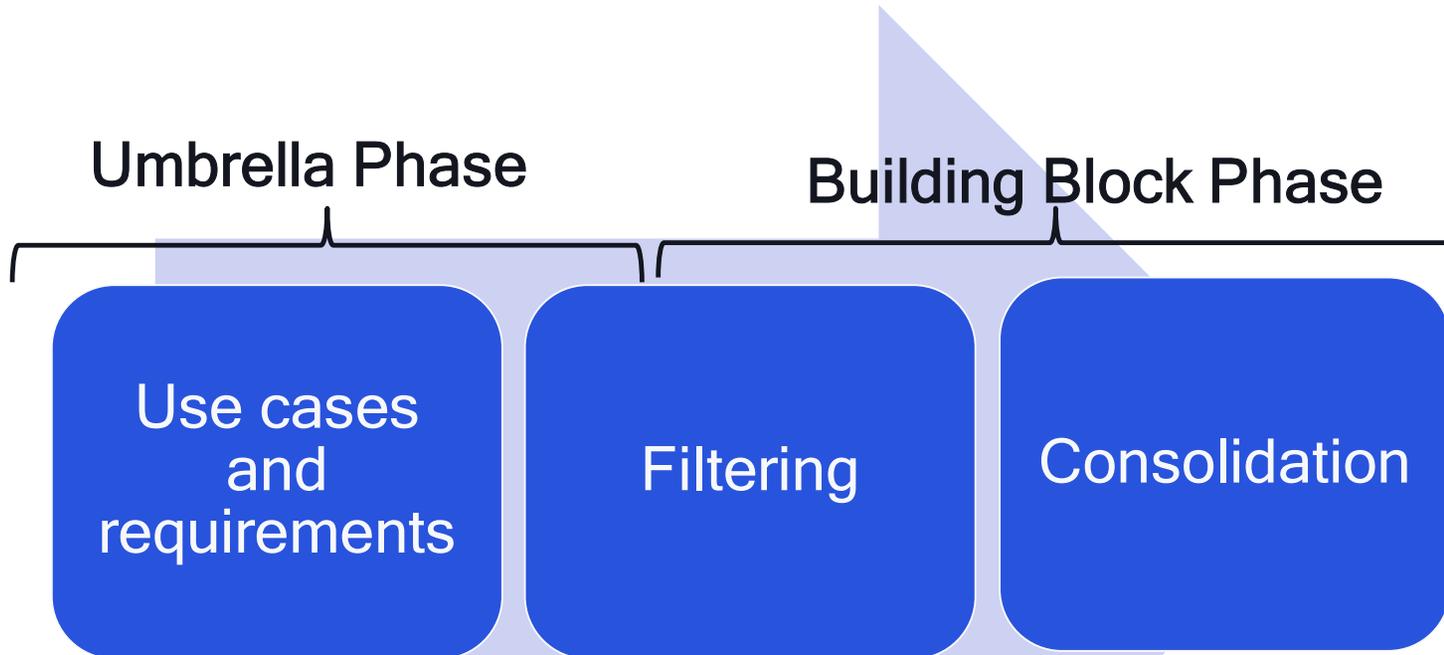
• Option 3: Umbrella + Building Block Approach

Step 1: Umbrella Study with the subgrouping based on ITU-R IMT2030 framework.

Step 2 : Based on use cases in step1, filter use cases and -divide each subgroup into the building blocks and consolidate requirements.

Pros: Combines the benefits of option 1 and 2

Option 3



Goal:

- Collect use cases and high-level requirements with justification on why 6G is required and what capabilities are required.

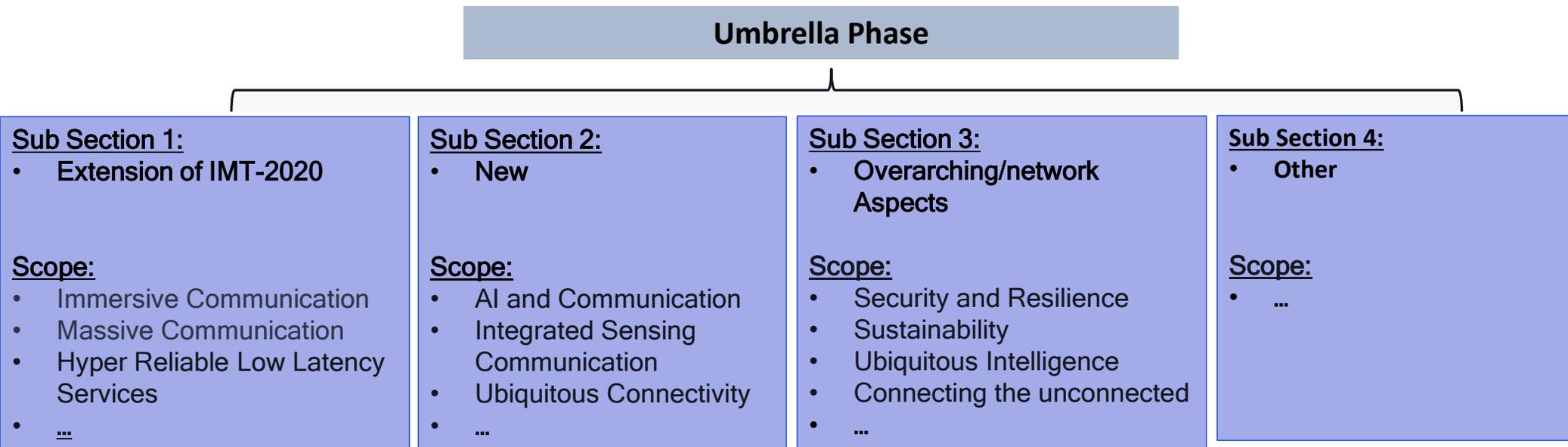
Goal:

- Selected building blocks from Umbrella phase and develop detailed use cases, and functional and performance requirements.
- Consolidated functional and performance requirements per building block.

Note: The umbrella phase and building block phase may overlap.

Umbrella Phase

View 1: Use the ITU-R IMT 2030 Framework as basis for the umbrella study and follow the high-level categorization of ITU-R IMT 2030 usage scenarios and overarching aspects.

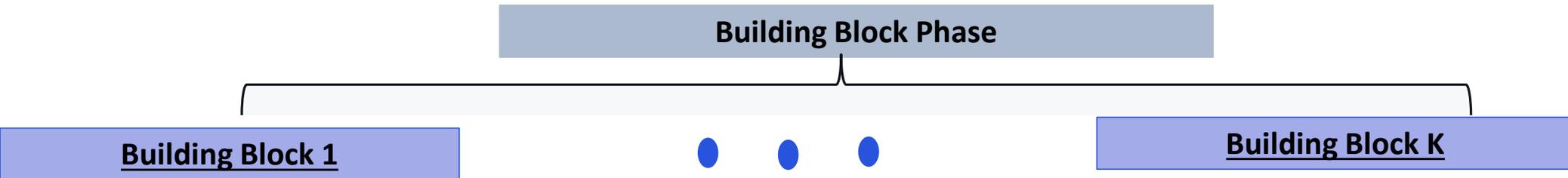


View 2: Capture use cases and high-level requirements into categories in one TR with the following sections :

- Extension of IMT-2020 Usage Scenarios
- New Usage Scenarios
- Overarching/Network Aspects
- Other (subsection could capture items that are outside the current scope of ITU-R IMT-2030 framework)

Note: The final terminologies for the subsections could be discussed further.

Building Block Phase - Filtering Stage



View 3: Building Blocks should be selected based on the areas of importance to companies.

- There are many approaches that can be used in selecting building blocks. Below is an example based on the highest number of use cases in a building block. Other approaches could also be considered.
 - **Step 1:**
 - For each of sub-sections in the umbrella phase related to ITU-R framework, group use cases into the usage 6 scenarios and 4 overarching/network aspects proposed by ITU-R or other groupings based on other criteria. 2) Group use cases in the “Other” sub-group into multiple building blocks.
 - **Step 2:**
 - Select the top K usage scenarios/overarching aspects with the highest number of use cases.
 - Select M usage scenarios, N overarching aspects with highest number of use cases where $M+N = K$. e.g., 4 usage scenarios, 2 overarching aspects so there are 6 building blocks in total.

Note: During this process, considerations should be given to merging building blocks with significant overlap.

Note: Building blocks may start at different times and may overlap with the umbrella phase.

Building Block Phase- Filtering and Consolidation Stages

- Filtering Stage cont'd:

Areas for consideration

Note 1: There are Work Items in Release 19 related to ITU-R usage scenarios and overarching aspects for which downstream group standardization efforts has not started e.g., Sensing, Metaverse, SOBOTS, etc. We need consider if to leverage some of the Release 19 work when selecting building blocks and/or developing content for the selected building blocks.

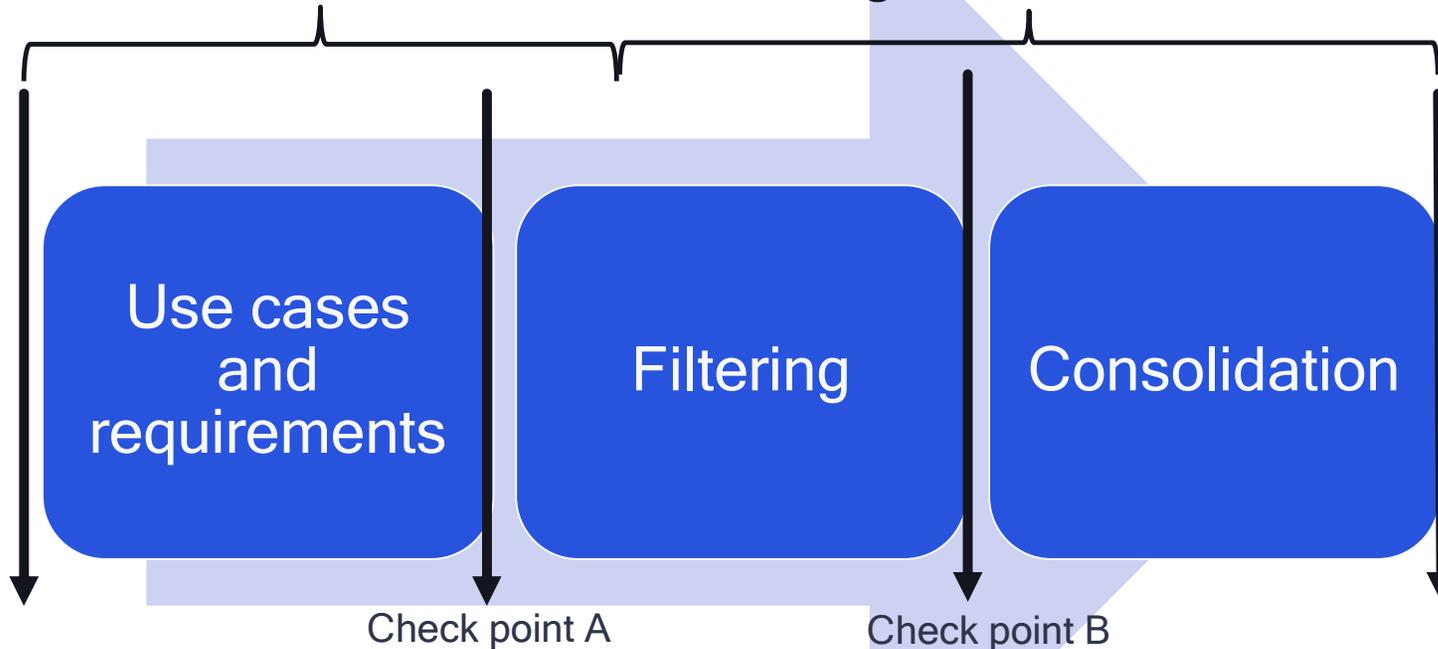
Note 2: Discuss the implications for the unselected building blocks.

- Consolidation Stage: Further grouping if required, down selecting and refining of requirements (functional and KPIs) would be performed at this stage.

Timeline Considerations

Umbrella Phase

Building Block Phase



Nov. 2024, SA1#108

March. 2026, SA1#113

View 4: There should be agreements on multiple check points during the umbrella and building block phase to measure progress and coordinate with downstream groups. Examples include check points at the end of umbrella phase, filtering stage and consolidation stage.

Note: The umbrella phase and building block phase may overlap.

Conclusion

- We are indeed at the dawn of exciting times as we shape the future of wireless communication!
- Given the scope of the stakeholder needs and expectations, it is imperative to select a 6G study approach with sufficient scope for meaningful work to be completed within the study duration.
- We can leverage lessons learnt from the 5G, while adapting the approach to the multi-dimensional aspects of the upcoming 6G.
- We propose to discuss the merits of the umbrella-building approach leveraging the ITU-R IMT2030 framework taking Views 1 to 4 into consideration.

Thank you

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Backup

Source sample text

Next Generation Broadband

Description: Use cases requiring significantly higher peak data rates and user experience than those that are supported in 5G



Backhaul for Wireless Data Centers



Wireless Fiber to Home

Immersive Platforms and Services

Description: Use cases involving high data rate and very low latency for supporting multimedia, highly immersive and multi sensory interactions

Other Examples:

- Metaverse Gaming/Entertainment and Collaboration
- Mixed Reality Co-Design, Mixed Reality Telepresence,
- Holographic Video Conferencing



Holographic Telepresence



Metaverse Collaboration

Real Time Control

Description: This class of services will push the technology boundary to deliver even lower latency and higher reliability/availability beyond 5G

Other Examples:

- Vehicle Platooning/Cooperative Maneuvering
- Autonomous Service Robots,
- Rescue robots



Collaborative Industrial Robots



Autonomous and Interactive Service Robots

Spatial Perception

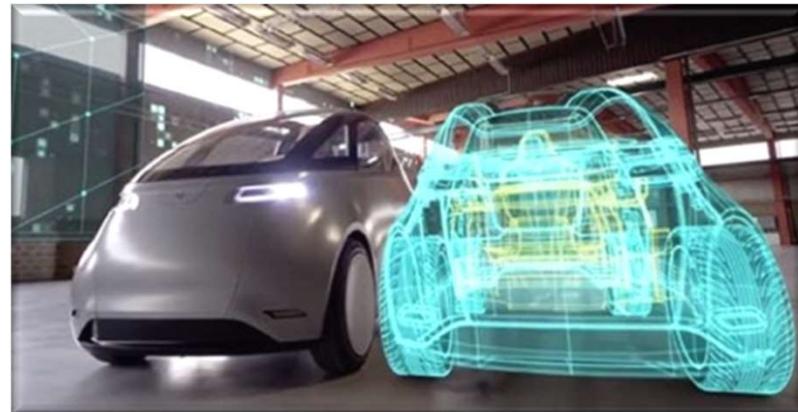
Description: Use cases exploiting new/improved capabilities of wireless sensing (and positioning) to offer services

Other Examples:

- Smart Agriculture
- Environmental Monitoring
- Brain Communications and human implants



Sensing Networks



Digital Twins*

*A digital twin is the real-time digital replica of a real-world object, which connects physical systems and digital spaces. Digital twin can monitor, design, simulate, analyze, optimize and predict the behavior of physical systems.

Pervasive Access

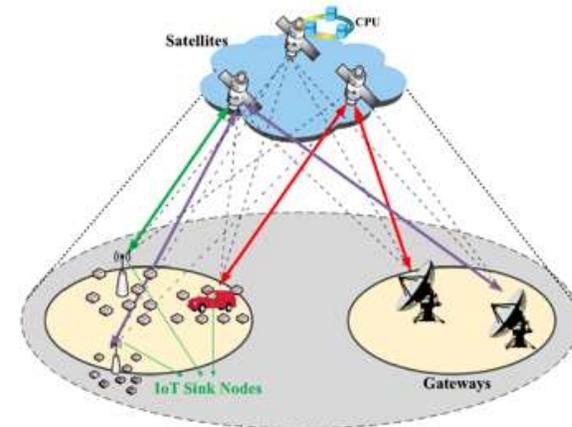
Description: Use cases supporting very high density of devices, specially, devices with low complexity

Other Examples:

- Public Safety applications
- Next Generation Smart Grid



Asset Management using Zero powered tags



Wide Area IoT Network with NTN

Sustainability and Societal Use cases

Description: Use cases that address social, environmental and economic sustainability challenges

Other Examples:

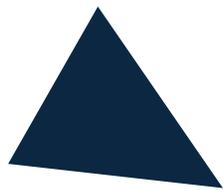
- Seamless and ubiquitous coverage and connectivity e.g., for bridging the divide
- Multi-connectivity using UAVs, GEOs, LEOs and HAPs
- Devices with scalable affordability



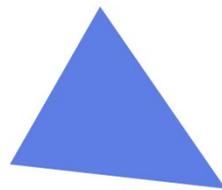
Global/3D Coverage and Connectivity

Overarching Aspects Mapping to QC Capabilities

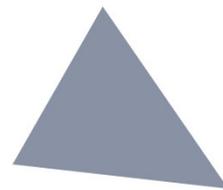
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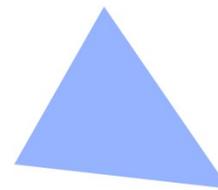
Communication



AI & compute



System resiliency



Integrated sensing



Green communications

6G Technologies

Large scale MIMO
Terahertz frequencies
Active and Passive
Meta Surfaces for
coverage
...

End-to-End AI Native across
device/network/cloud
Cloud Native Scalability
Distributed Compute
Joint Communication and
Compute powered by AI
...

Native security
Post-Quantum Security
Data Security and privacy
Robust trust
...

Integrated Communication
and Sensing
Sensor fusion across
RF and non-RF sensors
TN and NTN Sensors
Higher precision
positioning and localization
...

End-to-end "green"
communication service
System-wide energy
optimization
Energy-harvesting devices
Passive infrastructure and
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