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Title: 22.870 pCR Update of Use Case on Enabling Non-3GPP Wireless
 Sensing

Agenda Item: 8.1.4 (FS\_6G-REQ - Integrated Sensing and Communication)

Source: Samsung

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*Abstract: This 22.870 pCR updates the existing use case in 7.16 to address editor's notes and off-line comments.*

**Discussion**

This 22.870 pCR updates TR 22.870 use case 7.16 Use case on enabling non-3GPP wireless sensing, where non-3GPP sensing is used as a radio access technology to provide sensing services.

- The motivation is rewritten - to clarify 6G wireless sensing services comparable to those defined for use in TS 22.137, using 802.11bf are now enabled. This will allow mobile network operators to offer 6G wireless sensing services in location (e.g., indoor,) for example where 3GPP access coverage is poor, or WLAN service is excellent.

- The definition of a non-3GPP sensing station is updated to clarify the applicability of 3GPP standards to specific deployments, namely 'trusted' sensing stations.

 The previous two changes aim to address the Editor's Note in 7.16.6
"Editor’s Note: The above requirements are FFS."

- A performance KPI tables is provided. This was missing in the version of the use case added to TR 22.870.

 The addition of performance requirements information is to address the Editor's Note in 7.16.5
"Editor’s Note: The performance analysis table is FFS."

- Some clean up of Table 7.16.5-1 NOTE numbering.

Modification for r1

- change the definition of the non-3GPP sensing station to specifically support 802.11bf not all non-3GPP sensors [Ericsson, Xiaomi, Softbank, Qualcomm]

- remove the roaming requirement [Deutsche Telekom]

- change the terminology for 'sensing result' in requirement to 'non-3gpp sensing result'. In 5G only sensing result (for 3GPP wireless sensing only!) and combined sensing result (both 3GPP wireless sensing and non-3GPP sensing) are defined. To support the scenario described in this use case a new definition of sensing result is needed. [Ericsson, Deutsche Telekom]

**Proposal**

It is proposed to make the change listed below to TR 22.870, 0.3.1.

Begin changes

## 3.1 Terms

For the purposes of the present document, the terms given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**6G Computing Service:** A service provided by 6G network utilizing computing resources in Service Hosting Environment, which can be used by a subscriber (via UE)/3rd party.

**6G System Data**: the data that is generated and controlled by the 6G system.

NOTE 1: 6G system data is different from traditional user traffic data which is application level data being transmitted through the 3GPP system for user related services.

Editor’s Note: The definition of 6G System Data is FFS.

**6G Wireless sensing:** 6G system feature providing capabilities to get information about characteristics of the environment and/or objects within the environment (e.g. shape, size, orientation, speed, location, distances or relative motion between objects, etc) using radio frequency signals.

NOTE 2: The 6G Wireless sensing service can use data acquired with either NR-based radio signals, non-3GPP radio signals, or a combination.

**Al Agent:** an automated intelligent entity capable of e.g interacting with its environment, acquiring contextual information, reasoning, self-learning, decision-making, executing tasks (autonomously or in collaboration with other Al Agents) to achieve a specific goal.

Editor’s Note: This definition could be updated as the study goes on to align with the potential new understand of AI agent.

**AI service:** an 6G service (e.g. AI model inference) to support AI-related activities, which is provided by 6G core network to the 6G user, considering the required quality of the service (e.g. inference accuracy, latency).

NOTE 3: The above term does not imply any architectural assumption, e.g. whether 6G CN is a new or evolved CN (compared to 5G).

Editor’s Note: The definition of AI service is FFS.

**Digital Twin:** A real-time representation of physical assets in a digital world.

NOTE 4: This definition was taken from ITU-T Recommendation Y.3090 [113].

**Energy Supply:** The delivery of electricity to a physical location. This is typically realized by placing two or more wires coming from a DSO at a geographical location and connecting those wires to a metering device.

NOTE 5: This definition was taken from TS 28.318 [232].

**Intelligent Communication Assistant:** The virtual intelligent communication assistant locates in operator network and interacts with the users through voice, video, text, gestures or other modalities. The assistant can be customized for each particular user by accessing user data stored in the network, with user’s consent. It can provide various communication services and support individual users based on user’s intention and requirement utilizing AI capability. One subscriber can have one or more Intelligent Communication Assistants.

**Intent:** Expectations including requirements, goals and constraints without specifying how to achieve them. [147]

NOTE 6: Intent can be used for 6G services as well as OAM.

Editor’s note: NOTE 6 is FFS.

Editor’s note: this definition is FFS for further enhancement along the study goes on. If more detail regarding Intent is necessary to support the use cases in this TR it may be introduced in an Annex.

**Maximum slice energy credit limit:** a policy establishing an upper bound on the aggregate quantity of energy consumption by the 6G system to provide services for a specific slice, e.g. in kilowatt hours.

**Network Digital Twin**: virtual replica of (part of) a mobile network to emulate (or simulate) the behaviour of the actual network.

Editor’s Note: it is FFS to update this definition.

**Network Federation**: Refers to the interoperability of two or more 6G networks, enabling them to share resources and services, to achieve shared objectives. Federated 6G networks maintain their autonomy but coordinate to share resources, or services, ensuring mutual benefits without compromising individual operational control or data privacy.

NOTE 7: Network federation is currently defined in TS 28.538 [257], TS 23.558 [52] and allows MNOs to share edge computing resources.

**non-3GPP sensing result**: processed non-3GPP sensing data requested by a service consumer.

**non-3GPP sensing station**: a device capable of emitting and/or receiving non-3GPP radio signals specified in IEEE 802.11bf [201] that can result in acquisition of non-3GPP sensing data.

NOTE 8: The non-3GPP sensing station can be owned, operated and deployed by the network operator or its business partner.

**Personal Data**: any information relating to a user or subscriber that can be used to, either directly or indirectly, identify that user or subscriber, or to distinguish that user or subscriber from others.

**Sensing target density:** total number of objects to be sensed per geographic area. It is a measure of how many objects the 3GPP system can detect, identify and/or track within a target sensing area.

Second change

## 7.16 Use case on enabling non-3GPP wireless sensing

### 7.16.1 Description

In 5G, Sensing allowed ‘combined sensing results’ using 3GPP and non-3GPP sensing data. At the same time, Wireless sensing is a 3GPP service defined on the basis of NR-based capabilities:

**5G Wireless sensing:** 5GS feature providing capabilities to get information about characteristics of the environment and/or objects within the environment (e.g. shape, size, orientation, speed, location, distances or relative motion between objects, etc) using NR radio frequency signals, which, in some cases, can be extended by information created via previously specified functionalities in EPC and/or E-UTRAN.

The goal of this use case is to support indoor scenarios with the same 6G sensing service as provided by NR-based sensing services, whose requirements are captured in TS 22.137 [6].

This use case considers only non-3GPP wireless sensing, not other non-3GPP sensors (video, audio, LiDAR, etc.)

Just as 802.11 wireless LAN access has proved a valuable way to support 3GPP services in indoor scenarios often with poor 3GPP access coverage, this use case considers use of 802.11bf wireless sensing capabilities as well. 802.11 wireless access coverage is generally present where communication services are often accessed, in homes, businesses, vehicles, schools, etc. As 802.11bf sensing capabilities are adopted and deployed as part of future 802.11 base stations and terminal devices, there will also be an excellent opportunity to extend 3GPP sensing services to these generally indoor environments.

The goal of IEEE Sensing standardization is quite aligned with the aims in 3GPP. It aims to provide a unified framework to support a variety of applications such as presence detection, motion detection and gesture recognition supporting a wide range of verticals e.g. healthcare and smart environment automation. IEEE 802.11bf [201] is in draft standard status currently and has been implemented and deployed. It is compatible with existing 802.11 standards and can operate in different scenarios. One fundamental scenario requires an upgrade of either a single or multiple access points, to support monostatic, bistatic and multistatic sensing scenarios. Support by client-based systems is also possible, which provides improved resolution and better support in environments where there is only a single access point. Work continues in IEEE to improve these capabilities, for greater sensing precision, capacity, leveraging improved channel states, wider frequency bands and support for more antennas.

Work in ETSI ISG ISAC investigates use cases and technical feasibility for ISAC development and standardization that could occur in 6G. ETSI ISG ISAC identifies 6G use cases, sensing types, channel models, architectures and deployment considerations, KPIs and evaluation assumptions. Most of the work is still ongoing. However, GR ISC 001 [95] identified potential advanced 6G use cases dependent on ISAC and the corresponding technology gains. For each use case, the potential requirements provided are centred on the 6G system. Notably, over 50% of the identified use-cases require the 6GS to receive, process, fuse, and store sensing data from non-6GS entities indicating the crucial role of non-3GPP sensor data to complement existing system capabilities.

Most of the requirements included in TS 22.137 [6] are already satisfied by IEEE 802.11bf [201]. This use case analyzes the where there are gaps in support and proposes requirements for the 6G system to fill these gaps.

### 7.16.2 Pre-conditions

In this use case, it is assumed that access points have been deployed that supports IEEE 802.11bf [201].

NOTE: Scenarios in which terminal equipment (that is also a UE) also support IEEE 802.11bf [201] are not discussed in this use case.

It is also assumed that a network operator supports sensing service functionality, as described in TS 22.137 [6]. These sensing services support specific requirements that can be supported through interworking with IEEE 802.11bf [201] as described below.

The use case is presented in an abstract manner, as it embraces many of the use cases in TR 22.837 [9].

The ‘sensing service consumer’ (SSC) is a third party, a customer of an MNO, that receives sensing services. Sensing results are exposed to the third party.

### 7.16.3 Service Flows

1. The SSC identifies a need for sensing in a given area of interest.
2. The SSC requests this service from the MNO.
3. The SSC once authorized by the MNO, provides information concerning what sensing results are needed and other parameters concerning the sensing service.
4. The MNO controls the suitable WLAN sensing stations to acquire non-3GPP sensing data.
5. The MNO processes the non-3GPP sensing data to create a sensing result.
6. The MNO exposes the sensing result to the SSC.
7. The MNO accounts for the sensing service provided to the SSC in the form of charging data.

### 7.16.4 Post-conditions

The SSC receives sensing data results. The SSC does not know or care whether these results were acquired using 3GPP or non-3GPP access. The MNO is able to enable 6G wireless sensing service to indoor locations that are served by WLAN.

### 7.16.5 Existing features partially or fully covering the use case functionality

Table 7.16.5-1: Feature comparison of TS 22.137 [6] and 802.11bf [201]

|  |  |  |
| --- | --- | --- |
| Ref. | TS 22.137 [6] Requirement | Applicability, IEEE 802.11bf  [201] … |
| 5.2.1 | The 5G system shall be able to provide sensing service to detect, and/or track one or more objects (e.g. UAVs, birds) and the environment around the object(s). | Provides sensing capabilities to detect the range, velocity and motion of objects of interest, principally for indoor scenarios. |
| Based on operator’s policies, operator’s control and regulation, the 5G system shall be able to collect 3GPP sensing data from sensing receivers for processing. | Collects sensing data from sensing receivers for processing according to the architecture. |
| The 5G system shall be able to provide 5G wireless sensing service in a target sensing service area location using sensing transmitters and sensing receivers. | Defines a wireless sensing area of interest to support applications such as presence detection and gesture classification. |
| Subject to regulation and operator policy, the 5G network shall be able to activate, configure, and deactivate 5G wireless sensing based on parameters such as location and network conditions (e.g. network load). | Configures parameters for timing and both associated and non-associated stations. Sensing measurement procedures exchange these parameters both for trigger-based and non-trigger-based modes. |
| Subject to operator’s policy, the 5G system may be able to use sensing assistance information to derive the sensing result. | Supports information to be provided to define sensing behaviour, including range, velocity, and motion are based on channel state information, timing and bandwidth. |
| Subject to user consent, regulation, and operator’s policy, the 5G system shall be able to collect non-3GPP sensing data from authorized non-3GPP sensors and securely provide it to 5G network. | Supports this capability. |
| Subject to user consent, regulation, and operator’s policy, the 5G system should support the joint processing of the 3GPP sensing data and non-3GPP sensing data to derive a combined sensing result. | Supports the capability of gathering non-3GPP sensing data. This could be combined with 3GPP sensing data to derive a combined result. |
| The 5G system shall support continuity for 5G wireless sensing service (e.g. for sensing a moving object). | Supports sensing capabilities in a given service area but does not in itself support service continuity. To support service continuity for sensing for a moving object, further support would be needed (by the 6G system) to selectively use specific stations that support IEEE 802.11bf. [201] |
| Subject to operator’s policy, the 5G System shall be able to provide the 5G wireless sensing service in case of roaming. | Does not itself support roaming. This would have to be supported by the 6G system. |
| Subject to regulation and operator’s policy, 5G network shall provide prioritization among 5G wireless sensing services as well as prioritizing between communication and sensing services. | Supports prioritization including the point coordination function interframe space (PIFS) mechanism for measurement exchange. This supports different types of traffic using the same MAC resources. |
| Subject to local regulation, the 5G network shall enable UEs without 5G coverage to use unlicensed spectrum to provide 5G wireless sensing service. | Supports the use of unlicensed spectrum (only). |
| Subject to regulation, the 5G network shall enable UEs supporting V2X application to perform 5G Wireless sensing when not served by RAN using the allowed ITS spectrum and unlicensed spectrum. | Does not support V2X requirements. The interior of the vehicle could be supported, but this is out of scope of V2X. |
| 5.2.2 | Subject to regulation and operator’s policies, the 5G network shall be able to configure and/or authorize or revoke authorization of sensing transmitter(s) and sensing receiver(s) for 5G wireless sensing service.NOTE 1: Such configuration and authorization can be based on sensing transmitter or sensing receiver location, specific time, sensing duration, sensing accuracy, target sensing geographical area, establishing of communication to transfer sensing data, etc.NOTE 2: Such configuration and authorization can also include the selection of multiple sensing transmitters/receivers for 5G wireless sensing services. | Does not support authorization of this kind itself. This could be supported by the 6G system. |
|  | The 5G network shall be able to provide a mechanism for an MNO to configure UEs supporting V2X applications to support 5G Wireless sensing service when not served by RAN. | Does not support V2X requirements. |
|  | Based on location, the 5G network shall be able to ensure that sensing transmitters and sensing receivers use licensed spectrum only in network coverage and under the full control of the operator who provides the coverage.NOTE 3: The above requirement does not apply for public safety and V2X networks with dedicated spectrum, where 5G wireless sensing can be allowed out of coverage or in partial coverage as well. | Does not support licensed spectrum, so will never use licensed spectrum without operator control. |
| 5.2.3 | Subject to operator’s policy, the 5G network shall be able to provide secure means to report sensing result to a trusted third-party requesting information about a target object when specific requested conditions are met.NOTE **4**: These conditions could be e.g. the target object distance from the restricted area border or entering restricted area. | Supports acquiring sensing data based on conditions (trigger-based sensing.) This includes the area and other characteristics in which sensing data is acquired. IEEE 802.11bf [X] does not support reporting of sensing results to third parties. This could be added by the 6G system. |
| Subject to operator’s policy, the 5G network shall provide secure means for a trusted third-party to request 5G wireless sensing service based on specific parameters (e.g. refresh rate, period of time, sensing KPIs, geographical location) and to receive the corresponding sensing results. | Supports non-trigger-based sensing for unassociated stations, within a period of time. There is also a protected sensing measurement frame which is encrypted and authenticated only by associated stations. The sensing data can be acquired based on specific parameters including refresh rate, period of time, etc.) |
| Subject to operator’s policy and regulation, the 5G system shall be able to provide secure means for a trusted third-party to receive sensing results with contextual information. | Does not support reporting of sensing results to third parties. This could be added by the 6G system. |
| Subject to user’s consent, regulation and operator’s policy, the 5G network may provide secure means to expose to a trusted third-party the combined sensing result derived from the joint processing of the 3GPP sensing data and non-3GPP sensing data. | This requirement in 5G is also supported in 6G, though the implications are expanded by the new definitions. |
| Subject to operator’s policy, the 5G network may provide secure means for the operator to expose information towards trusted third-party on whether a given sensing service is available and the estimated quality of the given service for a certain geographic area and time. | This requirement in 5G is also supported in 6G, though the implications are expanded by the new definitions since ‘sensing service’ now includes sensing results from non-3GPP sensing data. |
| Subject to operator’s policy, the 5G network may enable secure means for a trusted third party to provide sensing assistance information. |  Does not support exposure of interfaces to third parties. Supports a means to configure sensing capabilities based on parameters. These parameters could be determined by the 6G system, as provided by a third party. |
| 5.2.4 | The 5G system shall support encryption, integrity protection, privacy of the 3GPP sensing data, non-3GPP sensing data and sensing results, to protect the data inside the 5G system. | Supports IEEE 802.11 security mechanisms. The 6G system could protect acquired sensing data and sensing results.  |
| The 5G system shall provide a mechanism to protect identifiable information that can be derived from the 3GPP sensing data from eavesdropping. | Does support a mechanism to protect confidentiality of data, including non-3GPP sensing data. |
| The 5G network shall limit the exposure of the sensing results only to a trusted third-party authorized to receive that sensing results. | Does not support exposing sensing service information to third parties. This could be added by the 6G system. |
| The 5G system shall support appropriate sensing KPIs of 5G wireless sensing for both situations where consent can be obtained, and where it cannot. | Supports KPIs for sensing in the form of KPI requirements including range coverage, field of view, range resolution, angular resolution, velocity resolution, accuracy, probability of detection, latency, refresh rate and number of simultaneous targets. Does not support consent, or obtaining it. The 6G system could support consent aspects. |
| Subject to regulation and user consent, the 5G network may be able to link sensing results with 3GPP subscriber identity of a UE for a sensing target associated with that UE served by the same network.NOTE **5**: The purpose of this requirement is to ensure that association of 3GPP subscriber identity and sensing results is possible only with user consent and according to regulatory requirements. | Does not support linkage of sensing results with 3GPP subscriber identity. The 6G system could support this capability. |
| 5.2.5 | The 5G system shall be able to support charging for the 5G wireless sensing service (e.g. considering sensing KPIs, duration). | Does not support charging. This could be added by the 6G system. |

The performance characteristics of IEEE 802.11bf [201] differ from the requirements in TS 22.137 [6]. This use case does not suggest that the existing sensing performance requirements change. The performance comparison in Table 7.16.5-1 identifies that certain scenarios in which 3GPP wireless sensing service could be used are more or less advantageous using IEEE 802.11bf [201].

The performance capabilities of IEEE 802.11bf [201] in Table 7.16.5-2 below, is compared to performance requirements in TS 22.137 [6]. Though IEEE 802.11bf [201] supports only a subset of the requirements, it is important to note that it supports a significant set of scenarios.

Editor's Note: Performance levels provided in the figure are from papers published at the 'requirements' phase of the IEEE 802.11bf standardization process. The draft standard is now under review, a necessary step before any specification is issued as an IEEE Standard. Performance evaluations are taking place based on the results achieved by standards-compliant implementations of the complete technical specification. It is expected that further detail and adjusted values will become available before the end of 2026.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 7.16.5-2: Performance comparison of TS 22.137 [6] and 802.11bf [201]Scenario | Sensing service category | Confidence level [%] | Accuracy of positioning estimate by sensing (for a target confidence level) | Accuracy of velocity estimate by sensing (for a target confidence level) | Sensing resolution | Max sensing service latency[ms] | Refreshing rate[s] | Missed detection[%] | False alarm[%] | Sensing service description in a target sensing service area |
| Horizontal[m] | Vertical[m] | Horizontal[m/s] | Vertical[m/s] | Range resolution[m] | Velocity resolution (horizontal/ vertical)[m/s x m/s] |
| Object detection and tracking | 1  | 95 | 10 | 10 | N/A | N/A | 10 [3]  | 5 [3] | 1000 | 1 | 5 | 2 | Indoor/outdoor (e.g., detection of human, UAV)  |
| 2  | 95 | 2 | 5 | 1 | N/A | 1  | 1 | 1000 | 0.2 | 0.1 to 5 | 5 | Outdoor (e.g., detection of human, UAV) |
| 3  | 95 | 1 | 1 | 1 [3], [4] | 1 | 1 [3], [4] | 1 x 1 [3] | 100 [2], or 1000 (NOTE 3); 5000 for detection in highway | 0.05 to 1 | 2 | 2 | Indoor/outdoor (e.g., detection and tracking of human, animal, UAV)  |
| 3A | [FFS] | 0.5-2 [x] | 0.5-2 [x] | 0.1-0.3 [x] | 0.1-0.3 [x] | 0.5-2 [x] | 0.1-0.3 x 0.1-0.3 [x] | [FFS] | minimum sensing interval 0.0005 [y] | [FFS] | [FFS] | Indoor (e.g. detection of human, animal, object, etc.) |
| 4  | 99 for public safety, otherwise, 95 | 0.5 | 0.5 | 1.5 for pedestrian,15 for vehicle, otherwise, 0.1 | 1.5 for pedestrian | 0.5  | 0.5 x 0.5for factories  | 100 to 5000 | 0.1 | 1 | 3 | Indoor/outdoor (e.g., detection and tracking of human, animal, UAV, AGV, vehicle)  |
| 4A | [FFS] | 0.2-2 [x](NOTE 7) | 0.2-2 [x](NOTE 7) | 0.1-0.3 [x] | 0.1-0.3 [x] | 0.5-2 [x] | 0.1-0.3 x 0.1-0.3 [x] | [FFS] | minimum sensing interval 0.0005 [y] | [FFS] | [FFS] | Indoor (e.g. detection and tracking of human, animal, moving object, etc.) |
| Environment monitoring | 5 | 95 | 10 | 0.2(NOTE 4) | N/A | N/A | N/A | N/A | 60000 | 60 to 600 | 0.1 to 5 | 3 | Nature of environments monitored by sensing (e.g. rainfall, flooding monitoring)  |
| Motion monitoring | 6 | 95 | N/A | N/A | N/A | N/A | N/A | N/A | 60000 |  60 | 5 | 5 | Human motions and activities obtained by sensing (NOTE 5) |
| 6A | [FFS] | 0.2 [x] | 0.2 [x] | 0.1 [x] | 0.1 [x] | 0.03 m (0.5m range)0.1m (2m range) | 1.5-3 m/s x 1.5-3 m/s [x] (NOTE 7) | [FFS] | minimum sensing interval 0.0005 [y] | [FFS] | [FFS] | Human motions and activities obtained by sensing (NOTE 5) |
| 7 | 95 | 0.2 | 0.2 | 0.1 | 0.1 | 0.375 | 0.3 | 5 to 50 | 0.1 | 5 | 5 | Human hand gestures obtained by sensing (NOTE 6) |
| 7A | [FFS] | <1 | <1 | 0.1 [x] | 0.1 [x] | 0.03 m (0.5m range)0.1m (2m range) | 1.5-3 m/s x 1.5-3 m/s [x] (NOTE 7) | [FFS] | minimum sensing interval 0.5 ms [y] | [FFS] | [FFS] | Human hand gestures obtained by sensing (NOTE 6) |
| NOTE 1: For sensing service categories to which UAV, human or vehicle is a sensing target, the typical size (Length x Width x Height) of UAV is 1.6m x 1.5m x 0.7m, the typical size of human is 0.5m x 0.5m x 1.75m, and the typical size of vehicle is 7.5m x 2.5m x 3.5 m.NOTE 2: The safe distance between pedestrian/vehicle and power transmission station/line is 0.7m/0.95m.NOTE 3: To realize 1m granularity tracking, when the velocity resolution is 1 m/s, the maximum corresponding sensing service latency is 1 s.NOTE 4: This value is derived from the water level where people feel difficulty in walking.NOTE 5: To achieve human motion monitoring, different accuracy KPI is needed to measure different human motions. E.g., respiration rate accuracy (2 times/min) is a KPI used to measure the accuracy of sleep monitoring, sit-up rate accuracy (3 times/min) is a KPI used to measure the accuracy of sports monitoring.NOTE 6: Category 7 has more stringent requirements (e.g., for KPIs such as positioning accuracy and sensing resolution) compared to other categories and typically requires more radio resources.NOTE 7: The variation in performance metric depends on the use case - more detailed sensing tasks have stricter requirements. |

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### 7.16.6 Potential New Requirements needed to support the use case

NOTE 1: The applicability of this feature is limited to non-3GPP sensing stations that are operated and trusted by the network operator. This is analogous to ‘trusted non-3GPP access.’

The main new implication expressed by this use case is captured by *broadening* the definitions of the terms 6G wireless sensing beyond 5G wireless sensing, and sensing results, to include non-3GPP sensing data with or without 3GPP sensing data. The implication of this change is that the *existing* TS 22.137 [6] requirements can be satisfied by other radio access technology than NR-based sensing. The claim is not that all requirements can be satisfied in this way, however, since 802.11bf capabilities have certain limitations (in terms of performance), so they are not suited for some requirements such as use outdoors, for tracking UAVs, etc.

The following requirements fill the gaps identified in clause 7.16.5, where support is lacking in the existing standard. The text of each requirement is *almost* the same as that in TS 22.137 [6]; the additions and changes are explained in the NOTE which follows. Additional NOTEs are copied as they were present in existing requirements.

[PR 7.16.6-1] Subject to operator’s policy, the 6G System shall be able to provide the 6G wireless sensing service in case of roaming.

NOTE 2: As the term 6G Wireless sensing does not specifically mention 3GPP radio access technology, this requirement applies to a Sensing service using 3GPP sensing data and/or non-3GPP sensing data.

[PR 7.16.6-2] Subject to regulation and operator’s policies, the 6G network shall be able to configure and/or authorize or revoke authorization of non-3GPP sensing station(s) for 6G wireless sensing service.

NOTE 3: Such configuration and authorization can be based on non-3GPP sensing station(s) location, specific time, sensing duration, sensing accuracy, target sensing geographical area, establishing of communication to transfer sensing data, etc.

[PR 7.16.6-3] Subject to operator’s policy and regulation, the 6G system shall be able to provide secure means for a trusted third-party to receive sensing results derived from non-3GPP sensing data.

[PR 7.16.6-4] The 6G system shall be able to support charging for the 6G wireless sensing service (e.g. considering sensing KPIs, duration).

Third change

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

Editor's Note: all References numbers to be corrected, missing references to be added

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] QIAN LI et all: "6G Cloud-Native System: Vision, Challenges, Architecture Framework and Enabling Technologies" in IEEE Access, Received 19 August 2022, accepted 1 September 2022, date of publication 8 September 2022, date of current version 19 September 2022. ([6G Cloud-Native System: Vision, Challenges, Architecture Framework and Enabling Technologies | IEEE Journals & Magazine | IEEE Xplore](https://ieeexplore.ieee.org/document/9882121)).

[3] GSMA: "Going green: benchmarking the energy efficiency of mobile networks (Second edition)", Feb 2023. ([Going green: benchmarking the energy efficiency of mobile networks (second edition)](https://prod-cms.gsmaintelligence.com/research-file-download?confluenceId=74384072&filename=280223-Going-Green-Second-Edition.pdf)).

[4] 3GPP TR 32.972: "Study on system and functional aspects of energy efficiency in 5G networks".

[5] 3GPP TR 23.700‑66: "Study on Energy Efficiency and Energy Saving".

[6] 3GPP TS 22.137: "Service requirements for Integrated Sensing and Communication; Stage 1".

[7] 5G Automotive Association (5GAA): "5GAA MRP input to 3GPP Stage 1 workshop on IMT 2030 Use Cases".

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End of changes