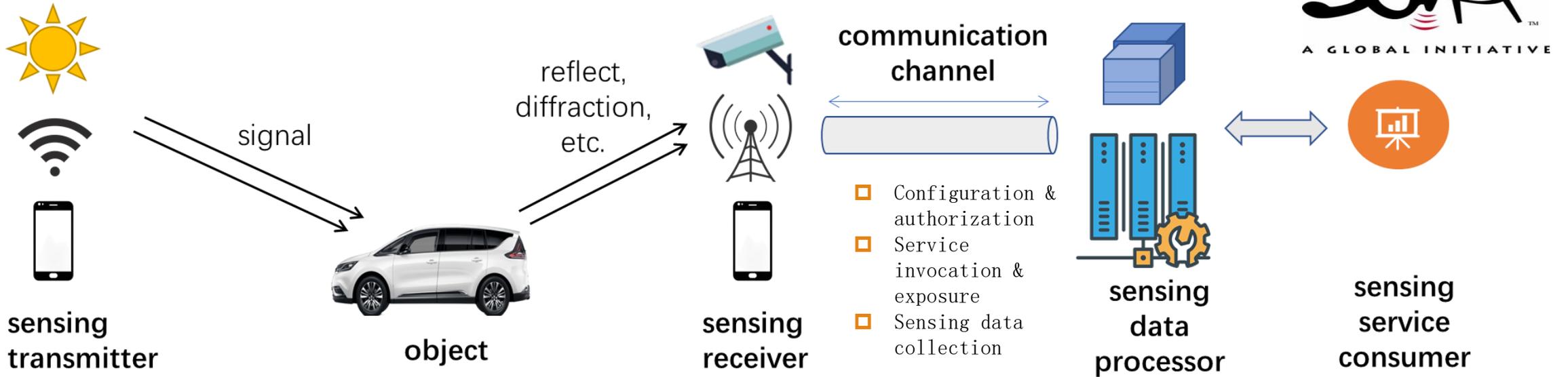


Motivation for Integrated Sensing and Communication

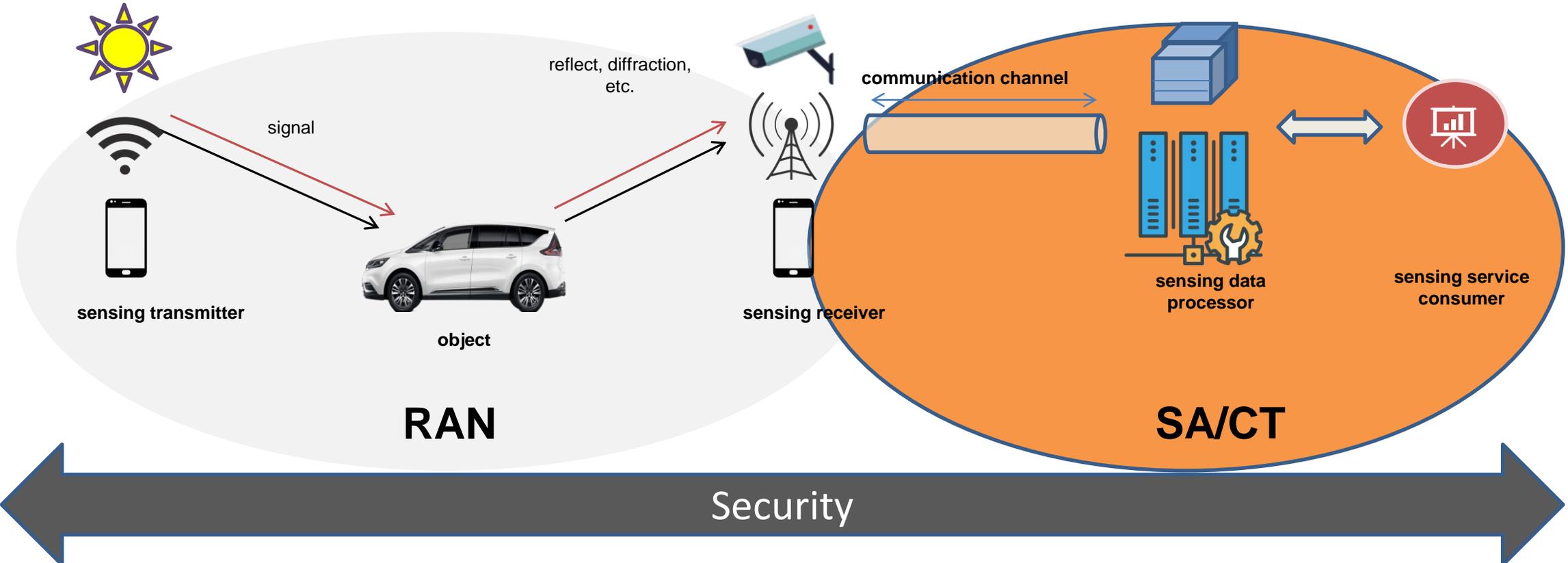
Xiaomi

Key components of sensing system



- Sensing transmitter
- Sensing receiver
- Communication channel
- Sensing data processor
- Sensing service consumer

Work split between RAN WGs and SA/CT WGs



- ❑ Measurement: signaling procedure for controlling the measurement, signal transmission/receiving
- ❑ Performance evaluation (5G-NR)

- ❑ Configuration & authorization
- ❑ Service invocation & exposure
- ❑ Sensing data (3GPP/non-3GPP) collection
- ❑ Sensing data (3GPP/non-3GPP) processing
- ❑ Charging

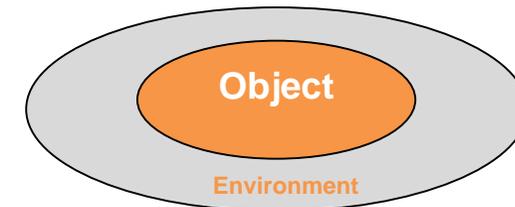
Overview (TR 22.873)

Concept

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 RF signals and, in some cases, previously defined information available in EPC and/or E-UTRA.

Scope & Scenarios

- Served or not served by NG-RAN
- Licensed or unlicensed spectrum
- 5G NR RF, non-RF, and previously defined information available in EPC and/or E-UTRA (no impact to EPC/E-UTRA is assumed)
- UE on board target object or non-UE on board target object
- Commercial, V2X, public safety and emergency services



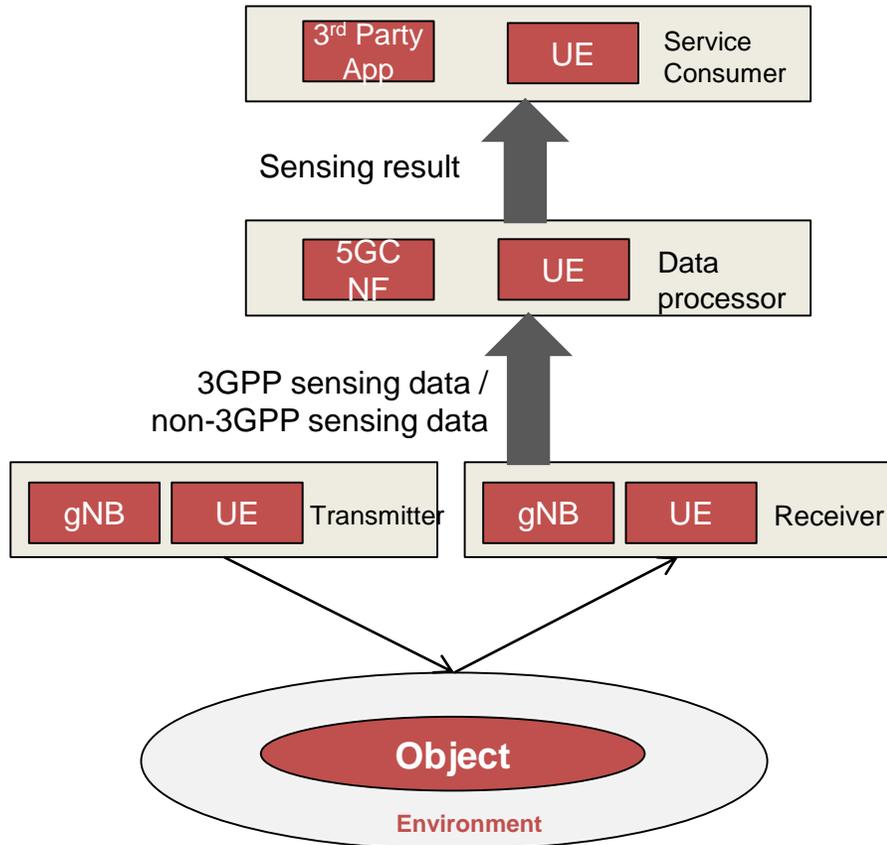
Sensing receiver

- an entity that receives the sensing signal which the sensing service will use in its operation.
- A sensing receiver is an NR RAN node or a UE.
- A Sensing receiver can be located in the same or different entity as the Sensing transmitter.

Sensing transmitter

- the entity that sends out the sensing signal which the sensing service will use in its operation.
- A Sensing transmitter is an NR RAN node or a UE.
- A Sensing transmitter can be located in the same or different entity as the Sensing receiver.

Potential Architecture Impacts



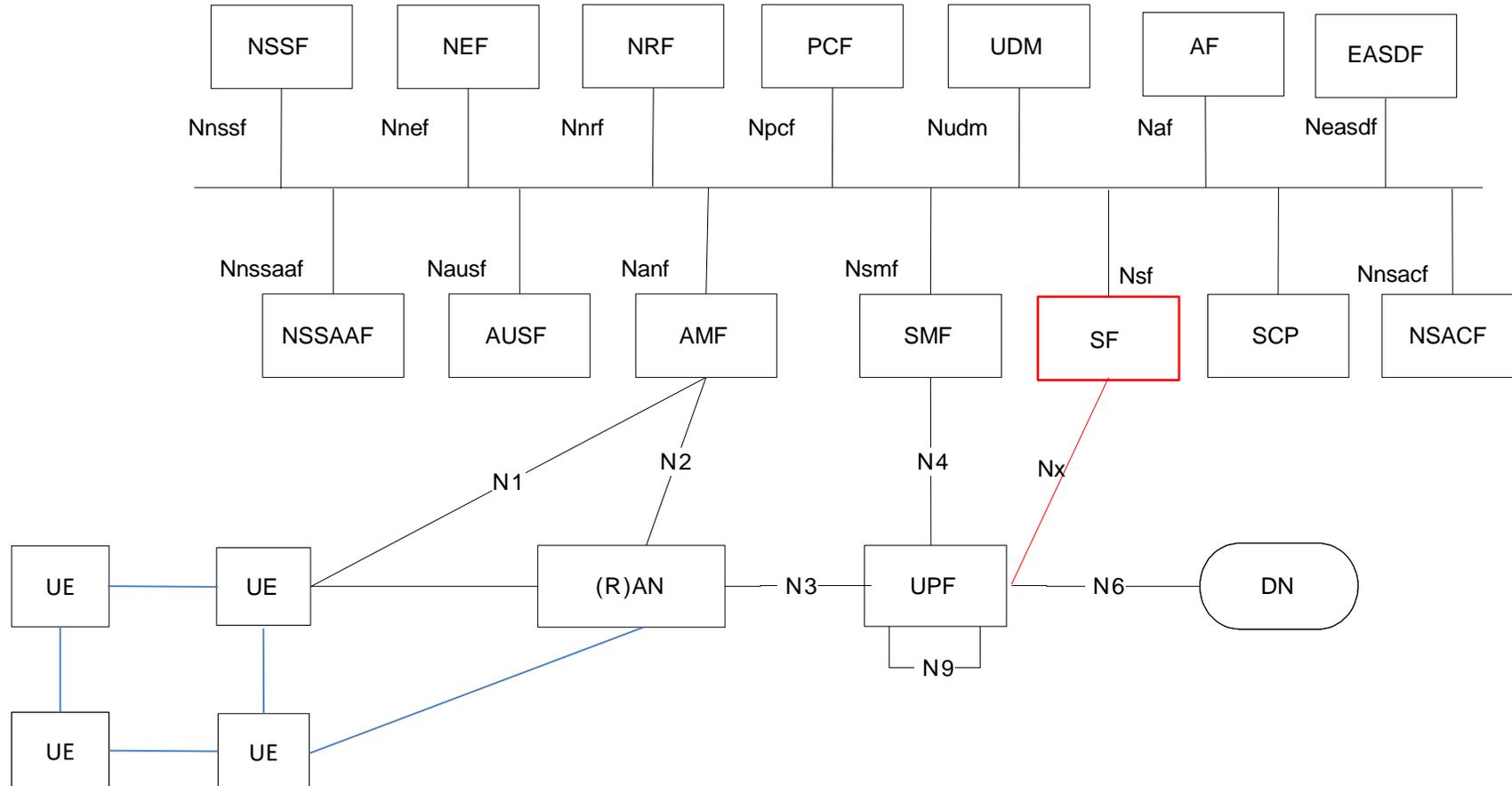
- ❑ **Sensing result:** processed 3GPP sensing data requested by a service consumer.
 - ❑ **3GPP sensing data:** Data derived from 3GPP radio signals impacted (e.g. reflected, refracted, diffracted) by an object or environment of interest for sensing purposes, and optionally processed within the 5G system.
 - ❑ **non-3GPP sensing data:** Data provided by non-3GPP sensors (e.g. video, LiDAR, sonar) about an object or environment of interest for sensing purposes.
- Source: TR 22.837

- Sensing result can be requested and exposed to 3rd party App or UE
 - ❑ Sensing result may include the final result or the processed sensing data per request of service consumer
- Sensing data can be processed at the 5GC NF or at UE
 - ❑ 5GC NF in the figure performs sensing measurement data processing, which can be a new NF or an existing NF
- Based on sensing option(s) adopted, transmitter/receiver may be gNB or UE
- Based on sensing option(s) adopted, a communication channel (over CP or UP) may be established between gNB and the data processor or between UE and the data processor
- UE(s) shown in the figure does not have to be served by NG-RAN



5GC Architecture Option 1

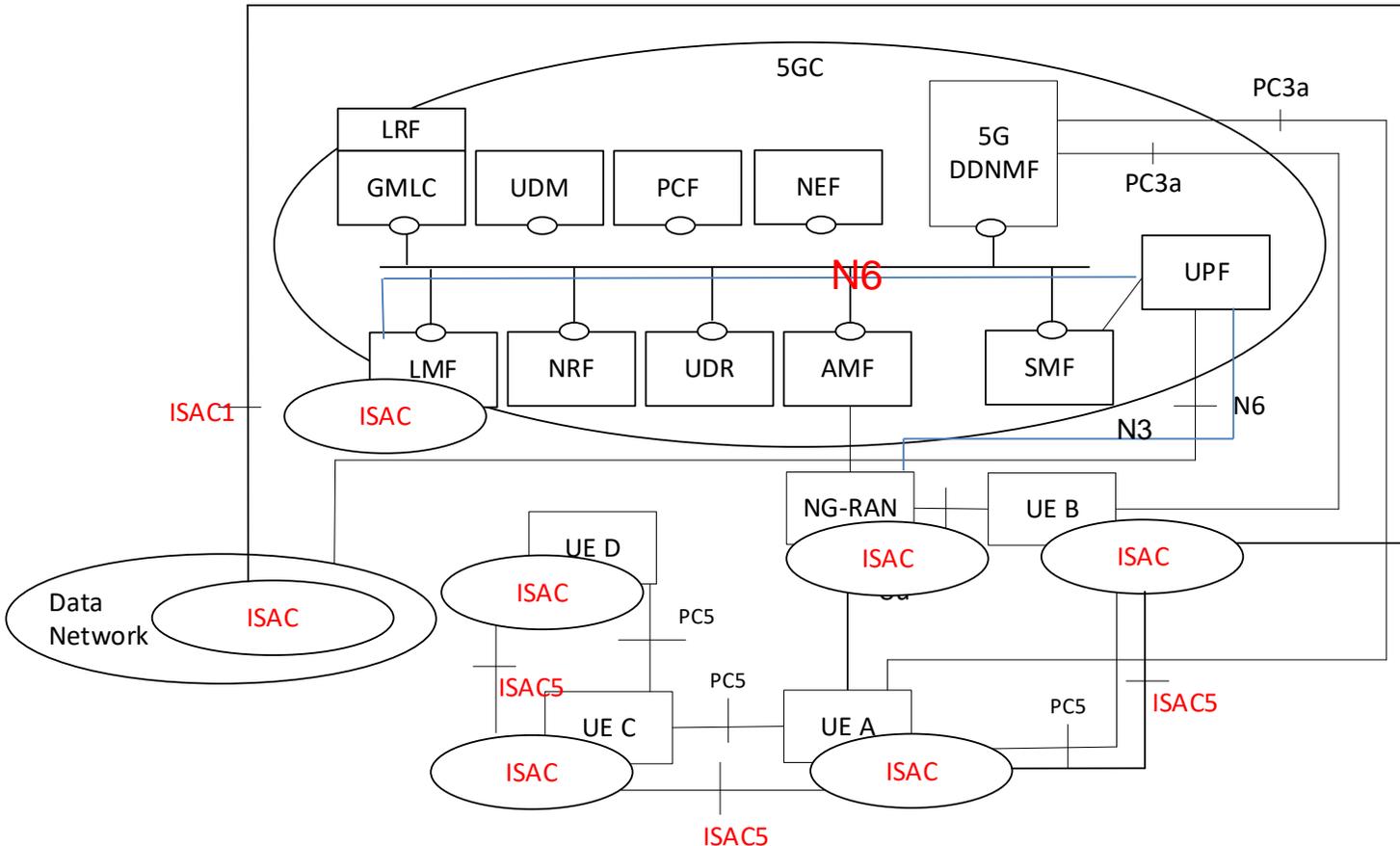
New NF and new reference point



- Sensing Function (SF)
 - ❑ transmitter/receiver selection
 - ❑ transmitter/receiver coordination
 - ❑ data processing
 - ❑ result exposure
- Nx reference point
 - ❑ Interface between UPF and SF
 - ❑ If sensing data is collected over UP, a PDU session may be established between UE and SF (Uu+N3+Nx) or between gNB and SF (N3+Nx) based on the adopted sensing option

5GC Architecture Option 2

Reusing eLCS/Ranging_SL architecture



- LMF is enhanced to support:
 - ❑ transmitter/receiver selection
 - ❑ transmitter/receiver coordination
 - ❑ data processing
 - ❑ result exposure
- N6 is reused for sensing data collection over UP
 - ❑ a PDU session established between UE and LMF (Uu+N3+N6) (existing solution)
 - ❑ a PDU session established between gNB and LMF (N3+N6) (new enhancements)
- LMF-UE interaction: enhance LPP or define similar protocol to support ISAC (developed by RAN WGs)
- LMF-gNB interaction: enhance NRPPa or define similar protocol to support ISAC (developed by RAN WGs)
- ISAC5 is used for communication between UEs when acting as sensing transmitter/sensing receiver and data collection when sensing data is processed at UE

Potential SA2 objectives for the R19 study



Architecture enhancement to support Integrated Sensing and Communication for an target object (and its environment) with or without UE on board over licensed or unlicensed spectrum for commercial, V2X, public safety and emergency services use cases:

- 📶 Sensing Transmitter/ Sensing Receiver registration and management
- 📶 Service authorization and policy/parameter provisioning for a UE or a gNB
- 📶 Sensing service operation
 - ❑ Sensing Transmitter/Sensing Receiver discovery and selection
 - ❑ Coordination between Sensing transmitter(s) and Sensing receiver(s)
 - ❑ Data (3GPP sensing data and/or non-3GPP sensing data) collection and transmission by the gNB or the UE or both
 - ❑ Data (3GPP sensing data and/or non-3GPP sensing data) processing
- 📶 Sensing service invocation and exposure to the 3rd party application and to the UE
- 📶 QoS mechanism and QoS handling
- 📶 Sensing service continuity
- 📶 Power saving
- 📶 Charging
- 📶 Security



Thank You!