3GPP TSG RAN WG1 Meeting #124b **R1-2601981**
St Julian's, Malta, April 13th – 17th, 2026

Agenda Item: 10.8.2

Source: EURECOM

Title: Aspects of integration with communication

Document for: Discussion and decision

1. Introduction

According to Releases 19 and 20 ISAC, the use cases, channel model and evaluation assumptions are defined as follows:

- Five use cases are studied for ISAC:
  - UAVs
  - Humans indoors and outdoors
  - Automotive vehicles
  - Automated guided vehicles (e.g. in indoor factories)
  - Objects creating hazards on roads/railways, with a minimum size dependent on frequency
- Six sensing modes: transmission reception point (TRP)-TRP bistatic, TRP monostatic, TRP-user equipment (UE) bistatic, UE-TRP bistatic, UE-UE bistatic, UE monostatic are supported in these use cases.
- ISAC channel model is specified in Section 7.9 in TR 38.901.
- Evaluation assumptions and performance metrics are specified in TR 38.765.

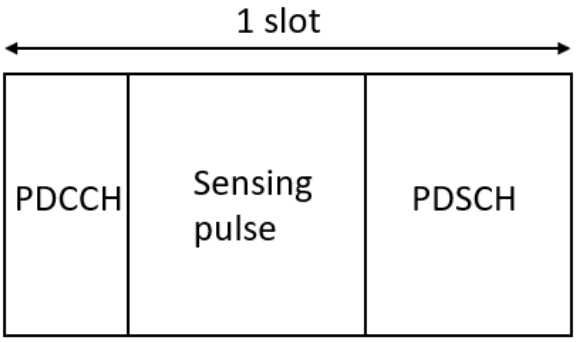
A unified design for sensing and communication is required for ISAC use cases.

2. Discussion

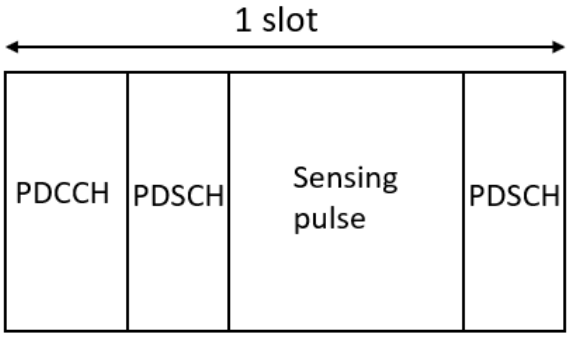
2.1. Slot design for sensing and communication

A unified design of sensing and communication requires a new slot design. Time and frequency resources must be allocated to sensing and communication functions to guarantee sensing and communication performance. In some ISAC use cases, the distances among the transmitter, the target and the receiver are small under 100m like human indoor and outdoor sensing and automated guided vehicle in factory. These applications need to fast switch between sensing and communication to achieve the communication and sensing requirements.

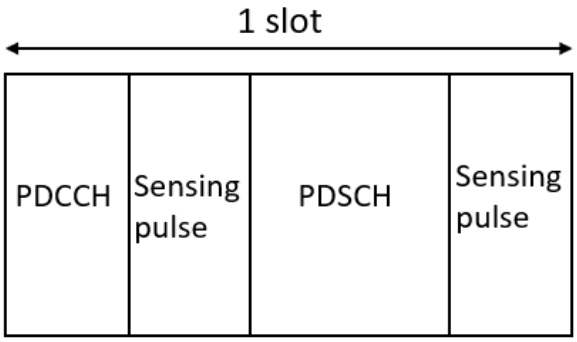
2.1.1. DL slots for ISAC



a. Continuous PDSCH resource



b. Discontinuous PDSCH resource



c. Discontinuous sensing resource

Figure 1: Slot structure for sensing and communication signals in DL

In Figure 1, the DL slot structure for integrated sensing and communication is introduced. This slot structure is used for DL communication and supports the following sensing modes: TRP-TRP bistatic, TRP monostatic, TRP-UE bistatic.

In Figure 1, physical downlink control channel (PDCCH) is transmitted by the base station (BS) at the beginning of a slot to indicate the time and frequency resources of physical downlink shared channel (PDSCH). Communication data is encoded and transmitted via PDSCH. The resource for sensing signal is configured in the middle of a slot.

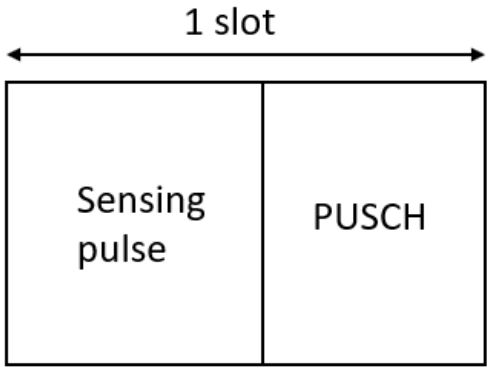
In Figure 1a, sensing resource is configured after PDCCH and before PDSCH. In Figure 1b, sensing resource is configured in the middle of two PDSCH resources in a slot. In Figure 1c, PDCCH resource is configured in the middle of two sensing resources in a slot. The BS/TRP can preconfigure the time and frequency resources in a slot for sensing signal then inform the receiver allowing it to detect the sensing signal in those resources. The BS sends downlink control information (DCI) contained in PDCCH or radio resource control (RRC) signaling to the UE in order to indicate time and frequency resources of sensing signal. PDCCH used to indicate sensing resource can be transmitted in the same or different CORSET as PDCCH used to indicate communication resource.

Proposal 1: In a DL slot, communication and sensing resources are configured in time division multiplex.

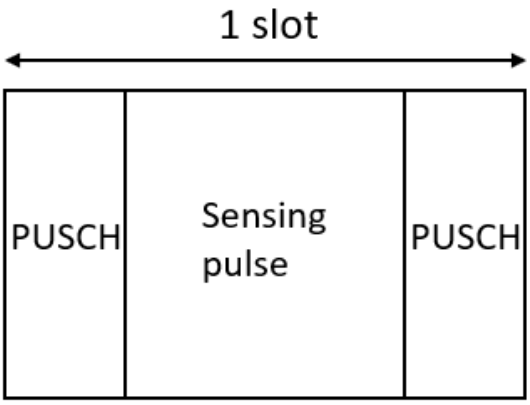
Proposal 2: In a DL slot, sensing resource can be configured before, after PDSCH resource or in the middle of two PDSCH resources.

Proposal 3: PDCCH used to indicate sensing resource can be transmitted in the same or different CORSET as PDCCH used to indicate communication resource.

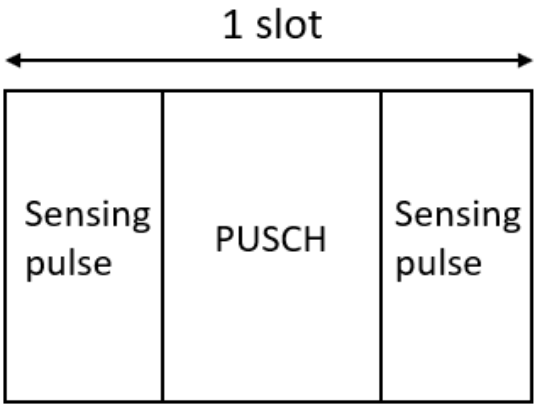
2.1.2. UL slots for ISAC



a. Continuous PUSCH resource



b. Discontinuous PUSCH resource



c. Discontinuous sensing resource

Figure 2: Slot structure for sensing and communication signals in UL

In Figure 2, the UL slot structure for integrated sensing and communication is introduced. This slot structure is used for UL communication and supports the following sensing modes: UE-TRP bistatic.

In Figure 2, communication data is transmitted by the UE to the BS via physical uplink shared channel (PUSCH). Sensing resource is multiplexed with communication resource in time division multiplex (TDM) in a slot as shown in Figure 2. Sensing resource is configured before (in Figure 2a) or after PUSCH. In Figure 2b, sensing resource is configured in the middle of PUSCH. In Figure 2c, PUSCH is configured in the middle of sensing resources.

In one mode, sensing resources are preconfigured to the UE by the BS through DCI or RRC signaling. The period of sensing resources is indicated by DCI or RRC signaling. In another mode, the UE requests the BS to configure sensing resource through uplink control information (UCI) when it needs to carry out a sensing task then the BS configures sensing resource through DCI.

PDCCH used to indicate sensing resource can be transmitted in the same or different CORSET as PDCCH used to indicate communication resource.

Proposal 4: In an UL slot, communication and sensing resources are configured in time division multiplex.

Proposal 5: In an UL slot, sensing resource can be configured before, after PUSCH resource or in the middle of two PUSCH resources.

Proposal 6: In one mode, sensing resources are preconfigured to the UE by the BS through DCI or RRC signaling. The period of the sensing resources is indicated by DCI or RRC signaling.

Proposal 7: In another mode, the UE requests the BS to configure sensing resource through UCI when it needs to carry out sensing task then the BS configures sensing resource through DCI.

2.2. Sensing reference signal design

Sensing reference signal is transmitted by a transmitter then a receiver receives the reflected signal of the sensing signal from the target. The design of sensing signal is based on positioning reference signal (PRS) including DL-PRS and sounding reference signal (SRS) as a starting point. Gold sequence and Zadoff-Chu sequence are a starting point to study the sequence to generate sensing signal.

Proposal 8: Positioning reference signal (PRS) including DL-PRS and sounding reference signal (SRS) as a starting point to study sensing reference signal design.

Proposal 9: Gold sequence and Zadoff-Chu sequence are a starting point to study the sequence to generate sensing signal.

3. Conclusion

Proposal 1: In a DL slot, communication and sensing resources are configured in time division multiplex.

Proposal 2: In a DL slot, sensing resource can be configured before, after PDSCH resource or in the middle of two PDSCH resources.

Proposal 3: PDCCH used to indicate sensing resource can be transmitted in the same or different CORSET as PDCCH used to indicate communication resource.

Proposal 4: In an UL slot, communication and sensing resources are configured in time division multiplex.

Proposal 5: In an UL slot, sensing resource can be configured before, after PUSCH resource or in the middle of two PUSCH resources.

Proposal 6: In one mode, sensing resources are preconfigured to the UE by the BS through DCI or RRC signaling. The period of the sensing resources is indicated by DCI or RRC signaling.

Proposal 7: In another mode, the UE requests the BS to configure sensing resource through UCI when it needs to carry out sensing task then the BS configures sensing resource through DCI.

Proposal 8: Positioning reference signal (PRS) including DL-PRS and sounding reference signal (SRS) as a starting point to study sensing reference signal design.

Proposal 9: Gold sequence and Zadoff-Chu sequence are a starting point to study the sequence to generate sensing signal.