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# Study on Network of Service Robots with Ambient Intelligence:

*Response to Revision Points from SA1#97E with Way-Forward Proposals*

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# Target Audience of this Study

## *Target audience: external at this stage*

1. Robotics industry, especially related to service robots that require close human interactions, including machine-type interactions (robot-robot)
2. Explicitly, 9xx series TR
  - a group/family of service robots *work together for a task*, often referred to as a multi-agent scenario/model

## *Way-Forward* (based on pre-meeting offline discussions)

1. New Aspects
  - a) As listed in S1-220210
  - b) Potential relations with existing Rel-19 Studies
2. Existing Aspects
  - a) V2X (.186), UAS (.125), CAV (.104), VIAPA/positioning/ranging (.261)
3. High-level spectrum usage scenarios related to implementation, deployment and operation of a group of service robots that are relevant to external audience

# The Objectives (revised as)

Note: The following is based on S1-221027 (version 01c-b1).

The objective of this study is to identify use cases and the potential service requirements ~~for 5G system enhancement to provide support~~ efficient communications service and cooperative operation for a group of service robots ~~(each acting as a UE, Relay UE, or both)~~ including:

- exposure of information between application layer and communications layer (e.g., capability to handle on-demand high priority events)
- support of on-demand high priority communications, to help avoid or minimize disruptions of service robot operation
- support of time bounded communication to help timely delivery of information/data between multiple service robots (including KPIs related to access delay, communication re-establishment, etc.), especially for large-scale group operation scenarios, e.g., due to robot's communication failures or other event triggers
- support of scalable and efficient use of radio resources needed for stable operation of multiple service robots especially when a large number of service robots are present
- requirements related to media applications specific for service robots (e.g. speech, haptics, multiple simultaneous media types)
- aspects related to security, privacy and charging.

In addition, this study aims at |

- collecting the existing functional and performance requirements that are relevant to support particular use cases of service robots that have human-machine and machine-machine interactions
- identifying potential correlation with some of stage-1 studies, e.g., Sensing, Metaverse

Also, this study may consider high-level spectrum usage considerations based on specific use cases for implementation, deployment and operation of a group of service robots, which are relevant to external audience from robotics-related industry.

## **References:**

**3GPP S1-220150 (end-of meeting version of SID at SA1#97e)**

**3GPP S1-220151 (presentation at SA1#97e)**