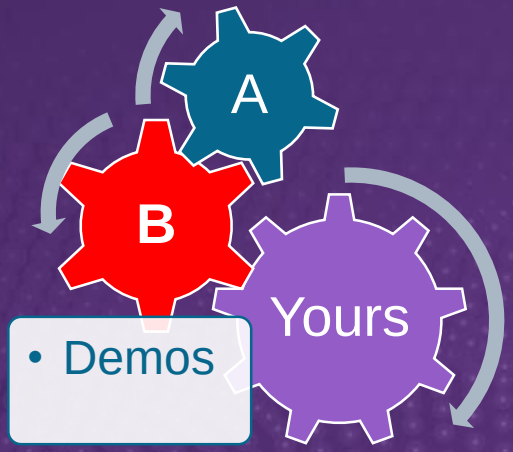

CALL FOR DEMOS AND PROTOTYPES FOR ONE6G SUMMIT2022
APPLICATION FOR A DEMO AT THE ONE6GSUMMIT 2022 BY HUAWEI ON

INTEGRATED SUBTHZ AND OPTICAL WIRELESS SENSING AND COMMUNICATION (ISAC) IN DYNAMIC FACTORY ENVIRONMENTS

Contact: Mohamed Gharba (mohamed.gharba@huawei.com)

Munich, May 12th 2022

WG4: CALL FOR DEMOS AND PROTOTYPES

HUAWEI DEMONSTRATOR

Integrated subTHz and Optical Wireless Sensing and Communication (ISAC) in dynamic factory environments

Motivation

- 6G is expected to be no longer just a platform that connects everything but an intelligent platform that offers integrated sensing and AI services for people and industries to create greater social value
- Digital transformation is set to be further improved and expanded upon in the emerging intelligent connectivity era, and applications such as interactive immersive experience, robots collaboration in unmanned factories, smart healthcare with real-time sensing, and ultimately autonomous driving will be a reality on a large scale during the next decade. However, this will drive significantly higher network performance requirements, such as Tera-bit/s data transmission rates and millimeter-level sensing precision. With this in mind, Huawei has proposed and promoted the ISAC vision. In higher-frequency and higher-bandwidth scenarios, communications systems will natively integrate wireless sensing capabilities which can explore the physical world by analyzing radio wave transmission, echo, reflection, and scattering. As a result, communications systems will possess high-resolution sensing, localization and tracking, imaging, and environment reconstruction capabilities, which not only improve communications performance and unlock new network service capabilities but also lay a data foundation for building an intelligent digital world.
- Huawei want to showcase its prototype of integrated sensing and communication (ISAC) for moving object with 3D tracking and non-intrusive 3D imaging with THz and optical wireless (OW) spectrum in particular showcasing a typical industrial factory scenario.
- The proposed demo is aligned with the one6G/WG1 **Use case #8: Integrated sensing and communication (ISAC) for motion control in dynamic factory environments**

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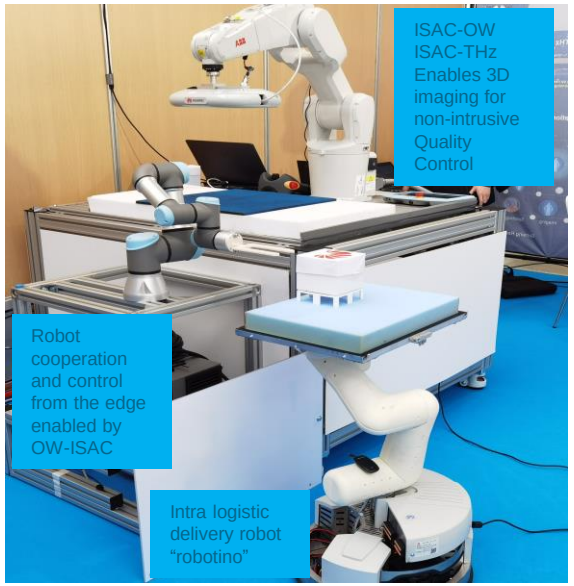
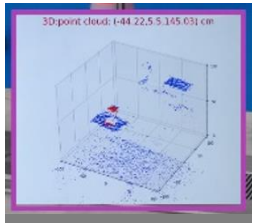
Demo Description

- The ISAC prototype address a typical industrial scenario e.g. in factories, food production or logistic warehouse of an hospital of the future.
- Several robots are coordinated by a edge based machine controller (PLC) to deliver an object to the quality control station before it is delivered either to the next production step or to the customer. Integrated ISAC on THz and OW are demonstrated as key technology enablers.
- In the first step, ISAC with optical wireless (ISAC-OW) is used to track a target carton box with the goods inside. The box is held by a delivering Robot called “Robotino” which carries the carton box to a target location, then a collaborative robot will take the box from Robotino and put it right under a robot arm. OW-Sensing enables real-time tracking and monitoring of the movement of the robots while the OW communication channel connects the robot with the PLC. The real-time OW sensing is displayed by the 2D and 3D point-clouds in the screen.
- In the second step, the robotic arm uses ISAC at THz (ISAC-THz) to scan and image the object in the closed carton box. There are two metal characters “6” and “G” placed inside the box, and the 3D imaging results could achieve about 3 millimeter resolution, as shown in the figure.
- After successful quality check the item will be delivered to the next production step or the delivery station.



3D imaging with ISAC-THz



3D tracking and control with ISAC-OW

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Outlook

- THz lies between the mmWave and infrared frequencies, and thus has millimeter-level and even sub-millimeter-level wavelength, making ISAC-THz system particularly suitable for high resolution sensing applications such as millimeter level resolution 3D imaging. Like the other lower frequency radio waves, THz can penetrate some obstacles, achieving high-precision sensing in all weather and light conditions. Noticeably, using the same radio architecture but with higher gain antennas, Huawei claims the ISAC-THz system has achieved a world first 240 Gbit/s outdoor transmission over 500 meters LOS air interfaces, proving that it is technically feasible to use THz for outdoor ultra-high-speed communications .

- The optical frequency band, on the other hand, includes both infrared and visible light spectrum, which has nearly unlimited spectrum resources available for high speed communication and ultra-high-precision sensing. In particular, since the ISAC-OW system does not generate electromagnetic interference, it can safely and friendly be used even in medical environments. When further combined with spectrogram analysis techniques, ISAC-OW can also be conveniently applied to monitor daily health status such as number of heartbeats or breaths per minute in a contactless way .

- ISAC is an important future-oriented vision, and its applications are not limited to THz or optical wireless bands. Huawei is looking into the integration of ISAC into full spectrum research and looks forward to cooperating with partners in this field to make "Intelligence of Everything" a reality.

References:

1. More information could be found at 6G ISAC-THz Opens up New Possibilities for Wireless Communication Systems - Huawei.
2. More information could be found at 6G ISAC-OW Extends the Frontier of Spectrum for Wireless Communication Systems - Huawei.

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THANK YOU FOR YOUR ATTENTION

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OPEN QUESTIONS

How to apply?

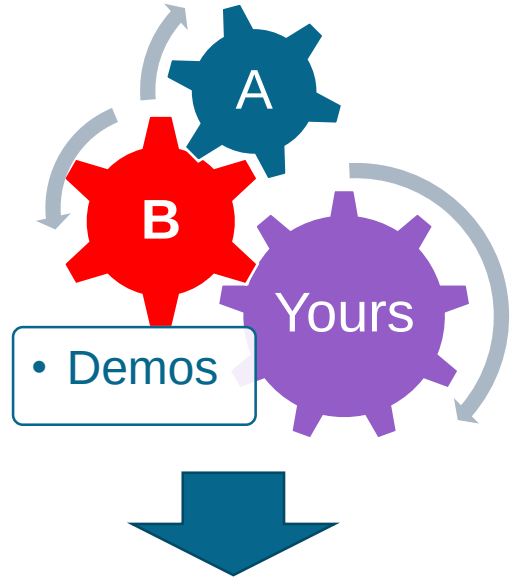
1. Applicant has to upload a description of the planned demonstrator or prototype to the one6G sharepoint.

   incomming applications (https://shared.one6g.org/f/14983)

2. Register your proposal in the excel-file on

   one6G-call-for-demo-2022.xls (https://shared.one6g.org/f/14985)

3. Notify the WG4 chair. If any question, contact WG4 chair (joseph.eichinger@huawei.com)



one6G summit Nov 10th 2022