Problem statements

1. **<u>Evaluate the optimal base station positioning, including antenna panning, to support seaport use cases</u>**

   The shipyard area is where TEU containers are stored, for both imports and exports. Due to the dynamic container load change during loading/unloading, the height of containers can stack from nil to several (eg. 5). The metallic nature of TEU containers can severely affect RF propagation especially if towers are inland and serving is required at the far end of vessel berth. Investigation/analysis is suggested to determine the optimal antenna placement and panning to ensure 5G services are unaffected for all use cases.

Varying heights of TEU containers

2. **<u>Evaluate and recommend the most appropriate spectrum strategy at geographical boundary between wholesale and private network</u>**

   There are many campus scenarios where 5G wholesale signal will penetrate into private compound, like Airports, large manufacturing hubs, Seaports, etc. Most of these cases macro private network transmission is a must to support high requirement use cases, like self-driving tractors. What is the recommended spectrum strategy to mitigate or even prevent RF interference?

The distance between vessel berth (left) to offices (right) spans around 500-1000m only.

3. **Improving rural connectivity through 5G**: The scope of this problem statement is to find ways to use 5G technology to improve connectivity in rural areas at competitive costs which typically have poor or non-existent internet access. The background of this problem is that while 5G technology has the potential to bring

faster and more reliable internet access to remote areas, there are still many challenges to overcome in terms of infrastructure and cost.

4. **Enhancing smart city infrastructure with 5G:** The scope of this problem statement is to explore how 5G technology can be used to improve the efficiency and effectiveness of smart city infrastructure, such as traffic management systems, public transportation, and emergency response systems. The background of this problem is that as cities become more connected and reliant on technology, the need for faster and more robust communication networks becomes increasingly important.
5. **Using 5G for remote healthcare:** The scope of this problem statement is to investigate how 5G technology can be used to improve healthcare delivery in remote and underserved areas. The background of this problem is that 5G technology has the potential to enable high-definition video conferencing and telemedicine services, allowing doctors to remotely diagnose and treat patients in areas where healthcare resources are scarce.
6. **Enhancing virtual and augmented reality with 5G:** The scope of this problem statement is to investigate how 5G technology can be used to improve the performance and experience of virtual and augmented reality applications. The background of this problem is that 5G technology can provide faster and more reliable communication between devices and the internet, allowing for more immersive and responsive virtual and augmented reality experiences.

7. Hand Gesture Reading and Dynamic Interaction using AI and 5G capabilities

Scope & Background:

In recent pandemic days, Navel Coronavirus or COVID-19 had widely spread across many regions of the world and continues to reshape changing our lifestyle and daily activities. Contactless technology is emerging and creating a platform for creative and interactive solutions to new problems, thus leading a safer world. Though there are pre-existing solutions offering gesture recognition using computer vision algorithms and cameras, a sturdy and robust detection of hand gesture and dynamic interaction between physical and digital avenue is still difficult.

Usecases:

a. Directory navigation system in Hospitals, Shopping malls etc
b. Smart study in Education

Capabilities:

a. Select
b. Zoom in
c. Zoom out
d. Hold, Drag and Release
e. Scroll up
f. Scroll down

8. Personal Jarvis

Scope & Background: An application that supports VR to assess on any type of product a consumer purchased, providing detail information about product specifications, usage steps, commercials, and warranty. Additional capabilities to incorporate troubleshooting tips, live support etc. Products such as electronic devices, cars etc can be considered as examples.

Usecases:

a. Consumers have flexibility to get every information about the product from the phone app itself
b. Live support from the representative can be provided even in a remote area using 5G capabilities.

9. 5G based cameras image collection as input for AI-Machine Vision.

Under 5G the need for Machine Vision modeling will explode given the large increase in image data being collected and for that reason we need to look for good quality Open Source Machine Vision software (edge or cloud based) making it easier and faster to analyze this image data for the predefined errors, etc.- Therefore we do look for Open Source solutions picking up the image data, applying the AI-MV models, presenting the results and of course supporting the development of these models.

10. DIGITAL based Charging MNOs

Make an overview of the options if / how (5G enabled) DIGITAL Services can make a big change to the way we are planning to charge the MNOs for DNB services. Rivisit / Create the relevant Business Workflows and optimize making use of (5G enabled) Digital Services. I put ''5G enabled'' between brackets since some of the improvements might not need the 5G element. Make it clear how the proposal does really improve the ways of working.

11. Predictive Maintenance

Develop means how really applying AI – Machine Learning (ML) can improve the availability and service levels of the DNB 5G services. Indeed we do not expect that you do develop the relevant AI-ML models, but make it clear what these models should predict and, to get to that and what data types (in detail) need to be used for that? Validate whether these data types are or can be made available.

12. Customer satisfaction

Using 5G enabled Digital Services develop proposals to get to more accurate / specific / targeted Customer satisfaction measurements whereby also look at options to support as part of the measurement different customer categories so we get an refined understanding of the customer satisfaction. Do work out a number of ways of doing this.