

# GUIDE FOR APPLICANTS

## TARGET-X

### 2<sup>nd</sup> Open Call

*Submission of applications starts on the 6<sup>th</sup> of December, 2023  
at 13:00 Brussels Time*

*Submission deadline: 28<sup>th</sup> of February, 2024  
at 17:00 Brussels Time*



*Version: 12/12/2023*

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## HISTORY OF CHANGES

12.12.2023	The title for topic 22 was changed.	Pages: 40
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## 1. Basic info about TARGET-X

TARGET-X is a project the European Commission co-funded from the HORIZON EUROPE programme. It is coordinated by FRAUNHOFER Gesellschaft Zur Forderung Der Angewandten Forschung Ev with the participation of 14 Consortium Partners from 6 countries (see details at <https://target-x.eu>).

The total TARGET-X budget of cascade funding (Financial Support to Third Parties - FSTP) is €6 000 000 of which up to €3 840 000 will be distributed under the 2<sup>nd</sup> TARGET-X Open Call: Testing or implementation of technologies oriented to use cases.

### VISION

TARGET-X 's Vision is to strengthen important economic sectors in Europe by integrating 5G and 6G, accelerating the digital transformation.

TARGET-X aims at that vision by providing testbeds for different verticals, developing new 5G/6G features, intuitive usage of 5G/6G and new business models. TARGET-X brings together information technology providers, operational technology providers and SMEs.

### AMBITION

The main ambition of TARGET-X is to advance the state of the art of 5G technology with technical elements “beyond 5G”, integrate those elements in testbeds operated in the project, and validate them in several use cases in four different verticals.

The fifth generation of wireless technology (5G) has arrived and is being rolled out globally. First industrial sectors such as manufacturing are testing the capabilities of 5G showing great potential for ubiquitous connectivity. With the sixth generation (6G), wireless communication will bring several industrial sectors new features, improved performance, and functional benefits.

The TARGET-X project envisions accelerating the digital transformation of key verticals:

- Energy;
- Construction;
- Automotive;
- Manufacturing & robotics.

using large-scale trials in multiple testbeds.

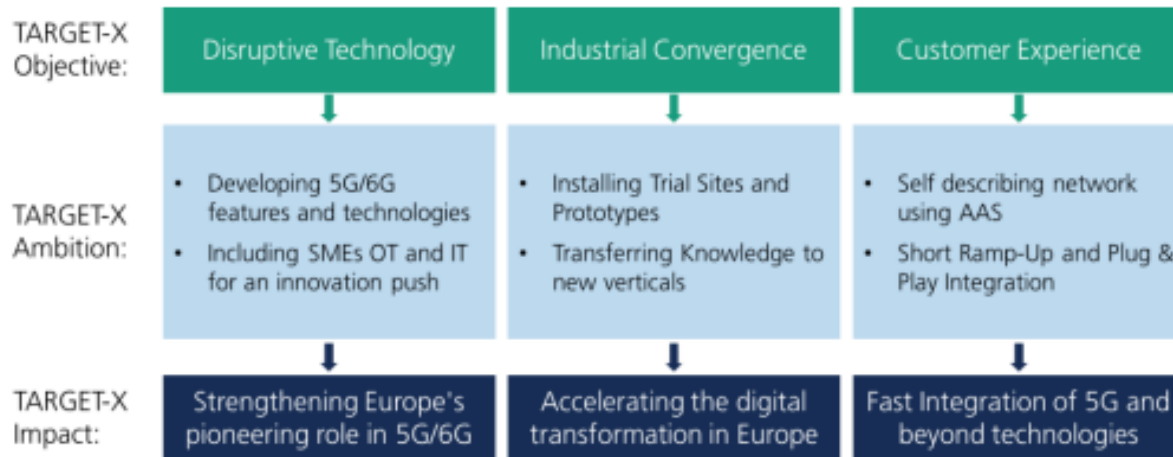


Figure 1 Motivation and ambition of TARGET-X

**Disruptive Technology:** One key objective is the technical evolution of 5G towards 6G. In the TARGET-X project, new 5G/6G features and key enablers for 6G will be defined, implemented, and validated for the whole value chain (devices, connectivity, service delivery). Features such as localization, real-time communication, and digital twinning will be tested as prototypes in the trial sites. Enablers such as native AI/ML integration, high-performance computing, and IoT solutions will be included in the design of the 5G/6G ecosystem at each trial site. The integration of edge and cloud clusters with GPU capabilities for AI/ML or the large-scale distribution of several IoT devices will give important input towards 6G and the subsequent SNS phases.

**Industrial Convergence:** TARGET-X aims at large-scale testbeds for trial and pilot implementations and identification of KPIs and KVI of the verticals. The verticals targeted in the project are energy, automotive, construction, manufacturing & robotics. With the 5G-Industry Campus Europe and the IDIADA trial site, the TARGET-X project starts with existing, fully operational 5G-infrastructures and can focus from day one on integrating new elements. Without ramp-up time, new use cases, verticals, and new features can directly be integrated, and the 5G-infrastructure can be extended by enabling technologies for 6G. Furthermore, the experiences already made at the trial sites are directly transferred to the other verticals, enabling rapid integration.

**Customer Experience:** To reduce the ramp-up and integration time of new 5G/6G systems and enabling technologies, TARGET-X aims at developing a self-describing network, enabling plug & play integration of new components. By evolving the 5G/6G infrastructure to a self-describing network, the integration of new hardware and software components can be done easily on all levels of the value chain.

## 2. 2<sup>nd</sup> Open Call - what do we offer?

The exact amount of financial support to be granted to each selected entity under the 2<sup>nd</sup> TARGET-X Open Call is a fixed lump sum of up to €60 000 per entity. As a Consortium composed of 2 entities, you will get up to €120 000 (max €60 000 per entity).

**NOTE!** In case of for-profit companies maximum grant amount is 70% of the eligible costs needed to execute the project.

During the 2<sup>nd</sup> Open Call up to 64 entities will be selected.

### 3. Admissibility and eligibility criteria

We will check the admissibility and eligibility of all proposals submitted before the deadline 28<sup>th</sup> of February 2024 at 17:00 Brussels Time) via our online application form here: <https://target-x-2oc.fundingbox.com/>. The projects that do not comply with the criteria presented in this section will be excluded and marked as ineligible. We will check the admissibility and eligibility criteria based on the information provided in your application during the whole evaluation process.

#### 3.1 Who are we looking for?

We are looking for:

1. a single entity:

- a. 1 SME<sup>1</sup> or
- b. 1 University or
- c. 1 Research and Technology Organisation (RTO),

or

2. a micro-consortium composed of 2 entities only in one of the following configurations:

- a. 1 SME + 1 SME or
- b. 1 SME + 1 University or
- c. 1 SME + 1 RTO or
- d. 1 SME + 1 mid-cap or 1 large company or
- e. 1 University + 1 University or
- f. 1 University + 1 RTO or
- g. 1 University + 1 mid-cap or 1 large company or
- h. 1 RTO + 1 mid-cap or 1 large company or
- i. 1 RTO + 1 RTO.

Mid-caps and large companies can compose a micro-consortium only with an SME, University, or an RTO.

**Micro-consortia must be composed of one entity acting as technology provider and one entity acting as end-user or both entities acting as end users.**

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<sup>1</sup> An SME will be considered as such if it complies with the European Commission's Recommendation 2003/361/EC. As a summary, the criteria defining an SME are:

- Headcount in Annual Work Unit (AWU) less than 250;
- Annual turnover less or equal to €50 million OR annual balance sheet total less or equal to €43 million.

Note that the figures of partners and linked enterprises should also be considered as stated in the SME user guide. For detailed information check the EU recommendation: [https://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition\\_en](https://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en)

SMEs, mid-caps, and large companies must be legally registered in the relevant national company/business registers prior to the launch of the TARGET-X 2<sup>nd</sup> Open Call (6<sup>th</sup> of December 2023).

The entities have to be established in any of the:

- The Member States of the European Union<sup>2</sup> and its Overseas Countries and Territories (OCT) or;
- Associated Countries (AC)<sup>3</sup> to Horizon Europe.

Consortium members applying for this Open Call cannot be entities related by capital.

The applicants who are subject to EU restrictive measures under Article 29 of the Treaty on the European Union (TEU) and Article 215 of the Treaty on the Functioning of the EU (TFEU)<sup>4</sup> are not eligible to participate in this open call.

The TARGET-X Partners are not eligible to act as applicants and CANNOT be involved in the grantees' projects, neither their affiliates nor employees - including persons working under the employment contract or contract equal or similar to the employment contract and board members..

### 3.2 What types of activities can be funded?

The proposed activities must:

1. address Performance testing or implementation of technologies or solutions oriented to technology providers and use cases applicable to only **one topic** in one of the following verticals: Manufacturing, Energy, Automotive, Construction and other topics for the development of new devices/ solutions and other topics for evaluation with KPI&KVI-based methodological assessment framework. For more details please check available in Annex 1 and our website;
2. aim to reach Technology Readiness Level (TRL) 7 during the Support Programme, starting from TRL 3-4, preferably. TARGET-X counts on the participation of European innovative SMEs with a clear commercial ambition and a potential for high growth and internationalisation.

The results obtained by the selected projects will be integrated into the TARGET-X project's repository. The technology developed by the projects must be available in Open-Source Code and with open interfaces for further reutilisation in the subsequent phase (i.e. beneficiaries of the 2<sup>nd</sup> TARGET-X Open Call). More details on Access Rights will be included in the SubGrant Agreement.

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<sup>2</sup> Following the Council Implementing Decision (EU) 2022/2506, as of 16<sup>th</sup> December 2022, no legal commitments can be signed with Hungarian public interest trusts established under Hungarian Act IX of 2021 or any entity they maintain. Affected entities may continue to apply to calls for proposals. However, in case the Council measures are not lifted, such entities are not eligible to participate in the TARGET-X 2<sup>nd</sup> Open Call. In case of consortium, co-applicants will be invited to remove or replace that entity. Tasks and budget may be redistributed accordingly.

<sup>3</sup> **AC as of (05.12.2023):** Albania, Armenia, Bosnia and Herzegovina, Faroe Islands, Georgia, Iceland, Israel, Kosovo, Moldova, Montenegro, North Macedonia, Norway, Serbia, Türkiye, Tunisia, Ukraine, for the most up-to-date list please first part of this document. For the avoidance of doubt, New Zealand is not eligible in this open call.

<sup>4</sup> Please note that the EU Official Journal contains the official list and, in case of conflict, its content prevails over that of the EU Sanctions Map.

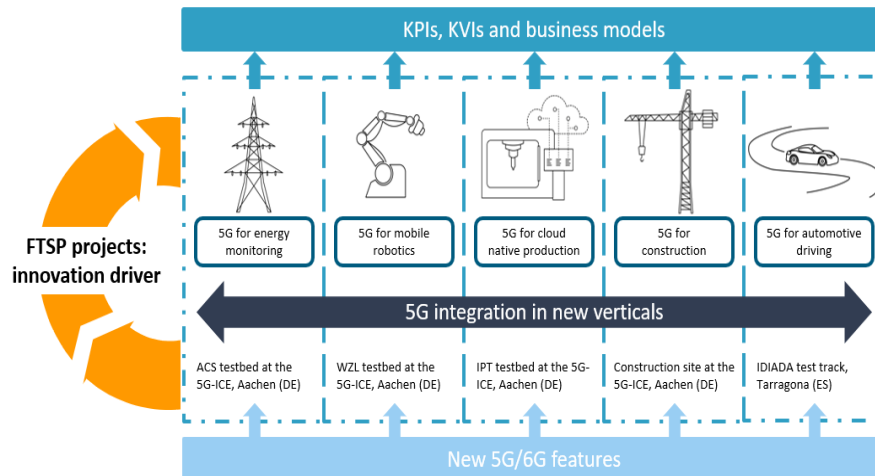


Figure 2 Overall concept of TARGET-X

### 3.3 How to apply?

Proposals must be submitted through the TARGET-X Open Call microsite: <https://target-x-2oc.fundingbox.com/>

- **Be on time and use our system**

Make sure you submit your proposal through the online form before the deadline on the 28<sup>th</sup> of February, 2024 at 17:00 Brussels Time (admissibility criteria). If you submit the form correctly, the system will send you a confirmation of your submission. Get in touch with us if it is not the case. We will not be evaluating any proposal sent after the deadline and submitted outside the dedicated form.

- **English Language**

Your proposal must be written in English in all mandatory parts in order to be eligible. Only parts written in English will be evaluated. If the mandatory parts of the proposal are in any other language, the entire proposal will be rejected (admissibility criterion).

- **Every question deserves your attention**

All mandatory sections of your proposal - generally marked with an asterisk - must be completed (admissibility criterion). The data provided should be actual, true, and complete and should allow assessment of the proposal. Additional material, not specifically requested in the online application form, will **not** be considered for the evaluation.

- **Choose only one topic**

Your project should directly address one of the topics proposed by the TARGET-X in [Annex 1](#).



- **European dimension**

Your proposal should have a clear European Dimension (fostering the projects that generate a substantial positive impact for European citizens).

- **Be exhaustive & precise**

You have to verify the completeness of the form, as it won't be possible to add any further information after the deadline. After the proposal is submitted, you will be able to modify the form until the deadline.

- **Multiple submissions?**

Though applicants can submit multiple applications, each entity can receive the TARGET- X grant only once per Open Call. If several selected proposals in the 2<sup>nd</sup> TARGET-X Open call have the same team member(s) and/or the same organisation(s), it is only the proposal with the highest number of points that will be funded.

- **Absence of conflict of interest**

We will take into consideration the existence of the potential conflict of interest between you and one or more TARGET-X Consortium Partners. Indeed, the Consortium Partners, their affiliated entities, employees, board members and permanent collaborators cannot take part in the TARGET-X support programme. All cases of potential conflict of interest will be assessed on a case-by-case basis.

- **It is your proposal**

Your project should be based on your original work, if the project is not based on your original work, your right to use the IPR must be clearly defined (you must have a licence agreement or the IPR (Intellectual Property Rights) must be transferred to you from somebody who created the work). In particular, any work related to the implementation of the project described in the application may not violate the IPR of third parties, and the IPR to the application project may not be the subject of a dispute or proceedings for infringement of third party IPR.

- **Gender Equality Plan**

Public bodies, higher education institutions, and research organisations from EU countries and associated countries must have a Gender Equality Plan (GEP)<sup>5</sup>.

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<sup>5</sup> For more details please check [here](#).

- **Healthy finances and a clean sheet are a must**

We don't accept entities that are under liquidation or enterprises in difficulty according to Commission Regulation No 651/2014, art. 2.18. Neither will we accept proposals from entities that are excluded from the possibility of obtaining EU funding under the provisions of both national and EU law or by a decision of both national or EU authorities. We also don't accept entities that are meeting national regulations regarding bankruptcy.

- **Acceptance of the open-call rules**

To apply for this Open Call you have to accept its rules and regulations detailed in this Guide for Applicants.

- **Limit on the FSTP**

As a beneficiary, you cannot receive more than €120 000 per entity taking into consideration both TARGET-X Open Calls.

TARGET-X is planning a certain number of online webinars about this Open Call. They will be announced at the [TARGET-X Open Call Microsite](#) and [Community Space](#).

## **4. How will we evaluate your proposal?**

Our evaluation process is transparent, fair and equal to all our participants. We will evaluate the projects in a few phases. For this call, we are looking for the best fit for our project and we expect a high number of applications. Since we are much more concerned with quality than quantity, we suggest putting more effort into the project's presentation, providing as much detail as possible.

### **4.1 Step 1: Admissibility and Eligibility Check**

Once the Open Call is closed, we will check whether the proposals meet the admissibility and eligibility conditions set up in section 3. We will do it on the basis of the statements included in the proposals.

At this stage, the eligibility criteria are checked against a Declaration of Honour or self-declarations included in the application form. Later on, the above criteria will be verified during the whole evaluation process (including the final formal check).

The projects that do not comply with these criteria will be rejected. As a result of the checking, an 'List of eligible applications' will be produced.

We will inform the applicants about the results of the admissibility and eligibility check phase.

## 4.2 Step 2: In/Out Scope Screening

The In/Out Scope Screening will be done by the ‘Selection Committee’ members (TARGET- X Consortium Partners).

The ‘Selection Committee’ will review the proposal in terms of the general objectives of all proposals assessing the following aspects:

- **Scope.** The objectives of the proposal must fit within the scope of the TARGET- X project as described in the Guide for Applicants (GfA). In particular, the proposal should directly address one of the topics proposed by the TARGET-X in [Annex 1](#);
- **European Dimension.** The project should have a European dimension;

The ‘Selection Committee’ members will provide reasoning in the cases where no compliance evidence is found.

Be aware that proposals that do not comply with any of the aspects described above will be rejected. The ones complying with all of them will move on to the experts’ independent individual evaluation phase.

We will inform the applicants about the results In/Out Scope Screening.

## 4.3 Step 3: Independent Individual Evaluation

Independent Individual Evaluation will be done for all ‘In Scope’ proposals.

In this phase, each project will be evaluated by two Independent Experts. They will be appointed according to the specific characteristics of the applicants from the pool of External Experts.

The projects will be evaluated within the following awarding criteria:

### (1). EXCELLENCE will evaluate:

- **Ambition.** The applicants have to demonstrate to what extent the proposed third party contributes to the project scope, how the project contributes to the respective topic, the overall TARGET-X goal and how it has to have an European dimension.
- **Innovation.** Applicants should provide information about the level of industrial and/ or scientific innovation within their market and about the degree of differentiation that this project will bring. The third party project has to describe the scope beyond the state of the art and the innovative approach behind it (e.g. ground-breaking objectives, novel concepts and approaches, new products, services or business and organisational models).
- **Soundness of the approach and credibility of the proposed methodology.** How will you contribute to solving the selected topic.

## (2). IMPACT will analyse:

- **Market opportunity.** The applicants have to demonstrate a clear idea of what they want to do and whether the new/improved product has market potential, e.g. because it solves a problem for a specific target customer.
- **Competition.** The applicants have to provide information about the degree of competition for their particular product/service and if the idea is disruptive and breaks the market. i.e. the products/services to be brought to market can be clearly differentiated from the competition.
- **Commercial Strategy and Scalability.** The applicants have to demonstrate the level of scalability of the new/improved product meaning by not addressing a specific problem but able to be commercialised to solve a structural problem in a specific sector/process/etc.
- **Environmental and social impact.** The applicants have to demonstrate the project contribution towards environmental, social and economic impacts to contribute to sustainable development, Green Deal and other European policies.

## (3). IMPLEMENTATION will consider:

- **Team.** The applicants have to demonstrate their capacity to perform the development or field trial. They have to demonstrate their management and leadership qualities, their ability to take a concept from ideas to market, and their capacity to carry through their ideas and understand the dynamics of the market they are trying to tap into. The team should be a cross-functional team, with a strong background and skills base and taking into account its gender balance (at all levels of personnel assigned to the action, including at the supervisory and managerial levels); the team should take all reasonable measures to promote equal opportunities between men and women in the implementation of the action.
- **Resources.** Demonstrate the quality and effectiveness of the resources assigned in order to get the objectives/deliverables proposed. In the case of for-profit entities, the compromise of 30% self-financing of activities should be secured by each for-profit entity.
- **Project Plan/ Work Plan.** The applicants have to demonstrate the plan and structure of the project.

The evaluators will score each criterion on a scale from 0 to 5:

0 = Proposal fails to address the criterion or cannot be assessed due to missing or incomplete information

1 = Poor – criterion is inadequately addressed or there are serious inherent weaknesses

2 = Fair – proposal broadly addresses the criterion, but there are significant weaknesses

3 = Good – proposal addresses the criterion well, but a number of shortcomings are present

4 = Very good – proposal addresses the criterion very well, but a small number of shortcomings are present

5 = Excellent – proposal successfully addresses all relevant aspects of the criterion. Any shortcomings are minor.

Each evaluator will produce an **‘Individual Evaluation Report’**. The final score for each individual criteria will be calculated as an average of the scores’ provided by each evaluator.

If scores on a project show significant divergence between the two reviewers, a third external reviewer will be involved to provide an additional independent assessment of this proposal.

The final score per application will be calculated as the sum of the score for each individual criteria. The threshold for individual criteria will be 3. The overall threshold, applying to the sum of the three individual scores, is 10 points.

#### **4.4. Step 4: Evaluation Consensus Group**

After carrying out the ‘Independent Individual Evaluation’, experts who have evaluated the proposals will join a Consensus Group, to agree on a common position, including comments and scores for all evaluated proposals.

The Consensus Group will specially discuss the cases where there is a significant divergence between the evaluators’ scoring. In case no consensus is reached between the evaluators, an additional evaluator will be included to provide an extra evaluation.

In case of ties, the following criteria will be used to rank the projects, in order:

- The highest score in the Impact Section;
- Gender balance among the personnel responsible for carrying out the activities.

As a result of the Independent Evaluation, a ‘Ranking List’ will be produced.

All proposals obtaining a score above the threshold will pass to the next phase. Please note that we need time to process through all the proposals in this phase, so you probably won’t hear back from us for a while.

#### **4.5 Step 5: Consensus Meeting**

The ‘Selection Committee’ with the support of two external experts and the external ethics expert (with voice but without vote) will decide, by Consensus, the ‘Provisional List of FSTP recipients’ and a ‘Reserve List’.

The decision will be based on the ‘Ranking List’ obtained as a result of the previous step. ‘Selection Committee’ will make sure (in order to ensure a balanced portfolio of supported activities in the different Verticals) that at least the highest ranked proposal per vertical will be funded provided that it attains all thresholds.

Whilst normally the highest ranked proposals will be selected for funding, the ‘Selection Committee’ might have fair reasons for objecting to a specific third party project, like the alignment with TARGET-X goals and scope, the ability to achieve the highest impact possible, commercial competition, as well as the existence

of significant ethical concerns or a potential conflict of interest. In this case, the choice may pass to the next ranked proposal.

The exact number of proposals approved will be decided based on the overall quality of the proposals.

#### 4.6 Step 6: Ethics Review

The 'Ethics Review' will be done for all selected proposals, considering possible scenarios with ethics issues. These will be mainly related to the handling of Private Data:

- Person-related data: camera surveillance, image processing in the context of manufacturing, construction and automotive;
- Industrial data: industrial data generally need specific protection;
- Artificial intelligence: no specific developments of AI are expected, but some tools for human-robot collaboration could deploy AI tools.

### 5. What's next? SubGrant Agreement Preparation and Signature

Before the beneficiary gets started with the TARGET-X programme, they need to sign the SubGrant Agreement with the TARGET-X Consortium. In the case of consortia, the SGA will be signed by each third party.

Prior to signing the SubGrant Agreement, you should provide documents regarding your formal status. The TARGET-X Consortium will verify them, to prove your eligibility. Please do it within the deadlines that will be communicated to you.

Be extremely vigilant with respect to:

**1. The nature of the documents we request.**

If the documents you provide do not prove your eligibility, the process will end here for you.

**2. The deadlines that we will give you to hand us these documents.**

If you do not deliver the requested documents on time, without a clear and reasonable justification, we will have to exclude you from further formal assessment. Another applicant from the 'Reserve List' will then replace you.

### 6. Our Support Programme and Payment Arrangements

Once your eligibility has been confirmed following the formal check and the SubGrant Agreement signed, you will become an official beneficiary of the TARGET-X Programme.

As a selected grantee, you will receive a fixed lump sum of up to €60 000 (for a single applicant) or up to €120 000 (for a micro-consortium of 2 applicants, but no more than €60 000 per entity). The Support Programme will last 9 months.

**NOTE!** When you apply as a micro-consortium, your application form must include information on how the grant will be distributed between consortium members.

The lump sum is a simplified method of settling expenses in projects financed from Horizon Europe funds. It means that you as a beneficiary are not required to present strictly defined accounting documents to prove the cost incurred (e.g. invoices).

However, you are obliged to demonstrate the implementation of the project in line with the milestones set for it. Simply speaking it means that we will carefully assess your progress and the quality of your work during Interim Reviews, not your accountancy.

The milestones (deliverables, KPIs and ethical recommendations) will be fixed in the **‘Individual Mentoring Plan’** elaborated at the beginning of the programme.

The lump sum does not release you from the obligation to collect documentation to confirm the costs under fiscal regulation.

## 6.1 Payment Arrangements

For the sake of simplicity and transparency, the Financial Support will be paid against the achievement of certain milestones or KPIs (which will be included in the ‘Individual Mentoring Plan’ annexed to the SGA and based on the results of the Milestone Reviews). As a beneficiary, you will receive funding as follows:

Payment Milestones	Deliverable	Delivery Date	Payment Milestone (instalments)
Stage 1	‘Individual Mentoring Plan’	M1	Up to 5 000 EUR
Stage 2	Project development report	M7	Up to 35 000 EUR
Stage 3	Market uptake report	M9	Up to 20 000 EUR
TOTAL			<b>UP TO 60 000 EUR</b>

*Table 1 Payment Milestones*

### Milestone review process

A Milestone Review will be organised in each payment milestone established at the project level, namely:

- 1<sup>st</sup> Milestone Review: Individual Mentoring Plan;
- 2<sup>nd</sup> Milestone Review: Interim progress review;
- 3<sup>rd</sup> Milestone Review: Final review.



The evaluation of the third-party projects' performance at the 'Milestone Review' will be done by the mentors assigned to each project and, if specified in the Individual Mentoring Plan, also by the ethics expert. The evaluation will be done based on the following criteria:

- Deliverable quality (30%);
- Technical performance indicators (60%);
- Deadline Compliance (10%).

Each criterion will be scored from 0 to 10 and, based on the weight of each criteria, the final score will be calculated. The threshold to continue in the programme is 7 points.

The 'Selection Committee' will review and validate the evaluations from mentors, putting special attention to the 'under threshold' cases, if any, by taking into consideration all possible objective reasons for underperformance (i.e. external factors which might have influenced the beneficiaries' performance). The 'Selection Committee' will take the final decision, and approve the payments or invite third party projects which have not reached the threshold to leave the programme.

A delayed payment mechanism might be applied to the payments. The final payment (up to 15% of the total grant amount awarded to one beneficiary) might be done after the TARGET-X project ends (which is 30.06.2025).

In the case of for-profit legal entities, the grant cannot exceed 70% of the costs estimated for the execution of the project.

## 7. Contact us

How can we help you?

If you have extra questions regarding our Open Call process, you can post your questions at:

- ✓ Ask your question in the [HELPDESK](#).
- ✓ Send us an email to the following address: [contact.target-x@ipt.fraunhofer.de](mailto:contact.target-x@ipt.fraunhofer.de).

In case of any technical issues or problems, please include the following information in your message:

- ✓ Your username, telephone number and your email address;
- ✓ The details of the specific problem (error messages that appeared, bug descriptions such as a dropdown list that isn't working, etc.);
- ✓ Screenshots of the problem.

### COMPLAINTS

If, after receiving the results of one of the evaluation phases (when foreseen), you consider that a mistake has been made, you can send us your complaint. To do so please send us your complaint in English by email to [contact.target-x@ipt.fraunhofer.de](mailto:contact.target-x@ipt.fraunhofer.de), including the following information:

- ✓ Your contact details (including email address);
- ✓ The subject of the complaint;
- ✓ Information and evidence regarding the alleged mistake.



**Important note regarding the timeline:**

You have **3 calendar days** to submit your complaint starting from the day after the communication was sent. On our side, we will review them within no more than 14 calendar days from its reception.

If we need more time to assess your complaint, we will inform you by email about the extension.

We will not review anonymous complaints as well as complaints with incomplete information.

Please take into account that the evaluation is run by experts in the field, and we do not interfere with their assessment, therefore we will not evaluate complaints related to the results of the evaluation other than related to the mistakes in the evaluation of the eligibility criteria.

## **8. Last but not least - final provisions**

Any matters not covered by this Guide will be governed by Polish law and rules related to the Horizon Europe programme and European Union grants regulations.

Please take into account that we make our best effort to keep all provided data confidential; however, for the avoidance of doubt, you are solely responsible to indicate your confidential information as such.

**Your IPR will remain your property.** Further contracts may be needed in case of IPR generated from work carried out jointly by you and one or more TARGET-X Partners. TARGET-X project has received funding under the Smart Networks and Services Joint Undertaking (hereinafter **SNS JU**) actions and therefore may undergo additional requirements when it comes to granting access rights of the TARGET-X funded project results to the TARGET-X consortium partners, SNS JU members and contributing partners and the European Commission. The additional requirements for the access rights to results include but are not limited to: Access for Key Performance Indicators (KPI) and Key Value Indicators (KVI) evaluation, data generated within the TARGET-X funded project, access to results of the TARGET-X funded project, Open-source energy data anonymized for further scientific use.

Please note that TARGET-X beneficiaries must enable a potential assessment of their project based on a methodological assessment framework that is being developed as part of TARGET-X. The framework is currently being developed to evaluate implemented 5G use cases and assess their technical, economic and societal impact. Key Performance Indicators (KPIs) and Key Value Indicators (KVIs) are defined for the assessment to make the impact of 5G use cases measurable in a variety of categories. Examples of assessment include calculating the return on investment (RoI) of 5G use cases or calculating the greenhouse gas reduction potential from the use of 5G, etc.

For the selected beneficiaries, the SubGrant Agreement will include a set of obligations towards the European Commission (for example: promoting the project and giving visibility to the EU funding, maintaining confidentiality, IPR, understanding potential controls by the EC/ECA, EPPO and OLAF).

The TARGET-X Consortium might cancel the call at any time, change its provisions or extend it. In such a case we will inform all applicants about such change. The signature of the SubGrant Agreement is an initial condition to establish any obligations among applicants and any X-Target Consortium Partners (with respect to the obligation of confidentiality of the application).

You didn't find what you were looking for? You may want to check our '[Frequently Asked Questions](#)' section.

## 9. Extra hints before submitting your proposal

A proposal takes time and effort and we know it. Here are a few crucial points you should read before submitting your proposal in order to maximise your chances of success:

- ✓ Is your project in line with what TARGET-X is looking for? Not 100% sure? You can consult this [section 3.2](#) as well as the [website](#).
- ✓ Did you present your project in a way that will convince evaluators? Not sure if you did? Go back to [section 4.3](#) if you have any doubts.
- ✓ Is your project fulfilling all the admissibility and eligibility requirements described in the Guide for Applicants? Check again [section 3](#).
- ✓ Are you sure you are able to cope with our process of the SubGrant Agreement signature and payment arrangements for selected proposals? You may want to go over [this section](#).
- ✓ Did you check our SubGrant Agreement Template? You didn't? Check it out [here](#).
- ✓ Do you need extra help? [Get in touch!](#)

You can read our [R.E.C.I.P.E. for an outstanding European Funding Opportunity application](#) for additional advice. Good luck!

# ANNEX 1

## Topics description

### TARGET-X

## LIST OF TOPICS FOR THE TARGET- X 2<sup>nd</sup> OPEN CALL



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## METHODOLOGICAL ASSESSMENT FRAMEWORK

### Topic: 1\_Techno-economic Analysis of Industrial 5G Use Cases

<b>Summary</b>	<p>The use of industrial 5G enables a variety of positive impacts on various aspects of business processes. Massive machine-type communications (mMTC), enhanced mobile broadband (eMBB), and ultra-reliable low-latency communications (URLLC) enable a multitude of different optimization options. For instance, production processes can be more efficient and streamlined due to real-time control enabled by 5G-based communications.</p> <p>However, the techno-economic value of the use of 5G often remains unknown, resulting in a lack of information on the business value of industrial 5G use cases. For this reason, a techno-economic analysis of industrial 5G use cases shall be conducted in this project.</p>
<b>Scope</b>	<p>Estimation of the added value achieved through the implementation of industrial 5G use cases in manufacturing, robotics, energy, construction, or autonomous driving from a technical as well as an economic perspective.</p>
<b>Objectives</b>	<p>Identify the impact areas of industrial 5G use cases from a technical and an economic perspective and how the impact can be quantified with key performance indicators (KPI). Calculation of the techno-economic value of industrial 5G use cases to quantify the value proposition of the use of industrial 5G.</p>
<b>Description of the ideal candidate</b>	<p>The ideal candidate is either a university or a research and technology organisation (RTO) or a micro-consortium composed of an SME/University/RTO together with a mid-cap or large company. The candidates need to offer both in-depth knowledge of the industrial use of 5G as well as the techno-economic assessment of processes and industrial use cases.</p>

## Topic: 2\_Life cycle Assessment of Industrial 5G Use Cases

<b>Summary</b>	<p>The use of industrial 5G enables a variety of positive impacts on various aspects of business processes. Massive machine-type communications (mMTC), enhanced mobile broadband (eMBB), and ultra-reliable low-latency communications (URLLC) enable a multitude of different optimization options. For instance, production processes can be more efficient and streamlined due to real-time control enabled by 5G-based communications.</p> <p>However, the ecological impact of the use of 5G often remains unknown, resulting in a lack of information on the ecological footprint of industrial 5G use cases. For this reason, a life-cycle assessment of industrial 5G use cases shall be conducted in this project.</p>
<b>Scope</b>	<p>Creation of a life-cycle assessment (LCA) according to ISO 14040/44 for selected 5G use cases:</p> <ul style="list-style-type: none"> <li>• Define goal and scope for the assessment;</li> <li>• Conduct an inventory analysis;</li> <li>• Calculate the ecological impact in selected impact categories;</li> <li>• Interpret the results.</li> </ul> <p>The LCA is to be conducted on a use case from one of the project's verticals (manufacturing, energy, construction, autonomous driving).</p>
<b>Objectives</b>	Quantification of the ecological footprint of industrial 5G use cases in selected impact categories by identification of the impact areas of industrial 5G use cases from an ecologic perspective.
<b>Description of the ideal candidate</b>	The ideal candidate is either a university or a research and technology organisation (RTO) or a micro-consortium composed of a SME/university/RTO together with a mid-cap or large company. The candidates need to offer both in-depth knowledge of the industrial use of 5G as well as the ecological assessment of processes and industrial use cases.
<b>Description of the ideal candidate</b>	The ideal candidate is either a university or a research and technology organisation (RTO) or a micro-consortium composed of a SME/university/RTO together with a mid-cap or large company. The candidates need to offer both in-depth knowledge of the industrial use of 5G as well as the ecological assessment of processes and industrial use cases.

## MANUFACTURING | EDGE ROBOTICS

### Topic: 3\_Integration of Ethernet Bus Protocols (ProfiNet, EtherCAT, CC-Link) with ROS2 on Embedded Systems

<b>Summary</b>	<p>Industry 4.0 has brought about a new era of interconnected industrial systems, emphasizing the crucial role of seamless data exchange for optimizing efficiency. Integrating industrial Ethernet bus protocols like ProfiNet, EtherCAT, and CC-Link with the Robot Operating System 2 (ROS2) is a significant challenge and opportunity. These protocols, known for their specific strengths, struggle to coexist within a unified framework, impeding collaboration among industrial devices. ROS2, an open-source middleware for robotics, is pivotal in robotic system development with its modular architecture. However, integrating it with diverse industrial Ethernet bus protocols poses challenges due to varying communication standards in manufacturing environments. This project aims to create a specialized device facilitating seamless interconnection between industrial Ethernet bus protocols (e.g., ProfiNet, EtherCAT, CC-Link) and ROS2. The focus is on developing a software stack enabling communication and data exchange between devices using different Ethernet bus protocols and ROS2. Addressing the need for interoperability in industrial automation, this project provides a communication bridge, enhancing the integration of robotic systems with existing industrial networks. The developed solution has the potential to foster collaboration and efficiency in diverse manufacturing environments.</p> <p>Within TARGET-X, a methodological assessment framework is built enabling an evaluation of the implemented 5G use cases and assessing their technical, economic, and societal impact. To ensure a holistic assessment of as many 5G use cases as possible, a project funded by the TARGET-X cascaded funding initiative should also be able to be assessed using the developed methodological assessment framework.</p>
<b>Scope</b>	<ul style="list-style-type: none"> <li>• Implementation of a secure and adaptable architecture for diverse embedded systems, with strong authentication.</li> <li>• Development of a device that effortlessly links devices via ProfiNet, EtherCAT, CC-Link with ROS2.</li> <li>• Provision of user and developer documentation and guidelines.</li> <li>• Insights into future developments and enhancements in the field.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Implement a protocol translation layer for Ethernet bus devices to communicate with ROS2, ensuring real-time capabilities for industrial applications.</li> <li>• Develop a hardware abstraction layer for diverse embedded systems, ensuring flexibility in deployment.</li> <li>• Implement security measures and reliability mechanisms to uphold data integrity and confidentiality, following industrial standards.</li> <li>• Design a user-friendly interface for device configuration and status monitoring, catering to users with varying technical knowledge.</li> <li>• Deliver comprehensive documentation and guidelines to facilitate adoption and customization in different industrial settings.</li> </ul>
<b>Description of the ideal candidate</b>	<p>A company or organisation that has expertise in embedded systems, proficiency in industrial Ethernet bus protocols and ROS2, and experience in secure architecture design. The candidate should also understand the broader impact of 5G use cases and align with the TARGET-X initiative goals.</p>



## Topic: 4\_ROS2 Topic Sniffer for Bandwidth Management in Wireless 5G/6G Networks

<b>Summary</b>	<p>The advent of 5G and the ongoing development of 6G networks promise fast data transfer speeds and low-latency communication, unlocking new possibilities for real-time control and decision-making in robotics. However, optimizing bandwidth, crucial for bandwidth-heavy devices like cameras and 3D-LiDARs in robotic applications, remains a challenge. The project addresses this challenge by proposing a sophisticated software solution built on the Robot Operating System 2 (ROS2). ROS2 has emerged as a robust and widely adopted framework for developing robotic applications, providing a middleware that facilitates communication between different components of a robotic system. This project aims to create an advanced ROS2 topic sniffer for optimizing bandwidth on wireless 5G/6G networks in robotic applications. The software intelligently controls ROS2 topics, dynamically adjusting data streams to enhance bandwidth efficiency. The focus is on scenarios where bandwidth-intensive devices, like cameras and 3D-LiDARs, can be selectively deactivated to allocate resources for critical tasks, such as robotic manipulation. This addresses the crucial need for intelligent bandwidth management in robotic systems on wireless networks, potentially improving efficiency and reliability by allowing users to prioritize and allocate bandwidth based on specific task requirements. Ultimately, this enhances overall robotic system performance in dynamic environments.</p> <p>Within TARGET-X, a methodological assessment framework is built enabling an evaluation of the implemented 5G use cases and assessing their technical, economic, and societal impact. To ensure a holistic assessment of as many 5G use cases as possible, a project funded by the TARGET-X cascaded funding initiative should also be able to be assessed using the developed methodological assessment framework.</p>
<b>Scope</b>	<ul style="list-style-type: none"> <li>• Design of streamlined algorithms for 5G/6G network bandwidth management, with a focus on real-time efficiency.</li> <li>• Development of a user-friendly interface to define and manage bandwidth policies, prioritizing security, and misuse prevention.</li> <li>• Design of a ROS2 topic sniffer for dynamic bandwidth management in wireless networks.</li> <li>• Provision of user documentation for software configuration and utilization.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Develop a sniffer component for monitoring ROS2 topics, analysing data rates, and adjusting bandwidth dynamically.</li> <li>• Implement algorithms to prioritize critical tasks, deactivate non-essential topics for bandwidth conservation, and seamlessly integrate with 5G/6G networks.</li> <li>• Enable users to set policies for bandwidth allocation and topic deactivation based on robot state, task, or environmental conditions.</li> <li>• Implement real-time decision-making mechanisms for prompt response to operational changes, incorporating security measures for authorized control of topic activation/deactivation.</li> </ul>
<b>Description of the ideal candidate</b>	<p>A company or organization that has expertise in ROS2, possess knowledge of 5G/6G networks, excel in real-time algorithm design, and have experience in user interface and software development. The candidate should also understand the broader impact of 5G use cases and align with the TARGET-X initiative goals.</p>

## Topic: 5\_Wearable robotics

<b>Summary</b>	<p>A wearable robot is a specific type of robot capable of reducing the physical load on the human worker. They help, give support and assistance to workers performing demanding manual activities. For instance, an occupation skeleton (OE) can reduce the physical pressure on the human worker. In order to secure smooth interworking of wearable robots and humans, demanding requirements are placed on computation and hardware. A wearable robotics use case relies on computational offloading capabilities and require a deterministic communication performance. Computational offloading is required to improve energy efficiency, costs and accelerate adoption across various industries, especially in manufacturing. The offloading requires highly precise and deterministic communication performance as unpredictable latency variations could directly jeopardize the operations of such applications. Therefore, this project is aimed to third parties developing and implementing a wearable robotics solution using 5G systems. The third party is expected to present and develop a wearable robotics use case in a real industrial shopfloor along with testing and doing an over-the-air performance analysis. The project can be divided into four phases: planning and network connectivity, measurements campaign, analysis/evaluation of experiments and presentation of key findings.</p> <p>Within TARGET-X, a methodological assessment framework is built enabling an evaluation of the implemented 5G use cases and assessing their technical, economic, and societal impact. To ensure a holistic assessment of as many 5G use cases as possible, a project funded by the TARGET-X cascaded funding initiative should also be able to be assessed using the developed methodological assessment framework.</p>
<b>Scope</b>	<ul style="list-style-type: none"> <li>• Realization of wearable robotics use case.</li> <li>• Leveraging from wireless communication techniques for reliability, low and deterministic latency.</li> <li>• Network requirements and performance evaluation of the wearable robotics use case.</li> <li>• KPI-based.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Successfully testing a wearable robotics use case in a real industrial environment.</li> <li>• Understanding and analysis of network requirements for wearable robotics use case.</li> <li>• Add-on: proposal of a joint publication based on key findings and results obtained during the open call.</li> </ul>
<b>Description of the ideal candidate</b>	<p>A company or organization that has expertise in developing industrial wearable robotics, proficiency in 5G systems for reliable communication, and experience in analysing network requirements. They should excel in implementing real-world industrial solutions, managing project phases, and potentially contributing to joint publications. The candidate should also understand the broader impact of 5G use cases and align with the TARGET-X initiative goals.</p>

## Topic: 6\_Large-scale Objects 3D Scan with Mobile Manipulators

<b>Summary</b>	<p>In today's rapidly evolving technological landscape, there is a growing demand for efficient and accurate 3D scanning solutions for large-scale objects. Mobile robots, particularly mobile manipulators, can offer several benefits in terms of enhanced versatility, time efficiency, precision, adaptability, automation, cost-effectiveness, remote operation, and customization. These advantages are further amplified when these robots are equipped with state-of-the-art 5G technology, enabling them to excel in the intricate task of 3D scanning large-scale objects within assembly processes. This project proposes the development of a system that combines edge-controlled mobile manipulators with advanced 3D scanning technology to enable the rapid and precise scanning of large objects. The integration of mobile manipulators ensures flexibility and adaptability, allowing the system to navigate and scan objects in diverse environments, facilitated by the speed and low-latency capabilities of 5G networks.</p> <p>Within TARGET-X, a methodological assessment framework is built enabling an evaluation of the implemented 5G use cases and assessing their technical, economic, and societal impact. To ensure a holistic assessment of as many 5G use cases as possible, a project funded by the TARGET-X cascaded funding initiative should also be able to be assessed using the developed methodological assessment framework.</p>
<b>Scope</b>	<ul style="list-style-type: none"> <li>• Development of a 5G edge-controlled mobile manipulator framework for effective navigation and positioning around large objects, employing advanced 3D scanning for detailed point clouds.</li> <li>• Implementation of efficient algorithms enabling real-time processing of 3D scan data, ensuring timely model reconstruction.</li> <li>• Integration of sensors enabling environmental perception for obstacle avoidance, ensuring safe navigation.</li> <li>• System architecture and coordination algorithms supporting the integration of additional mobile manipulators for parallel scanning.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Integrate mobile manipulators with edge cloud navigation for efficient scanning around large objects.</li> <li>• Employ advanced 3D scanning for high-resolution data, ensuring detailed 3D models.</li> <li>• Implement real-time processing algorithms for efficient model reconstruction.</li> <li>• Development of an edge-controlled framework for seamless robotic control, monitoring, and visualization of the scanning process.</li> <li>• Ensure the system's adaptability to different environments by incorporating sensors and algorithms for obstacle avoidance and navigation.</li> <li>• Design the system to be scalable, allowing for the integration of additional mobile manipulators for parallel scanning of multiple large objects.</li> </ul>
<b>Description of the ideal candidate</b>	<p>A company or organization that has expertise in robotics, 3D scanning, and 5G technology. They should be skilled in algorithm development for real-time data processing, sensor integration, and system architecture design. The candidate should also excel in edge-controlled navigation, adaptability, scalability, and project management, with a holistic understanding of the broader impacts within the TARGET-X initiative.</p>

## Topic: 7\_Assembly of Large-scale components with (large-scale) mobile manipulator

<b>Summary</b>	<p>In recent years, the demand for large-scale component assembly in industries such as manufacturing, construction, and aerospace has increased significantly. However, the conventional methods of assembly often face challenges in terms of efficiency, flexibility, and adaptability to different environments. This project proposes the integration of (large-scale) mobile manipulators for large-scale component assembly, leveraging 5G communication through an edge-control system. This cutting-edge approach aims to overcome existing challenges and revolutionize the assembly process, ultimately enhancing productivity and reducing costs.</p> <p>Within TARGET-X, a methodological assessment framework is built enabling an evaluation of the implemented 5G use cases and assessing their technical, economic, and societal impact. To ensure a holistic assessment of as many 5G use cases as possible, a project funded by the TARGET-X cascaded funding initiative should also be able to be assessed using the developed methodological assessment framework.</p>
<b>Scope</b>	<ul style="list-style-type: none"> <li>• Development of a 5G edge-controlled (large-scale) mobile manipulator framework for effective navigation and positioning around large-scale components.</li> <li>• Integration of sensors enabling environmental perception for obstacle avoidance, ensuring safe navigation for assembly of large-scale components.</li> <li>• System architecture and coordination algorithms supporting the integration of the 5G edge-controlled system.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Implement a 5G edge-controlled (large-scale) mobile manipulator framework capable of navigating large-scale assembly environments autonomously.</li> <li>• Establish a robust 5G communication infrastructure, ensuring low latency for real-time data transfer.</li> <li>• Develop an adaptive edge-control system for dynamic assembly scenarios, optimizing the overall process.</li> <li>• Conduct comprehensive testing, measuring key indicators, and gather feedback for system fine-tuning.</li> </ul>
<b>Description of the ideal candidate</b>	<p>A company or organization that has expertise in robotics, 5G technology, and mobile manipulator development. They should be skilled in sensor integration, system architecture, adaptive edge control, testing, and project management. The candidate should also understand the broader impact of 5G use cases and align with the TARGET-X initiative goals.</p>

## Topic: 8\_Assembly of Flexible Components with Mobile Manipulators

<b>Summary</b>	<p>1- This project proposes the development of an AI-driven mobile manipulator that can manipulate flexible components for the e-mobility industry. With the growing relevance of e-mobility components, such as batteries and electric motors, the challenge of manipulating flexible components becomes an even more important challenge. To achieve economic success of e-mobility, new automation techniques are required to improve the efficiency of component manipulation. The project will consist of four main phases: Design and development, AI-driven control system, wire-less communication, and manipulation execution evaluation. The mobile manipulator will be equipped with sensors to collect real-time data about the environment and utilize machine learning algorithms to analyse and interpret the environment to make decisions about the manipulation of flexible components. The use of wire-less communication and edge computing infrastructure will enable the deployment of AI-driven techniques to mobile manipulators, improving their processing power and reducing latency. The expected results include a mobile manipulator that can move autonomously and manipulate flexible components with precision, an AI-driven control system, integration of wire-less communication, and improved efficiency and accuracy of component manipulation in the e-mobility industry.</p> <p>2- Within TARGET-X, a methodological assessment framework is built enabling an evaluation of the implemented 5G use cases and assessing their technical, economic, and societal impact. To ensure a holistic assessment of as many 5G use cases as possible, a project funded by the TARGET-X cascaded funding initiative should also be able to be assessed using the developed methodological assessment framework.</p>
<b>Scope</b>	<ul style="list-style-type: none"> <li>• Realization of an edge-controlled mobile manipulation use case for assembling electronic cables.</li> <li>• Utilizing AI-techniques for mobile robotic path planning.</li> <li>• Deploying the mobile manipulator control to edge cluster and running 5G wire-less communication.</li> <li>• KPI-based 5G use case evaluation.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Successfully plug in cables in battery automotive assembly use-case.</li> <li>• Virtualization of robot control on edge cluster.</li> <li>• Achieving high product flexibility with the given edge robotics setup.</li> </ul>
<b>Description of the ideal candidate</b>	<p>A company or organization that has expertise in robotics, AI-driven mobile manipulators, wireless communication, and edge computing. They should be skilled in deploying machine learning algorithms for real-time decision-making and have experience in 5G use case evaluation. The candidate should also understand the broader impact of 5G use cases and align with the TARGET-X initiative goals.</p>

## MANUFACTURING | CLOUD PRODUCTION

### Topic: 9\_Wireless 5G/6G based localization solutions for Manufacturing

<b>Summary</b>	<p>Wireless 5G/6G based localization solutions for manufacturing are important because they enhance improve safety measures, increase productivity, reduce costs, and future-proof manufacturing operations. By providing tracking and monitoring of assets, equipment, and personnel, these solutions optimize resource allocation, streamline workflows, prevent accidents, and enable quick emergency response.</p> <p>The project aims to develop wireless 5G/6G based localization solutions specifically designed for the manufacturing industry. The objective is to provide accurate tracking of assets, equipment, and personnel within manufacturing facilities. The solution should leverage the advanced capabilities of 5G/6G networks to enable localization, improve operational efficiency, and enhance safety measures in manufacturing environments. The solution can be either software or hardware based and needs to fit indoor requirements such as missing GPS signals.</p>
<b>Scope</b>	<ul style="list-style-type: none"> <li>• Focus on localization for manufacturing processes, therefore indoor requirements such as missing GPS signals.</li> <li>• Implementation of a localization solutions using 5G/6G technology.</li> <li>• The solution can be based on software or hardware solution, using SDR boards, 5G-UEs or similar.</li> <li>• The solution needs to be compatible with existing manufacturing systems and equipment.</li> <li>• Test and validate the localization solutions in the manufacturing environment of the IPT shopfloor in Aachen.</li> <li>• Provide documentation and support for the implemented solutions.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Develop and implement wireless 5G/6G based localization solutions specifically designed for manufacturing environments.</li> <li>• The solution shows the benefits of using 5G/6G solutions for localization.</li> <li>• The solution aims to offer a robust and scalable localization solution that can be seamlessly integrated into existing manufacturing systems such as AGVs or sensor systems.</li> </ul>
<b>Description of the ideal candidate</b>	<p>A company or organization that has expertise in wireless communication technologies, localization algorithms, and experience in developing solutions for the manufacturing industry.</p>



## Topic: 10\_Software Stack for fieldbus protocols such as CC-Link IE TSN, EtherCat, ProfiNet for Linux systems

<b>Summary</b>	<p>As the world continues to move towards digitalization, the demand for virtual PLCs and NCs increasing rapidly. To connect such virtual PLCs to the shopfloor, fieldbus protocols such as CC-Link IE TSN, EtherCat or PROFINET are needed, allowing communication between various devices and systems. Today these fieldbus protocols are mostly bound to specific hardware. In this cascaded project, a virtualized fieldbus Master needs to be developed, which can be deployed on different Linux distributions.</p> <p>Running these virtualized masters and local stations on Linux operating systems provides numerous advantages. First and foremost, Linux is a free and open-source operating system that is widely used in industrial automation. By using Linux, developers can reduce licensing costs and take advantage of the vast community support available for the platform. Another advantage of virtualized fieldbus protocol masters and local stations running on Linux is their ease of deployment. With virtualization, companies can easily deploy new instances of masters and local stations as needed, without the need for additional hardware. This can lead to significant cost savings, particularly for large-scale industrial applications.</p>
<b>Scope</b>	<ul style="list-style-type: none"> <li>• Implementation of a hardware independent fieldbus master and local station deployable for Linux based operating systems.</li> <li>• Implementation of a user interface for configuration and interaction.</li> <li>• Validation on a real production shopfloor located in Aachen.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Implementation of a virtual fieldbus protocol.</li> <li>• Successful communication between different Linux devices via fieldbus protocols.</li> </ul>
<b>Description of the ideal candidate</b>	<p>We are seeking proposals from experienced developers with a proven track record in developing masters and local stations for fieldbus protocols.</p>

## Topic: 11\_Simultaneous Wireless Information and Power Transfer (SWIPT) for smart sensors in manufacturing

<b>Summary</b>	<p>The project aims to develop Simultaneous Wireless Information and Power Transfer (SWIPT) technology for smart sensors in manufacturing. SWIPT enables wireless communication and power transfer to smart sensors simultaneously, eliminating the need for wired power connections and frequent battery replacements. This technology offers enhanced flexibility, reduced maintenance efforts, improved scalability, cost savings, and enhanced efficiency in manufacturing processes. By implementing SWIPT, manufacturing facilities can benefit from a more flexible, scalable, and cost-effective approach to sensor deployments, leading to improved productivity and operational efficiency.</p> <p>The project will primarily focus on proof of concepts and initial steps towards the implementation of SWIPT technology in manufacturing. The objective is to demonstrate the feasibility and potential benefits of SWIPT for smart sensors in a manufacturing environment. Initial prototypes and experiments will be conducted to validate the concept and assess the technical challenges and requirements. The project will serve as a foundational step in paving the way for future advancements and full-scale implementation of SWIPT in manufacturing processes.</p>
<b>Scope</b>	<ul style="list-style-type: none"> <li>• Develop proof of concept for Simultaneous Wireless Information and Power Transfer (SWIPT) technology in manufacturing.</li> <li>• Conduct experiments and validation tests to assess the feasibility and performance of SWIPT in a manufacturing environment.</li> <li>• Evaluate and address technical challenges related to wireless power transfer and reliable communication.</li> <li>• Validation on a real production shopfloor located in Aachen using the 5G-mmWave system.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Demonstrate the feasibility of SWIPT technology in manufacturing.</li> <li>• Assess the potential benefits of SWIPT in terms of flexibility, maintenance reduction, scalability, and cost savings.</li> <li>• Contribute to the advancement of SWIPT technology and knowledge sharing in the industry.</li> </ul>
<b>Description of the ideal candidate</b>	<p>We are seeking proposals from experienced developers and institutes with a proven track record in SWIPT.</p>



## Topic: 12\_Cyber Security assessment and tools for 5G/6G use cases in manufacturing

<b>Summary</b>	<p>The project aims to address cyber security concerns and conduct a comprehensive evaluation of existing cyber security tools and infrastructures for 5G/6G use cases in manufacturing. The objective is to assess the effectiveness, suitability, and applicability of available tools and systems in addressing cyber security concerns in manufacturing processes utilizing 5G/6G technologies.</p> <p>The project will involve researching and compiling a list of relevant cyber security tools that can be applied to manufacturing environments. These tools may include intrusion detection systems, vulnerability scanners, network monitoring solutions, security information and event management (SIEM) systems, and encryption software, among others. Further an evaluation of existing 5G-solutions needs to be addressed, showing the relevant security risks of commercially available solutions.</p> <p>Each identified tool will be evaluated based on criteria such as functionality, compatibility with 5G/6G technologies, ease of implementation, scalability, performance, and cost-effectiveness. The evaluation process will consider the specific requirements and challenges of manufacturing environments, ensuring that the selected tools align with industry needs.</p> <p>The project should result in a comprehensive report that includes the list of evaluated cyber security tools, their strengths and limitations, and recommendations for their adoption in 5G/6G use cases in manufacturing. The report will provide manufacturing organizations with valuable insights and guidance to make informed decisions regarding the selection and implementation of appropriate cyber security tools to protect their critical assets and operations.</p>
<b>Scope</b>	<ul style="list-style-type: none"> <li>• Conduct a thorough assessment of cyber security risks and vulnerabilities in the context of 5G/6G use cases in manufacturing.</li> <li>• Research and compile a comprehensive list of existing cyber security tools applicable to manufacturing environments utilizing 5G/6G technologies.</li> <li>• Evaluate each identified tool based on criteria such as functionality, compatibility, ease of implementation, scalability, performance, and cost-effectiveness.</li> <li>• Consider industry-specific requirements and challenges to ensure the suitability of selected tools for manufacturing environments.</li> <li>• Assess the strengths and limitations of existing 5G-solutions addressing cyber security concerns in manufacturing.</li> <li>• Create a report summarizing the cyber security assessment findings, the list of evaluated tools, and their recommendations for manufacturing organizations.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Conduct a comprehensive assessment of cyber security risks and vulnerabilities in 5G/6G use cases in manufacturing.</li> <li>• Provide recommendations for the adoption and implementation of appropriate cyber security tools in manufacturing environments.</li> <li>• Promote awareness and understanding of cyber security risks and best practices in the context of 5G/6G technologies in manufacturing.</li> </ul>
<b>Description of the ideal candidate</b>	<p>We are seeking proposals from experienced developers and institutes with a proven track record in wireless technologies and cyber security.</p>

## Topic: 13\_Development of an authentication mechanism for end devices in a 5G-network

<b>Summary</b>	<p>The objective of this project is to develop a robust authentication mechanism that ensures secure communication between industrial end devices, such as robots and sensors, a 5G network and cloud resources.</p> <p>Current authentication solutions are based on SIM-card authentication of the 5G-UE, independent on the industrial device connected to it. In this project, a holistic authentication mechanism from the industrial end device to the factory cloud via the 5G-network is to be developed. Besides the access permission, there should be the option to categorize access to different resources (spanning multiple dimensions, e.g. access to communication resources, storage resources, processing resources) based on the user group. After the authentication, these resources will be made available to the end device.</p> <p>The project will involve conducting a comprehensive literature review on existing authentication mechanisms used in 5G networks, analysing the requirements and challenges specific to manufacturing network authentication, and designing and implementing an authentication mechanism based on these findings. The developed mechanism will be tested and evaluated to assess its performance, security, and usability. The project will deliver detailed documentation of the authentication mechanism, testing and evaluation reports, and recommendations for further improvements.</p>
<b>Scope</b>	<ul style="list-style-type: none"> <li>• Development of an authentication system for industrial end devices in a 5G-network.</li> <li>• Integration of the authentication system with existing network infrastructure.</li> <li>• Implementation of a user group-based resource allocation system connected to the authentication system.</li> <li>• Testing and validation of the authentication mechanism at the IPT shopfloor in Aachen.</li> <li>• Documentation of the authentication mechanism for future reference and troubleshooting.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Develop a robust authentication mechanism to withstand security threats.</li> <li>• Ensure scalability to handle a large number of end devices in the 5G network.</li> <li>• Ensure compatibility with existing network infrastructure and protocols.</li> <li>• Optimize user experience by providing a seamless and user-friendly authentication process.</li> </ul>
<b>Description of the ideal candidate</b>	<p>We are seeking proposals from experienced developers and institutes with a proven track record in wireless technologies and cyber security.</p>

## Topic: 14\_Testing of sustainable 5G/6G use cases for manufacturing

<b>Summary</b>	In this project scope an evaluation and testing of sustainable 5G/6G use cases for manufacturing will be done. The project aims to collaborate with manufacturing companies to validate their use cases that align with sustainable manufacturing practices. Validated use cases will be assessed for their potential impact on environmental sustainability, energy efficiency, and social responsibility. First a detailed elaboration of the use case and its requirements will be done. Secondly the use case will be implemented and tested at the IPT shopfloor. Test results will be analysed, and comprehensive documentation and reports will be produced, highlighting the sustainability findings and recommendations.
<b>Scope</b>	<ul style="list-style-type: none"> <li>• Validate the use cases and assess their potential impact on environmental sustainability, energy efficiency, and social responsibility.</li> <li>• Develop a comprehensive test plan for each validated use case, including test scenarios and success criteria, together with IPT.</li> <li>• The funded partner needs to implement the use cases.</li> <li>• IPT will support during the testing and analysing of the use case at the IPT shopfloor.</li> <li>• IPT will support with evaluation of the performance and sustainability impact of the use cases.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Test advanced and sustainable use cases for manufacturing in the context of 5G/6G technology.</li> <li>• Identify and address potential challenges and limitations of deploying 5G/6G in a manufacturing environment.</li> <li>• Explore innovative applications of 5G/6G for improving quality control, automation, and real-time monitoring in manufacturing.</li> </ul>
<b>Description of the ideal candidate</b>	We are seeking proposals from manufacturing companies interested in 5G/6G.

## ENERGY

### Topic: 15\_Multi-level Visualization

<b>Summary</b>	<p>Within TARGET-X, a methodological assessment framework is built enabling an evaluation of the implemented 5G use cases and assessing their technical, economic, and societal impact. To ensure a holistic assessment of as many 5G use cases as possible, a project funded by the TARGET-X cascaded funding initiative should also be able to be assessed using the developed methodological assessment framework.</p> <p>Intuitive user interface design and a broad integration of different use cases can be challenging. Providing an interactive and real-world annotated visualization will enable the prosumer to better understand the impact of the different components of the system and their impact on energy consumption. This virtualization will include a variety of different data sources and combine the information in a grand schema.</p>
<b>Scope</b>	To achieve the goals in the European green deal until 2030 for the reduction of CO2 emissions in all sectors, the first step is to identify the areas of maximum potential for CO2 reduction. This can be supported by visualizing the energy consumption and other metrics of the different components in, for example, the manufacturing or construction process.
<b>Objectives</b>	The objective is to develop a visualization that provides an easy to use interface for large-scale industrial consumers.
<b>Description of the ideal candidate</b>	The ideal candidate specialises in modern UI development, as well as the key indices used to visualise the consumption and production of energy.

## Topic: 16\_Energy-aware industrial solutions

<b>Summary</b>	<p>Within TARGET-X, a methodological assessment framework is built enabling an evaluation of the implemented 5G use cases and assessing their technical, economic, and societal impact. To ensure a holistic assessment of as many 5G use cases as possible, a project funded by the TARGET-X cascaded funding initiative should also be able to be assessed using the developed methodological assessment framework.</p> <p>The knowledge about the consumption of industrial devices like machines, robots or other industrial systems is a key indicator for the reduction of energy consumption in industrial applications. This task will deploy and integrate these measurements and will provide the resulting data sets as far as possible as open datasets for third parties to pick up on, for the development of new optimization algorithms.</p>
<b>Scope</b>	The industrial sector is a key contributor to the global CO2 emissions. Thus, reducing consumption in this sector will contribute to a future CO2-neutral economy. The first step is to identify the potential for reduction of energy consumption by deploying measurement devices and understanding the relationship between production and energy consumption.
<b>Objectives</b>	The objective is to deploy and or integrate energy measurements in industrial applications.
<b>Description of the ideal candidate</b>	The ideal partner is working in the production sector and already running small to medium-sized machinery.

## Topic: 17\_Power supply for mobile 5G sensors

<b>Summary</b>	<p>Within TARGET-X, a methodological assessment framework is built enabling an evaluation of the implemented 5G use cases and assessing their technical, economic, and societal impact. To ensure a holistic assessment of as many 5G use cases as possible, a project funded by the TARGET-X cascaded funding initiative should also be able to be assessed using the developed methodological assessment framework.</p> <p>The use of wireless technologies may be in doubt if a wired connection is required for its power supply. Since 5G sensors have a significant energy consumption when used for permanent data transmission, the question arises as to how a practicable use of 5G can be achieved in the industrial environment.</p>
<b>Scope</b>	<p>Determine what is the best solution for 5G usage in an industrial environment, e.g:</p> <ul style="list-style-type: none"> <li>• increase in battery size which affects sensor size;</li> <li>• switch to low-band frequencies which lowers bandwidth;</li> <li>• use of energy harvesting technologies;</li> <li>• use of inductive power transfer;</li> <li>• use of photovoltaics.</li> </ul>
<b>Objectives</b>	The goal is to find a viable solution for a 5G sensor that can survive an entire shift.
<b>Description of the ideal candidate</b>	The ideal partner is working and knows about the Communication and Power sector and already running small to medium-sized machinery.

## Topic: 18\_Deployment and data gathering in distribution grids

<b>Summary</b>	<p>Within TARGET-X, a methodological assessment framework is built enabling an evaluation of the implemented 5G use cases and assessing their technical, economic, and societal impact. To ensure a holistic assessment of as many 5G use cases as possible, a project funded by the TARGET-X cascaded funding initiative should also be able to be assessed using the developed methodological assessment framework.</p> <p>To allow for future big data analytics applications based on historical data, real-world data of the distribution grid will be acquired and sent to a central database. The goal is to provide the anonymized data to third parties by putting the data under a open-source licence as far as possible. The data will also be used to raise energy awareness for the data provider. The acquisition will utilize the edgePMU technology.</p>
<b>Scope</b>	Increasing the observability is important, especially for the distribution grid, which is currently undergoing substantial changes. Placing additional monitoring devices will help that. As a side effect, the data can be stored and made available for scientific use to develop new algorithms and validate them based on real-world data.
<b>Objectives</b>	The objective is to deploy edgePMU measurement devices within a distribution grid and gather the data for increased grid and energy awareness as well as for central storage to foster future big data analytics use cases.
<b>Description of the ideal candidate</b>	The ideal partner is a distribution system operator.

## Topic: 19\_Predictive algorithms for consumption and generation (PV, wind) to allow for functions maximising the usage of sustainable energy

<b>Summary</b>	<p>Within TARGET-X, a methodological assessment framework is built enabling an evaluation of the implemented 5G use cases and assessing their technical, economic, and societal impact. To ensure a holistic assessment of as many 5G use cases as possible, a project funded by the TARGET-X cascaded funding initiative should also be able to be assessed using the developed methodological assessment framework.</p> <p>Based on the data acquired within the TARGET-X project, new forms of prediction algorithms for production and consumption will be developed and tested on the datasets acquired by the TARGET-X project.</p>
<b>Scope</b>	The optimization of energy use will allow for more volatile energy resources to be integrated into today's power grid. To allow for better integration as well as reduce the need for grid reinforcements, the consumption and production patterns need to be predicted as accurately as possible.
<b>Objectives</b>	The objective is to develop new algorithms for the prediction of production and consumption. The algorithms will be validated based on the data acquired within the TARGET-X project.
<b>Description of the ideal candidate</b>	The ideal partner for this task, it specialized in prediction algorithms for power production and consumption.

## Topic: 20\_Data-driven energy sustainability solutions in parallel sectors such as buildings and e-mobility

<b>Summary</b>	<p>Within TARGET-X, a methodological assessment framework is built enabling an evaluation of the implemented 5G use cases and assessing their technical, economic, and societal impact. To ensure a holistic assessment of as many 5G use cases as possible, a project funded by the TARGET-X cascaded funding initiative should also be able to be assessed using the developed methodological assessment framework.</p> <p>Picking up the technology and solution provided by TARGET-X is an important goal to drive the widespread of the solutions. This will be done in particular for the building and e-mobility sector. This will show the possibilities outside the project consortium. The acquired data should be provided as far as possible as an open-source dataset to allow third parties to develop new approaches in analytics and control.</p>
<b>Scope</b>	Energy awareness is not only important in the verticals covered by TARGET-X. Adopting the TARGET-X approach will allow for a higher impact of the TARGET-X solution and foster the exchange with other verticals. Especially, the building and e-mobility sector will play a major role in the energy transition.
<b>Objectives</b>	Integration and deployment of the solutions provided within TARGET-X in parallel sectors, for example, the building and e-mobility sectors.
<b>Description of the ideal candidate</b>	The ideal candidate is part of a parallel sector, e.g., building or e-mobility, or has contacts for the deployment of measurement devices in those sectors.

## Topic: 21\_Creation of Energy related Business Models to Turn Data into Value

<b>Summary</b>	<p>The industrial utilization of 5G will enable a variety of new approaches for the creation of business models. The use of 5G will significantly increase the amount of data that comes directly from processes. For example, energy consumption data can be obtained directly in the process and then used to gain new insights for optimizing the energy consumption of the process.</p> <p>In order to turn the new insights into value, new business models shall be created within this project.</p>
<b>Scope</b>	<ul style="list-style-type: none"> <li>Analyse the value proposition of 5G use cases in the verticals manufacturing, energy, and construction.</li> <li>Collect requirements and restrictions for the creation of business models that aim towards the utilization of new insights into energy consumption within processes.</li> <li>Define the data needed for the creation of the business model and determine how legal and privacy constraints can be taken into consideration.</li> <li>Derive the business model turning new insights into value.</li> </ul>
<b>Objectives</b>	Analysis of the economic potential and value proposition of industrial 5G use cases in the verticals manufacturing, energy, and construction and identification of how the identified potential can be used to derive energy-related business models turning insights into value.
<b>Description of the ideal candidate</b>	The ideal candidate should have in-depth knowledge of energy-related 5G use cases as well as on how to monetize optimization potential which is enabled by new insights into processes.



## AUTOMOTIVE

### Topic: 22\_Tele-operation and remote supervision for autonomous driving

<b>Summary</b>	<p>Many autonomous driving services such as busses (People Movers) and taxis (Robo Taxis) only have a business case when there is no human driver on board. Still, for various reasons, interaction with a human must still be possible. The same principle is applied for every elevator, where passengers can always request contact to a human. Furthermore, automated driving algorithms might not be able to handle certain situations and/or authorities might demand that a human supervises or even remotely drives the vehicles in certain cases. Jurisdictions like Germany and California, US have put in place legal requirements for remote supervision.</p> <p>Within TARGET-X, a methodological assessment framework is built enabling an evaluation of the implemented 5G use cases and assessing their technical, economic, and societal impact. To ensure a holistic assessment of as many 5G use cases as possible, a project funded by the TARGET-X cascaded funding initiative should also be able to be assessed using the developed methodological assessment framework.</p>
<b>Scope</b>	<p>Remote supervision typically consists, at least, of telematics and a bi-directional voice channels, according to Californian regulations (as of April 2023). For Germany, the remote supervisor must also be able to approve driving trajectories the vehicle is not able to autonomously decide and monitor the execution of these trajectories, always ready to press the emergency stop button. Monitoring is typically done through video streaming.</p> <p>As those are legal obligations, certification authorities will typically demand a solution to monitor the network state, typically realized through a “watchdog”. The key challenge is therefore to guarantee network performance that prevents the watchdog from triggering an alarm, that would result in the vehicle having to stop.</p> <p>It should be noted that IDIADA will provide only the communication infrastructure.</p>
<b>Objectives</b>	<p>The objective of this challenge is to implement and evaluate:</p> <ul style="list-style-type: none"> <li>• New QoS prediction algorithm based on collected measurements by the vehicle/other vehicles.</li> <li>• A watchdog to monitor the network conditions.</li> </ul> <p>A tool to collect and show 5G performance measurements.</p>
<b>Description of the ideal candidate</b>	<p>An autonomous bus or taxi company would be ideal, but only replicating the telematics and video-streaming service and especially the watchdog would be sufficient. Entities with experience in watchdogs are very welcome as well as certification bodies approving such solutions.</p>



## Topic: 23\_Digital twins' generation methodology for road safety based on real time vehicle information

<b>Summary</b>	The aim of this challenge is to promote knowledge of digital twins based on real scenarios in which the information must be modelled in order to be able to recreate them digitally. Within TARGET-X, a methodological assessment framework is built enabling an evaluation of the implemented 5G use cases and assessing their technical, economic, and societal impact. To ensure a holistic assessment of as many 5G use cases as possible, a project funded by the TARGET-X cascaded funding initiative should also be able to be assessed using the developed methodological assessment framework.
<b>Scope</b>	Using the various sensors of the vehicles (radars, cameras, LiDARS, positioning sensors, accelerometers, etc.), the challenge is to collect all vehicle information in real time and share it with a platform that will be running on IDIADA's Edge node. This platform must analyse the data obtained from the real scenario and must be able to recreate this scenario using a virtual simulator. It should be noted that IDIADA will provide only the communication infrastructure.
<b>Objective</b>	The objective of this challenge is to implement and evaluate a new methodology to create digital twins by using real data. The proposed solution should include: <ul style="list-style-type: none"> <li>• An in-vehicle platform to collect vehicle and/or environment data. The platform should contain sensors (e.g., radars, cameras, LiDARS, positioning sensors, accelerometers, etc.), a collection tool to gather the data, and a communication tool to send these data to the edge node.</li> <li>• A processing platform to be deployed in the Edge server (if needed) provided by IDIADA to process the data send by the vehicle and use it to create a traffic simulation model based on digital twins' generation. This model should be able to adapt and integrate in one or more virtual environments (ViL, SiL, MiL, HiL, driving simulator, etc.).</li> </ul>
<b>Description of the ideal candidate</b>	<ul style="list-style-type: none"> <li>• Suppliers of V2X equipment to provide material to the vehicle (cameras, LiDARS, position sensors, accelerometers, outdoor cellular antennas, cellular 4G/5G modems, and OBUs);</li> <li>• OEMs who wish to virtualize their data to be used later in any use case required in EURO NCAP;</li> <li>• Any company which aims to create EURO NCAP CAV use cases;</li> <li>• Any SW company wishing to design and integrate a complex data system in order to simulate digital twins in a virtualized environment;</li> </ul> <p>Any company which can provide SW development to create traffic simulation models (ViL, SiL, MiL, HiL, driving simulator).</p>

## Topic: 24\_Cooperative perception for Connected and Automated Vehicles (CAVs)

<b>Summary</b>	<p>This challenge is intended to design a C-ITS service capable of providing collision warnings to users in the environment.</p> <p>The idea is adding vehicle safety metrics into the road digital twin to obtain complete insight about the perception of safety in each individual point of the road. This is mandatory to be able to map relevant events happening in the vehicle into road events and have the correct process on that specific time. Hence, the reaction of the vehicle in terms of safety KPIs can be studied in different road situations.</p> <p>Within TARGET-X, a methodological assessment framework is built enabling an evaluation of the implemented 5G use cases and assessing their technical, economic, and societal impact. To ensure a holistic assessment of as many 5G use cases as possible, a project funded by the TARGET-X cascaded funding initiative should also be able to be assessed using the developed methodological assessment framework.</p>
<b>Scope</b>	<p>This challenge is intended to give an opportunity to any applicant who wants to develop and test a new collision warning service by using cellular network (4G and 5G) technologies.</p> <p>It should be noted that IDIADA will provide only the communication infrastructure.</p>
<b>Objective</b>	<p>The objective of this challenge is to implement and evaluate the behaviour and performance of a new collision alert service (C-ITS) using:</p> <ul style="list-style-type: none"> <li>• <i>instrumented</i> vehicles, motorbikes, scooters (host and target) and any application service to be deployed at the edge, which will be provided by the applicant.</li> <li>• One server (Edge) and two technologies (4G and 5G) provided by IDIADA.</li> </ul>
<b>Description of the ideal candidate</b>	<p>Companies that can provide connected testing vehicles.</p> <p>Any company which aims to develop a preventive collision warning platform/service by using C-ITS technologies considering they will need a minimum of 2 vehicles to test their service.</p>

## CONSTRUCTION

### Topic: 25\_5G supported process automation for large scale assembly

<b>Summary</b>	<p>In the TARGET-X project, 5G is being introduced to the construction industry as a new standard for wireless communication. The resulting potentials are being explored in large-scale trials on the Reference Construction Site of the Center Construction Robotics in Aachen. For this purpose, a multi-material demonstrator structure (approx. 9mx15mx12m) will be set up on the test bed. It will cover the entire life cycle of a building, including planning, construction and deconstruction (cradle to cradle).</p> <p>The TARGET-X project includes a methodological assessment framework that evaluates the technical, economic, and social impact of 5G use cases. To ensure a comprehensive assessment of as many 5G use cases as possible, the framework can also be applied to projects funded by the TARGET-X cascaded funding initiative.</p>
<b>Scope</b>	<p>To combat major socio-economic challenges such as shortage of skilled workers or sustainability, construction industry must introduce major changes in digitalization and automation of construction processes.</p> <p>An autonomous large-scale assembly is one of the most complex tasks in this endeavor, due to extremely high number of interconnected industrial sectors. This topic focusses on (semi-)autonomous large-scale assembly of modular timber-based building systems and the determination of the potential in the given 5G network infrastructure as a communication backbone for the large-scale assembly projects. Typically, these processes range from the fields of data collection and actuation, control of large-scale machinery, big-data management and analysis, process operation and user interaction to onsite assembly processes and lifting operations.</p>
<b>Objective</b>	<p>Provide an automated large-scale assembly process for prefabricated timber-based building systems.</p> <p>Evaluation of 5G network for different scopes of communication, such as sensors (e.g. Lidar, IMU, Load, GPS, ...) and lifting actuator, process data between digital twins, and data management infrastructure from prefabrication to onsite assembly.</p> <p>Validation of reliability, safety, and security properties in the scope of large-scale assembly processes (e.g., remote control of lifting equipment such as lifting hooks and traverses, weight sensing and monitoring) in the 5G network at the construction vertical's testbed in Aachen.</p>
<b>Description of the ideal candidate</b>	<p>The ideal applicant can be a single prefabricator or a team of technology enabler and prefabricator to provide a fully digitalized value chain, from planning to automated prefabrication and large-scale onsite assembly. Furthermore, the ideal candidate can proof to execute large scale assembly projects. The ideal candidate should be an expert for special lifting solutions, with a high level of digitalization in terms of data collection, data management and data driven decision making. The ideal applicant aims to develop a fully or semi-autonomous large scale assembly platform within a provided 5G network infrastructure in the construction vertical's testbed in Aachen.</p>

## Topic: 26\_Automation of a tower crane for 5G supported large-scale assembly tasks

<b>Summary</b>	<p>In the TARGET-X project, 5G is being introduced to the construction industry as a new standard for wireless communication. The resulting potentials are being explored in large-scale trials on the Reference Construction Site of the Center Construction Robotics in Aachen. For this purpose, a multi-material demonstrator structure (approx. 9mx15mx12m) will be set up on the test bed. It will cover the entire life cycle of a building, including planning, construction and deconstruction (cradle to cradle).</p> <p>The TARGET-X project includes a methodological assessment framework that evaluates the technical, economic, and social impact of 5G use cases. To ensure a comprehensive assessment of as many 5G use cases as possible, the framework can also be applied to projects funded by the TARGET-X cascaded funding initiative.</p>
<b>Scope</b>	<p>The construction industry is facing major socio-economic challenges such as shortage of skilled workers but also a lack of affordable housing. In order to tackle these challenges, a revision of traditional processes is often proposed in combination with a focus on automation and digitalization.</p> <p>Tower cranes are a key element in any major construction project. Although modern crane control systems already record a wide range of processes and operating data, crane operators still manually determine all positions and speeds of a crane's movement. In view of the increasing shortage of skilled workers, the potential for partial automation of the lifting process including remote monitoring is immense. However, this also increases the requirements on acquired data and to communication and data management infrastructures. In this context 5G as the new communication standard could help to achieve the necessary availability and low latencies for smooth remote operation.</p>
<b>Objective</b>	<p>Partial automation of a lifting process with a top-slewing tower crane including:</p> <ul style="list-style-type: none"> <li>• Real-time enabled reporting of status data to the remote operator by the use of 5G technologies.</li> <li>• Automated reporting on wear and tear of the crane to a remote maintenance system.</li> <li>• Pre-programming of pathways and velocities along a lifting path.</li> <li>• Storage and open access to control parameters for analysis and optimization.</li> <li>• Deployment, test and verification of the setup on the construction vertical's test bed in Aachen.</li> </ul>
<b>Description of the ideal candidate</b>	<p>The ideal candidate can be a crane manufacturer with an inhouse software development department or a team of a crane manufacturer and a software developer who can provide a top-slewing tower crane (lifting capacity up to 8t) and full access to the crane control system. Additionally, the ideal candidate must be able to read, process, interpret and store the relevant control parameters. Moreover, the tower crane has to be capable of processing preprogrammed path planning. Furthermore, the candidate must be able to deploy the developed setup on the construction vertical's test bed in Aachen for proof of concept for the whole funding period.</p>

## Topic: 27\_Retrofittable control unit for the automation of construction machines

<b>Summary</b>	<p>In the TARGET-X project, 5G is being introduced to the construction industry as a new standard for wireless communication. The resulting potentials are being explored in large-scale trials on the Reference Construction Site of the Center Construction Robotics in Aachen. For this purpose, a multi-material demonstrator structure (approx. 9mx15mx12m) will be set up on the test bed. It will cover the entire life cycle of a building, including planning, construction and deconstruction (cradle to cradle).</p> <p>The TARGET-X project includes a methodological assessment framework that evaluates the technical, economic, and social impact of 5G use cases. To ensure a comprehensive assessment of as many 5G use cases as possible, the framework can also be applied to projects funded by the TARGET-X cascaded funding initiative.</p>
<b>Scope</b>	<p>The construction industry is facing major socio-economic challenges such as shortage of skilled workers but also a lack of affordable housing. Attempts to compensate for the lack of manpower often include the automation of the necessary machines. Retrofittable remote control systems could provide a solution. In this context 5G as the new communication standard could help to achieve the necessary availability and low latencies for smooth remote operation.</p>
<b>Objective</b>	<ul style="list-style-type: none"> <li>• Development of a transferable, 5G capable control unit for teleoperation or remote control of construction machines (e.g., mobile cranes).</li> <li>• The design should support intuitive operation ideally with ergonomic haptic controls.</li> <li>• Proof of concept for portability between different construction machines.</li> <li>• Software for controlling manipulated variables on the machines e.g., by using actuators.</li> <li>• Inclusion of a 5G-capable interface to test the performance of the 5G-network for remote control purposes.</li> </ul>
<b>Description of the ideal candidate</b>	<p>An ideal candidate can provide a combined hardware and software solution for a transferrable, 5G capable control unit for the teleoperation or remote control of construction machines. The company must be able to integrate its solution into the existing 5G network on the construction vertical's test bed in Aachen.</p>

## Topic: 28\_Interface between industrial and 5G wireless technologies

<b>Summary</b>	<p>As part of the TARGET-X project, a multi-material demonstrator structure (approx. 9mx15mx12m) is to be created on the Reference Construction Site of the Center Construction Robotics.</p> <p>The demonstrator will provide the basis to investigate the real and technical feasibility of the cradle-to-cradle principle (C2C), including construction and deconstruction of a built structure. In order to meet not only the challenge of material scarcity, but also other current challenges of the construction industry, such as the shortage of skilled workers and lack of digitalization, as many process steps as possible in the construction and deconstruction of the reference structure should be automated and/or performed by robots within the infrastructure and applying the technologies of an existing 5G-network.</p> <p>The TARGET-X project includes a methodological assessment framework that evaluates the technical, economic, and social impact of 5G use cases. To ensure a comprehensive assessment of as many 5G use cases as possible, the framework can also be applied to projects funded by the TARGET-X cascaded funding initiative.</p>
<b>Scope</b>	<p>Trained specialists are becoming less and less available. In particular in the construction industry, there is an increasing shortage of specialized skilled workers who can operate machines. Machine-specific training is often lengthy and costly. Simplified, possibly modular, control devices that can be transferred to a variety of machines may provide a solution. This means that only one control system needs to be learned to enable skilled workers to operate different construction machines. Additionally, this could drastically expand the group of people who are capable of performing these tasks. For example, female workers or people with handicaps could be enabled to operate heavy construction machinery.</p>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Development of a transferable, teleoperated control unit/remote control for construction machines (e.g., mobile cranes, excavators or other mobile robotic platforms);</li> <li>• The design of the control unit should support an intuitive operation ideally with ergonomically designed haptic controls;</li> <li>• Proof of concept for portability between different machines;</li> <li>• Software for controlling manipulated variables on the machines, e.g., by using actuators;</li> <li>• Implementation of an emergency stop function;</li> <li>• Inclusion of a 5G-capable interface to test the performance of the 5G-network for remote control purposes;</li> <li>• Possibility of extension with additional displays for more challenging teleoperation tasks.</li> </ul>
<b>Description of the ideal candidate</b>	<p>An ideal candidate can provide a combined hardware and software solution for a transferrable, teleoperated control unit for construction machines. This could also be a proofed implementation from another domain like agriculture or logistics which is adaptable for construction machines from various brands. The company must be able to integrate its solution into the existing 5G network at least for the purpose of data transfer.</p>



## Topic: 29\_Construction logistics and asset tracking in a 5G environment

<b>Summary</b>	<p>In the TARGET-X project, 5G is being introduced to the construction industry as a new standard for wireless communication. The resulting potentials are being explored in large-scale trials on the Reference Construction Site of the Center Construction Robotics in Aachen. For this purpose, a multi-material demonstrator structure (approx. 9mx15mx12m) will be set up on the test bed. It will cover the entire life cycle of a building, including planning, construction and deconstruction (cradle to cradle).</p> <p>The TARGET-X project includes a methodological assessment framework that evaluates the technical, economic, and social impact of 5G use cases. To ensure a comprehensive assessment of as many 5G use cases as possible, the framework can also be applied to projects funded by the TARGET-X cascaded funding initiative.</p>
<b>Scope</b>	<p>The integration of 5G networks and a spectrum of sensor technologies, notably Low Power Wide Area Networks (LPWAN), holds immense potential for the optimization of construction logistics. These technologies enable real-time data exchange and analysis, offering unprecedented insights into construction processes. By leveraging 5G's data rates and low latency, coupled with LPWAN sensors, construction sites can achieve enhanced tracking, monitoring, and resource allocation, leading to minimized delays, reduced waste, and increased productivity. However, addressing potential interferences and ensuring coexistence among these technologies is crucial. In sum, the synergy of 5G and multi-sensor systems promises more efficient, data-driven construction logistics that meet the demands of modern construction practices.</p>
<b>Objective</b>	<ul style="list-style-type: none"> <li>• Set up a stable cost-effective low-power network to cover large construction sites for energy monitoring, asset tracking, and material management indoors and outdoors.</li> <li>• Ensure secure end-to-end communication for monitoring operations and process sequences.</li> <li>• Leverage 5G's data rates and low latency along with LPWAN sensors to enhance tracking, monitoring, and resource allocation.</li> <li>• Provide tracking data through an open API for accessibility and analysis.</li> </ul> <p>Test setup and validation at the construction vertical's testbed in Aachen.</p>
<b>Description of the ideal candidate</b>	<p>An ideal candidate can provide a comprehensive low-power solution for asset tracking, including hardware and software. They should demonstrate a successful track record in the planning and setup of LPWAN, particularly in robust bi-directional data transfer to be integrated into the 5G network. Moreover, the candidate should prove their expertise in working with BIM models, deep understanding of IoT and digital twin concepts be able to test and verify the development within the vertical's test bed in Aachen.</p>



## Topic: 30\_Renewable energies for energy self-sufficient construction sites

<b>Summary</b>	<p>In the TARGET-X project, 5G is being introduced to the construction industry as a new standard for wireless communication. The resulting potentials are being explored in large-scale trials on the Reference Construction Site of the Center Construction Robotics in Aachen. For this purpose, a multi-material demonstrator structure (approx. 9mx15mx12m) will be set up on the test bed. It will cover the entire life cycle of a building, including planning, construction and deconstruction (cradle to cradle). The TARGET-X project includes a methodological assessment framework that evaluates the technical, economic, and social impact of 5G use cases. To ensure a comprehensive assessment of as many 5G use cases as possible, the framework can also be applied to projects funded by the TARGET-X cascaded funding initiative.</p>
<b>Scope</b>	<p>For the operation of critical infrastructure, machines, containers, etc. on construction sites, a reliable supply of electricity is necessary. Up to now, electricity has usually been produced by diesel generators. Their operation generates noise, causes emissions and consumes fuel. An alternative for ecological, sustainable and reliable power supply could be <b>mobile wind turbines or solar panels</b> with dedicated storage solutions.</p>
<b>Objective</b>	<ul style="list-style-type: none"> <li>• Development of a sustainable power supply concept for construction sites based on <b>mobile wind turbines or solar panels</b>.</li> <li>• Deployment of a test set-up on the Reference Construction Site in Aachen.</li> <li>• Assessment of the contribution to the overall energy demand of the construction site.</li> </ul> <p>Realtime monitoring of the set-up via 5G.</p>
<b>Description of the ideal candidate</b>	<p>A suitable applicant will have several years of experience in designing and implementing sustainable energy solutions. The applicant must be able to provide the system on the construction verticals' testbed in Aachen and visit for measurements and analysis of requirements.</p>

## Topic: 31\_Alternative Emergency power supply for critical 5G infrastructure

<b>Summary</b>	<p>In the TARGET-X project, 5G is being introduced to the construction industry as a new standard for wireless communication. The resulting potentials are being explored in large-scale trials on the Reference Construction Site of the Center Construction Robotics in Aachen. For this purpose, a multi-material demonstrator structure (approx. 9mx15mx12m) will be set up on the test bed. It will cover the entire life cycle of a building, including planning, construction and deconstruction (cradle to cradle).</p> <p>The TARGET-X project includes a methodological assessment framework that evaluates the technical, economic, and social impact of 5G use cases. To ensure a comprehensive assessment of as many 5G use cases as possible, the framework can also be applied to projects funded by the TARGET-X cascaded funding initiative.</p>
<b>Scope</b>	<p>For the operation of critical infrastructure, machines, containers, etc. on construction sites, a supply of electricity is necessary. Up to now, emergency electricity has usually been produced by diesel generators. Their operation generates noise, causes emissions and consumes fuel. An alternative for ecological, sustainable and reliable power supply could be e.g. hydrogen with dedicated storage solutions. Establishing a reliable and sustainable emergency power supply system for critical 5G infrastructure (e.g. 5G Antennas &amp; Server) using alternative technologies such as hydrogen is important to addresses critical issues related to network reliability, emergency preparedness, environmental sustainability, cost-efficiency, and overall resilience.</p>
<b>Objective</b>	<ul style="list-style-type: none"> <li>• Establish a reliable and sustainable emergency power supply system for critical infrastructure, e.g. 5G antennas and server using alternative technologies such as hydrogen technology.</li> <li>• Seamless integration of an emergency power supply such as hydrogen fuel cell technology into 5G antenna and server power supply systems.</li> <li>• Ensure uninterrupted network operation during power outages, emergencies, and natural disasters.</li> </ul> <p>Utilize back-up power as an energy storage solution for renewable energy integration.</p>
<b>Description of the ideal candidate</b>	<p>A suitable applicant will have several years of experience in designing and implementing alternative energy and storage solutions. The applicant must be able to provide the system on the construction verticals' testbed in Aachen and visit for measurements and analysis of requirements.</p>

## Topic: 32\_As-built information enhanced material passport

<b>Summary</b>	<p>In the TARGET-X project, 5G is being introduced to the construction industry as a new standard for wireless communication. The resulting potentials are being explored in large-scale trials on the Reference Construction Site of the Center Construction Robotics in Aachen. For this purpose, a multi-material demonstrator structure (approx. 9mx15mx12m) will be set up on the test bed. It will cover the entire life cycle of a building, including planning, construction and deconstruction (cradle to cradle).</p> <p>The TARGET-X project includes a methodological assessment framework that evaluates the technical, economic, and social impact of 5G use cases. To ensure a comprehensive assessment of as many 5G use cases as possible, the framework can also be applied to projects funded by the TARGET-X cascaded funding initiative.</p>
<b>Scope</b>	<p>The digital material passport was adopted at EU level as one of the means of meeting the current challenges in the construction industry. However, these models are often not yet very meaningful, as they seldom integrate real construction process data. Therefore, in many cases, simulated data or assumptions are used.</p> <p>The 5G-enabled real-time recording and tracking of construction processes along the value chain, and the feedback and storage in the digital material passport, could significantly improve these models and increase the reusability of building materials for circular construction.</p>
<b>Objective</b>	<p>Development of a material passport, enriched with as-built information:</p> <ul style="list-style-type: none"> <li>• Conceptualization of a meaningful, real digital twin for building components</li> <li>• Development of a suitable database for an updatable material passport</li> <li>• Use of 5G technologies to track the product while tracing product-related data</li> <li>• Feedback of as-built information into the database and live update of the material passport</li> <li>• Ensure robustness of the system for deployment on a construction site</li> </ul> <p>Deployment, test and validation of the developments on the construction vertical's testbed in Aachen.</p>
<b>Description of the ideal candidate</b>	<p>The ideal candidate should have proven experience in implementing digital material passports that track information from production to assembly of a product. The applicant must be able to provide the system on the construction verticals' testbed in Aachen and visit for measurements and analysis of requirements.</p>

## Topic: 33\_5G enabled site management beyond state-of-the-art BIM coordination

<b>Summary</b>	<p>In the TARGET-X project, 5G is being introduced to the construction industry as a new standard for wireless communication. The resulting potentials are being explored in large-scale trials on the Reference Construction Site of the Center Construction Robotics in Aachen. For this purpose, a multi-material demonstrator structure (approx. 9mx15mx12m) will be set up on the test bed. It will cover the entire life cycle of a building, including planning, construction and deconstruction (cradle to cradle).</p> <p>The TARGET-X project includes a methodological assessment framework that evaluates the technical, economic, and social impact of 5G use cases. To ensure a comprehensive assessment of as many 5G use cases as possible, the framework can also be applied to projects funded by the TARGET-X cascaded funding initiative.</p>
<b>Scope</b>	<p>The TARGET-X demonstrator has the potential to showcase the benefits of 5G technologies for efficient and data driven site management beyond state-of-the-art BIM coordination. A key focus is on the integration and use of 5G technology and wireless networks, which will allow construction operations to be monitored and coordinated in real time. Efficient collaboration and real-time synchronization of the construction progress and coordination of stakeholders on site by 5G enabled data transfer provided by the TARGET-X use cases, will enable continuous efficient work throughout the lifecycle of the built structure.</p>
<b>Objective</b>	<ul style="list-style-type: none"> <li>• Data based real-time update of construction progress monitoring and stakeholder collaboration.</li> <li>• 5G enabled data transfer to construction site management for real-time synchronization.</li> <li>• Data driven, real time update of onsite scheduling.</li> <li>• 5G enabled bi-directional information flow.</li> </ul> <p>Ensure reliable data transfer for improved decision making.</p>
<b>Description of the ideal candidate</b>	<p>The ideal candidate could be for example a planning office or construction company with inhouse construction management and controlling or a team of construction company with external management and controlling partners. A suitable applicant will have several years of experience in site management and be proficient in utilizing construction management software and tools for real-time data collection and analysis. The ideal candidate has the ability to integrate data-driven insights into scheduling processes for improved efficiency.</p> <p>The applicant must be able to provide the system on the construction verticals' testbed in Aachen and visit for measurements and analysis of requirements.</p>

## Topic: 34\_Automation or semi-automation of timber construction processes

<b>Summary</b>	<p>In the TARGET-X project, 5G is being introduced to the construction industry as a new standard for wireless communication. The resulting potentials are being explored in large-scale trials on the Reference Construction Site of the Center Construction Robotics in Aachen. For this purpose, a multi-material demonstrator structure (approx. 9mx15mx12m) will be set up on the test bed. It will cover the entire life cycle of a building, including planning, construction and deconstruction (cradle to cradle).</p> <p>The TARGET-X project includes a methodological assessment framework that evaluates the technical, economic, and social impact of 5G use cases. To ensure a comprehensive assessment of as many 5G use cases as possible, the framework can also be applied to projects funded by the TARGET-X cascaded funding initiative.</p>
<b>Scope</b>	<p>To combat major socio-economic challenges such as shortage of skilled workers or sustainability, construction industry must introduce major changes in digitalization and automation of construction processes.</p> <p>An autonomous large-scale assembly is one of the most complex tasks in this endeavor, due to extremely high number of interconnected industrial sectors. This topic focusses on (semi-)autonomous large-scale assembly of modular <b>timber-based</b> building systems and the determination of the potential in the given 5G network infrastructure as a communication backbone for the large-scale assembly projects.</p>
<b>Objective</b>	<ul style="list-style-type: none"> <li>• Prefabrication and onsite assembly of the <b>timber modules</b> (wall, slab, façade, roof modules) as part of a multi-material demonstrator structure (approx. 9mx15mx12m)</li> <li>• Adaption of characteristic construction processes and/or materials to fulfill C2C requirements and semi-/automated assembly and disassembly</li> <li>• Ensure access to coherent data flow from preproduction processes to onsite assembly</li> <li>• Incorporation of robotic assistant systems for modular timber construction</li> </ul> <p>Recording of process data, feedback and data exchange into the underlying BIM-model for C2C project assembly/ disassembly and documentation.</p>
<b>Description of the ideal candidate</b>	<p>The ideal applicant can be a single prefabricator or a team of technology enabler and prefabricator. Ideally, they can provide a (semi-) digitalized process chain, from planning to automated prefabrication and onsite assembly. Furthermore, the ideal candidate can proof expertise in large scale assembly projects. The ideal applicant aims to develop a fully or semi-autonomous platform/process within a provided 5G network infrastructure in the construction vertical's testbed in Aachen.</p>

## Topic: 35\_Automation or semi-automation steel construction processes

<b>Summary</b>	<p>In the TARGET-X project, 5G is being introduced to the construction industry as a new standard for wireless communication. The resulting potentials are being explored in large-scale trials on the Reference Construction Site of the Center Construction Robotics in Aachen. For this purpose, a multi-material demonstrator structure (approx. 9mx15mx12m) will be set up on the test bed. It will cover the entire life cycle of a building, including planning, construction and deconstruction (cradle to cradle). The TARGET-X project includes a methodological assessment framework that evaluates the technical, economic, and social impact of 5G use cases. To ensure a comprehensive assessment of as many 5G use cases as possible, the framework can also be applied to projects funded by the TARGET-X cascaded funding initiative.</p>
<b>Scope</b>	<p>To combat major socio-economic challenges such as shortage of skilled workers or sustainability, construction industry must introduce major changes in digitalization and automation of construction processes.</p> <p>An autonomous large-scale assembly is one of the most complex tasks in this endeavor, due to extremely high number of interconnected industrial sectors. This topic focusses on (semi-)autonomous large-scale assembly of modular <b>steel</b> building systems and the determination of the potential in the given 5G network infrastructure as a communication backbone for the large-scale assembly projects.</p>
<b>Objective</b>	<ul style="list-style-type: none"> <li>• Prefabrication and onsite assembly of <b>steel modules</b> (wall, slab, façade, modular stairs, roof) as part of a multi-material demonstrator structure (approx. 9mx15mx12m).</li> <li>• Adaption of characteristic construction processes and/or materials to fulfill C2C requirements and semi-/automated assembly and disassembly.</li> <li>• Ensure access to coherent data flow from preproduction processes to onsite assembly.</li> <li>• Incorporation of robotic assistant systems for modular steel construction.</li> </ul> <p>Recording of process data, feedback and data exchange into the underlying BIM-model for C2C project assembly/ disassembly and documentation.</p>
<b>Description of the ideal candidate</b>	<p>The ideal applicant can be a single <b>steel construction prefabricator</b> or a team of technology enabler and prefabricator. Ideally, they can provide a (semi-) digitalized process chain, from planning to automated prefabrication and onsite assembly. Furthermore, the ideal candidate can proof expertise in large scale assembly projects. The ideal applicant aims to develop a fully or semi-autonomous platform/process within a provided 5G network infrastructure in the construction vertical's testbed in Aachen.</p>

## Topic: 36\_Automation or semi-automation of handling processes for prefabricated concrete elements

<b>Summary</b>	<p>In the TARGET-X project, 5G is being introduced to the construction industry as a new standard for wireless communication. The resulting potentials are being explored in large-scale trials on the Reference Construction Site of the Center Construction Robotics in Aachen. For this purpose, a multi-material demonstrator structure (approx. 9mx15mx12m) will be set up on the test bed. It will cover the entire life cycle of a building, including planning, construction and deconstruction (cradle to cradle).</p> <p>The TARGET-X project includes a methodological assessment framework that evaluates the technical, economic, and social impact of 5G use cases. To ensure a comprehensive assessment of as many 5G use cases as possible, the framework can also be applied to projects funded by the TARGET-X cascaded funding initiative.</p>
<b>Scope</b>	<p>To combat major socio-economic challenges such as shortage of skilled workers or sustainability, construction industry must introduce major changes in digitalization and automation of construction processes.</p> <p>An autonomous large-scale assembly is one of the most complex tasks in this endeavor, due to extremely high number of interconnected industrial sectors. This topic focusses on (semi-) autonomous handling of <b>prefabricated concrete</b> building elements and the determination of the potential in the given 5G network infrastructure as a communication backbone for small, medium and large-scale assembly projects.</p>
<b>Objective</b>	<ul style="list-style-type: none"> <li>• Prefabrication and onsite assembly of <b>concrete</b> elements (e.g., wall, slab, façade, modular stairs, roof) as part of a multi-material demonstrator structure (approx. 9mx15mx12m).</li> <li>• Adaption of characteristic construction processes and/or materials for semi-/automated handling of building elements such as automated element recognition or placing.</li> <li>• Optimization of the building elements for automated handling and cradle-to-cradle requirements.</li> <li>• Evaluate data flow from preproduction processes to onsite assembly.</li> <li>• Incorporation of assistant systems for remote control.</li> </ul> <p>Recording of process data, feedback and data exchange for assembly/ disassembly and project documentation.</p>
<b>Description of the ideal candidate</b>	<p>The ideal applicant could be a single <b>concrete construction prefabricator</b> or a team of prefabricator and technology or construction service provider. Ideally, they can provide a (semi-) digitalized process chain, from planning to automated prefabrication and onsite assembly. Furthermore, the ideal candidate can proof expertise in large scale assembly projects. The ideal applicant aims to develop a fully or semi-autonomous platform/process within a provided 5G network infrastructure in the construction vertical's testbed in Aachen. The ideal applicant can implement design changes to the components and validate these.</p>



## Topic: 37\_5G enabled life cycle tracking of circular construction materials

<b>Summary</b>	<p>In the TARGET-X project, 5G is being introduced to the construction industry as a new standard for wireless communication. The resulting potentials are being explored in large-scale trials on the Reference Construction Site of the Center Construction Robotics in Aachen. For this purpose, a multi-material demonstrator structure (approx. 9mx15mx12m) will be set up on the test bed. It will cover the entire life cycle of a building, including planning, construction and deconstruction (cradle to cradle). The TARGET-X project includes a methodological assessment framework that evaluates the technical, economic, and social impact of 5G use cases. To ensure a comprehensive assessment of as many 5G use cases as possible, the framework can also be applied to projects funded by the TARGET-X cascaded funding initiative.</p>
<b>Scope</b>	<p>The integration of circular construction elements alongside 5G applications offers a potent combination for the construction industry. This synergy streamlines material sourcing, real-time communication between construction sites and material platforms / suppliers. Moreover, it results in a lowered environmental footprint and reduced costs due to the use of sustainable materials.</p> <p>Additionally, the integration of 5G promotes efficient collaboration, real-time lifecycle assessment, as it is accessible where the element is, how it has been assembled and how it can be disassembled, if it is available and what is the history of it.</p>
<b>Objective</b>	<ul style="list-style-type: none"> <li>• Integrate circular construction elements on a 5G construction site.</li> <li>• Consider automated construction and deconstruction methods for integrating elements e.g., facades in construction structure</li> <li>• Utilize 5G technology for real-time material sourcing, life cycle tracking and assessment, efficient collaboration, and environmental monitoring</li> <li>• Design and pre-construction of elements on a very detailed level in real construction projects</li> <li>• Provide the digital background of material information</li> </ul> <p>Test and evaluation of the development within the 5G network infrastructure in Aachen.</p>
<b>Description of the ideal candidate</b>	<p>An ideal candidate for integrating circular construction elements could be a single expert for circular economy or a team of technology provider and circular economy expert. He/She or they should have the know-how and the possibility to design and pre-construct the elements on a very detailed level in real construction projects and in providing digital background of material information to test within the 5G network infrastructure in Aachen. The applicant must be able to implement the solution on the Reference Construction Site in Aachen and should also be able to handle the assembly and commissioning of circular construction elements by themselves.</p>

## TECHNOLOGY EVOLUTION BEYOND 5G

### Topic: 38\_Auto-device onboarding

<b>Summary:</b>	The onboarding of 5G UEs consists of the device connectivity but also of the actual deployment and control of software running on the device. . This includes the initial customized software deployment, updates and control of services and applications. One example for the OS deployment could be a Debian deployment for Raspberry Pis. Examples for application configuration and control are VPN, VILLASnode GPS and others. A solution like network boot via PXE could be interesting.
<b>Scope:</b>	Implement methods to ease the onboarding of devices into private 5G networks. Typically, many manual steps need to be executed before a device is online and ready to use in the network. This challenge looks for methods to optimize the onboarding of new devices to a NW and demonstrates the methods in 1 of the available testbeds. This should include the onboarding from the side of connectivity as well as from a user software deployment perspective.
<b>Objective:</b>	The objective is to provide an easy-to-use framework for device provisioning and service control that goes beyond the connectivity management. The deployment should be simplified to the point where no manual configuration is needed before placing the UE in the field. The evaluation of a network boot like solution in public and private 5G networks should be part of this work.
<b>Description of the ideal candidate</b>	A company specialized in cloud infrastructure and software development or a university with a computer science and telecommunications interest

## Topic: 39\_Multiple device, automated and systematic network performance measurements tool

<b>Summary</b>	New and extended applications are leveraging of the benefits, new features and technologies from 5G NR. Those applications often have different traffic network requirements compared to the classical mobile broadband (MBB) approach in cellular communications. For instance, industrial applications usually have higher UL requirements compared to the DL oriented traffic in MBB. Other verticals also have applications with different network requirements coexisting under the same coverage area. As the variety of applications coexisting may scale up it is highly important to systematically study the performance of each coexisting application at the same time. Generally, the different coexisting traffic profiles may have different packet sizes, transmission bitrates, quality of service and time critical requirements, such as bounded latency or non-jitter applications. Therefore, there is a need for understanding and systematically study the network performance specially for those environments with mixed traffic profiles.
<b>Scope</b>	The intention is to onboard a third party capable of conducting systematic measurements with multiple 5G devices, different traffic profiles, collecting the necessary data and extract relevant key performance indicators (KPIs) to analyze the network behaviour for mixed traffic scenarios.
<b>Objectives</b>	A tool to systematically carry out 5G measurements in one of the TARGET-X testbeds with multiple devices and traffic profiles.
<b>Description of the ideal candidate</b>	<p>A third party bringing their own hardware and software capable of carrying out measurements in a 5G network with the following requirements:</p> <ul style="list-style-type: none"> <li>• Tests with different traffic profiles and multiple devices at the same time;</li> <li>• Collecting data of the experiments;</li> <li>• Extraction of relevant key performance indicators (KPIs). For instance, one-way throughput, round trip time, one-way latency, packet loss, jitter, etc.</li> </ul> <p>Add-on would be a study proposal related to the technology or verticals in TARGET-X with the potential for a conference or journal publication.</p>

## Topic: 40\_Applicability of mmWave for TARGET-X verticals

<b>Summary:</b>	Showing is believing! Following the motto, the challenge is to come up with the implementation of a use case that uses the benefits of the FR2 spectrum and that is not or not easy to realize with sub-6GHz spectrum. The 5G high bands (mmWave, also referred to as FR2) deliver large quantities of spectrum and capacity over the shortest distances. They also use massive MIMO to expand capacity and extend coverage. Moreover, they include wide spectrum segments available for 5G along with lower latencies. However, while capacity remains the primary driver for choosing the high band, coverage is also important for a broader business case. Today, highband coverage is limited by radio uplink signal quality and high-band propagation characteristics.
<b>Scope:</b>	Present use case proposal for mmWave application, preferably relevant to 1 of the 4 TARGET-X verticals. Create a working demonstrator of the presented use case.
<b>Objective:</b>	Some countries in the EU are starting to offer for mmWave / FR2 spectrum, dedicated to Non Public Networks. The availability of this spectrum brings new opportunities to the realization of use cases. Design and implement a use case that benefits specifically from the FR2 spectrum.
<b>Description of the ideal candidate</b>	An ideal candidate could be a company providing solutions to the verticals of TARGET-X, requiring wireless connectivity.  Another candidate profile could be research institutes with research areas covering the verticals of TARGET-X and with an interest to bring wireless 5G/6G connectivity to the next level.

## Topic: 41\_Indoor heatmapping

<b>Summary:</b>	App development for heatmapping of indoor 5G networks
<b>Scope:</b>	Develop an application that uses onboard sensor data, camera data, etc to correlate RSSI, RSRP values to a position within an <b>indoor</b> area. Output this data in a format for further online or offline use. Develop a novel method to perform these actions in an easier/more comfortable way by making smart use of smartphone SDKs and onboard sensors. In an ideal case, the outcome of the development activity, is an application that performs the correlation between 5G network measurements and an indoor position without any manual interaction.
<b>Objective:</b>	Application development on smartphone Heatmap visualization tool (on phone and on computer)
<b>Description of the ideal candidate</b>	The ideal candidate is a third party with good knowledge in app development, using the SDKs offered by the smartphone OSes to access available sensor, modem & camera data. Knowledge of 5G network architectures and relevant performance indicators, such as RSSI, RSRP is a pre-condition for applicants

## Topic: 42\_Access control for inter-AAS communication

<b>Summary:</b>	Thanks to standardized interface and language, AAS provides an interoperable communication at the factory floor. However, the access for certain data stored in the AAS should be restricted. For example, NW AAS stores relevant information about the 5G NPN (e.g., performance measurements), which should not be easily accessed by all device AAS instances. It is a challenging process to implement access control for devices, which is scalable. The requirements of security and other processes should be taken into consideration for controlling the device access in AAS layer.
<b>Scope:</b>	AAS provides standardized interface and language for establishing communication among AAS instances. However, there should be an access control mechanism to address the security and privacy issues. For example, the device or 5G UE AAS instances should not be able to access the low-level information (e.g., performance measurements) available in 5G NW AAS. Therefore, authenticating the AAS instances and controlling their access to other AAS instances (e.g., submodels) plays an important role in the overall management system.
<b>Objective:</b>	The main objective in this topic is to design and develop access control solutions for communication among AAS instances. The developed solution should consider the requirements regarding management operations and confidentiality.
<b>Description of the ideal candidate</b>	The candidate should have expertise in security and/or access control for IT/OT applications, combined with knowledge or a profound interest in AA for 5G-based industrial applications

## Topic: 43\_5G Watchdog system

<b>Summary:</b>	From the Core and RAN end, we always have instruments to continuously monitor and evaluate network parameters. But in many special deployments, it is also necessary/useful to record network parameters and KPIs from the UE side. This makes the process of network troubleshooting way easier.
<b>Scope:</b>	Continuous Network performance record and assessment for quickly benchmarking and evaluating network related KPIs. Useful for record the stability of the network and worthy for the period of evaluating the network after deployment.
<b>Objective:</b>	<p>The candidate should provide a CPE which can work with 5G SA mode. This CPE should:</p> <ol style="list-style-type: none"> <li>1. Also provide another network interface to be able to remote access to it even when the 5G network is not functioning.</li> <li>2. It should have an embedded processing unit, like small PC, to be able to run assessment test.</li> </ol> <p>The candidate should propose standard KPI evaluation through automated script where it stores results in a way to be easy to report and assess</p>
<b>Description of the ideal candidate</b>	The challenge addresses third-parties who have an affinity to 5G UE / module integration, combined with a vision to create solutions for automated network performance records.

## Topic: 44\_AAS based device integration enabler for private industrial 5G

<b>Summary</b>	<p>Integrating new industrial 5G applications depends a lot on a working 5G connection. The onboarding of new devices can be cumbersome. Manual steps and in case of problems the trouble shooting is challenging.</p> <p>The Asset Administration Shell allows to build a Digital Twin of network and UEs, as e.g. described in TARGET-X Deliverable 6.3, and allows the exchange of information between network and UE without an established 5G connection.</p>
<b>Scope</b>	<p>Device compatibility checks (are UE and network configured in a compatible way?), troubleshooting support (what is wrong and how to fix it)</p> <p>Using industrial 5G devices and private networks</p>
<b>Objectives</b>	<p>Implementation of a software that enables plug and play integration of 5G UEs into private industrial networks using Asset Administration Shells (AAS).</p> <p>Demonstrate the methods in 1 of the available testbeds.</p>
<b>Description of the ideal candidate</b>	<p>The ideal candidate has experience with the attachment and integration process of industrial 5G devices as well as a deep understanding of the concept of AAS.</p>

## ANNEX 2

# Information clause for personal data processing in the 2nd Open Call organized under TARGET-X Project

Grant Agreement No. 101096614

### CONTROLLER`S IDENTITY AND CONTACT DETAILS

The data controllers are all entities in the FundingBox capital group as the Joint Controllers. All FundingBox entities have agreed on common data processing purposes. In all matters regarding personal data, you can contact us using the following email address: [privacy@fundingbox.com](mailto:privacy@fundingbox.com).

The essence of the arrangement is available [here](#).

PURPOSES, LEGAL BASIS AND PROCESSING PERIOD		
The purpose and legitimate interest of processing	Legal basis for processing	Period
1) To run an Open Call and collect data necessary to evaluate applications submitted in the Open Call.	Legitimate interest of FundingBox (based on Art. 6.1.f) of GDPR) which is fulfilling the obligations and our other interests related to implementation of the Project.	6 years from the end of the year in which the Project ended.
2) To realize the Project goals described in the Grant Agreement (e.g. communication, reporting, collaborating with other project partners).		
3) To consider potential complaints.		
4) To gather feedback from applicants when the Open Call is over to improve processes.		
If an applicant has been selected to become the beneficiary of the project:		
5) To collect the applicant’s details and documentation necessary to verify its legal status. Data will be collected in separate form via FundingBox platform.	Processing is necessary for the performance of a contract (based on Art. 6.1.b) of GDPR).	

TARGET-X is Smart Networks and Services (SNS) project, co-funded by the EU Horizon Union Programme. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Commission. Neither the European Union nor the granting authority can be held responsible for them. The project is supported by the SNS JU and its members.



## DATA RECEIVERS

The Joint Controllers will transfer personal data only to trusted recipients such as IT service providers, accountants, law firms, postal and courier companies (who process personal data on the controllers' behalf).

Due to the fact that we use the services of Google LLC, your data may be transferred to the USA. We have concluded an agreement with those entities – the so-called Standard Contractual Clauses. This means that in accordance with the decision of the European Commission No. 2021/914 EU of June 4, 2021, your personal data may be processed by this company in the USA. More information about the decision at: <https://fundingbox.com/trust/transfer-outside-eea/>.

To realize the Project, data can be transferred also to Project Partners (complete list of the project partners is available at the email address: [privacy@fundingbox.com](mailto:privacy@fundingbox.com)) and European Commission.

## RIGHTS OF DATA SUBJECT

Due to the fact that we process your personal data, you have the right to:

- 1) request access to your personal data,
- 2) demand the rectification of your personal data,
- 3) request to remove or limit the processing of your personal data,
- 4) data portability,
- 5) complain with the supervisory authority ([https://edpb.europa.eu/about-edpb/about-edpb/members\\_en](https://edpb.europa.eu/about-edpb/about-edpb/members_en)).

You also have a right to object to processing of your personal data for all purposes indicated above (according to the Article 21 of GDPR).

## INFORMATION ABOUT VOLUNTARY OR OBLIGATORY DATA PROVISION

Providing data is voluntary, although it is necessary to participate in the Open Call. Without providing your data, it is not possible to contact you and evaluate the application.