FT07.08_2024 IoT Technologies

IoT-drevet forretningsdesign – digitalisering af virksomheder og samfund

Indledende oplysninger

Indsatsområde	IoT-drevet forretningsdesign – digitalisering af virksomheder og samfund
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Revisions

This is the first version of the activity description for 2024. It builds on and continues the activities and achieved results in 2023 where the activities were started.

Description

Objectives

In 2024 this activity will continue help the industry to adapt new technology in their IoT solutions, including Quality of Service based wireless communication technologies such as 5G, as described in the overall description for the overall Indsatsbeskrivelse 'IoT-drevet forretningsdesign – Digitalisering af virksomheder og samfund".

New IoT technologies will be brought to the market, while the interest in some of the existing technologies will disappear. This depends on how they fulfil the technical requirements from the use-cases with respect to response time, battery lifetime, reliability, security, data throughput, coverage, mobility, and commercial price level. Therefore, it is important that Dansh industry is aware of this development, so they can make the right selection based on technology capabilities and market requirements. To that end FORCE Technology will deliver services to the industry including demonstration projects, consultancy services on technological and regulatory requirements, an IoT technology radar and organising knowledge sharing and collaboration events. These services will be partly offered through the newly (2023) established Danish 5G Innovation Hub and Testbed which aims to strengthen the collaboration in the eco-system and enable easy access to 5G test networks of the mobile network service providers for companies developing IoT solutions.

The evolution of IoT and the ability to collect real-time sensor data has underpinned the recent development and application Digital Twins that couples digital models with their physical counterparts. Digital Twins can e.g. be used to show the status levels of a physical device, as support and optimization of a manufacturing process, to assist in preventive maintenance, or to simulate the future of a city (also known as CityVerse).The ability to use data collected by sensors and other IoT devices is an indispensable part of realising Digital Twin applications in order to ensure that the digital twins show an up-to-date representation of the physical counterpart and to establish the required feed-back loop between the physical reality and the digital model representation, either through physics based modelling or pure data driven models using AI and machine learning. The activity will establish a framework for coupling IoT data protocols and platforms to the standardisation effort on a reference architecture on Digital Twins developed in the performance contract "Fremtidens hybride testbeds" and for assisting Danish industry in adopting IoT technology in Digital Twin applications.

The goals of this activity plan are to:

- Finalize the development of a service that can help the Danish industry in selecting the most appropriate technology for use-cases, e.g. applications of robots and drones, requiring wireless communication technologies that support high demands to Quality of Service (QoS) and thereby reliability. These use-cases can be a mean to overcome the challenge that comes due to a reduced workforce as well as improve the level of digitization in the Danish industries and authorities. The developed service providing consultancy, collaboration, test facilities, training and sharing of latest technology developments will help the eco-system to overcome the technological, commercial, and regulatory barriers that until now have hindered commercial deployments of such use-cases.
- Finalize the development of a consultancy service based on the developed Technology Radar, a tool that includes the up-to-date knowledge about wireless communication technology and IoT solutions. The Technology Radar is a tool to assess the maturity of new and emerging technologies within IoT and hence their relevance for commercial IoT based products.

Content

The activity plan consists of several activities that support the achievement of the objectives above. These are:

1. **5G Innovation Hub and Testbed and IoT use-cases where QoS is critical**
   a. Finalize development of consulting and test services to Danish industry in the framework of the Danish 5G Innovation Hub and Testbed launched in 2023, enabling critical applications requiring highly reliable wireless communication technologies with guaranteed QoS. The 5G Innovation Hub and Testbed supports and underpins the required collaboration across the entire 5G eco-system needed to deploy commercially viable 5G-based use-cases in 2024, by facilitating solutions for the technological, regulatory, and commercial challenges.
   b. Develop and submit a funding application for the continued operation of the 5G Innovation Hub & Testbed in 2025 and beyond, to support the development of reliable and high-performance technologies which continues in the coming years and do not end with the launch of 5G 3GPP release 16 and Wi-Fi 6.
   c. Identify 2-3 use-cases that set requirements to reliable wireless communication to be successful, and from here identify which of the QoS enabled technologies that are most applicable, e.g. the newest standards within 5G and Wi-Fi that are about to be deployed. The activity will include development of an application for funding to build one or more demonstrators that require reliable wireless communications with strict demands to latency, reliability and bandwidth.
   d. Participate in key events, domestic and international, including Mobile World Congress in Barcelona, to gather and share the latest knowledge on relevant use-cases and global maturity within reliable wireless communications, in the framework of the Danish 5G Innovation Hub and Testbed. Expand and consolidate collaboration with both Danish and international partners.

2. **IoT Technology radar**
   a. In 2023, FORCE Technology developed a technology radar that provides a picture of the maturity of wireless communication technologies, communication protocols, IoT security, data platforms and HW. In 2024, the technology radar will be offered as part of a service to assess the maturity of new and emerging IoT technologies guiding companies on technology choice when developing and implementing new IoT solutions.
   b. The technology radar service and tool will be advertised by participating in different IoT and wireless communication events, meetings and through relevant networks like Nordic IoT Centre.

3. **IoT data protocols and platforms for Digital Twins and Internet of Skills**
   a. In 2023, the ambition was to build experience about Internet of Skills, remote collaboration in the digital space, and the use of IoT data in combination with Digital Twins in selected domains. In 2024, the goal is to create a generalized framework for application of real-time time-series IoT/sensor data with Digital Twin development and Internet of Skills that can be applied across domains and verticals. This work will be based on the defined reference model for Digital Twins

developed in FORCE Technology's performance contract on "Fremtidens hybride testbeds", combined with knowledge of IoT data protocols, platforms, analytics and data validation developed through this performance contract period.

The framework will provide the basis for a service offering to companies working with Digital Twin implementation and applicable to different use-cases, e.g. establishment of a hybrid testbed, Digital Twins applied to manufacturing lines, smart cities and structural health monitoring of critical infrastructure, e.g. bridges.

b. The acquired knowledge in point a. is planned to be made generally available via training sessions, consultancy services and via knowledge sharing networks like Nordic IoT Centre reaching out to both public and private stakeholders. The main focus of the services developed is on how to collect data from sensors and IoT devices, and how these data can be made generally available and integrated with Digital Twins in different domains.

c. Apply for additional funding to continue the work also in 2025.

4. **Cybersecurity**

a. The activities from 2023 will continue in 2024. This includes participation in relevant fora for the latest standards and directives within cybersecurity, such as NIS 2, the Cyberresilience Act and ETSI EN 303 645. In 2023, a Grand Solution application was submitted to Innovation Fund Denmark about Cybersecurity in OT in collaboration with AAU and other partners, but unfortunately it was rejected. In 2024, this application will be improved in collaboration with the project partners and then resubmitted to support Danish companies connecting their production environment to the digital infrastructure while ensuring data and OT systems security.

Stakeholders and collaboration partners

The Activity plan involves FORCE Technology's competencies within IoT, Connectivity, IoT Infrastructure, Cybersecurity and Digital Twins. Hereto comes collaboration with:

- The Danish 5G eco-system that have been gathered in FORCE Technology's Dansk 5G Innovation Hub & Testbed and involves both network equipment vendors, network operators, authorities, chip and module providers, product developers, public users and private industries, industry associations, innovation clusters and academia.
- Production companies that work with relevant use-cases within e.g. Industry 4.0
- IoT solution providers, including members of the Nordic IoT Centre
- Odense Robotics, Danish Technological Institute and Digital Lead
- Leading universities within IoT Technology, Cybersecurity, and reliable wireless communication technologies.

Synergies/Collaboration with other projects

As part of the activity plan, coordination is ensured with the following other efforts and projects, so that knowledge and services developed under these become available to the target group:

Performance Contracts (Resultatkontrakter):

- "Fremtidens hybride testbeds", FORCE Technology: about the use and validation of data from tests and from digital twins
- "Værdi igennem standarder og måleteknisk infrastruktur". This activity contributes with knowledge of the technical aspects of the European and international standardization that takes place within FORCE Technology's classic subject areas.
- "IoT-drevet forretningsdesign", FORCE Technology: Three other activities in the same performance contract as this activity. Collaboration on the AI aspect will take place across these three for knowledge sharing and development. The activities are: FT07.03, FT07.04 and FT07.05.
- "Digitale vandløsninger til den grønne omstilling", DHI (lead) and FORCE Technology: The activity contributes knowledge about IoT environmental sensors and IoT systems in harsh environments as well as knowledge on data spaces.

Other FoU projects

- The EDIH project AI-Boost, which is a large 3-year collaboration project in the Capital Region and Zealand Region, which aims to increase the quality of life for people in Greater Copenhagen and on Zealand by pushing out advanced digital technologies in the Danish SMEs. The focus is on creating an increased degree of digitization for companies working in the fields of life science, health tech and the built environment - "Healthy Living". The project has connections to other performance contract areas and is expected to contribute in particular with numerous knowledge dissemination activities, including workshops, webinars, test cases, etc.
- TEF AI-Matters: Artificial Intelligence Test and Experimental Facilities (TEF) for manufacturing innovation. The EU project contributes to increasing the resilience and flexibility of the European manufacturing sector through the dissemination of the latest developments in artificial intelligence, robotics, intelligent and autonomous systems.
- The Grand Solutions project CP-Sense in regard to Digital Twins
- The Grand Solutions project GreenCOM - Innovation solutions for next generation of Green COMmunications infrastructure

Advisory Board

The activity plan has been shared by email with Advisory Board on November 28, 2023.

Knowledge dissimination

The achievements from this activity plan will be continuously shared, e.g. in newsletter, presentation at conferences/events, and via Nordic IoT Centre (nordiciot.dk), IoT & Wirelessklubben, Dansk 5G Innovation Hub & Testbed, and global collaborations like AIOTI. The specific activities for knowledge sharing will be described in FT07.09_2024 Videnspredning og økosystem.