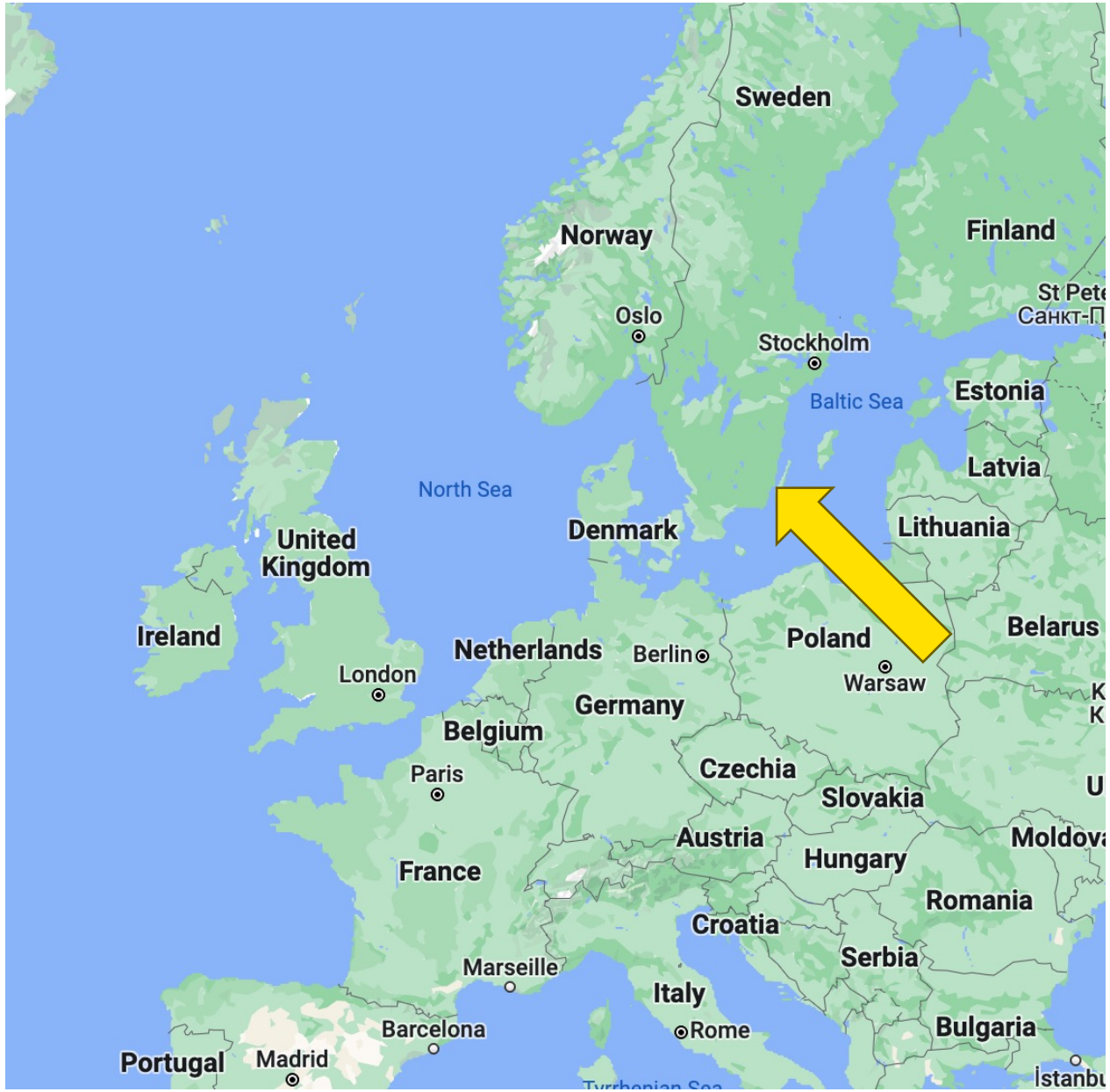
Sweden
Norway
Finland
Oslo
Stockholm
Baltic Sea
Estonia
Latvia
North Sea
Lithuania
Denmark
United Kingdom
Belarus
Ireland
Netherlands
Berlin
Poland
London
Warsaw
Germany
Belgium
Paris
Czechia
Slovakia
Austria
Hungary
France
Romania
Croatia
Serbia
Marseille
Italy
Barcelona
Rome
Bulgaria
Portugal
Madrid

Boosting awareness of the possibilities of the Internet of Things (IoT) and developing innovative ideas and products among small and medium-sized enterprises (SMEs) in the Linnaeus Region.

IoT-lab 2.0

Fredrik Ahlgren, Senior Lecturer
Linnaeus University

Region Kalmar län · Linnéuniversitetet · Kalmar Energi · WEXNET · Region Kronoberg · Europeiska unionen, Europeiska regionala utvecklingsfonden

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Neda Maleki
Forskare

Arslan Musaddiq
Forskare

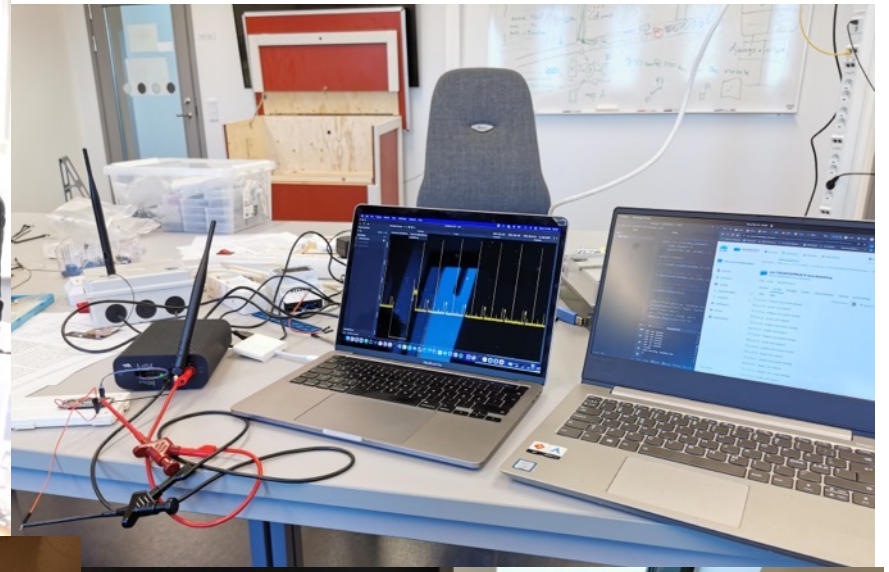
Martin Holmberg
Forskare/Professor

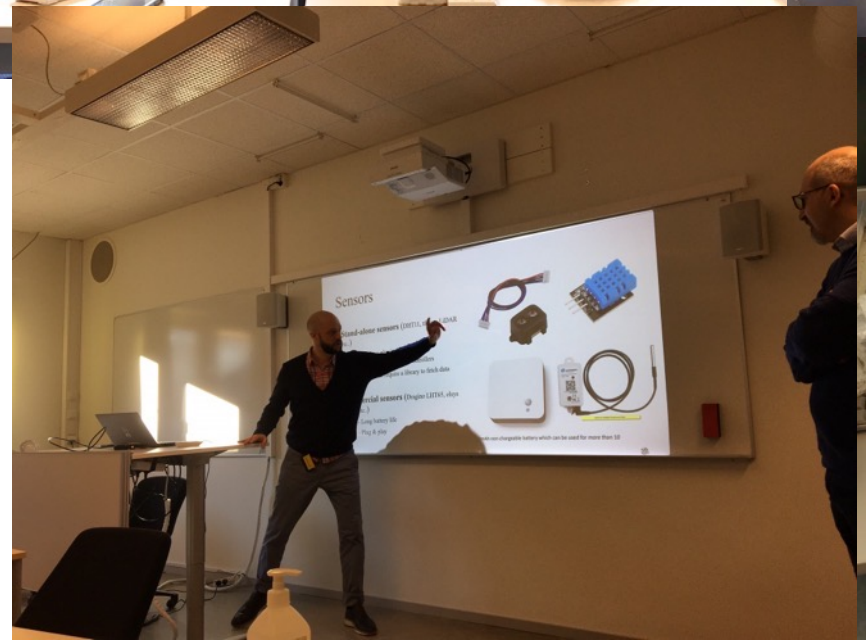
Johan Leitet
Adjunkt

Workshops

Workshop 22

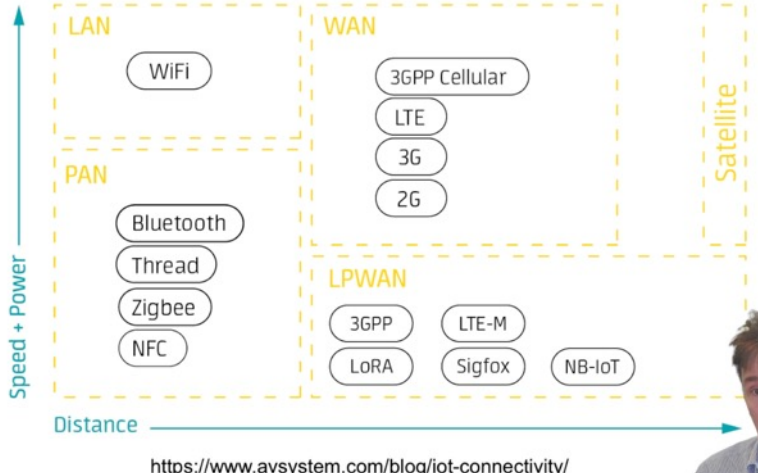
Name	Aktivitet
Workshop för SME - Växjö	Workshop
Workshop för SME - Växjö	Workshop
Workshop för SME - Växjö	Workshop
Workshop för SME - Kalmar	Workshop
Workshop för SME - Kalmar	Workshop
Workshop för SME - Kalmar	Workshop
Workshop för SME - Kalmar	Workshop
Workshop för SME - Växjö	Workshop
Workshop efter IoT-tech day VXO	Workshop
Workshop efter IoT-tech day KMA	Workshop
Svenska våg Workshop	Workshop
Mar 8th - Wexnet	Workshop
Mar 1st - Vöfab	Workshop
Mar 2nd - Vöfab	Workshop
Feb 7th - Holtab AB	Workshop
Jan 20th - Holtab AB	Workshop
Workshop DIGDAG skolsamverkan	Workshop
QTF - Workshop 28 feb	Workshop
QTF - Workshop 31 mar	Workshop
QTF - Workshop 21 mar	Workshop
Aquateq - Workshop	Workshop
Honestbox - Workshop	Workshop





Inspiration lectures

Lindås - Emmaboda inspirationsföreläs	Inspirationsföreläsning
Föreläsning IoT Campus Ljungby	Inspirationsföreläsning
Föreläsning för IUC, online	Inspirationsföreläsning
Möte med näringslivsrådet	Inspirationsföreläsning
Presentation Samhällsbyggnadsförval	Inspirationsföreläsning
Forum för lokalförsörjning. Föreläsn.	Inspirationsföreläsning
Linneakademins sammankomst	Inspirationsföreläsning
Frukostmöte Mönsterås kl 09	Inspirationsföreläsning
Frukostföreläsning Emmaboda	Inspirationsföreläsning
Gröna näringen OPEN	Inspirationsföreläsning
Frukostmöte Södermöre	Inspirationsföreläsning
IoT-lunch TietoEvry Svensknabben	Inspirationsföreläsning
Föreläsning senioruniversitetet	Inspirationsföreläsning
Rotary	Inspirationsföreläsning
Vatten och IoT, Markaryd	Inspirationsföreläsning
Föreningen Företagarna Öland	Inspirationsföreläsning
Smarta sensornät fastighet	Inspirationsföreläsning
Hack för hopp och hälsa, eHealtharena, S	Inspirationsföreläsning
Digitala veckan Kalmar, Kronoberg	Inspirationsföreläsning
e-health arena, digitalt Västervik	Inspirationsföreläsning
Kalmar Science Park, digitala affärer	Inspirationsföreläsning
Kalmarsundsveckan	Inspirationsföreläsning
Markaryd, invigning föreläsning	Inspirationsföreläsning
Digital idag, Lunchseminarium, vatten	Inspirationsföreläsning
Ehälsoinstitiutet, föreläsning	Inspirationsföreläsning
Linné Live, ett öppet universitet	Inspirationsföreläsning



Pilot cases Framework

- 6 months per project cycle
- Collaboration with 4 companies

Project Drive

- Company-led initiatives

Technical Collaboration Days

- Mondays, Tuesdays, and Fridays
- Team: David, Neda, Arslan, Fredrik, Tobias

Business Model Focus

- Experts: John & Katarina



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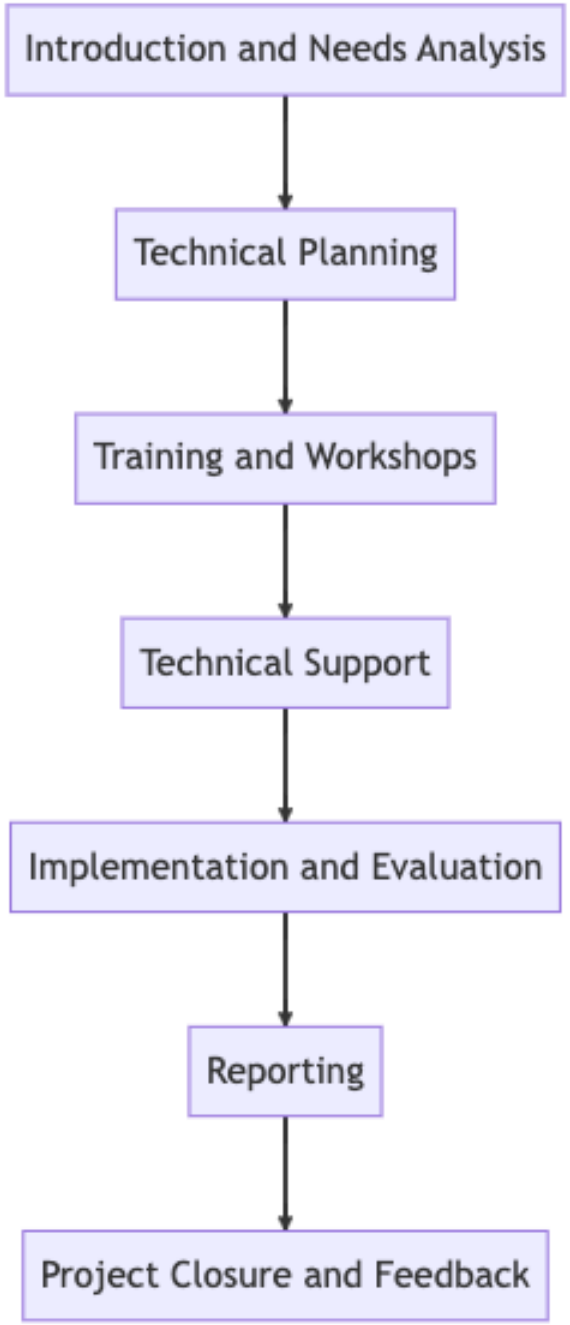
Process

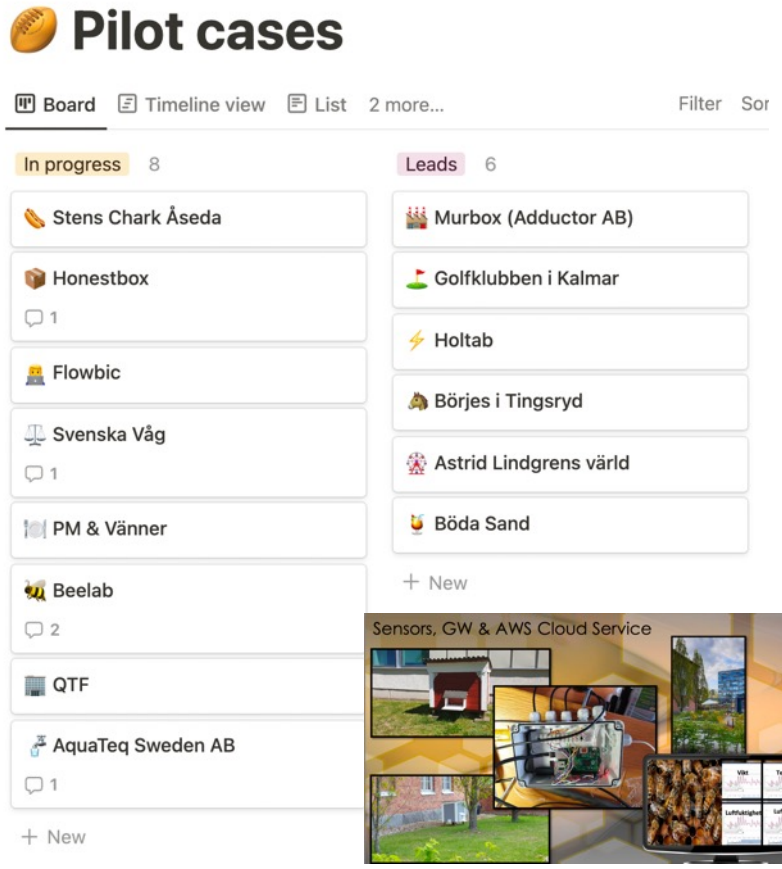
In the project, companies undergo a stepwise process that includes needs analysis, technical planning, participation in trainings and workshops, collaboration with a lab engineer, implementation and evaluation of IoT solutions, and reporting.
These steps are concluded with a project closure where companies share results and experiences and discuss future collaborations.

Simply put: You drive the project – we support.



Pilot cases 2022

- Kalmar Dämme – Institutionen för Biologi och Miljö
  - Flowbic
- Uppkopplade bikupor, Beelab
- PM & Vänner, matsvinn
- QTF, filter och övervakning VVS
- Honestbox – obemannade butiker
- Aquateq – tryckmätning dysor, spolning
- Sensorer i charkuteri, Stens Chark Åseda
- Uppkopplade vågar, Svenska våg
- Böda Sand, Öland
- Murbox, Adductor AB
- PBS Solution, vattenrening
- Uppkopplat miljöhus, ”spelifierat”



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- Food waste (PM & Vänner and Stens Chark)
- Transportation and accessibility (unmanned stores and QTF)
- Water measurement and environmental monitoring (Dam)
- Efficiency improvement (QTF, Svenska Våg, Böda Sand)
- Biodiversity (Beelab)
- Improved recycling behaviors (environmental housing)
- Water purification in the developing world (Pure Bio Synergy)

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Enablers

- Networks that today can send data with very low power consumption over longer distances. LPWAN.
- Better batteries, especially cheaper.
- Hardware (microcomputers) that has become smaller, more powerful, and also, especially cheaper.
- Software that has become more accessible and easier.

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Department of Computer Science and Media Technology

Svenska Våg AB

Pilotcase Svenska Våg AB: Introduction

Background

Svenska Våg AB is one of the main manufacturers and suppliers of weighing machines in Sweden.
Sometimes customers need weighing at stations and places that are remote. They can be in hard-to-reach environments or places that have no access to the Internet at all.

Problem Definition

The customer wants to be able to weigh and have the opportunity to see the weight value without having to be physically present at the weighing instrument.

Motivation

Customers can check and update themselves on how much content is left in the container remotely. In a simple way, monitoring the weight, e.g., via a smartphone, is a convenient solution.

RAK7431 connected to the scale with a blue pair of wires

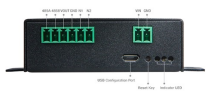
RAK7431 sending data to TTN and then to Datacake for visualization

Proposed Approach

The Applied IoT Lab developed a long-range communication mechanism using LPWAN RS485 bridge. The current setup consists of multiple types of load cells where all the cells use one common communication channel, i.e., Modbus RS485-based protocol.
The proposed solution uses the Modbus LoRaWAN bridge, and the approach of using RS485 instead of TCP/IP is to remove the access point dependency.

RAK7431

RAK7431 peripheral connectors



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Kalmar Dämme

Pilotcase Kalmar Dämme: Introduction

Purpose of Establishment

The wetland Kalmar Dam was artificially created near the Kalmar airport to remove nitrogen from the water used to de-ice the runways.

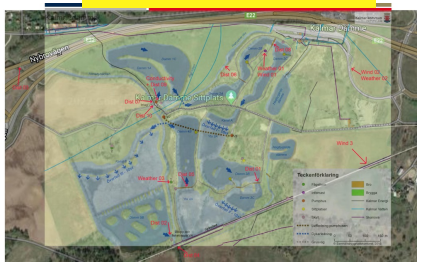
Problem Definition

Wetlands are subject to damages and destruction, for example, flooding or seawater influx. Collecting information and live data to preserve and conserve the wetland for optimal decision-making is essential.
Thus, in Kalmar Dämme, there is a requirement for different measurements, for example, water level, weather conditions, wind direction, oxygen, carbon dioxide, and water conductivity.

Motivation

The measurements at Dämme used to be performed manually on-site. This pilotcase aims to automate data measurement and processing by implementing an IoT-based monitoring system.

Kalmar Dämme map



Conductivity sensor at Dämme

Weather and wind station at the Dämme

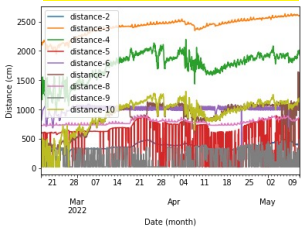
Proposed Approach

Linneause University together with the company Flowbic AB, installed number of sensors at the Dämme. Applied IoT lab proposed Helium network-based IoT communication infrastructure.

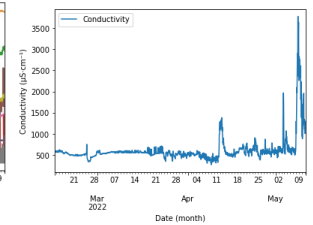
Helium network layerd architecture

Blockchain
Helium Network Server / OUI
Helium Hotspots
IoT Sensors

Distance sensors data

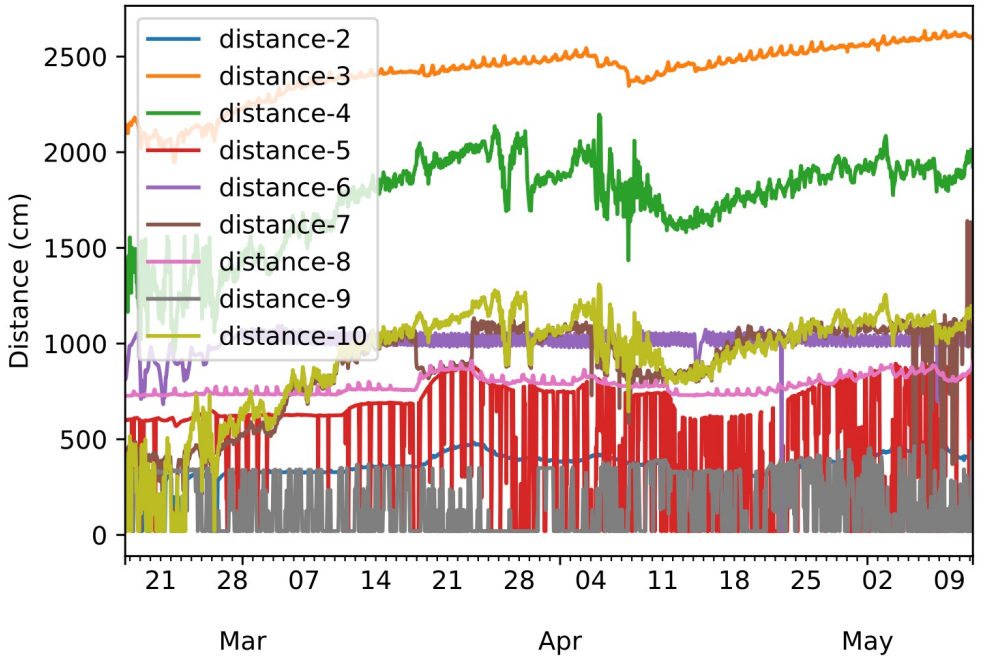


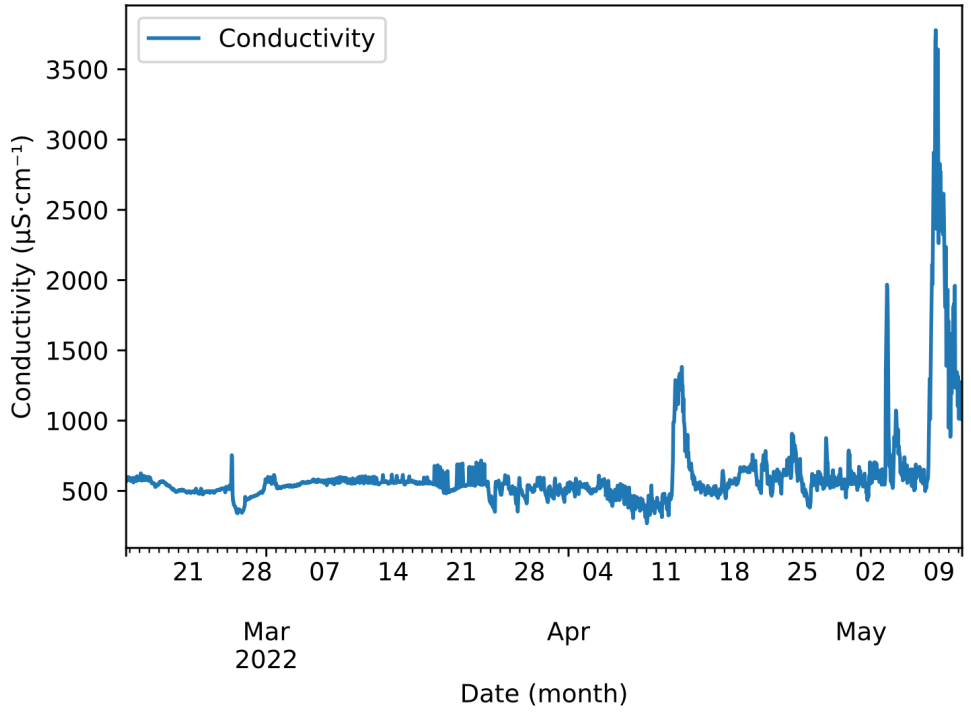
Conductivity sensor data



(a) Conductivity sensor (DL-CTD10)

(b) Distance sensor (LDDS75)





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AquaTeq Sweden AB

◈ Pilotcase AquaTeq Sweden AB: Introduction

Background

AquaTeq Sweden AB started in 1986 to develop cleaning nozzles for the sewage system. When maintaining sewage and stormwater systems, it is a great advantage to know the conditions in and around the nozzle or equipment that unplugs it using high-pressure water.

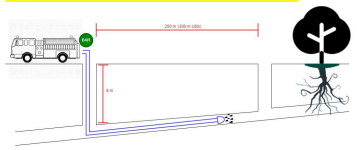
Problem Definition

Monitoring the operating condition where the target is a 100mm diameter and up to 150m long pipe located approximately 10m underground is challenging. There is a need to integrate sensors into the nozzles.

Motivation

Each flushing nozzle consumes liters of water per minute. Similarly, operators are not immediately aware of potential obstacles such as tree roots and continuously feeding the hose, resulting in a waste of time. At the same time, we can reduce diesel consumption if we know the water pressure. An average cleaning truck consumes 25-50 liters of diesel per

Experiment overview



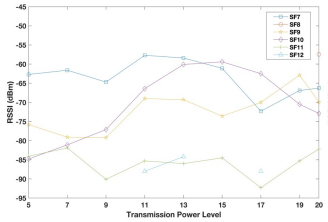
Cleaning nozzles

Cleaning

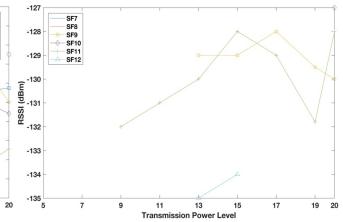
Proposed Approach and Results

The Applied IoT Lab proposes to initiate the project with Fipy development board with LoRaWAN and NB-IoT technology.

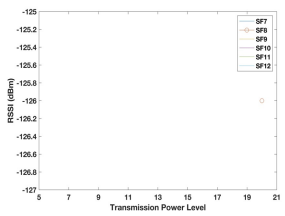
RSSI at 5 meters



RSSI at 10 meters



RSSI at 15 meters



During the experiment, NB-IoT and 433 MHz LoRa failed. These are the results of 868 MHz LoRa
communication using different spreading factors with different transmission power levels.

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QTF Sweden AB

◈ Pilotcase QTF Sweden AB: Introduction

Background

QTF Sweden AB works to ensure that all plumbing systems have system fluid that allows the systems to work energy efficiently, without malfunctions, and without rusting.
The company works to identify the status of system fluid, for example, oxygen, pH, pressure, and conductivity level of fluid.

Problem Definition

The company monitors the fluid system at the facilities, which might be located 30-50 km away from the head office in Kalmar city.
The company aims to have a mechanism that monitors the fluid systems and transmits the information wirelessly.

Motivation

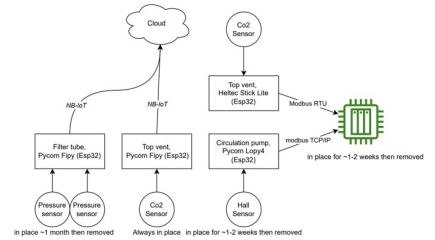
Monitoring the fluid systems wirelessly and remotely, geographically independent of where the facility is located, can help to save time and cost. Similarly, it also brings great customer benefit by indicating and preventing malfunction before there is a breakdown in the system.

Tube used for filtering heating system liquid

Proposed Approach

- **The Applied IoT Lab proposes using a Pycom Fipy and a sensor fit for each stage.**
- **In the first stage, i.e., when monitoring deviations in the magnetic field, the data is sent from the Fipy to the PLC using Modbus TCP/IP.**
- **Data will be transmitted to a remote server using NB-IoT in the remaining two stages.**
- **The proposed solution introduces flexibility in terms of mobility.**

Proposed architecture for QTF system



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Beelab

Pilotcase Beelab: Introduction

Background

Beelab Technology Sweden AB develops and manufactures products and services for digitally connected beehives. The objective of Beelab is to introduce eco-friendly communication technology to monitor the bees population and honey production. A sustainable digital beekeeping solution is expected to offer better beehives observation and monitoring system.

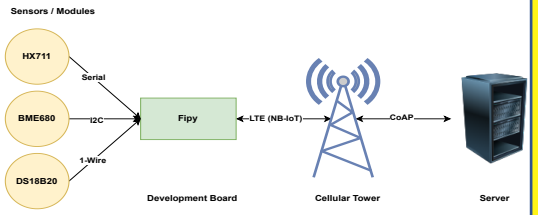
Technologies and Protocols

- CAT-M1 and NB-IoT LTE: CAT-M1 and Narrowband IoT (NB-IoT) use a simplified version of 4G mobile communication standard. LTE CAT-M1 offers better coverage than 4G in, for example, indoor environments and remote locations.
- Constrained Application Protocol (CoAP): CoAP is an internet application protocol mainly used on low-power devices that only transmits a few bytes each time. It is built on top of UDP but comes with optional reliability.
- I2C: I2C stands for Inter-Integrated Circuit and is a multi-master multi-slave communication protocol. Multiple slaves can be connected to a single master (like SPI), and multiple masters can control one or multiple slaves.
- OneWire: OneWire is a device communications bus system that provides low-speed (16.3 kbit/s) data, signaling, and power over a single conductor.

Proposed Prototype

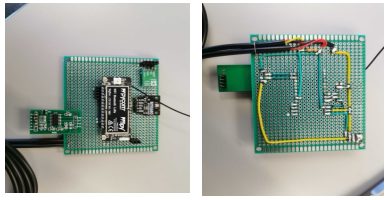
The final prototype is a circuit with a Fipy on board, two DS18B20 sensors connected to the same bus with a 470 Ω resistor, one HX711 load cell amplifier, one BME680 for air quality and conditions measurements, and an S7V8F3 step-down regulator to feed constant 3.3V to the circuit.

Architecture



The prototype has pulses of 185mA for 14 seconds every 15 minutes.

Final prototype



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PM & Vänner

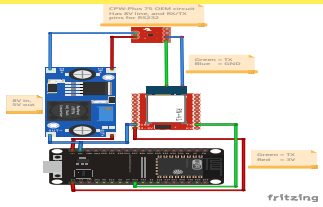
Pilotcase PM & Vänner: Problem and Objectives

- PM & Vänner AB is a hotel and restaurant group in Växjö, Sweden.
- Food waste is a major problem that has environmental and sustainability impacts.
- To gamify the process of documenting food waste in small to medium-large restaurant kitchens.
- Investigate the built-in communication interfaces of the scale.
- Explore ways to transmit weigh-values and combine them with labels.

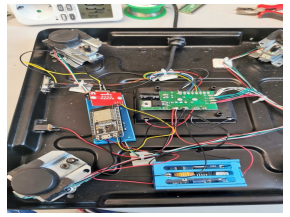
Proposed Prototype

An OEM circuit of the scale, one ESP32, one RS-232-to-TTL circuit, and one step-downconverter.

Circuit diagram of the prototype



Designed prototype



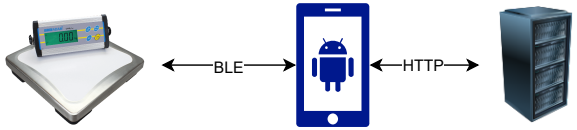
Web Application

Using BLE on the device allows users to pair their device with the ESP32 inside the scale.

Landing page

Scanning for BLE devices

Proposed Architecture



RS-232 enabled scale(s)
With Esp32 built in

Any Android (or PC)
Provides UI and Dashboards

Server

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Department of Computer Science and Media Technology

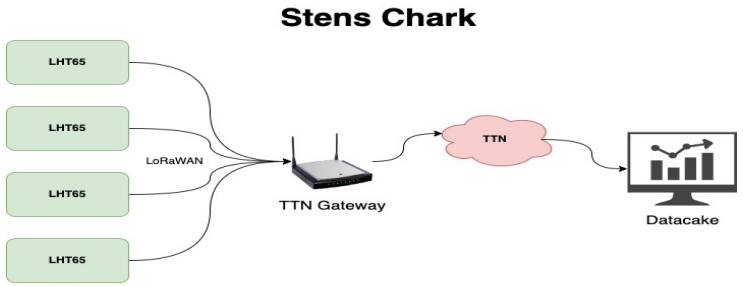
Stens Chark Åseda

Pilotcase Stens Chark Åseda: Problem Definition

Stens Chark is a company in Åseda that produces meat-based products. The aim is to automatically measure temperature and humidity inside the factory.

Proposed Architecture

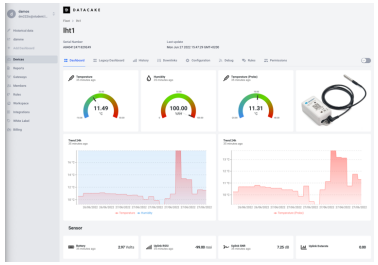
The Applied IoT Lab proposed one LoRa gateway, four LoRa-enabled temperature and humidity sensors, and a configured visualisation platform Datacake.



Sensor and Software

LHT65 Humidity and Tempeature Sensor.

Datacake Visulization.



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Eventcenter

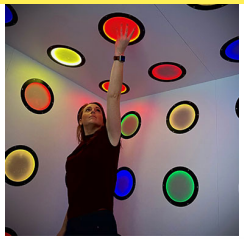
Pilotcase Eventcenter: Introduction

Eventcenter's Challenge concept features ten game rooms referred to as Action rooms. In some of these rooms, IR technology sensors are utilized, but there have been issues with their unreliability in the Twister room.

Eventcenter System

- Approximately 100 sensors are positioned on the walls, ceiling, and floor and are meant to respond to a hand or foot placed against the clear and frosted Plexiglas plates, but not to the Plexiglas itself.
- The current sensors are not deemed reliable enough, and the aim is to improve their functionality either through alternative sensors or another altered setup.

Eventcenter game room

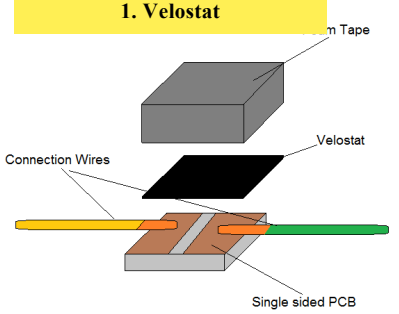


Proposed Solutions

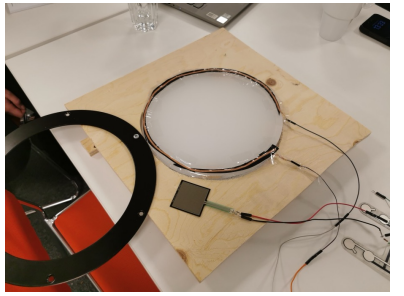
1. Velostat is a pressure-sensitive material that changes its electrical resistance when subjected to pressure. In this scenario, velostat could be used as a replacement for the IR sensors in the Twister room. The velostat material would be placed behind the clear and frosted Plexiglas plates and would detect changes in electrical resistance caused by a hand or foot being pressed against the plates. The role of the velostat is to shorten two conductive surfaces and can be set up in several ways. The first image (1.Velostat) shows how velostat can short the left and right sides of the PCB if pressure is applied to the foam tape.

2. Another way to do this is to place a conductive wire (copper etc..) on each side of the velostat film, as shown in the second image.

1. Velostat



2. Conductive wire



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Department of Computer Science and Media Technology

Smart Rollator

Pilotcase Smart Rollator: Introduction

Background

A smart rollator is a device that is designed to assist sick and old individuals with mobility issues by providing balance and stability as they walk. These devices can be incorporated a range of sensors and technologies to help improve mobility and prevent falls, such as GPS sensors and accelerometers.

Objectives

The objective is to install an accelerometer sensor to know whether the rollator is in use or not. Using the GPS sensor to identify the location and travelled distance of the rollator and transmit this data to a remote server such as MQTT for visualization

Hardwares

1. **M5Stack: M5Stack is a modular, stackable development platform that is based on the ESP32 microcontroller.**
2. **GPS Sensor: GPS is an M5Stack Unit that integrates an AT6558 navigation chip and a MAX2659 amplification chip which is used for amplifying the antenna signal**
3. **Accelerometer: An electromechanical device that will measure acceleration forces.**

M5Stack

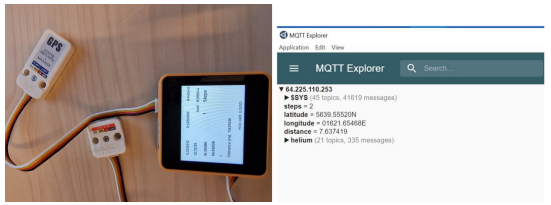
GPS Sensor

Accelerometer

Prototype

Rollator with M5stack prototype

M5Stack and MQTT broker



Linnæus University

Applied IoT Lab
Department of Computer Science and Media Technology

Adductor AB

Pilotcase Adductor AB: Introduction

Background

Adductor AB is a company based in Växjö, Sweden, that specializes in the development of hardware systems for industrial applications. One of the company's flagship products is MUR-Box, a hardware system designed to monitor the uptime of industrial systems.

Objective

Adductor AB is looking to expand its product offerings by exploring the use of wireless technology for industrial system monitoring

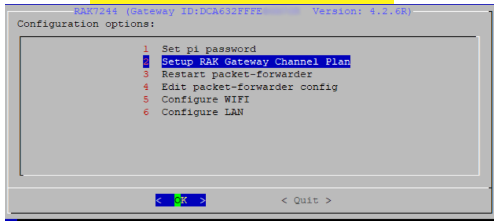
Proposed Solution and Implementation

When it comes to communication technologies and protocols, there are a number of options available for industrial systems. The Applied IoT Lab proposed the use of LoRaWAN networking protocol to connect and transmit data.

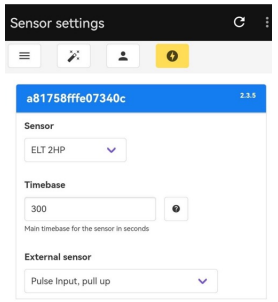
During the implementation process, the following different components are configured.

- **WisGate Developer D4 / D4+ / D4P (RAK7244C):** To configure the WisGate, the SD-card is flashed with the latest firmware by following the WisGate Developer Gateway Firmware Setup guide. In the configuration phase, under RAK Gateway Channel Plan, ChirpStack is selected.
- **ELT-2, LoRaWAN wireless sensor:** ELT-2 is utilized by enabling its pulse-count functionality, allowing it to detect signals through two channels. Two switches are connected to the sensor, The sensor samples the input pins and counts the number of times the circuit is closed.
- **Code-base in C#:** The code base for this project utilizes the ChirpStack REST API.

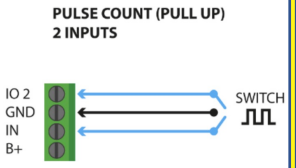
Wisgate configuration



Sensor settings



Two switches connected to ELT-2



Applied IoT Lab
Department of Computer Science and Media Technology

TiVA AB

Pilotcase TiVA AB: Introduction

Background

TiVA is an innovation company that develops cutting-edge technical products linked to water and environmental monitoring.

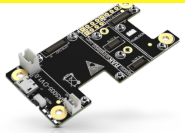
Objective

The objective of this project is to develop a battery-powered remotely connected sensor that can measure the water level in lakes and waterways. The result must be presented on a web page and the data must be able to be processed and automatically sent to SMHI to be integrated into their water web.

Proposed Solution and Implementation

Hardwares

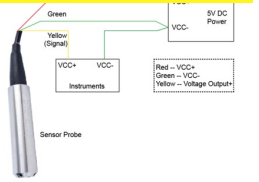
RAK5005-O WisBlock Base



RAK4630 WisDuo LPWAN Module

BMP280

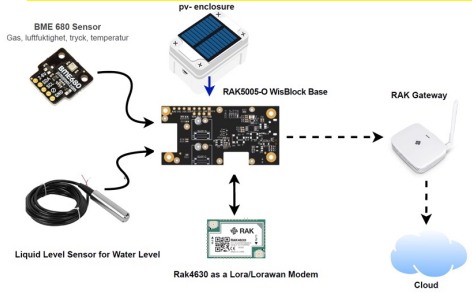
Seeed Sensor for Liquid Level Monitoring



Implementation

- **The RAK5005-O WisBlock Base is a low-power, wireless, and modular solution for IoT applications, making it an ideal platform for TiVA's water and environmental monitoring products.**
- **The Base provides the necessary connectivity options for data collection and processing, including support for WiFi, Bluetooth, and LoRaWAN communication protocols.**
- **The water level sensor from Seeed is used to monitor the water level in rivers, lakes, and other bodies of water, and the BMP280 sensor is used to measure atmospheric pressure and temperature.**
- **These sensors provide valuable data about the environment, which is analyzed data for Tiva by using RAK5005-O WisBlock Base to provide real-time insights into the water and atmospheric conditions.**

Architecture implementation and prototype



Applied IoT Lab
Department of Computer Science and Media Technology

JobOut

Pilotcase JobOut: Introduction

Background

JobOut is one of Burde's brands that offers various forms of products that will contribute to better ergonomics and variety in workplaces.

Objective

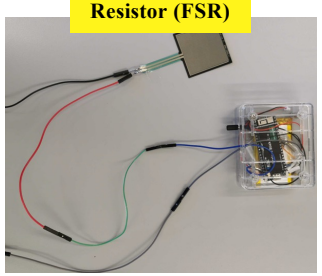
JobOut has a challenge to get users to become more motivated to use their products. It is believed that individuals and organizations can be motivated to achieve better results in their use by using sensors to measure how people vary their way of working. The goal is to learn about the different possibilities of carrying out measurements with the products.

Proposed Solution and Implementation

The Applied IoT Lab proposed the following three possible solutions:

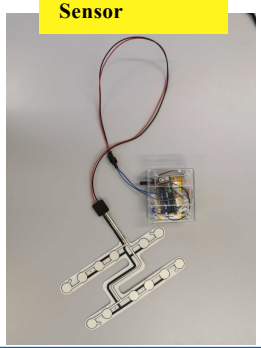
1. **Force Sensitive Resistor (FSR):** An FSR (Force Sensitive Resistor) sensor works as a touch sensor by detecting changes in resistance due to pressure applied to its surface. The sensor consists of a conductive material, typically carbon mounted on a flexible substrate. When pressure is applied to the surface of the sensor, the conductive material compresses, and the resistance between the two conductive layers changes.
2. **Velostat:** Velostat is a type of conductive polymer that is commonly used as a touch sensor. It works by detecting changes in electrical resistance when pressure is applied to its surface. The material is made of a thin layer of conductive material, typically copper, that is coated onto a flexible plastic substrate. When pressure is applied to the Velostat, the electrical resistance of the copper layer changes, causing a change in voltage that can be measured and interpreted as a touch.
3. **Pressure Sensor:** The auto seat sensor is a membrane touch point sensor commonly used in car se seat is empty or not. It works similarly to the previously discussed sensors.

Force Sensitive Resistor (FSR)



Velost at

Pressure Sensor



Linnæus University
Applied IoT Lab
Department of Computer Science and Media Technology

Böda Sand Beach Resort AB

◈ Pilotcase Böda Sand: Introduction

Background

Böda Sand Beach Resort AB is a business located in the north of Öland by the Böda bay. The resort consist of 1,350 campsites and 125 cabins with pool, spa, sauna, restaurants, and pub.

Objective

Every summer number of people visit the site and the objective of this project is to find a way to automate the process of counting visitors. Similarly, the site also requires to measure the weather conditions.

Proposed Solution and Implementation

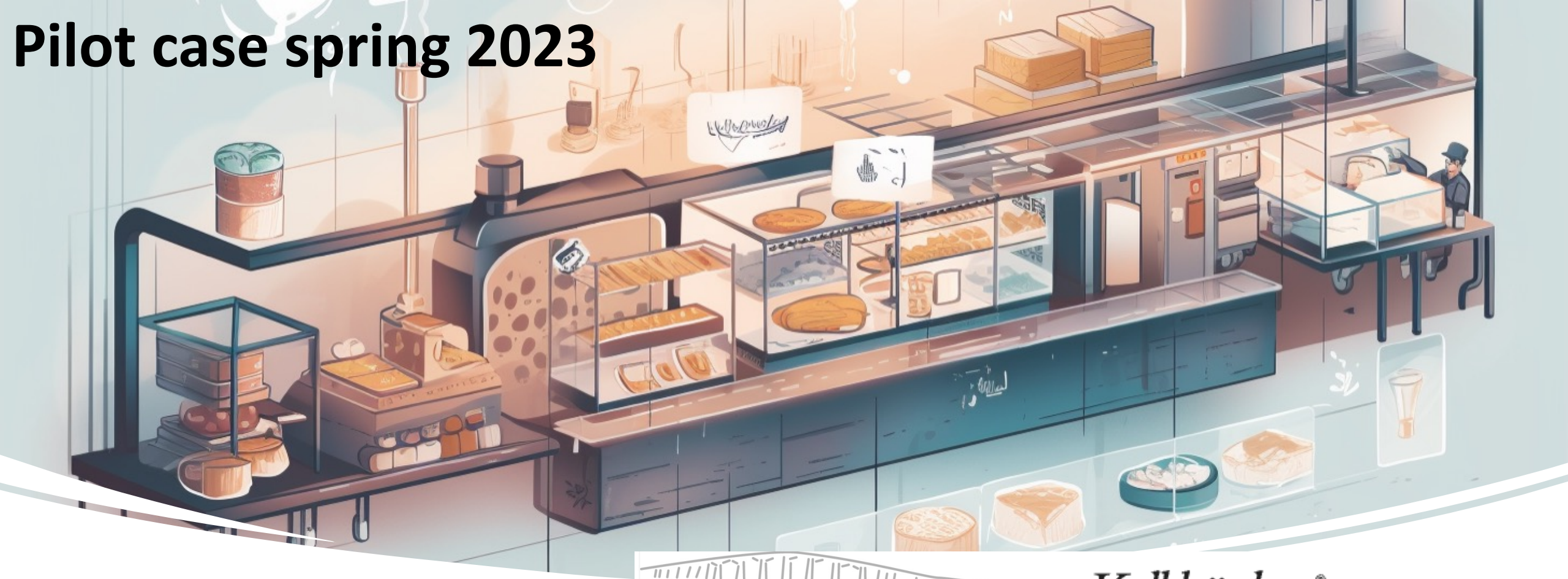
- **Kalmar Energi successfully established a LoRaWAN coverage in Böda Sand and installed LoRaWAN devices of Böda Sand in the field.**
- **The entire process resulted in providing LoRaWAN coverage, connecting the devices to Kalmar Energi LoRaWAN network and transmitting the data of the devices to Kalmar Energi IoT portal.**
- **The devices that were installed in Böda Sand are as follows:**
  - Two items of BARANI DESIGN - METEOHELIX IoT PRO. The latter devices are for performing climate observations in all weather conditions.
  - One item of BARANI DESIGN - MeteoWind. The latter device is for wind resource assessments.
  - One item of Sensing Lab P. The latter device is a passive infrared sensor, enabling frequenting statistics reporting and passage detection.

Böda Sand Site building

METEOHELIX IoT PRO & MeteoWind

Antenna; SCAN 9dBi

Pilot case spring 2023



- Astrid Lindgrens Värld
- Ölands Köksmejeri
- C3C Beredskap
- Kallskänken

ÖLANDS KÖKSMEJERI

Kallskänken

C3C

ASTRID LINDGRENS VÄRLD

Linnæus University

Pilot case Fall 2023

- Jemac
- ETEC Oskarshamn
- Elektroverkstaden
- Novacore
- Stenugnsbageri Olof


ASTRID LINDGRENS VÄRLD
VIMMERBY

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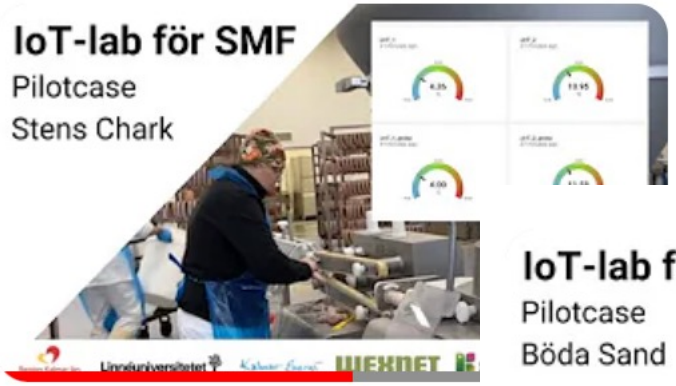

IoT för SMF - Pilotcase - Sten Chark

IoT för SMF - Pilotcase - Böda Sand

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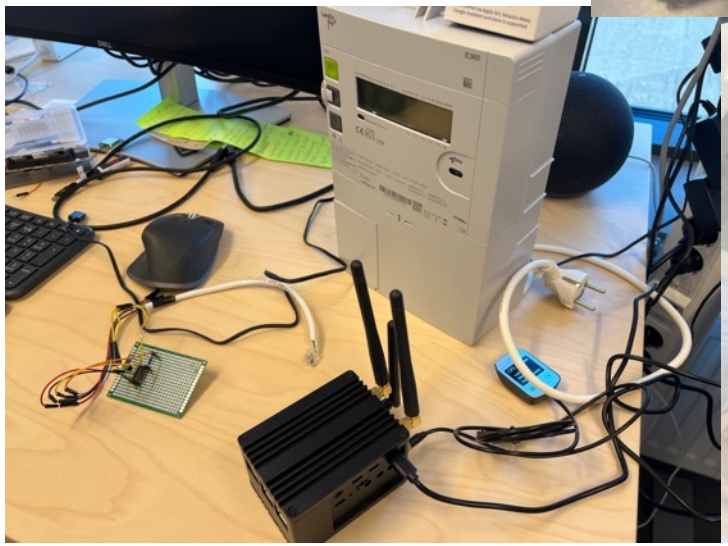
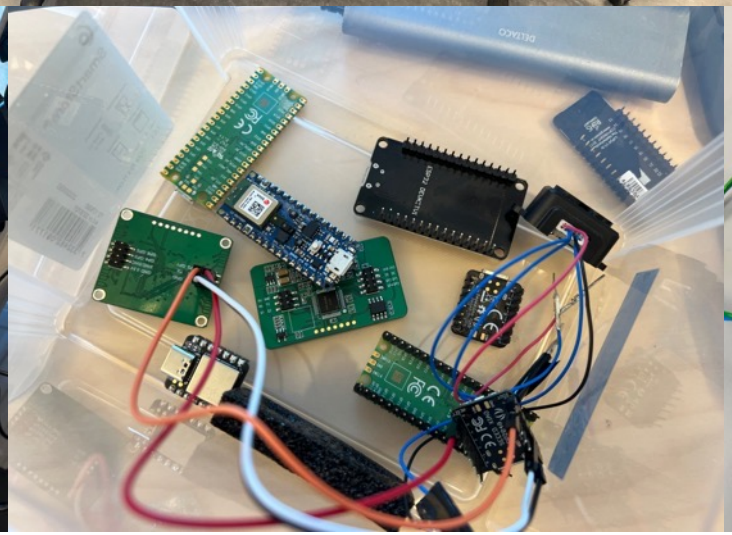
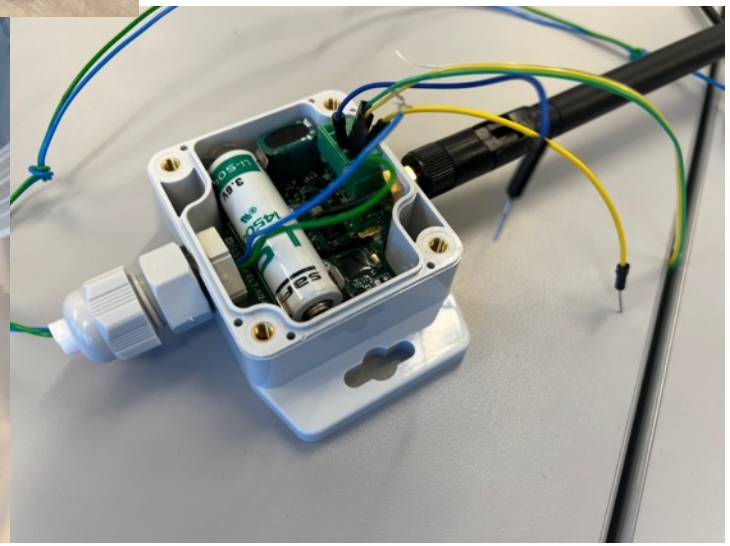
IoT för SMF - Pilotcase - PM och Vänner







The IoT-lab

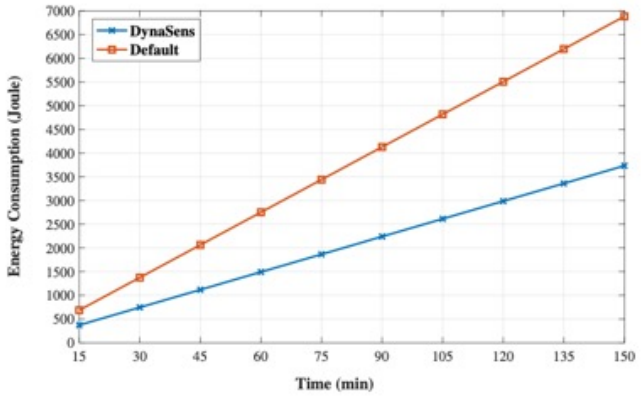
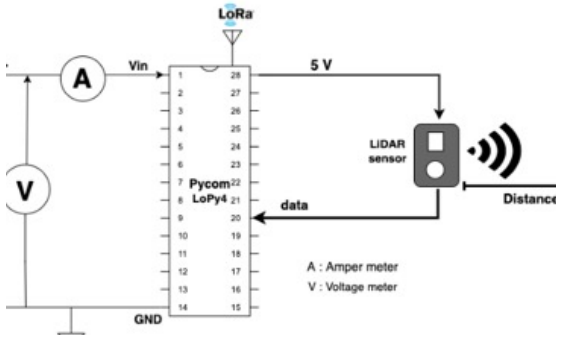


Fig. 2. Time vs. energy consumption comparison of DynaSens and default algorithm.



Overview of system circuit diagram.

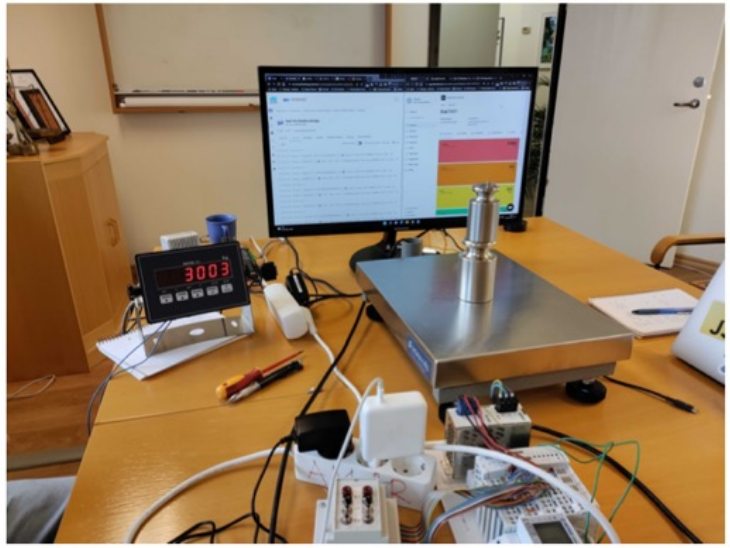
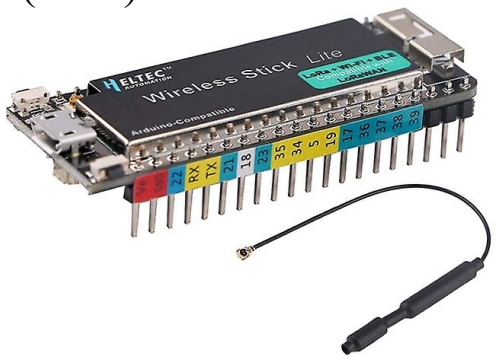


Fig. 2. An RS-485 enabled scale sending data using LoRaWAN to The Things Network and Datacake.

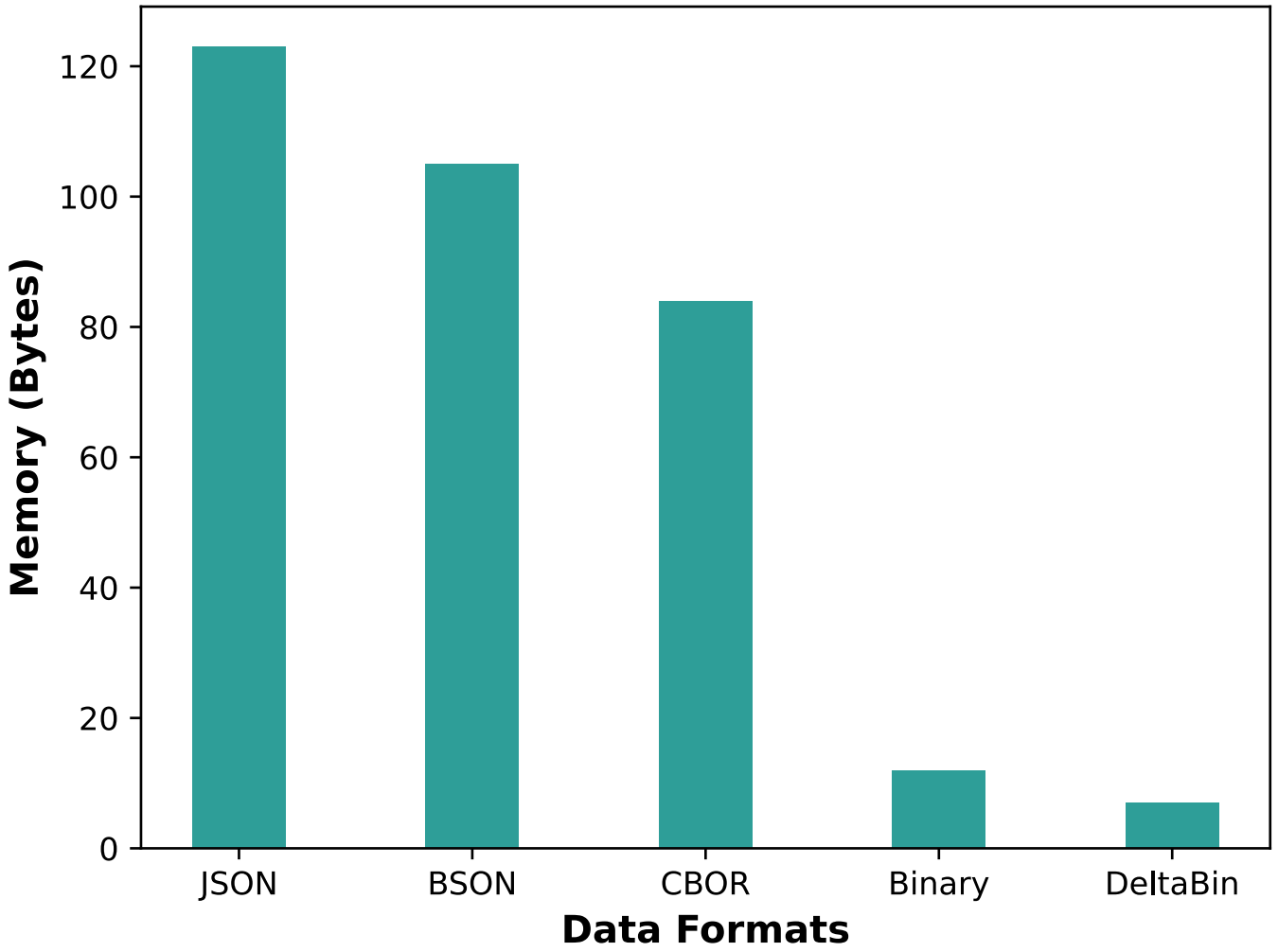
Fig. 5. Linnaeus University visiting PM & Vänner to discuss how to apply potential IoT solutions.

Usecase: Beelab Platform For Evaluating Data Formats

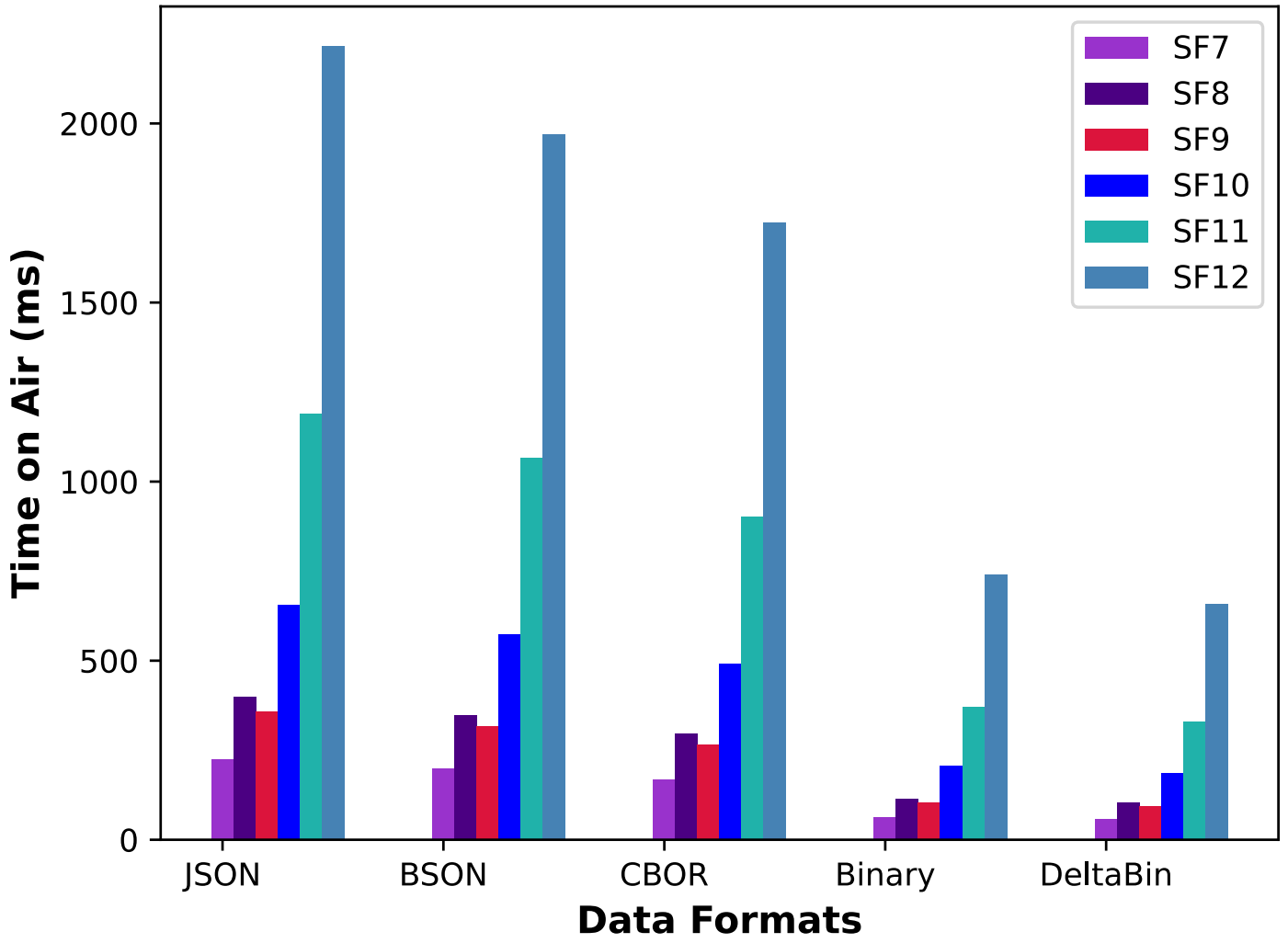
- Heltec Wireless Stick microcontroller. The module is capable of communicating via multiple wireless protocols, including WiFi, Bluetooth, and Long Range (LoRa).
- We utilize three temperature sensors at different locations within the hive.
- We utilize air pressure sensor, humidity sensor, VOC sensor, and load cell sensor to gather data on various aspects of the hive environment.
- The data gathered by these sensors is transmitted using LoRa to The Things Networks (TTN).



Performance Evaluation: Memory Size



Performance Evaluation: Time on Air



M/S Dessi (2023)

M/S Dessi is a small passenger ferry that operates between Kalmar and Färjestaden during the summer and thus transports many tourists during the summer period. The project aims to use batter efficient IoT (internet of things) sensors to measure air quality, vibrations, energy consumption and number of passengers on the ship, even in its two end ports so that a passenger flow can be measured before arrival. The data can be used for better knowledge of the environment on board the ship for both crew and passengers, energy use for efficiency and data for the number of passengers waiting at each port is a great value for both route optimization and local tourism industry. The sensors will utilise LPWAN (low power wide area network) technology, which means long battery life, low price point and an easy installation.

Smart cargo securing (2023 - 2024)

This project wants to investigate whether with the help of connected sensors (IoT) it is possible to get an early indication of whether any lashing in the load is slacking and thus needs to be fixed before it is too late. By being able to measure the lashing with the help of sensors, a safer working environment is created, as there should be less risk for personnel to go near poorly lashed cargo and also better maritime safety. The technology to be tested is based on existing sensors that are adapted for the application, it is wireless and powered by batteries and is today relatively cheap, which means that there is a great potential for implementation at scale.

Beehive (2022)

The project aims to provide battery-powered wireless-communication-based connected hives solutions. The project also aims to use cutting-edge sensors to offer additional added value for beekeepers, researchers, and authorities. With this project, the Applied IoT Lab at Linnaeus University (LNU) aims to develop an energy-efficient wireless connected hives solution using a low-power wireless communication-based development board. We plan to utilize either LoRaWAN, LTE CAT-M1, or NB-IoT for a long-range, battery-operated wireless infrastructure.

IoT on ships (2021)

The project is the first step to study the access and exploitation of new data resources in the domain of IoT in the shipping industry. In order to reduce the energy consumption on board, measurements are needed to make the right decisions. Today, there is a need for being able to collect data from older ships not equipped with sensor technology. The vast majority of all ships today are of an older standard, and there are both technical challenges and costs involved in leveraging on both the existing data on board as well as installing new sensors.

https://lnu.se/en/research/searchresearch/linnaeus-university-centre-for-data-intensive-sciences-and-applications/seed-projects/iot-for-ships/

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