CELTIC Proposers Brokerage Day
- Business Impact Session -

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Business Impact of CELTIC Projects

Moderator:
Mr Richard Foggie, Innovate UK Business Connect, Knowledge Transfer Manager – Digital Economy and Internet of Things

Pannelists:

F4iTECH: Mr Ismail Uzun from Inosens (TR)

AI4GREEN: Mr Orhun Ergul from Piworks (UK)

IEoT: Mr Pedro Lousa from Beyond Vision (PT)

SENDATE & AI-NET: Mr Reijo Savola Reij from University of Jyväskylä (FI)

CELTIC Proposers Brokerage Day
-Business Impact Session-

F4iTECH
Federated AI Platform for Industrial Technologies

CELTIC-NEXT
Σ eureka Cluster

Dr. İsmail Uzun
CEO @INOSENS

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Summary

Key Info

Project Status: running

Start Date: March 2022

End Date: February 2025

Budget (total): 2232.44K€

Effort: 49.06 PY

Project-ID: C2021/1-10

Coordinator

Name: Ismail Uzun

Company: Inosens

Country: Türkiye

E-mail: ismail.uzun@inosens.com.tr

**F4iTECH Project – Kick-off Meeting Minutes**
04/03/2022

F4iTECH Summary:
Start Date: March 2022
End Date: February 2025
Budget (total): 3304.4K€
Effort: 68.1 PY
Project-ID: C2021/1-10

Attendants:
All patterns attended to the Kick-off meeting:

- Korea: DLIT, HUFS and SmartCore team
- Turkey: TORUN, KoçSistem, TAV Tech, SAMM and INOSENS team
- Portugal: Sistrade, ISEP (SIDONIOS not attended and presented by Sistrade)
- Romania: BEIA team
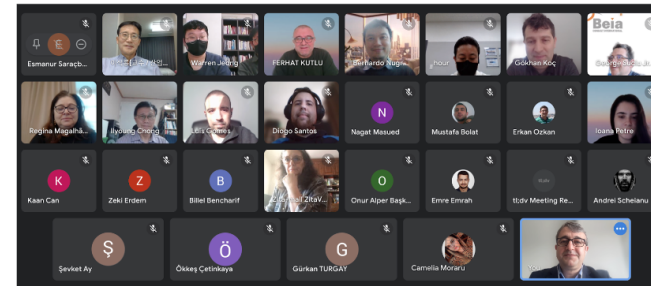
Consortium

Inosens, Türkiye

KocSistem, Türkiye

TAV Technologies, Türkiye

SAMM Teknology, Türkiye

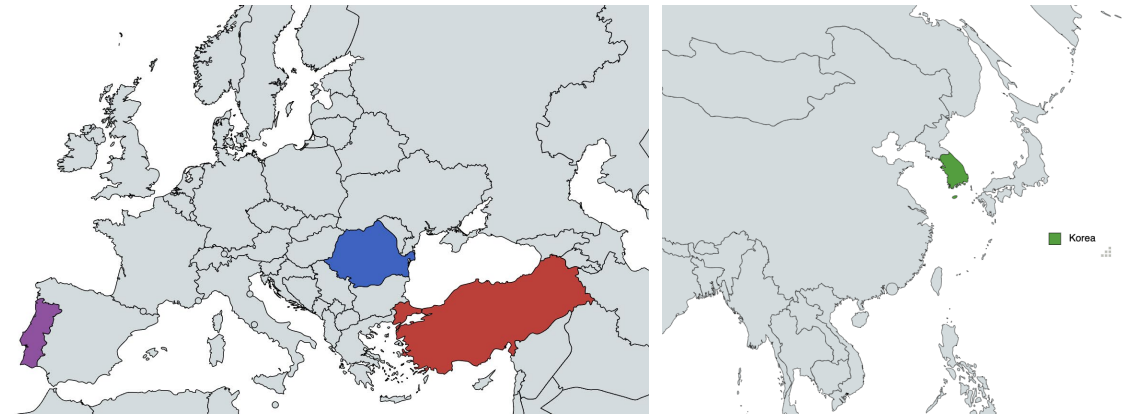TORUN, Türkiye

DLIT, South Korea

HUFS, South Korea

SmartCore, South Korea

ISEP/IPP, Portugal

Sistrade Software Consulting S.A., Portugal

SIDONIOS MALHAS S.A., Portugal

F4iTECH
- Turkey
- Romania
- Portugal

Korea

4 Countries,

12 organizations

2 Universities,
3 Industrial Partners
7 SMEs

* 1 University in Turkey is Subcontractor

Timeline

| F4iTECH	2022/I				2022/II					2023/I					2023/II					2024/I					2024/II					2025/I	
WPs	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
WP1: Project Management (D1.1, D1.2 … D1.3)																																				
Task 1.1: Project Management																																				
Task 1.2: Risk Management																																				
Task 1.3: Dissemination and Exploitation																																				
WP2: Architecture, Requirements & Specifications (D2.1, D2.2, D2.3)																																				
Task 2.1: Requirements and specifications																																				
Task 2.2: Infrastructure architecture design																																				
Task 2.3: Blockchain architecture design																																				
WP3: Infrastructure Development (D3.1, D3.2, D3.3)																																				
Task 3.1: AI Model Management Module																																				
Task 3.2: Blockchain Infrastructure																																				
Task 3.3: Client Cluster Management Module																																				
Task 3.4: Federated Learning Core Services & Components																																				
WP4: Use Cases and (D4.1 … D4.2)																																				
Task 4.1: Business Requirement Analysis																																				
Task 4.2: Development and Integration																																				
Task 4.3: Demonstrations and																																				

Deliverables

Del. No.	Name of Deliverable (Dx.x) or Milestone (Mx.x)	Type (report, software)	Dissem. level[1]	Delivery month[2]	Responsible	Reviewer 1	Reviewer 2
D1.1	Project Management Plan	Document	CO	M1	INOSENS	SAMM	TAV Tech
D1.2	Risk Management Plan	Document	CO	M2	SAMM	INOSENS	BEIA
D1.3	Analysis and performance results of airport scenario	Document	CO	M36	TAV Tech	SisTrade	INOSENS
D2.1	Requirements and specifications	Document	CO	M6	ISEP	TAV Tech	SisTrade
D2.2	Infrastructure architecture	Document	CO	M12	INOSENS	HUFS	ISEP/GTU
D2.3	Blockchain architecture	Document	CO	M12	SmartCore	KoçSistem	ISEP
M2.1	Final system architecture accepted by the consortium	Document	CO	M12			
D3.1	Federated Learning Infrastructure v1.0	Software	CO	M24	HUFS, INOSENS	KoçSistem	TAV Tech
D3.2	Federated Learning Infrastructure v2.0	Software	CO	M30	HUFS, INOSENS	KoçSistem	TAV Tech
D3.3	Blockchain Infrastructure.	Software	CO	M24	SmartCore	İNOSENS	TAV Tech
D4.1	Use Case Definition and Requirements Analysis Report document	Document	CO	M12	TAV Tech	ISEP	DLIT
D4.2	Analysis Output of Demonstrations	Document	CO	M36	INOSENS	SAMM	TORUN
M4.1	Specifications and requirements of the use cases identified and described	Document	CO	M12			

Federated Learning (FL)
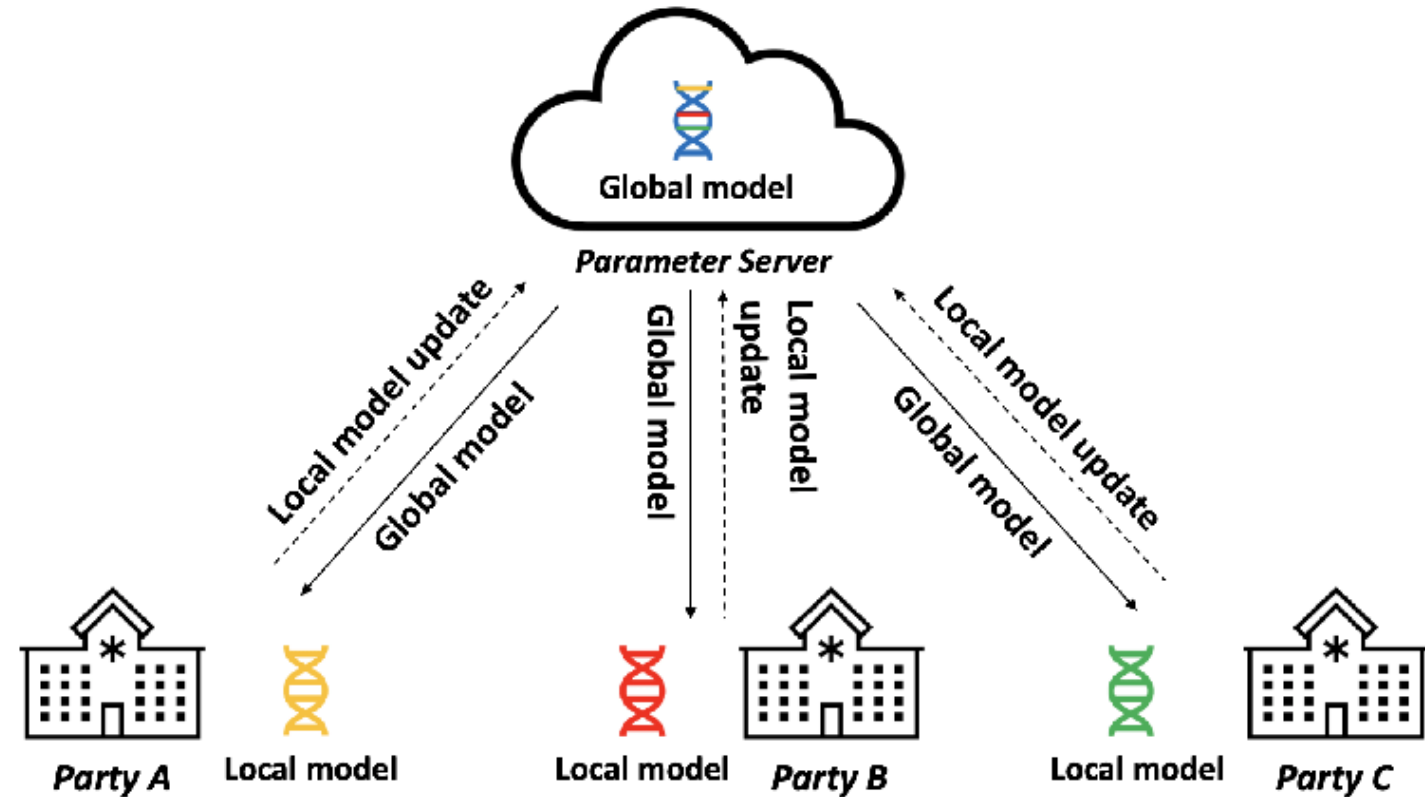
FL is a decentralized machine learning technique that enables multiple parties to collaboratively train ML models while keeping their data **securely** stored on their local devices.

Idea of F4iTECH
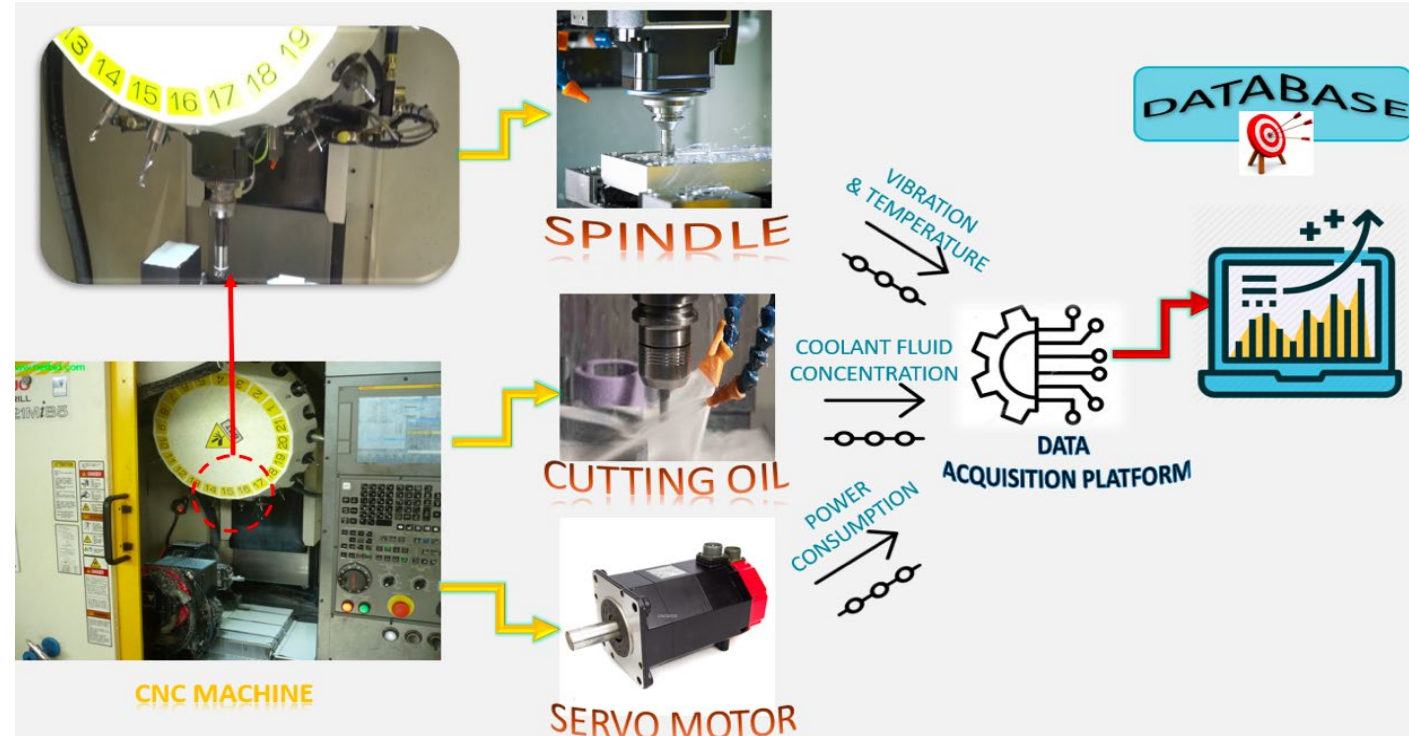
Current AI-based industrial applications follow a linear, sequential approach to data collection, processing, and model deployment, often leading to centralized data collection challenges and potential quality issues.

To address this, F4iTECH aimed to develop a federated learning platform tailored for industrial automation.

FLaction

Flaction Platform
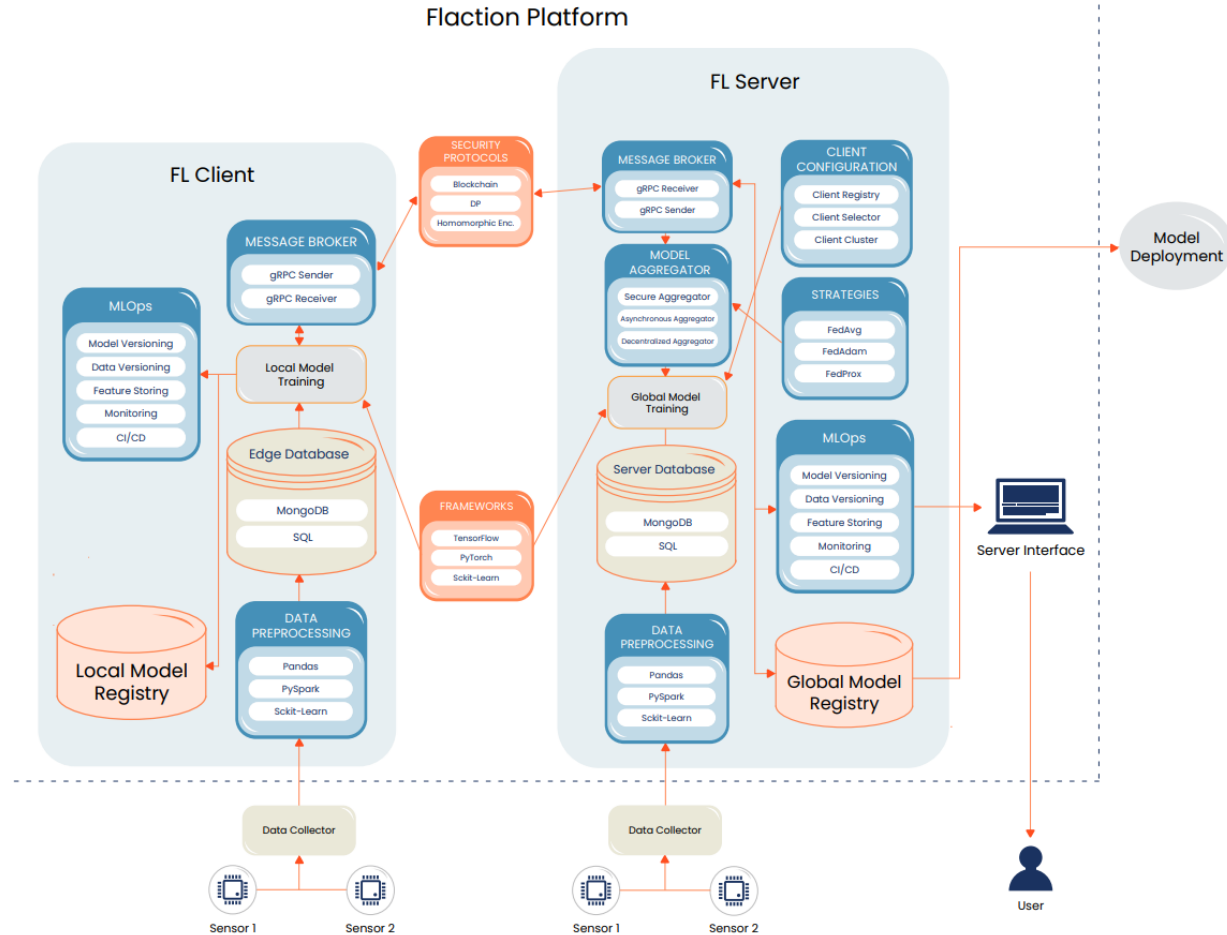
A **Federated Learning (FL)** platform for industrial automation that offers solutions by building AI models on decentralized data and may use blockchain approach to disseminate data allowing accuracy and privacy.

F4iTECH

Use Cases

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2. Smart Factories
Remaining Useful Lifetime

4. Textile
Manufacturing Process

6. Supply Chain
Blockchain Based Management

1. Aviation
Airport Passenger

3. Retail
Customer Emotion

5. DAS
Anomaly Detection by Distributed Acoustics Sensing

Business Impact

1 Enhanced Data Privacy and Security

2 Cost Reduction and Efficiency Gains

3 Customization and Flexibility

4 Operational Resilience

5 Sustainability and Resource Optimization

Business Impact

New Products 6

7 **Technological Leadership**

Partnership and Strategic Collaboration 8

9 **Understand New Markets and Cultures**

Industry Collaboration (SME-Uni-I) 10

İNOSENS and DLIT (http://eng.dlit.co.kr/), partners in the F4iTECH project, entered into a Memorandum of Understanding (MoU) with the aim of strengthening their cooperation in the Smart Factories market across ...more

On October 4th, 2023, a seminar titled "Building a Smart Industry (AI, Federated Learning and Blockchain) - A Case Study for Turkey and South Korea Collaboration" was held at GOSB Teknopark A.Ş. The event was organized by the #F4iTECH project partners, İNOSENS, DLIT (http://www.dlit.co.kr/), and smartcore. The seminar aimed to strengthen cooperation between South Korea and Turkey in the fields of AI, Federated Learning, and Blockchain. #smartfactories #ai #blockchain #SouthKorea #Türkiye

32	Standardization activities: Submission of 2 Contributions to International Standardization Organization (ITU–T SG 20)	January 2023	Contribution Title: Revised texts of Y.DPM-qm based on TD-GEN-0267 R1 Output text of draft Recommendation ITU-T Y.DPM-qm "Requirements and functional model to support data quality management in IoT" Q4/20 meeting (Geneva, 30 January - 10 February 2023) - for consent	Data engineers and Industrial data applications management group
33	Publication of International Standard: ITU-T Y.4603	May 2023	International Standard Title: "Requirements and functional model to support data quality management in Internet of things"	Data engineers and Industrial data applications management group
34	Standardization activities: Submission of 1 Contributions to International Standardization Organization (ITU–T SG 13)	October 2023	Contribution Title: Considerations to create data products in accordance with data ownership classification of digital assets in Web 3.0 environment	Data engineers and Industrial data applications management group

45 Dissemination activity (publication, seminar etc.)

+

Contributions to ITU-T Standards

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- **Federated AI Platform for Future Industry**

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Project: IEoT

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Sub-title text or presenter name

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IEoT – Intelligent Edge of Things

A three-tier Edge-IoT data service architecture

Introduction

- **Main focus** on AI to achieve
  - Real-time performance
  - High level of security and privacy
  - Resource and energy efficiency
  - Scalability and manageability

- **Services placement depends on**
  - Need for computational capacity
  - Availability
  - Responsiveness
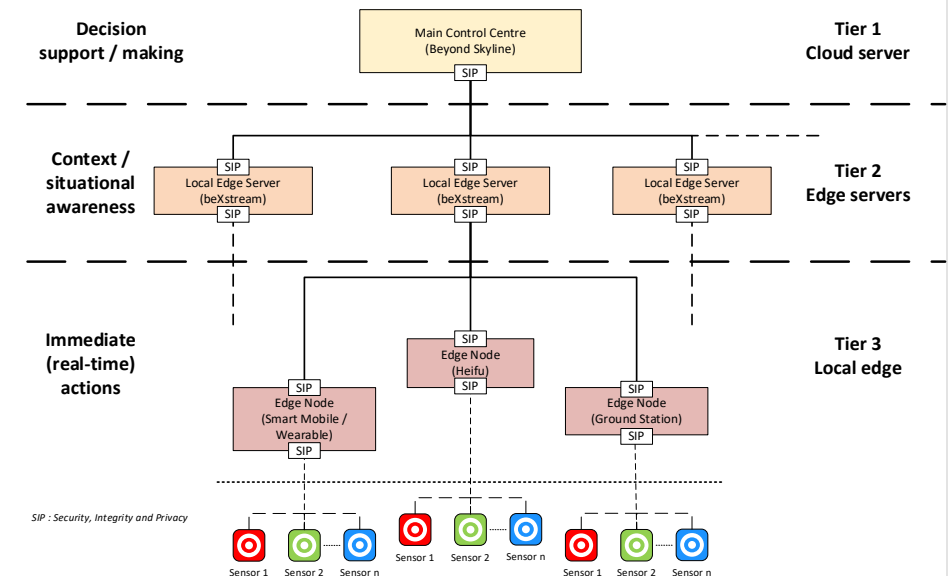 - Context-awareness
  - Energy criticality
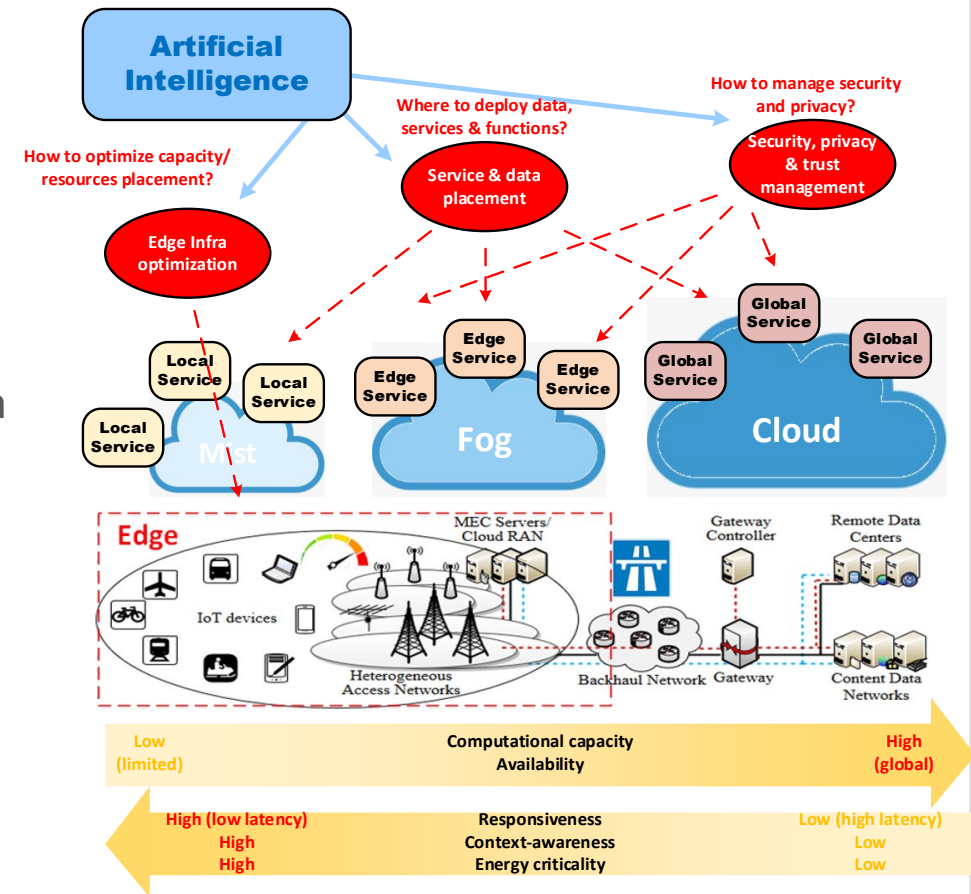
Consortium

- **Portugal**
  - Beyond Vision (leader)
  - PDMFC
  - Inst. Telecom. Aveiro

- **Austria**
  - TUW
  - AVL

- **Turkey**
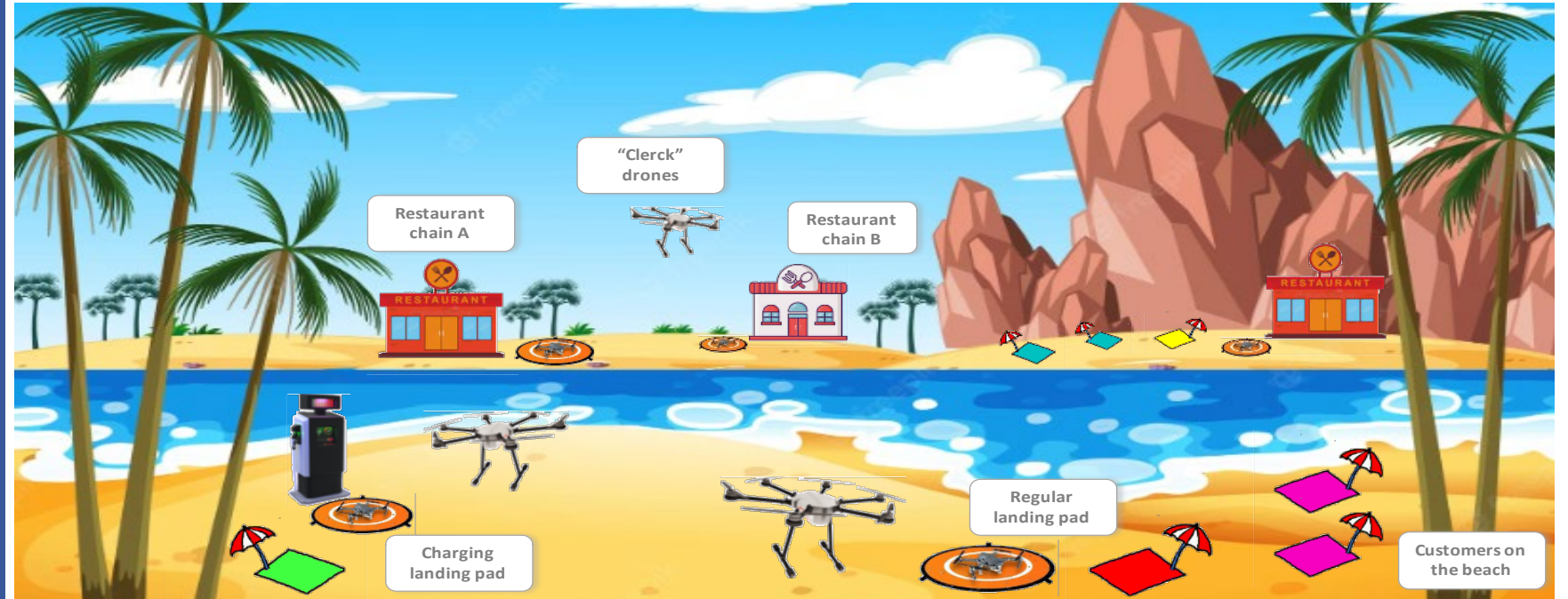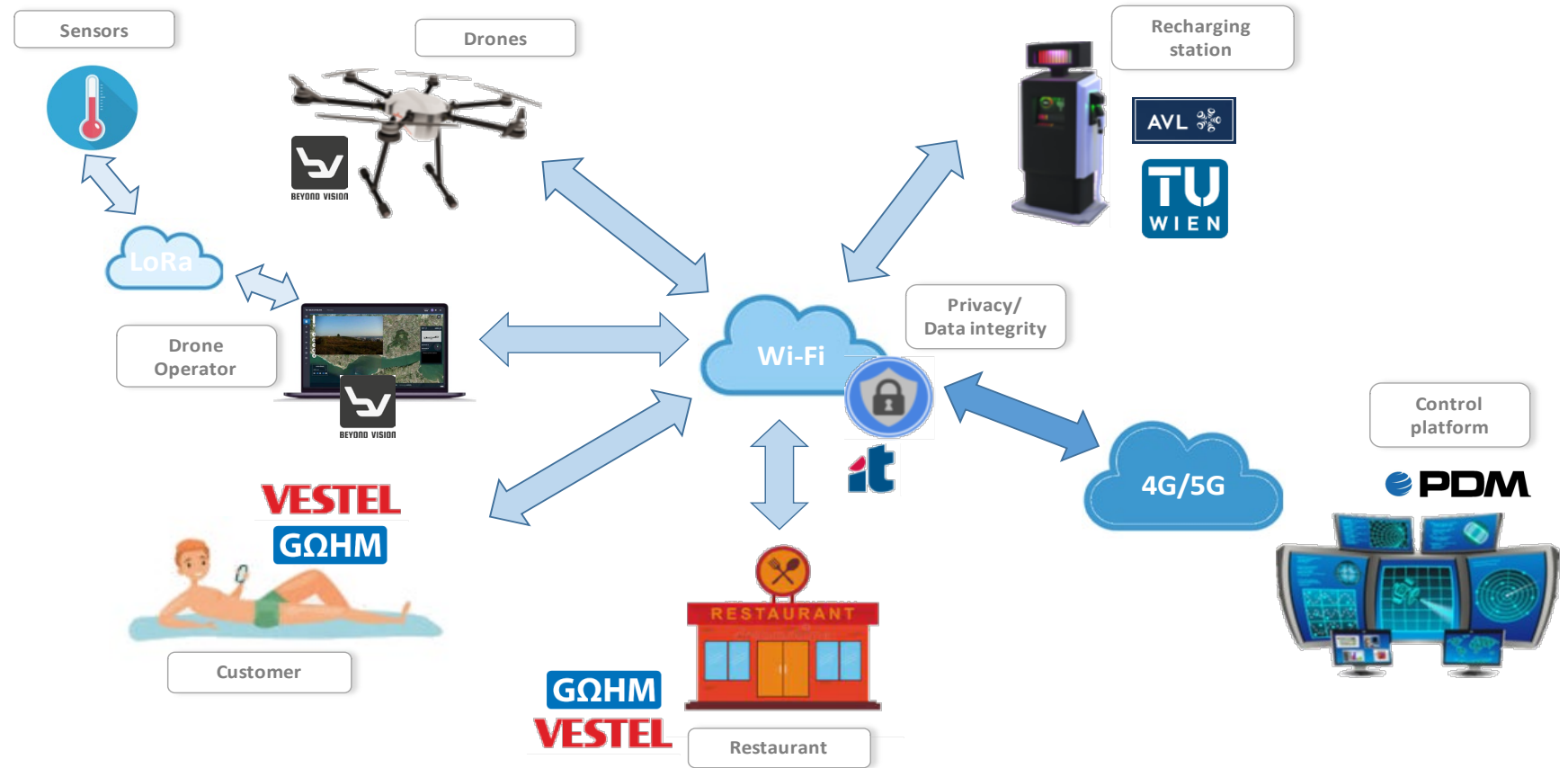 - Gohm
  - Vestel

Architecture

- **Tier 1 (Beyond Skyline)**
  - Cloud server platform
  - Group info from Local Edge Servers
  - Perform long-term tasks (e.g. drone behavior fine-tuning)

- **Tier 2 (beXStream)**
  - Local edge platforms
  - Group info from edge nodes
  - Perform short-term tasks (e.g. drone routes planning)

- **Tier 3 (drones, wearables, etc.)**
  - Edge node sensors and drones
  - Retrieve environment info
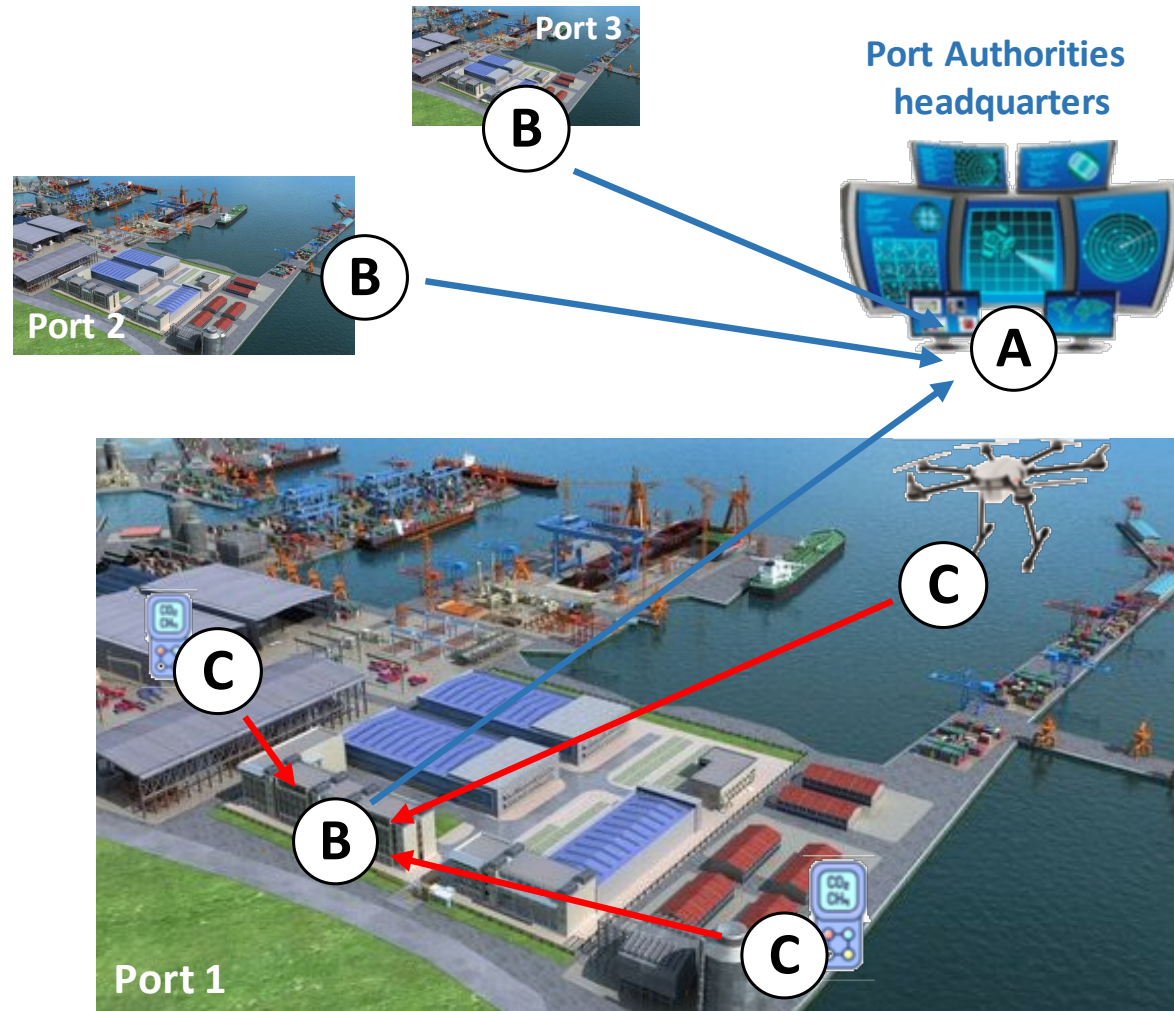 - Perform real-time tasks (e.g. collision avoidance)

21

Grand-demo (scenario)

Grand-demo (physical implementation)

Sensors

Drones

Recharging station

AVL

TU WIEN

LoRa

Drone Operator

Privacy/ Data integrity

Wi-Fi

4G/5G

Control platform

PDM

VESTEL

GΩHM

Customer

GΩHM

VESTEL

Restaurant

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Developed use-cases (port)

Port 3

B

Port 2

B

Port Authorities headquarters

A

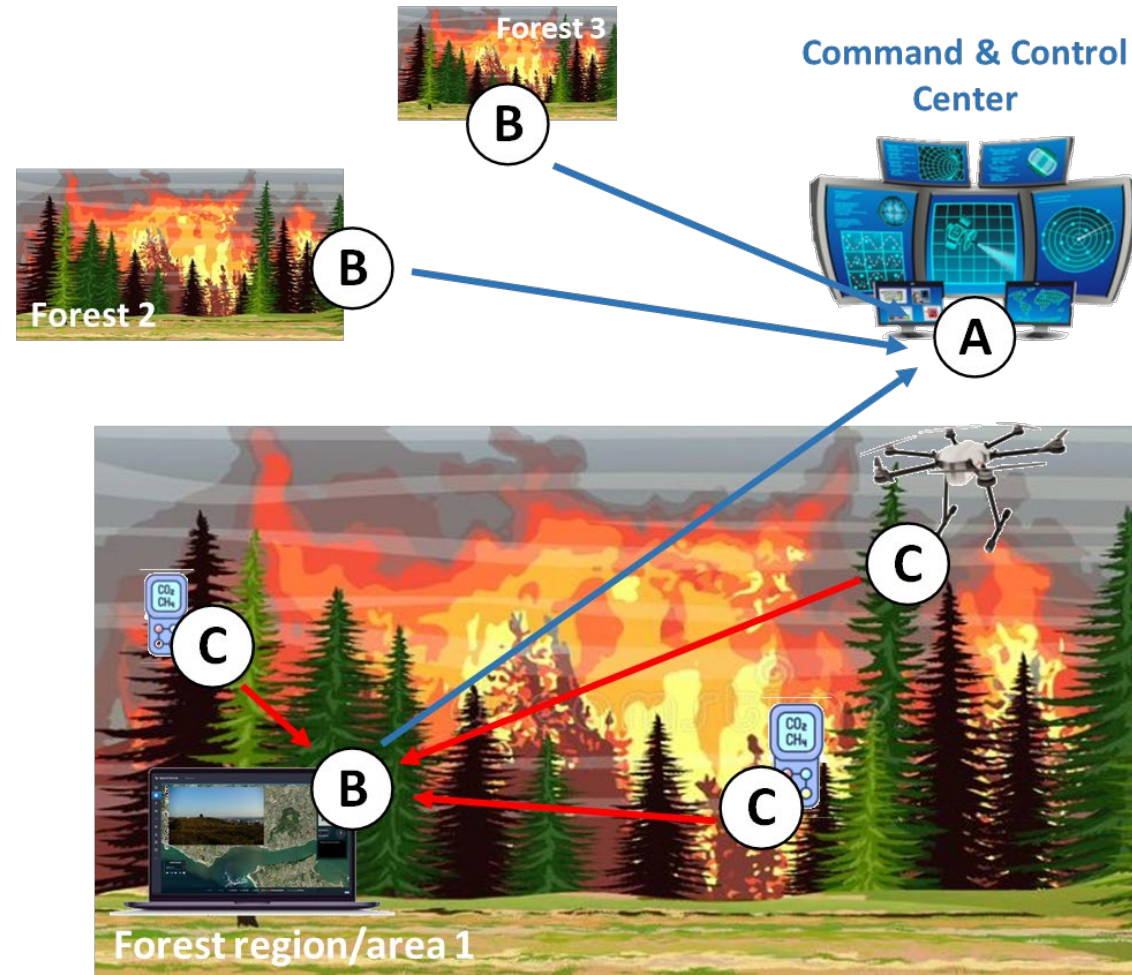**C**

C

B

C

Port 1

Outcome: in a partnership with Vodafone, demos done at the Port of Leixões (one of the biggest ports in Portugal)

Developed use-cases (construction)

Site 3

Site 2

Company's headquarters

B

B

A

C

C

C

B

Construction site 1
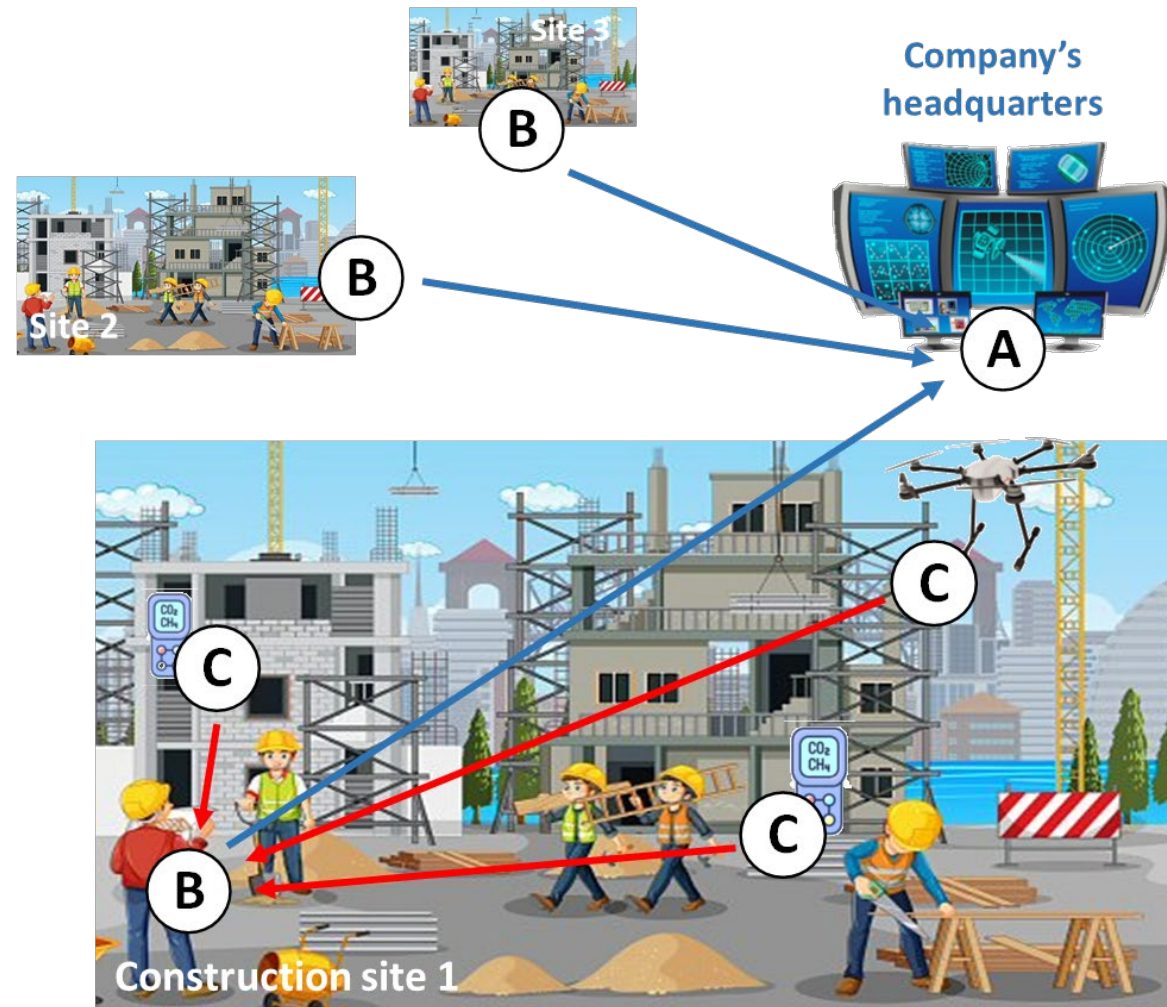
Outcome: several contacts being held at this moment in the Middle East!

Developed use-cases (hazardous)

Outcome: partnership with the biggest company dealing with fires in Portugal!

Developed use-cases (wildfires)

Factory 3

Company's headquarters

B

B

A

C

C

C

B

C

Factory 2

Factory 1
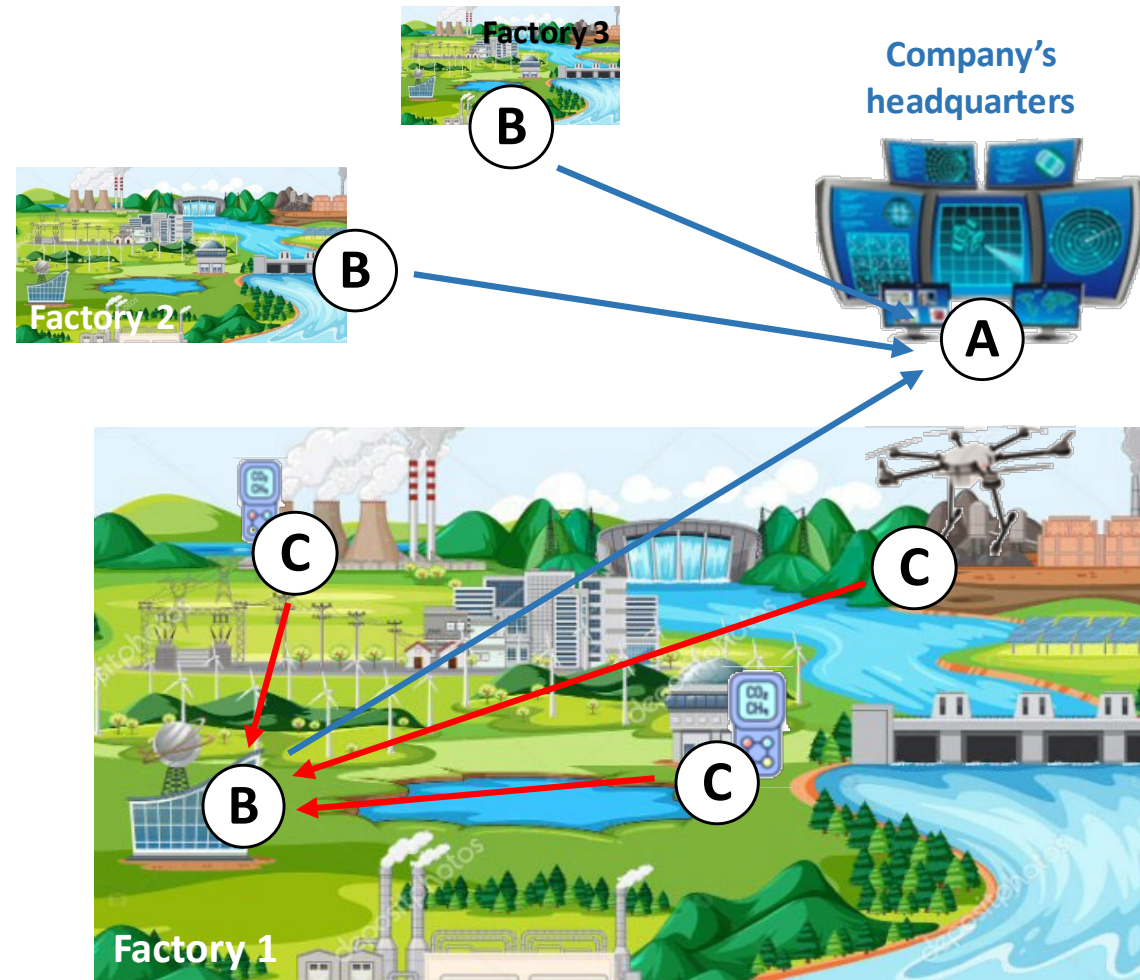
Outcome: PoC done near Riyadh for pipeline inspection! 16

Business Impact (coarse numbers)

- **New products:** Beyond Skyline, LoRa sensors

- **Improved products**: UAVs, beXStream

- **New projects**: at least two

- **Revenues**: expected 6M€ in 2024 (compared with 1.5M€ in 2023)

- **Round of investment** under way

MANY THANKS FOR YOUR ATTENTION.

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- Pedro Lousã
- **Beyond Vision, S.A.**
- pedro.lousa@beyond-vision.com
- https://beyond-vision.com/

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AI4GREEN

Orhun Ergul
Technical Delivery Lead, P.I.Works

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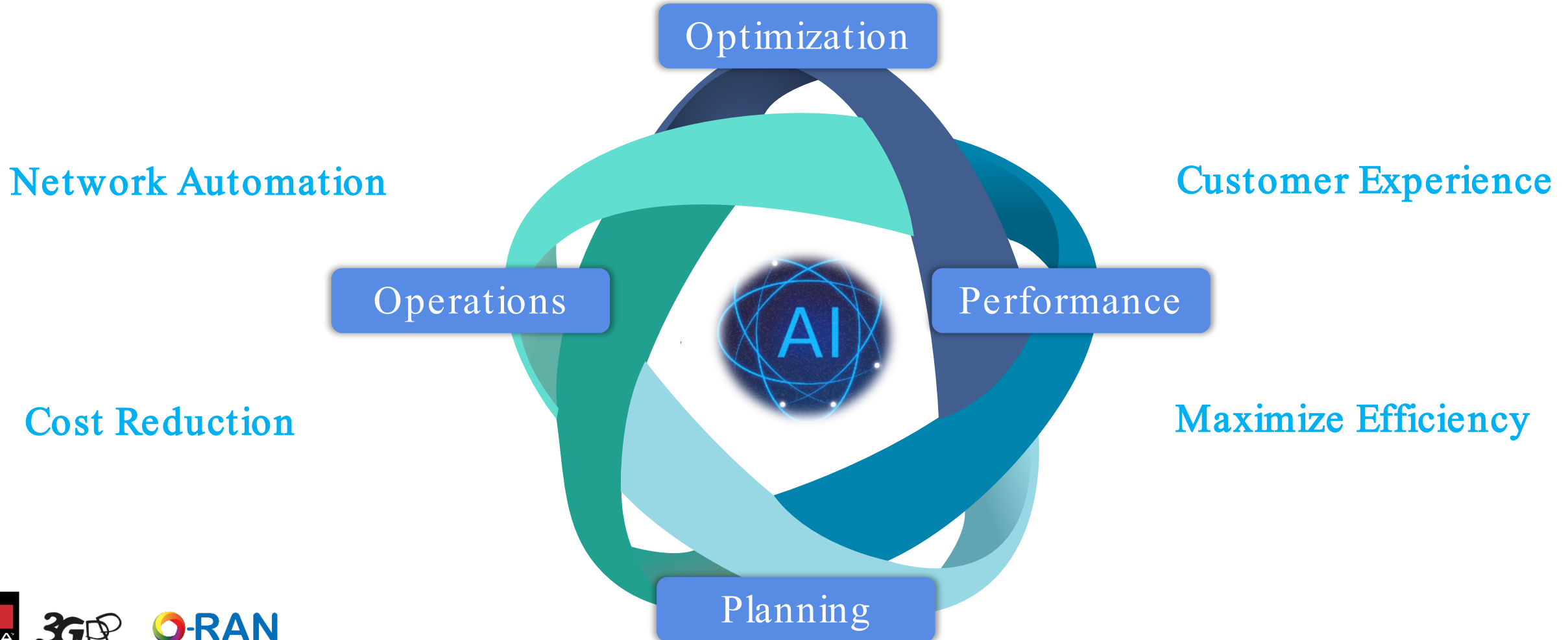**82** Operators | **58** Countries | **10M+** Cell Count | **1.7B+** Subscribers

CELTIC-NEXT
Eureka Cluster

References

Virgin media O2 · 3 · V VEON · Telefónica · Singtel

MTN · ooredoo · TELUS · Telkomsel

TURKCELL · dish · maxis · Smart

etisalat · CETIN MEMBER OF PPF GROUP · AT&T · c spire wireless

Global Recognition

GSMA Foundry
Winner.
GSMA Foundry Excellence Award
with Know It All

GLOTEL AWARDS 2022
Winner.
Managed Services Innovation

FUTURENET AWARDS
Winner.
Successful Automation Deployment
Network Sustainability Award

Gartner
Recognition.
Network AI and Automation

Joint-initiatives with operators to drive innovation

Partners & Motivation

Started: Oct 2019
Completed: Dec 2022

Project leader TELE2 / KTH

17 partners
- 3 telcos
- 6 universities/research institutes
- 8 private companies

AI4 GREEN

Goal:
The main goal of this project is to achieve an improvement of about 30-40% of the end-to-end energy efficiency compared to current networks.

Energy Saving

I - PREDICTIVE CARRIER SHUTDOWN ALGORITHM

Benchmark of 8 algorithms
- **92% Prediction Accuracy** on decisions
- **18% more shutdown** vs reactive approach

Best in Class Predictions

Improved Saving Methods

II - PREDICTIVE SECTOR SHUTDOWN ALGORITHM

- Identifying sectors during underutilized periods
- Awareness of coverage gaps & QoS Constraints
- **10% More saving** on RAN vs vendor features

Risk-Awareness

III - CROWD MOVEMENT ANALYTICS ENGINE

- ML based geolocated call traces
- GNN based prediction
- **86% Accuracy** on saving actions
- **52% Energy saving opportunity** during events

Geo-Spatial Awareness

Knowing the Unexpected

IV- SOCIAL MEDIA ANALYTICS ENGINE

- Minimization of capacity risks
- Disaster awareness by Social Media feeds i.e. X, Google News, etc.
- SON orchestration
- **3 Minutes response time** to unplanned events

Sector Shutdown Results

	Energy consumption (W)	Energy Saving (W)	Saving Percentage	Annual Saving (GWh)	Estimated Whole Network Annual Saving (GWh)
Only Vendor Features	932,942	58,728	5.90%	0.0214	6.18
Vendor Features + Sector Shutdown	**927,305**	**64,635**	**6.50%**	**0.0235**	**6.78**
No energy saving	991,671	-	-	-	-
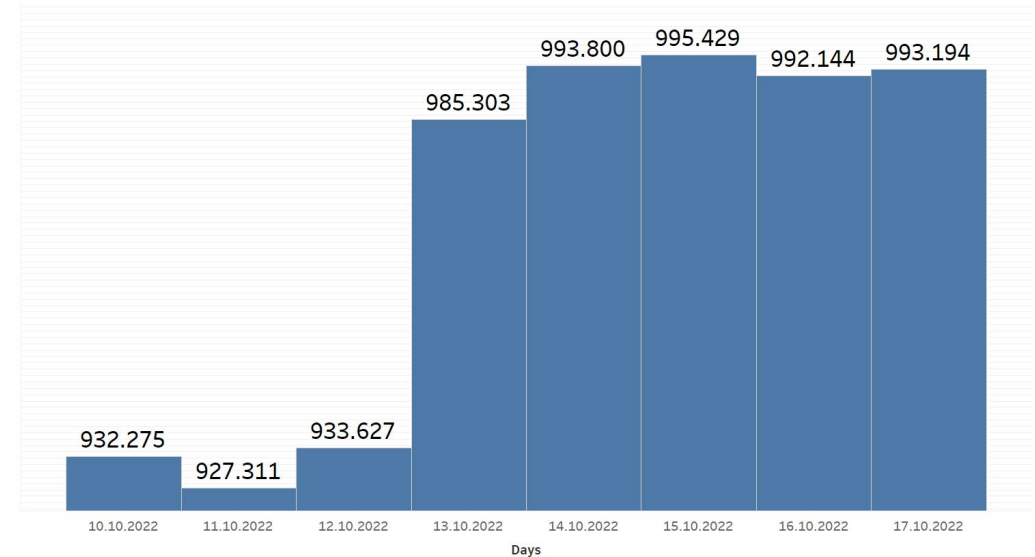
Energy consumption between 2 AM - 6 AM of **104 sites.**

The estimation for Turkcell's annual countrywide overall network energy saving using this method is about **6.78 GWh**

Crowd Movement Modelling Results

Using the exclusion list (network load expectations on each cell), it is possible to **determine when the energy saving algorithms** are allowed **to take/stop action** on the network.

There is room for **52.5%** of **energy saving** even on special event days around event venues when crowd movements are modelled with machine learning.

The energy saving algorithms save ~14682 Watts per hour on a normal day in Kadıköy region.*
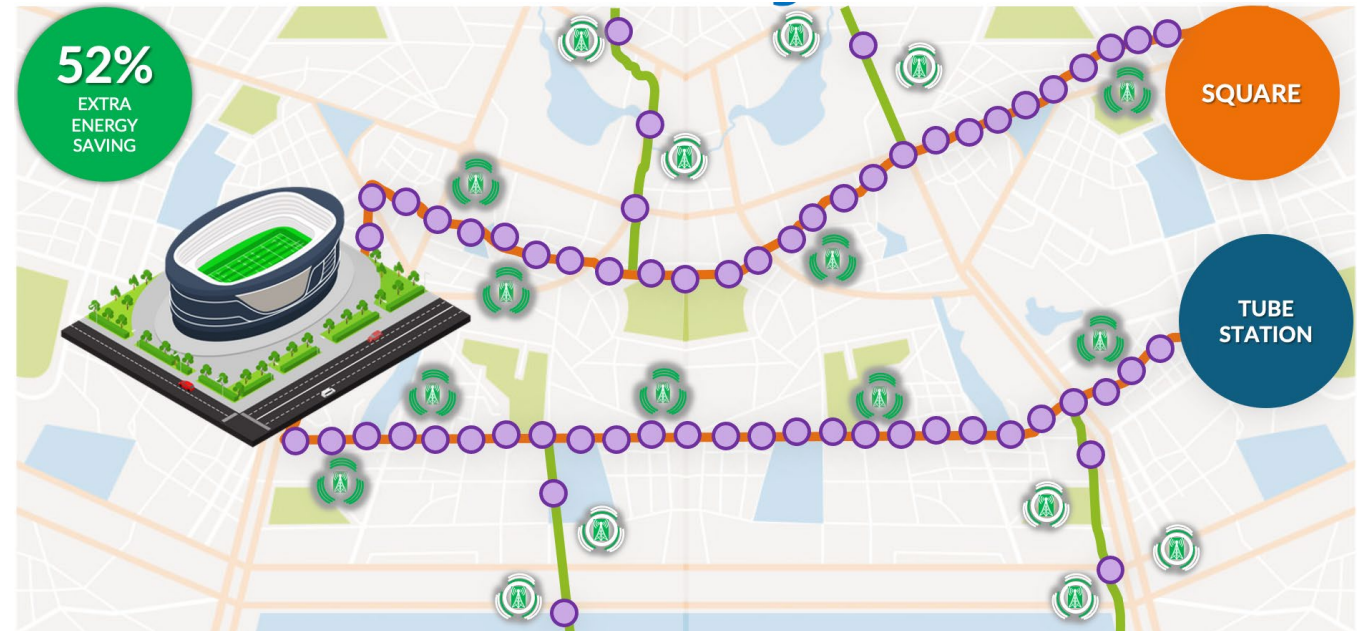
Energy Saving (Estimates)	Per Hour Saving*	5 Hours Saving*	Percentage (5 Hours)*
Regular Day (no match) with ES	14682 Watt-Hour	73410 Wh	6%
Match Day with no risk (off ES)	0 Wh (No Saving)	0 Wh	0 %
Match Day with CMM assisted ES	**7635 Wh**	**38173 Wh**	**3.2 %**

52.5% saving

* Based on the values in "Live Network Results" section of this presentation.

Business Impact

New Products: 6

Improved Products: 11

Expected ROI : 1-50x

New Employees 12-14

Patents & Trademarks: 2

Prototypes & Fields trials: 7

Contributions to standards: 2

Open-source Software: 3

Techno economics: 1

Awards

CELTIC-NEXT project AI4Green received the Eureka Innovation Award in the clusters category at the Global Innovations Summit 2024

HOME / CELTIC-NEXT PROJECT NEWS / CELTIC-NEXT PROJECT AI4GREEN RECEIVED THE EUREKA INNOVATION AWARD IN THE CLUSTERS CATEGORY AT THE GLOBAL INNOVATIONS SUMMIT 2024

CELTIC Excellence Award for Green Networking:
AI4Green – Artificial Intelligence for Green networks

AI4Green

The Excellence Award 2024 in the category green networking
has been handed over to the project leader Mrs Cicek Cavdar from KTH, Sweden

Dissemination Summary

CONFERENCES PAPERS: 10

JOURNAL PAPERS: 16

THESIS:9

MANY THANKS FOR YOUR ATTENTION.

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Cicek Cavdar
AI4Green Project Co-Ordinator
Assoc. Prof. KTH Royal Institute of Technology

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CELTIC-FLAGSHIP Projects success of
SENDATE and AI-NET

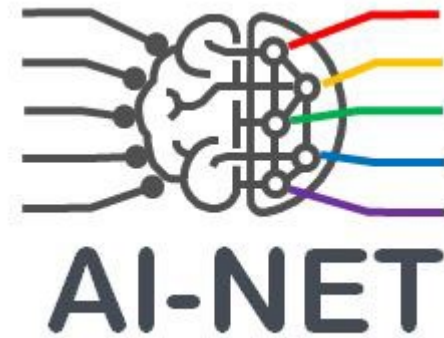Mr Reijo Savola, University of Jyväskylä (FI)

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SENDATE

SEcure Networking for a DATa center cloud in Europe

Accellerating digital transformation in Europe by Intelligent NETwork automation

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CELTIC FLAGSHIP: AI-NET

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- **University of JyväskyläSavola**
- **Email:reijo.m.savola@jyu.fi**

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Moderator:
Mr Richard Foggie, , Innovate UK Business Connect, Knowledge Transfer Manager – Digital Economy and Internet of Things
Pannelists:
F4iTECH: Mr Ismail Uzun from Inosens (TR)
AI4GREEN: Mr Orhun Ergul from Piworks (UK)
IEoT: Mr Pedro Lousa from Beyond Vision (PT)
SENDATE & AI-NET: Mr Reijo Savola from University of Jyväskylä (FI)