Project Achievements

RIOT-ES

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Partners:
KAIST, South Korea
Kuls.Co.; Ltd., South Korea
PROEF, Portugal
Ubiwhere, Portugal

Co-ordinator:
Rita Santiago
Ubiwhere, Portugal
E-mail: rsantiago@ubiwhere.com

Project Website
www.celticnext.eu/project-riot-es
https://riot-es.org/

Resource-Efficient IoT Edge Systems

Riot-ES researched and developed new methods, technologies and systems for maximising energy efficiency and increased performance in IoT systems, focusing on IoT devices and processing at the edge of wireless networks for two specific use cases - Smart Homes and Smart Parking.

Main focus

As Energy efficiency and performance are often at odds with each other, the project's primary focus was investigating solutions to optimise energy efficiency given performance constraints and, conversely, optimise performance given energy constraints. The project explored a mix of sensor devices and computational and data management platforms, where the complementary expertise of the project partners created strong synergy effects and understanding of all parts of the global IoT edge systems.

Approach

Smart Home Use Case

This use case explores scenarios for an autonomous IoT smart home system that elderly people can easily manage.

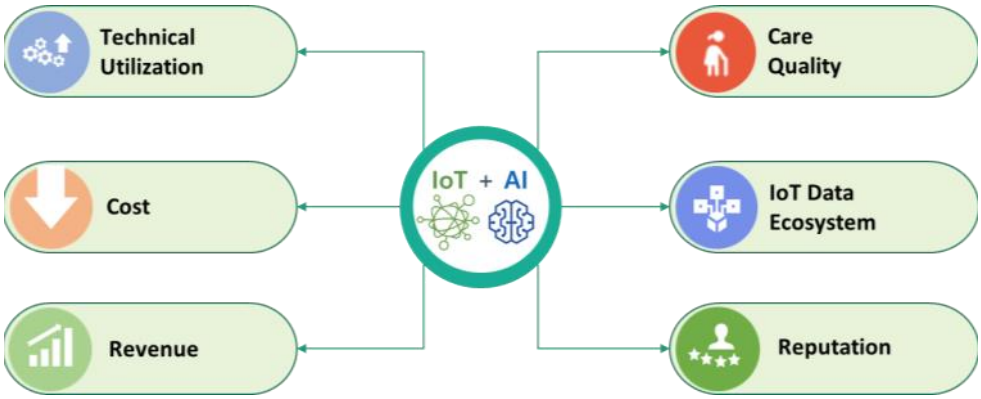
The technology employed facilitates the seamless integration of IoT devices into smart homes, ensuring compatibility with users' lifestyles and preserving the aesthetics of the house interior. Emphasising energy efficiency and reliable data collection, our solution prioritises optimal performance. Our partners have focused on two key scenarios: single-living elderly care and healthcare service operation for elders. The solution encompasses several key features, including small and lightweight IoT devices that seamlessly blend into users' lifestyles, continuous connectivity to a server with ample power for accurate health monitoring, and the development of advanced algorithms for detecting and predicting the health status of single-living elderly individuals. These features collectively contribute to a comprehensive and user-centric solution that enhances the quality of care and well-being for the elderly population.

Smart Parking Use Case

This use case explores real-life parking occupancy monitoring scenarios and management situations.

For maximising energy efficiency and increased performance in IoT systems in use cases such as this, a solution composed of two services was developed. These consisted of a Machine Learning (ML) Processing service for vehicle detection and counting and a service designed to show some metrics.

The Machine Learning Processing service is responsible for analysing a video stream captured by a CCTV camera using the RTSP protocol. Its main purpose is to detect and count vehicles in real-time.



Achieved results

The RIOT-ES project's achievements in resource-efficient IoT-edge systems have the potential to impact businesses, R&D activities, and the industry. The project offers solutions for reducing energy consumption and enhancing the performance of IoT devices and edge processing systems by optimising energy efficiency while considering performance constraints.

The findings, particularly in the Smart Homes and Smart Cities use cases, can enable proactive healthcare monitoring in smart homes, improving the well-being of elderly individuals as well as revolutionising urban management, including traffic control, waste management, energy usage, and public safety.

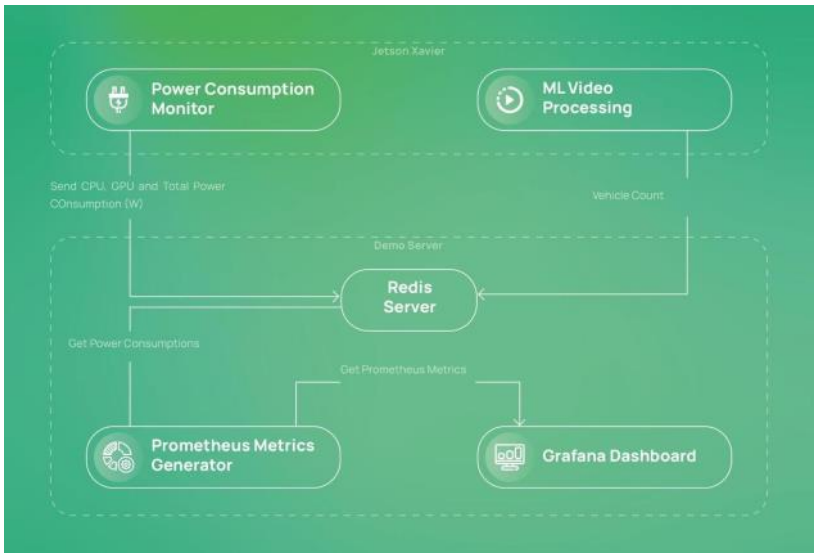
The demonstrated functionalities, such as elderly people's health monitoring, vehicle detection, and counting, can drive industry adoption of energy-efficient IoT systems.

Participated in a total of 12 conferences, for example, Korean Institute of Communications and Information Science Conference, 2021 Join EuCNC & 6G Summit, Smart City Expo World Congress Barcelona 2021 and 2022, 2022 International Conference on Artificial Intelligence in Information and Communication (ICAIIC), 2023 Information and Control Symposium

Submitted a total of 7 papers to scientific journals like Data Analysis and Consideration of Radar-based Contactless Biometrics Monitoring Testbed for Single Elderly Households, MultiCNN-FilterLSTM: Resource-efficient sensor-based human activity recognition in IoT applications and PPO-based Autonomous Transmission Period Control System in IoT Edge Computing.

based Sampling Period in IoT-Digital Healthcare and Privacy-preserved User Context Prediction Method and System for Healthcare Services with Radar-based Contactless Biometric Monitoring System.

Regarding standardisation, the Riot-ES project has contributed as an editor in The Internet Engineering Task Force (IETF).



A total of 6 domestic patents were submitted (Republic of Korea), for example, IoT Missing Data Imputation Management and Control in Edge Computing Environment, Method Apparatus for Controlling of Human Behavioral Pattern-

Impact

RIOT-ES project has developed an energy efficiency module, smart mood lamp equipped with environmental sensors, a biosensor module, and EM100 Gateway and improved the object detection module. During the entire duration of the project, two young employees were hired from Kuls company concerning this project.

About Celtic-Plus

Celtic-Plus is an industry-driven European research initiative to define, perform and finance through public and private funding common research projects in the area of telecommunications, new media, future Internet, and applications & services focusing on a new „Smart Connected World“ paradigm. Celtic-Plus is a EUREKA ICT cluster and belongs to the intergovernmental EUREKA network. Celtic-Plus is open to any type of company covering the Celtic-Plus research areas, large industry as well as small companies or universities and research organisations. Even companies outside the EUREKA countries may get some possibilities to join a Celtic-Plus project under certain conditions.

Celtic Office

c/o Eurescom, Wieblinger Weg 19/4

69123 Heidelberg, Germany

Phone: +49 6221 989 0

E-mail: office@celticnext.eu

www.celticnext.eu

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