

日本—EU 国際共同研究「災害初期対応技術」 2021 年度 年次報告書	
研究課題名（和文）	安全かつ効率的な災害初期対応
研究課題名（英文）	First responder Advanced technologies for Safe and efficient Emergency Response (FASTER)
日本側研究代表者氏名	Yuri Adrian Tijerino
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## 1. 日本側の研究実施体制

氏名	所属機関・部局・役職	役割
Yuri Tijerino	Kwansei Gakuin University – Intelligent Blockchain+ Innovation Research Center, Professor/Director	Japan Research Leader

## 2. 日本側研究チームの研究目標及び計画概要

### **ワークパッケージ No. 3 : Requirements, specifications, and system architecture**

- To collect and revise the end-user requirements and the FASTER technical specifications.
- To prepare and define the end-user requirements and the FASTER architecture
- To collaborate with end-users to comprehensively analyze their expectations and formulate them into user requirements and use cases
- To monitor the usability and performance of the tools

### **ワークパッケージ No. 4 : IoT Platform, Wearables, and Social Media Sources**

- To design and implement a robust, resilient, and trustworthy communication

framework for the deployed IoT sensors.

- The provision of a regulatory compliant IoT middleware and devices that enable the transactional model of the FASTER tools in a fast, secure, and reliable manner.
- The definition and provision of system components that enable the transactional model in wearables for humans and K9s.

#### **ワークパッケージ No. 6 : Resilient communication solutions for first responders**

- To provide the design and base implementation of the distributed framework of trust
- To enable resilient communication solutions for first responders.

#### **ワークパッケージ No. 9 : Integration**

- To start integration planning so that the distributed framework of trust can interoperate with other components of the FASTER network in a private, secure, and minimally invasive manner.
- To test in the laboratory environment and validate it for deployment and usage in a real environment.

#### **ワークパッケージ No. 10 : Pilot Demonstration and Evaluation**

- To work with the EU team to design appropriate scenarios that incorporate the distributed network of trust components for demonstrating the FASTER system,
- To demonstrate the capabilities of the distributed network of trust as a component of the FASTER system in pilots that simulate real-life conditions of the work of first responders

#### **ワークパッケージ No. 11 : Dissemination and exploitation**

- To collaborate with the EU counterparts and disseminate the results.
- To deal with the interactive dissemination of the project results in Japan and abroad
- The definition of the Dissemination and Communication channels for the project, including hosting a major event in Japan to disseminate European and Japanese advances
- To accomplish all FASTER task force instructions

### 3. 日本側研究チームの実施概要

The FASTER project had the following requirements for communication between IoT devices:

- Enable real-time encrypted and secure transmission.
- Resilience to low or no Internet connection.
- Support intelligent processing of data streams at the edge level to meet the privacy requirements of the European General Data Protection Regulation (GDPR).

To meet these requirements, the Japan team set out to develop a unique distributed ledger technology (DLT) framework to provide security through decentralization and high performance through scalability. Thus, the team developed from scratch an IoT-oriented DLT, the first of its kind, called AIngle, which offers the

following:

- It has been designed from the ground to support low-powered, resource-limited IoT device communication and interoperation.
- It is the first-of-its-kind semantic DLT, which supports semantic distributed applications (SemDAPPS) to support intelligent M2M and P2P “transactability” in a trustable and secure manner.
- It is based on DAG (Directed Acyclic Graph) architecture that drastically improves transactional reliability and validation times. It also benefits from almost unlimited scalability, i.e. the more nodes, the better the data transmission speed.
- Due to GDPR, data privacy requirements include a data anonymization algorithm (digital twins) that works with AI and Vaticle.
- It includes a data communication system called ACM (Authenticated Crypto Message) that allows customizing the information communication channel, for both DLT storage and real-time streaming of data, without sacrificing security as the information is cryptographically encrypted in both cases.
- Cryptographic security is quantum-safe, which means that it will be secure even after the advent of quantum computers.

That said, during the 2020 fiscal year, the Japanese team emphasized developing the validation frameworks and experiments for the AIngle development (interfacing, interconnection, node creation, and data transmission, among others). At the same time, the requested documents and deliverables were produced. In the third year (2021) the emphasis was placed on the next stage of development: the certification of AIngle with FASTER tools, in the framework of secure intercommunication through a decentralized DLT.

Additionally, the activities during the 2021 fiscal year included, but were not limited to:

- Organization and implementation of the first Japanese pilot experiment, whose main objective was the integration of AIngle with FASTER tools.
  - Convening 4 European partners (UNIWA, ENG, CERTH, and CS) and 4 Japanese partners (Tohoku University, SANDA, Japan Rescue Association, and Tarumi Fire Station) in the Japanese pilot.
  - Creation of open online installation manuals (GitHub).
  - Creation of AIngle technical documentation
  - The integration process, flow, technical calls, etc of the following tools:
  - MORSE (UniWA) - Lite Integration through AIngle-Kafka.
  - CoP (ENG) - Lite Integration through AIngle-Kafka
  - 2DMapping and AI analysis (CERTH) - Lite Integration through AIngle-Kafka
  - AR Tool for operational support (CS) - Lite Integration through AIngle-Kafka
  - DogSuit (Tohoku University) - Deep Integration
- Organizing and holding the public online (originally planned to be held on-site) event called: The First EU-Japan Symposium on Advanced Technologies for First Responders (<https://www.faster-project.eu/japansym/>), which was held in conjunction with the annual CERIS event (<https://www.cmine.eu/events/73793>):