

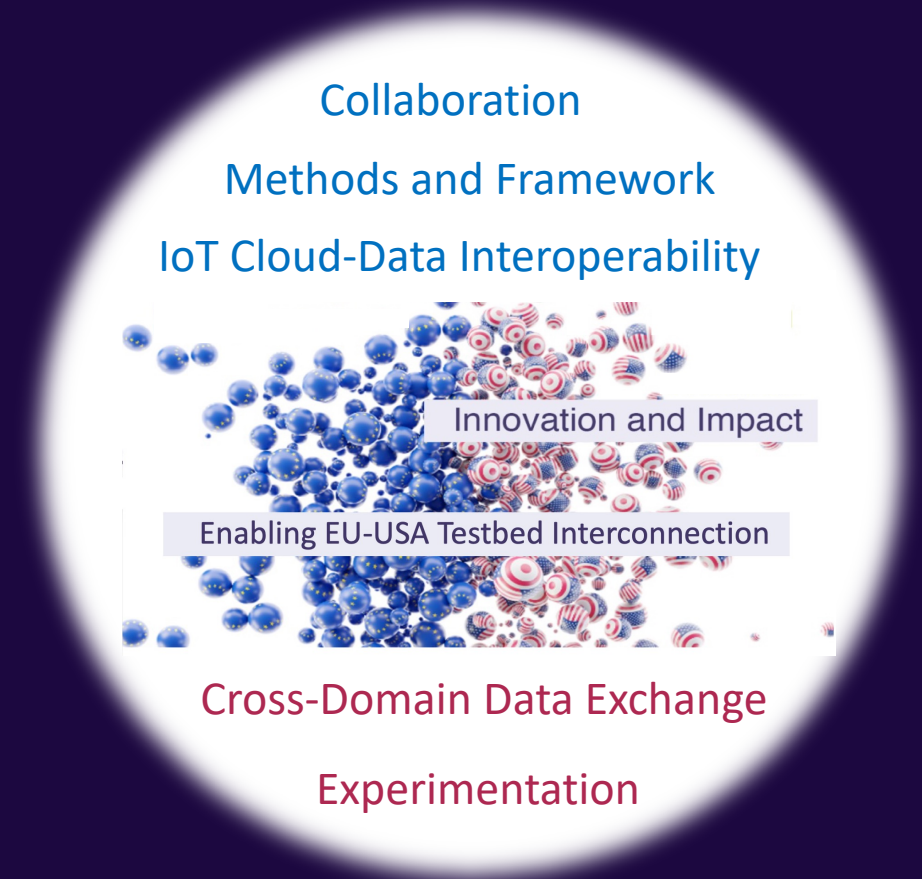


Alliance for IoT
and Edge Computing
Innovation

AIOTI AWARD 2023 – 10/10/2023

The use of IoT Cloud-Data in data exchange and semantic interoperability experiments

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Background and Aims

The Internet of Things (research and/or industrial application area) has matured over the last 20 years,

IoT is today **supporting end user applications** using the **collected data, mostly stored cloud data** from the devices connected over the Internet – advances are ongoing **exploring Edge-IoT Capabilities**

IoT **systems interoperability** are gradually demonstrating the benefits and impacts in society.

The use of IoT & Big Data Data to enhance Data Exchange and Interoperability

- *Combine the use of continuous data streams and data stored in cloud-based systems.*
- *Data processing systems evolution to facilitate big data processing and storage at the edge,*
- *Provide a standard methodology and methods to classify, identify and access large IoT quality data.*

IoT Cloud-Data Experiments

cross-Border experiments for Open data
testbedS interconnection
for Atlantic Interoperability



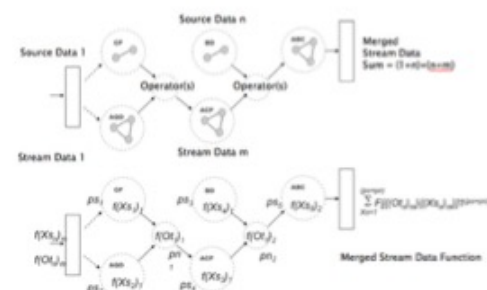
Bridging EU-US
— research on **NEXT
GENERATION
INTERNET**

IoT benefits and impacts are considered crucial in the process to define the Next Generation of the Internet of Things Applications and Systems (NG-IoT) which should not only collect large amounts of data, but also **combine the use of continuous data streams, processing at the edge of devices and store the data securely in cloud-based systems.**

Challenges

There is yet a number of challenges that remains open in the IoT Domain Area

They can be summarised in the capacity for sharing and/or exchange of large amount of IoT data (IoT Cloud Data) - both data series and/or data streaming forms.



There is a large demand of such type of applications.

It is clear that such methods can benefit not only IoT industrial community but also other communities

There is a need to innovate the way IoT Cloud data is shared but also enabling the knowledge transfer between data sets processed at the cloud or at the edge.

“It is clear that the resolution of the following challenges are very relevant for academia and industry and other interested particular stakeholders, i.e. smart city, energy management, digital transformation, etc.”



Solution or methods

The solution proposed rely on:

The demonstration that semantic technologies and the use of statistical methods are a viable alternative for solving the challenge on data exchange and interoperability

The definition of a framework (Standard-way) or enabler for establishing new methodologies for processing large amount of data and increasing

The large impact as result of cooperation between EU and USA Partners to enable exchange of knowledge and improve the scientific novelty and quality of experimental results.



Data-Driven Experiments

- Graph Data Modelling using Formal Methods representation
- Multi-Stream Mashups Data Builder
- Multiple Query Processor for Live Real World Linked Data

Resilient Cross-Domain Experiments

- Data Acquisition & Transformations
- Data Accessing, Analytic Tools & Representations
- Distributed Multi-Cloud Cloud Processing



The uniqueness of the proposed solution for the “research AIOTI award category” rely in the implemented semantic-driven solution and the use of statistical methods over real data for exchange as part of the execution of semantic interoperability experiments performed in the context of real experiments performed over 10 months during March to December 2022 in the NGI-Atlantic international program between EU and the USA,

The IoT academic and industrial communities testify the outcomes and results at the last AIOTI Signature and Showcase Event in September 2022 in Brussels at the Expo Room where results and a demonstrator were presented to the attendees ans thus submitted for this AIOTI Award-Research category.

Benefits or results

The specification of new holistic method for data discovery, accessing and classification and its application over large heterogeneous data sources to accelerate the process of creating the multi-source data IoT Cloud Data scenarios for validation purposes.

The publication of the H-KPI Framework as technical report an open access document published by the National institute for Standard and Technology (NIST) - Standards

The experiments with unified access interfaces and tools that enable the accessibility to data sets to build and explore the H-KPI framework

(<https://bons-ai.web.app/h-kpi-explorer>).

The Experimentation by using the H-KPI framework which published at the NIST DOI public repository <https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1900-206-upd1.pdf>

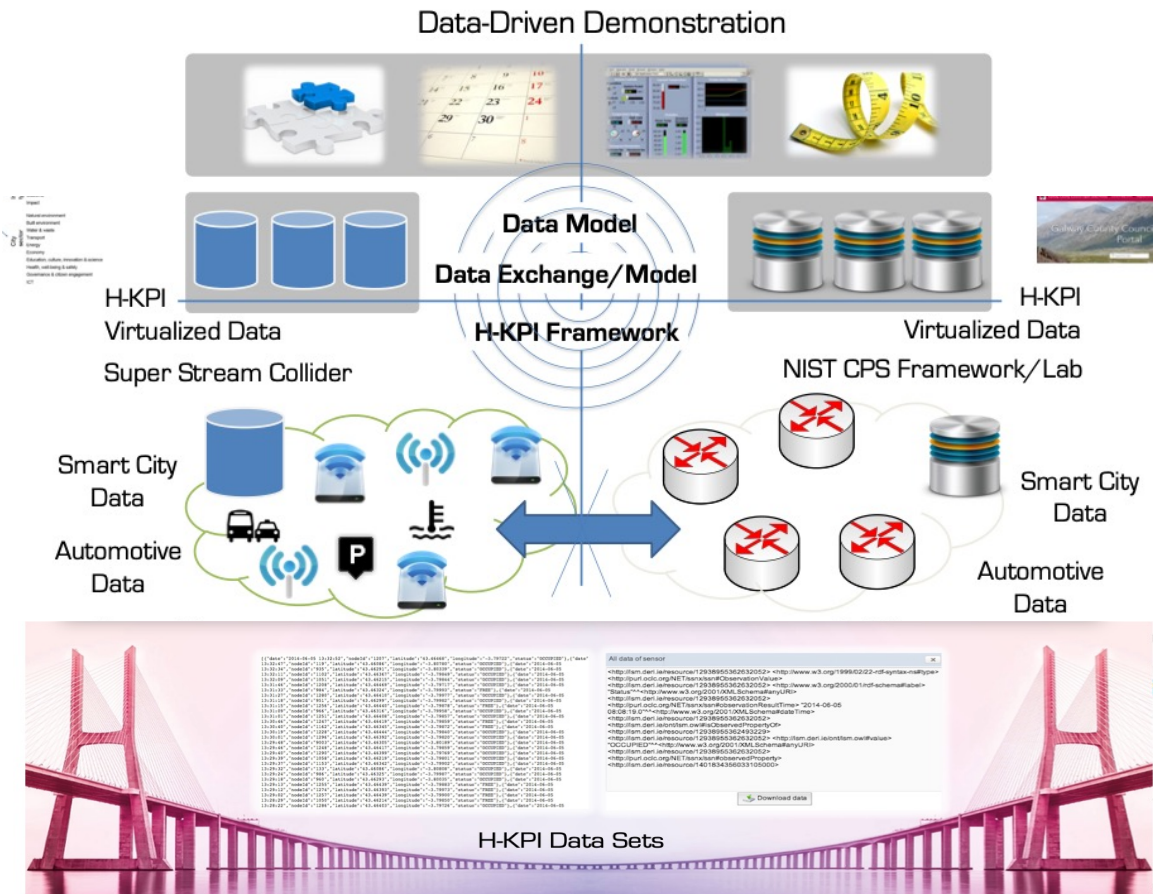
Two partners, one from USA at the National Institute for Standards and Technology (NIST) – Department of Commerce US Government and the second one from EU at the University of Galway in Ireland (Leaders in Semantic Interoperability).



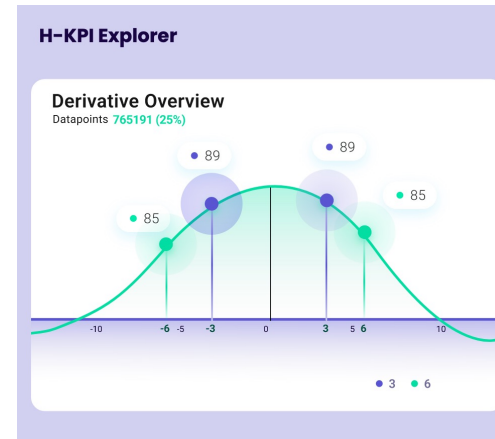
This data interoperability cross-domain data using a multi-stream largely-distributed data management objective was demonstrated at the AIOTI show room at the AIOTI Signature Event in Brussels – Sept 2022 where features on multi-domain collected data processing, for example IoT data services provisioning, and distributed data collection running interconnected data servers were showcased and demonstrated to the AIOTI Community.

Conclusions

The outcomes of the H-KPI framework and the use of Formal Statistical Methods in IoT Cloud-Data experiments serves as a blueprint for further studies on Large amount of data processing and as validation of the Next Generation of IoT data applications.

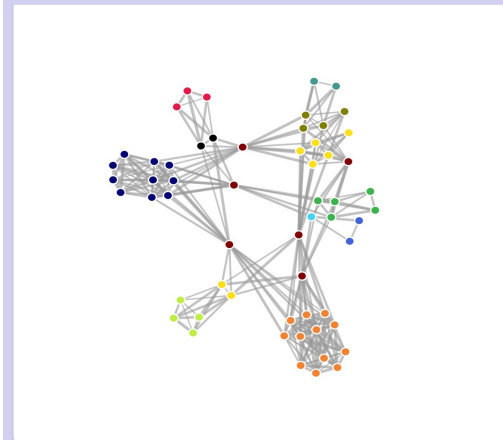
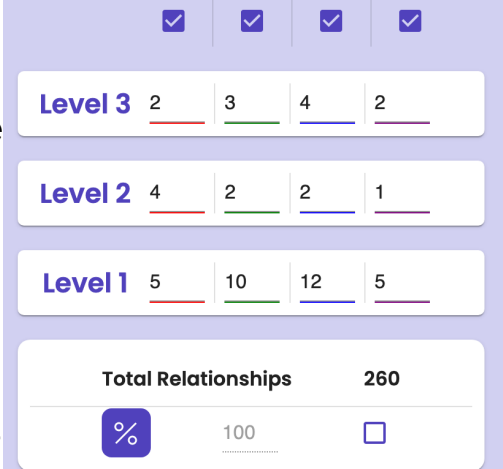


The use of formal methods to quantify IoT cloud-data using data sets to experiment the methods proposed as linked data, and semantic web technologies (W3C) and the holistic Methods (EU-USA H-KPI NGI Explorer) provides a way for demonstration of the data management features for access, search and discovery over large IoT Cloud-Data sources



H-KPI Builder

Indicate the number of identified KPIs in each level according to the H-KPI framework specification and the number of systems in each column; if there is no available KPI, indicate by adding the number "0."



The Graph above indicates the number of data points identified at level 1 to level 3 according to the number of systems defined per column. Each color represents a different set of data points

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Thank you



...Working in collaboration to build standards.