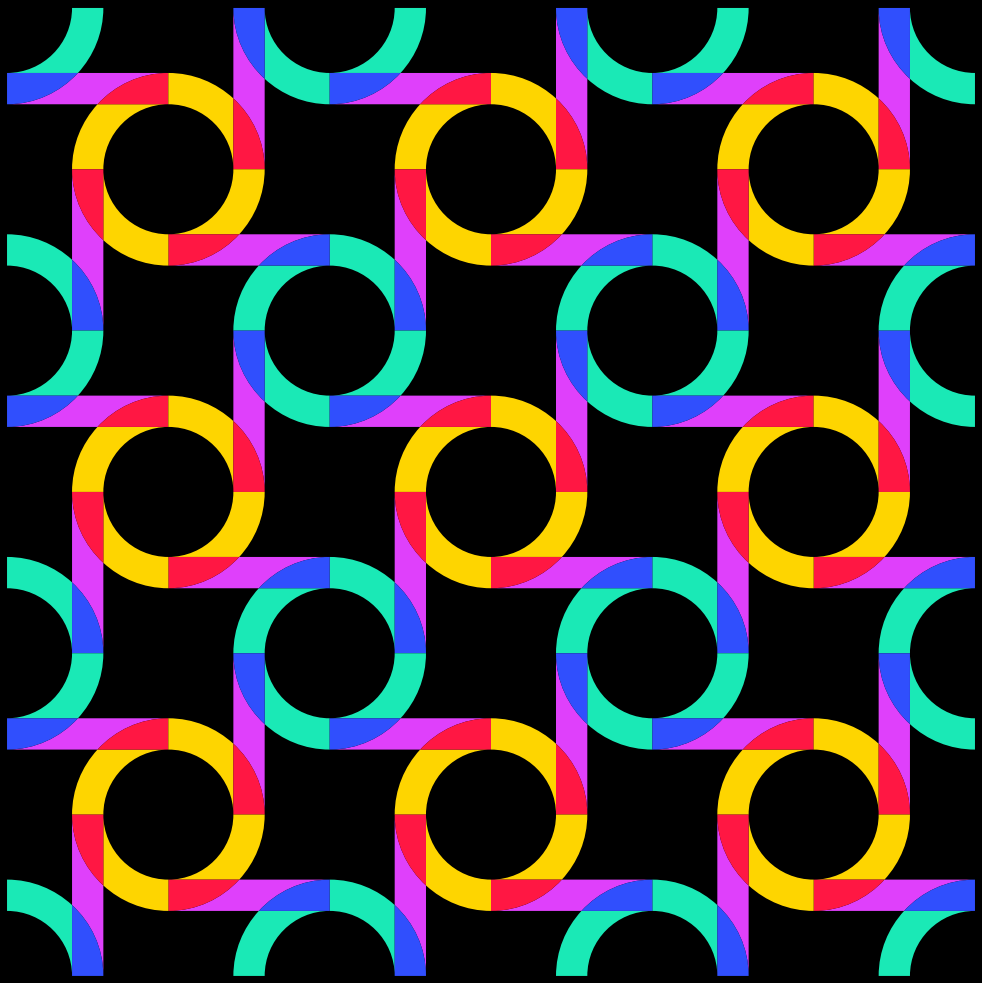
i4Trust



TUDD2

Trust ur data center data

Dataspaces for sustainable & transparent cloud infrastructure

i4Trust – Data Spaces for effective and trusted data sharing

www.i4trust.org

Smart Environment

TUDD - Trust ur data center data

Dataspaces for sustainable & transparent cloud infrastructure

The data centre's operation cost directly impacts the cost of the cloud services. Optimised and fine-turned data centres are managed remotely and are even unmanned. To enable effective remote management, real-time and accurate operational information from the data centre is needed. Data centre's operational data is business-critical and very confidential and there should be a very high level of trust needed to exchange and share the data.

With the contribution of:

Contrasec

Profirator

Luolakallio

DigiCenterNS

Challenge & Context

Data centres, which are powering the cloud Infrastructure are constantly under pressure to optimise the operational costs and be more sustainable. At the same time, customers are demanding more transparency about the operations. The major cost of running the data centres is the environmental control around the infrastructure which the data centre hosts. Due to the electricity price increase in recent times, data centres are compelled to optimise costs and find an alternative way to save energy costs. Our experiment members are Finnish data centres operating in Finland that have the advantage of using natural cooling most of the time of year. Still, it comes with the challenges of controlling various aspects like airflow, humidity, etc. Most data centres are in remote locations due to cost reasons and are potentially unmanned, and operations are controlled remotely.

Small and medium-sized data centres come together to enable centralised remote monitoring for facility, operation, and energy management in order to optimise their costs. Sharing the operational information about data centres becomes essential to monitor and control the operations and enable appropriate environmental control around the infrastructure.

Traditionally the data has been handled via reports, emails, and other means. Digitalisation does not mean having an excel in an email anymore, there is a need to have a way and process to share information in real-time, relevant to various parties and in a trusted manner. Also, there is an increasing amount of information coming from server equipment and sensors, and data centre operators are increasingly utilising this information to optimise operations to reduce energy consumption. The operational data is often in various formats, utilising different data models and not necessarily available via APIs, which makes the utilisation of that data difficult. There is no unified way to offer data centre operational data digitally and conveniently. This operational data is often confidential and business-critical in nature. Data centre operators and owners are reluctant to share data as they fear that critical information about their capacity, or their operations will be leaked.

One of our experiment members, Luolakallio, has established its data centre operations in an ex-military cave which used to be a nuclear bunker with EMP-proof. The fact that the data centre is in a cave makes environmental monitoring particularly difficult. A FIWARE-based platform was deployed in 2020 to monitor and control the temperature, airflow, humidity, and other metrics needed for the operations. Luolakallio is a vendor of Contrasec that is also a member of our experiment. Contrasec uses Luolakallio's capacity for redundancy and balancing between its data centres and Luolakallio. Luolakallio also outsourced the remote operations of its data centre to Contrasec so it needs to share the required data with Contrasec to enable the remote operations.

Not only for remote management, Luolakallio and Contrasec need to share information with their customers about the status of their services, capacity, redundancy, and availability. Their customers typically have sophisticated IT infrastructure and prefer to have the possibility for integrations instead of reporting via other means. This creates another challenge, the data which needs to be shared should be different for different stakeholders. There is also a recognised need to provide easy-to-access dashboards for Luolakallio's and Contrasec's operational teams to create immediate situational awareness.

Operational efficiency and data-driven decision-making when planning facility management operations are essential for data centres. Operational efficiency means reduced carbon emissions; data centres will benefit from this. According to the International Energy Agency (IEA), [1], data centres accounted for 300 metric tons of CO2e in 2020, equivalent to 0.6% of overall GHG emissions or 0.9% of energy-related GHG emissions.

Solution

Even when the problems have been recognised, solving them is not a trivial task. Agreeing on ways of working and how to proceed always takes time and buy-in from the stakeholders, which means Governance. The unified approach of i4Trust breaks down these barriers. It enables data sharing by delivering a set of standard-based open-source technology building blocks and legal frameworks enabling the creation of data spaces and enabling easy Governance.

The TUDD project aims to provide a way of sharing the data centre operational data for the remote operations, customers of the data centre and owners. This is the core goal, but the solution has additional benefits. We are unifying how data is stored and distributed; data is now stored to NGSI-LD context broker in standard data models and available via NGSI-LD API.

The most prominent and easy to access part of the solution is the "portal" where different operators can access the data they are authorized for.

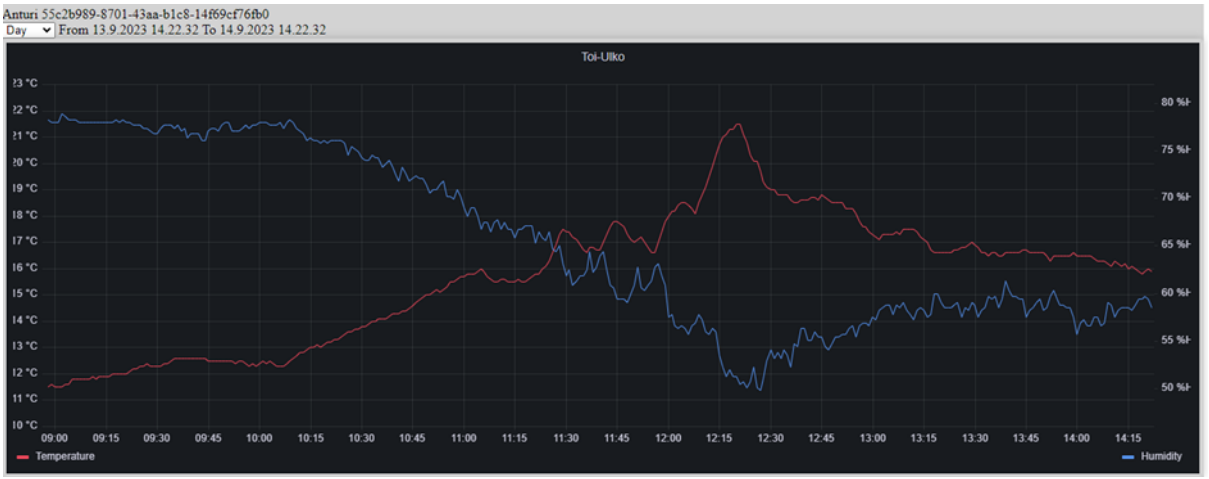


Figure 1 – Sample data on the portal

One of our implementation partners is Luolakallio, the data provider in our data space. Luolakallio's team has been deploying additional sensors to bring more data points to the new NGSI-LD based system. Luolakallio's team will also decide which data can be shared with Contrasec and what data could be opened to 3rd party customers of Contrasec.

Contrasec is our implementation partner, who is a customer of Luolakallio. Contrasec will create more data sources with its team. Contrasec will provide all the inputs to Profirator to understand the specifics of the data they need from Luolakallio. The data from Contrasec's system can be made available to 3rd party customers.

Profirator has deployed and maintained the FIWARE-based platforms to monitor and control the operations of the data centres of Luolakallio and Contrasec. Profirator is a service provider for Luolakallio and Contrasec for the experiment and has been the main driver when implementing the i4Trust technology-based solution, which enables data sharing between them using i4Trust architecture.

DigiCenterNS - Our DIH, led by Savonia University of Applied Sciences ("Savonia"), supports implementation partner companies in their digital transformation journey by providing services that improve digital skills, foster technology development and testing, increase networking of companies and mentor business cases. Employees of our DIH have 20 years of experience in technology, innovation management and leadership positions (for example, as

a CEO in the software, IT service and telecommunication industry), having experience and knowledge from B2B data sharing. DigiCenterNS has been a great partner, as they have experience in the previous round of the i4Trust experiment.

By delivering this solution to our customers, we want to:

- Reduce the time to access the data via standard APIs and operational models.
- Reduce the effort to access the data via dashboard view.
- Improve security via trusted and uniform data space framework.
- Improve data quality via utilisation of standard data models.

How it works

Experiment stakeholders have existing business relationships, which Figure 2 demonstrates between different stakeholders.

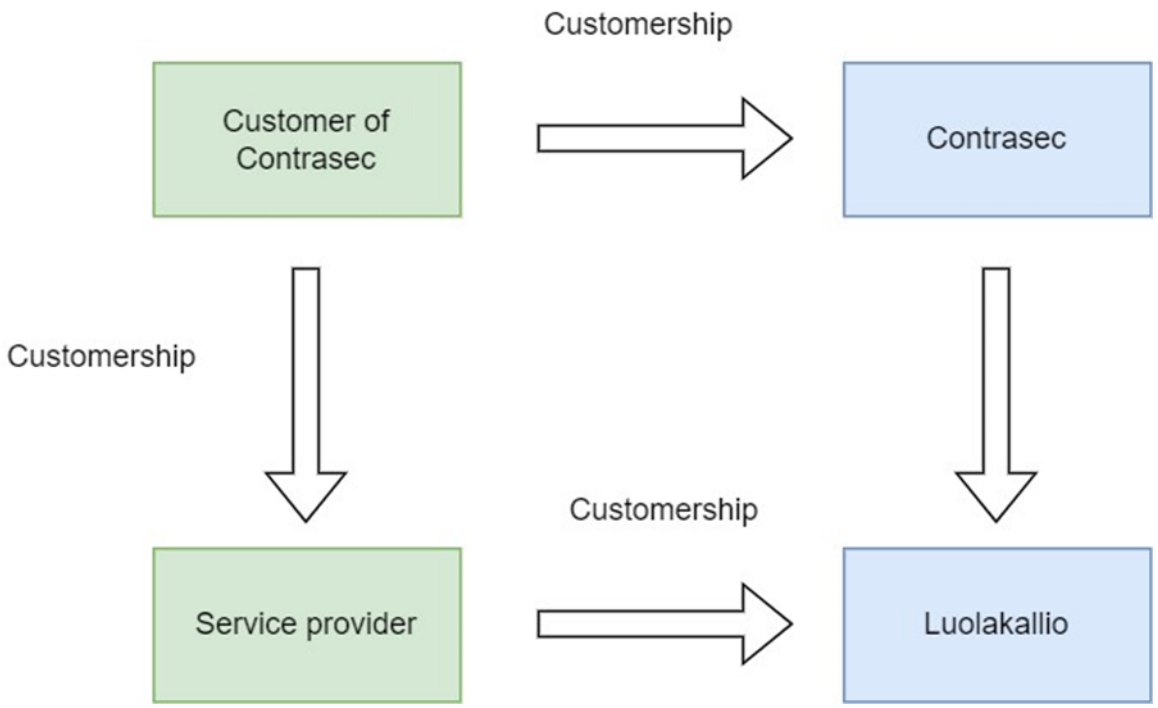


Figure 2 – business interactions between stakeholders.

TUDD2 has established different roles for the actors in the data space derived from the i4Trust structure for the i4Trust experiment: the operating entity as Profirator, which runs all the Dataspaces-related infrastructure for Luolakallio. Luolakallio is the data provider for other actors and entities. Contrasec has both roles, it's the data provider for its customers but a data consumer simultaneously.

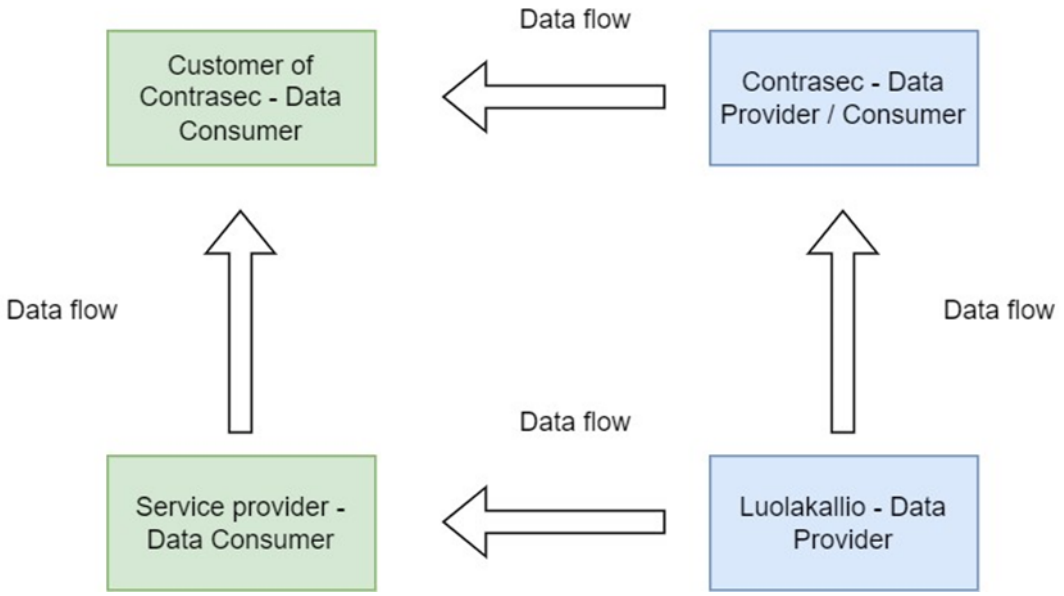


Figure 3 – roles in Data Space.

The data models used in the system are based on FIWARE's standard data models and are linked data through the NGSI-LD specifications. To ensure security and accessibility, iSHARE integration and the Satellite Service validate access, authorise user accounts, and manage policies. The rules for the access are in the Authorization registry, and access to that is restricted to Luolakallio's personnel.

Data is being connected via various sensors or from the data centre equipment itself. As the sensors are of various origins, they have different protocols. Transformation is needed, and for this, we use Node-RED. Node-RED is a low-code, no-code tool which allows rapid development even for those who do not have years of coding experience.

From Node-RED, standardised data is fed to the Stellion NGSI-LD context broker, which stores it in the PostgreSQL database. Grafana is used to pick the data from the PostgreSQL database for analytics. Kong, iSHARE infra and Keyrock form the Data Space layer. Stellio also includes the information that can be shown as Grafana charts. The portal UI was developed during the experiment. Kong is a PEP proxy and will filter the charts requested by the Portal UI based on the rules of the Authorization Registry in the Keyrock.

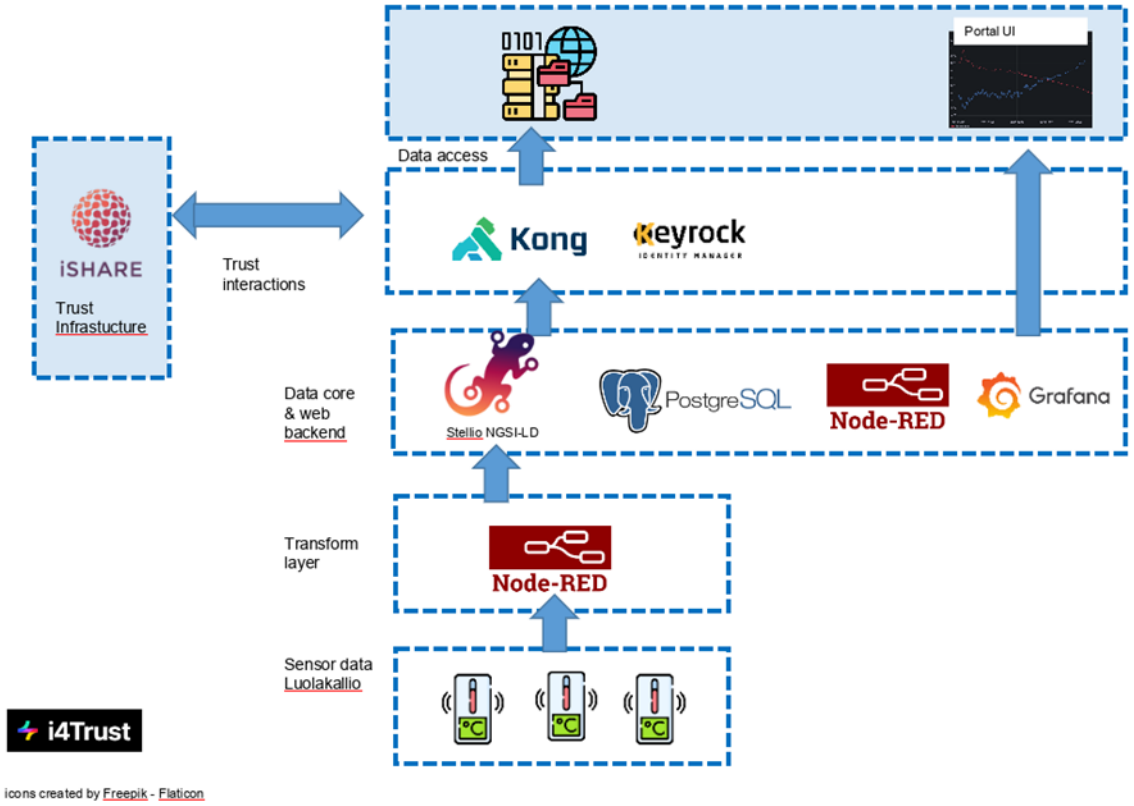


Figure 4 – Architecture diagram

We have learned a lot during the experiment execution. Some learnings are technical; we picked the Node-RED as the website backend. The reasoning for this was that we generally want to consolidate the tool base we use. However, we discovered during project execution that this is not a flexible choice, making some feature development cumbersome. Initially, we wanted to use Grafana's functionality as much. Grafana is the de facto analytics tool in the open-source space, and it has a rich functionality set and a great plugin library. We executed security tests and discovered that some of the functionality we intended to use

opens up a security hole in the system. Given these learnings, we consider redoing the Portal UI with other technology stacks.

As positive learnings, we all got a good dose of Data Space technology priming. The interactions are complex, but once you get the hang of it, you'll appreciate the architecture's intricate beauty.

Benefits & Impact

TUDD is essentially a B2B solution which allows Data Space stakeholders to transfer information in a trusted manner.

The most visible and easy-to-start-with part is the Portal UI. This allows easy access to the particular data a stakeholder is interested in. Currently, it's data centre operational data as analytics, but there can be other additional services in the future.

This work has allowed the data centre operators to streamline their operations using the same data models and ease remote monitoring and control. Real-time information allows the data centre operative personnel to make data-driven decisions and develop more streamlined operational models. This solution is essential to the project stakeholders since they can optimise their operations using the newly available data.

Some optimisation is already done in many cases, but there are areas where this newly collected data can help. Estimated savings on the operational side (mainly electricity) are expected to be more than 5%.

We are currently at the end of the experimentation period and planning pilot production with our customers. Once taken into operational use, the streamlined data sharing will help reduce costs by enabling data centre customers to automate certain operations, like alerting, based on the triggers coming from the data.

All SMEs in this experiment can leverage these benefits to increase their sales. Not having digital services like TUDD in place can be a blocker for market entry in some cases. Hyperscalers, like AWS, have APIs readily available for consumption, and mid-tier has been following the same route. Different

companies in the experiment have different profiles. We think that the biggest immediate benefactor in our experiment consortium is Profirator. Profirator is an orchestrator which can apply Data Space technology to other domains, like Mobility, Industrial IoT and Smart Cities. It is reasonable to expect 30% growth in this market segment.

Added value through i4Trust

The i4trust experience has been great so far. The mentors are really supportive when ever we have questions to ask asn there is a general good spirit around the experiment. Opportunities wise, this has given us a key to open a few doors. Data spaces are an emerging topic and there is a lot of hype about it. Whenever we mention that we are engaged in a Data Spaces program, it usually stimulates a good conversation.

Our experiment has different stakeholders with different profiles. Contrasec and Luolakallio are data center capacity providers. Their interest lies in improving their internal processes and developing better and new services for their customers. Profirator is an integrator and technology provider at heart. For Profirator it is faster to turn the data space angle into money, and Profirator is currently engaged in discussion with a few Finnish and German cities on how to take the data space work forward.

The i4Trust work is also integrated into the ODALA project by Contrasec.

Peeling back the layers of the TUDD dashboard for data center customers, which is the visible side, allows us to examine the mechanisms that are behind the true value of i4Trust. The value comes mostly from standardisation: standard APIs, data models, contracting and so on. There is no need for custom solutions and integrations, follow the rules of the data space, and things are simple from there on in.

I4Trust is the right tech choice, since it’s forward looking. The problems i4Trust is solving are already solved, but not in such a holistic manner. In a world driven by rapid advancements, i4Trust emerges as a beacon of sustainable progress. Its multifaceted approach not only solves immediate challenges but also lays the foundation for a more interconnected, data-driven future.

Next steps

As next steps, we are piloting the solution with our customers during Q4/2023 – Q1/2024.

In general, we keep on improving on the product. We are working with our AI partner, Qualetics, on integrating anomaly detection and predicting events. This work has just started, and we plan to see the first results in the Q4 of 2023. It will be exciting to be able to see into the future.

We have a clear vision for the product and are happy to receive feedback. This is important so we can deliver solutions that solve a problem for our customers or improve the internal efficiency of the data centre stakeholders. Working with our customers is one of our key priorities.

One of the most profound value-adds brought forth by i4Trust is the empowerment it provides to businesses. The project propels enterprises into a new realm of efficiency and adaptability by streamlining data sharing and enhancing interoperability. The possibilities are endless, from optimising operational processes to enabling data-driven decisions that underpin growth. We are most excited to take the fruits of the experiment and push forward.

References

- https://8billiontrees.com/carbon-offsets-credits/carbon-ecological-footprint-calculators/carbon-footprint-of-data-centers/

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Categories

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Do you have questions or want to know more?

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