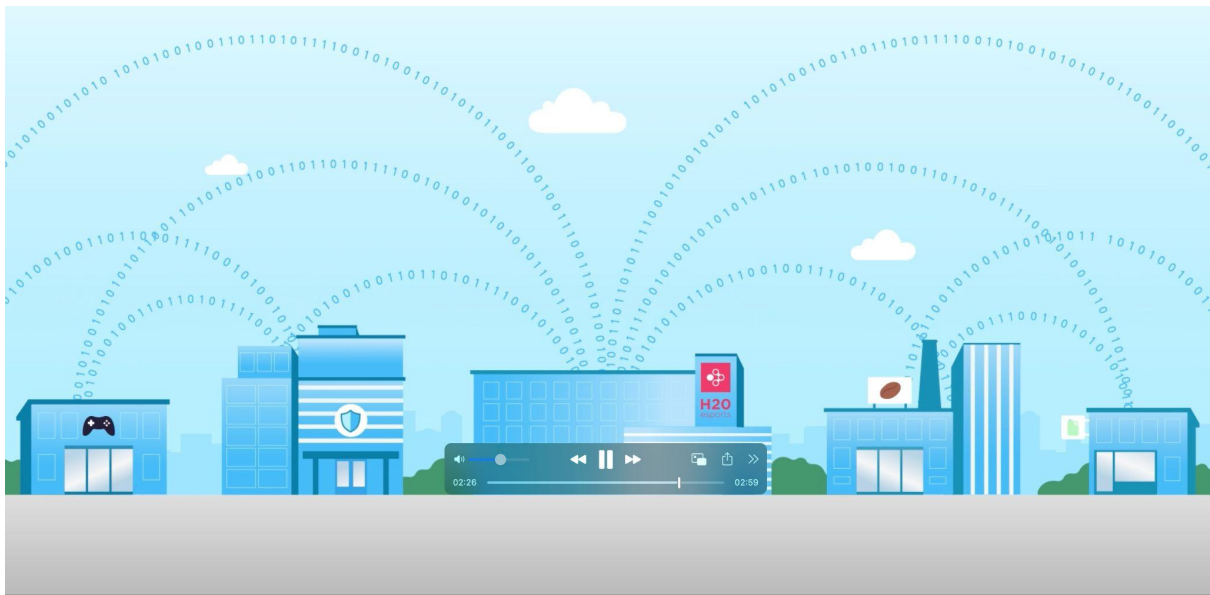


AMdEX

Sharing sensitive sensor data from building
and public spaces



Smart City, Smart Building

Sharing sensitive sensor data from building and public spaces

With the contribution of:



Amsterdam Data Science

(DIH) [data consumer]



Life Electronic

[Data Provider]



Tapp

[Data intermediary / policy
onboarding]



Facility Apps

[Data provider / building owner /
Data consumer]



Luminis

[Data provider / service provider]



KPN

[intermediary / infrastructure
service provider]



University of Amsterdam

[Policy component provider]



Dexes

[Trust provider AMdEX / iSHARE,
dataspace provider]



Textinfo

Dexes supplier [data exchange
component provider]



ARGU

Dexes supplier [data exchange
component provider]

Challenge & Context

Parties started the I4trust challenge in Januari 2023. Read more here:
<https://i4trust.org/experiments/sharing-sensitive-smart-building-data-on-amd-ex/>

[H20 eSports Campus](#) is a smart building near Amsterdam. The private owner equipped it with 114 sensors that collect data related to facility management. [KPN's](#) infrastructure enables this innovative entrepreneur to collect and share this data reliably with his business partners. [AMdEX](#) ensures the data is exchanged between trusted parties only.

H20 eSports Campus in Purmerend (near Amsterdam) is an event location for businesses and private parties. The owner has equipped the building with 114 sensors that collect data on the use and occupation of the building's facilities. What is the level of human occupation throughout the day? Do people have a

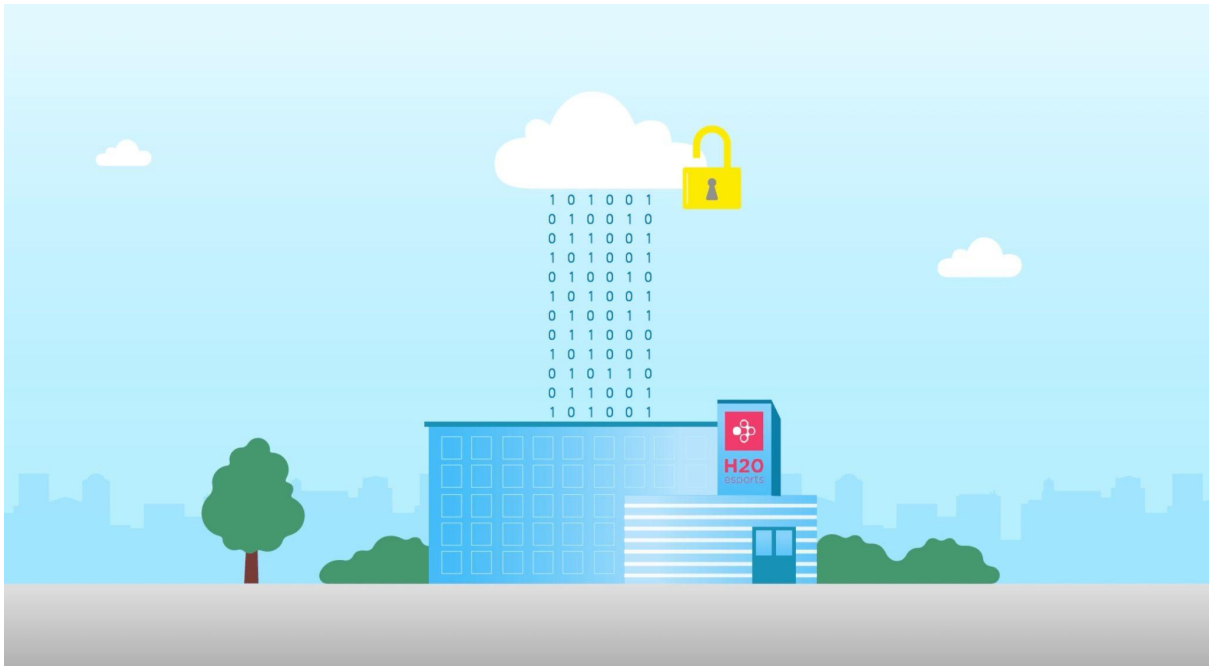
preference for specific elevators? Which toilet areas are used most frequently? How full are bins and soap dispensers? These data can be of great interest to cleaning companies and facility managers, to plan their work more efficiently and cost effectively. Unoccupied areas do not need to be cleaned as frequently as busy ones. The entrepreneur reached out to AMdEX via the [Dutch Data Sharing Coalition](#) with the question of how to disclose his data to his business partners in a safe and trustworthy manner.

For AMdEX, the question from eSports Campus came at exactly the right time. The field lab in the Marineterrein in Amsterdam has proven that users can share or trade public data in a trusted environment, when they agree beforehand on the same terms and conditions. The challenge is how AMdEX can scale the solution. “We were ready for a more complicated case,” says Hayo Schreijer, managing director of [Dexes](#), one of the founding partners of AMdEX. “The case at eSports Campus is a mix of private and public data, collected in a private space and to be shared over the Internet.”

The challenge we approached in the i4Trust project for AMdEX is to use the components provided by iSHARE and FIWARE to scale the solution for Marineterrein. The eSports Campus has a lot more parties involved. The i4Trust experiment could show how AMdEX can be used as an authority provider to reduce the legal, organisational and technical hassle to share sensitive sensor data.

Solution

The solution described from a user viewpoint. The solution is close to the initial challenge description. After analysing the business opportunities we focussed not only on the App for cleaning companies but also on the tenants of the building that contains the sensors.



Step 1: a building owner wants to make the tenants happy by providing a liveable office space. Good quality facility services like cleaning, coffee, security and meeting rooms are important. The building owner is familiar with the value that data can bring to improve the quality of facility services. His building has been built with a lot of sensors in the right places: rest rooms, meetingrooms, coffee machines have sensors that provide data on occupancy, use of facilities and status of equipment. But how to make this data available to facility providers? And what about the privacy protection of the tenants? And how do you arrange the access to data in a legal sound way without compromising sovereignty and control?

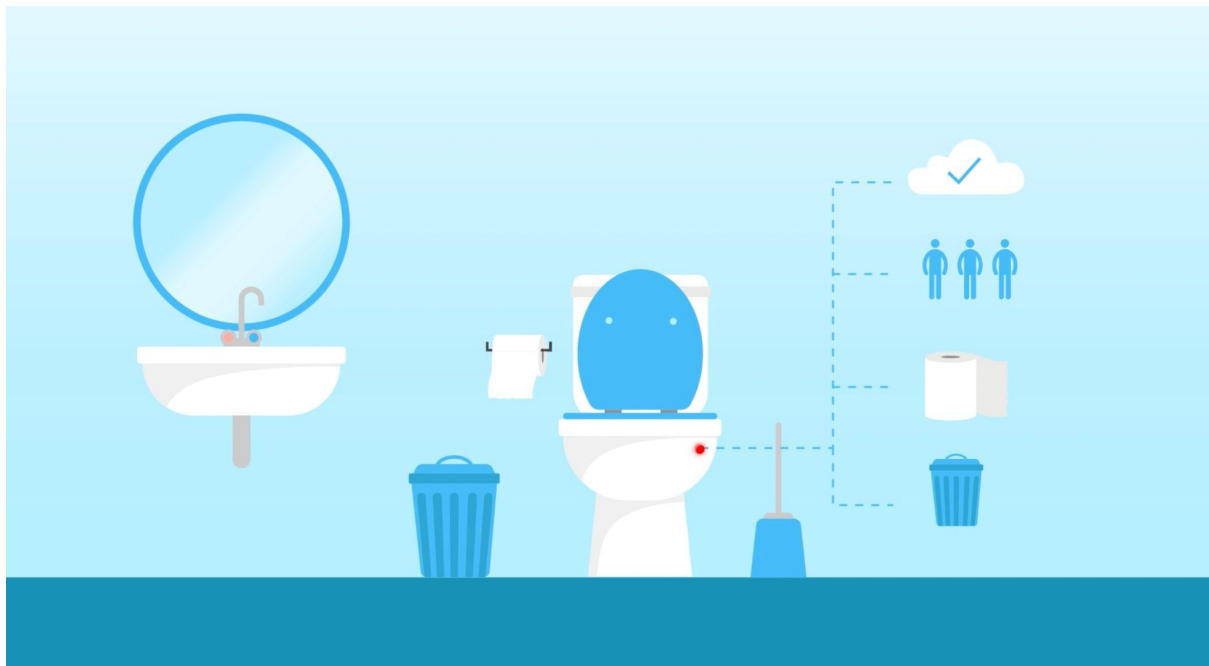


Illustration: The rest rooms are full of sensors.

Step 2: The building owner comes into contact with a cleaning company that offers a “data driven” cleaning service. The cleaning company uses software and Apps made by [Facility Apps](#). Facility Apps is a data platform provider that collects data from various sensors in buildings and that makes applications that collect data and make planning decisions for facility providers like the cleaning company. The building owner likes this innovative approach and sees the value it can deliver to improve the efficiency and effectiveness of the facility services in the building.

Step 3: The building owner accepts the offer of the cleaning company. Both the cleaning company and the building owner join the “Smart Building dataspace” provided by the neutral organisation AMdEX. The parties agree on a set of policies that are stored in the authorisation registry of AMdEX.

Step 4: onboarding and setup: the various sensors are connected to the Data Service Hub (a scalable data connectivity infrastructure, [video explainer in Dutch](#)) which is provided by the connectivity partner [KPN](#). 5g and IoT connections are set up where needed. Partner Luminis sets up a data platform to collect data sources and transform various streams to a standardised data stream. Partner Facility Apps connects the App to these i4Trust enabled datastreams. The Luminis data platform is FIWARE and iSHARE enabled. The App uses NGSI-LD to fetch datastreams from the Luminis context broker.

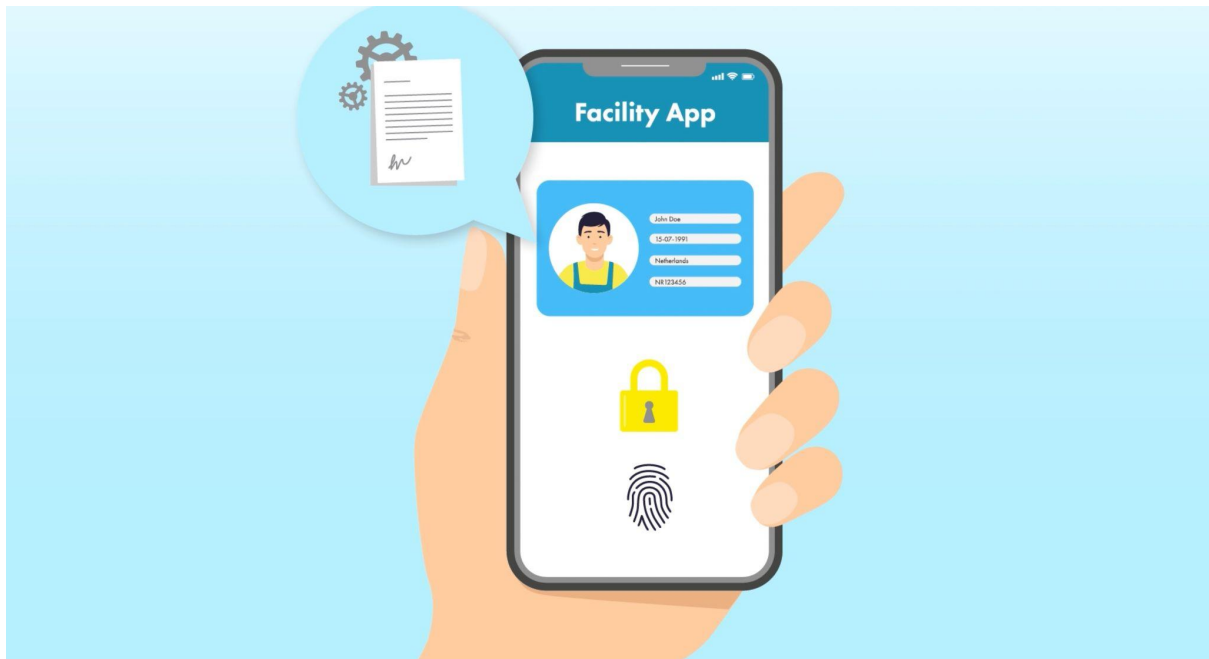
Step 5: On the Luminis Authority provider (hosted on KPN infrastructure) a set of policies are made to reflect the agreement between parties to give access to the specific data streams. The policies are stored in the AMdEX policy store.



Illustration: a man and machine readable version of a policy is stored in the AMdEX policy store.

Step 6. delegation in the policies is a “delegation policy” for the cleaning companies personnel included, so any person that can identify as an authenticated user in the cleaning company directory, can start a request for access to the datastream from the Facility Apps App.

Step 7: Beginning of a working day. As soon as a cleaning person starts up the app and confirms the building, the App is redirected to the context broker providing the datasteam for the specific building. The person needs to identify and then iSHARE is called to confirm membership and provide the necessary tokens.



Step 8: As soon as iSHARE provides a valid token, the context broker checks authorisations and gives access to the datastreams based on the valid policies for the cleaning company that the cleaning person represents. The app loads all available and relevant streams in real time and provides an overview of the work that needs to be done.

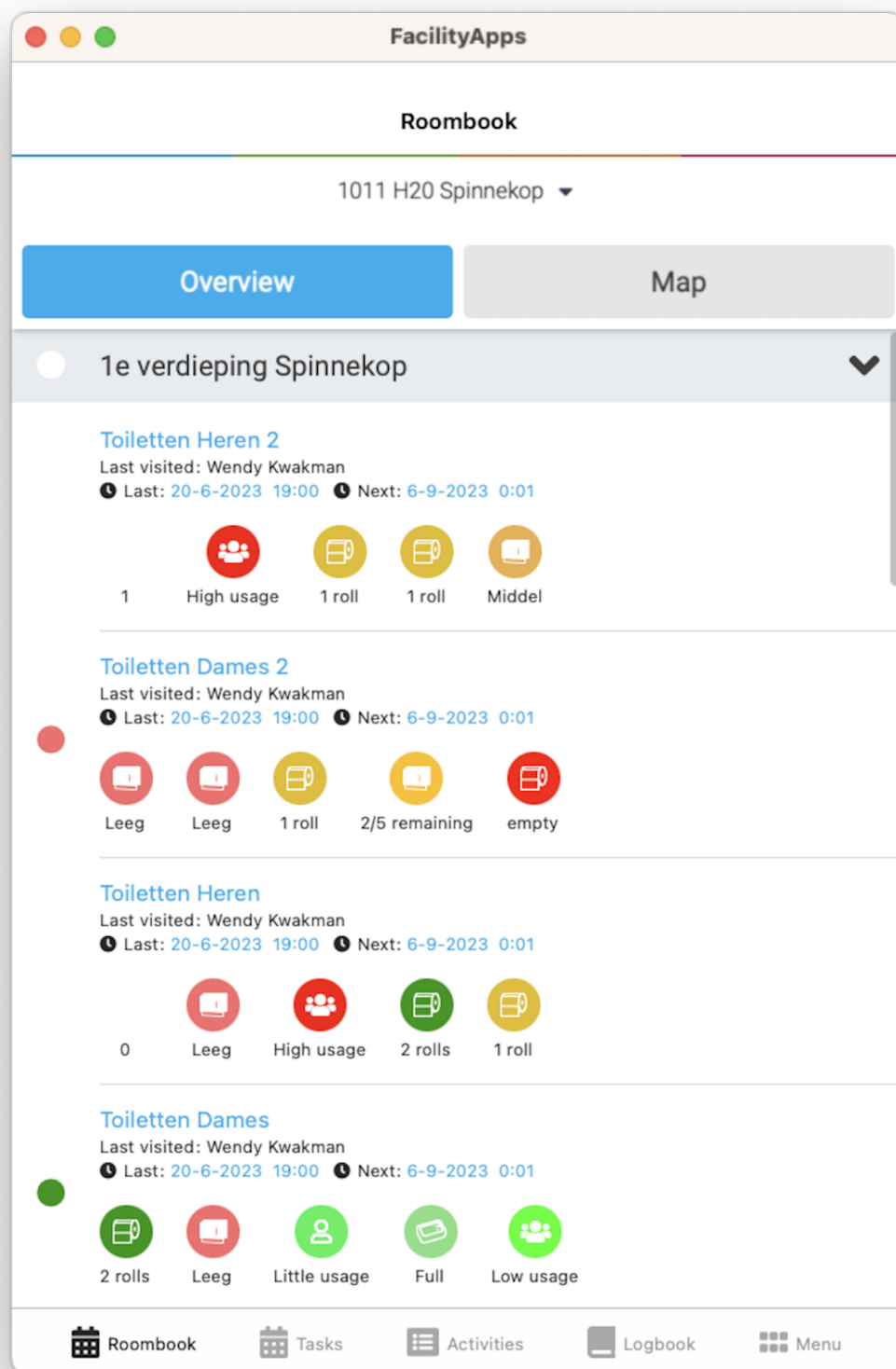
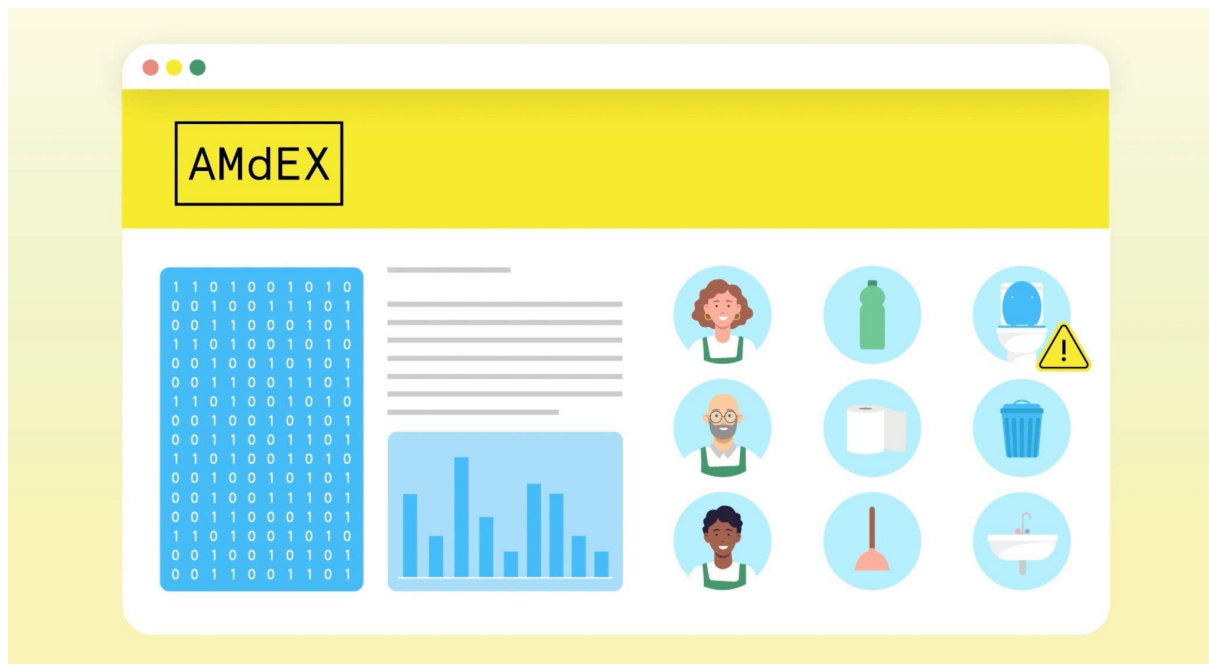


Illustration: the Facility App showing where cleaning action is needed.

This way the cleaning person can get access to an updated work planning, as long as the person is authenticated by the cleaning company and the company has a valid 'permit' policy at AMdEX for accessing the buildings sensor data. As soon as the person is removed from the Cleaning companies authentication system or the contract with the cleaning company ends, there is no access to the sensors of the building anymore.



The way the solution works for the user is described in the video we made for the experiment:

<https://www.youtube.com/watch?v=w9Tveykzdn8>

How it works

We created a “smart building dataspace” where data coming from the eSports building and the Marineterrein public space is visible. The dataspace shows the endpoints for the various datasources. This the “data market” or catalogue function in the dataspace.

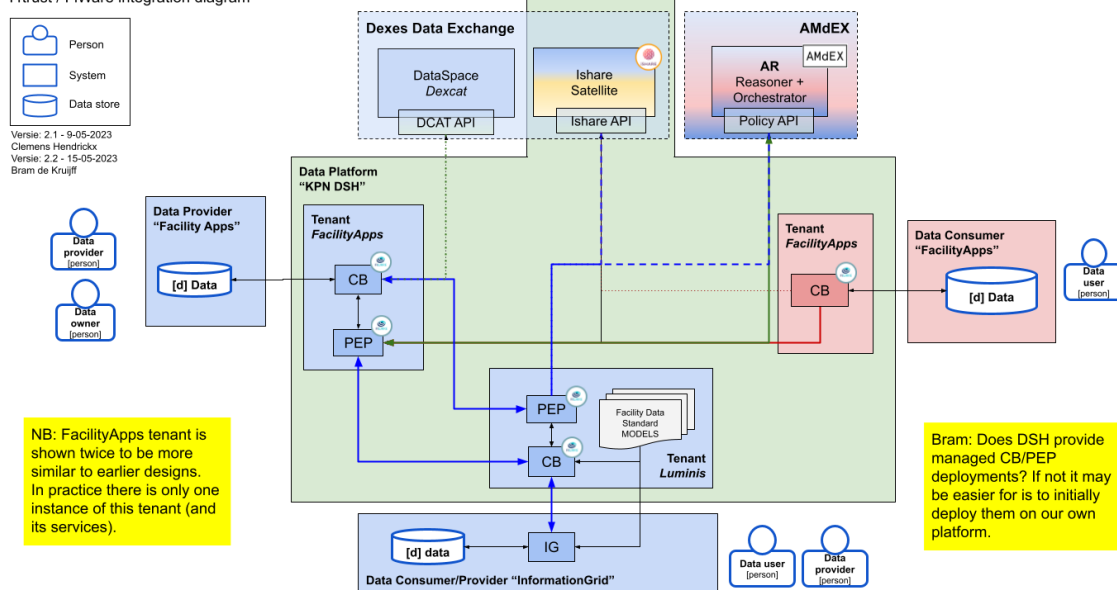
In the dataspace is an option to get an overview of all parties involved in the dataspace. For this function we query the iSHARE satellite to get a fully up-to-date overview of members.

iSHARE provides the “member registration” for all applications that provide or use data. iSHARE also provides the basic “token” delivery to determine if a party can have access to a certain system or resource.

The parties that collect data use the FIWARE component “Context Broker” and components that offer service to connect to iSHARE and authority providers. These FIWARE components are added on top of the existing data infrastructure and applications.

I4trust- scenario 3 + 4 [15-05-2023]

I4trust / FiWare integration diagram



Lessons learned from the experiment:

- the i4Trust components can be added as a layer on top of the already existing data platforms in organisations. This makes implementation easier and reduces the impact of a data sharing solution based on i4Trust components.
- it was difficult to get concrete input for the policies for accessing sensor data from the building owner.
- the i4Trust approach for sharing data has a steeper learning curve than expected. It took more time from the development team to get deep enough understanding. The intensive support available in the i4Trust experiment helped the team a lot.

Benefits & Impact

The eSports Campus pilot ran in parallel with the next phase of the field lab at [Marineterrein](#) in Amsterdam. Tom van Arman, founder of [Tapp](#), says: “At Marineterrein we measure environmental & busyness of public space: water quality, temperature, numbers of people. eSports is a private space that collects more personal and commercially sensitive data. We had to include new terms and conditions in the agreements with all parties involved.” We now also included [the Tada principles of the city of Amsterdam](#) that prescribe safe and inclusive sharing and usage of data. Collecting data inside a building results in whole new datasets to play with.

This summer, a milestone was reached: a prototype of Facility Apps, the all-in-one app solution for cleaning and facility management. Data from the eSports Campus is made available to the cleaning partners through this app, allowing them to plan the work more efficiently. The AMdEX layer verifies the identity of parties that want to access the data and authorises them to do so, if they are certified parties. Schreijer clarifies that AMdEX does not ‘see’ the data, it is a service that tells systems whether access or usage of data is allowed and makes these decisions auditable. Nijhuis also wants to emphasise that KPN enables the technical data exchange and has no access to the data themselves. The next step is to evaluate the app with the actual users.

This pilot has shown that private data can be shared reliably between private partners. Combined with the results from the public space of Marineterrein, all three partners see great potential for smart city applications. City planning based on actual data, more efficient energy management of buildings or even industrial areas, innovation in sustainable logistics. “Especially when we all work together,” concludes Nijhuis. “If you run alone, you go faster, but together you go farther.”

The benefits are for several user groups:

- the facility providers benefit from data driven planning of their work. Employees only work on places where they are needed, have a more dynamic schedule and use the app to register their results;
- Employees of facility providers have more fun and better work situation. They can use their own device and know that the access to data is secure; no one but themselves can access the data of their work environment;

- the building owners have a way to manage facility services in their building, get good offers from external facility suppliers based on the actual use of the building and save money because the data driven facility services are more efficient to provide;
- tenants of the buildings get a more livable environment because facility services are provided when and where needed. This may lower the total costs of the services, but more important increases the satisfaction of users and creates less disturbance while working.

Added value through i4Trust

The i4Trust experiment has shown that iSHARE and AMdEX can work together where iSHARE provides real added value for AMdEX to exchange trust between various dataspace and ecosystems. iShare provided an added value by implementing a trust framework that was not yet available in AMdEX. AMdEX can focus on providing authority and policy enforcement.

The FIWARE components could be integrated in an existing data platform or data consumer solution. The experiment taught us how to implement the components and how to combine them in the existing data infrastructure of customers. Added value came from the way the components could easily be added on top of existing components and provided an almost out-of-the-box connectivity to iShare and the decentralized components on other nodes in the ecosystem.

The support team provided by i4Trust helped us through the challenges of connecting new software to the existing software. This was a challenge since the way iSHARE and the data sharing architecture works was new for most of the team members.

One of the team members was certified to [LEBDS](#) during the experiment. This certification will provide value for coming projects.

We are looking forward to using the i4Trust components in coming projects and ecosystems.

Next steps (if applicable)

The i4Trust experiment was a preliminary project that led the team to join a new initiative: the Ecosystem for sharing data, [Dutch Mobility Innovations \(DMI\)](#), which the Dutch ministry for Infrastructure and Water (MinlenW) will launch at the end of 2023. The AMdEX team will provide data sharing services for all members of the DMI ecosystem. iSHARE will be the central member registry for the ecosystem. More than 17 projects are already selected to join the ecosystem of which some will use FIWARE components to share data.

References

- www.amdex.eu - all about AMdEX
- <https://dutchmobilityinnovations.com/spaces/1216/dmi-ecosysteem/landing> - about DMI

Authors & Contributors

- AMdEX, www.amdex.eu

Categories

User(s):

examples: Smart City

Key words:

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Founding Partners



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