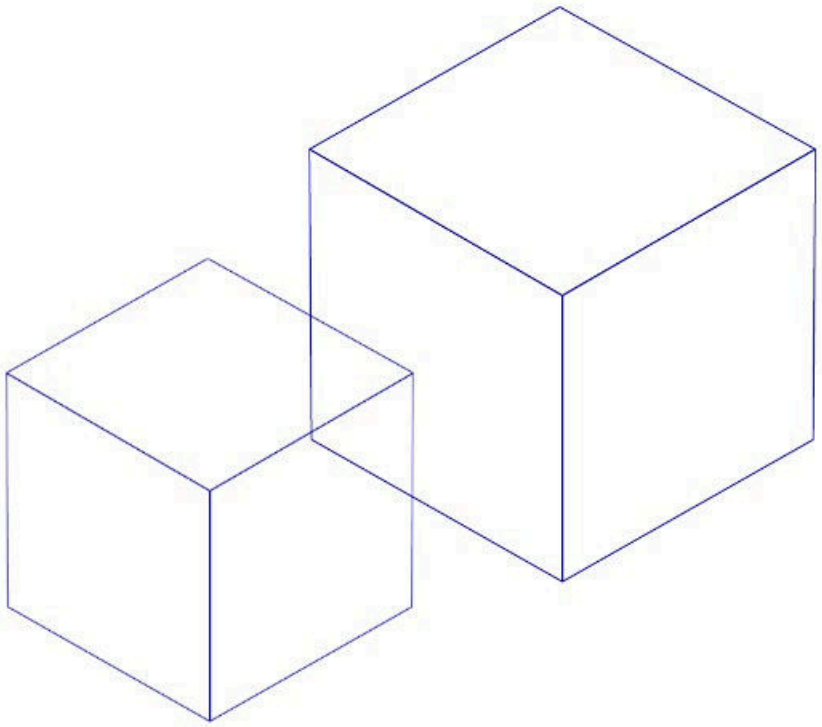
#5 Gaia-X Hackathon
26 + 27 September 2022

gaia-x

Gaia-X Hackathon Report

Results and Lessons from the Gaia-X Hackathon #5

26-27 September 2022



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Executive summary

The Gaia-X Hackathon #5 is the latest event with hands-on developing and integrating software at its core. While Gaia-X Compliance was still a big part of it – similar to Hackathon #4 – we extended the challenge so that we get one step closer to end-to-end functionality, as well as tackle some of the technical open issues.

The event had something for everyone: an Ask Me Anything slot for people completely new to Gaia-X, short presentations of the hacking topics for those curious about what is new, and hands-on hacking into specific technical challenges for the ones dedicated to build Gaia-X.

Although available for a few months, the Gaia-X Compliance Service is still new, and it is getting a lot of traction. People new to it are learning how to use and how to integrate it in their software stacks. Those who already have experience with it, are using it to describe new services. The result is that more than seventy Self-Descriptions (SD) with real participants and service offerings being created during the event. In the future, they will serve as examples to all that want to create their own SD files.

Several GXFS software components have been introduced and real-time support was given to all who wanted to try them and take on the challenges of the organisers. For the advanced GXFS users, an integration between the Creation Wizard and TSA was undertaken. An awesome collaboration took place between two of the teams, Walt.ID and Sovereign Cloud Stack, which joined forces in an integration effort even though they didn't know each other at all beforehand. And to top it off, the Gaia-X 4 Future Mobility moveID Consortium enabled service offerings and data exchange based on Gaia-X Self-Descriptions, applied on a real-life scenario where images captured by a car (on the edge) were used to map road damage using machine learning algorithms.

The slides presented during the event can be found on our wiki page.

Sessions

Introduction to Self-Description

Since Self-Descriptions are the centre of how trust is created in Gaia-X ecosystems, it has become a tradition to start our hackathons explaining what they are, why and how they used.

In addition to clarifying the difference between various types of Self-Descriptions (Claims, Verifiable Credentials, Verifiable Presentation) the session also touched on how to automatically generate these files.

Outcome & take-aways

While some important clarifications were brought with this session, an important question remains open on how to link self-descriptions to each other. This link is needed to describe complex service offerings, which usually are composed from multiple services which are potentially offered by different providers. There are multiple ways to do it, but currently, there is no widely agreed method, and the discussion will certainly continue in the relevant Gaia-X working groups.

Gaia-X Trust Framework – latest

The Gaia-X Compliance Service had a prominent role in the event, as there are still questions about what it takes to be Gaia-X compliant. A short tutorial was presented on what are the prerequisites, how to use the service and what can be expected from it, then it was up to the participants to work on creating their self-descriptions in the hacking room. Also, an overview of what has been introduced since 22.04 was presented, based on the change log of the Trust Framework document.

One important goal of this session is that example Self-Descriptions with real participants and services are being created. These examples help others when they create their own Self-Descriptions, as well as software developers to test and improve the software that deals with these files. So far, these files have been stored in the Hackathon repos, where it may be cumbersome to find, and the user needs to re-validate them to make sure they are compliant. With the latest functionality, they can be stored directly when using the Gaia-X Compliance Service. Only valid Self-Descriptions will be stored, and only if the issuer explicitly chooses to; the files are automatically removed after six months.

Outcome & take-aways

More than seventy valid Self-Descriptions were created for and during the event, and the storage feature was quite popular, gathering twice as many files in the storage than in the Hackathon repos.

While there is an improvement on the understanding and use of the X.509 certificates, some confusion was still observed among the participants, especially on the relation between these certificates and the Trust Anchors. As a result, the documentation of the Gaia-X Compliance service was improved, and an initiative to create a Java implementation to sign Self-descriptions was started by one of the hackathon participants, adding to the existing tool provided by deltaDAO in Hackathon #4 and the signing tool from GXFS TSA components.

Among the direct result of the hacking are ten Merge Requests to the Compliance Service which have been created during the two days to fix minor bugs and add improvements. For any questions or issues, the team can be reached through this GitLab project page.

GXFS Onboarding Session

During this session, the GXFS components related to Identity, Credential and Access Management were introduced: Organization Credential Manager (OCM), Trust Services API (TSA), and Notarization API (NOT). Each component was described in relation to the architecture of the GXFS tool stack, and in addition to demonstrating their functionality, guidance was given on how to set up the components locally and how to develop them further.

Outcome & take-aways

Participants in this session got to try out the components in their local deployments and get a good understanding of each software component, how they relate to each other, and what are use-cases where these components add value. One immediate result of having new people working with the components was to improve the documentation with more clear steps for developers. But there were take-aways with an impact on the near future as well, since the team identified some overlap in how Self-Descriptions are handled by complementary tools like the Gaia-X Compliance Service and the Self-Description Wizard. Other aspects that need to be harmonised with TSA are Data Contracting and Usage Execution Policies, as well as the format of the Self-Description, which is not consistent among all the tools with the format described by the Service Characteristics Working Group.

It is important to highlight that besides the compliance required by Gaia-X, federations can define and enforce their own additional rules. Since TSA is the GXFS component where that is translated into software, the participants in this session worked on setting up and use their own policies for both simple and complex use cases. For any questions or issues, the team can be reached through this GitLab project page.

GXFS Integration: Self-Description Wizard

In some cases, Self-Descriptions can be automatically generated, and using a tool like the Creation Wizard supports that. But the tool creates unsigned claims only, which then must be signed by an authority. In this session, the team worked on implementing a script to send Claims to GXFS TSA and receive a signed Verifiable Credential.

Outcome & take-aways

The team achieved the challenge during the two days and created a script to automate the calls to TSA which then signs and stores the Self-Description. A second script has been created to define CLI commands for easier use of this functionality, and the documentation on how to use it was added in the hackathon repo.

While working on this task, interaction with the APIs exposed by TSA got to be tested, identifying a couple of improvements that can be done there as well. For any questions or issues, the team can be reached through this GitLab project page.

GXFS - Continuous Automated Monitoring

The Continuous Automated Monitoring (CAM) component is part of the GXFS toolbox, and it is designed to continuously gather compliance-relevant information about Services and Nodes operations, and then validate them against set criteria. The functionality is split in Collection Modules, where service configuration information or security information from public registers can be monitored. While the current collection modules are focused on security and integrity, CAM can be extended with new monitoring capacity on any measurable metric. This session aimed at creating a new collection module with a simple metric, with the purpose of walking participants through the process of developing the component.

Outcome & take-aways

The architecture of the component and detailed developer's guidance was provided during this session, with direct troubleshooting support. Setting up the dev environment proved to be trickier than expected when choosing not to use the recommended way of developing inside a container, but the participants managed to make it run and complete the challenge. As a result – like in most sessions – the documentation got to be improved.

This challenge can be completed after the event as well, since detailed instructions how to create new modules are here. Some more information is available in the demo provided by the team, and a live CAM dashboard can be seen in the dev environment (just make sure the settings are on "Use test" for a quick browsing). For any questions or issues, the team can be reached through this GitLab project page.

moveID - Mobility Data Ecosystem & Gaia-X Edge Integration

Two of the most tangible sessions that participated in the event was brought through a collaboration between the moveID consortium – part of the Gaia-X 4 Future Mobility family project in the Gaia-X German Hub – and deltaDAO, with their Compute-to-Data and edge device implementation.

On one side, data from the camera of a car was being collected and transformed in a data set. The challenge of the hackathon was to describe the data set as a service offering through a Gaia-X Compliant Self-Description and then published in the Web3 ecosystem federated catalogue.

On the other side, an algorithm that processes these images could be applied to the data so that damages to the road can be detected. The algorithm is also provided as a service offering, with an associated Gaia-X Compliant Self-Description that can be verified through the portal. The challenge of the hackathon was to do the algorithm processing in the car (the edge device) and gain insights without having direct access to the data.

Outcome & take-aways

This team went the extra mile quite literally: a real car was used to collect the data during the event. All the Self-Descriptions were added to the federated catalogue and could be retrieved through the moveID portal and the Gaia-X Web3 Ecosystem Demonstrator portal, and their validation was nicely integrated by calling the Gaia-X Compliance Service on the fly. It was a lot of effort to bring it all together, but they pulled through and even managed to show the results of the algorithm in a graphical app, pin-pointing the damages in the road on the city map.

It was exciting to go beyond the details of the different technologies and see how Gaia-X gets applied in real-life use-cases that we can all relate to. The session results have been captured in this video and the teams can be reached at contact@delta-dao.com.

Cloud Federation via OIDC & SSI-based Auth using Gaia-X SD, OPA and Rego

Another collaboration between two teams – walt.id and Sovereign Cloud Stack (SCS) – took place with impressive results. It is worth highlighting that the members of the teams did not know each other prior to the event, but after seeing each other's proposals and identifying complementary goals, they decided to join forces. The teams worked together on an SSI-based authentication with Gaia-X compliant Participant Self-Descriptions for Legal Person and integrated that with the authentication mechanism of SCS.

Outcome & take-aways

The authentication of a Legal Person through a Gaia-X Participant Self-Description was achieved during the two days of hacking. The functionality of SD creation and signing was added to the SSI Kit component, which then can be loaded in the Web Wallet; during this process, the Gaia-X Compliance Service is called in the background to validate the Self-Description. The credentials stored in the wallet can then be used to provide access to a Gaia-X ecosystem based on OIDC and KeyCloak.

From here, the SCS team took over, working on integrating the walt.id IdP with the SCS KeyCloak, so than a user can authenticate on multiple cloud stacks with the same credentials, kept in a wallet. Though there was a bump in the road when a bug in KeyCloak impacted the work, a workaround made

the integration successful and Gaia-X Verifiable Credentials can be used to authenticate on SCS. More details of this awesome collaboration and the technologies behind them can be found in this blog post, and in the videos linked above. The teams can be reached at info@osb-alliance.com and office@walt.id.

EDC - Minimum Viable Data Spaces

The goals of this session were to deploy the Eclipse Minimal Viable Dataspace (MVD) on different infrastructures, create Self-Descriptions for its participants and validate them with the Gaia-X Compliance Service. The particularities of the stack were described, with focus on how identities are handled and how participants are onboarded in their Identity Hub component.

Outcome & take-aways

Eclipse MVD was deployed on local environments, and Azure. The hackathon team discussed other deployment targets like Kubernetes on Openshift, AWS, GCP and IONOS. A couple of test Self-Descriptions were created with the support of the Gaia-X Trust Framework team, and the process of signing them with a X.509 certificate was clarified. But since the certificate must be issued by a Trust Anchor, these SDs could not be validated with the Gaia-X Compliance Service.

However, the Eclipse MVD team has got all the answers on what Gaia-X compliance means for their solution, and next steps have been described in detail in an Architecture Decision Record So, the EDC user can follow the guideline to make their EDC deployment GAIA-X compliant. This GitHub issue is also a blueprint for a deeper discussion with the community on how to further automate the deployment. The two days of information exchange and hands-on exercises were extremely useful in understanding the status of the Gaia-X trust and compliance services and plan the next steps in the EDC roadmap. The EDC presentation with the agenda and results can be found under this OneDrive link. The team can be reached through this GitHub project page.

Feedback from the participants

This was another successful event with our participants, where the overall satisfaction averaged above four out of five ranking. Though all the onboarding was done in the first day, most participants chose to join on both days to finalise the hacking goals they set out to do. More than half of the participants who took the survey confirmed that they are now familiar with the Gaia-X Compliance Service.

One insight we got from the feedback form is that some of the topics are too challenging, and although we had an Ask Me Anything slot for new-commers and a beginner's introduction to Self-Descriptions,

it would be useful to have some challenges with intermediate difficulty. Spelling out in advance how to set-up the development environment and expected knowledge in each session, would help choosing between sessions and speed up working on the challenge. There is still room to improve, but most survey respondents found the event helpful and were rather happy with the variety of topics presented.

Below are some quotes from the feedback we got on the event.

"*A hackathon is a great opportunity to exchange ideas, create understanding for the technical challenge and work together on a solution. Unique, keep it up!*"

"The 5th Hackathon event has been a great help to evaluate different technologies based on the state of their development and implementations instead of just presentations and roadmaps."

"The hackathon gives a good overview of which technologies need to be mastered and is a good source for a self-learning curriculum."

"The systems being built to support/improve decentralisation, transparency, security, and (regulatory) compliance are coming from many directions. Gaia-X is making significant contributions on fundamental levels of interoperability, such as digital ID / SSI. The Gaia-X Hackathons are an essential part of this, and a pleasure to be part of."

Conclusions

Despite the Hackathon being a virtual event, the spirit of collaboration pushed through the limitations of the online calls and created a great atmosphere of people exchanging ideas, supporting each other, and working together on a common goal.

Bugs were found, patches were created, questions were answered, new questions arose, new features have been planned, and gaps have been identified. But most importantly, we all came together in these two days and marked another milestone in the evolution of Gaia-X. While it is the last hacking event of this year, one cannot help but feel that this is just the beginning.

We would like to thank all the contributors and members of the Gaia-X open-source software community that made this event possible and so successful.