TITAN presentation

Trusted envIronments for confidenTiAl computiNg and secure data sharing

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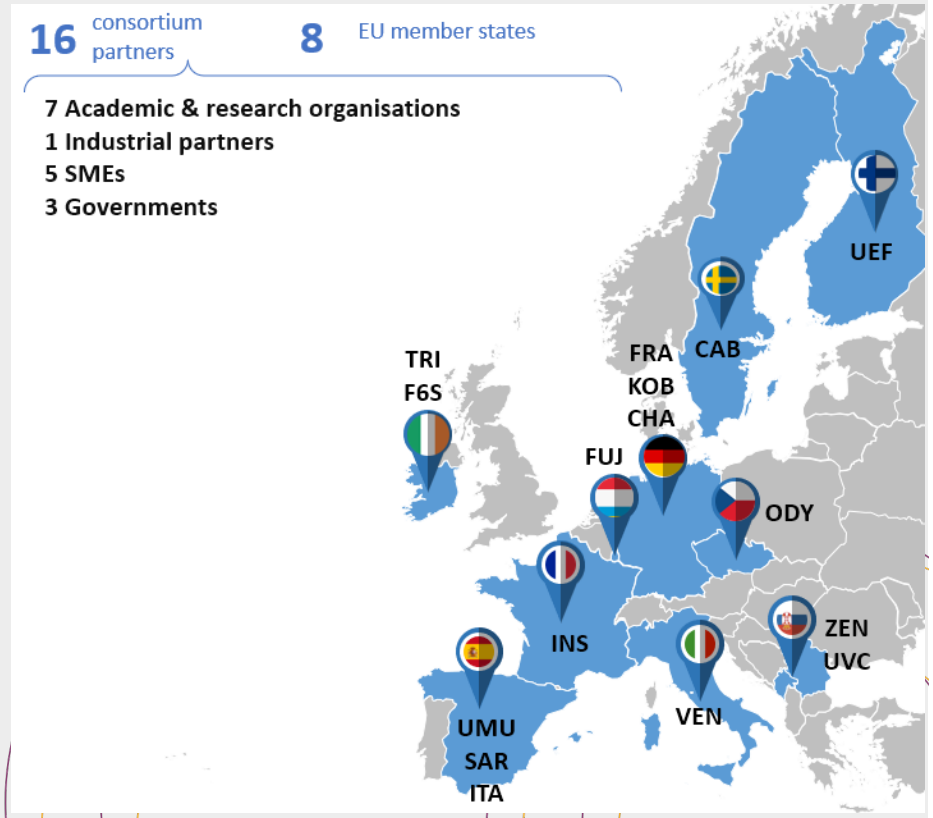

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Objectives

Enriching the EOSC with a **software platform solution for confidential data collaboration and secure and privacy-preserving data processing.**

- Objective 1: Collect legal, technical, and architectural requirements and define a **platform architecture for secure sharing of sensitive data** and publishing anonymised data sets in the **EOSC Interoperability Framework IF**.
- Objective 2: **Develop secure data sharing and auditing mechanisms for sensitive data**, including secure data zones, data **access control, and end-to-end data protection** (storage - transfer - processing).
- Objective 3: Develop an end-to-end secure data processing framework for **collaborative and privacy-preserving Machine Learning (ML) using Trusted Execution Environments**.
- Objective 4: **Implement confidential mechanisms, algorithms, and tools** with cloud infrastructure platforms and the EOSC IF, and validate solutions in sensitive data-driven **use cases (government and healthcare)**
- Objective 5: **Disseminate and promote the solutions for data governance** and stewardship through collaboration with EOSC Partnership initiatives, standardisation, and integrating with the EOSC infrastructure

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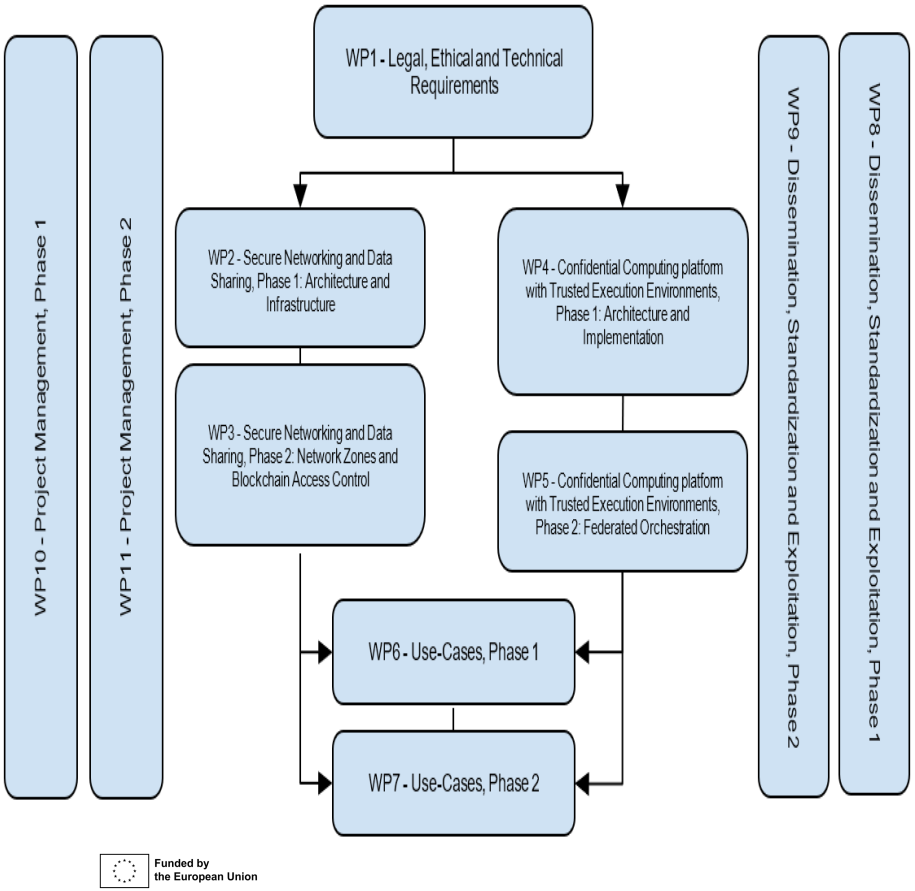
Organization

Use cases



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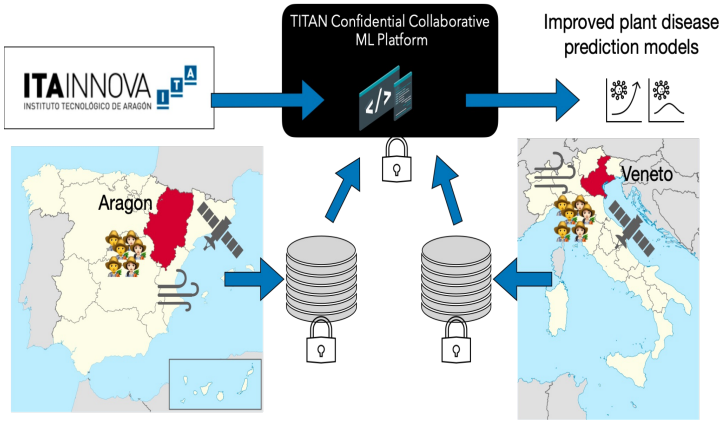
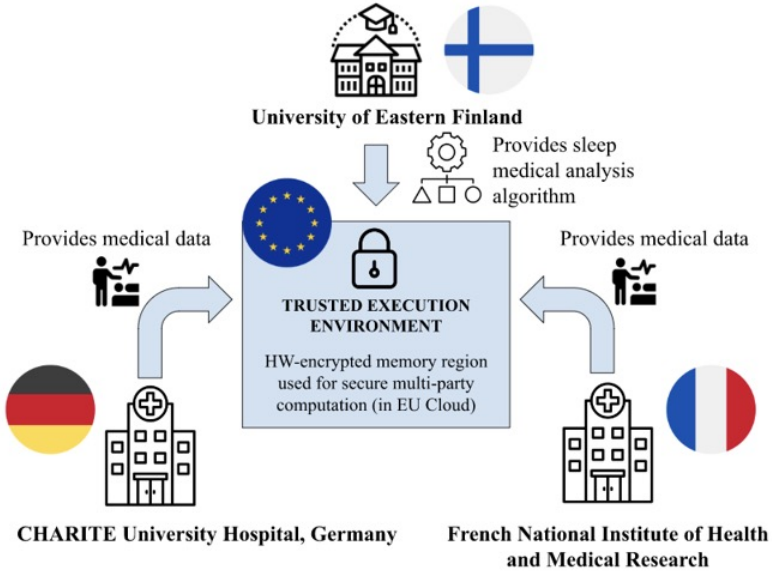
- Use Case 1: Confidential sharing and collaboration with sensitive agrifood government data.



- Use Case 2: Collaborative Use of ML in Healthcare



Vision

New paradigm of secure access to sensitive public data and applications.

- **TITAN will focus on end-to-end secure data sharing and collaboration platform** requires advancements in network security, **distributed access control**, security domain segmentation, application of state-of-the-art **protection for data in use**, as well as **usable and scalable data anonymisation**
- **Three main areas**
  - **Domain 1: Confidential data processing enabling confidential collaborative data processing**: memory encryption, confidential computing, remote attestation, confidential GPUs, confidential ML.
  - **Domain 2: Scalable data anonymisation for wide data access:** Differential Privacy, k-anonymity, Secure Multiparty Computation (SMC), Multi-Party Computations (MPC), Zero-Knowledge Proof (ZK-SNARKs), and Homomorphic Secret Sharing (HSS).
  - **Domain 3: Distributed access control and transaction logging using decentralised solutions:** blockchain technologies, network security domains, cloud security zones, access control and management.

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How TITAN can provide solutions to EOSC

- TITAN looks for mechanism to allow consumer and producer (data, processing, confidential processing, AI/ML algorithm service) describe their properties and capabilities using a FAIR approach
- Integrate a SSI and DLT based AAI solution interoperable with DSBA and EOSC
- Provide a matchmaking mechanism based on the meta-models used for describing capabilities to facilitate the put in communication consumer and providers in a data space governance architecture
- Support deployable and configurable connectors (following DSBA architecture) with different privacy preserving and confidential models to support the communication between consumer and providers
- Integrate mechanism to control what to share, with whom and how the data sharing will take place
- Provide confidential computing capabilities on demand to support data treatment based on TEE, secure enclave and federated learning functions

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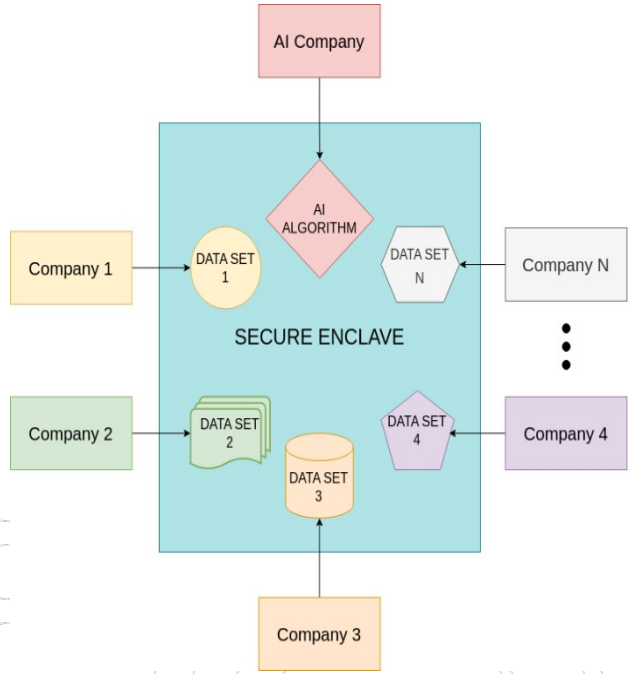
How TITAN can provide solutions to SPE

- TITAN will develop an improved **access control management ecosystem through the application of DLTs**, and more concretely **smart-contract-enabled blockchains**
- **Privacy-preserving, collaborative (confidential multi-party) ML** by combining the aforementioned techniques and leveraging Federated ML. To achieve immutability of the learning data model, the model will be stored on the **distributed ledger**.
- TEEs to implement confidential data processing for the shared datasets
- Discovery, sharing, and federation of heterogeneous data from multiple sources, **semantic interoperability data models**



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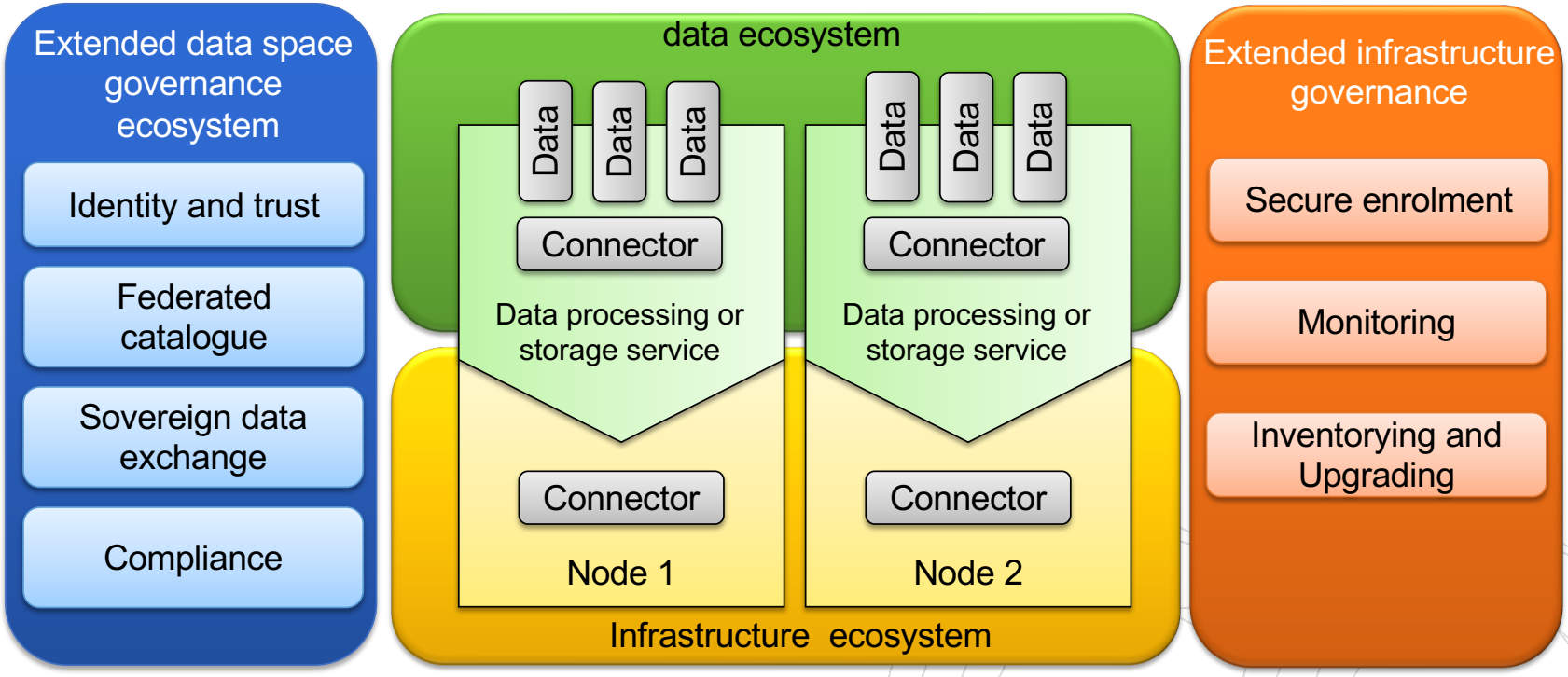
High Level Architecture



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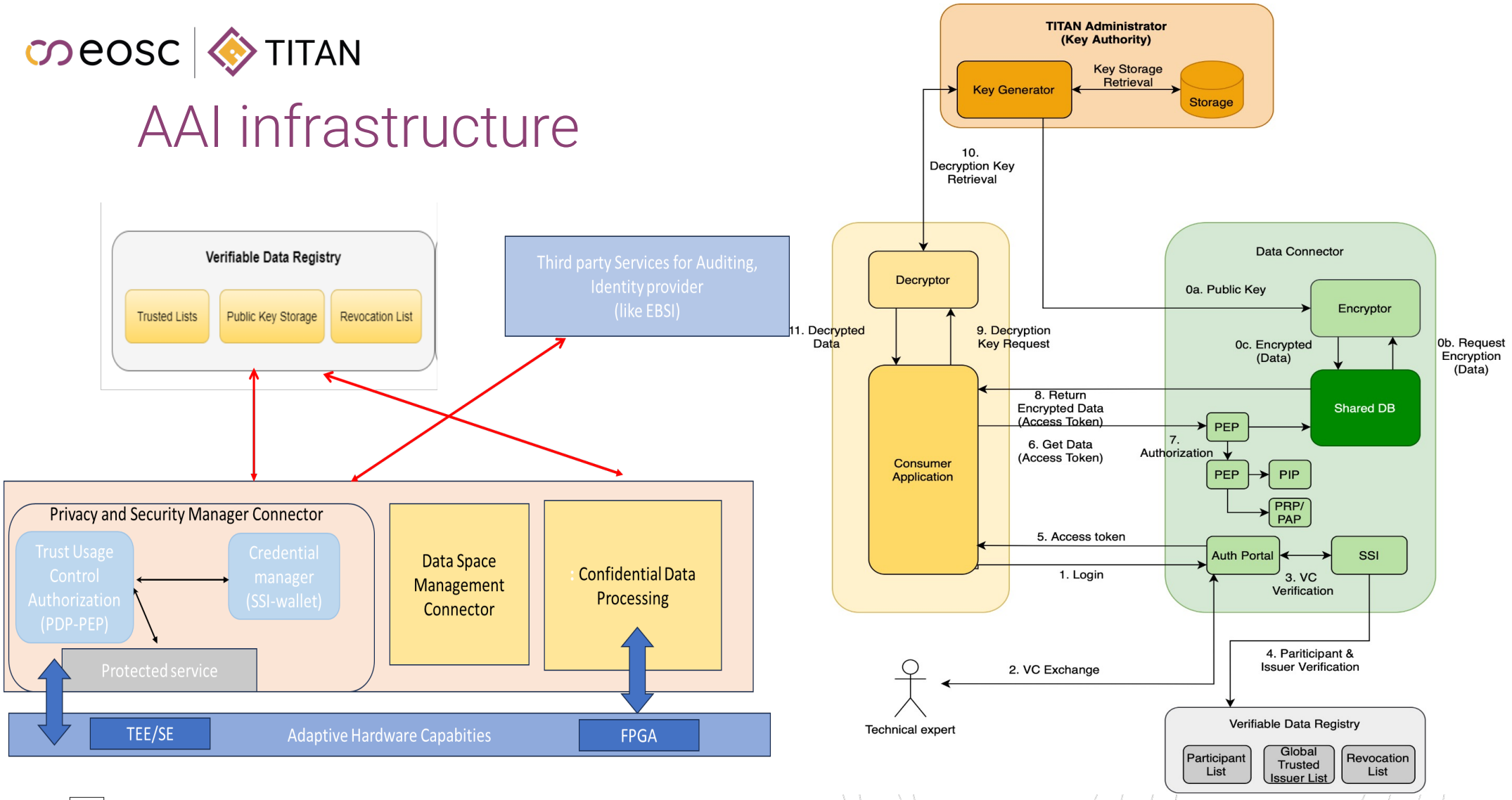
AAI infrastructure



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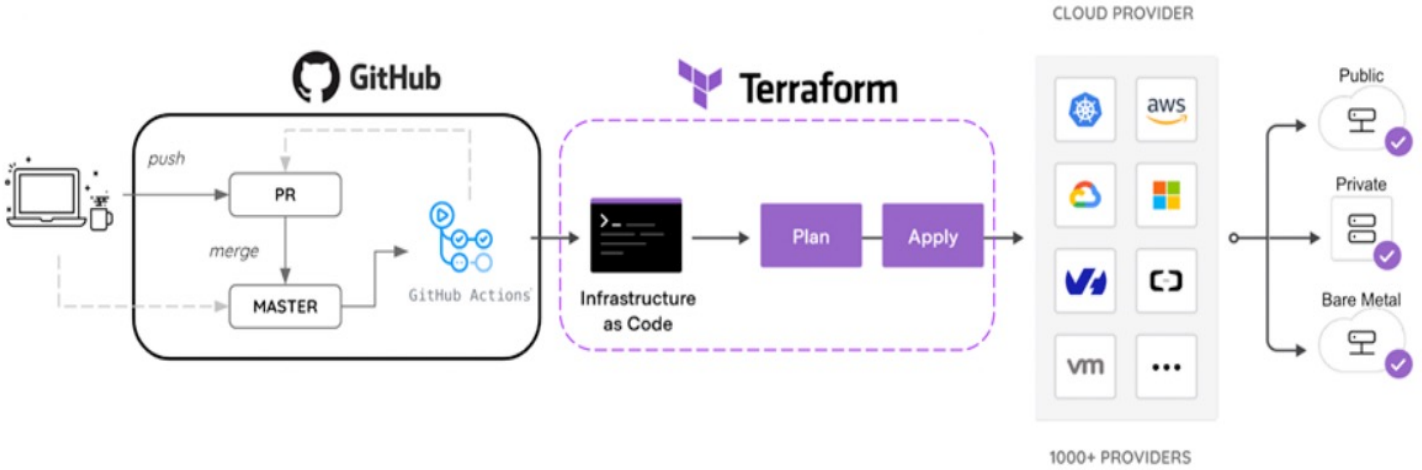
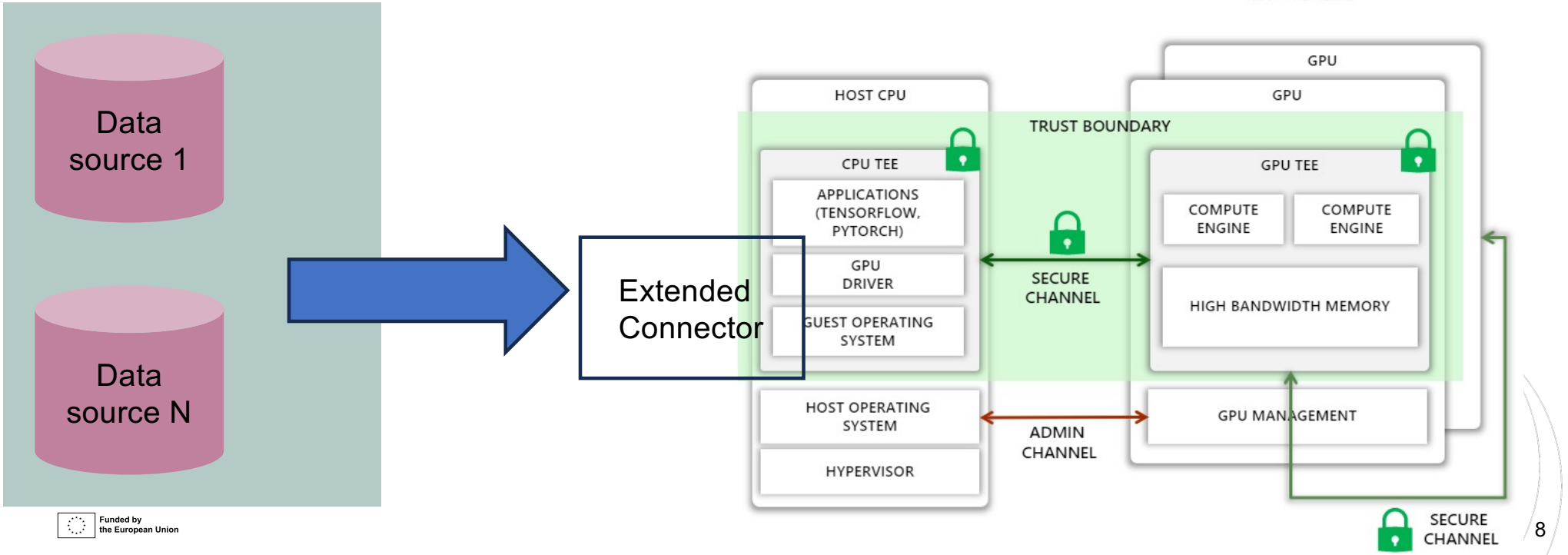
Confidential Execution of processing over data





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Conclusion

- TITAN builds on the vision of combining a thorough **understanding of legal and technical aspects** to build solutions for a new paradigm of secure access to sensitive public data and applications and support data-driven science.
- Solutions envisioned in TITAN align by design with the objectives of the **EOSC IF**, aiming to increase the value of scientific data assets through wide-spread availability and reduce the costs of scientific data management while ensuring adequate data protection following EU regulations.
- While realising the challenges of achieving technical, semantic, organisational, and legal interoperability, **TITAN will develop automated technical solutions to manage, govern and bridge the gaps** in semantic, organisational, and legal interoperability.
- TITAN's solutions will **help practitioners solve their regulatory and compliance challenges**, as well as semantic, and organisational interoperability challenges. To validate the utility of TITANs solutions for the EOSC IF and ensure that results are exploitable.
- The developed solutions will be integrated **with EOSC-compliant data sources** and applications already during the project by **publishing them in the EOSC resource catalogue**.

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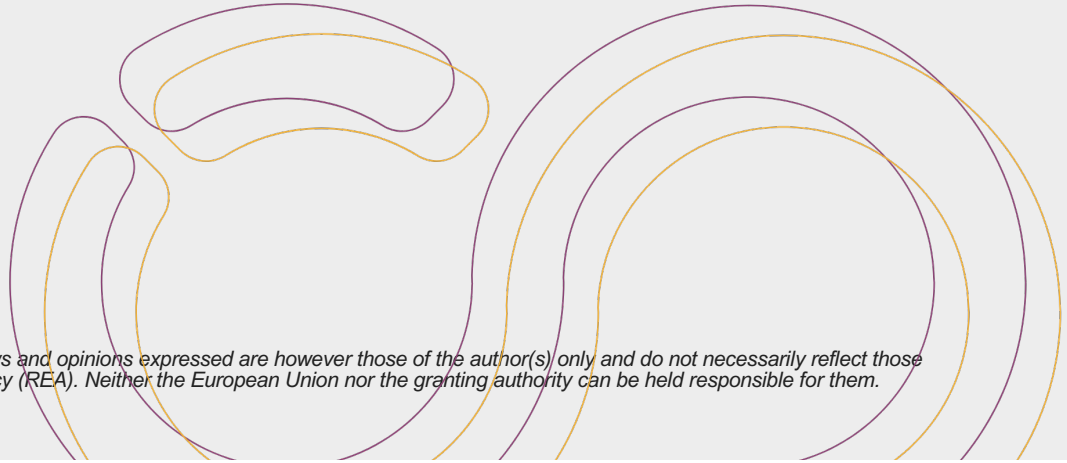
Thank you for your attention



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