

Solid Cockpit - A Web Interface for Piloting Your Solid Pod

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Abstract

Solid Pods provide a flexible and powerful framework for decentralized, user-controlled data storage, enabling individuals to manage and share data while retaining fine-grained privacy controls. For users, the benefits of the Solid ecosystem are accompanied by a large learning curve, especially for users unfamiliar with RDF or web-based servers. To fully leverage the capabilities of Solid Pods for users, we developed a web-based application that facilitates intuitive interaction with data stored in Solid Pods along with data discovery functionalities. The primary objective of this work was to design an application that supports core data management tasks, including uploading and organizing data, modifying privacy and access control settings, and querying stored resources all within one user interface. The resulting application, Solid Cockpit, allows users to securely connect to their Solid Pod and perform these operations through a web application. Solid Cockpit is implemented using the Inrupt Solid-Client SDK and provides intuitive client-side content management functionality for Solid Pod data.

Keywords

Solid Web Application, Data Management, User Interface

1. Introduction

Solid Pods provide a flexible foundation for decentralized data storage, access control, and interoperability. However, interacting with Pod data, even through some popular applications, still exposes users to many of the underlying complexities of RDF-based data management, including resource modeling, access policy configuration, and query formulation. For non-expert users in particular, common data interaction workflows remain difficult to perform in practice. Existing Solid applications largely address these concerns in isolation. File managers and Pod dashboards such as SolidOS, Solid File Manager, Pod Pro, and Penny focus on data management in different ways but all tend to be oriented toward RDF proficient users. Other tools target specific use cases but have limited usability in general cases [1].

This work presents Solid Cockpit, a web-based application hosted on GitHub pages (<https://knowledgeonwebscale.github.io/solid-cockpit/>) as a unified user-interface for interacting with Solid Pod data. The application abstracts over RDF-level complexity while supporting the core data interaction functionalities required by end users: data modification, privacy management and access control, notifications, and data discovery through querying. By integrating these capabilities into a single interface, the application aims to lower the barrier to effective Pod interaction for both end users and application developers without constraining the flexibility of the underlying Solid data model.

2. Infrastructure

Solid Cockpit is implemented as a client-side web application, using the VueJS framework, that interacts directly with Solid Pods using standardized Solid protocols and libraries. The application is built on top of the Inrupt Solid-Client JavaScript SDK [2], which provides abstractions for authentication, resource access, and access control management within the Solid ecosystem. This design choice ensures

Solid Symposium 2026, 4th Privacy Personal Data Management Session, April 30 - May 1, London, England

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compatibility with existing Solid infrastructure and adherence to best practices defined by the Solid specifications. As part of this work, two additional technical specifications were created to mediate linked-data privacy notifications (<https://ecrum19.github.io/ldp-permissions-notifications-specification/>) and SPARQL query result caching (<https://ecrum19.github.io/sparql-view-materialization-containers/>) within Solid Pods.

At a high level, the architecture consists of four main functionalities: Solid pod connection and authentication, data management services (i.e. data upload and management), data privacy modification, and data querying via SPARQL queries. Authentication is handled through Solid's decentralized identity mechanisms, allowing users to securely connect to their own Pod using their WebID. Once authenticated, the application establishes a session that enables authorized read and write operations on Pod resources without requiring centralized data storage or processing. The data management layer is responsible for handling content operations within the Pod, including uploading data and organizing resources. Privacy and access control are managed through the configuration of access control policies, allowing users to modify permissions and define which agents or applications can access specific resources. The data querying functionalities allow for the federated querying via the SPARQL query language of SPARQL Endpoint(s) or Solid Pod sources. All queries are executed within the user's browser environment using the Comunica query engine [3].

Throughout the application, a simplified graphical interface exposes these functionalities in an accessible manner to the user. Rather than requiring users to understand underlying RDF structures or access control mechanisms, the interface presents intuitive workflows for common data management tasks. By keeping all data interactions confined to the user's Pod and browser environment, Solid Cockpit maintains a fully decentralized architecture consistent with Solid's core design principles.

3. Impact

Solid Cockpit contributes to the Solid ecosystem by addressing a critical usability challenge in decentralized data management. By offering a comprehensive and user-friendly interface for interacting with Solid Pods, the application lowers the technical barrier associated with Pod usage and enables broader adoption among users who may not have expertise in linked-data technologies or semantic web systems.

By integrating notifications for data sharing and access changes, Solid Cockpit makes interactions with Pods more transparent and responsive, enabling users to better understand and manage how their data are accessed over time. Additionally, providing query-based data discovery within the same interface shifts Pod interaction from manual resource navigation to meaningful information retrieval, making decentralized data more accessible and actionable.

More broadly, the approach taken in Solid Cockpit highlights the potential for client-side applications to serve as effective intermediaries between users and decentralized data infrastructures. As Solid continues to evolve, research-oriented applications such as Solid Cockpit can help shape future production-grade Solid applications by demonstrating how combining data modification, privacy management, notifications, and querying lowers the barrier to effective Pod use for non-expert users.

Acknowledgments

Project funding provided from the Research Foundation – Flanders (FWO) (SB Fellowship 1S27825N) and from the CHIST-ERA grant CHIST-ERA-22-ORD-09. Ruben Taelman is a postdoctoral fellow of the Research Foundation – Flanders (FWO) (1202124N).

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