Decentralized and Ontology Based Purposeful Online Community Application Framework

Serkan Özel, Advisor: Prof. Dr. Suzan Üsküdarlı
Department of Computer Engineering, Bogazici University

Abstract

- This study is designed to build a knowledge-centric online community model that supports the specification of a privacy concerned, easily processable and analyzable data producing application by non-tech savvy users.
- In our project, data produced stored in decentralized, user managed servers, called pods. This leads to true data ownership, better privacy and reusing existing data for different applications.
- We are building our framework on the online community framework[1], we investigate advantages, disadvantages and challenges of the future's web architecture.

Introduction

- A Purposeful Online Community(POC) is an online group of people that share a common purpose and have their own data types that they want to collect and process.
- People often use social media or online sheets for collaborative projects, but they produce unstructured data, and data access control is not advanced.
- In our framework, the community builder, can specify custom data types and the workflows that can happen in the community.
- Solid project[2], emerged at MIT, brings decentralization to our framework.
- In Solid, user data is stored in user controlled personal online datastore(POD), which brings privacy.

An Example

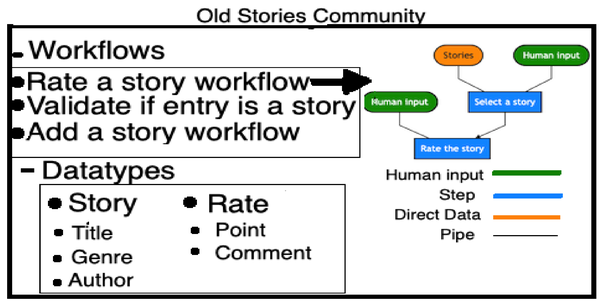

Figure 1:Old stories community

Algorithm 1: Workflow execution algorithm

```
while Workflow not ended do
    if No uncompleted steps left then
        break;
    Run Topological Sort on the steps;
    if There is a step with no dependency then
        Execute step and mark it as completed;
    else if there is a step needs user input then
        Ask input from user;
        break;
end
```

- For an example, we have a community that makes a collection of old stories and rates them.
- There are several workflows in the community but we showed one of them, rating a story.

System Architecture

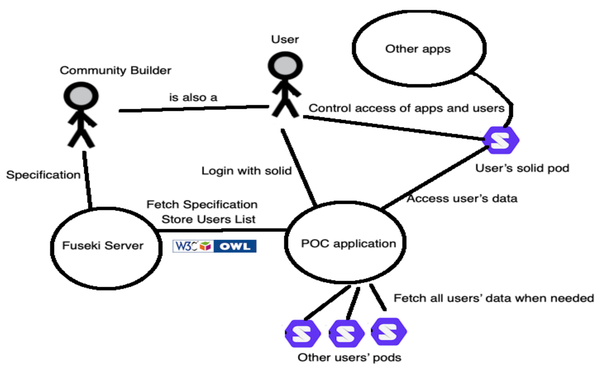

Figure 2:System Architecture

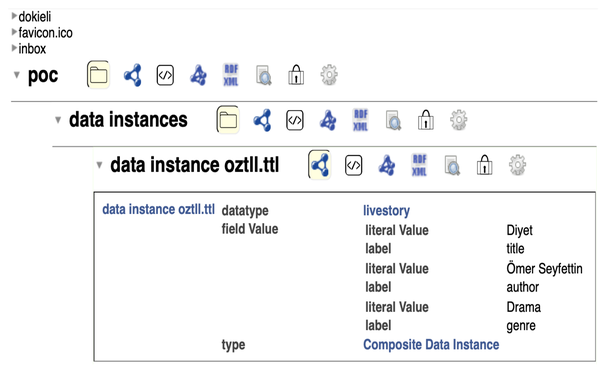

Figure 3:Semantic representation of a in the user's solid

- In Solid, every user's data in his or her pod. Multiple applications can access user's pod. In Figure 3, you see another application folder dokieli and our application's poc folder.

```
PREFIX storytelling: <http://web.cmpe.boun.edu.tr/soslab/ontologies/storytelling>
SELECT ?title
WHERE {
  ?story a storytelling:story.
  ?story storytelling:genre "Drama".
  ?title storytelling:title ?story.
  ?author storytelling:author "Ömer Seyfettin".
}
```

Figure 4:Example Sparql Query for finding titles of drama stories by Ömer Seyfettin

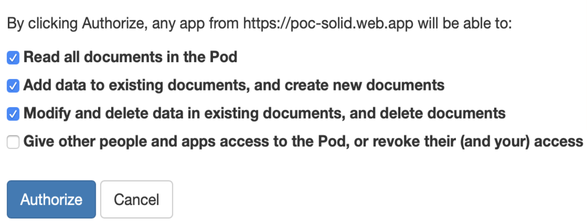

Figure 5:Solid Authorize Application Screen

Results

- Our framework uses ontologies[3] along with other W3C standards, which means it is structured data and it is possible to make a semantic search like in Figure 4.
- Privacy protecting data persistence is achieved with use of Solid pods. You can see how an application is authorized in Figure 5.
- In order to reduce time to fetch all users' data, there is a need for a central observer, keeping track of existing of data for each user.
- A user interface for workflow specification can be built for convenience.

Conclusion

- Our application framework is a step forward for making web better place for non-tech savvy persons by making them create their own application.
- Solid is is under development so it requires further work with respect to performance issues.

References

[1] M. Seyhan, "An ontology based framework for creating purposeful online communities," 2016.

[2] A. V. Sambra and et al., "Solid : A platform for decentralized social applications based on linked data," 2016.

[3] "Ontology." `https://www.w3.org/standards/semanticweb/ontology`. Online; accessed 27 January 2020.

Contact Information

- Source Code: https://gitlab.com/srknzl/solid-decentralized-web-applications
- Email: serkan.ozel@boun.edu.tr