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Implementing and assessing Seamlessaccess: A publisher's experience

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Abstract. This essay provides insights into a publisher's perspective on implementing and evaluating SeamlessAccess, a collaborative initiative that facilitates seamless access to scholarly resources subscribed by libraries. The essay outlines the motivations behind adopting SeamlessAccess, including the surge in federated authentication usage during the pandemic, its adoption by other publishers, and considerations regarding security and privacy. It discusses IEEE's decision to employ a hybrid approach, combining the advantages of SeamlessAccess with its own solutions to maximize flexibility. The essay also highlights pilot projects focused on incorporating Identity Providers (IDPs) and EZproxy login URLs into the discovery process, along with strategies employed to monitor and assess the implementation of SeamlessAccess. By utilizing data, the essay demonstrates the overall success of the SeamlessAccess implementation project, while acknowledging potential obstacles that publishers and libraries may encounter during integration. Furthermore, the essay emphasizes the importance of increased collaboration between publishers and libraries to fully realize the vision of federated authentication as a genuinely seamless experience for researchers.

Keywords: SeamlessAccess, federated authentication, publisher, implementation, tracking, user engagement, identity providers (IDP), EZproxy, pilot projects, IEEE Xplore

1. Introduction

1.1. Federated authentication

Federated Authentication [1] is a secure and efficient user authentication method that allows individuals to access multiple online services using a single set of credentials. Unlike traditional authentication methods that require users to create separate accounts and remember multiple usernames and passwords for each service, federated authentication enables users to authenticate themselves through their home organization, such as a university or company, which acts as the Identity Provider (IdP). This authentication process relies on established standards and protocols like SAML (Security Assertion Markup Language) [2] and Shibboleth [3] to securely exchange user information between the IdP and the service provider, ensuring seamless access while maintaining privacy and security. By implementing federated authentication, organizations can simplify user access, enhance the user experience, and improve security by reducing the need for password management and eliminating the risks associated with password reuse and storage.

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1.2. SeamlessAccess service

SeamlessAccess (SA) is a service designed to enhance the online access experience for users of scholarly collaboration tools, information resources, and shared research infrastructure. The service's primary goal is to facilitate seamless authentication by leveraging existing single sign-on infrastructures provided by users' home institutions, all while prioritizing personal data protection and privacy. By bridging the gap in user experience, SA improves the usability of federations and federated services. The development and implementation of this service were driven by the RA21 Initiative (NISO RP-27-2019, Recommended Practices for Improved Access to Institutionally-Provided Information Resources: Results from the Resource Access in the 21st Century), a collaborative effort between the International Association of STM Publishers and the National Information Standards Organization. The SA guidelines encompass three key components: integrating the SA Login Button, designing and integrating IDP discovery, and implementing institution persistence for improved user convenience.

1.3. IEEE and IEEE Xplore

IEEE is the world's largest technical membership association, with over four hundred thousand members in one hundred and sixty countries. It has five core areas of activity: Publishing, Conferences, Standards, Membership, and E-learning in the fields of electrical and electronics engineering and computer science. The IEEE Xplore platform publishes IEEE journals, conference proceedings, standards, and eLearning courses and hosts third-party content like eBook collections and the SMPTE Digital Library. It houses nearly six million records.

1.4. Reasons for publisher implementation of SeamlessAccess

In an era where seamless access to scholarly resources is a paramount concern, publishers have increasingly turned to solutions such as SeamlessAccess to address the evolving needs of end users. This section explores the reasons behind the implementation of SeamlessAccess by publishers, shedding light on the key factors driving this adoption. From the observed increase in full-text usage through federated authentication to the surge in adoption during the pandemic, as well as the growing trend of publishers integrating SeamlessAccess, the introduction sets the stage for understanding the significance of this community-driven initiative.

1. More Full-Text Usage from Federated Authentication:

Through implementing federated authentication options like Shibboleth, OpenAthens [4], and SAML, IEEE *Xplore* observed increased full-text usage from users compared to other remote authentication options. Users coming from federated authentication stayed on the platform longer, visited more often, viewed more pages, and had higher full-text usage (Fig. 1).

2. Increased Federated Authentication Usage During the Pandemic:

While federated authentication accounted for a small fraction of all authentication counts for several years, there was a significant increase in federated access authentication counts during the pandemic. The assistance provided by the China consortium in setting up Shibboleth for several hundred Chinese university libraries contributed to this shift.

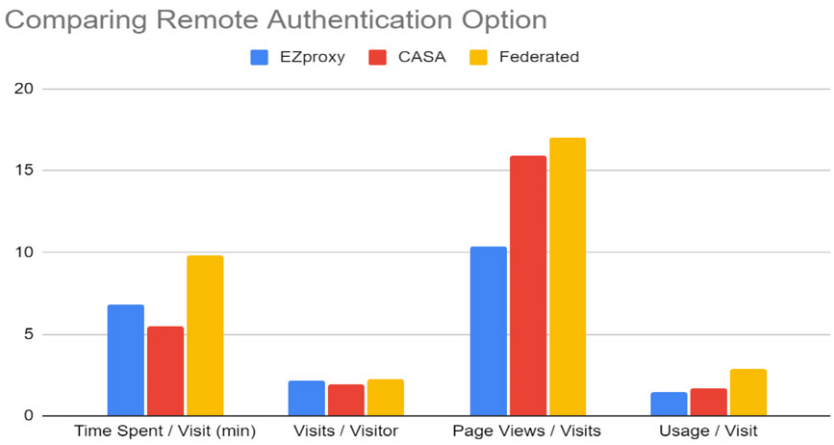

Fig. 1. Comparing metrics for remote authentication options.

3. More Publishers Integrating SeamlessAccess:

As more publishers implemented SeamlessAccess [5] and some publishers, such as ACS [6], IOP Publishing [7], and Emerald [8], reported positive usage increases after integrating SeamlessAccess, IEEE *Xplore* considered implementing SeamlessAccess to standardize the button design and remember institutions.

4. Security and Privacy:

A review of the literature reveals that multiple industry experts have adequately discussed the issues of security and privacy since 2019 [9–12]. Even though several librarians expressed reservations about privacy and security [13–15], more and more libraries embraced Federated Authentication and SeamlessAccess during the Pandemic and addressed privacy issues from the library side [16]. After studying the SeamlessAccess documentation and talking with the SeamlessAccess team, we are convinced there is no real danger of insecure authentication as SeamlessAccess plays no part whatsoever in any exchange of data between the home institution and the service. This assurance helped our management decide to move the project forward.

2. Methods

The Methods section of this paper is dedicated to detailing the specific procedures and techniques employed to implement and assess the integration of SeamlessAccess for enhanced authentication in the scholarly resource ecosystem. This section serves as a comprehensive guide, offering a systematic and transparent account of the steps taken to ensure the validity and reliability of our findings. By presenting a clear outline of the methodologies utilized, including the selection and implementation of SeamlessAccess features, data collection and analysis techniques, and the evaluation of the implementation, we aim to provide readers with a thorough understanding of the research process. This section serves as a valuable resource for researchers and practitioners seeking to replicate or build upon our approach in future endeavors, ultimately contributing to the advancement of seamless authentication in the academic community.

2.1. Implement SeamlessAccess with advanced/hybrid option

As a member of the SeamlessAccess Steering Committee, IEEE has been dedicated to enhancing the authentication experience for its users. Over the years, IEEE *Xplore* implemented an internal solution incorporating some SeamlessAccess elements, providing both advantages and limitations. This section examines the strengths and weaknesses of IEEE *Xplore*'s internal solution and compares it with the implementation guidelines of SeamlessAccess. Recognizing the need for a comprehensive and adaptable authentication system, IEEE *Xplore* has adopted an advanced/hybrid approach that combines the best features of both solutions. By leveraging the benefits of this advanced/hybrid option, IEEE *Xplore* aims to deliver users a seamless and user-friendly authentication experience.

IEEE *Xplore*'s internal solution had the following characteristics:

1. Internal Control:

   IEEE *Xplore* maintained full control over the solution, without relying on external dependencies.

2. Integration of Existing IdP List:

   The solution allowed for integrating a wide range of Identity Providers, accommodating diverse user authentication preferences.

3. Integration of EZproxy Domains:

   The solution allowed for the integration of EZproxy login URLs.

4. Lack of Cross-Site Persistence:

   The solution did not remember users' selections from other STM sites, limiting the seamless experience across multiple platforms.

By comparing the SeamlessAccess implementation guidelines and the IEEE *Xplore* internal solutions, it becomes evident that a hybrid approach offers the best of both worlds, combining the strengths of each approach to create a comprehensive and adaptable authentication system.

1. Presentation:

   IEEE *Xplore* implemented the SeamlessAccess (SA) Presentation layer guidelines to ensure a consistent and user-friendly authentication experience. The platform incorporated buttons, forms, and other user interface elements, following the recommended design principles provided by SA. While adhering to these guidelines, IEEE *Xplore* also made some customizations to align the presentation with its branding and user expectations, ensuring a seamless and familiar interface for users.

2. Discovery Service:

   By opting for the advanced option, IEEE *Xplore* has the capability to independently add Single Sign-On Identity Providers (SSO IDPs). This flexibility allows for the inclusion of institutional IDPs specific to IEEE *Xplore*'s user base. Additionally, IEEE *Xplore* utilizes a homegrown solution to add EZProxy URLs, providing enhanced control and customization options for sign-in URLs.

3. Persistence:

   IEEE *Xplore* enables SeamlessAccess Single Sign-On (SSO) persistence across multiple publisher platforms. Once users have authenticated themselves using SeamlessAccess, their SSO session remains active when accessing other participating publisher platforms within the same browsing session. This persistence eliminates the need for users to repeatedly authenticate themselves when navigating through different platforms, offering a seamless and convenient user experience.

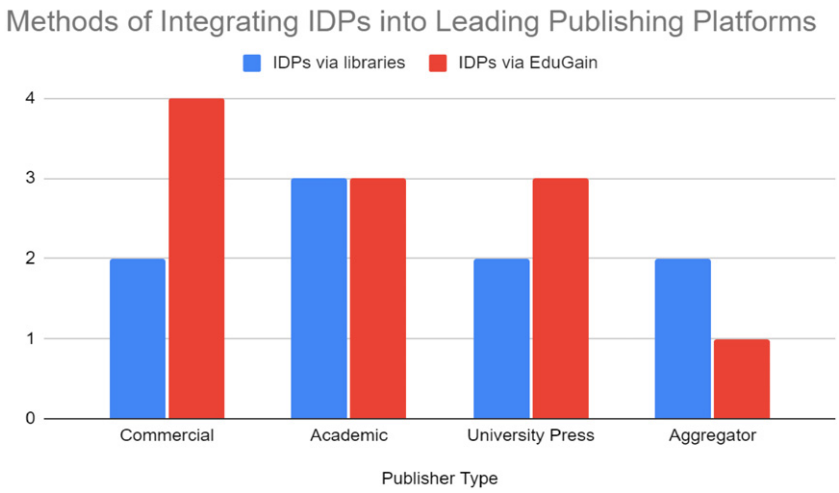

Fig. 2. Methods of integrating IDPs into leading publishing platforms.

4. Fall-Back Solution:

In case of any SeamlessAccess performance issues or the service's potential cessation, IEEE *Xplore* has implemented a robust fall-back solution. The platform can rely on its homegrown system to handle both Federated and EZProxy authentication. This fall-back option guarantees that users can authenticate and access content even if SeamlessAccess encounters technical difficulties or is no longer available.

2.2. Pilot project 1: Add Canadian Access Federation (CAF) IDPs

Implementing federated authentication in institutions worldwide has been a continuous process, with institutions registering their Identity Provider (IDP) attributes in federations. These federations facilitate sharing metadata attributes with EduGain, a platform that provides convenient access to IDP metadata through tools like the Metadata Explorer Tool [17]. However, it is essential to note that the adoption of federated authentication by libraries in these institutions is not uniform.

Traditionally, publishers relied on libraries to take the initiative and configure federated authentication for their subscriptions. Libraries would then reach out to publishers to integrate the necessary authentication mechanisms. This approach required active involvement from libraries to enable federated authentication for their users.

During the pandemic, some publishers recognized the need to simplify the authentication process for library users and took proactive measures. They downloaded metadata from EduGain and compared it against their customer lists. By integrating this metadata into their Institutional Sign In functionality, these publishers aimed to streamline the authentication experience for library users, especially during remote access.

A test conducted in May 2022 assessed the methods used to integrate IDPs into twenty-four leading publishing platforms across various types of publishers: six commercial, six society, six university press, and two aggregating. The results revealed that large commercial publishers were more likely to take proactive measures. They downloaded metadata from EduGain and integrated it into their Institutional Sign-In functionality, reducing the reliance on libraries for the configuration process (Fig. 2).

However, it is worth noting that end users may still experience variations in their authentication experiences due to the differing federated authentication setups implemented by libraries. Testing institutional sign-in on multiple publisher platforms uncovered various types of error messages, highlighting potential challenges and inconsistencies in the user experience.

In early 2022, our attention was drawn to reports from Canadian libraries regarding the low usage of their subscribed content on IEEE *Xplore*. Upon conducting a preliminary analysis, it became apparent that while several Canadian institutions had successfully integrated their SAML or OpenAthens Identity Providers (IDPs) into our platform, none of the Shibboleth IDPs from the Canadian Access Federation (CAF) were present. Recognizing the significance of improving accessibility and engagement with Canadian libraries, we made a strategic decision to embark on a pilot project. This initiative aimed to integrate approximately forty IDPs from the Canadian Access Federation (CAF) into our access system while implementing SeamlessAccess, thereby addressing the existing gap. We outline three key drivers that propelled us to undertake this pilot project, underscoring our commitment to fostering fruitful collaborations with Canadian libraries.

1. Expanded Access and User Engagement:

Integrating CAF IDPs would broaden access and enhance user engagement among Canadian libraries. By seamlessly incorporating the IDPs into our access system, we would streamline the authentication process for users and encourage increased usage of our content within Canadian institutions.

2. Comprehensive Coverage through Independent IDP Addition:

To ensure comprehensive coverage, we would take the initiative to independently add the Canadian IDPs to our access system. By leveraging metadata from EduGain, we could include a wide range of Canadian institutions and eliminate any gaps in access. This proactive approach would demonstrate our commitment to delivering a robust and inclusive access solution that caters to the needs of Canadian libraries.

3. Thorough Testing and Evaluation:

The manageable sample size of approximately forty accounts would allow us to conduct thorough testing and evaluation throughout the pilot project. We could assess the impact of SeamlessAccess on accounts with existing IDPs as well as those with newly added Canadian IDPs. This evaluation would provide valuable insights into the effectiveness of the integration, identify potential challenges or areas for improvement, and inform our decision-making process for future enhancements.

Through this pilot project with CAF IDPs, we aim to optimize access workflows, increase usage, and strengthen our partnership with Canadian libraries. By providing a seamless and comprehensive access experience, we strive to empower researchers and ensure that valuable content is readily accessible to Canadian institutions and their users.

2.3. Pilot project 2: Integrate EZproxy login URLs into institutional sign in

We have received some library requests to incorporate EZproxy into IEEE *Xplore*'s Institutional Sign In due to their reliance on EZproxy for library subscriptions instead of federated authentication. We have found that many of our subscribing libraries still rely heavily on EZproxy as the primary remote authentication option. As a result, we decided to initiate a pilot project to explore the integration of EZproxy login URLs into the Institutional Sign In search box and integrate EZproxy as part of our SeamlessAccess process. Several compelling reasons were driving this decision:

1. Inclusive User Experience:

Our primary objective is to provide users with a seamless and convenient access experience without federated authentication options. By directly integrating EZproxy login URLs into the Institutional Sign In search box, we simplify the login process for users relying on EZproxy for remote access. This integration eliminates the need for users to navigate through library home pages, reducing friction and significantly enhancing the overall user experience.

2. Leveraging Existing Infrastructure:

Incorporating EZproxy into the SeamlessAccess Plus service aligns with our strategy of leveraging our established infrastructure and solutions. EZproxy is a widely adopted authentication mechanism within the library community. Building upon our existing systems, we can provide enhanced experiences for users with the EZproxy authentication method.

3. Insights and Feedback:

The pilot project allows us to gather valuable insights and feedback from users and institutions. By testing the integration of EZproxy login URLs and evaluating its impact on user experience, we can assess the effectiveness of this enhancement and identify any challenges or areas for improvement. This feedback would be crucial in guiding our decision-making process and shaping future developments to ensure the delivery of an optimal access solution.

2.4. Track SeamlessAccess and federated authentication

When planning the implementation of SeamlessAccess, we acknowledged the importance of diligently tracking and assessing its impact to gain valuable insights into its effectiveness. To accomplish this, we developed a framework of three methods to monitor SeamlessAccess usage and evaluate its performance.

1. Button Tagging: Monitoring User Interactions with SA Buttons

To gather insightful data on user engagement, we implemented a robust tagging system for all SeamlessAccess buttons. This system allowed us to track and analyze button clicks and geographic distribution. By capturing these metrics, we could assess the adoption and popularity of SeamlessAccess across different user segments and regions.

2. Recording Steps, Successes, and Failures of Adding IDPs:

Considering that not all libraries were set up for federated authentication of subscriptions, we recorded steps to set up and test the addition of IDPs on IEEE *Xplore*. This documentation would allow us to see which libraries' federated authentication integrations were successful, which failed, and why.

3. Comparative Analysis: Assessing the SA Impact on Authentication

To evaluate the impact of SeamlessAccess, we conducted a comparative analysis of authentication methods. By comparing usage statistics before and after SeamlessAccess implementation, we measured its effectiveness in improving user convenience, streamlining access workflows, and driving the adoption of the new system.

Through these tracking methods, we gained valuable insights into user engagement, behavior, and the impact of SeamlessAccess. This data-driven approach empowered us to refine and enhance the system, ensuring our users a seamless and efficient research experience.

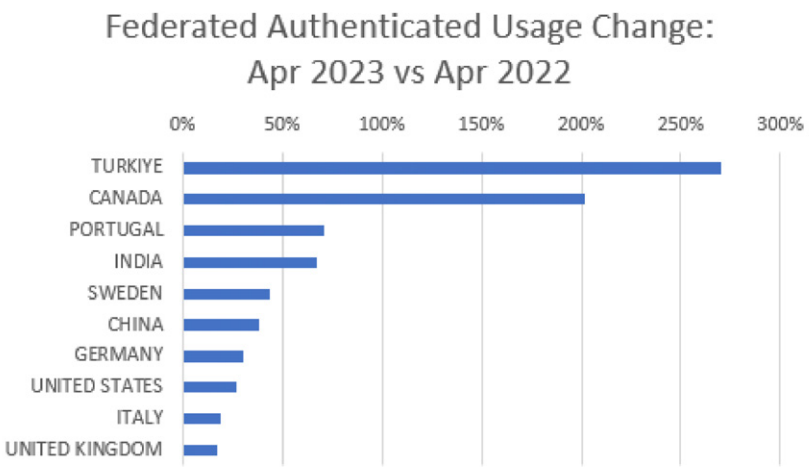

Fig. 3. Federated authenticated usage change by country.

3. Results

3.1. Increase in global federated authentication usage after SeamlessAccess

With help from the SeamlessAccess team, we successfully released the SeamlessAccess implementation on IEEE *Xplore* in October 2022. After the release, we saw an immediate increase in federated authenticated usage across the countries. By comparing the federated authenticated usage in April 2022 and April 2023, there was an overall 33% increase across the globe. Figure 3 shows the breakdown by some leading countries.

1. Steady Growth in Established Federated Authentication Countries:

Since the SeamlessAccess implementation, countries such as China, the United Kingdom, and Germany, which have well-established federated authentication systems, have consistently increased full-text usage. It is evident that in countries with a strong adoption of federated authentication, SeamlessAccess can further streamline access to IEEE *Xplore* content.

2. Prominent Influence of Canadian IDP Integration:

The pilot project of addition of Identity Providers (IDPs) in Canada has significantly impacted the usage of SeamlessAccess. With the integration of these IDPs, Canadian users now have seamless access to IEEE *Xplore* content, resulting in improved convenience and increased usage.

3. Significant Usage Spike in Library-Driven IDP Integration:

While not included in the pilot project, several countries, including Turkiye, witnessed a remarkable upsurge in the adoption of federated authentication. A notable development occurred between February and June 2022 when over one hundred libraries in Turkiye proactively collaborated with IEEE to incorporate their Identity Providers (IDPs) into IEEE Xplore. This compelling evidence highlights the substantial benefits that SeamlessAccess brings to libraries that take the lead in integrating federated authentication into their publishing platforms through close collaboration with publishers.

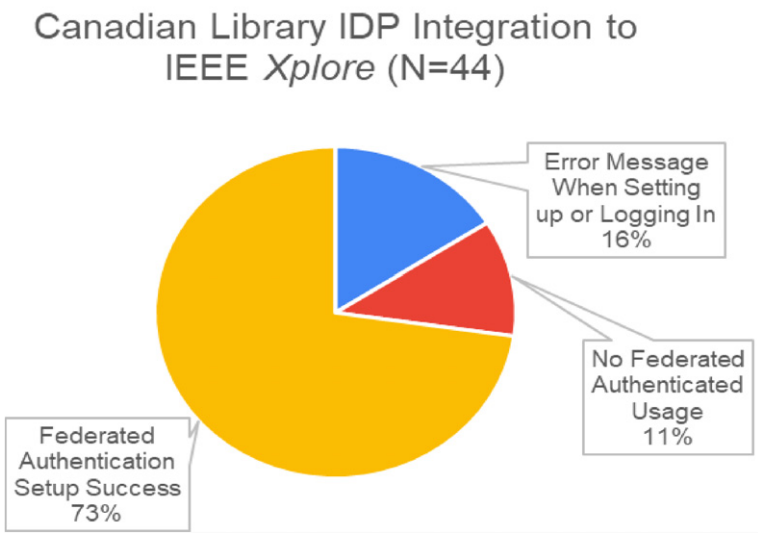

Fig. 4. Canadian library IDP integration to IEEE Xplore.

3.2. *Success and troubleshooting in integrating canadian library identity providers (IdPs)*

For Pilot Project 1, we tried to add forty-four Canadian IDPs into IEEE *Xplore*, some with success and some with errors. Figure 4 presents data on integrating Canadian Library Identity Providers (IDPs) with IEEE *Xplore*, explicitly focusing on the success rate of federated authentication setup, the occurrence of error messages during setup or login, and the percentage of libraries not showing federated authenticated usage.

1. High Federated Authentication Setup Success:

73% of the Canadian libraries show no errors for us to integrate their IDPs and see a significant increase in federated authenticated usage of IEEE *Xplore* content. This substantial percentage implies that although most Canadian libraries have not taken the initiative to contact IEEE *Xplore* to integrate their IDPs, they have correctly configured their federated authentication for IEEE *Xplore* content. It confirms IEEE's decision to add more IDPs to the IEEE *Xplore* Institutional Sign-In.

2. Error Message When Setting up or Logging In:

We encountered errors during the integration of federation authentication or library login testing for 16% of the libraries. Further investigation and troubleshooting may be required to address these issues and improve the user experience. These errors also confirm the necessity of this pilot project.

3. No Reported Usage Despite Seemingly Successful Integration:

For 11% of these Canadian libraries, we encountered no errors when integrating their IDPs into IEEE *Xplore* or testing the sign-in, but we saw no full-text usage of IEEE *Xplore* content after eight months. This lack of usage suggests that these libraries do not use federated authentication for library subscriptions or have not put IEEE *Xplore* content under federated authentication. Understanding the reasons behind this non-usage can provide insights into these libraries' specific needs and preferences, allowing for targeted support or alternative access options.

3.3. Impacts of EZproxy integration with Seamlessaccess: Success, usage, and benefits

The implementation of SeamlessAccess has significantly enhanced the usage of EZproxy, a widely used remote authentication option for accessing scholarly content. By comparing the EZproxy-authenticated usage of IEEE *Xplore* content in three pilot libraries, from before the SeamlessAccess implementation (April 2022), one month after the implementation (October 2022), and eight months after the implementation (April 2023), we can observe remarkable increases in engagements and usage.

1. Enhanced EZproxy Usages with SeamlessAccess Implementation:

Comparing the full-text usage of IEEE *Xplore* content from EZproxy sessions in April 2023 after the SeamlessAccess (SA) implementation to the usage in April 2022 before the implementation, the results show significant increases. Library A experienced a 13% increase, Library B saw a 62% increase, and Library C witnessed a substantial 264% increase.

2. Significant contributions of SeamlessAccess to overall EZproxy usages:

The implementation of SeamlessAccess buttons has made a significant impact on EZproxy usage. In April 2023, a substantial portion of EZproxy session usages involved interactions with the SeamlessAccess button, accounting for 99% for Library A, 57% for Library B, and 19% for Library C.

3. Increased User Readiness for SeamlessAccess for EZproxy Usage:

The readiness of users to utilize SeamlessAccess for EZproxy sessions has shown improvement over time. From October 2022 to April 2023, there has been a notable increase in the percentages of EZproxy usage involving the SeamlessAccess buttons. Library A experienced an increase of 252%, Library B 434%, and Library C 78%.

The implementation of SeamlessAccess has had a profound impact on EZproxy usages in various libraries, significantly enhancing the accessibility and usability of scholarly resources. The SeamlessAccess services have been crucial in facilitating increased engagement with EZproxy sessions. With users' readiness and acceptance of SeamlessAccess steadily rising, it is evident that SeamlessAccess can revolutionize how users access and interact with scholarly content through EZproxy.

4. Discussions: Next steps

Building on the success of the SeamlessAccess project and its positive impact on Federated Authentication worldwide, we have identified several key next steps to further enhance the authentication experience and promote wider adoption. These steps include:

1. Add more IDPs from federations:

We will continue to expand the range of Identity Provider (IDP) options available on our IEEE *Xplore* platform. By including more IDPs from various federations, we aim to provide users with broader authentication options, increasing convenience and accessibility.

We understand that integrating more IDPs into publishing platforms can be a complex process. Therefore, we will work closely with the industry to streamline and simplify the integration process. By collaborating with publishers, federations, and IDP providers, we aim to establish standardized procedures and guidelines that facilitate the seamless integration of new IDPs into publishing platforms.

2. Collaborate with libraries for troubleshooting:

We understand that some libraries may encounter challenges during the federated authentication setup process. To address this, we will actively engage with libraries, offering our support and expertise to troubleshoot any issues they may face. By working closely with libraries, we can ensure a smooth and seamless implementation of federated authentication.

We will continue to advocate for the benefits of federated authentication and engage in outreach activities to encourage more libraries to adopt this authentication method for accessing subscribed content. Through targeted communication and educational efforts, we aim to increase awareness and persuade libraries to embrace federated authentication as a secure and convenient access solution.

3. Expand EZProxy Sign-In URLs:

Acknowledging the diverse needs of libraries, we understand that EZProxy plays a crucial role in providing access to subscribed content. In addition to federated authentication options like Shibboleth and OpenAthens, we are committed to expanding the integration of EZProxy Sign-in URLs. This approach ensures a wide range of authentication methods are available to accommodate libraries that rely on EZProxy.

To ensure a seamless user experience for EZproxy users across multiple platforms, we are committed to collaborating with key organizations such as OCLC and SeamlessAccess. By working together, we can address the unique needs of EZproxy users and streamline the authentication process. Our collaborative efforts will focus on developing solutions and implementing best practices that enhance the integration of EZproxy, ultimately providing users with a cohesive and user-friendly authentication experience.

By undertaking these next steps, we aim to further enhance the SeamlessAccess experience, expand the reach of federated authentication, and ensure that users and libraries can access subscribed content conveniently, securely, and with ease.

5. Conclusion

SeamlessAccess significantly enhances end users' access to library-subscribed content, resulting in increased usage and an improved user experience. By streamlining the authentication, SeamlessAccess simplifies the access to resources and removes barriers that might hinder users from utilizing the subscribed content to its fullest extent. This enhanced accessibility translates into higher engagement and utilization of library resources, benefiting both end users and publishers.

For publishers, it is essential to implement SeamlessAccess and embrace its features. By integrating SeamlessAccess into their platforms, publishers can ensure users a seamless and efficient authentication experience, thereby reducing friction and increasing user satisfaction. Moreover, publishers should consider expanding the range of Identity Providers (IDPs) and EZproxy options, providing users with broader remote authentication options. This flexibility allows users to leverage their existing credentials and encourages more usage of publishers'content.

Furthermore, publishers and libraries need to collaborate closely to make federated authentication a truly seamless experience for end users. By sharing knowledge, addressing technical challenges, and exchanging feedback, publishers and libraries can work together to refine and optimize the SeamlessAccess infrastructure. This collaboration is essential for resolving configuration issues, improving system reliability, and ensuring that users can seamlessly access resources across different platforms.

In summary, implementing SeamlessAccess benefits all stakeholders - end users, publishers, and libraries. It simplifies access to subscribed content, increases usage, and improves the overall user

experience. Closer collaborations between publishers and libraries can help create a truly seamless and user-friendly environment and contribute to a more accessible and efficient scholarly research ecosystem.

About the author

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