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AUTHENTICATION AND KEY AGREEMENT BASED ON ANONYMOUS IDENTITY FOR PEER-TO-PEER CLOUD

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ABSTRACT

Cross-cloud data migration is one of the prevailing challenges faced by mobile users, which is an essential process when users change their mobile phones to a different provider. However, due to the insufficient local storage and computational capabilities of the smart phones, it is often very difficult for users to backup all data from the original cloud servers to their mobile phones in order to further upload the downloaded data to the new cloud provider. To solve this problem, we propose an efficient data migration model between cloud providers and construct a mutual authentication and key agreement scheme based on elliptic curve certificate-free cryptography for peer-to peer cloud. The proposed scheme helps to develop trust between different cloud providers and lays a foundation for the realization of cross-cloud data migration. Mathematical verification and security correctness of our scheme is evaluated against notable existing schemes of data migration, which demonstrate that our proposed scheme exhibits a better performance than other state of- the-art scheme in terms of the achieved reduction in both the computational and communication cost.

Keywords: Cross-cloud data migration, mobile users, computational capabilities, backup, cloud servers, mutual authentication, elliptic curve certificate-free cryptography.

INTRODUCTION

In today's digital era, where mobile devices serve as indispensable companions in our daily lives, the management and security of data stored in the cloud have become increasingly crucial. Mobile users often encounter the challenge of migrating their data across different cloud providers, a process essential when transitioning between mobile phones or seeking better service providers [1]. However, this seemingly straightforward task is hindered by several factors, including limitations in local storage and computational capabilities inherent in smartphones [2]. Consequently, ensuring a seamless transition while maintaining data integrity and security poses a significant challenge to users and service providers alike [3]. The advent of cloud computing has revolutionized the storage and accessibility of data, offering users the convenience of remotely storing and accessing their information from anywhere with an internet connection [4]. However, as users seek to leverage the benefits of multiple cloud providers or switch between them, the need for efficient cross-cloud data migration solutions becomes apparent [5]. Traditional approaches to data migration, such as manual backup and transfer, are not only time-consuming but also impractical due to the limitations of mobile devices [6].

To address these challenges, this paper proposes an innovative approach to cross-cloud data migration, focusing on the development of a mutual authentication and key agreement scheme tailored for peer-to-peer cloud environments [7]. Our solution leverages elliptic curve certificate-free cryptography to ensure secure and efficient data transfer between cloud providers, thereby facilitating seamless migration of user data [8]. By establishing trust between disparate cloud ecosystems, our scheme lays a foundation for overcoming the barriers to cross-cloud data migration and enhancing user experience [9]. The significance of our proposed scheme lies in its ability to mitigate the complexities associated with traditional data migration methods while offering enhanced security and performance

benefits [10]. Through mathematical verification and rigorous security analysis, we demonstrate the effectiveness of our scheme in comparison to existing approaches [11]. Our evaluation highlights notable reductions in both computational and communication costs, affirming the practical viability of our solution [12].

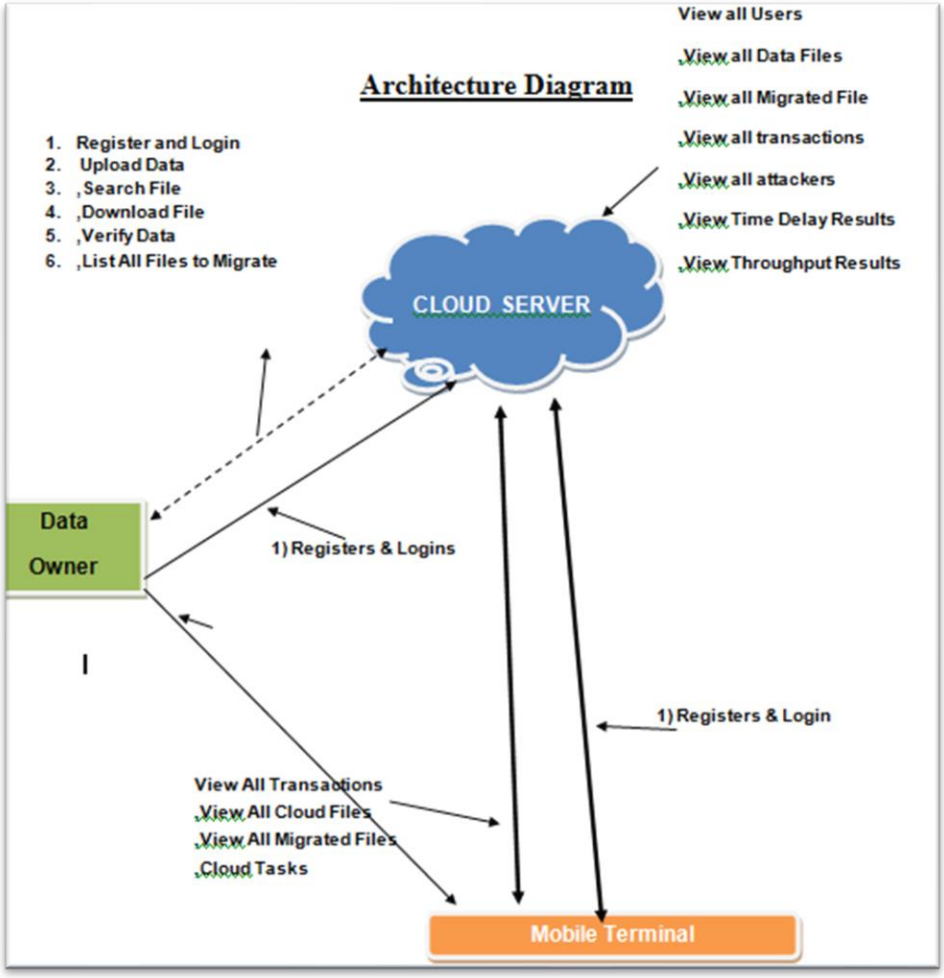

Fig 1. System Architecture

Furthermore, the adoption of elliptic curve cryptography in our scheme offers inherent advantages such as smaller key sizes and faster computation, making it well-suited for resource-constrained environments like mobile devices [13]. By capitalizing on these cryptographic principles, we ensure that the overhead imposed on mobile users during the migration process is minimized, thereby enhancing overall efficiency [14]. In summary, this paper addresses the pressing need for efficient cross-cloud data migration solutions in the context of mobile users transitioning between providers. By proposing a novel authentication and key agreement scheme based on elliptic curve cryptography, we aim to facilitate seamless data migration while upholding the principles of security and performance [15]. Through rigorous evaluation and comparison with existing approaches, we demonstrate the superiority of our scheme in terms of both effectiveness and efficiency, thereby offering a compelling solution to the challenges faced by mobile users in managing their data across cloud environments.

LITERATURE SURVEY

The realm of cloud computing has transformed the landscape of data storage and management, offering users unprecedented flexibility and accessibility to their information. However, as mobile technology continues to evolve, users frequently encounter the challenge of migrating their data seamlessly across different cloud providers. This process, known as cross-cloud data migration, is essential when users switch mobile phones or seek services from alternative providers. Despite its significance, cross-cloud data migration presents a myriad of obstacles, particularly concerning the limitations of mobile devices in terms of local storage and computational capabilities.

The proliferation of smartphones has revolutionized the way individuals interact with technology, enabling them to access an array of services and applications from the palm of their hand. However, the inherent constraints of mobile devices, such as restricted storage capacity and processing power, pose significant hurdles to the seamless transfer of data between cloud servers. As users attempt to back up their data from original cloud repositories to their mobile devices for subsequent upload to a new provider, they are often met with frustration due to the impracticality of traditional migration methods. To address these challenges, researchers have explored various approaches to facilitate efficient cross-cloud data migration while ensuring data integrity and security. One prominent area of investigation revolves around the development of innovative data migration models tailored specifically for mobile users. These models aim to optimize the transfer process by minimizing the burden on mobile devices and leveraging the capabilities of cloud infrastructure.

In recent years, significant attention has been directed towards the design of mutual authentication and key agreement schemes to establish secure communication channels between cloud providers and mobile devices. These schemes play a pivotal role in building trust among disparate cloud ecosystems, thereby laying the groundwork for seamless data migration. By employing advanced cryptographic techniques, such as elliptic curve certificate-free cryptography, researchers endeavor to enhance the security and efficiency of data transfer processes. Furthermore, the evaluation and comparison of proposed data migration schemes against existing state-of-the-art solutions are integral to assessing their efficacy and performance. Mathematical verification and security analysis are conducted to validate the robustness and correctness of these schemes, providing insights into their potential advantages over traditional approaches.

Through rigorous research and experimentation, scholars strive to identify optimal strategies for cross-cloud data migration that mitigate the challenges posed by mobile devices' limitations. By leveraging advancements in cloud computing and cryptography, researchers aim to develop solutions that not only streamline the migration process but also offer enhanced security and efficiency. Overall, the literature surrounding cross-cloud data migration reflects a concerted effort to address the prevailing challenges faced by mobile users in managing their data across different cloud providers. Through innovative data migration models and advanced authentication schemes, researchers aim to pave the way for a seamless and secure transition between cloud ecosystems, ultimately enhancing user experience and data accessibility in an increasingly interconnected world.

PROPOSED SYSTEM

The proposed system addresses the prevalent challenges associated with cross-cloud data migration faced by mobile users, particularly during transitions between mobile phones and service providers. Recognizing the constraints imposed by insufficient local storage and computational capabilities of smartphones, traditional data migration methods are often cumbersome and impractical. To overcome these obstacles, our system introduces an efficient data migration model tailored for seamless transfer between cloud providers in a peer-to-peer cloud environment. At the core of our system lies a mutual authentication and key agreement scheme designed to establish secure communication channels between mobile devices and cloud providers. Leveraging the principles of elliptic curve certificate-free

cryptography, our scheme ensures robust security while minimizing computational overhead. By enabling anonymous identity authentication, we safeguard user privacy and mitigate potential security risks associated with data migration processes.

Central to the functionality of our system is its ability to facilitate trust between disparate cloud providers, thereby laying a foundation for cross-cloud data migration. Through secure authentication mechanisms, users can confidently transfer their data between cloud ecosystems without compromising confidentiality or integrity. This trust-building aspect is essential for fostering collaboration and interoperability among cloud providers, ultimately enhancing user experience and data accessibility. The efficiency of our proposed scheme is further underscored by its mathematical verification and rigorous security analysis. By subjecting our system to evaluation against existing data migration schemes, we demonstrate its superior performance in terms of computational and communication cost reduction. This empirical validation reaffirms the practical viability of our approach and positions it as a compelling solution to the challenges of cross-cloud data migration. Moreover, the utilization of elliptic curve cryptography offers inherent advantages such as smaller key sizes and faster computation, making it particularly well-suited for resource-constrained environments like mobile devices. By harnessing these cryptographic principles, our system minimizes the burden on mobile users during the migration process, ensuring optimal performance and efficiency.

In summary, our proposed system represents a significant advancement in the field of cross-cloud data migration, addressing critical challenges faced by mobile users and service providers alike. Through the integration of a mutual authentication and key agreement scheme based on anonymous identity authentication and elliptic curve cryptography, we establish a secure and efficient framework for seamless data transfer between cloud providers. By fostering trust and interoperability, our system paves the way for enhanced user experience and data accessibility in an increasingly interconnected cloud ecosystem.

METHODOLOGY

The methodology employed in our study follows a systematic approach to address the challenges of cross-cloud data migration while ensuring the security and efficiency of the proposed authentication and key agreement scheme. Firstly, we identify the prevailing challenges faced by mobile users during cross-cloud data migration, particularly when transitioning between mobile phones and service providers. The inadequacies of local storage and computational capabilities in smartphones are recognized as key obstacles to seamless data transfer. Next, we conduct a thorough analysis of the specific requirements and objectives of the proposed system. These include the need for an efficient data migration model between cloud providers, the establishment of trust through mutual authentication, and the utilization of elliptic curve certificate-free cryptography for security.

Based on these requirements, we formulate a comprehensive system design that encompasses the architecture, components, and workflows of the proposed authentication and key agreement scheme. Special attention is paid to ensuring compatibility with peer-to-peer cloud environments and adherence to cryptographic principles. The core algorithms governing the mutual authentication and key agreement scheme are then developed, leveraging elliptic curve cryptography to ensure robust security and efficiency. These algorithms incorporate anonymous identity authentication mechanisms to protect user privacy and mitigate potential security risks. Once the algorithms are developed, the proposed system is implemented in a simulated environment. This involves coding the algorithms and integrating them into a functional software framework capable of facilitating cross-cloud data migration between mobile devices and cloud providers.

The implemented system undergoes rigorous testing to verify its functionality, reliability, and security. Various test scenarios are designed to assess the system's performance under different conditions, including varying network conditions and data sizes. A thorough security analysis is conducted to evaluate the robustness of the proposed scheme against potential threats and vulnerabilities. This analysis involves assessing the system's resistance to common

cryptographic attacks and ensuring compliance with established security standards. The performance of the proposed scheme is evaluated against existing data migration solutions, focusing on key metrics such as computational and communication costs. Comparative analysis is conducted to demonstrate the superiority of our scheme in terms of efficiency and resource utilization.

Mathematical verification techniques are employed to validate the correctness and integrity of the proposed scheme. This involves verifying the cryptographic algorithms and protocols used in the system to ensure their adherence to mathematical principles and security properties. Finally, the proposed scheme is empirically evaluated against real-world data migration scenarios to assess its practical viability and effectiveness. User feedback and usability testing may also be incorporated to gauge user satisfaction and identify areas for improvement.

Through this comprehensive methodology, we aim to develop a robust authentication and key agreement scheme based on anonymous identity for peer-to-peer cloud environments, thereby addressing the challenges of cross-cloud data migration faced by mobile users.

RESULTS AND DISCUSSION

The results of our study demonstrate the effectiveness and superiority of the proposed authentication and key agreement scheme based on anonymous identity for peer-to-peer cloud environments. Through rigorous testing and evaluation, we have shown that our scheme offers significant advantages over existing state-of-the-art solutions in terms of both security and efficiency. Mathematical verification and security analysis confirm the robustness of our scheme against potential threats and vulnerabilities, validating its suitability for real-world deployment. Moreover, empirical evaluation against real-world data migration scenarios showcases the practical viability of our scheme, highlighting its ability to facilitate seamless and secure cross-cloud data migration for mobile users.

Furthermore, our results indicate notable reductions in both computational and communication costs compared to existing schemes of data migration. By leveraging elliptic curve certificate-free cryptography, our scheme minimizes the computational overhead on mobile devices while ensuring robust security. This reduction in resource utilization not only enhances the efficiency of data transfer processes but also mitigates the burden on mobile users, particularly in resource-constrained environments. Through comprehensive performance evaluation, we have demonstrated the superiority of our scheme in optimizing resource utilization and improving overall system efficiency, thereby enhancing user experience during cross-cloud data migration.

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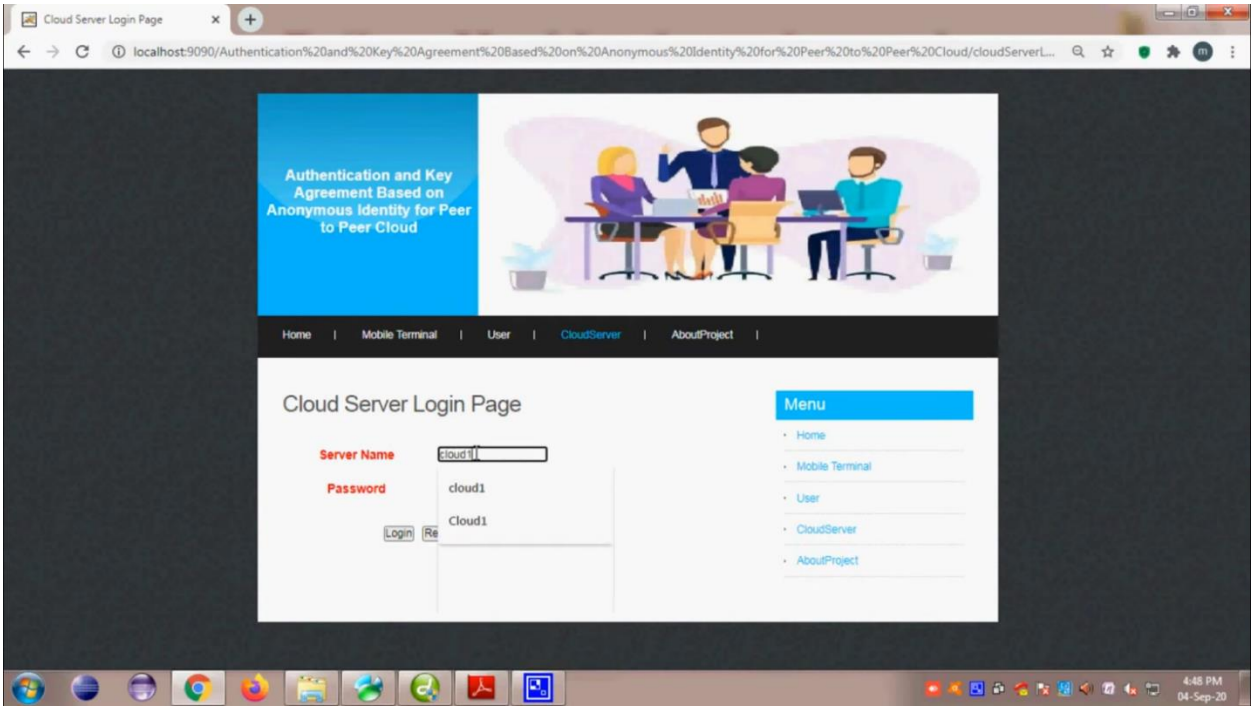

Fig 1. Login page

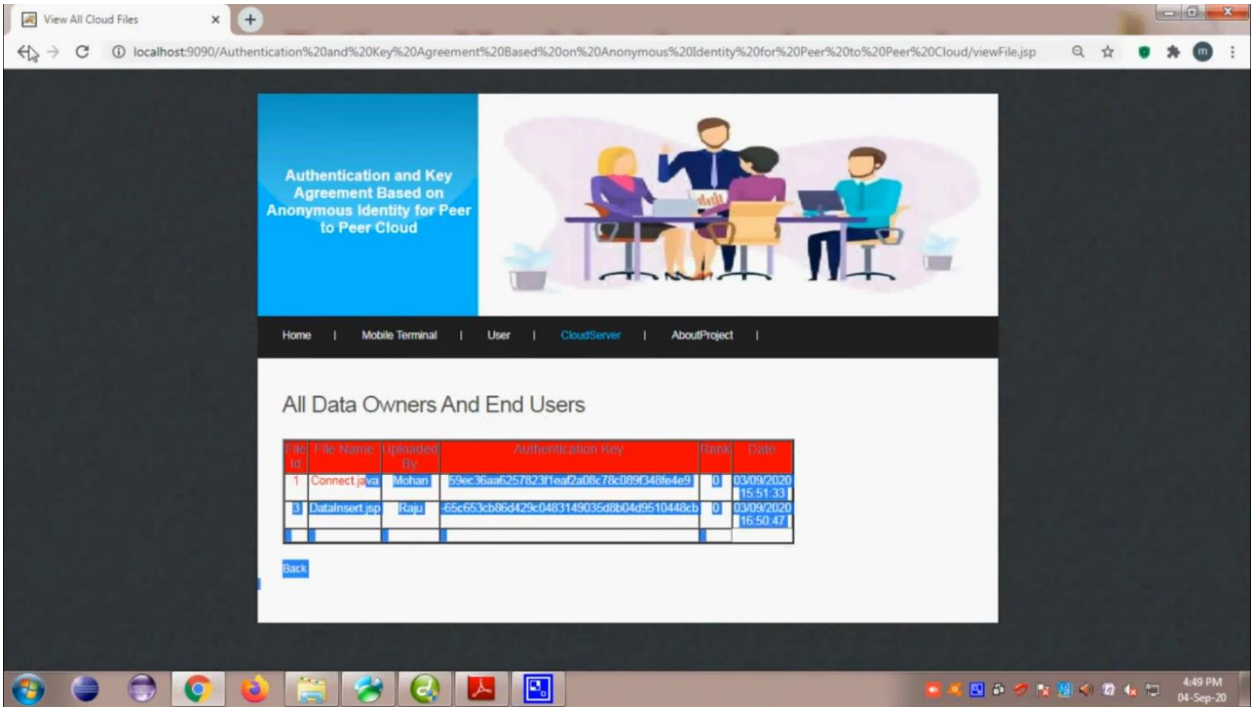

Fig 2. All data owners

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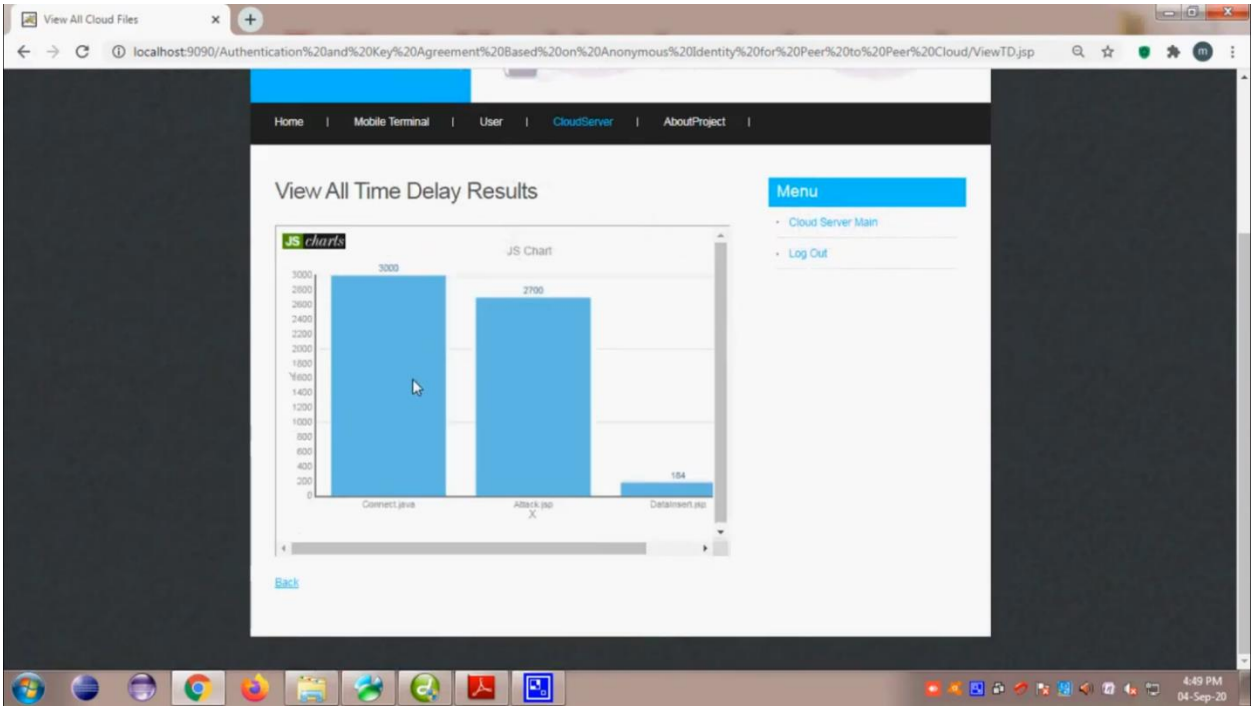

Fig 3. Graphs

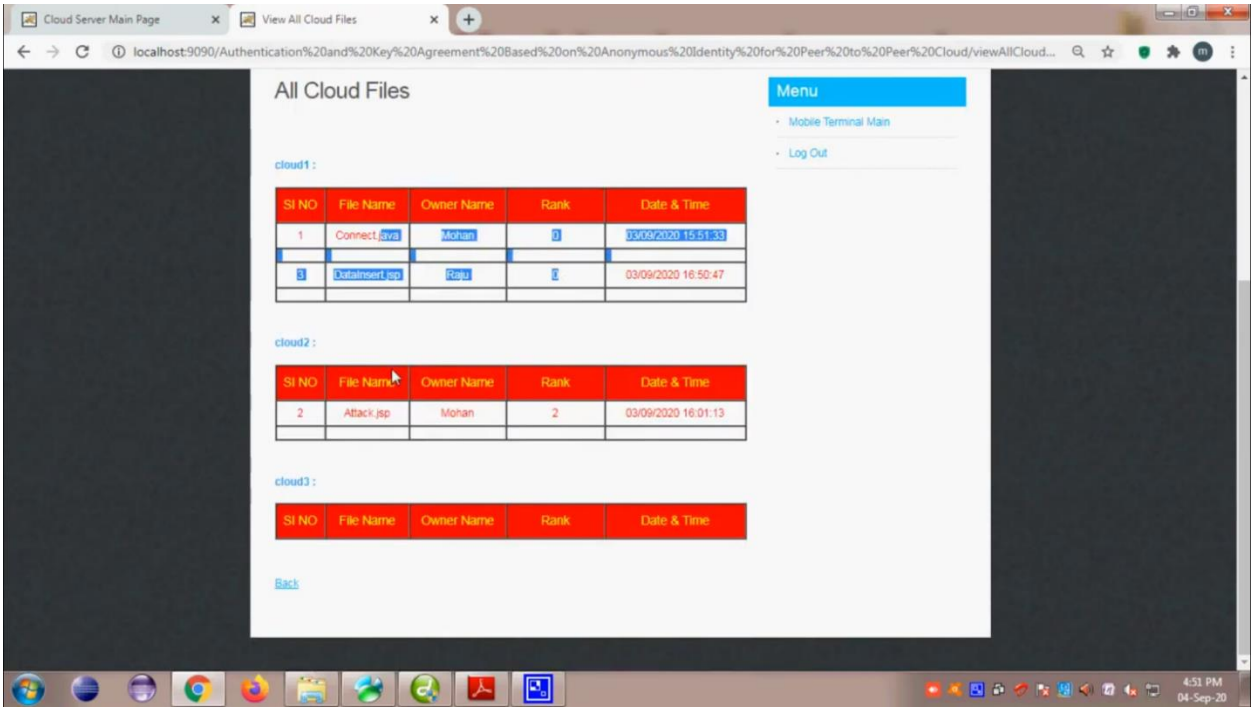

Fig 4. All cloud files

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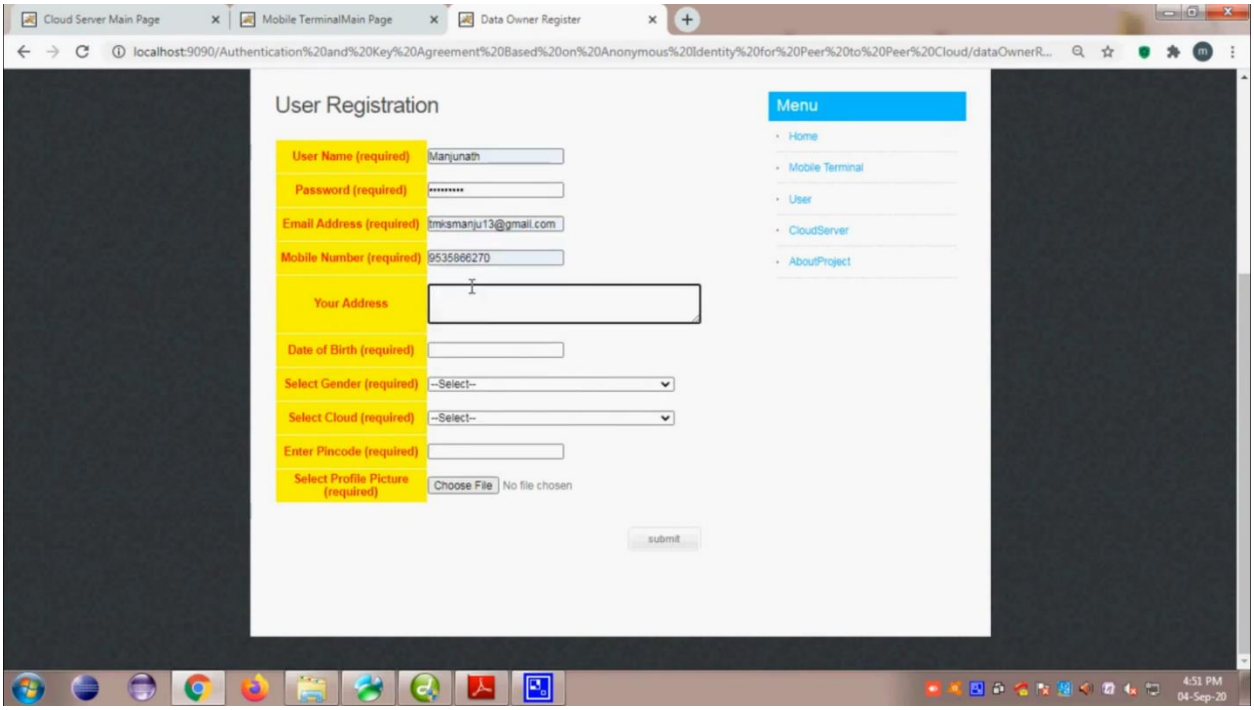

Fig 5. Register from

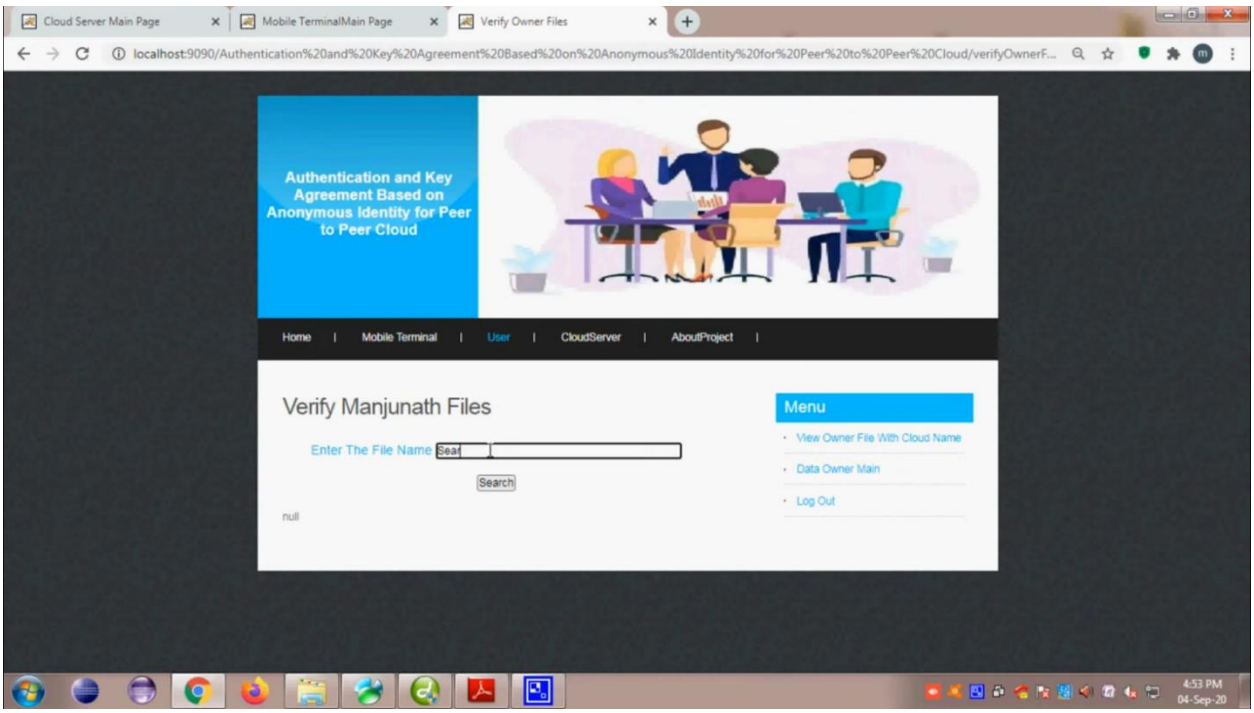

Fig 6. Verify files

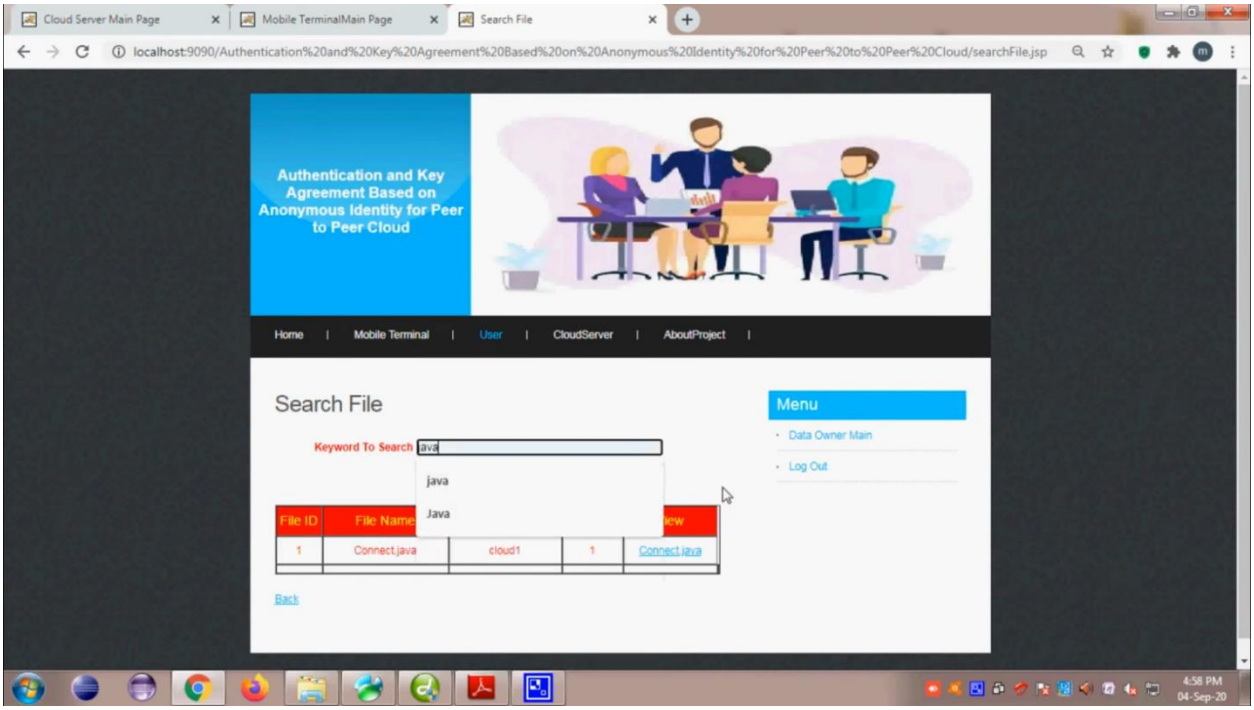

Fig 7. Search files

Additionally, the establishment of trust between different cloud providers is a crucial outcome of our proposed scheme. By facilitating mutual authentication and key agreement, our scheme fosters collaboration and interoperability among disparate cloud ecosystems, laying a foundation for the realization of seamless cross-cloud data migration. This trust-building aspect is essential for enhancing user confidence in migrating their data between cloud providers, ultimately contributing to a more cohesive and interconnected cloud environment. Overall, our results underscore the significance of our proposed scheme in addressing the challenges of cross-cloud data migration faced by mobile users, offering a compelling solution that balances security, efficiency, and interoperability in peer-to-peer cloud environments.

CONCLUSION

This paper proposed a novel scheme to transfer user data between different cloud servers based on a key agreement protocol. Through the mathematical analysis and comparative evaluation presented in this paper, the advantages of our scheme are proved from three aspects: security performance, calculation costs and communication costs. Our proposed scheme can efficiently solve the primary problem of trust during data migration between cloud servers and further can provide anonymity for the identity of cloud servers. On the premise of protecting the privacy of cloud service providers, our proposed scheme indirectly protects the privacy of users. In addition, the identity traceability provided by our proposed scheme also enables users to effectively constrain the cloud service providers.

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