Patent Search

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Inventor

Name	Address	Country	Nationality
Dr. Kalyankumar Dasari	HOD & Associate Professor, Department of CSE-CS, Chalapathi Institute of Technology, A. R. Nagar, Mothadaka, Guntur District, Andhra Pradesh, India. Pin Code:522016	India	India
Mrs. Swetha Gadde	Associate Professor, Department of Artificial Intelligence and Data Science, B. V. Raju Institute of Technology, Vishnupur, Narsapur, Medak District, Greater Hyderabad, Telangana, India. Pin Code:502313	India	India
Mr. S Krishna Sakalabattula	Assistant Professor, Department of Computer Science and Engineering, Ramachandra College of Engineering, Vatluru, Eluru District, Andhra Pradesh, India. Pin Code:534007	India	India
Mrs. Bajjuri Usha Rani	Sr. Assistant Professor, Department Of CSE, Lakireddy Bali Reddy College of Engineering (A), Mylavaram, Krishna District, Andhra Pradesh, India. Pin Code:521230	India	India
Mrs. Mahalakshmi	Assistant Professor, Department of Biomedical Engineering, KIT-Kalaginarkarunanidhi Institute of Technology, Coimbatore, Tamil Nadu, India. Pin Code:641402	India	India
Dr. B. Senthil Kumar	Associate Professor, Department of Electronics and Instrumentation Engineering, St. Josephs College of Engineering, Chennai, Tamil Nadu, India. Pin Code:600119	India	India
Mr. Kishore Dasari	Assistant Professor, Department of Computer Science and Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram, Andhra Pradesh, India. Pin Code:522302	India	India
Dr. Priyanka More	Assistant Professor, Department of Computer Engineering, Vishwakarma Institute of Technology, Pune, Maharashtra, India. Pin Code:411037	India	India
Dr. Rizwana	Associate Professor, Department of Physics, Institute of Aeronautical Engineering, Dundigal, Hyderabad, Telangana, India. Pin Code:500043	India	India
Dr. Ramesh Kumar Yadav	Associate Professor, Department of Faculty of Science & Technology, The ICFAI University Raipur, Kumhari, Durg District, Chhattisgarh, India. Pin Code:490042	India	India

Applicant

Name	Address	Country	Nationality
Dr. Kalyankumar Dasari	HOD & Associate Professor, Department of CSE-CS, Chalapathi Institute of Technology, A. R. Nagar, Mothadaka, Guntur District, Andhra Pradesh, India. Pin Code:522016	India	India
Mrs. Swetha Gadde	Associate Professor, Department of Artificial Intelligence and Data Science, B. V. Raju Institute of Technology, Vishnupur, Narsapur, Medak District, Greater Hyderabad, Telangana, India. Pin Code:502313	India	India
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Dr. Priyanka More	Assistant Professor, Department of Computer Engineering, Vishwakarma Institute of Technology, Pune, Maharashtra, India. Pin Code:411037	India	India
Dr. Rizwana	Associate Professor, Department of Physics, Institute of Aeronautical Engineering, Dundigal, Hyderabad, Telangana, India. Pin Code:500043	India	India
Dr. Ramesh Kumar Yadav	Associate Professor, Department of Faculty of Science & Technology, The ICFAI University Raipur, Kumhari, Durg District, Chhattisgarh, India. Pin Code:490042	India	India

Abstract:

The invention discloses a system and method for secure multi-user access in virtualized cloud environments using role-based encryption. The system integrates a Role Encryption Manager (REM) and a Virtual Access Controller (VAC) to dynamically generate, distribute, and revoke encryption keys based on user roles, ensuring that data and virtual resources are accessible only to authorized users. A hierarchical encryption structure allows higher-level roles to access subordinate data while preventing unauthorized access, and a Role Transition Protocol (RTP) automatically re-encrypts data during role changes or revocations. A Secure Key Repository (SKR) maintains tamper-proof records of key management activities, enhancing compliance and auditability. The invention provides a scalable, efficient, and secure framework for real-time, multi-user access control in distributed virtualized and hybrid cloud environments. Accompanied Drawing [FIGS. 1-2]

Complete Specification

Description:[001] The present invention relates generally to the field of information security and access management in virtualized and cloud computing environments. More particularly, the invention pertains to a system and method for secure multi-user access control using role-based encryption techniques, wherein encryption keys are dynamically generated, distributed, and revoked based on user roles and privileges within a virtualized infrastructure. The invention integrates cryptographic key management with role-based access control (RBAC) mechanisms to ensure data confidentiality, integrity, and secure resource sharing across multi-tenant, distributed, and hybrid cloud environments.

BACKGROUND OF THE INVENTION

[002] In modern computing environments, virtualization and cloud technologies have become fundamental to enterprise infrastructure, allowing multiple users and organizations to share computing resources efficiently. These systems enable scalability, cost reduction, and dynamic resource allocation. However, they also introduce significant challenges in data privacy, secure access control, and role management, particularly in multi-tenant or distributed environments.

[003] Traditional access control mechanisms, such as password-based authentication and static user permissions, are insufficient in dynamic virtualized environments. These systems fail to adapt to real-time role changes and cannot guarantee secure segregation of data among users with different levels of authorization. As a result, unauthorized data exposure or privilege escalation attacks are common, especially in shared cloud infrastructures.

[004] To address these limitations, organizations have adopted Role-Based Access Control (RBAC) models. RBAC assigns permissions to roles rather than individual users, simplifying policy management and reducing administrative overhead. However, conventional RBAC systems primarily operate at the access permission level and do not integrate encryption at the data layer. Consequently, if an attacker compromises the access control layer, they can still retrieve sensitive information in plain text.

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