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### Patent Search

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#### 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 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. 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 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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