

Seminar Report

On

**Cloud Secure Storage Mechanism**

**Based on Data Dispersion and Encryption**

SUBMITTED BY

### Kalp Patel

### PRN NO: 72139949F

Under the guidance of

### Ms. Supriya Sathe

In partial fulfillment of the requirements for Bachelor’s Degree in Computer Engineering of

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Department of Computer Engineering

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**D. Y. Patil College of Engineering Aurkdi, Pune - 411044**

**Department of Computer Engineering**

***CERTIFICATE***

This is to certify that **Mr. Kalp Patel** has satisfactorily completed the seminar work entitled **“Cloud Secure Storage Mechanism Based on Data Dispersion and Encryption”** Which is a bonafide work carried out by him under the supervision of **Ms. Supriya Sathe** and it is approved for the partial fulfillment of requirement of Savitribai Phule Pune University, for the award of the degree of Bachelors of Engineering (Computer Engineering) for the academic year 2022-23.

Ms. Supriya Sathe Dr. M. A. Potey

(Seminar Guide) (HOD Computer)

Place: Akurdi Date:

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**NAME: Kalp Patel**

**Roll No.: TECO2223A005**

**Signature:**

## ABSTRACT

The most evenhanded of the proposed component is to get distributed storage against information break, which can be the consequences of designated assault (for example plate cloning) or the executive’s carelessness, in the event programmers even a malignant overseer is prepared to take client information. Distributed storage administration has shown its state and wide fame which offers essential help for fast improvement of distributed computing. Nonetheless, as a result of the board carelessness and vindictive assault, there actually lie colossal security occurrences that cause amounts of delicate information spillage at distributed storage layer. Massive security events, resulting on enormous volumes of sensitive information escaping at the cloud-based tier, continue to occur as a result of managerial incompetence and malicious attacks. The CSSM (Cloud Secure Storage Mechanism) was introduced to protect the cloud data privacy. To keep away from information break at the capacity layer, CSSM coordinated information scattering and dispersed stockpiling to see the value in encoded, hurled and conveyed capacity. moreover, CSSM took on a progressive administration approach and joined client secret key with secret sharing to prevent cryptographic materials spillage. The exploratory outcomes demonstrate that proposed system isn't just appropriate for guaranteeing the information security at capacity layer from spillage, however can also store tremendous measure of cloud information really without forcing a lot of time upward. For instance, when clients transfer/download 5G measured record with CSSM, it just takes 646seconds/269seconds, which is OK for clients.

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## Introduction

Distributed computing has shown amazing advancement in ongoing many years. At the point when the capacity as an assistance, it possesses the center stage and spine for a long time, similar to design acknowledgment picture measurable and phony identification. Subsequently, bigger volumes of data are visiting be a part of the cloud region. inside the cloud business, Amazon Web Service (AWS) has turned into the specific norm. since the center part of the Opens tack that keeps this guideline, Swift has become one out and out the preeminent well known distributed storage instrument. In any case, Opens tack Swift instrument actually faces numerous genuine security dangers while offering helpful types of assistance. per Cloud Security Alliance's top danger case examination report delivered in 2018, 66% of the cases will cause client information spillage, chiefly because of the executive’s carelessness and pernicious assaults. for instance, under default arrangement, OpenStack Swift system ordinarily stores information in plaintext for execution. which is prepared to guide unapproved admittance to client information at capacity layer. moreover, Security Report delivered by Openstack Vulnerability Management Team VMT, the Swift system might spill client information or design data in temperance of safety weaknesses. Shah et al proposed a cloud-arranged information security capacity system under the structure of Apache Spark, which forestalls information spillage and works on the assurance of Apache Spark structure. to safeguard client information on the cloud, different encryption plans are taken on to stay away from data spillage during AI process. By and by, above explores require secure key administration systems to hinder cryptographic materials openness.

Zerfos et al. constructed a safe disseminated stockpiling framework upheld Hadoop framework, which keep the privacy of cloud information through information scattering and encryption. It plays out the information unscrambling and get together assignments prior to understanding information. to thwart the keys from being taken, this technique requires key reserve server and each one keys ought to be put away in memory as it were. A few methodologies acquainted autonomous outsider with deal with the key. The fact that third gatherings stay believed makes it acknowledged.

Zheng et al. given a cloud information duplication plan to distinguish and remove indistinguishable client information inside the cloud. Nonetheless, from the mentality of forestalling information misfortune because of calamity, a specific number of duplicates should

be shipped off different districts. In a word, to protect cloud information from spillage at capacity layer, this paper presents CSSM, a Cloud Secure Storage Mechanism. CSSM joins information scattering with encoding, all together that largescale cloud information and keys would be put away in pieced figure texts. On this premise, client secret key and mystery sharing are acquainted with further safeguard keys security. The primary commitments of this work are recorded beneath:

**1) Data Secure Storage:** so as to stop data leakage and increase the problem of attack, CSSM presents a way combining data distribution and encoding to enhance data storage security.

**2) Hierarchical Key Management:** to guard the key and forestall the attacker from using the key to recover the information, CSSM introduces secret sharing and key hierarchy derivation algorithm together with user password to boost key security.

**3) Experimental Evaluation and Analysis:** the safety analysis and experimental results show that CSSM can effectively guarantee the safety of knowledge storage, and also the increased performance cost is suitable.

## Problem Definition

**To understand and analyze a Cloud Secure Storage mechanism with the help of Data dispersion and Encryption algorithms.**

With the use of Unreal Engine 5, building a simulation of Metaverse and understanding the Scalability Factor to achieve a fully functional Metaverse.The blossom of emerging technologies, such as real-time rendering technologies, digital twin, artificial intelligence, 6G communications and blockchain, can promote the proliferation of the metaverse

## Motivation, Objective and Social Relevance

### MOTIVATION:

Metaverse as the latest buzzword has attracted great attention from both industry and academia. Metaverse seamlessly integrates the real world with the virtual world and allows avatars to carry out rich activities including creation, display, entertainment, social networking, and trading. Thus, it is promising to build an exciting digital world and to transform a better physical world through the exploration of the metaverse

### OBJECTIVE:

1. To understand the features and functions provided by Unreal Engine 5.
2. Whether it is feasible and scalable to create a Virtual World using UE5.
3. To understand the basic needs required to build a fully functioning Meta-World.
4. Creating Human-Like Virtual Avatars for every person.

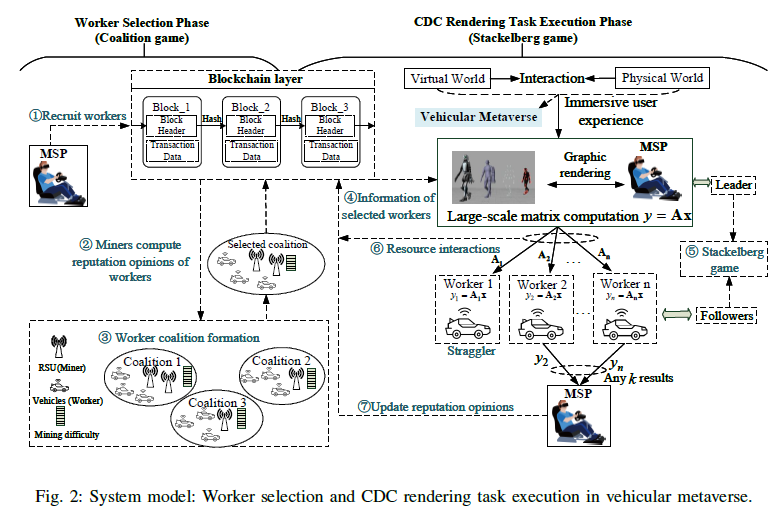
### SOCIAL RELEVANCE:

After the impact of Covid-19 on the global scale, the world is working in hybrid mode i.e., both virtually and physically. It is important to create a virtual world for all types users and develop a common place where users can interact with each other globally. It is necessary to test and analyze the available tools and scale them to overcome the massive need of Metaverse. The analysis of technological needs of Metaverse is crucial to understand the scope and resources needed to develop it. Citizens in the Metaverse will be able to buy, sell and exchange from the E-commerce shops that are pre-built in the virtual world. Users can interact with different people across the world the likes of which never seen before.

## Literature Survey of Topic

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr No** | **Title and Authors** | **Conference/Journal Name and Publication Year** | **Topic Reviewed or Methodology Used** | **Advantages and Disadvantages** |
| 1 | Reliable Distributed Computing for Metaverse: A Hierarchical Game-Theoretic Approach | 2022 | The main objective of this Journal is to achieve immersive user experiences in the metaverse, real-time rendering is the key technology. However, computing intensive tasks of real-time rendering from metaverse service providers cannot be processed efficiently on a single resource-limited mobile device. Alternatively, such mobile devices can offload the metaverse rendering tasks to other mobile devices by adopting the collaborative computing paradigm based on Coded Distributed Computing (CDC). Therefore, this paper introduces a hierarchical game-theoretic CDC framework for the metaverse services, especially for vehicular metaverse. In the framework, idle resources from vehicles, acting as CDC workers, are aggregated to handle intensive computation tasks in the vehicular metaverse | 1)Helps in understanding the approach needed to build a large-scale distributed system for Metaverse.  2) A distributed computing framework is proposed for the vehicular metaverse based on CDC and blockchain.  3)Doesn’t provides the platform on which we can develop the Metaverse and its entities. |
| 2 | Fusing Blockchain and AI With Metaverse | 2022 | In this survey, the author dive into the metaverse by discussing how Blockchain and Artificial Intelligence (AI) fuse with it through investigating the state-of-the-art studies across the metaverse components, digital currencies, AI applications in the virtual world, and blockchain-empowered technologies. Further exploitation and interdisciplinary research on the fusion of AI and Blockchain towards metaverse will definitely require collaboration from both academia and industries. Author wishes that their survey can help researchers, engineers, and educators build an open, fair, and rational future metaverse. | 1)Helps us understand the crucial role of Artificial Intelligence and Blockchain in Metaverse.  2) Metaverse can use artificial intelligence and blockchain to create a digital virtual world where anyone can safely and freely engage in social and economic activities |
| **3** | Development of Character Design Frameworks using Game Engine: Unreal Engine | 2016 | The purpose of this study is to show how to improve the character design frameworks by using game engine, Unreal Engine 1. The contents emphasized on 3-dimensional production processing of the project “The creation of Science fiction Character inspired from Ramayana” which was created by 4 th year student from Department of Animation and Game, College of Arts, Media and Technology, Chiang Mai University. This project decided to adapt the frameworks by integrating between digital animation and game technique to establish a new design process more capability | 1)No concept of virtual reality has been discussed  2)Provides an in-depth understanding of Character Development in Unreal Engine  3)Framework is thoroughly explored with pros been the Animation arc |
| **4** | Serious Games: Review of methodologies and Games engines for their development | 2019 | The methodology used is based on the protocol defined by Barbara Kitchenham, 27 studies from 2013 published in various conferences and magazines were analyzed. The conclusion is that Unity or Unreal are the most used engines, the methodology to follow depends a lot on the nature of the project, being SUM the best option to be used, it should be noted that other authors have chosen to use their own methodologies, and finally to choose A game engine must take into account the basic components and features. | 1)Discusses the trend follow in the last couple of years for Unity and Unreal Developers  2)User Acquisition is analyzed with Data acquired from Unity and Unreal Engine |
| **5** | Game Engine Architecture and Comparative study of Different Game Engine | 2017 | Study of architecture, availability, and performance for Game Engines.  This paper eludes the game engine architecture and its constituents and illustrates the features and comparative analysis between four popular game engines namely, Unity, Gamemaker, Unreal, and CryEngine. | 1)Various features of different Game Engine has been discussed  2)Does not provide the user experiences  3)Helps in gaining an Insight of different Game Engines |
|  |  |  |  |  |

# Discussion of Base paper



A distributed computing framework is proposed for the vehicular metaverse based on CDC and blockchain. The subjective logical model is used to compute the reputation values of vehicles. A hierarchical game-theoretic CDC framework is proposed for the vehicular metaverse, the coalition formation game is combined with the reputation metric in the upper layer to select reliable workers, and the Stackelberg game is designed in the lower layer to incentivize workers to join the CDC rendering tasks. Finally, the proposed CDC reliable worker incentive mechanism is simulated and analyzed. Simulation results indicate that the proposed reliable CDC scheme is resistant to malicious workers and is suitable for the decentralized CDC in the vehicular metaverse. The utility of the MSP has been increased by 17%, and the average profit of workers has been increased by 14% compared with the best-effort worker selection scheme.

**System Model:**

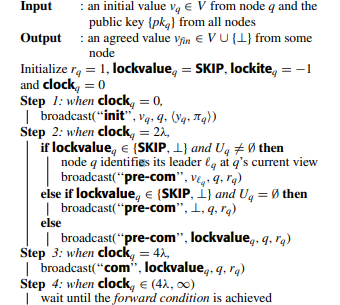
The vehicular metaverse mainly includes the virtual world, physical world and interaction layer. Passengers can immerse themselves in the fusion of virtual and real scenarios through the interaction layer. The immersive user experience is a significant part of the interaction layer [4]. To achieve immersive user experiences in the metaverse services (e.g., projecting avatars into passengers’ seats or enjoying the virtual attractions through interactive holographic windscreens), high fidelity rendering technologies (e.g., graphic and spatial sound rendering) are adopted to create 3D or holographic digital media, which require intensive matrix computation tasks to be processed by onboard units or devices in vehicles. Those vehicles can choose to execute rendering tasks by collaborating with other vehicles within a limited communication distance. In the metaverse, vehicles that distribute large-scale matrix computation tasks (e.g., projection and shadow mapping in graphic rendering [23]) are called MSPs. The vehicles that execute the computing tasks of metaverse services are called workers. RodeSide Units (RSUs) with sufficient computation and storage resources in vehicular networks act as miners to execute the blockchain consensus algorithm. In addition, miners are motivated to join the reputation calculation, and miners that have contributed to the reliable worker selection will be rewarded by the blockchain (e.g., receiving tokens or obtaining resource rewards).

**Metaverse Services**

Metaverse-related research is still in its infancy. There are some works studying the metaverse services in graphic or audio rendering, extended reality technologies etc. The authors propose a vision of the metaverse native communications that include encrypted address-based access model and blockchain. In order to realize the audio/visual and virtual/reality congruence in metaverse services, the authors design the 6-degree-of-freedom interactive audio engines based on objects. The authors give a comprehensive survey on computational arts that blend virtual and physical environment in the metaverse. The authors design a brain-to-speech scheme for smart communication in the real world, which is also presented as a potential application in the metaverse. The authors propose an operating system for the metaverse based on extended reality, which integrates hardware, computer vision and extended reality specific network. The authors propose a blockchain-based framework for the metaverse. The sharding scheme is used to improve the scalability of blockchain networks. The above works have not considered the metaverse services in vehicular networks. As metaverse might have a profound impact in the automotive field, a great deal of research needs to be done on the vehicular metaverse, including the distributed computing that is meaningful for the user immersive experience in the vehicular metaverse.

# Algorithm

Algorithm 1 Robust Byzantine Agreement for Node *q*



RBA (Algorithm 1) is an iteration-based protocol. Initially, for all honest nodes *q ∈ S, q* initializes its internal variables by *rq* = 1, **lockvalue***q* = **SKIP**, **lockite***q* = −1 and **clock***q* = 0 and also chooses its initial value *vq ∈ V*. Our protocol has four steps in each iteration. At Step 1, all the nodes broadcast their own initial value vq in the format (‘‘init’’, vq, q, (yq, πq)).

When **clock***q* = 2λ, *q* enters Step 2. If ***lockvalueq*** ∈ ***{SKIP,*** ⊥***},*** *q* verifies the initial messages it receives and computes the set ***Uq*** of nodes whose VRF values are valid.

If *Uq* != ∅, *q* identifies its leader `*q* and pre-commits `q’s value; otherwise, *q* pre-commits ⊥. If **lockvalue***q*∈ {SKIP, ⊥}, node *q* pre-commits **lockvalue***q*.

We say node *q* pre-commits on a value *v* if node *q* broadcasts the message (‘‘**pre-com**’’, *v, q, r*) where *r* is the iteration index that node *q* is working at. Note that node *q* updates its **lockvalue***q* and **lockite***q*immediately if the lock condition holds. When **clock***q* = 4λ, node q enters.

Step 3. Node *q* commits on its current **lockvalue***q*. We say node *q* commits on a value *v* if node *q* broadcasts the message (‘‘**com**’’, *v, q, r*) where *r* is the iteration index that *q* is working at. After node *q* broadcasts the commit message, *q* enters.

Step 4, at which q waits for the forward conditions.

## 

## Lumen

## Lumen Global Illumination and Reflections Enabled

## Fig 3: Lumen

Lumen is a completely dynamic global lighting and reflections system that responds instantly to changes in scene and light, enabling artists and designers to produce more realistic and dynamic settings. Indirect lighting and reflections can be altered by changing the sun's angle, using a flashlight, opening an outside door, or even detonating a wall. The method highlights even the smallest details in vast, complicated settings by rendering diffuse interreflection with infinite bounces and indirect specular reflections.

**Improvements**: Since the launch of Unreal Engine 5 Early Access, Lumen has seen the following improvements:

* Full Hardware Ray Tracing pipeline for Lumen GI and Reflections
* Shipped on next-gen consoles in [The Matrix Awakens](https://www.unrealengine.com/en-US/wakeup?utm_source=GoogleSearch&utm_medium=Performance&utm_campaign=an*3Q_pr*UnrealEngine_ct*Search_pl*Brand_co*US_cr*Frosty&utm_id=15986877528&sub_campaign=&utm_content=July2020_Generic_V2&utm_term=the%20matrix%20awakens)
* Support for large view ranges with Far Field Hardware Ray Tracing
* Feedback driven Surface Cache, giving higher quality in reflections
* Lumen visualization view modes for troubleshooting content
* Improved Final Gather quality, especially visible on foliage
* Improved Reflections denoiser, especially for glossy reflections and behind moving objects
* Translucency Final Gather, which improves global illumination quality on translucency and Volumetric Fog
* Landscape support
* Radiosity Final Gather, which improves the quality of multi-bounce global illumination and GI seen in reflections
* Lumen settings exposed to the user interface for quality/performance tradeoffs
* Subsurface / Two-Sided Foliage shading models supported

**REAL-TIME GLOBAL ILLUMINATION TECHNIQUES**

RENDERING EQUATION

Kajiya [20] states that light can be described as an electromagnetic radiation using the following equation:



where *L*(**x***,* ***ω***) represents the radiance leaving from point **x** in direction ***ω***. *Le*(**x***,* ***ω***) is the emittance term, which rep- resents the radiance directly emitted from point **x** in direction ***ω***. *fr* (**x***,* ***ω****,* ***ω***r) is the scattering function of the surface in point **x** for the radiance which comes from direction ***ω***r and is reflected in direction ***ω***. *Li*(**x***,* ***ω***r) represents the radiance which comes from direction ***ω***r to **x**. *▲*+ is the upper hemisphere oriented around the normal vector *N*˙**x** and ***θ*** is the angle by the direction ***ω***r with *N*˙**x**.

*fr* (**x***,* ***ω****,* ***ω***r) function represents the distribution of the radiance reflected over the upper hemisphere of point **x**. The function is evaluated for a pair of directions (***ω****,* ***ω***r) in relation to the angle with the normal vector. It widely known as the bidirectional reflectance distribution function (BRDF) [10]. This surface material specific function can be described using various reflection models like the ones proposed by Lambert, Phong [11], Blinn [11], Cook and Torrance [11] or Walter *et al.*[11]. A comprehensive analysis of the reflection models was presented by Schlick [11].

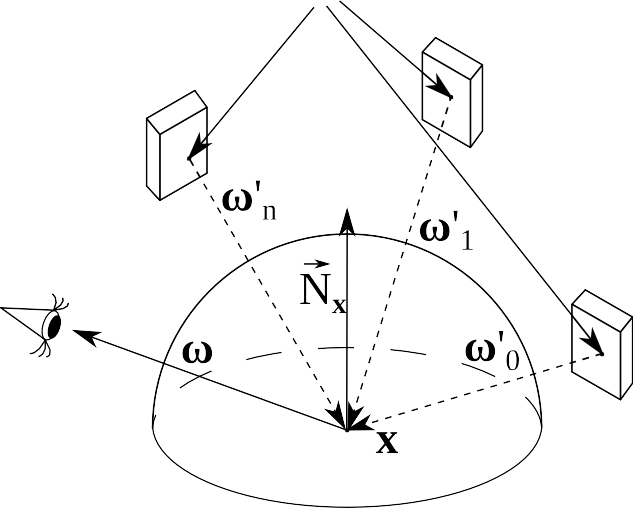


Fig 4: Rendering Superficial

# Summary

Gaming Engines (Unreal Engine 5) and blockchain technologies are expected to play essential roles in the ever-expanding metaverse. For example, metaverse uses Virtual Reality and blockchain to create a digital virtual world where anyone can safely and freely engage in social and economic activities that transcend the limits of the real world. Exploiting metaverse, the application of these latest AI and blockchain technologies will be accelerated as well. By surveying the most related works across metaverse components, digital currencies, AI technologies and applications in the virtual world, and blockchain-empowered technologies, we wish to offer a thoughtful review to the experts from both academia and industries. We also envisioned critical challenges and open issues in constructing the fundamental elements of metaverse with the fusion of VR and blockchain. Further exploitation and interdisciplinary research on the metaverse entail collaboration from both academia and industries to strive for an open, fair and rational future metaverse.

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