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Content Delivery Networks In Azure Cloud

Dr.Shubha Rao V[1], Rekha R[2], Nethravathi S[3]

Associate Professor, Information Science, BMS College of Engineering, Bengaluru, India[1]

Student, Information Science, BMS College of Engineering, Bengaluru, India[2]

Student, Information Science, BMS College of Engineering, Bengaluru, India[3]

Abstract: The majority of Internet traffic today and in the future is related to media. To support the storing and distribution of Internet-enabled material, numerous storage services, media apps, and devices have evolved. The adoption of distributed storage technology by the edge servers in Content Delivery Networks (CDN) based on cloud storage enables effective resource utubilisation and efficient data storage and retrieval systems. Although each edge server has a full copy of the content files to be provided, existing CDNs based on cloud storage do not use distributed storage on edge servers. We suggest implementing a cooperative content outsourcing approach in CDN in this article. This method will distribute the cloud's media content (such as static/dynamic websites) across various edges.

Keywords: Origin, Endpoint, Page Speed Insights, Azure Cloud.

I. INTRODUCTION

A network of network components organised for efficient content distribution to end users is known as a content delivery network (CDN). By maximising bandwidth and enhancing accessibility and content reliability through content duplication, CDNs offer services that enhance network performance. By spreading content across edge (surrogate) servers that are close to users, they offer an infrastructure for hosting and operating applications and services. It covers infrastructure for content delivery, request routing, and dissemination.A group of edge servers make up the content delivery infrastructure, which distributes copies of the material to users. While the distribution infrastructure transfers material from origin servers to edge servers and ensures that it is consistent across origin and edge servers, the request routing infrastructure is in charge of routing client requests to the proper edge servers.Despite their ability to efficiently store and retrieve online content, CDNs do not fully take advantage of edge servers' peer-to-peer connection for content delivery and storage.

Our work aims to provide a solution that implements a content outsourcing mechanism in the CDN infrastructure and provides partial storage of the scalable coded media content from cloud server onto multiple edge servers in order to implement an efficient data retrieval and storage system. With this solution, network traffic will be spread, server workloads will be minimised, and traffic latency will be decreased. Through experiments, we have produced test results that have confirmed the existing approach's ability to boost performance.The paper is organized as follows: overview of content delivery networks in Section 2. We briefly examine the rationale for the proposed CDNs with distributed edge servers and System Architecture in Section 3.The Lietrature Survey Details is explained in section 4 . The implementation of the CDNs with dispersed Edge Servers are then presented in Section 5. We present and discuss the experimental findings in Section 6. Finally, we wrap up the paper in Section 6.

II. THE CDN SYSTEM

In order to distribute content to end users promptly and reliably from nearby edge servers, a CDN system copies the content from the origin servers to edge servers that are dispersed across the world, as shown in Figure. 1.

End users, CDN providers, and content providers are the three main pillars of CDN architecture. One who delegated the Uniform Resource Identifier (URI) namespace of the web objects to be disseminated is known as a content provider or customer. These objects are stored on the content provider's origin server. A CDN provider is a private organisation or business that offers infrastructure facilities to content providers so that material can be delivered punctually and reliably.

Entities that access content from the content provider's website are referred to as end users or clients.In order to replicate content, CDN companies offer a network of cache (or replica) servers spread across many regions.Edge servers and surrogate servers are other names for CDN cache servers. The same content is distributed to edge servers through CDNs

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so that each edge server has the same content. Requests from clients are routed to adjacent edge servers, and a The end-users receive the requested material from the chosen edge server.

By shortening user access times, enhancing accessibility, and preserving accuracy through content duplication, CDNs offer services that enhance network performance.

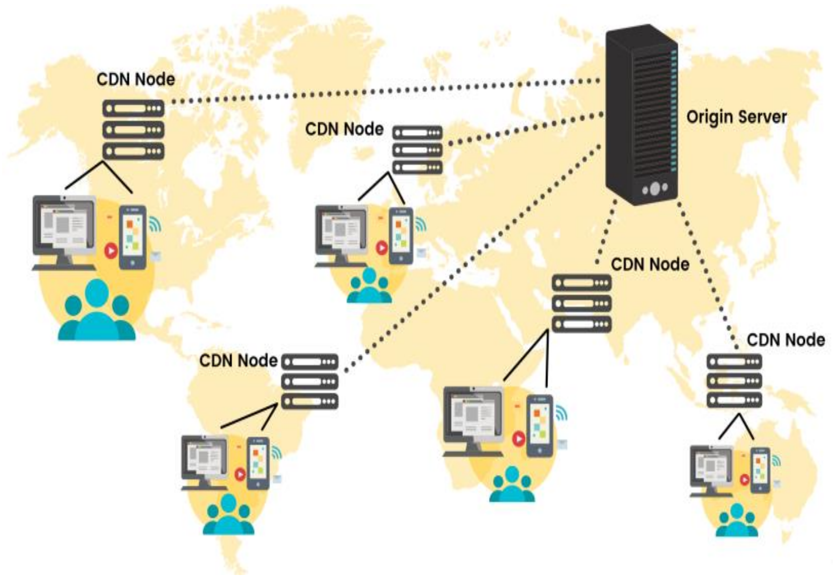

Figure 1(CDN Architecture)

Figure 1 shows the architecture of content delivery network.

III. SYSTEM ARCHITECTURE

Our implementation consists of different modules as illustrated in Figure 2. We implemented the cloud storage at the origin server using Microsft Azure which will store the content.The Edge Servers are placed in different locations in network. The Edge servers helps the end users with the content on behalf of the orign server it is represented in above Fig1..

A CDN server supplied a cached version of the website to the user when they made a request for a page from a CDN-enabled website before the user even sent a request to the website server. The number of requests to the website server would be significantly decreased if the CDN server made a request back to the website server if it did not already have a cached copy of the website.

The usage of several servers or Points of Presence spread out throughout the globe was another key strategy employed by CDNs to enhance website speed. At this time, users to websites were also accessing them through sluggish connections like dial-up modems, so if a visitor from California requested a page from a server in New York, the greater geographic distance may have a significant effect on load time. Visitors may be routed to the server nearest to them by establishing many distributed servers, which would cut down on the distance requests had to travel.

1. First, the user goes to www.xyz.com. The request is sent to the DNS by the browser.
2. The DNS delivers the 'xyz' server's IP address, which is the source of the content.
3. The user contacts the 'xyz' server with a request for the HTML.
4. The server replies with HTML and an edg server URL.
5. User provides URL to DNS, which receives data from data collector.
6. User sends IP address of be: surrogate server.
7. The user now addresses the designated edge server with his request.
8. If the edge server does not have the requested data, it will forward the request to the origin server, cache the response.
9. Then present the user with the requested material.

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The service provider generates billing data based on bandwidth and storage usage. As a result, information is gathered and analysed from every replica server connected to the content distribution network. When the request is being redirected, this data is crucial for mapping between the enduser and the replica server.

IV. LITERATURE SURVEY

Yuedui Wang, Xiangming Wen, Yong Sun, Zhenmin Zhao, and Tianpu Yang concentrate on a unique Content Delivery Network (CDN) system based on Cloud Storage, with the goal of enhancing content availability and reliability. The suggested approach provides a scalable and affordable way to handle changing content demands and user traffic by utilising cloud storage services. The architectural layout and use of the CDN system built on cloud storage are emphasised, exhibiting its potential to revolutionise content distribution in contemporary web applications and services. The study demonstrates the efficiency and scalability of this novel CDN system by thorough assessments and in-the-wild testing, making it a significant contribution to the field of content delivery networks in cloud computing.

Darothi Sarkar, Nitin Rakesh, and Krishna Kumar Mishra with a focus on insightful observations. It covers a wide range of topics, including CDN design, optimisation methods, and performance measurement metrics. Recent developments are highlighted in the article, including edge computing, AI integration, and dynamic content caching techniques. It provides key information for researchers, practitioners, and companies looking to improve their content delivery infrastructure and keep up with the most recent developments in CDN technology through a thorough study of the body of research and case studies currently available. In general, this study advances CDN technology and its effect on content delivery in the digital era.

Parag Panchal, Nikhil Meenakshaiah Ramaswamy, Xiao Su, and Yi Dong focuses on the usage of distributed edge servers to integrate content delivery networks (CDNs) into cloud architecture. For effective content distribution and an enhanced user experience, CDNs are essential. The study attempts to reduce latency and improve content availability by strategically putting Distributed Edge Servers closer to end-users. The paper analyses the integration's architectural design and implementation while highlighting its benefits in terms of affordability, speedy content delivery, and low latency. The research makes a significant contribution to the development of content delivery networks in cloud computing by demonstrating the potential advantages of using distributed edge servers in cloud-based CDNs through simulations and practical testing.

S.Sajithabanu, S.R.Balasundaram focused is placed on a cloud-based content delivery network (CDN) that employs a Genetic Optimisation Algorithm (GOA) to effectively reduce storage costs. The suggested CDN achieves improved content placement and lowers storage costs for content providers by dynamically adjusting content distribution techniques based on real-time data and server capacity. The paper uses meticulous simulations to show how reliable and affordable this novel approach is, making it an attractive option for cloud computing's content delivery networks.

Cloud Content Delivery Networks (CDNs) are the subject of a comparative investigation by Chen Wang, Andal Jayaseelan, and Hyong Kim that focuses on how well these networks perform when streaming adaptive video. It assesses different CDN structures, algorithms, and delivery methods while taking into account network circumstances, content quality, and buffering. The article conducts in-depth analyses to provide significant insights into the advantages and disadvantages of various CDN solutions, assisting developers and content providers in choosing the best CDN for adaptive video streaming. The evolution of CDN technology and its effects on video distribution in the age of cloud computing are both benefited by the findings of this study.

A data-driven parallel video transcoding strategy for Content Delivery Networks (CDNs) in the Cloud is the focus of Mingang Chen, Wenjie Chen, and Lizhi Cai. The suggested solution optimises video transcoding for effective content delivery by making use of data-driven methodologies and parallelization. This method facilitates smooth video streaming for end users, improves scalability, and shortens processing times. The study emphasises the architectural design and application of this technique, emphasising its potential advantages in terms of enhanced content delivery and decreased latency. The research provides important insights into the future of video delivery in cloud-based CDNs by rigorously simulating and testing this novel method to show its efficacy and scalability.

Focus is placed on a Primal-Dual Parallel Algorithm created for the best possible content delivery in cloud-based Content Delivery Networks (CDNs) by Gadiraju Mahesh, V V R Maheswara Rao, R Shiva Shankar, and R Shiva Shankar. The programme dynamically optimises content placement among cloud servers, taking into account elements like content popularity, user demand patterns, and server capacity, by utilising primal-dual optimisation techniques and parallel computing. This method results in more efficient content delivery, lower storage expenses, and better performance.

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The research provides a potential solution for content distribution in cloud-based CDNs by showcasing the scalability and effectiveness of the Primal-Dual Parallel Algorithm through comprehensive simulations.

Yudi Haribowo and Achmad Imam Kistijantoro focused on doing a performance analysis of content-based mobile applications on Content Delivery Networks (CDNs),. The goal of the study is to enhance the user experience of mobile applications by measuring the speed of content delivery, user response times, and network efficiency. The study offers useful insights into how CDNs affect content-based mobile applications, showing their potential to greatly improve performance and user satisfaction through thorough evaluations and measurements. This study advances CDN technology and its function in the modern era of optimising content delivery for mobile applications.

Yale Li, Yushi Shen, and Yudong Liu focuses on the use of Content Delivery Networks (CDNs) in relation to cloud computing. It investigates how CDNs may enhance user experiences, optimise content delivery, and decrease latency in cloud contexts. Through architectural design and implementation considerations, the study emphasises the advantages of combining CDNs with cloud infrastructures and utilising their scalable resources for effective content delivery. The study offers thorough analyses that show the potential benefits of employing CDNs in cloud computing, including reduced costs and increased content accessibility. Overall, this research offers insightful information for researchers and practitioners looking to improve content delivery performance in contemporary cloud-based services and applications.

Zhouyun Wu, Jianmin Zhang, Weiliang Xie, and Fengyi Yang focused on a cutting-edge method to improve content delivery networks, CDN Convergence based on Multi-access Edge Computing (MEC). In order to reduce latency and increase content availability, the system makes use of edge computing capabilities by merging CDN capability with MEC. The article explores this convergence's architectural design, resource management, and performance evaluation, highlighting its potential advantages like decreased network congestion and enhanced user experience. The report provides insightful information for researchers and practitioners looking to optimise content delivery performance in the age of edge computing and 5G networks by demonstrating the efficacy of this novel approach through thorough assessments.

Focusing on edge computing, a revolutionary paradigm that moves processing and storage closer to end users and devices, Weisong Shi, George Pallis, and Zhiwei Xu examine this topic. It goes over edge computing's architectural design, implementation, and benefits, including lower latency, better application performance, and more data privacy. The article examines potential uses for and difficulties with implementing edge computing, including Internet of Things, real-time analytics, and content delivery. The paper provides insightful information for researchers and practitioners looking to take advantage of edge computing's ability to meet the rising needs of data-intensive and latency-sensitive applications through thorough analysis and case studies.

Amjad Hameed Shehab and Sufyan T. Faraj Al-Janabi explore the usage of Microsoft Azure IoT-based Edge Computing for Smart Homes. It goes over how this connection raises the sophistication and effectiveness of smart home systems. Edge Computing reduces latency and boosts responsiveness by bringing data processing close to smart home devices by utilising Microsoft Azure's IoT platform. The paper demonstrates the advantages of leveraging Microsoft Azure's IoT-based Edge Computing, including improved automation, energy savings, and customised user experiences. For researchers and practitioners attempting to optimise edge computing-based smart home applications in the IoT era, this research offers helpful insights.

Aniello Castiglione, Kim-Kwang, Florin Pop, and Christian Esposito through the lens of security and forensics, Raymond Choo focuses on examining the difficulties associated with integrating edge and cloud computing. When merging these computer paradigms, it analyses potential weaknesses and security threats. The study examines the security repercussions of data transmission between edge devices and cloud servers as well as the difficulties in doing digital forensics in such a connected environment. The paper offers crucial information for researchers and practitioners to ensure a secure and reliable integration of these technologies through in-depth analysis and case studies that shed light on the security and forensic challenges faced when utilising Edge and Cloud Computing.

Chandana Sai Thondebhavi, Neha Harish, Eshanya, and Anandi Giridharan focuses on investigating the combination of Edge Computing with the Internet of Things (IoT) for real-time applications. In order to reduce latency and enable real-time capabilities, it is discussed how edge computing brings computation and data processing closer to IoT devices. The study outlines the potential advantages of utilising edge computing in IoT systems, such as greater data privacy, lower bandwidth use, and improved responsiveness. The article offers crucial information for researchers and practitioners looking to optimise IoT systems in the era of edge computing by presenting insightful case studies and evaluations into the benefits of employing edge computing for real-time IoT applications.

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Yu Nakata, Mayuko Takai, Hiroaki Konoura, and Masafumi Kinoshita focused to introduce a cross-site edge framework designed for location-aware distributed edge computing applications. It shows how the framework makes use of location-based data to optimise computation and data processing at the network edge. The paper looks into the framework's architectural design and implementation and highlights some of its potential benefits, including decreased latency and enhanced performance for location-aware apps. A great resource for researchers and practitioners looking to use distributed edge computing in location-sensitive applications, the paper delivers insightful information on the advantages of using this cross-site edge framework through thorough evaluations and case studies.

V. IMPLEMENTATION

We have Implemented Content Delivery Network Using Edge servers. In this implementation we have used Microsoft Azure for Cloud Storage,Edge servers, origin server, Database.We have hosted our website from the Visual Studio ,we can also do it from Microsoft Azure portal.

Steps for Hosting Our Website to Microsoft Azure Cloud

1. First, open your .sln file(means your website code) in visual Studio
2. Right Click on Project File, click on Publish Once profile is created .then click on that profile
3. In this we need to create our End Points, so Click on Create Endpoint icon
4. Give the name for endpoint,click create Now, we successfully created our End point, if we want more servers,then again we have to the steps 3 and 4.
5. Now we have configure the EndPoint ,in which we have to Give the Website name which we createed earlier, so that we arer creating endpoint for the origin website
6. Once the End Point is created ,we are Now able to access the original content from this point
7. Now Create Resouce Group to hold our whole implementation components.
8. Create AppService to host our Website(give the name for your website)
9. Create Azure Sql Database in this, Create a Sever Give Authorization for Server(like Username and Password)
10. Same Authorization for database also, Now connect Database and Server
11. Once connection was Established,Click on Publish Button Now, Your Website is hosted Successfully.

Now, We have to Create Content Delivery Network and CDN’s Endpoints(edges)

1. In Azure Portal Create CDN Profile
2. In that create Endpoint, in origin space give the orign website link which is hosted already
3. Now we can access the website from Endpoint

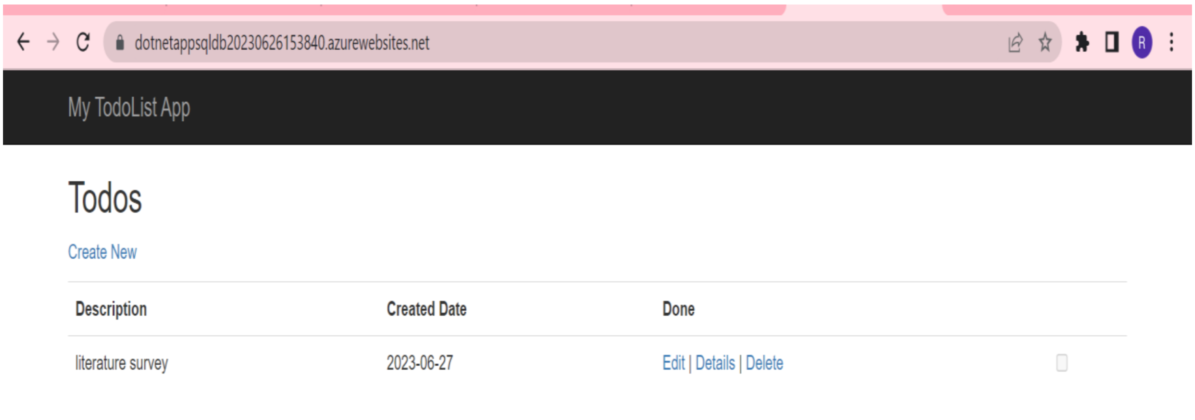

Figure 2(Origin)

Figure 2 shows the link of original website which we have deployed on azure cloud .

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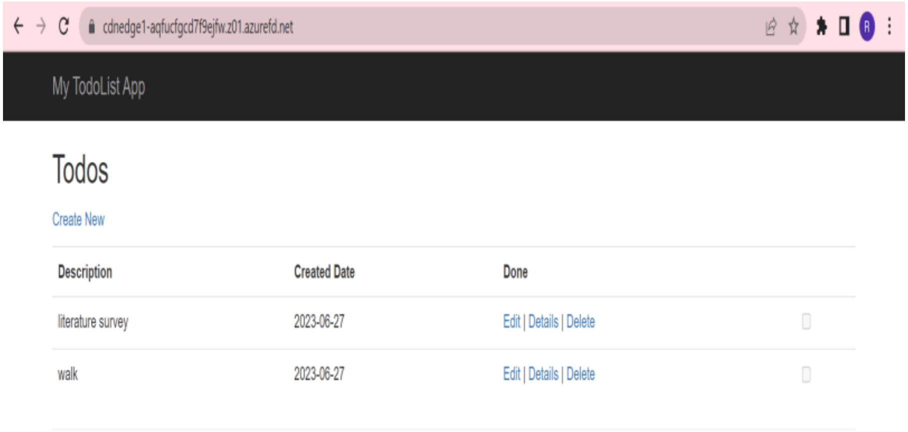

Figure 3 (Endpoint)

Figure 3 shows the link of endpoint website which we have created in on azure CDN network.

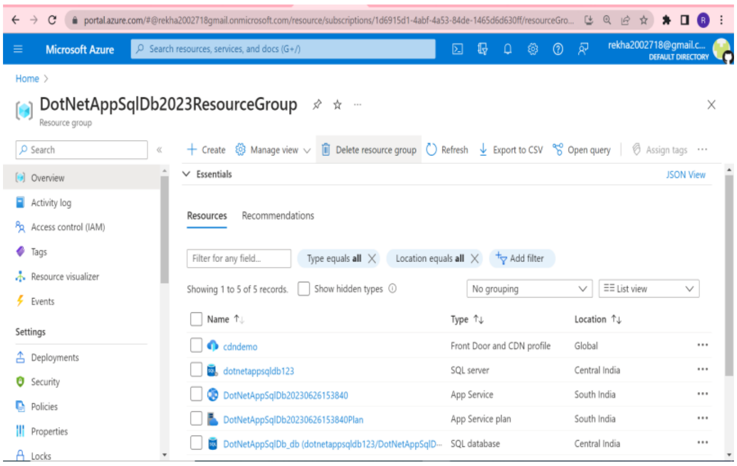

Figure 4 (Azure Portal Resources we created)

We can see the below Figure4 of Azure portal Which shows our Resources like Database,Sever,Website,CDN Profile etc.

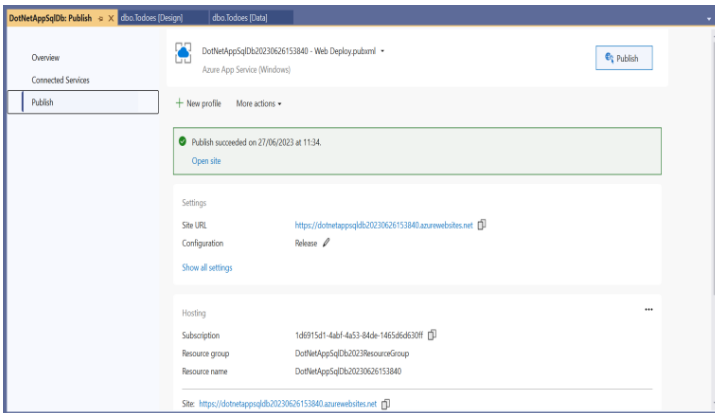

Figure 5 (Visual Studio to publish website)

Figure5 shows that publish window of Visual Studio from which we have deployed our original website

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VI. EXPERIMENTAL RESULTS

We have used PageSpeed Insights tool to measure the performance of the both the origin and Endpoint websites.

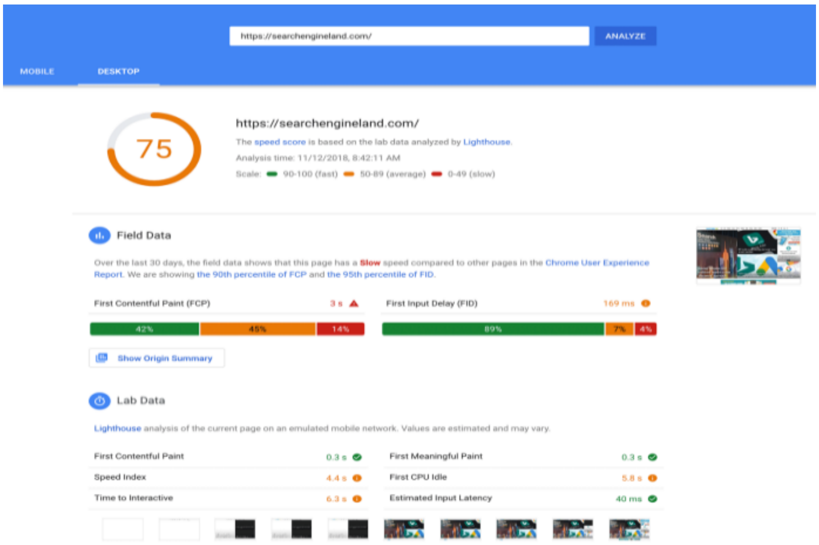

Figure 6 (Page Speed Insights)

Figure 6 shows Homepage of Pagespeedinsights which is used to measure the performance of the website

Following, we'll go through how our present method of accessing website from various edge servers performs better than the conventional method of accessing the website from a single edge server.

In this we compares the average response times of the two approaches—the conventional centralised technique and our suggested distributed approach.. We notice that acccessing the website from edge servers concurrently results in a considerable reduction in the response time of our distributed system as compared to accessing a website from a single edge server. As illustrated in below Figures , the decrease in response time becomes more noticeable as the number of concurrent requests rises.

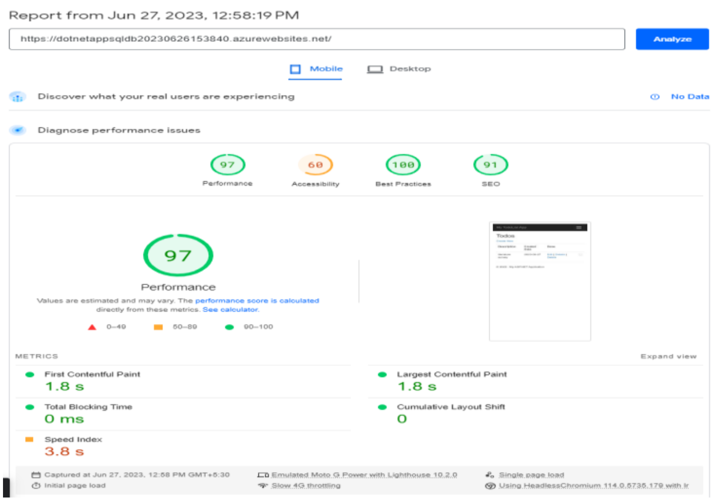

Figure 7(Origin Performance)

Above Figure 7 shows Performance of the Origin Website

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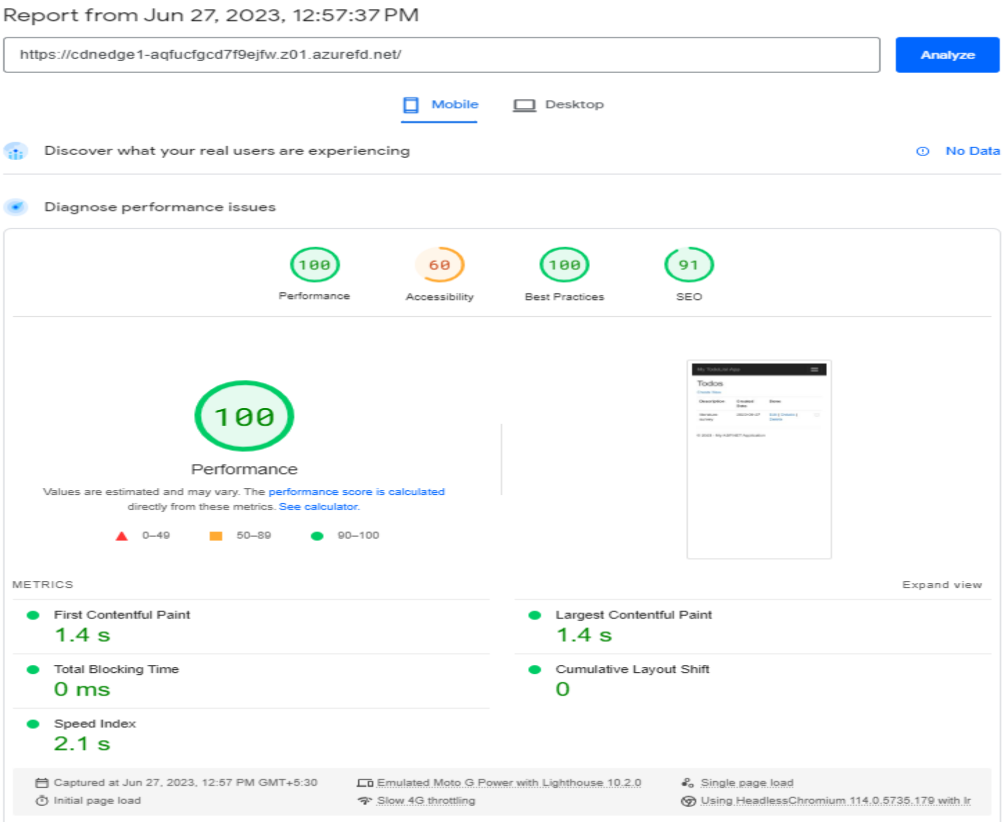

Figure 8 (EndPoint Performance)

Figure 8 shows the performance of the Endpoint which is created in CDN network.

In The above Figure 7 and 8 we can noticed that the first origin website showing 97% Performance where as our CDN Endpoint showing 100% Performance .And according to time also origin website take 3.8 s while endpoint website take 2.1 s . By viewing this, now we can analyze that the endpoint provide more performance and it will take less than the original one.

VII. CONCLUSION

In this study, we developed a cooperative content outsourcing system for CDNs. In order to lower the cost of replication and update, the material is deployed from the origin content server onto the edge servers. The performance of fulfilling client requests would be enhanced by this solution.

We have verified the performance gain using the test platform provided by the PageSpeedInsights. By allowing the use of numerous edge servers for each client request and lowering the redundant data stored in the edge servers, this method lessens the strain on a single server.

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