GLOBAL RESEARCH NETWORK
ONLINE RESEARCH HUB

AMERICAN JOURNAL OF SOCIAL AND HUMANITARIAN RESEARCH

ISSN: 2690-9626
Vol. 4, No. 11, 2023

Cloud Computing in Media & Entertainment

Matthew N. O. Sadiku
Department of Electrical & Computer Engineering, Prairie View A&M University, Prairie View, TX USA

Uwakwe C. Chukwu
Department of Engineering Technology, South Carolina State University, Orangeburg, SC, USA

Janet O. Sadiku
Juliana King University, Houston, TX, USA

ABSTRACT: Cloud computing is the delivery of various on-demand computing services like servers, software, storage, databases, networking, analytics, and intelligence over the Internet Different industries worldwide now recognize the importance of cloud computing because it has played a vital role in various industries, especially the media and entertainment (M&E) sector. The creation and delivery of media using cloud infrastructure is a paradigm shift in the M&E sector. The M&E companies are using cloud computing to re-engineer customer relationships, streamline operations, enhance governance, and create new market opportunities, while increasing flexibility, scalability, and cost-effectiveness. This paper provides an introduction to the use of computing computing in M&E sector.

KEYWORD: cloud computing, edge computing, technology, media, entertainment.

INTRODUCTION

The media and entertainment (M&E) industry provides us all with print and online newspapers, magazines, TV, radio, movies, video games, music, and books. The industry always provides fun, entertainment, enjoyment and amusement to people. It includes but not limited to television programs, movies, broadcast, radio, books, video games and special events wherein live streaming of content is seen. An example of online news is shown in Figure 1 [1]. The sector generates and delivers huge volumes of data and are held to high standards of performance. Traditional media outlets such as television, radio, and newspapers are being supplemented and in some cases replaced by digital media such as streaming video, podcasts, and online news outlets. For media and entertainment (M&E) companies, using the traditional broadcasting methods and delivering the content traditionally is just not possible in this digital age. The M&E industry has to go through multiple challenges and changes. Change is inevitable in the M&E industry, and the organizations that cannot adapt will not survive in the market.

One of the industries that cannot stop itself from cloud adoption is the entertainment and media industry. Media and entertainment (M&E) companies like publishing, broadcasting, sports and music make use of cloud computing applications to improve their operating efficiency. The top players in M&E industry include household names such as Disney, Netflix, Time Warner, YouTube, and Comcast, but the sector also includes

ISSN 2690-9626 (online), Published by "Global Research Network LLC"
under Volume: 4 Issue: 11 in Nov-2023 https://globalresearchnetwork.us/index.php/ajshr

thousands of small-to-medium enterprises. Cloud technology has impacted all organizational departments such as accounting, marketing, and human resources. It is becoming a very popular space for media entertainment professionals to innovate. Figure 2 shows cloud computing architecture [2].

CLOUD COMPUTING BASICS

Cloud computing is the on-demand availability of computing resources (such as storage and infrastructure), as services over the Internet. It represents the underlying platform technology enabling cloud manufacturing. It is a newly emerging service-oriented computing technology. It is the provision of scalable computing resources as a service over the Internet. It allows manufacturers to use many forms of new production systems such as 3D printing, high-performance computing (HPC), industrial Internet of things (IIoT), and industrial robots [3].

The key characteristic of cloud computing is the virtualization of computing resources and services. Cloud computing is implemented in one of three major formats: software as a service (SAAS), platform as a service (PAAS), or infrastructure as a service (IAAS). These services are illustrated in Figure 3 [4] and explained as follows.

SaaS: This is a software delivery model in which software and associated data are hosted on the cloud. In this model, cloud service providers offer on-demand access to computing resources such as virtual machines and cloud storage.

PaaS allows the end-user to create a software solution using tools or libraries from the platform service provider. In this model, cloud service providers deliver computing platforms such as programming and execution.

In the HaaS model, cloud service providers can rent manufacturing equipment such as 3D printers.

Just like cloud computing, CM services can be categorized into four major deployment models (public, private, community, and hybrid clouds) [5]:

- Private cloud refers to a centralized management effort in which manufacturing services are shared within one company or its subsidiaries. A private cloud is often used exclusively by one organization, possibly with multiple business units.
- Community cloud is a collaborative effort in which manufacturing services are shared between several organizations. Services are provided to multiple organizations from a certain community with similar business goals.
- Public cloud realizes the key concept of sharing services with the general public. Public clouds are commonly implemented through data centers operated by providers such as Amazon, Google, IBM, and Microsoft.
- Hybrid cloud that spans multiple configurations, and is a composed of two or more clouds (private, community or public), offering the benefits of multiple deployment modes.

CLOUD COMPUTING IN MEDIA & ENTERTAINMENT

The media and entertainment industry is rapidly shifting to cloud computing, with many organizations looking to capitalize on the agility, scalability, flexibility, and cost-effectiveness of cloud technology. Cloud computing offers organizations in the media and entertainment industry access to advanced analytics and machine learning capabilities. It has enabled M&E companies to increase efficiency, improve customer engagement, and create new revenue streams. A generic architecture of cloud-based media streaming is shown in Figure 4 [2].

ISSN 2690-9626 (online), Published by "Global Research Network LLC"
under Volume: 4 Issue: 11 in Nov-2023 https://globalresearchnetwork.us/index.php/ajshr

Here is a step-by-step guide to adopting cloud computing in the media and entertainment industry [6]:

Step 1: Identify Your Needs: You should first identify the specific requirements of your media and entertainment business. Consider which resources you will need, such as storage, computing power, or streaming capabilities. Also, think about which services you need, such as data analytics, scalability, and security.

Step 2: Choose a Cloud Service Provider: Next, you can choose a cloud service provider. Consider which providers offer the services and features that you need, as well as their pricing and terms. It is expedient to choose a cloud provider that offers the right mix of features, scalability, and security. Amazon Web Services (AWS) remains the best choice for media companies who are looking to adopt private cloud model.

Step 3: Implement a Cloud Solution: With the cloud service provider selected, you can begin implementing a cloud solution. This will involve setting up the necessary infrastructure and services, such as storage, compute, and networking.

Step 4: Monitor and Manage Your Cloud Environment: Once your cloud environment is up and running, you will need to monitor and manage it to ensure that it is running smoothly.

Step 5: Optimize Performance: Finally, you will need to optimize the performance of your cloud environment. This involves ensuring that your cloud resources are used efficiently and that your applications are running at peak performance.

By following these steps, you can easily adopt cloud computing for you media and entertainment company. You can modernize your business to become cloud-native. Pay-as-you-go pricing and fully-automated resource scaling allow you to handle any sized audience without upfront capital investment.

APPLICATIONS OF CLOUD COMPUTING IN MEDIA & ENTERTAINMENT

There is no doubt about the impact that cloud computing is having on businesses in all sectors. It has revolutionized businesses in all sectors through cost cutting, mobility, and by creating a competitive edge. One of the industries most impacted by cloud technology is media and entertainment. The M&E sector has a mounting burden on its shoulders: Create ongoing content rapidly, cost-effectively, and securely—then distribute the highest-quality final products to highly demanding and content-hungry viewers around the world. With these challenges in mind, M&E companies of all sizes are looking to the cloud to dramatically transform their operations [7]. Cloud Computing offers an array of services for M&E industry that avoids the need for physical storage for organizations. These include the following:

- *Studio:* When a studio wants to open up a location in another city, they can immediately start working in the cloud, can create a cluster, replicate data from one place to another and collaborate. The cloud brings world-class technologies to smaller studios at a cost-effective price.
- *Media Enterprises:* The media landscape is transforming the way content is being produced and consumed. Media enterprises are making a shift to AWS, which is the pioneer in cloud hosting, to take advantage of its high scalability, elasticity and secure cloud services. Media enterprises need not worry about resource constraints. The only focus should be on creating quality content.
- *Cable TV:* This section of media and entertainment sector is being challenged by new trends in television broadcasting. Agile and low-cost over the top (OTT) companies are competing with the traditional media distribution methods.

ISSN 2690-9626 (online), Published by "Global Research Network LLC"
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BENEFITS

Cloud computing offers many benefits for businesses of all sizes. The main benefit of shifting to cloud infrastructure is the requirement of minimal in-house infrastructure that can be complemented with cloud services. According to Statista, just over 30% of all corporate data was stored in the cloud in 2015. Cloud computing simplifies processes so that there is not any complex cloud media workflow. Without the cloud it would be almost impossible to store, manage, and deliver the huge quantities of digital content in an agile, dynamic, and cost-effective manner. Other benefits of cloud computing on M&E industry include the following [2,8,9]:

- *Accessibility:* Cloud computing is all about accessibility. Workers can access whatever they need, wherever they are, whenever they want. Reducing IT operational costs and providing anytime and anywhere accessible high quality content will soon trigger global adoption of cloud solutions by media and entertainment.
- *Connectivity:* Cloud providers can offer improved connectivity to reduce the chances of a breakdown in communications. Cloud connectivity must be reliable and storage solutions should adapt to different configurations.
- *Flexibility:* M&E companies need flexibility in storage configurations to move files quickly, whether in the cloud or on-premise. Cloud solutions provide flexibility in the deployment of storage configurations. Without the flexibility of connections, M&E businesses may face disruptions in service.
- *Faster Time to Market:* Companies who want to adopt cloud technology can deliver their content more quickly than their counterparts, almost in no time as compared to traditional methods. Cloud computing enhances user experience and helps deliver content to users more quickly compared to traditional methods.
- *Cost Reduction:* Computing infrastructure costs a lot in terms of its establishment, operation, and maintenance. Major factors that are challenging the bottom lines of the content-oriented M&E companies are the rising costs of content licensing and shortened technology lifecycles. Cost saving is a key trait for entertainment leaders to consider when analyzing the benefits of cloud computing. Cloud Computing helps M&E Companies to reduce all of the costs involved in the production and delivery of content to up their quality and revenues. The cloud service provider is responsible for everything.
- *Scalability:* The on-demand characteristics of cloud computing provide the levels of scalability that the M&E sector needs to cost-effectively meet volatile demand. Media companies can scale up or scale down depending on their needs. As compared to other technologies, the scalability of cloud computing is simply unmatched and it provides the companies with the ability to quickly scale up or scale down the resources at will.
- *Reduces Operations*: When you are working on the cloud, you are essentially outsourcing your computing resources to a third-party that is an expert in cloud technology and computers. You do not have to worry about things like servers and managing, upgrading, or replacing them. These are all handled by cloud service providers.
- *Collaboration:* For many, cloud-based remote collaboration is vital to completing their job. Cloud computing empowers the M&E industry to break down geographical barriers and improve collaboration by offering a centralized and easily accessible platform for content creation and sharing. Cloud computing makes it easy for teams to collaborate on projects from different locations. Regardless of which platform you choose based on your needs, working style, preference, and budget, you need the

ISSN 2690-9626 (online), Published by "Global Research Network LLC"
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cloud technology tools to allow employees to collaborate in and out of the workplace. Remote collaboration feels both less remote and more collaborative.

- *Sustainability:*Moving to the cloud is not just cost-effective, easy to implement, secure, and productivity-boosting, but it is also environmentally friendly. Cloud-powered offices allow their workforce anytime, anywhere access to their programs.
- *Lower Latency:* Cloud media servers can be located anywhere in the world. Hence, cloud-based media companies can deliver content to viewers via the closest best media streaming server or data center, which reduces streaming latency.
- *Agility:* M&E companies should have the option to move their business data rapidly and effectively for seamless operations. The M&E sector is among the most quickly evolving sectors in the world and this fact requires companies to be highly agile to quickly and successfully adapt to the market's changing demands and expectations. This task is made easier with cloud computing.
- *Productivity:* By leveraging the advantages of cloud computing, companies can save time and money while maximizing productivity.
- *Global Reach:* The M&E companies have leveraged cloud computing services to seamlessly transmit their videos and media assets across the globe in a cost-effective manner.

Some of these benefits are illustrated in Figure 5 [10].

CHALLENGES

Implementing cloud computing in M&E industry faces several challenges. These include the following [11]:

- *Security Threats:* With more digital assets being stored in multiple locations, cybersecurity becomes a crucial part of business continuity. There are security risks involved whether you store data in local servers or have them hosted in cloud storage off-site. Keep in mind that you will be sharing your company's media files, customer's personal data, and other sensitive information with a third party cloud computing provider. Skilled hackers could gain access to this information. M&E companies are particularly attractive targets for hackers.
- *Technical Issues:* Most cloud infrastructures are entirely owned and managed by the service provider which means that there will be various degrees of control for your entertainment company.
- *Unpredictable Demand:* Consumer demand is unpredictable. Today's consumers of media and entertainment content expect flexibility and choices.
- *Simplicity:* Cloud storage solutions should be easy for non-technical staff to manage.
- *Complexity:* The complexity and mix of M&E content deployment strategies can leave gaps in content coverage and technical knowledge.

CONCLUSION

M&E companies all over the world are capitalizing on cloud technology and making changes on how they operate. Cloud computing has now become the horoscope of the media and entertainment industry. The cloud services offer the advantage of scalability, flexibility and speedier market delivery. Cloud technology is definitely the future and the companies that adapt to this will definitely see a huge increase in their growth. Any company that does not want to be left out should keep up with digital change and adopt cloud technology.

ISSN 2690-9626 (online), Published by "Global Research Network LLC"
under Volume: 4 Issue: 11 in Nov-2023 https://globalresearchnetwork.us/index.php/ajshr

Cloud computing has become an essential part of the modern media and entertainment industry, providing more efficient and cost-effective solutions to the challenges that media and entertainment companies face. Media and entertainment companies can benefit from many of the advantages provided by cloud solutions. More information about cloud computing in M&E industry can be found in the following related journal: *Journal of Cloud Computing*

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under Volume: 4 Issue: 11 in Nov-2023 https://globalresearchnetwork.us/index.php/ajshr

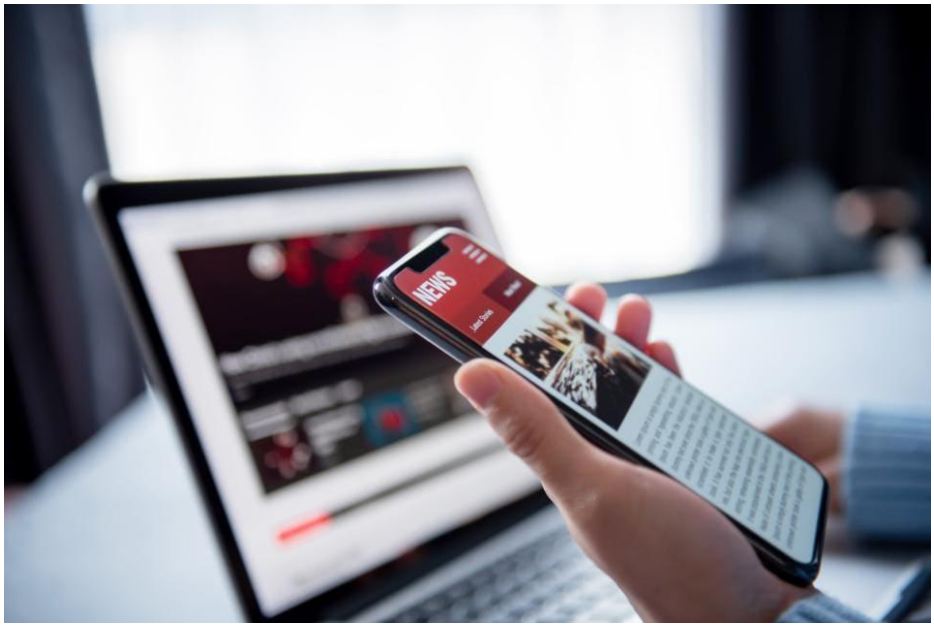

Figure 1. An example of online news [1].

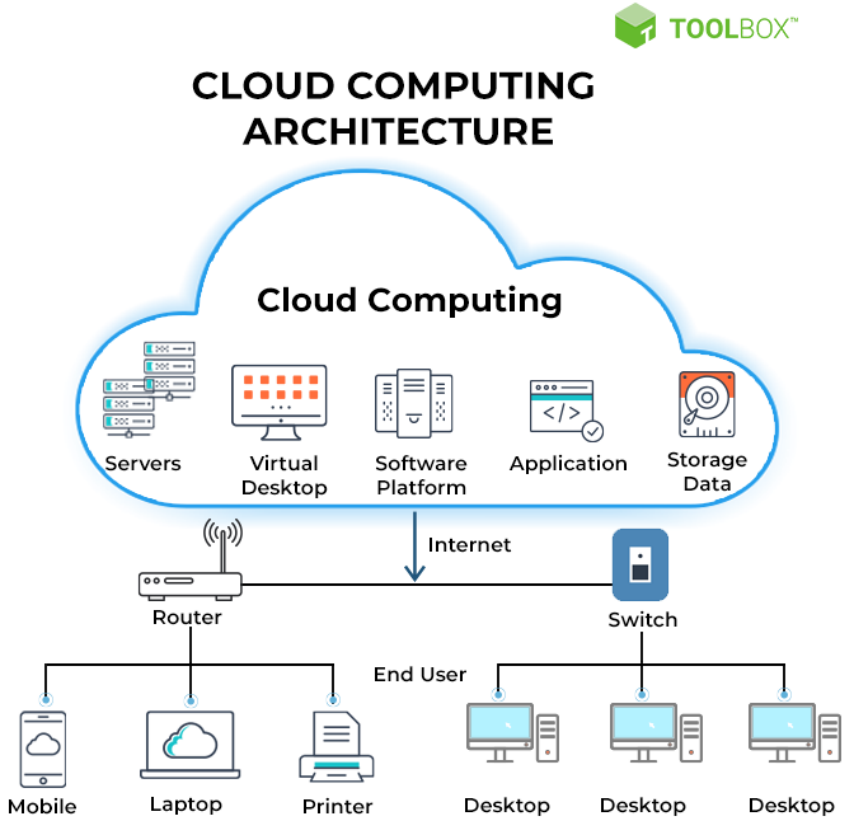

Figure 2 Cloud computing architecture [2].

ISSN 2690-9626 (online), Published by "Global Research Network LLC"
under Volume: 4 Issue: 11 in Nov-2023 https://globalresearchnetwork.us/index.php/ajshr

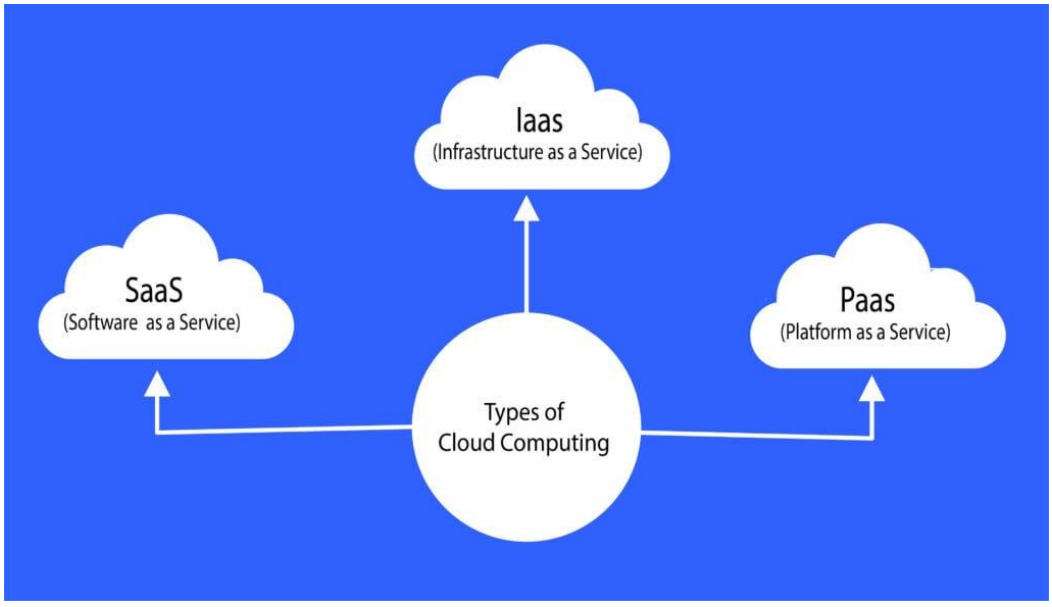

Figure 3. Three types of cloud computing [4].

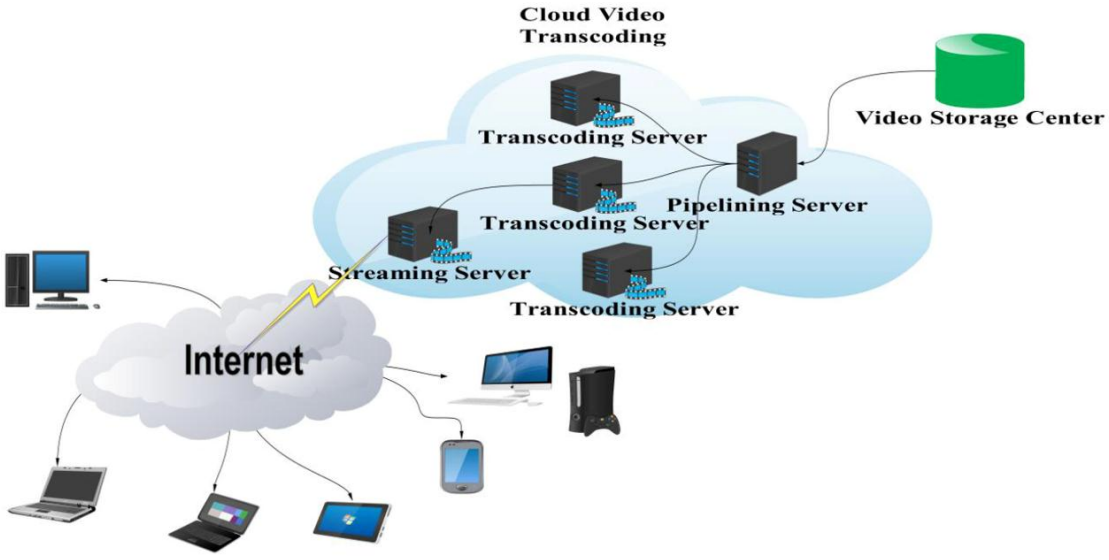

Figure 4. A generic architecture of cloud-based media streaming [2].

ISSN 2690-9626 (online), Published by "Global Research Network LLC"
under Volume: 4 Issue: 11 in Nov-2023 https://globalresearchnetwork.us/index.php/ajshr

Figure 5. Some benefits of cloud computing in M&E industry [10].

ISSN 2690-9626 (online), Published by "Global Research Network LLC"
under Volume: 4 Issue: 11 in Nov-2023 https://globalresearchnetwork.us/index.php/ajshr