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**Research Article**

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# Traffic Routing Challenges and Solutions for Hybrid Infrastructures: Balancing AWS and On-Premises AEM

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**Abstract:** Data consistency, secured distribution, reduced latency, performance optimization, scalability, reliability, and overall better user experience can be achieved with the proper use of hybrid infrastructure. The prominent terms in this are Amazon Web Services and Adobe Experience Manager (AEM) On-Premises as these cloud platforms help achieve the objectives mentioned. Still, the balance distribution between them is significant to achieve. This writing mainly focuses on the balanced distribution of traffic routing, where half is routed to AWS and the other half is left on AEM On-Premises. Furthermore, challenges like failure potential, data consistency, load balancing, security, and latency are underway to achieve balanced traffic routing. However, the appropriate solutions are addressed to overcome these challenges and make efficient routes in hybrid infrastructures. Finally, some future directions are given while keeping in context the current developments in the field.

**Keywords:** AWS, Hybrid Infrastructures, On-Premises AEM, Traffic Routing, Challenges, Balancing, Solutions

## 1. Introduction

As the world is going towards digitalization, organizations are paving their way to provide smart solutions to clients to reduce client-side resource spending and increase their profits within their capacity. Adopting hybrid infrastructure is one of the solutions created by these large service providers using the latest methods. The most famous one is Amazon Web Services (AWS) within modern systems like Adobe Experience Manager (AEM).

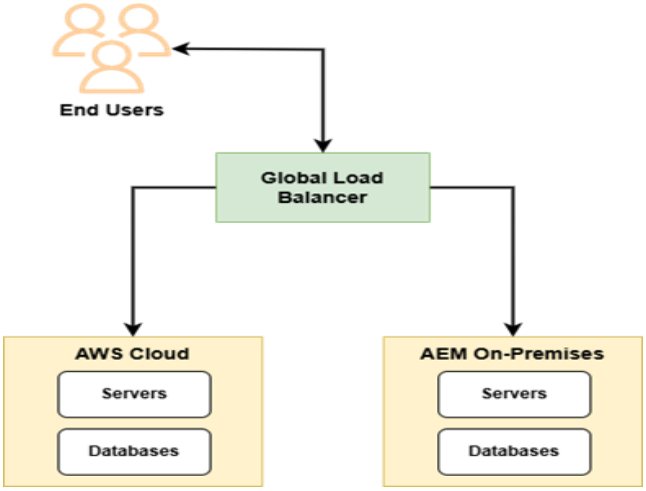


*Figure 1: Load Balancing between AWS and On-Premises AEM*

As in Figure 1, the perfect image of load balancing is shown where a load balancer manages to utilize the resources of both these environments. So, the objective remains an equal distribution as shown in Figure 2. The major advantages are the reduced challenges in implementing complex traffic routing and increased scalability and flexibility to large systems. Performance and security are the other major advantages that come with the utilization of these services [1].

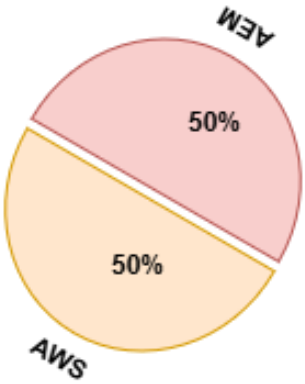


*Figure 2: Balancing Distribution*

The background of AEM and its relationship with AWS cloud services can be understood with the following diagram given in Figure 3. This is to take into account the configuration of AEM and its relationship with AWS cloud and how the resources are consumed in the environment. As an example of this, the CloudWatch subsequently mentioned in the solutions is used as a monitoring tool for instances. The other services are listed on the right as well, which can be used by AWS Certificate Manager (ACM). There can be multiple AEM resources provided under the gateway of AWS and can be managed by multiple load balancers. The subnet, however, can be public and not strictly required to be private within the CloudFront. However, the encapsulation methods are employed to make the secure transfer of data. The AWS works as a responsible entity to manage these complex operations. This however, doesn't need to be exposed completely to the users and only the required processes are revealed to complete the user side actions.

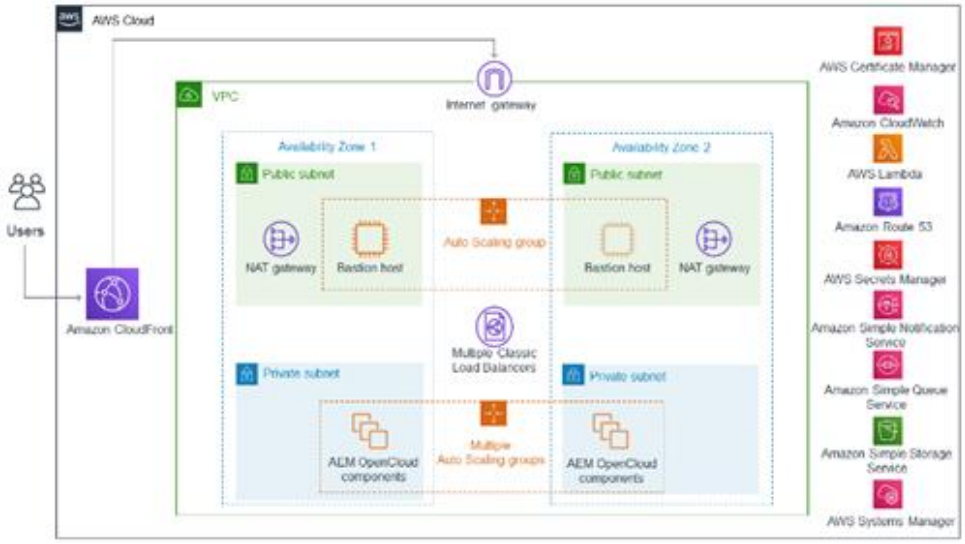


*Figure 3: AEM OpenCloud on AWS [2]*

The presented research writing is structured in a way that the challenges are first addressed which are underway for traffic routing in hybrid infrastructures and then the solutions are presented against these challenges. The focus however remains on AWS and on-premises Adobe Experience Manager On-Premise for cross-channel customer experiences. The primary problem that needs to be addressed is to manage the traffic between well-known cloud

services and resolve the challenges that are accompanied by this. In addition to those extended methods, future developments are discussed which seems to be potential considering the present development in the field. The problems of efficiency, load balancing, interruption, latency, and security are addressed throughout the writing.

## 2. Literature Review

The studies of hybrid infrastructures are extensively considered to point out the traffic routing challenges. The benefits however are associated with some potential challenges. The research methods highlight the need for efficient traffic routing to overcome these challenges through the seamless integration of cloud services. The different aspects that can be considered are latency reduction, session management, security, and data consistency in hybrid model environments [3].

Monitoring of cloud computing processes is significant to properly allocate the resources to the databases and servers in the environment. However, system failures may occur which is why patterns need to be detected to cope with these situations. The efficient hybrid network is therefore required that add another layer to the existing network. The performances are compared in this writing and efficient computation results are displayed with the utilization of minimum resources [4].

This new hybrid cloud computing model presents a solution to combine public clouds with local clouds. The infrastructure however remains the same between the clouds and resembles the optimized distribution methods we want to propose. The application-specific services are provided with the use of these techniques. The architecture model helps to transfer the existing environments to cloud computing environments with effective distribution [5].

## 3. Problem Statement

The hybrid setup of traffic routing is majorly based on both AWS and AEM. However, certain challenges need to be addressed in an efficient way to overcome the challenges that are faced during traffic routing for hybrid infrastructures. Some of those to be covered in this research document are,

- Efficient mechanisms to avoid low resource availability.
- Load balancing with consistent outcomes through all platforms.
- Uninterrupted user sessions.
- Provide better user experience with decreased latency.
- Providing more secure controls

## 4. Importance

The world today is primarily dependent on hybrid infrastructures and most organizations are using outsourced services to provide them cost reduction. So, it's crucial to overcome the challenges of traffic routing in hybrid infrastructures. The effective implementation of strong infrastructure guarantees performance, availability, efficiency, and security and ultimately better user experience. The optimized traffic routing in hybrid infrastructures has the following significance:

- Data Consistency and Secured Distribution.
- Minimum latency and thus better user experience.
- Performance Optimizations and Scalability.
- High Availability with the assurance of reliability by handling emergencies.

## 5. Challenges

### Session Persistence

Session persistence is significant for all applications which require continuous user interactions and cloud services are a direct example of this argument. The biggest challenge is to maintain sessions for different users across several platforms considering the distribution between AWS and on-premises AEM.

The biggest challenge here is to direct an upcoming request stream that needs to be assigned to the same environment that was responsible for handling the initial request. The impact in case of resolving this absence is serious and can cause restricted user action in critical times. The workflow is therefore affected and destroys user experience.

**Failure Possibility**

The mechanisms of choice for the functionalities of cloud infrastructures are not always efficient in switching between AWS and on-premises AEM specifically in more complex situations. The challenge here is to cope with security policies and potential vulnerabilities.

The rerouting of traffic can therefore become more time-consuming sometimes. Automated rerouting is necessary to maintain the performance of the system and uphold the data integrity for both organization and users.

**Data Consistency**

The data consistency between on-premises AEM and AWS is crucial for the prevention of data inconsistency. The delays in data synchronization and some conflicts in the existing data modification may appear as the biggest factors to support this challenge [6].

Synchronization is needed in real-time with consistent bandwidth and conflicts are required to be avoided. In the absence of data consistency, the rendering may not remain consistent as well and inefficient results may be generated due to potential deadlocks. This specifically happens when the data is not synced well and is more diversified.

**Load Balancing**

The limitations of capacities and scattered characteristics of performance metrics lead to difficulty in even traffic distribution between AWS and on-premises AEM. The old methods are not helpful to mitigate these problems in a hybrid environment and therefore more advanced techniques are needed for better implementation.

So, the primary challenge is to not overload a specific environment and rather make distribution equally between AWS and on-premises systems. Otherwise, the imbalance between the requests and their loads can create latency, lead to less utilization of resources, and sometimes can cause complete system failure.

**Security**

There are different security aspects involved in the cloud services that directly contribute to traffic routing. The most commonly faced challenges are control management, encryption methods, and other vulnerabilities during data transmission.

Data integrity, encryption, and secured data transfer across environments is mandatory for organizations following the privacy of users. This becomes challenging when organizations have to deal with multiple environments and resources are mainly distributed.

**Latency**

The transmission of data between servers and other systems attached to the cloud has increased the risk of latency which directly contributes towards the responsiveness of the service. The famous factors for this are geographical distance, signal strength variations and network congestion are the major contributors to latency.

It is therefore a serious challenge to the respective providers to minimize the latency for users to provide a better experience. Priority for an environment should be to the users who are close to that and others to be assigned their own closer environments. If the latency is increased then user experience can be affected due to more waiting time on the user end.

## 6. Practical Solutions

**Automated Emergency Methods**

The automatic failure detection methods can be employed with the use of rerouting techniques for continuous user experience and avoiding disparity between these services. The DNS failure or elastic load balancing can be handled with AWS services to achieve automatic rerouting [7].

The CloudWatch functionalities can be used for automatic monitoring of user sessions and Route 53 helps check the network failures. The cross-environment features should be provided which helps in case of one environment failure. The system can therefore redirect the sessions to other environments in the meantime. In this way, the increased availability of sources can be achieved for a better user experience.

**Strategies for Continuous Sessions**

The long-lasting session mechanisms can be used to ensure that it will remain intact across all platforms for users. The possible methods can be the use of cookies or database-supported sessions. Both of which are accessible by AWS and AEM.

The session affinity on load balancing once configured, the sessions for a user can be assigned to closely related environments with the help of identifiers. This as mentioned results in improved user experience and errors are reduced which in turn increases the reliability of the system.

**Real-Time Synchronization**

The most commonly used solution is the deployment of data replication tools to synchronize data between the two in real time. Amazon Web Services is advantageous here as it provides services like data migration for continuous data replication [8].

Tools like DataSync, Azure functions, related APIs, and scripts can be used to set up the bio-directional synchronization between environments of AWS and On-Premises AEM. Therefore consistent content can be provided across environments.

**Reduced Latency Routing**

The latency-aware routing techniques help reduce conflicts and direct the traffic of the network considering its condition. One famous technique that is already in use is the longest prefix match helps to direct paths on hybrid networks with optimum performance [9].

The tools like AWS Route 53 are well known for improved DNS routing to reduce latency. The routing rules can be modified with the consideration of network latency for both users and environments. By employing these methods, an overall better user experience is achieved.

**Load Balancing Methods**

The modern load balancing methods equip the infrastructure with the traffic distribution between the given terms as they utilize real-time performance metrics with continuous monitoring. AWS itself provides a load balancer to support routing to IP addresses and to enable distribution across different hybrid platforms [10].

The AWS Global Accelerator can be used as a tool for global load balancing. This can help in directed traffic routing considering the geographies and available resources. Moreover, DNS-based load balancing helps to split traffic between environments. The result of applying these methods is not only better load distribution but better reliability and reduced latency.

**Security and Regulations**

Both infrastructures can be employed to use the same or more precisely unified security procedures with similar policies. The Identity and Access Management service of AWS makes it more applicable to manage access controls. The IAM implements encryption for data both in storage and during transfers [8].

As mentioned, security tools like Identity and Access Management (IAM) provided by AWS help to achieve security according to the company regulations. Modern data encryption methods like the lasted techniques in Transport Layer Security is a contributing factor to providing improved security according to the regulations.

## 7. Recommendations

The following are some recommendations that can help beat the challenges and keep the infrastructure running efficiently,

- The modern software industry utilizes microservices to balance the load for the software and make appropriate distributions. So, the functionalities can be divided to reduce failure or handle a failure easily.
- Monitoring tools like CloudWatch should be used to check the performance at continuous intervals.
- Keep the system ready and develop appropriate methods for emergencies.
- Increase latency and security of infrastructure with the utilization of optimized connectivity for the network.

## 8. Future Development

The current advancements and advanced studies are proof of a brighter future in terms of structured developments in the field of hybrid infrastructures and efficient traffic routing. The future methods are expected to use state-of-the-art techniques to provide better load balancing with efficient algorithms, advanced data synchronization tools, and dedicated security frameworks to mitigate the problems in hybrid environments.

## 9. Conclusion

The hybrid infrastructure has significance but has many difficulties in its implementation specifically in distributed traffic routing. The utilities of AWS and AEM On-Premises play an important role in hybrid

infrastructures but it is accompanied by complexity during some applications. Traffic routes, however, can be achieved in hybrid infrastructures and researchers made serious progress in recent times.

The implementation is therefore complex and challenges like latency management, security insurance, failures, load balancing, and data consistency can be found underway. However, some solutions are presented here for these challenges to achieve overall optimize performance and reliability of hybrid networks.

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