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Project Management for Cloud Compute and Storage Deployment: B2B Model

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Abstract: This paper explains the project's objectives, identifies the key stakeholders, defines the project manager's authority and provides a preliminary breakdown of roles and responsibilities. For the project's future, it acts as a source of authority. This paper's objective is to record the justifications for starting the project, its goals, limitations, solution instructions and the names of the principal stakeholders. This manuscript is meant to be used as a "Project Management Plan Light" for small and medium-sized projects when it would be uneconomical to prepare an entire collection of documents that make up a project management plan. A global media cloud will be provided and managed by the ABC cloud company inside of a consumer's current premises. In this paper, the authors explain the end-to-end delivery of cloud and compute services. The article mainly focuses on the delivery of virtual machines (VMs), graphics processing unit (GPUs), cloud storage, transcoding, packaging, 24/7 customer support and billing modules for the services used by end customers. The process starts with customer requirements gathering to initiate the feasibility check for the services desired or required by the clients. Pre-sale solution engineers capture all the customer requirements in the solution design document to review with the engineering and delivery team for the implementation. Based on the solution design document, the solution engineer needs to raise the system's feasibility for the local loops, cross connects, VMs, GPUs, storage, transcoders and packagers required to meet the end customer expectations on the service delivery. The solution engineer must sign-off on the solution design document agreed with end customer from the engineering and technical team. The program manager and technical team review the solution design document and confirm the order ID requirement in the system for the sales team to share with the order entry team to log the orders for a signed customer order form (COF). The program manager will initiate the service delivery for these order IDs logged in to the system for these services. Once services are ready for customer delivery, a technical team will share the customer portal with the end customer and provide training to the teams at the customer end use the required resources for cloud, compute and storage uses. Along with the services mentioned above, customers can access the usage and billing information in the customer portal. Moreover, the program manager is to share the project closure document, including the information about the services, reference IDs to log the trouble ticket with the supplier's 24/7 support team and billing start date for customer acceptance.

Keywords: cloud delivery; cloud project management; project deployment; cloud computing; network security; industry 4.0

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1. Introduction

The process of cloud and compute delivery starts with a request for proposal (RFP) initiated by the sales team. The RFP is a business document that outlines a project, requests proposals for its completion from competent contractors and announces the project. RFPs are the preferred method of project initiation by the majority of organizations, including many governments. When employing an RFP, the organization asking for bids is in charge of assessing the viability of the offers received, the financial standing of the companies submitting proposals and each bidder's capacity to carry out the project. After winning the RFP bid, the pre-sales team shares the customer order form, including the services, commercials, bill of material (BOM) and high-level solution diagram, including annexures, if any, for the sign and stamp of both organizations to initiate the service implementation. The program manager will start the internal and external project kick-off calls with the relevant stakeholders of both organizations to finalize the stakeholders, responsible, accountable, consulted and informed (RACI) matrix, communication plan and escalation matrix and review solution documents. The technical team, in consultation with the program manager and engineering team, will take the lead for the readiness of the service as per the signed COF. After the user acceptance testing (UAT), the program manager informs the customer that the service is ready or raises issues if any. Moreover, the service delivery team provides the customer portal uniform source locator (URL) and credentials, including training, to the end customer. Once the customer is happy with the services and portal usages, the customer is to sign off on the project closure document (PCD) provided by the program manager for service acceptance. After the customer's approval, the billing will be initiated as mentioned in the PCD. Finally, services will be handed over to the customer. The operation team will take off operations and support the smooth functioning of the services as per the service level agreement (SLA). Cloud uses are exponentially growing in various fields such as over-the-top (OTT) and live events in media industries, online data storage, e-commerce applications, test and developments, antivirus applications, extensive data analysis, agriculture and medicine. In 2020, the global cloud application market size was USD 171 billion and is expected to reach USD 356 billion by 2026. This paper is organized as follows: Section 2 describes the related work, Section 3 introduces the project background and Section 4 describes the cloud layer; Section 5 discusses program management, Section 6 gives a detailed view of service management and finally Sections 7–10 cover the project approach, change management process and conclusion, respectively.

2. Related Work

As mentioned above, the next phase of information communications technology (ICT) development is cloud computing. It will not go away. Year after year, it expands. This article shows how cloud computing may be very beneficial to project management. This is particularly true for projects involving several companies, multiple locations and multiple cultures, such as evolved packet core (EPC) projects. Such organizations want to create a clear plan for how cloud computing might help them with their project management problems. In order to provide a framework for utilizing this technology to its fullest potential while also taking into account how complex these organizations' processes are, this paper proposes a lean and digitized approach [1].

In this study, we investigated the performance gap between available edge-cloud stacks and industry requirements by conducting a thorough performance evaluation of the well-known containerized edge-cloud architecture. The Azure IoT Hub/IoT edge platform, one of the most advanced edge-cloud computing infrastructures, is used to benchmark three edge-cloud connectivity models. Full stack round trip time and system resource usage gauge a system's overall communication, computation and intelligence capabilities. We learn that the public cloud industry's existing edge-cloud infrastructure implementation is not fully ready for time-sensitive industrial applications. The performance in terms of concurrency, round-trip time (RTT) and message-sending interval must be enhanced by at least 3.3, 12 and 20 times, respectively [2].

It is crucial to comprehend how different cloud computing models differ and to determine which one is optimal for a developing company. This article offers information about cloud computing's fundamental ideas, models and services. The comparison of all cloud computing deployment models is also covered in the paper. The supported platforms, supported languages, storage capacity, services and products are contrasted with these clouds. With about 39% usage, hybrid cloud, which combines public cloud services with on-premises private cloud infrastructure, comes in third. The conclusion is that, even though the public cloud is by far the most popular option, the majority of the surveyed organizations use a variety of cloud services [3].

Our research demonstrates that most current cloud delivery network (CDN) providers are based on a single cloud platform and do not support dynamic user-generated content, an emerging form of content distribution. The services do not consider cost models when utilizing cloud content storage across multiple cloud providers because the solutions are based on a single cloud provider. Additionally, most commercial and very few educational systems do not offer user-level personalizing. The future of customized CDN, in our opinion, will revolve around the requirement to enable user-generated content, the capacity to support hybrid cloud platforms and the need to solve issues like quality of service (QoS), service level agreement (SLA) and price brought about by hybrid clouds [4].

This study has examined several concepts and the problems that arise naturally in various cloud computing contexts. It has reviewed different cloud computing delivery models, including Software as a Service, which lets customers access the provider's infrastructure through a user interface. The infrastructure has also been considered a delivery model where clients can access basic computing capabilities from the service provider. The final delivery model analyzed in the study is the platform as a service model, which provides platform development as a service. The security issue has also been examined in the study as another troubling idea [5].

The author in [6] provides an integrated and cost-effective multiple criteria decision-making (MCDM) solution for cloud service evaluation and system selection, enabling decision-makers to compare cloud services based on QoS criteria. Given the lack of differential measurement in traditional cloud models, a more comprehensive distance measurement algorithm based on cloud droplet distribution has been proposed. A new distance measurement algorithm was used to measure cloud image similarity and gray correlation coefficient. The dynamic skill weights are determined by calculating the similarity between the expert rating cloud model and the arithmetic mean cloud model. Next, the authors propose an ideal solution similarity technique for order of preference by similarity to ideal solution (TOPSIS) enhanced with gray relational analysis (GRA) to determine the relative proximity of positive and negative ideal solution alternatives and construct multiple optimization models. The relative proximity of all options is assessed to determine the importance of the situation.

The purpose of [7] was to select the appropriate software for implementing a cloud computing system for the new faculty of science and technology of Tehran University. For implementing a cloud computing system, applicable criteria are first extracted from the relevant literature and defined with the help of expert opinions. The criteria are then weighted and the alternatives are prioritized using the intuitive combinative distance-based assessment (CODAS) multi-attribute decision method using category values. The results show that the open-stack cloud computing system can be chosen as the best option.

In [8], the authors examine optimal energy management issues for smart grid privacy, including supply-side energy distribution and supply response to distributed energy. The authors initially proposed a cloud computing architecture for smart grids and modeled the problem of optimal energy management as a problem of maximizing social welfare with net income and consumer net income. Ref. [9] aimed to use application container virtualization technology to create an integrated resource management platform with a micro-service framework. The platform provides a supportive environment for building and deploying IoT cloud applications. However, there is no unified definition of the micro-

service model. The new tool service was created to build and deploy IoT cloud applications. Developers can combine services through their invocation relationships to create a set of service functions.

Edge computing resources significantly impact end-to-end performance, but performance trade-offs related to the virtualization technology and application capabilities have not been fully explored. In [10], the authors examined the performance dynamics of alternative cloud computing technologies with examples of various uni-kernels, container architectures and web service implementations. The experimental results inspired a conceptual edge cloud orchestration platform and its basic design guidelines. Different virtual components in an edge cloud are combined with specific capabilities or performance requirements.

The authors of [11] propose an efficient fine-grained uncorrelated data mining scheme based on a reversible Bloom filter. The authors stated that if the cloud server does not process or delete the data in good faith and does not present any relevant evidence, the user can quickly identify the malicious behavior of the cloud server with high probability. The authors provide a detailed security and performance analysis and estimates to demonstrate the safety and utility of the proposed scheme. The authors in [12] designed and implemented an integrated science cloud framework called science gateway cloud. This framework mediates users and vendors to process various scientific applications on heterogeneous cloud resources efficiently. Specifically, based on the long-term payment plans of cloud resource providers, we design cost-optimized resource management schemes that significantly reduce resource management costs without compromising performance. Finally, the authors show through various experimental and simulation results that the proposed system substantially outperforms traditional cloud systems.

The authors propose an effective, secure mitigation scheme [13] that supports user-defined access control. In particular, allowing cloud service providers to authorize access to data on behalf of data owners maximizes de-duplication without compromising the security and privacy of cloud users. In-depth security analysis shows that our trusted secure redaction system ensures data privacy and tag integrity by preventing brute-force attacks. Moreover, extensive simulations show that our scheme outperforms competing schemes regarding computation, communication, storage costs and reduced efficiency. The deep neural network is vulnerable to adversarial examples. The adversarial example is a model created by adding a small amount of noise to the original data model, which is not perceived as anomalous by humans but is misclassified by the model. Ref. [14] introduced the study of conflicting paradigms in 2014 and investigated various attack and defense techniques. The following developed methods are used to classify adversarial examples: deepfool, jacobian-based saliency map assault, iterative FGSM (I-FGSM), fast gradient signed method (FGSM), and (JSMA). Carlini [15] and wagner [16] investigated the conflicting training methods for images, text fields and intrusion detection fields. Li and Qiu [17] proposed a method for increasing robustness over competing text examples.

The paper suggested a backdoor attack on the picture caption model using deep neural networks [18,19] configuring three different types of triggers. For each trigger size, the backdoor sample's attack success rate and the original sample's error rate were examined. Regardless of the trigger type, when the backdoor sample's trigger size is 4%, the experimental findings indicate that the original sample's average error rate is 9.65%, while the backdoor sample's average attack success rate averages 96.67% [20]. In this work, the authors presented research on cloud server failure prediction and tested their hypothesis that incorporating several system indicators will enhance failure prediction. The paper focuses on fully substantiating the hypothesis using data analysis, a correlation study and experimental findings based on our data collected from 100 cloud servers. The authors illustrated the competitive advantage of integrated metrics [21].

The paper shows that only 17.6% of the examined works that dealt with risk assessment included it in the business process life cycle, according to the results of the evaluation of the business process life cycle [22]. According to the domain applicability evaluation results, 53% of the evaluated works were tested in real-time and afterward validated

and reused. The research was conducted utilizing an existing risk analysis technique, with positive results for its use in security risk analysis [23]. The suggested architecture offers a hybrid strategy combining the advantages of replication and erasure coding to produce the best storage option focusing on dependability and recovery. The actual outcomes demonstrate the suggested hybrid framework's significant influence on cloud storage efficiency [24]. Data privacy and security is a complex topic that prevents businesses from using cloud services. Triple Data Encryption Standard methodology is presented to address this problem by supplying security for big data in cloud environments using healthcare data [25].

With its three service models, namely IaaS, PaaS and SaaS, cloud computing offers access to various applications/software services among many other things. It also delivers the best services following user expectations and several add-on facilities. The pay-per-usage method it uses, which incurs no extra costs while scaling up and down, makes it the best of them all. There is a win–win situation, signifying providers and users receiving wonderful advantages. Here, the comparison between IaaS and PaaS was the main focus and it was determined that while both do an excellent job, PaaS is more in demand among customers [26].

In this research, the Chaotic Fuzzy Encryption (CFE) technology and the Greedy Chemical Reaction Optimization (GCRO) algorithm are used to meet the data security dilemma of the cloud platform. The chaotic fuzzy encryption method is used in the offloading scenario to secure the data before it is transmitted to the cloud. When compared to existing algorithms like Proxy Re-Encryption (PRE) and the Advanced Encryption Standard (AES), the proposed CFE-GCRO algorithm takes less time to upload files, download files, use memory when uploading files and encrypt and decrypt files, taking less than 20%, 15%, 16.66%, 6.25% less time, respectively [27].

3. Project Background

With the cloud ABC company with the help of media cloud for consumers, users can self-manage compute resources such as the central processing unit (CPU), random access memory (RAM), disc and network that can be deployed as virtual machines or Kubernetes containers and can even be orchestrated against bare metal. Depending on the use case, these service components may be developed as ad hoc services, delivered from a service catalog or even as a whole "Application Blueprint. Figure 1 displays the scope of the work (SOW).

3.1. Infrastructure

Following are the two distinct service definitions that have been assigned to the media cloud [28]:

- Services for Media Storage
- Service for Media Computing

The initial deployment includes the media compute service hosted at the India site of ABC cloud company and the media storage service at the consumer facilities listed on the customer order form (COF). According to the media cloud service schedule, the ABC cloud company will offer capacity management in both a proactive and reactive manner. It is anticipated that line-of-sight opportunities needing a significant number of "cloud" resources will be brought to the party desiring to onboard service as soon as possible during the regularly scheduled service management meetings.

The ABC cloud company will provide a network ring connecting all of the consumer "cloud" equipped facilities. This network will be utilized for storage distribution in the global single name-space archive and inter-regional communication. The ABC cloud company will monitor and provide capacity augmentation by rising media cloud consumption. Facilities to support the society of motion picture and television engineers (SMPTE) 2110 and 2022-6 intra-region and inter-availability zone will be part of the capability. The global media cloud is shown in Figure 2 illustration.

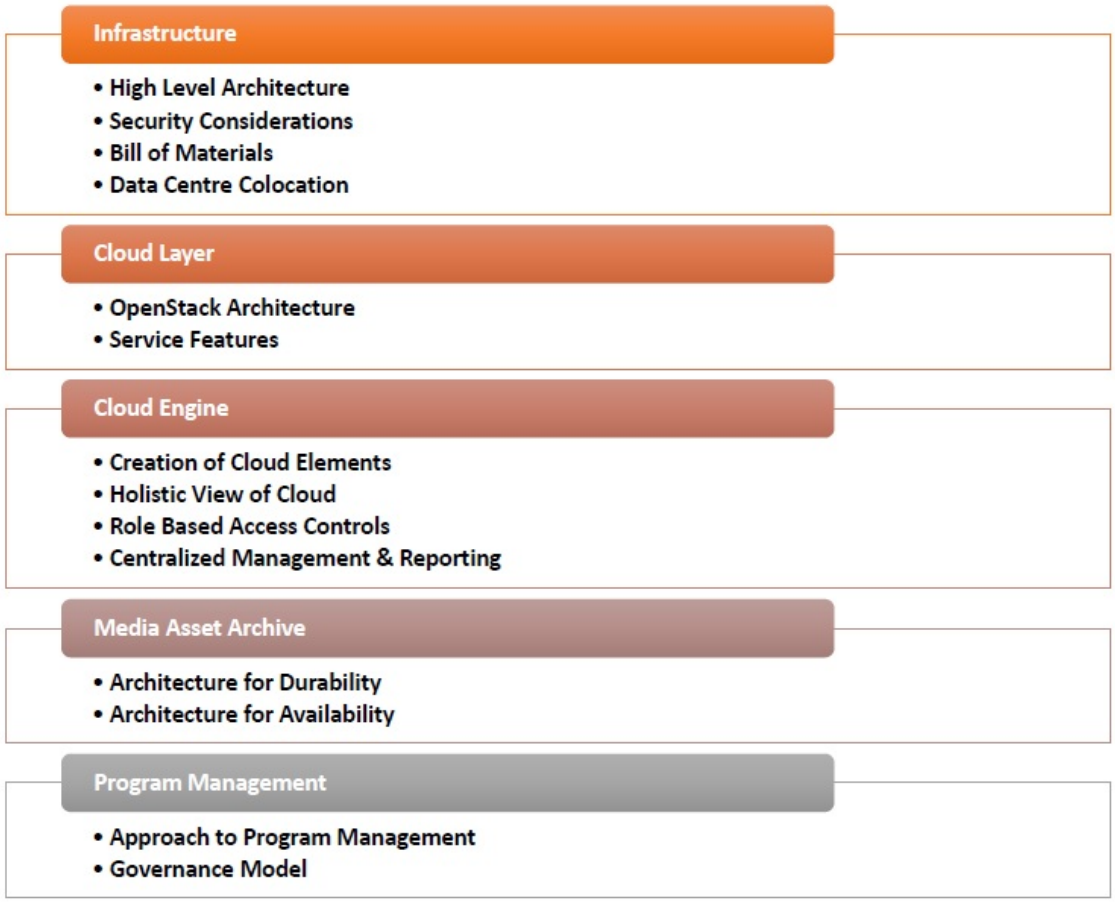

Figure 1. Scope of Work Sections.

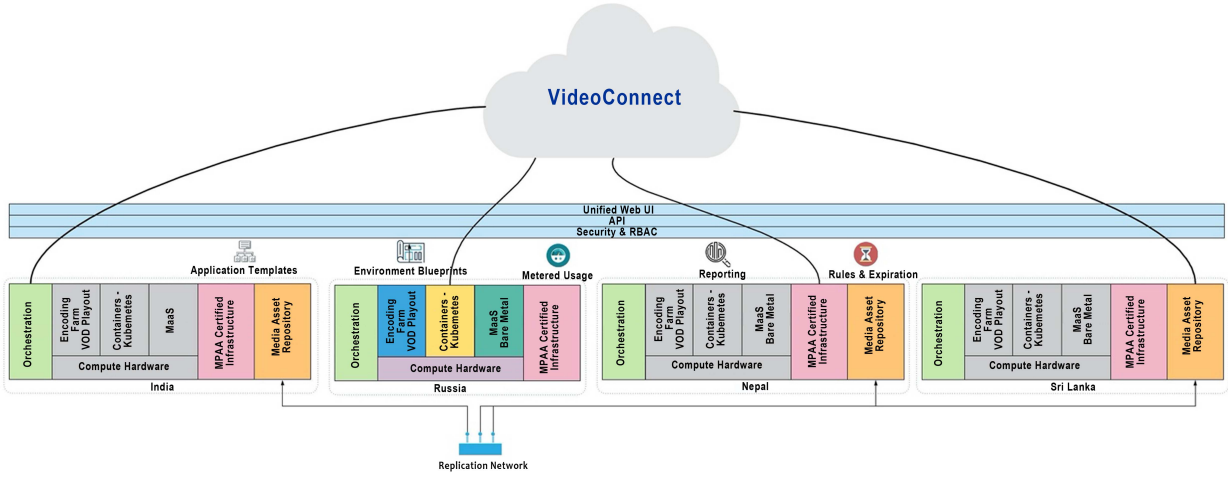

Figure 2. Global Media Cloud.

3.2. 'Ingress/Egress' Networks

ABC cloud company will offer adequate Internet capacity to and from the media cloud and ingress and egress network connectivity from the media cloud to the older customer networks. ABC cloud company will maintain the redundant capacity and management tasks will include network throughput monitoring up to the established ingress and egress demarcation. To avoid any misunderstanding, ABC cloud company manages the ingress and egress up-time and capacity from the media cloud to the internet independently of any

other internet capacity to the consumer legacy network infrastructure. The following consumer facilities will receive diversified and redundant video connect network connectivity from ABC cloud company as part of the cloud infrastructure deployment during the phase 1 implementation to enable access to the cloud platform:

- India
- Russia
- Nepal

Based on how the platform is used from each location, capacity will be sized and scaled to suit the traffic requirements. To be clear, the network infrastructure indicated above will not harm the economics or capacity responsibilities of the current network services agreement.

3.3. Security Considerations

Network Security: [29,30] An inline infrastructure of firewalls, intrusion prevention system (IPS), next generation firewall (NGFW) and web application firewall (WAF) safeguards the media cloud. At the system's edge, a firewall is installed. A platform for threat intelligence is in place to keep track of things and sound alarms as needed.

Platform Specific Security & Intrusion Detection Prevention System (IDPS): [31] The media cloud from ABC communications includes network intrusion detection and prevention systems (mIDPS). As a result, the platform may handle network intrusion detection on a two-tier firewall architecture and is monitored around the clock. This feature offers comprehensive and precise incident detection and escalation through early-warning global threat visibility, event tracking, correlation and assault recognition. **Distributed denial of service (DDoS) Protection:** At the consumer's request, ABC communications will enable DDoS mitigation services. Additional commercial considerations for such services will need to be explored and decided. **VMS:** The VA capability provides insight into configuration modifications needed to maintain compliance with best practices and standards around the clock every year. The list of VMS features is presented in Table 1.

Table 1. VMS Features [32,33].

Features	*Benefits*
Network Mapping	Enables rapid, accurate detection and identification of networked assets
Internal and External Scanning	Provides a 360-degree view of network and vulnerabilities
Scheduled, automated discovery and scanning	Uses daily, weekly or monthly scans to find pertinent vulnerabilities to enable consistent, repeatable assessments highlighting vulnerabilities and remediated assets.
Customize Scans for Specific Ports, Services and/or Vulnerabilities	Balances network and device bandwidth consumption against system performance needs
Authenticated Scanning	Allows for a comprehensive assessment to identify vulnerabilities based on network access as well as approved access
Inference-based Scanning Engines	Utilizes host fingerprint information to initiate appropriate scans based on operating environment
A comprehensive Vulnerability Knowledge base with 5500 Unique Checks	Provides an up-to-date repository of vulnerabilities that assures efficient identification of even the newest vulnerabilities

Table 1. *Cont.*

Features	*Benefits*
Auto-Generated Reports	Provides immediate access to results of scans, enabling a fast response to high-severity vulnerabilities
Detailed Reports with Verified Remediation Actions	Provides comprehensive information for IT staff to enable rapid decision-making on remediation activities
Customize Reports	Enables customer-specific reporting to meet unique requirements for each customer
Flexible Asset Prioritization and Grouping	Enables users to prioritize remediation activities based on asset value and severity of vulnerabilities
Automated Update of Signatures and Vulnerability Checks	Assures scan results reflect the most recent knowledge of vulnerabilities and remediation alternatives using consistent information base
Web-Based Interface	Access anywhere/anytime to reports and intuitive interface for requesting changes in policy, configuration and parameters
Secure Architecture	Protects scan results and customer infrastructure mapping from tampering and exposure
Audit Compliant	Following American Institute of Certified Public Accountants (AICPA) criteria, ABC Infrastructure Services supports SOC Attestation and other audit needs. It also responds to audit evidence requests, including ISO27001 and TNP demands.

3.4. Penetration Testing

Every year, ABC cloud company evaluates the security status of our ecosystem. This testing needs to be planned with customers and cannot interfere with services. Among the testing methods are

1. Identification of hosts and service discovery;
2. Vulnerability spotting;
3. Vulnerability exploitation;
4. False positive analysis;
5. Vulnerabilities are fixed in line with industry norms.

The penetration testing scenario mentioned in Figure 3.

It has been confirmed that the compute node configuration mentioned above can support up to two double-depth GPUs per server. This was not included in the initial specification because it is not currently necessary. When GPU services are needed for a future update, consumers will let ABC cloud company know.

Quantities for each of the BoM elements (Networking BoM [34], Hyper-Converged Compute BoM [35], Archive Storage BoM [36] and NFV Server BoM [37] mentioned in Tables 2–5, respectively) can be identified in the rack layout diagrams presented in Figures 4 and 5. ABC cloud company will provide Serial Digital Interface (SDI)/Asynchronous Serial Interface (ASI) conversion equipment, but physical equipment specifications have not currently been selected. The provision of agreed conversion equipment will be provided back to the consumer at a mutually agreed rate.

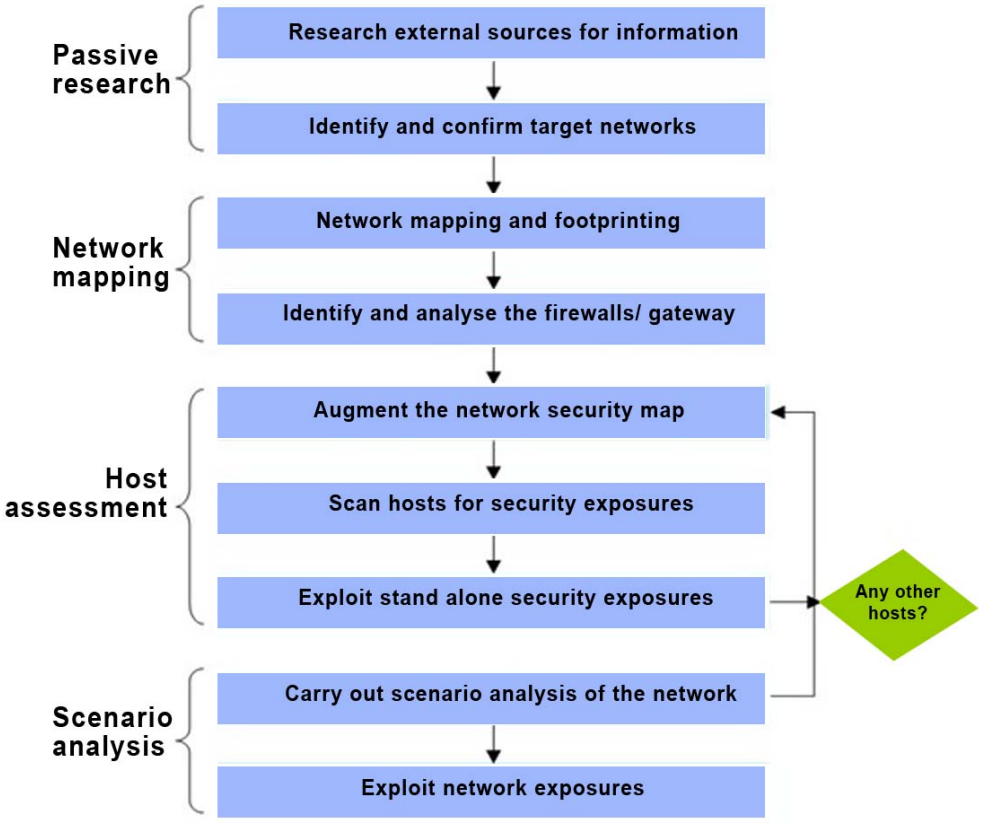

Figure 3. Penetration Testing.

3.5. Consumer Data Centre Co-Location

ABC cloud company will procure and install the devices documented within this SOW. It will be the consumer's responsibility to provide space, power and cooling as well as remote hands services when required.

3.6. Rack Layout and Power Requirements

Three availability zones must be deployed for each media cloud area. The logical failure domain for both computation and storage will be created by this. For sites with accessible dense power and cooling, the option below shows a consolidated layout. A scattered rack architecture is used for sites with less power & cooling demand or less heat density per rack. As stated in the previous description, the media cloud services will be introduced gradually. The Phase 1 starting space and power needs are shown in the rack diagram below. Future space requirements should be taken into account in accordance with the Phase 2 ambition diagram shown below.

Table 2. Networking BoM.

Product Code	*25 GB Core Switch*
MSN2410-CB2F	Spectrum(R) based 25 GbE/100 GbE 1U Open Ethernet switch with Cumulus Linux, 48 SFP28 ports and 8 QSFP28 ports, 2 power supplies (AC), x86 CPU, short depth, P2C airflow, Rail Kit

Table 3. Hyper-Converged Compute BoM.

Description
PowerEdge R740 Server
PowerEdge R740/R740XD Motherboard
2 units Intel Xeon Gold 6130 2.1 G, 16 C/32 T, 10.4 GT/s , 22 M Cache, Turbo, HT (125 W) DDR4-2666
24 units 32 GB RDIMM 2666MT/s Dual RanK
iDRAC9,Enterprise
6 units 8TB 7.2K RPM NLSAS 12 Gbps 512e 3.5in Hot-plug Hard Drive
2 units 240GB SSD SATA Mixed Use 6 Gbps 512e 2.5in Hot plug, 3.5in HYB CARR S4610 Drive
1 unit Dell 1.6 TB, NVMe, Mixed Use Express Flash, HHHL AIC, PM1725b, DIB
PERC H740P RAID Controller, LP Adapter
Mellanox ConnectX-4 LX Dual Port 10/25 GbE SFP28, rNDC
2 units Mellanox ConnectX-4 LX Dual Port 10/25 GbE SFP28 Adapter, PCIe Full Height
6 units Performance Fan forR740/740XD
2 units Hot-plug, Redundant Power Supply (1+1), 1600 W
GPU Ready Configuration Cable Install Ki
ReadyRails Sliding Rails With Cable Management Arm
5Yrs NBD

Table 4. Archive Storage BoM.

Description
PowerEdge R740xd2 Server
PowerEdge R740xd2 MLK Motherboard
2 units Intel Xeon Silver 4216 2.1 G, 16 C/32 T, 9.6 GT/s, 22 M Cache, Turbo, HT (100 W) DDR4-240
6 units 32GB RDIMM 2666MT/s Dual Rank
iDRAC9,Enterprise
23 units 14 TB 7K SAS 12 Gbps 512e 3.5in Hot-Plug Hard Drive
2 units 240 GB SSD SATA Mixed Use 6G bps 512e 2.5 in Hot plug, 3.5 in HYB CARR S4610 Drive
1 unit 480 GB SSD SATA Mix Use 6G bps 512 2.5 in Hot-plug AG Drive,3.5 in HYB CARR, 3 DWPD, 2628 TBW
PERC H730P Controller Car
2 units Mellanox ConnectX-4 LX Dual Port 10/25 GbE SFP28 Adapter, PCIe Full Height
Dual, Hot-plug, Redundant Power Supply (1+1), 1100 W
PEC Static Rails
5Yrs NBD

Table 5. NFV Server BoM.

Description
Power Edge R740 Server
Power Edge R740/R740XD Motherboard
2 units Intel Xeon Gold 6130 2.1 G, 16 C/32T, 10.4 GT/s , 22 M Cache, Turbo, HT (125 W) DDR4-2666
64GB: 2 units 32 GB RDIMM 2666MT/s Dual RanK
iDRAC9,Enterprise
3 units 8 TB 7.2K RPM NLSAS 12 Gbps 512e 3.5 in Hot-plug Hard Drive
2 units 240 GB SSD SATA Mixed Use 6 Gbps 512e 2.5 in Hot plug, 3.5 in HYB CARR S4610 Drive
PERC H740P RAID Controller, LP Adapter
Mellanox ConnectX-4 LX Dual Port 10/25 GbE SFP28, rNDC
Mellanox ConnectX-4 LX Dual Port 10/25 GbE SFP28 Adapter, PCIe Full Height
6 units Performance Fan forR740/740XD
2 units Hot-plug, Redundant Power Supply (1+1), 1600 W
GPU Ready Configuration Cable Install Ki
ReadyRails Sliding Rails With Cable Management Arm
5Yrs NBD

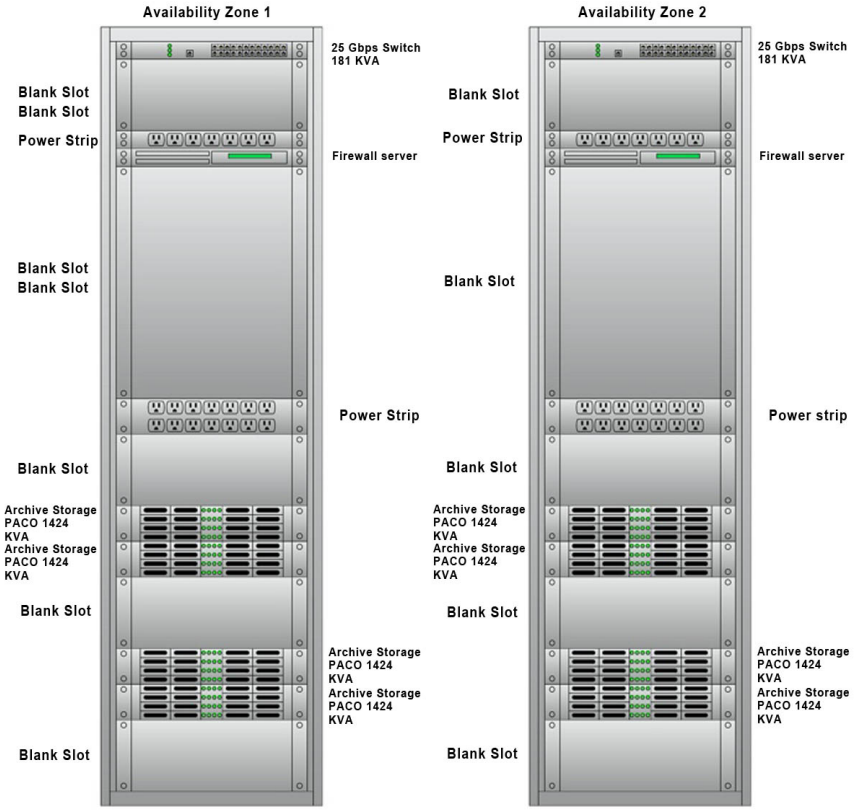

Figure 4. Phase 1 Space and Power Needs are Shown in the Rack Diagram.

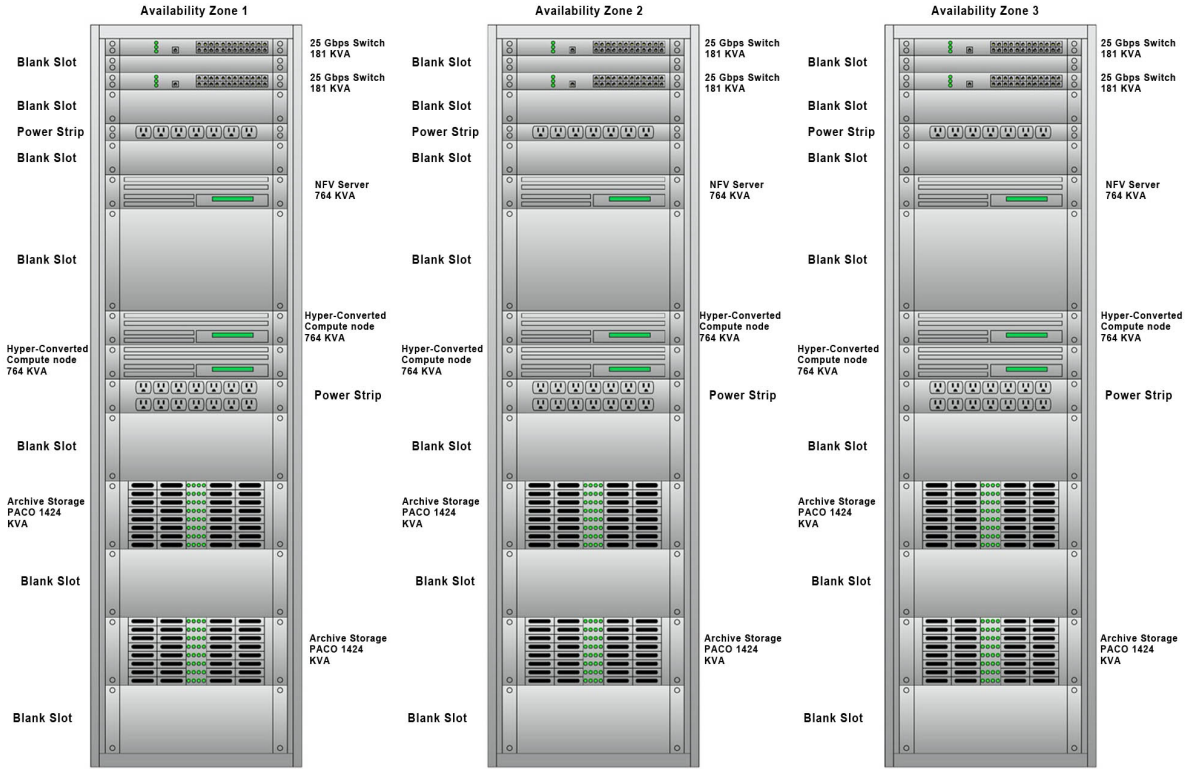

Figure 5. Phase 2 Space and Power Needs are Shown in the Rack Diagram.

3.7. Physical Security

Since the planned service will be housed in consumer facilities, the consumer will be in charge of providing physical security. This is assumed to at least comply with the requirements of ISO 27001 at this point. They include, but are not restricted to, the following:

- POPs are housed in hardened IDC facilities that employ a variety of security tools, methods and tactics to manage, keep track of and document access to the facility, including consumer's cage areas.
- 24/365 manned on-site security.
- Visitors are checked and guided to the proper locations in shared settings.
- Where suitable, two factor locks (key card and pin for entry) or biometric devices are used to secure all doors, including cages.
- Cabinet doors with kinetic locking.
- Comprehensive audit and surveillance logs and closed circuit television (CCTV) coverage of the entire facility, including the cages.
- Confidentiality laws and employee screening procedures are followed.

4. Cloud Layer

Open Stack Architecture:Within their India facility, the ABC cloud company will first deploy a production-grade media cloud using the most recent LTS versions of ubuntu, Open stack, metal as a service (MAAS), landscape and Juju. These media cloud components will be installed in the enabled facilities in accordance with the contract, the same as the global media compute infrastructure is installed at consumer facilities.

Service Features: As part of the media cloud, the following service functionalities which will be made available to the company are presented in Table 6.

Table 6. Service Features.

Features	*Description*
High Availability	Full Open Stack High Availability (HA), including Metal as a Service (MAAS)
Monitoring and Updates	Fully managed up to the Cloud Layer
Hypervisor Support	Nova KVM
Encryption	Control Plane Ceph Encryption at Rest
Identity	Keystone with LDAP, Active Directory or Okta back ends
Storage Services	Ceph Block and Swift Object
Network Topology	NIC bonding, unlimited underlay L2 network segregation and Multicast
IPv6 Addressing	Tenant networks only
Cloud Services	Virtual Machine Orchestration, Kubernetes Management, Multi-Tenancy, Usage Based Reporting, Blueprint Creation, Role-Based Access Controls (RBAC) Creation of Proof of Concept / Demo environment will be made available with a Quota no greater than 5% of the capacity available in Region.

4.1. Cloud Engine

Each region's engagement with the cloud ABC company will be made possible using a single UX by the media cloud engine. The resource handler will manage each region by giving environments (regions/availability zones, images, or blueprints) back to the consumer.

Groups of users will be established in conjunction with the consumer and role-based access controls (RBAC) will be used to ensure authorised access to specified media cloud assets.

It is acknowledged that the goal is to provide a service catalogue of pre-established blueprints. These blueprints will depict an entire use case of an orchestrable application or service. In order to define "blueprints" for selection within the cloud engine service catalogue, the ABC cloud company will collaborate with the consumer.

For an element developed in the cloud, life-cycle management within the media cloud can be configured to expire or alert based on a pre-defined service period.

Before deploying pieces or blueprints, authorization workflows can be enforced to request consent from an authorised user in the system.

There are reports that are easily accessible on the media cloud. Reports on expenses, servers and consumption are among them. By default, all reports are available. Admins that have been designated by consumers will be able to make customised reports as needed.

In order to ensure that the yet-to-be-defined low level functionality is captured and ready for execution, the ABC cloud company will collaborate with the consumer to define the day-one functionality of the cloud engine.

4.2. Media Asset Archive

The 'Write Anywhere... Read Everywhere' media asset archive will be made available by ABC cloud company as a single namespace object storage platform. The platform was built to meet extremely strict availability and durability standards. Erasure coding is used to disperse content across the whole "Cloud" as it is ingested in any of the "Cloud" regions. The Open stack swift model forms the foundation of the "Media Asset Archive" architecture, which offers seamless scaling across availability zones when storage requirements fluctuate, has no single point of failure and is fundamentally reliable. This strategy also offers an industry-standard RESTful API interface and has been specifically optimised for the effective storage and retrieval of media assets, making it simple to integrate with other on-premises and cloud-based applications such as media asset management (MAM), hierarchical storage management (HSM) and related services. The ingest/restore workflow components are clearly presented in Figure 6.

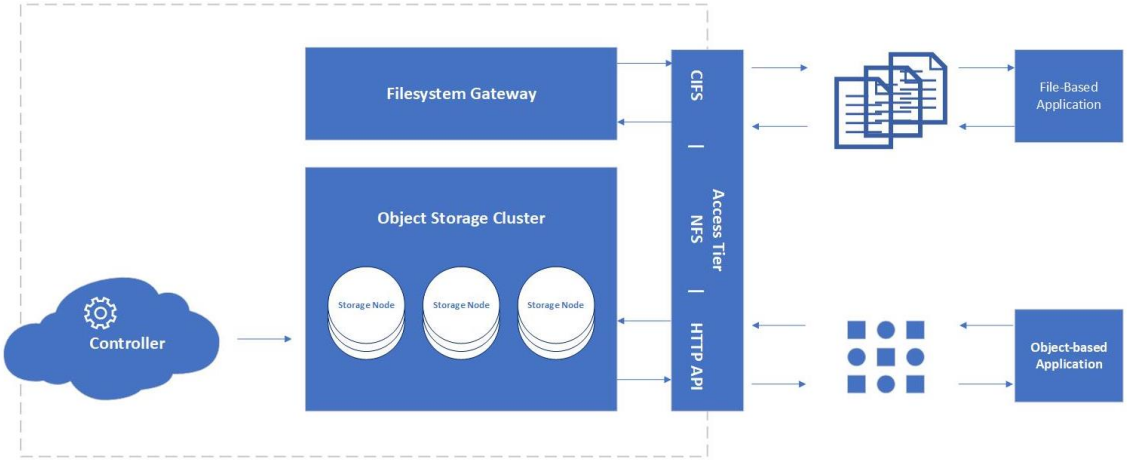

Figure 6. Ingest/Restore Workflow.

The archive storage service is an object storage platform capable of native swift and S3 REST as illustrated in Figure 7. As content is ingested, parity is created, data and parity are then distributed to policy directed availability zones throughout the global cloud:

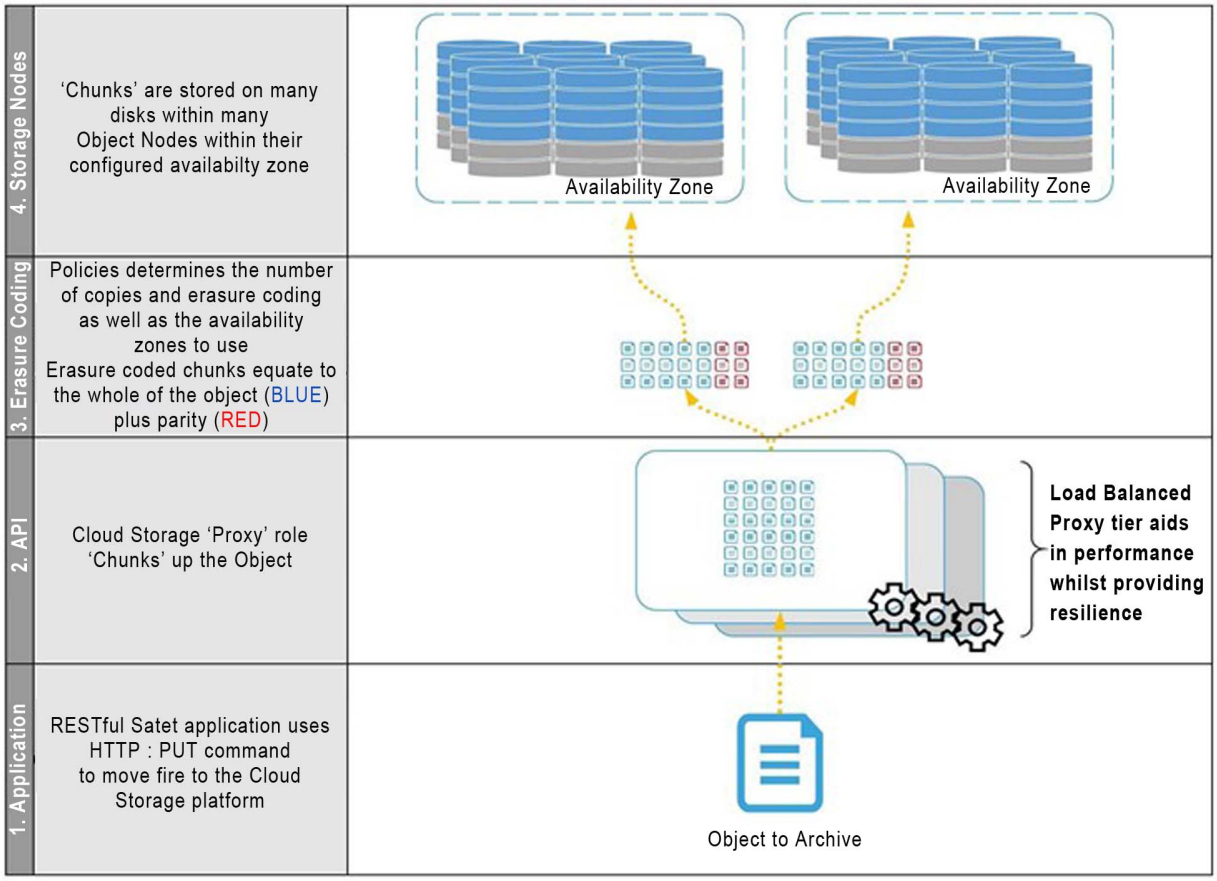

Figure 7. The Archive Storage Service and Object Storage Platform With Native Swift and S3 REST.

4.2.1. Distributed Erasure Coding

It is crucial to make sure that the most significant failure domain is located and taken out of the equation when developing a service that can deliver 11 × 9 s (99.999999999%) of durability. The platform's content storage must continue to be kept in a consistent state even if an entire region is unavailable.

Four parity pieces will be developed for each of the content's eight parts to ensure its long-term viability in a distributed service. Then, data and parity will be made available (four parts per region), as shown in Figure 8.

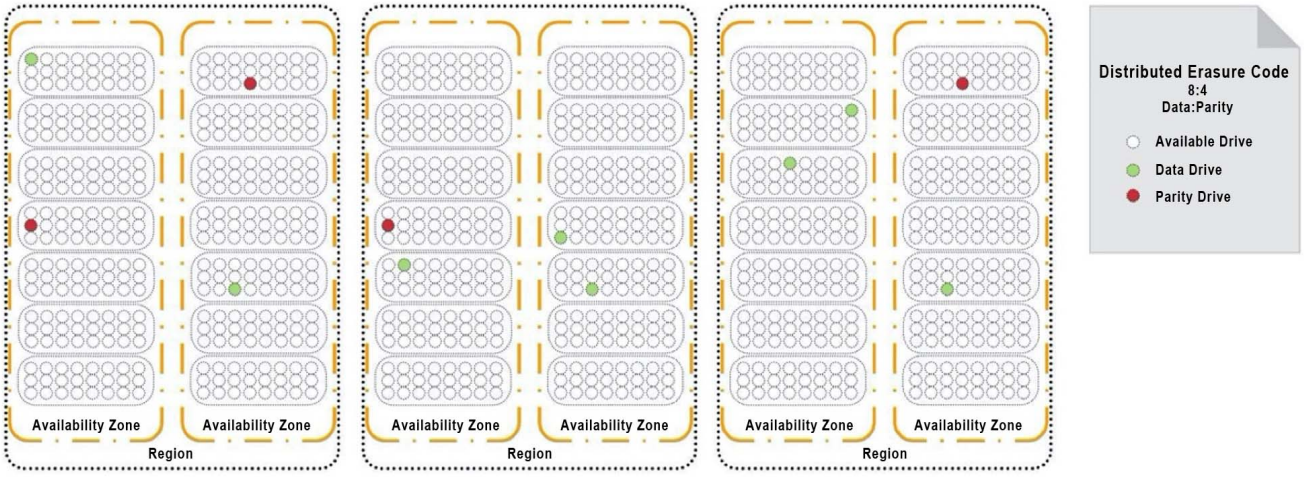

Figure 8. Distributed Erasure Coding.

4.2.2. Replicated Erasure Coding

More storage policy options will be available as capacity is increased and there are at least 10 object servers in each location that supports policies. Replicated erasure Coding only needs two regions to attain the same 11 × 9 s (99.999999999%) durability as the globally distributed erasure coding policy. For each of the content's seven parts, three parts of parity will be made to ensure its endurance in a duplicated erasure coding model. Then, data and parity will be written for distinct availability zones in the area where the material was ingested. The complete data set plus parity will be copied to the second area specified in the policy.

4.2.3. Additional Storage Policy

Options will be possible once the capacity is increased and the number of object servers rises to at least 20 servers per policy-enabled region. Single region erasure coding will only need one region to accomplish the same 11 × 9 s (99.999999999%) of durability as the globally spread erasure coding policy. For each of the content's 15 parts, four parity parts will be made to ensure its endurance in a duplicated erasure coding model. Then, data and parity will be written for distinct availability zones in the area where the material was ingested.

4.3. Out of Scope

This SOW does not cover the following things:

- Any management or assistance with operating system-related issues
- Network anti-virus
- Application management of any kind
- Application level backups
- Network anti-virus
- Network connectivity for remote sites using the media cloud
- On-premise engineering resources to consumer facilities
- Network connectivity for remote sites using the media cloud

4.4. Dependencies

The following list provides a high-level overview of the media cloud engagement's client dependencies: Access to the data centre for the installation and configuration of all on-premise hardware; a designated programme and project management team from the consumer to work side by side with the ABC cloud company team; an application flow that will be defined by consumer team; identification of key stakeholders for media cloud training; and 24/7 remote "smart hands" support the following defined SLAs.

4.5. Tools and Resources

Tools that are in use within ABC cloud company project management include the following:

- Microsoft Project: The gold standard tool for managing project schedules, in line with industry best practices.
- Salesforce.com: Used as a configuration management tool within ABC communications to ensure full records of all deployed assets. All configuration items within the customer's solution will be fully documented with an individual entry per configuration item.
- Project Tracker: This is used across all ABC cloud company projects and programs, this ensures consistency and that all required information is captured.
- Project Action, Risk, Issue Tracker: This is used across all ABC cloud company projects and programs, this ensures consistency and that all actions are properly followed. In addition, potential risks and issues are tracked and categorized and mitigation plans are developed.
- SharePoint Library: This is used as a database within ABC communications to ensure every project team member has access to all the project documents. The customer will have a dedicated library used by the project team to share documentation.
- Quality Tools: Customer satisfaction surveys are carried out after each project phase and quarterly after project completion.

5. Program Management

The ABC cloud company will offer a committed and knowledgeable staff to handle and supervise the entire deployment process. Deployment processes will also include a governance framework to properly manage risks, concerns and opportunities. The team's duties include:

- Manage the overall delivery and transition to service operations.
- Provide regular project status updates to the consumer.
- Manage risks, issues and opportunities.
- Ensure the media services are delivered on time and as per the requirement.
- Facilitate the early identification and resolution of any potential delivery problems

The service delivery team follows the standard ABC cloud company-stage delivery process described below.

- Initiation: The pre-sales process includes the initiating step. During this phase, ABC cloud company gathers your requirements, creates a solution that satisfies your needs, tests the solution's viability with you and with teams from the ABC cloud company's internal operations and then completes the solution. A COF that has been signed is the phase's output.
- Planning: Through the service provisioning questionnaire, we collect extra provisioning inputs from you throughout the planning process and we also record the date of the customer's service request (CRFS). A project manager at ABC communications creates an implementation strategy, including the delivery procedure and significant checkpoints to meet the CRFS. This plan includes a summary of the project's objectives and deliverables, a resource list, a timetable, a strategy for project communications

with an escalation matrix and a list of your duties as a client. It would be best if you approved the project plan, project scope, project deliverables and project.

- Execution: During the execution phase, all project execution steps are performed as per the agreed project plan and we deliver the service according to your requirements.
- Closure: This phase involves your acceptance of the service. After the build-out is finished, we provide you five days to test the service for compliance with your COF-specified requirements. If you discover any non-conforming requirements, you must inform us in writing. We will then immediately fix the issues and reopen the inspection and acceptance period. Once the service has been accepted, you are provided with support and escalation documents, including call logging instructions, a list of inputs required for trouble reporting and an escalation chart with names and contact information.

Roles and Responsibilities

The below RACI matrix defines the roles and clear demarcations: Definitions: R = Responsible, A = Accountable, C = Consulted and I = Informed. For different phases of the project, the detailed roles and responsibilities of the ABC company and consumers are presented in Table 7 with complex activities. The phases covered in the RACI matrix are planning and design phase, build and implement, DR services, Go-Live and handover. The agreement is signed between ABC company and the customer for all the roles and responsibilities. Based upon the RACI matrix, the sales, solutions, program management and operation departments deploy their workforce and other resources to fulfil customer requirements. The customer can demand extra resources on a paid basis. The technical design authority (TDA) of ABC communications creates a low-Level design document for the implementation of services.

Table 7. RACI matrix.

Phase	Service	Activities	ABC Company	User
Planning and Design Phase	–	Prepare Infrastructure High Level Design	RA	CI
		Prepare Infrastructure Deployment Design	RA	CI
		Prepare Detailed Infrastructure Design	RA	CI
		Define Infrastructure Monitoring Requirements	RA	CI
		Prepare Detailed Network and Security Design	RA	CI
		Prepare Detailed Server Environment Design	RA	CI
		Prepare software requirements up to OS	RA	CI
		Prepare software requirements above OS	I	RA
		Prepare Disaster Recovery Design and DR Plan	RA	CI
		Prepare Bill of Materials (HW and SW)	RA	CI
Build and Implement	Data center	Procure the materials and software as per approved BOM	RA	I
		Design and Build of Data center infrastructure facilities (Power, Cooling, Security, Access etc.), for the environments	I	RA
		Design and Build of racks, cabling, power for the infrastructure equipment like servers, firewall, load balancers, switches as per the design	RA	I

Table 7. *Cont.*

Phase	Service	Activities	ABC Company	User
		Ensuring compliance with Tier3 standard, aligning with government approved security policies, maintaining ISO 27001 and compliance needs of customer and solution	CI	RA
		Install and cable Servers, network equipment as per standard build diagrams	RA	CI
	Environment	Configuring tools for monitoring and Alerting	RA	C
	Network, Security and Access	Provision network interconnects including firewalls, switches, Load balancers with appropriate IP Address, sub-interface, 3rd Party Network Data Centre Cross-connects as Required	RA	RA
		Establishing site to site VPN connectivity to CONSUMER and Consumer's Clients	RA	RA
		Configure Network Equipment for High availability	RA	C
		Configure firewall with customer specific firewall rules, VLANs and ACLs	RA	C
		Add default route to dedicated firewall for internet access and configure for admin network access	RA	C
		Set up and configure VPN access for customer and external access	RA	C
		Configure two way authentication	RA	C
		Turn up and test circuits for internet between Data centers, user and admin connectivity	RA	I
		Assign Virtual IPs and Management IPs to Load Balancers and configure load balancer per customer specific requirements	RA	CI
		Provide domain and sub-domain information, SSL certificate information, URLs to be load balanced and algorithms to use in load balancing	RA	CI
		Deploy and Configure Security Information Event Management - SIEM	RA	C
		Deploy and Configure IPS/IDS	RA	C
		Deploy and Configure Vulnerability and DDOS detection systems	RA	C
		Conduct Penetrations testing and fix the security short gap findings if any	RA	C
	Server/Compute	Establishing and testing SAN, Backup, network connectivity to servers	RA	I
		Configuring the server for Hardware RAID, IP Address, DNS, latest approved Hardware Vendor support software and hardware drivers, logical configuration and partitioning of server storage	RA	CI
		Provisioning physical/Virtual server Operating System with latest Service pack, security fixes, patches, hot-fixes, Backup Client, Monitoring Agents and Provider management applications	RA	RA
		Build the platform for ALL (Test, Dev, Pre-Prod, Prod etc) environments	RA	C
		Server Hardening	RA	C
		Configuring the server with Logical and Physical Disk Counters, standard event log retention, time service source	RA	C
		Create customer administrative account, initial server admin/user accounts and integration with Active Directory	RA	C

Table 7. *Cont.*

Phase	Service	Activities	ABC Company	User
		Install file system backup agents	RA	I
		Installing antivirus in the all the administrative servers	RA	I
		Installation and configuration of Managed Applications (Oracle DB, Citrix XenApp)	RA	RC
		Configuration of monitoring tools for OS, Application, Data base	RA	RC
	Storage	Provision storage resources and SAN settings	RA	C
		Define storage volume, size and IOPS requirements	RA	C
		Create storage volumes per approved configuration	RA	C
		SAN/LUN Provisioning and Multi-path configuration	RA	C
		Storage/Replication Configurations	RA	CI
	Backup	Configuration of Backup for the data files	RA	CI
DR Services		Configure the load balancers, servers, firewall for the DR Failover	RA	CI
		Verification of DR fail over for RTO, RPO and availability services in absence of primary site	RA	CI
		Document fail over steps for managed service components and operations	RA	I
Go-Live		Ensure High Availability and DR	RA	R
		Backup Restoration Testing	RA	I
		Security Compliance - OS Level, Secured Infrastructure	RA	CI
		Security Compliance - Application Level (CONSUMER Product Applications)	I	RA
		Verification of Monitoring, configuration backup, platform	RA	I
		Documentation of Solution, design and configuration of all infrastructure components	RA	I
		Asset Inventory Management - Hardware, OS, Antivirus, Infra components, Managed Security Services)	RA	I
		Asset Inventory Management—DB, Applications Software	RA	RA
Handover		Backup and Storage Performance	RA	I
		Security incidents	RA	I
		Load Balancer Performance and Availability	RA	I
		Publish reports on agreed intervals	RA	C
		Operating System availability and performance	RA	I
		Network Infrastructure Availability and Performance Reporting (Network/LAN Aggregate Uptime and Utilization) for inter DC links, Internet	RA	I

6. Service Management

Service Management Team: A group of our experts will be assigned to the consumer and be in charge of supporting the in-scope services. Globally, this high-level support is offered on a region-by-region basis so that the consumer's unique demands in their area are recognized. The pertinent people to contact are:

Service Manager: Customers can speak with service managers at one time about the overall quality of the service. The following responsibilities fall under the purview of service managers:

- Monitoring availability and performance.
- Managing specific occurrences.
- Management of any general problems.
- Management of planned change.
- Localized point of escalation

Services Operations Centre (SOC): The services operations centre (SOC) delivers the managed services and ensures SLA is met. SOC has certified skilled resources available across technologies and frameworks. The SOC will act as an initial triage centre invoking escalation paths to respective technology owners both internally and with third party organizations within the service provided. Traceable SLAs are managed centrally with pre-agreed escalation paths. SOC strives to proactively diagnose and resolve any managed service issues before they become service-impacting incidents or faults, thereby minimizing your need to contact us to report problems. However, if end-user experience problems with the service, the SOC is your single centralized point of contact for all incident and fault reporting. SOCs are operated by highly trained support professionals who are accessible 24/365 via a toll-free number, direct international dial, or email. Once an issue is logged, the SOC assumes complete ownership until the trouble is resolved. They log tickets for all faults and requests, collect and input all information required as per information collection procedures, provide you with trouble ticket information and details, assign severity levels to trouble tickets and assign all logged tickets to the most appropriate ABC cloud company specialized support organization, SOC, IP network operations centre (IPNOC) when needed. The SOC monitors progress and provides updates to you regularly. For higher severity incidents, SOC representatives provide updates to you every hour and also provide a reason for outage (RFO) report for every outage lasting more than thirty minutes. This report is sent to you within a target time frame of 48 h of ticket closure. Before closing trouble tickets, the SOC representative will contact you upon fault resolution to obtain feedback and ensure your problem has been resolved to your satisfaction

6.1. Change Management

The service management team will oversee the change management process, record, evaluate, monitor and promptly inform the customer of all necessary modifications. They will also oversee their execution in accordance with the project plan. The workflow can be modified based on the categorization of changes (emergency, planning, etc.). The planned event (PE) process used by ABC communications is used to implement all changes designated as standard and normal changes. Any routine or scheduled maintenance carried out on the services, equipment, software or any component of the ABC cloud company is referred to as planned maintenance. These adjustments can be required to improve the service or stop accidents from happening. ABC cloud company often performs maintenance at a mutually convenient time to avoid or minimize any effects on live services. Any time maintenance is scheduled, regardless of the service type selected, an email notification outlining the maintenance operations is sent to all clients. Any planned maintenance event that could affect service shall be announced to consumers at least seven (7) days in advance. Any unscheduled or urgent repair action that results in a service outage will also send email notifications to customers.

6.2. Service Changes

Customers may initiate a change request with the ABC cloud company help desk for the following types of changes:

- Service upgrade request (i.e., to expand a customer's capacity/increase allocated computing resources) subject to feasibility and signed COF.
- Service downgrade request (i.e., to decrease computing resources).
- Service change request (i.e., configuration or policy changes)

When ABC cloud company receives a change request, we check it for completeness and accuracy, classify it (for example, routine, minor or major) and then prioritize it (low, medium, high or emergency). Depending on the classification and priority, we then handle the request as necessary, which may include performing risk assessments and impact analyses, obtaining approvals, setting implementation time frames with the customer, testing and implementing the change and notifying the customer. The detailed change management process is explained in Figure 9.

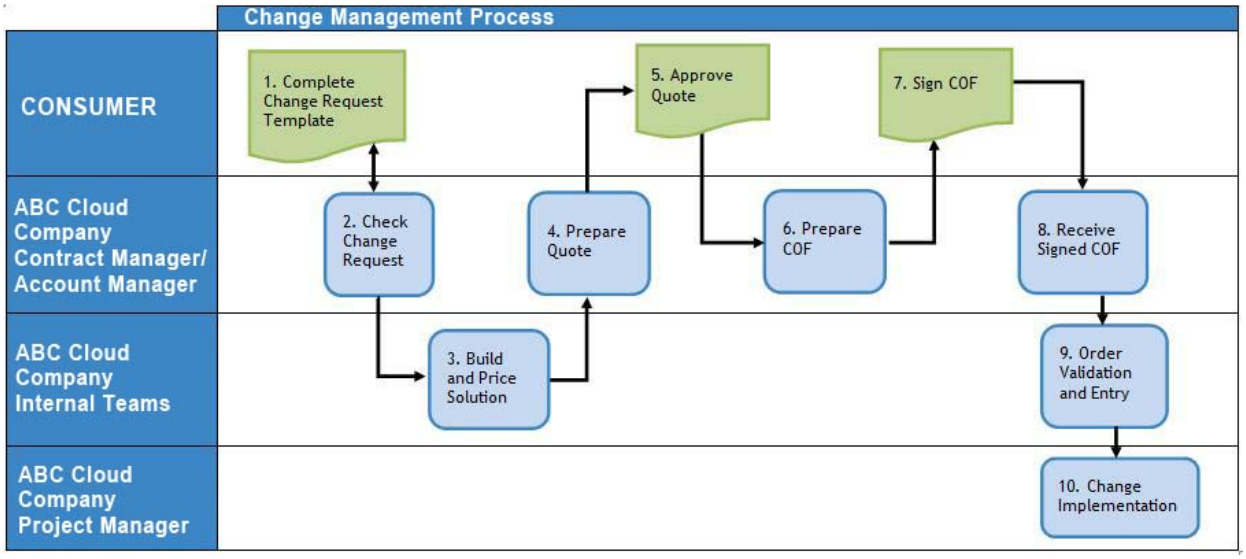

Figure 9. Change Process.

6.3. Emergency Maintenance

With the necessary experienced engineering Cab (ECAB) clearances, ABC communications implements any change requests that are classed as emergencies through its emergency maintenance process (emergency change advisory board). If an emergency modification may have an impact on a customer downstream, the customer may refuse or request a reschedule. Other tasks, such as interrupted power supply (UPS) maintenance or maintenance of other IT infrastructure components, that do not affect or cause any problems with the current service may also be scheduled as part of planned or emergency maintenance. Any anticipated change in the monitored objects of the consumer that could have an impact on the service, such as planned maintenance or downtime, must be drawn attention to in writing to the ABC cloud company thirty (30) days in advance. If the consumer fails to notify ABC cloud company in advance of any changes made to their monitored objects, customer-provided hardware, software or other accessories or peripherals that call for modification to configurations or other items provided as part of ABC communications' initial implementation of services, the consumer shall be responsible for, and is liable for, any and all costs, fees, charges and/or penalties associated with or resulting from that change. The monthly service fees are not included in these prices fees, fines or penalties.

6.4. Project Goals and Objectives

Deliver all ordered Services by consumer.

- On time, as per cross-reference file (CRFS) dates communicated.
- As per the quality agreed (as per COF and service agreement).

Agreed bandwidth available.
Tests run successfully.
SLA respected within the price agreed on for the COF.
Successfully migrate consumer traffic into ABC communications services.

7. Project Approach

Project Life Cycle Overview: According to the project management standards of ABC cloud company, this project will be completed. These are based on the project management body of knowledge (PMBOK). The various phases of the project life cycle are shown in Figure 10.

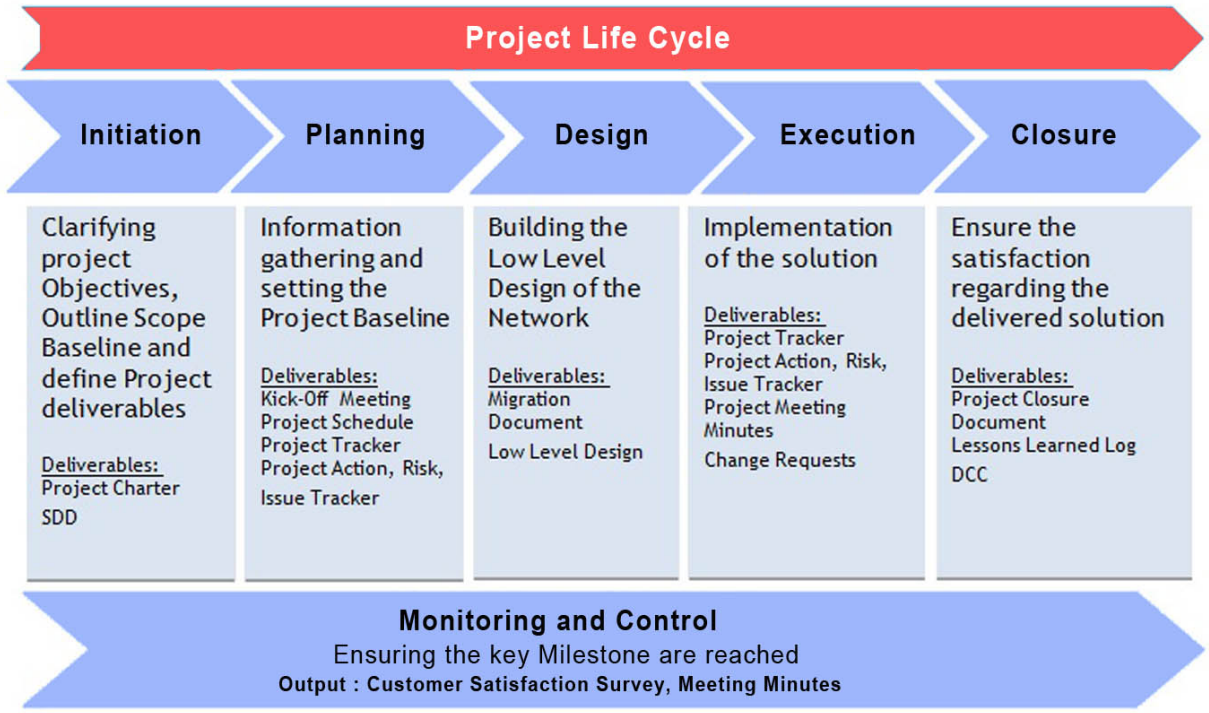

Figure 10. Project Life Cycle.

7.1. Project Deliverable

This section lists the major deliverables of the project; who's responsible for it and when they should be sent to the customer are shown in Table 8.

Table 8. Project Deliverable.

Project Phase	*Document Name*	*Document Owner*	*Target Stage Completed Date*
Project Initiation	Project Charter	Program Manager	11 February 2022
	Signed Solution Design Document	Solution Architect	20 December 2022
Project Planning	Customer Kick-Off Meeting Minutes	Program Manager	31 January 2022—Weekly
	Project Schedule	Program Manager	4 February 2022
	Project Tracker	Program Manager	Weekly
	Project Action, Risk, Issue Tracker	Program Manager	Weekly
Project Technical Design	Migration Document	TDA	TBC
	Low-Level Design	TDA	18th Feb'2022
Project Execution, Monitoring and Control	Project Tracker	Program Manager	Weekly
	Project Action, Risk, Issue Tracker	Program Manager	Weekly
	Project Meeting Minutes	Program Manager	After every Project Meeting
	Customer Satisfaction Survey	Program Manager	To close the phase
	Change Requests	Contract/Account Manager	Weekly
	Delivery Closure Confirmation	Program Manager	After every Project Meeting
Project Closure	Project Closure Document	Program Manager	Weekly
	Lessons Learned Log	Program Manager	Weekly
	Customer Satisfaction Survey	Program Manager	To close the phase

7.2. Project Team Roles and Responsibilities and Communications Overview

This section lists the members of the project team and their associated roles and responsibilities. In reference to the RACI table, the role of programme director/lead, project lead, contract manager, service manager, technical design authority (TDA), engineering head/SOC SD, solution architect and sales lead are presented in Table 9. The communications overview among the company and the customer is clearly shown in Table 10.

Table 9. Role and Responsibilities Table.

Role	*Responsibility*
Programme Director /Lead	Overall responsibility and ownership of the entire scope of the Programme.
Project Lead	All back office project management and service delivery lead. Day-to-day low-level supplier/customer engagement.
Contract Manager	Addresses all commercially impacting change requests and contractual queries, including pre-in-service billing queries
Service Manager	All in-service management and support (note a separate RACI is in place for all in-life management)
Technical Design Authority (TDA)	Overall technical owner from ABC for LLD. IP/MPLS lead technical engineer and also addresses any non-commercial technical changes
Engineering Head/SOC SD	SPOC for implementation queries and updates
Solution Architect	High-level solution owner; provides support to all future changes to the solution scope
Sales Lead	Sales owner

Table 10. Communications Table.

Meeting Type	*Objective*	*Medium*	*Frequency*	*Audience*	*Owner*	*Deliverables*
Kickoff meeting	introduction of the project team and the project. Review project objectives and management approach.	Conference Call	Once	Project Sponsors, Account Team, Project Team, Stakeholders	Program Manager	Agenda, Meeting Actions /Minutes
Customer Project Team Meetings	Review project status with the customer project team.	Conference Call	Weekly	Customer Project Team	Program Manager	Agenda, Meeting Actions /Minutes
Technical Design Meetings and Workshops	Discuss and develop design solutions for the project. Ad hoc meetings for technical issues which require further discussion.	Conference Call	During Project Design and Ad Hoc	Project Technical Staff	TDA	Agenda, Meeting Actions /Minutes
Steering Committee Meetings	Report the status of the project to management.	Conference Call	Monthly	Steering Committee	Contract Manager	Agenda, Meeting Actions /Minutes
Strategic Executive Committee Meetings	Allow senior sponsors to review the overall relationship and performance of the contracted services.	Conference Call	Quaterly	Project Sponsors Steering Committee	Contract Manager	Agenda, Meeting Actions /Minutes
Program/ Project Status Reports	Report the status of the project, including activities, progress, accomplishments, risks and issues.	Email	Weekly and Ad Hoc	Project Steering Board Project Team Stakeholders	Program Manager	Project Status Report

8. Risk Management Overview

Risk management is an ongoing process that is taken very seriously at ABC communications. The various components to handle project risks are clearly shown in Figure 11.

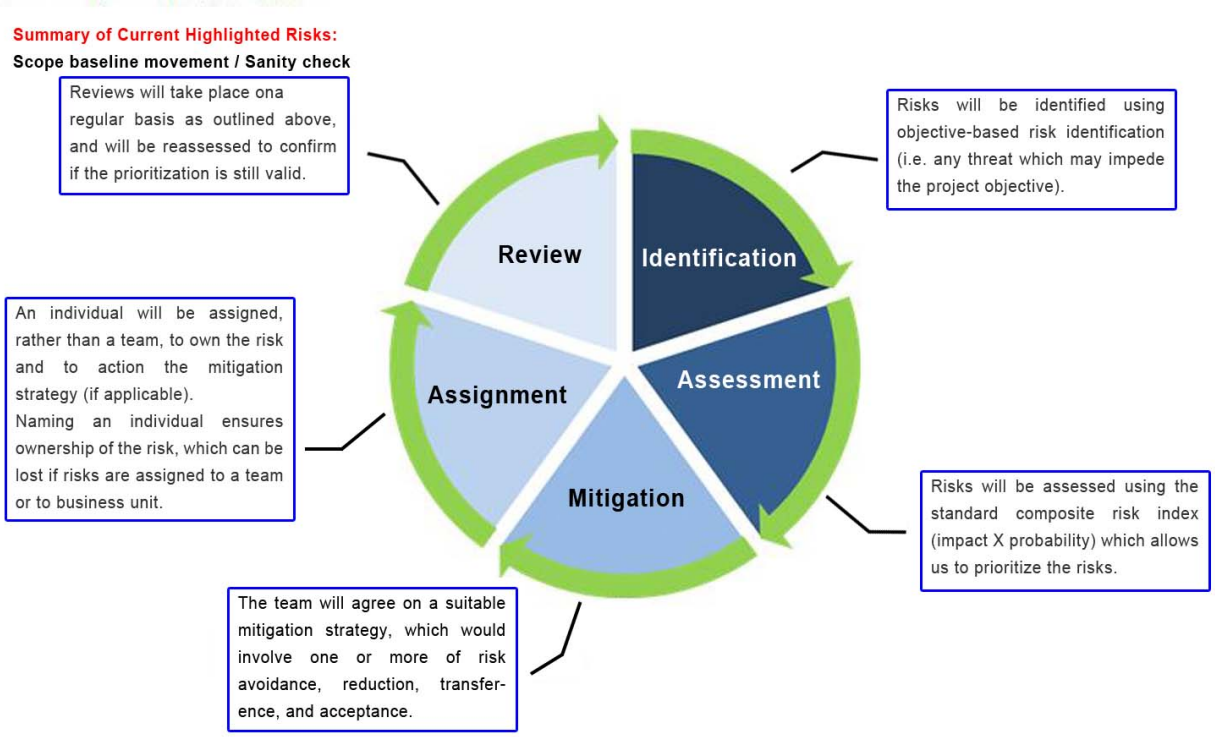

Figure 11. Risk Management Wheel.

During routine meetings, risks will be identified, categorized, reviewed and the necessary mitigation action will be taken; owners will be appointed to make sure risks are managed. Effective risk management depends on all stakeholders, including customer teams, participating in the process. Additionally, risk owners who are not part of the immediate project teams but who can lower risk may be assigned. The graphic on the following page provides a detailed breakdown of the main procedures that will be used for risk management.

8.1. Assumptions and Constraints

consumer local contacts will help ABC cloud company or ABC cloud company suppliers by granting access to the local system for hardware installation and configuration. Within five days of the handover date, the consumer will test the services and provide ABC cloud company with feedback. Suppliers and partners of ABC cloud company abide by the terms of the present relationship.

8.2. Project Schedule Overview

The project manager prepares the draft project plan and shares it on a committed date with customers to set delivery timelines and expectations. After the COF is signed, the program manager prepares the final project plan for all the deliverables to share with customers and other stakeholders in or before the external project kick-off call. The timelines mentioned in the project plan must be agreed upon between the customer and ABC company. Any deviation in the agreed project plan must be communicated to the end customer on time and must be signed off by both organizations.

8.3. Escalation Matrix

The communication type, objectives, medium, frequency, audience, owner and deliverable are presented in Table 10. The Project and Sales escalation points within ABC cloud company and for consumers are presented in Tables 11 and 12.

Table 11. ABC cloud company Escalation Matrix.

ABC Communications Project Management Escalation Level	*ABC Communications Project Management Escalation Matrix*	*ABC Communications Sales Escalation Level*	*ABC Communications Sales Escalation Matrix*
Level 1	Program Manager—Tel: Mob Email	Level 1	Senior Account Manager Tel: Mob Email
Level 2	Principle—Tel: Mob Email	Level 2	Sales Director Tel: Mob Email
Level 3	Director—Tel: Mob Email	Level 3	Ass. Vice President Tel: Mob Email
Level 4	Vice President, Tel: Mob Email	Level 4	Vice President, Tel: Mob Email

Table 12. Consumer Escalation Matrix.

Consumer Project Management Escalation Level	*Consumer Project Management Escalation Matrix*	*Consumer Sales Escalation Level*	*Consumer Sales Escalation Matrix*
Level 1	Program Manager—Tel: Mob Email	Level 1	Senior Account Manager Tel: Mob Email
Level 2	Principle—Tel: Mob Email	Level 2	Sales Director Tel: Mob Email
Level 3	Director—Tel: Mob Email	Level 3	Ass. Vice President Tel: Mob Email
Level 4	Vice President, Tel: Mob Email	Level 4	Vice President, Tel: Mob Email

9. Change Management Process

The successful delivery of a project depends on the management of change throughout the project's lifetime. Controlling change and variances in scope, cost and time will be accomplished through change management. Adjustments in functional or feature requirements, market or regulatory requirements or both may prompt changes from the customer. There may be instances where ABC cloud company submits a change request on the client's behalf, giving them more flexible alternatives. When this occurs, consideration is given to the potential effects and hazards of the modification on the project's existing goals. Requests for modifications to the established project baseline will be noted and documented and their effects will be evaluated (assessment may be billable). The responsible party will carry out the change activity in accordance with the change control document after the evaluation and client acceptance are complete.

10. Conclusions

Cloud computing is a cutting-edge innovation that could significantly influence the planet. It offers its users and businesses a wide range of advantages. The authors demonstrated the program management strategies, techniques and technical prerequisites illustrated in this paper for the cloud, compute and storage project delivery used in various organizations for their live events, linear channels and video-on-demand (VOD) services through the cloud. Further, the authors mentioned the stakeholders, their roles and responsibilities (RACI), escalation matrix of organizations, governance model, communication matrix, detailed scope of work with the bill of material (BoM), solution design document, service management and change management processes for the final delivery of the projects. The challenges, risks and specific issues encountered during the implementation of cloud project delivery are discussed in detail. Our findings show that these processes are essential in successfully delivering complex cloud-based projects to meet the customer's and industry's needs. The case of multi-company, multi-location and multi-cultural projects is examined in this paper. This paper proposes a "Lean and Digitize" way to provide a

framework to make the most of project management techniques while considering the complexity of the processes in this type of business for cloud and compute project delivery as we cover all the deliverables, and requirements utilizing optimal project management approaches in this paper to satisfy the end customer expectations. For instance, it shortens delivery schedules and significantly reduces change requests. Due to COVID-19, we are currently dealing with a global chip scarcity. Any changes during implementation could negatively influence project delivery schedules because it might take a long time to deliver hardware if we miss any CPE component. The majority of the hurdles in delivering cloud computing projects are covered in this paper. Further, Grafana open-source tool is used to compare various metrics related to cloud computing. It enables you to query, visualize, receive alerts about and comprehend your metrics regardless of where they are kept. Develop a data-driven culture by creating, exploring and sharing stunning dashboards with your customers and operation teams. Grafana provides metrics like service/system availability, reliability (mean time between failure and mean time to repair), response time, security, throughput, capacity, scalability, latency, service and helpdesk dashboards, etc. Based on Grafana's responses, the operation team evaluates the cloud services' performance and issues are immediately tackled to meet the agreed SLA (service level agreement). Moreover, in cases of any planned activity schedule, the operation team proactively informs the respective stakeholders of the downtime requirements and shifts the services, if required, to different service zones. The cloud-based services are having following research area:

1. *Integrated streaming engine for both Video-On-Demand (VOD) and live streaming*: Video-On-Demand (VOD) and live streaming are almost similar in computational demands and structure. However, processing them is relatively different. Live streaming tasks have a hard deadline and must be dropped if they miss their deadline. In contrast, VOD tasks have a soft deadline. They can tolerate deadline violations as, upon violating deadlines for a video segment, the deadlines of all segments behind it in the same stream should be updated. On the other hand, live streaming does not have dynamic deadline possibilities. There needs to be historic computational information for live-streaming tasks to predict the execution time of new arriving tasks. Based on these differences, video stream providers utilize different video streaming engines and even different resources for processing and providing the services. So, how can we introduce an integrated streaming engine that can perform both streaming types simultaneously on the same set of allocated resources? Moreover, how will this affect the processing and scheduling time estimation of the streaming engine?
2. *Video streaming using Block chain technology*: Block chain can be used to create peer to peer communication through a distributed ledge (database) for security and authenticity as we keep recording the entire history of all recorded transactions. By utilizing this technology, ordinary people can have more control over their video material on open platforms without being subject to the prioritizing algorithms that publishers manage as YouTube, Netflix, Amazon Prime, etc.
3. *Reliable cloud-based video stream processing*: Reliable cloud-based video streaming service is based on its tolerance against possible failures. Streaming service providers must have the Service Level Agreement (SLA) with the cloud service providers. Failures can be of two types: • Cloud service fault tolerance. Cloud service availability is most important for streaming service providers. Good availability means when one of the servers fails, its workloads must be transferred to the other servers to avoid streaming service disruption. Redundancy of cloud services and data checkpoints are required for cloud service fault tolerance. • Video processing fault tolerance. In case a few video streaming tasks fail during processing, video streaming engines must add policies to take care of the failure of video streaming tasks dispatching to the scheduling queue. These policies can re-dispatch the failed task for VOD streams or ignore it for live streaming.

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Abbreviations

The following abbreviations are used in this manuscript:

SOW	Scope of Work
COF	Customer Order Form
BOM	Billing of Materials
MAM	Media Asset Management
VMs	Virtual Machines
GPUs	Graphics processing unit(GPUs)
HSM	Hierarchical Storage Management
RACI	Responsible,Accountable,Consulted, Informed
URL	Uniform Source Locator
PCD	Project Closure Document
SLA	Service Level Agreemen
OTT	Over-the-Top
RTT	Round-trip Time
CDN	Cloud Delivery Network
QoS	Quality of Service
MCDM	Multiple Criteria Decision-Making
ICT	Information Communications Technology
EPC	Evolved Packet Core
UAT	User Acceptance Testing
TDA	Technical Design Authority
TOPSIS	Technique for Order of Preference by Similarity to Ideal Solution
CODAS	Combinative Distance-Based Assessment
GLA	Gray Relational Analysis
FSGM	Fast Gradient Signed Method
JSMA	Jacobian-Based Saliency Map Attack
CPU	Central Processing Unit
RAM	Random Access Memory
SMPTE	Society of Motion Picture and Television Engineers
IPS	Intrusion prevention system
NFGW	Next Generation Firewall
WAF	Web Application Firewall
IDPS	Intrusion Detection Prevention System
DDoS	Distributed Denial of Service
AICPA	American Institute of Certified Public Accountants
CCTV	Closed Circuit Television
MaaS	Metal as a Service
MAM	Media Asset Management
HSM	Hierarchical Storage Management
CRFS	Customer's Service Request
TDA	Technical Design Authority

SOC	Services Operations Centre
IPNOC	IP Network Operations Centre
RFO	Reason for Outage
ECAB	Experienced Engineering Cab
PMBOK	Project Management Body of Knowledge
VOD	Video-on-Demand
SDI	Serial Digital Interface
ASI	Asynchronous Serial Interface

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