



Digital Systems & Technology

10 Key Digital Infrastructure Considerations

As digital becomes ever-more essential to revenue growth and market relevance, its underlying infrastructure must be made as efficient as possible if digital is to realize its true potential. By prioritizing foundational technology modernization and simplification, organizations can accelerate their transformation into the digital era.

Executive Summary

For businesses gearing up to embrace digital transformation, applying traditional infrastructure designs or patterns can prove detrimental. Any well-architected application architecture needs to carefully consider advancements in the infrastructure space and leverage them to be truly effective.

While there are numerous issues to work through, what follows are 10 key infrastructure considerations for digital transformation projects. Please note that while this white paper focuses on Amazon Web Services (AWS), organizations can apply similar services provided by cloud service providers such as Microsoft or Google based on the cloud platform of their choice.



1 Continuous improvement is key

As the delivery of new iterations of applications becomes increasingly crucial, applying the DevOps construct of continuous delivery (CD) needs to be at the heart of the application design. CD determines the speed at which organizations can respond to threats, risks and opportunities.

For more, read our white paper, [“Continuous Integration and Continuous Delivery to Facilitate Web Service Testing.”](#)

AWS services such as CodeBuild, CodePipeline, Elastic Beanstalk and CloudFormation can play a pivotal role in ensuring faster, more consistent delivery of the application.



2 Consider being serverless

Wherever possible, consider using serverless architectures in application design. Leveraging content delivery network services such as Amazon CloudFront helps in delivering content (static and dynamic) to end users worldwide with minimal latency.

Utilizing a combination of AWS services such as Simple Storage Service (S3), API Gateway, Lambda

and DynamoDB/Aurora to host completely serverless web applications on the cloud can reduce costs and efforts while providing excellent availability and durability. Compared to the traditional approach, using services such as S3, CloudFront and Lambda can reduce the effort (and thereby costs) needed to build and manage multiple app/web servers.



3 Advocate loose coupling

Adopt loose coupling in the application architecture to ensure that dependencies between the application tiers/components are minimal. Achieving loose coupling will enable different tiers/components to scale independently based on the demand. Simple queue services (SQS) makes it easy and cost-effective to decouple application components.

When loosely coupled applications (such as web tiers, Hadoop, Stateless applications, etc.) leverage Spot instances, it improves the application’s robustness while also reducing costs significantly. As a best practice, one can have a script that will run every minute or so to check for the two-minute-warning received for Spot instances and remove the instance from elastic load balancers (ELB) accordingly. Using batching with SQS will significantly reduce costs while improving throughput.

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4 Think about failure

Thinking about failure while architecting the application will result in the consideration and inclusion of resilience and recovery strategies in the design, bringing about a much more stable application. For example, consider using multiple availability zones or even multiple regions if required.

Using Elastic IPs will allow the application to failover gracefully. Compared to traditional databases, fully managed databases such as DynamoDB and Aurora can enhance availability, durability, throughput and cost savings.



5 Prepare to let go

Consider the various platform-as-a-service (PaaS) and software-as-a-service (SaaS) offerings from the application/cloud hosting vendors.

This can lead to performance optimization or make it the least of your concerns. Using services such as DynamoDB and ElastiCache in the application design eliminates the need for dedicated server setup and configuration.

Also, using services such as Amazon Relational Database Service (for horizontally scaling the database tier) and Elastic Load Balancing will go a long way toward achieving the desired level of scalability while satisfying other operational requirements.



6 Monitoring drives performance & availability

Continuous monitoring of applications can have a profound impact on the performance and availability of applications. AWS Config enables IT organizations to assess, audit and evaluate the configurations of the resources. If any of the Config rules are triggered, AWS Config invokes the rule's Lambda function defined to simplify compliance auditing, security

analysis, change management and operational troubleshooting.

Integrating monitoring (CloudWatch) with services such as SQS, simple notification services (SNS) and Lambda helps identify and remediate issues at a very early stage, preventing failures, breaches or downtime.

Consider granting access by roles instead of individual users. Along with securing data at rest, architect the application to secure data in transit, thereby moving toward end-to-end security.

As application logs can often hold sensitive information, it is crucial that they be stored in a secure location with access restricted to auditing/incident response teams. Consider storing logs in an S3 bucket with access allowed through IAM roles for auditing accounts.



7 Security is sacrosanct

Block access by default and implement defense in depth. Consider granting access by roles instead of individual users. Along with securing data at rest, architect the application to secure data in transit, thereby moving toward end-to-end security.

Avoid using access keys and never create access keys for the root account. If the organization uses access keys — public key and private key — consider designing the application such that these values

can be passed as parameters while accessing the application through an application programming interface rather than storing the private key as a part of the application's source code repository. Incorporating multifactor authentication can provide an additional layer of security. Define a process to change access keys on a regular basis and delete unused ones.



8 Logging to improve compliance

Logging can provide organizations with actionable intelligence when responding to requests or even attacks. At times, logging can come in handy when responding to regulators. Although logging is predominantly used for troubleshooting errors or performance issues, logs have evolved to become the primary source of information about events related to application security.

As application logs can often hold sensitive information, it is crucial that they be stored in a secure location with access restricted to auditing/incident response teams. Consider storing logs in an S3 bucket with access allowed through identity and access management (IAM) roles for auditing accounts.

Consider using tools such as cost calculators, detailed billing reports and trusted advisor recommendations to understand cost savings and stay on top of spending.



9 Prioritize cost optimization

Identify and eliminate costs where possible. Cloud platforms are best suited for exploratory approaches because organizations only pay for what is used. Hosting the development/test/proof of concept environments on a pay-as-you-go model lowers costs. Features such as autoscaling can help scale optimally based on performance and increase the number of users per application.

For workloads (such as web servers and test servers), which do not often need to use the full CPU consistently, use burstable performance instances (T2) because they could deliver significant savings while providing the capability to burst occasionally with any simultaneous spikes in usage. Consider using tools such as cost calculators, detailed billing reports and trusted advisor recommendations to understand cost savings and stay on top of spending.



10 Load balance wisely

Achieve segmentation while reducing the number of ELBs by using application load balancers (ALBs). NGINX or NGINX Plus can come to the rescue if caching or multiple load balancing methods are required (as ELB/ALB only supports AWS's Round-

Robin). A combination of ELB and NGINX can also be used where ELB is primarily internet-facing and handles secure socket layer termination while multiple NGINX nodes handle caching and routing requests to the application servers.



Looking forward

Having an IT infrastructure that supports the business's digital transformation journey will require adequate foresight, planning, investment and innovation. Cloud offerings have been disruptive in transforming IT from being a cost center to a business enabler. Addressing the aforementioned considerations will help organizations avoid many typical pitfalls or anti-patterns that have undermined previous digital journeys.

While infrastructure-as-a-service cloud offerings for compute, storage and database operations can seem like a good fit in traditional tiered/layered application architectures, utilizing various PaaS and SaaS cloud offerings can help organizations deploy applications based on event-driven or microkernel- or microservices-based architectures cost-effectively — and with additional benefits such as agility, scalability and robustness. As always, evaluate before committing completely.

About the author

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Sudharson Aravamudhan is a Senior Infrastructure Architect with Cognizant Infrastructure Services. He has over 14 years of experience in the IT industry and has consulting experience at several leading companies across numerous industries, focusing predominantly on infrastructure consulting, data center migration, cloud and architecture. He holds a master's degree in human resource management from Pondicherry University and a bachelor's degree in electronics and communication from Madurai Kamaraj University. Sudharson can be reached at Sudharson.AN@cognizant.com.

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