

Deploying & Managing Trending Technologies in the Cloud

Integrating emerging technologies into a cloud environment requires organizations to evaluate, understand, and mitigate potential risks.

Over the last few years, we have seen the emergence of exciting new technologies while investments in digital transformation projects have accelerated to keep up. The rapid pace of innovation means that organizations can no longer conceive of technology modernization projects as occasional or one-time investments. The successful organization of the future is dynamic and evolutionary. Agility and adaptability are its core components.

Cloud environments have become a critical factor in this nimble approach to technology evolution. Cloud-based data ecosystems and applications, which are architected with far less rigidity, help organizations quickly take advantage of emerging technologies. The scalability and elasticity of cloud-based workloads just is not possible in an on-premises landscape—but the cloud opens up exciting possibilities.

For many organizations, those possibilities include artificial intelligence, advanced data analytics, and even “industry clouds” that are customized to align security and compliance services to specific industry verticals, such as healthcare or finance. More than 97% of organizations are planning additional



investments in those areas.¹ The fact that investment in these technologies is so widespread isn’t surprising given their potential impact. A recent study found that companies with big data solutions increased profits by an average of 8%.² As organizations expand their technology investments, navigating how to effectively build, migrate, and operate these technologies and related complexities in the cloud is becoming increasingly essential.

In this paper, we will look at the opportunities that trending technologies present. We will discuss how to implement advanced analytics, AI, and other emerging technologies securely and efficiently in the cloud, and the significance of zero trust architecture (ZTA), as an essential part of a secure cloud environment for enabling new technologies.

Advanced Data and Analytics

Implementing advanced data services and analytics is becoming a necessity in many sectors. Data analytics is not just critical for supporting data-driven decisions and organizations, it also helps expand data sharing and visibility across the enterprise. The cloud is a key part of the analytics strategy for most organizations, since it provides more flexibility and agility around how they implement or pivot their analytics investments. Below are some of the key advanced data and analytics-related considerations for every stage of your design, implementation, and management processes.



Design Phase

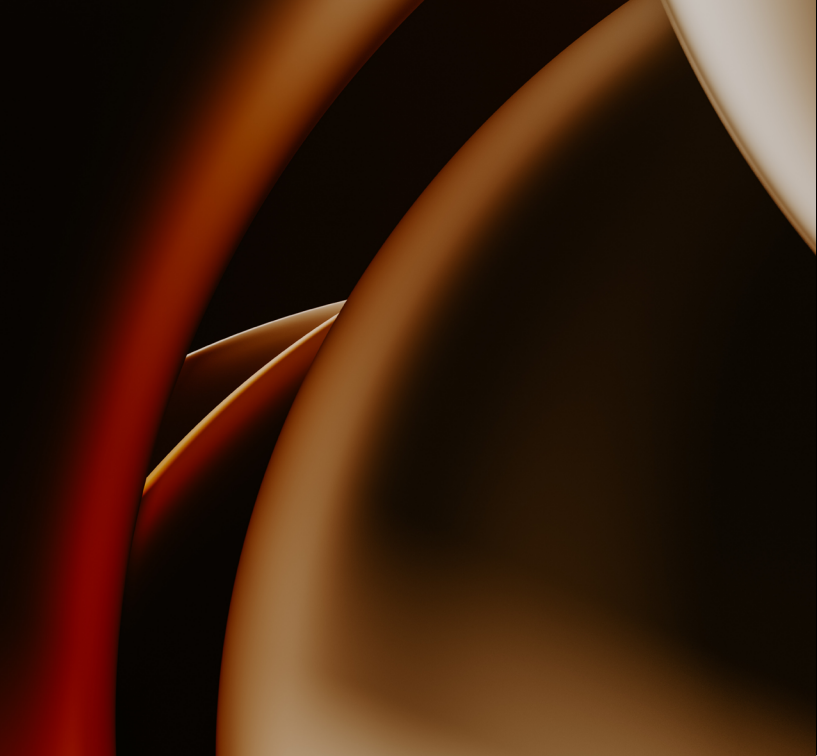
- **Requirements Gathering:** What are your organization's needs and goals for advanced analytics projects? What kinds of performance, reliability, or compatibility standards are required? Determine who the internal and external data consumers and producers are and understand their needs. Establish your cost and time constraints and scope your project accordingly.
- **Governance:** The cloud introduces novel data governance challenges. Revise or develop data governance policies, including data preparation and data retention guidelines that are specific to deploying advanced data analytics in your cloud environment.
- **Data Architectures:** It is critical to ensure that you implement the right data architecture for your analytics workload. Decide where to store data and how it will synchronize between systems. Enumerate and automate the steps needed for data preparation, transformation, governance, compliance, disaster recovery, and usage. Determine network visibility and security authorization boundaries between systems. Make sure that you scope your project with a total cost of ownership analysis of cloud costs to guarantee you can predict future cost allocation needs.
- **Optimization:** Whether your analytics will be focused on real-time or batch processing, it's important to optimize your real-time data movement architectures and non-real-time forms of data transfer. Ensure high availability and low latency for data.
- **Visibility:** Understanding how your data is moving and quickly identifying the source and cause of issues or outages in your data architecture are key. Be sure to install advanced telemetry and cloud-based network visibility tools.

Migration

- **Data Security:** The data revolution opens significant opportunities, but risks are inherent in storing, moving, and leveraging data. Ensure your data is protected during your migration to the cloud—both in transit and at rest.
- **Data Compliance:** Understand what requirements you must meet around the handling or use of your data. Architect your system to automate data compliance while allowing for portability and interoperability of data within your analytics ecosystem.

Management

- **Monitoring:** Once you have implemented your analytics architecture, it is important to monitor its performance, paying special attention to your data's security, the latency of your data queries or movement, and the cloud costs involved. Build processes to evaluate and improve your performance over time.
- **Auditing:** Audits are essential for everything from catching security vulnerabilities so you can patch them to understanding the performance of your system. Carry out regular data and system audits.
- **Optimization:** To get the most out of your cloud-based analytics, work to optimize your data architecture for latency, costs, and security using insights from monitoring and auditing your system. That could include everything from improving the quality of business intelligence derived from data to optimizing workloads.



Generative AI

With all the hype generative AI is receiving, many government agencies and businesses are looking to leverage it for things like advanced analytics, automation, customer service, coding, scientific or pharmaceutical research, and other use cases. Because it is prohibitively expensive for most organizations to host their own model, creating the right cloud architectures to effectively take advantage of technology is critical. When planning to implement generative AI, the following steps will help maximize the performance of your models and the quality of their outputs.

Design Phase

- **Requirements Gathering:** Determine what your organization is hoping to accomplish through generative AI and what AI risks you need to control for. Training your own generative AI model is prohibitively expensive for most organizations, but, for certain use cases, training a small purpose-built model or fine-tuning a commercially available model might make sense. For example, fine-tuning a commercial model could help you save on consumption pricing, as it will respond better to shorter queries. Sort through the options and decide whether to build or buy, then whether an open-source or commercial model is best. Determine what your budget is and scope the project accordingly.
- **AI Architecture:** Setting up your AI model architecture or orchestrating various models to work together requires some thought in a cloud environment, such as where to host the data to ensure the lowest latency responses from your model. Implement the right foundation model and fine-tune it to your needs. Then, decide which data sets or open-source query engines you want to connect it to.
- **Data Architecture:** Operationalize your data to guarantee the real-time movement of data across your complex cloud environment for use cases that require it.
- **Visibility:** Choose and set up the proper observability tools for deploying, monitoring, and managing your model to ensure high performance and quality outputs. Decide whether to use a software as a service (SaaS) analytics platform like Databricks or build your own.

Migration

- **Data Usage:** Do not fine-tune your model with any sensitive data. Do not use data that has regulations around its use and that could be compromised or leaked by the model.
- **Moving Data:** Migrate data that needs to be accessed by the model to the cloud so that it can be located nearer to the model to reduce latency. Ensure data security during all parts of the migration.
- **Access Management:** Make sure data access management is in place to protect your confidential data. Test before fully deploying.

Management

- **Performance:** Monitoring model performance is critical to catch things like model drift/bias or degradations in the quality of a model's data output. Make changes to the model or add guardrails when these things are detected.
- **Security:** Monitor access to your model and its outputs and audit data security to ensure your generative AI cloud project is secure.

Zero Trust Architecture

Based on the maxim “never trust, always verify,” ZTA is being used by organizations to help reduce cybersecurity operational costs and complexity while enhancing remote workforce security and providing organizations the flexibility to host their applications across distributed environments. Many businesses are currently implementing ZTA, and it has become a requirement for government agencies. It is especially crucial as more organizations move toward complex network deployments with multi-cloud or hybrid cloud environments. The following steps will help your organization implement a ZTA security framework that can be managed efficiently and will provide the required security protections.



Design Phase

- **Requirements Gathering:** What are your organization's security needs and goals? How will ZTA work with your organization's legacy technologies? What kinds of cyber risks does your organization face? Determine what's critical for your organization when it comes to implementing ZTA and then establish your cost and time constraints to properly scope out your project.
- **Security Architecture:** Design and deploy a security platform with comprehensive visibility across distributed environments. Architect secure apps and identify and fix security vulnerabilities.
- **Governance:** Choose and employ an identity and access management (IAM) governance model.
- **Risk Management:** Implement a secure procurement process to ensure all cybersecurity tools and IT products fit your security requirements.

Migration

- **Monitoring Process:** Set up a log and a process to verify, audit, and review things happening in the cloud and in the network, endpoints, and servers.
- **Identity and Access Management:** Set up your IAM protocols, including establishing separation of duties and assuming minimal need to know (least privilege). Assign access to those who require it.
- **Change Management:** Implement change management processes and upgrade IT staff's skills so they understand both their role in your ZTA security framework and how to execute it.

- **Interoperability:** Safeguard the ability for ZTA to run in parallel and interoperate with existing security products and tools, including those needed to protect legacy applications.

Management

- **Security:** Decide how trust is seeded and what access procedures are required, such as multi-factor authentication or single sign-on.
- **Monitoring:** Monitor your cloud networks for suspicious performance, including logging and capacity changes that could indicate breaches.

When it comes to taking advantage of technology opportunities like generative AI and advanced analytics in the cloud, organizations must consider governance, security, spend, and IT architectures to guarantee the best performance and outcomes of these projects.

Guidehouse has extensive experience implementing innovative technologies across distributed environments for government and enterprise clients. Our cross-functional expertise means that we build modernization strategies through the collaboration of our experts in specific industries, emerging technology, and back-end infrastructure. This ensures a project meets industry requirements and business needs while driving organizational innovation.



1. McCain, Abby. "26 Stunning Big Data Statistics 2023: Market, Size, Trends, and Facts." Zippia. January 16, 2023 <https://www.zippia.com/advice/big-data-statistics>
2. McCain, Abby. "26 Stunning Big Data Statistics 2023: Market, Size, Trends, and Facts." Zippia. January 16, 2023 <https://www.zippia.com/advice/big-data-statistics/>

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