

Three Pillars of Application Modernization for the Cloud Era

Marry your existing architectures with cloud services

In this paper:

- Simply moving your IT systems to cloud infrastructure misses the full opportunity available from true modernization.
- Application modernization is part of the broader effort to prepare as the organization responds to changing business needs.
- Organizations can unlock the full potential of application modernization and cloud adoption with IBM Cloud Paks™.

The adoption of cloud technologies continues to be one of the primary forces behind the digital transformation of businesses. In fact, IDC reports that spending on infrastructure for cloud IT is growing at approximately 59 percent annually, compared to 21 percent growth for non-cloud spending, and that cloud IT will account for the majority of IT infrastructure spend by 2022¹.

Unfortunately, it has become common for companies to rush onto the bandwagon of cloud adoption without a centralized and comprehensive strategy. Many organizations also struggle against the specter of “shadow IT,” where business units may independently put public cloud services in place without involving the IT organization. In either case, the result can be a patchwork of cloud services plagued by poor integration of the new with the old and a haphazard security posture. Businesses may also find themselves locked into a given set of vendors, which can create ongoing financial inefficiency.

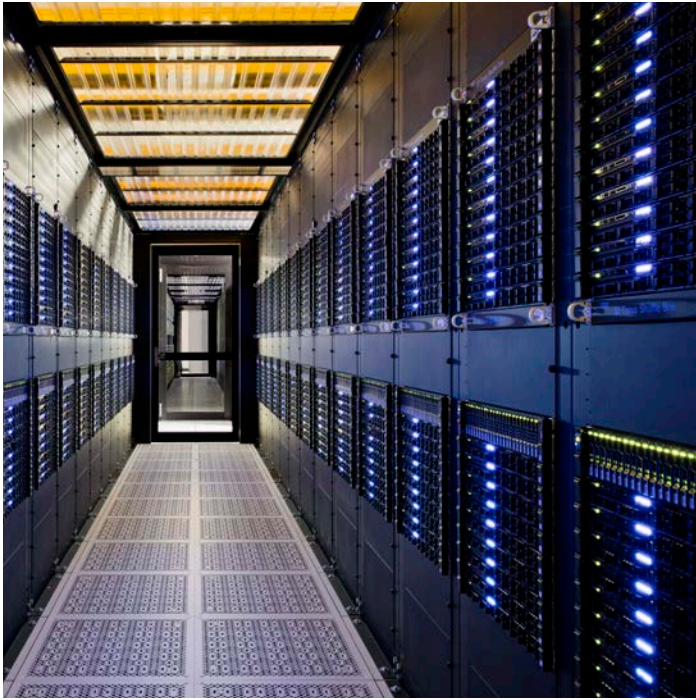
To avoid these pitfalls, three interrelated and overlapping pillars support an [application modernization](#) effort that can go the distance in providing businesses with the full benefit of the cloud paradigm:

- **Cloud-enable both new and existing applications.** This effort calls for open, flexible architectures based on cloud-era precepts such as elastic capacity, [containers](#), [microservices](#), and any-to-any connectivity.

- **Extend integration beyond the internal organization.** Modernized applications should have open but protected connectivity to trusted others outside the organization, such as customers and partners.
- **Build in adaptability and expandability to meet changing business needs.** Modernization must set the stage for future requirements with [open architectures](#), elasticity on demand, and management across clouds.

Providing protected, any-to-any data connectivity among all applications and systems is a critical aspect that runs through the entirety of this effort. These requirements are vital to building a forward-looking approach without data silos. Application modernization helps ensure a structured and holistic approach to cloud adoption that positions businesses to roll out robust applications and services with a fast, efficient, secure approach.

Simply moving existing IT systems to cloud infrastructure misses the full opportunity available from true modernization. Every business needs a coherent plan for application modernization as part of their strategy for cloud adoption. Their approach must marry existing architectures with cloud, providing free exchange of data and interoperability throughout the infrastructure. As part of that effort, organizations must embrace the full spectrum of cloud architectures, including public, private, hybrid, and [multicloud](#) topologies based on solutions and services from multiple vendors.



The Pillars That Support Cloud Software Modernization

Open application architectures designed with universal connectivity set the stage for rapid, simple support of new services and scenarios. That broadens the horizons of digital transformation, lowering the boundaries to change so the business can respond with greater agility to unforeseen opportunities. The ability to adopt diverse, novel technologies, workflows, and capabilities is foundational to innovation. Application modernization is a key means to that end.

Done well, application modernization spans all workloads throughout the organization, allowing data to traverse legacy, current, and future systems. It is a multi-dimensional effort that spans many roles across the organization, from rank-and-file developers to the executive suite.

Development and Operations (DevOps): Cloud-enable both new and existing applications

Both existing applications and those that will be developed or acquired in the future must be cloud enabled to ensure that they can interoperate to share infrastructure and deliver combined value.

Wherever a business finds itself along its modernization journey, there is clear value to building new applications in a cloud-native

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fashion. The development organization commonly looks to the future with a perspective that values open source software and open platforms for flexibility and low cost of ownership. It expects to be able to use its choice of leading-edge development, deployment, and management tools that can energize collaboration and DevOps initiatives, accelerating the pace of change.

As important as new workloads and solutions are to the organization, modernization must also encompass the existing install base of software to ensure that everything interoperates smoothly as a coherent whole. That requires transforming, refactoring, and leveraging software assets to accommodate the cloud context.

- **Deploying applications and services using containers** allows them to be packaged up with all of their dependencies in a lightweight bundle that can pass freely across topologies, executing anywhere. This decoupling of the software from the underlying infrastructure dramatically simplifies management and enhances agility while protecting existing investments.
- **Deconstructing monolithic applications into modular, independent microservices** allows for better reuse of code resources while also advancing agile development and DevOps initiatives. Individual microservices are reusable for future projects, accelerating development and increasing application quality.

Architects and CIOs: Extend integration beyond the internal organization

Integration with the broader ecosystem, including [by means of APIs](#) and AI, sets the stage for organizations to easily incorporate both present and future assets into a dynamically changing whole.

“Growing adoption of AI can help parse massive data sets to identify patterns, determine where to focus, and create understanding that fosters insight.”

As important in some ways to modernization as the applications themselves, it must be possible to interconnect workloads and data anywhere, outside the organization as well as within it. Realizing the full potential of this capability may require the company to reconceive the way it regards its digital perimeter. That is, the cloud age offers novel value from interoperation with external workloads and data sets from the broader ecosystem, including such as those at partners, customers, and service providers.

- **Open connectivity through APIs** is critical for efficiently connecting cloud workloads together. It must allow APIs from multiple providers and platforms to be adopted readily for simple, flexible connectivity and interoperability. Workloads must connect as universally as possible to applications, services, storage, and other resources. In addition, processes and tools must provide robust management for growing sets of APIs, to avoid bloat and facilitate reuse.
- **Growing adoption of AI** can help parse massive data sets to identify patterns, determine where to focus, and create understanding that fosters insight.

CIOs and CEOs: Build in adaptability and expandability to meet changing business needs

At a purely strategic level, application modernization is part of the broader effort to prepare as the organization inevitably shifts focus, responds to changing business needs, and seizes new opportunities. The perspectives of senior decision makers include the need to direct the organization as a whole toward monetizing data and workloads, creating an end-to-end open and compliant infrastructure that flexes and changes to facilitate novel requirements. That effort has multiple goals:

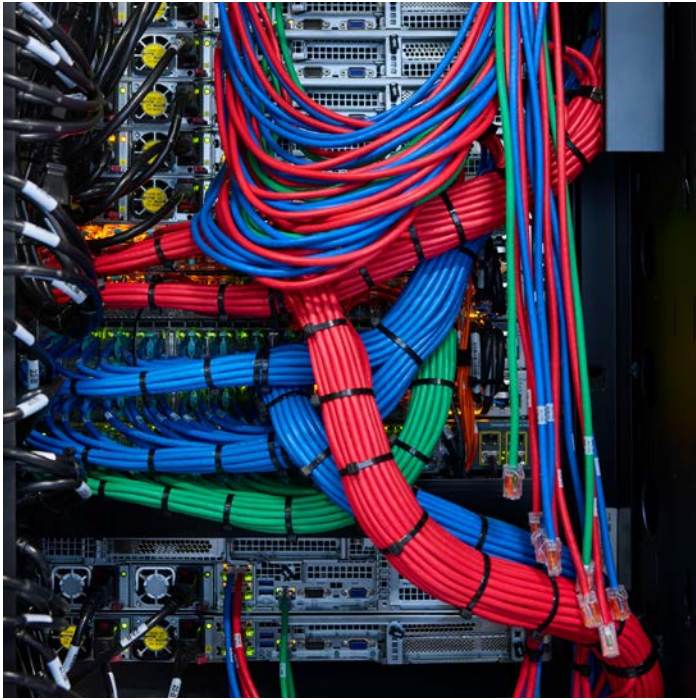
- **Generating revenue** through rapid time to market for new services.
- **Optimizing costs and control** as the infrastructure scales out.
- **Responding to advanced requirements** such as high availability and rapid recovery.

A critical factor to meeting unforeseeable needs is to enable all workloads with one of the chief benefits of cloud adoption: elastic capacity. Applications must be capable of effectively sharing and prioritizing resources in the data center as well as seamlessly scaling to public cloud resources as needed. In doing so, they make optimal use of resources, in terms of minimizing requirements for unused headroom while also responding to fluctuating needs for capacity.

Microservices also facilitate the isolation of services and functionality within applications. That architectural approach helps minimize the degree to which errors within one part of an application can interfere with other parts of the application. Thus, software becomes more error-tolerant as a whole, increasing uptime and minimizing unplanned work interruptions.

Treating all those resources as a single, coherent whole requires management capabilities that are unified and consistent across multiple clouds. Sufficient vision must exist to treat the broader ecosystem as an extension of the enterprise. Accordingly, the





executive suite proscribes guidance for self-paced multicloud adoption as applications grow and contract in cadence with the evolving business. In particular, they drive the adoption of tools and standards that facilitate an open, future-focused multicloud approach.

A Comprehensive Platform for State-of-the-Art Cloud Architecture

In setting their course for application modernization and cloud adoption, organizations must seek tools and platforms that unlock the full potential of the transition. They must transform their applications, services, and workloads to operate in a cloud-first context. They must integrate and connect software and data wherever it resides. And they must orchestrate and control the full spectrum of cloud resources at their disposal, including those they don't operate directly. IBM offers a range of solutions that

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combine to meet all these needs, while also being vendor-neutral to help avoid vendor lock-in.

Evolve from monolithic apps to microservices – IBM Cloud Pak for Applications

While not all applications will provide sufficient ROI to warrant modernization, IT organizations have a critical need both to modernize existing applications and to develop new cloud-native ones. Moreover, they need to do so without having to choose between private cloud-based platforms, traditional server deployments, or public cloud. [IBM Cloud Pak for Applications](#) addresses all these needs within a single toolset, so organizations can mix and match those environments freely as needed, as well as changing the combination of resources over time.

With IBM Cloud Pak for Applications, organizations can improve developer productivity and operational efficiency. They can flexibly meet current and emerging application needs with a cloud-first approach that leverages existing skillsets and preferred tools, applying them to an interrelated set of next-generation modernization methods:

- **“Open source first”** is an approach to building development culture and workflows based on open-source tools, DevOps pipelines, and runtimes.

Dig Deeper: Advanced Tools for Modernization

- **IBM Cloud Pak for Applications** facilitates development and deployment using microservices, DevOps, and containers. [Learn more.](#)
- **IBM Cloud Pak for Data** is an open cloud data platform that automates processes associated with data governance and turning data into insights. [Learn more.](#)
- **IBM Cloud Pak for Integration** enables fast, streamlined connectivity among applications, using any integration architecture. [Learn more.](#)
- **IBM Cloud Pak for Multicloud Management** provides consistent visibility, automation, and governance across a range of multicloud management capabilities. [Learn more.](#)

“Organizations gain the ability to accelerate and deepen the insights that drive more intelligent real-time decision making.”

- **Microservices-based architecture** for both new and existing applications provides a faster, more efficient path to application development and maintenance.
- **Open-ended deployment and integration** are based on a consistent application platform across any combination of containers and virtual machines.
- **Integrated DevOps pipeline** streamlines the deployment of microservices using containers that are managed using an integrated Kubernetes cluster.
- **Application modernization** based in the IBM Cloud Application Platform enables the adoption of cloud-native development approaches as well as modernization of existing applications.

Unlock the full value of data with AI – IBM Cloud Pak for Data

Organizations are challenged by the business potential as well as the complexity of distilling the full value from their data stores, which are themselves constantly becoming larger and more diverse. [IBM Cloud Pak for Data](#) is an AI-driven data and analytics automation platform with built-in data governance. Also available as a hyper-converged “private cloud in a box,” IBM Cloud Pak for Data runs on any private or public cloud.

Through a broad range of core data microservices, this platform enhances flexibility, security, and control over data. Organizations gain the ability to accelerate and deepen the insights that drive more intelligent real-time decision making, with a robust set of features and capabilities:

- **Unified data services platform** integrates data management, governance, and analysis.

- **Data virtualization** enables simple, secure queries on disparate data, even across multiple geographic sites.
- **Built-in data governance** automates data discovery and handling for regulatory compliance.
- **AI-readiness** enables building machine-learning models and prepares data for AI workflows.
- **Cloud-native agility** accelerates multi-cloud development and deployment using Kubernetes containerization.
- **Broad ecosystem** is facilitated by APIs, models and accelerators for a range of industry verticals.

Accelerate integration and connectivity to apps and data – IBM Cloud Pak for Integration

Digital transformation is powered by data, and applications must be able to access and operate on that data wherever it resides, whether in conventional on-premises infrastructure, private cloud, or public cloud services. [IBM Cloud Pak for Integration](#) securely integrates software and services together across resources such as multiple clouds and software-as-a-service offerings from various vendors.

Using IBM Cloud Pak for Integration to create a composite environment from disparate resources accelerates the time to a complete and functional business solution and helps ensure high performance and scalability. It provides a range of capabilities in a single coherent platform, including the following:

- **API management** exposes business services as APIs to enable data sharing internally and externally.
- **Security gateway** protects data, systems, and APIs in a highly connected, multi-cloud world.
- **Application integration** connects applications and data sources wherever they reside, on- or off-premises.
- **Message queueing** ensures that real-time data is available wherever and whenever it is needed.
- **Data integration** transforms and prepares business data to create a consistent view and format.
- **High-speed data transfer** moves large data sets quickly and securely between data centers and clouds.

Simplify and organize large environments – IBM Cloud Pak for Multicloud Management

As application innovation accelerates, enterprises have increasingly adopted a hybrid, multicloud architecture to deliver these applications. With this new architecture, the volume and complexity of objects and metrics to manage have skyrocketed, making monitoring and securing the enterprise a difficult task.

[IBM Cloud Pak for Multicloud Management](#) provides consistent visibility, automation, and governance across a range of multicloud management capabilities, such as multicluster management, event management, application management, and infrastructure management – plus integration with existing tools and processes. Organizations can use IBM Cloud Pak for Multicloud Management to simplify their IT and application operations management, while increasing flexibility and cost savings with intelligent data analysis driven by predictive signals. Key capabilities and benefits include the following:

- **Visibility** into clusters wherever they reside enables administrators to see where application components are running and monitor the health of those systems.
- **Security and governance** capabilities streamline the process of setting consistent policies across environments that are enforced at the cluster.
- **Automation** provides consistent, policy-driven application deployment across clusters, managing placement based on multiple configurable factors.

Conclusion

Organizations that simply migrate existing applications to the cloud using a “lift and shift” approach miss a significant opportunity for business transformation and innovation. Instead, it is vital to modernize applications by cloud-enabling both new and existing applications, integrating them with external entities, and making them adaptable and expandable for the future. IBM offers a comprehensive set of tools and platforms for adopting cloud approaches such as microservices, DevOps, and containers, integrating across applications and data, and

“It is vital to modernize applications by cloud-enabling both new and existing applications.”

managing clusters across multicloud environments. Application modernization based on this approach positions businesses to leverage cloud resources effectively so they can deliver products and services quickly, cost-effectively, and profitably.

To learn more about modernization and unlock the full value of cloud, visit www.ibm.com/cloud/application-modernization

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Sources

¹ International Data Corporation (IDC) Worldwide Quarterly Cloud IT Infrastructure Tracker. <https://www.idc.com/getdoc.jsp?containerId=prUS44358318>.





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