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FINANCIAL SERVICES TRANSFORMATION  
AND CLOUD ADOPTION:

# Architecting the Digital Enterprise

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## Introduction

More and more financial services companies are turning to modern cloud architectures and technologies as the foundation of their digital enterprise infrastructure. This paper provides an illustrative framework for understanding the key considerations in this decision. The paper also discusses how to integrate with other important emerging technologies that are modernizing the front, middle, and back office. Lastly, the paper describes the competitive advantages for Financial Institutions of deploying hybrid cloud with multi-cloud management over deploying into a single public cloud platform. These advantages will become more apparent as regulators become more attuned to the operational and systemic risk FinTechs may pose to the broader financial services economy.

Financial Institutions (FIs) must decide on whether to partner or compete with FinTechs, but in either case their underlying IT structures play a key role in speed to market. Many line-of-business (LoB) executives, who ultimately fund internal IT, believe they must have a “cloud first” (that is, public cloud) strategy to compete. However, this approach puts IT teams on the defensive, eliminates cloud platform choice, and relies on unproven ROI.

This Paper jointly developed with Vaxowave explains where hyperconverged infrastructure and hybrid cloud computing can provide the most effective enterprise digital platform to build and deploy FinTech-like offerings that are provisioned and managed from a single pane of glass within the datacenter. A hybrid cloud approach provides the flexibility and speed needed to meet business objectives while preserving choice, streamlining operations, optimizing ROI, satisfying compliance, and mitigating risk. Where appropriate, Nutanix products and solutions are referenced as an example of the capabilities being illustrated.

**TERMINOLOGY**

- **Financial Institutions (FIs)** refers to any regulated financial firm or market participant across banking, capital markets, and insurance.
- **Digital Transformation (DX)** is the process of using technology to either modify or create processes, culture, and customer experiences to meet changing business and market requirements.
- **Financial Technology (FinTechs)** describes individual companies using technology to reimagine and automate the delivery of financial products and services.
- **Digital Enterprise Architecture (DEA)** is a holistic term referring to the relationships among functional requirements and the enabling technical underpinnings required to “digitize” a product, service, line-of-business, or enterprise.
- **“Private cloud”** is used in this report to refer to automated, highly virtualized installations of IT infrastructure managed by an organization’s IT team.
- **“Public cloud”** indicates the use of an infrastructure-as-a service (IaaS) offering managed by a third-party provider.
- **“Hybrid cloud”** describes the combined use of at least one private cloud and at least one public cloud service, with some degree of integration between the two cloud environments.
- **“Multicloud”** is referenced in this report to indicate the use of more than one public cloud service.

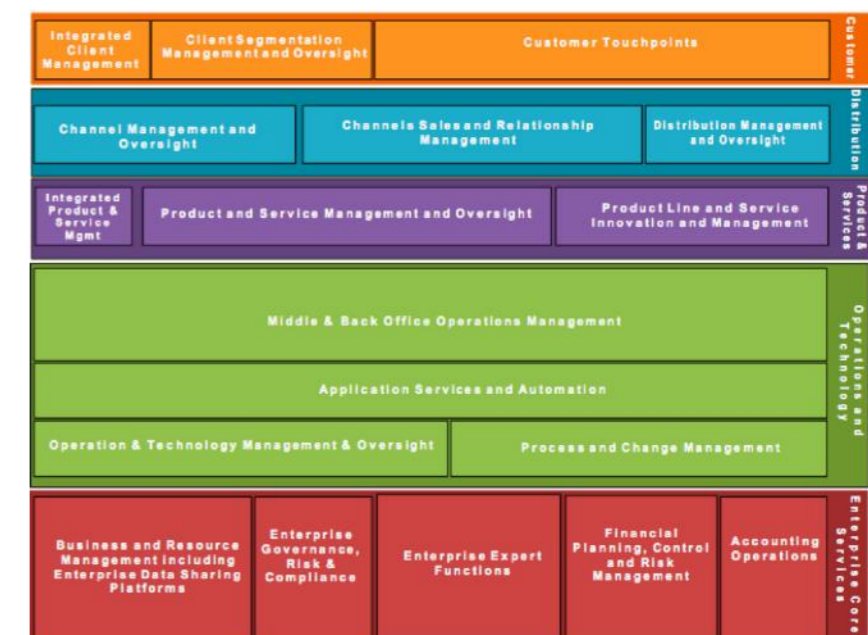
# Defining The Financial Services Digital Enterprise Challenge

In the quest to maintain market leadership, financial institutions (FIs) across banking, securities, and insurance need to respond to a rapidly changing landscape where unprecedented competition is propelling these institutions towards a need for digital transformation (DX).

There is a widespread recognition among leaders in the financial industry that DX is shifting technology infrastructure from being a driver of marginal efficiency to becoming an enabler of fundamental disruption, innovation, and growth. Usually characterized as conservative and resistant to change, FIs are now being challenged by emerging Financial Technology companies (FinTechs) that are competing in their space and threatening to disinter-mediate them from their customers. These emerging FinTechs have used cloud-native development and infrastructure to create unprecedented agility and speed, while not carrying the high regulatory, risk management, and cost overhead burden of traditional financial firms. In response, financial business and technology leaders are rapidly shifting budget and resources towards DX initiatives, including implementing private and hybrid cloud infrastructure while still trying to operate their overly complex and mono-lithic legacy infrastructures. This is an unsustainable approach, causing some financial institutions to acquire and partner with FinTechs, while others find scale in merging within their peer group.

It is clear that to compete Financial Institutions need to transition from traditional 3-tier datacenter infrastructure and siloed business applications to an agile digital enterprise architecture enabled by fit for purpose hybrid infrastructure. The ability to move across private and public clouds by applying “containerization” architectures is becoming a competitive advantage in the DX era. An additional critical success factor is simplified operations and management for the digital enterprise architecture, thereby freeing resources to focus on creating leading-edge customer experiences.

Before we begin addressing enterprise infrastructure, it is important to understand the functional business components and stakeholders required to deliver a single financial digital product or service into market and how those functions interoperate as illustrated below:



THE NEED FOR CHANGE:

## The Emergence Of “Cloud-Only” Fintech

Financial Institutions have continued to pursue massive transformation programs aimed at improving the customer experience through digital technologies and new ways of working. However, the gap between them and FinTechs continues to widen. FinTechs have disrupted the market by offering discrete financial services without becoming fully fledged, regulated financial institutions.

FinTech business models have been characterized by the following factors:

- Simplicity
- Transparency
- Ease of customer acquisition
- Ease of distribution and commercial attractiveness
- Step-function reduction in the cost to serve
- Agility
- Innovative uses of data
- Managing risk and regulatory stakeholders

FinTechs have an advantage because their technological infrastructure is typically public cloud-only, therefore they are more agile and cheaper to operate than the legacy systems underpinning the financial institutions. Notwithstanding these advantages, the technology itself is not the disruptor, but rather how FIs deploy the technology. Hybrid cloud capabilities level the playing field against FinTechs, given the flexibility and simplicity that hyper-convergence brings to the datacenter. Similar to public-cloud services, hyperconverged infrastructure solutions enable technology teams to start small and scale incrementally, providing the precise amount of resources that applications demand.

Moreover, hyperconverged infrastructure makes it possible to operate legacy and hybrid cloud adjacently, which means FIs can access capabilities not available to the FinTechs, while accessing all the benefits of the cloud.

FINANCIAL INSTITUTIONS MOVING INTO THE DIGITAL AGE:

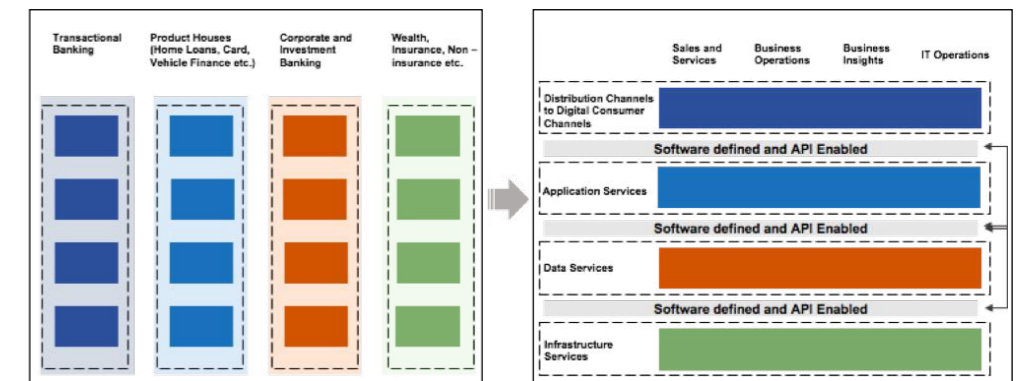
## Transformation Through An Agile Digital Enterprise Architecture

Financial Institutions have traditionally aligned their business models to a product type or a business unit type. Infrastructure and technology are usually siloed and independent of each other, which makes it difficult to give customers a common digital experience and increases cost significantly. Rearchitecting the enterprise into infrastructure, data, application, and distribution services facilitates holistic digital experiences for customers.

It is now a business imperative to move from siloed business units with monolithic applications to a Digital Enterprise Architecture (DEA) using the best hybrid cloud infrastructure. As FIs aim to provide an omnichannel experience to keep up with changing customer expectations, business capabilities and digital technology services intersect more and more.

We illustrate this intersection in the following figure, which depicts a DEA with common frameworks and processes that provide application functions as services to business functions.

Figure 1. Moving from siloed business unit infrastructure to a digital enterprise architecture



This approach has several advantages, including:

- The ability to adapt quickly and efficiently to changing market conditions in a constantly evolving industry
- Less dependence on accurately forecasting load, growth rates, and uneven capacity demands
- Lower IT maintenance costs from a common standard, resulting in improved infrastructure services performance
- Greater efficiency and interoperability among technology systems due to accepted standards.

The ultimate aim is to enable an omnichannel cross-product experience for customers via hybrid infrastructure which houses structured and unstructured data that is accessible to all applications. This accessibility allows the apps to consume the same content and empowers them to distribute it to digital consumer devices.

# Creating A Digital Enterprise Architecture To Align Business And Technical Priorities

Agreeing on a Digital Enterprise Architecture (DEA) is a combined business and technology imperative that sets the direction of how infrastructure and processes will work together to drive speed and agility. This requires both business and technology leaders to rethink the way they view infrastructure and how it supports business functions across sales and services, business operations, business insights, and technology operations.

Embracing the concept of a DEA reshapes the way business and IT work together to build and deploy digital applications, leading to new process flexibility, insights, delivery speed, and lower technology costs.

It begins with creating a topographical illustration of the business, as is shown in the following figure. This illustration is technology agnostic, depicting how hybrid-cloud platforms like Nutanix Enterprise Cloud can simultaneously solve enterprise, line-of-business, and functional requirements to create speed and competitive advantage.

Figure 2. Simplified Business Architecture



Even though datacenter infrastructures have evolved significantly over the last few decades, many FIs still battle with aging, siloed, and incompatible legacy infrastructure systems. This situation is why “cloud first” strategies have defaulted into public cloud deployment. However, hybrid cloud platforms such as Nutanix Enterprise Cloud are now filling the capabilities gap within highly regulated industries like Financial Services. These solutions (which, for ease of illustration, we simply call “Nutanix” or “Nutanix solutions”), are based on hyperconverged infrastructure to eliminate operational issues common with legacy datacenters. These issues include unpredictable capacity, storage management complexity, and expensive technology change management. Other key Nutanix capabilities supporting a digital enterprise architecture include:

## Technology Operations

Nutanix solutions simplify operations, reducing the need for numerous IT teams and technology specialists to manage servers, storage, networking, and virtualization. The consumer-grade Nutanix management user interface provides one-click infrastructure management, operational insights, planning, and performance monitoring.

Nutanix Enterprise Cloud eliminates the need for separate teams to manage infrastructure technology operations; it is so easy to use that a single administrator can conduct maintenance, backup, patches, and upgrades with no system downtime. Lower infrastructure costs and resourcing needs provide an opportunity for FIs organizations to redeploy their staff to other high priority areas, increasing overall productivity.

In addition, because the infrastructure can be scaled linearly with a single click, without worrying about computational needs, demand is always met by supply, which increases speed to market. Nutanix not only enables significant infrastructure savings over traditional 3-tier infrastructure, it provides real opportunities for improved business productivity, which is of even greater value.

## Business Insights

The financial services industry is shifting to a real-time economy that processes data transactions automatically and instantly. FinTechs have deployed an agile development approach and established a business model based on monetizing business and customer insights through API-enabled platforms. FIs now recognize that non-banks are setting customer expectations. Customers now expect their services to be available 24/7, rather than just during traditional business hours. To meet these changing expectations, FIs must maintain back-end databases and analytics engines to deliver accurate, responsive intelligence on customer needs and preferences. Harnessing big data is the key to resolve many of these industry challenges. Financial Institutions must deploy solutions that help analyze and take advantage of available data assets, deriving intelligence that provides a competitive edge.

Financial Institutions can use Nutanix solutions to keep pace with changing business and customer demands, comply with tougher regulations, and mitigate new risks.

## Business Operations

The core of Financial Institutions sits in business operations. Nutanix web-scale architecture and stability provides the safe and reliable platform that institutions require. This reliable foundation and operational efficiency enable IT to support higher value tasks, such as innovation and transformation.

No two FIs have the same market focus, segmentation, or technology. Despite these differences, every FI application has backend operations, including storage, database transactions, and analytics, which must scale and be flexible.

**Sales and Services**

Most Financial Institutions that have implemented digital technologies across their business have seen enhanced revenue sources, gaining and retaining market share. It used to take Fortune 500 companies an average of 20 years to reach a billion-dollar valuation. Today's start-ups that successfully harness digital technology are getting there much quicker. Google managed it in eight years and companies such as Uber, Snapchat, and Facebook in four years or less.

The days of FIs being dominated by physical distribution are rapidly coming to an end. Reduced management burdens often begin with simplified deployment and high levels of automation and self-service channels. Digital technologies such as smartphones, wearable devices, social media, tablets, and ATMs offer an effective way for FIs to understand and strengthen their relationships with customers.

Nutanix solutions enable FIs to keep pace with changing business and customer demands with elasticity and scalability, higher performance, increased speed to market, and more opportunities for new business models.

## Hybrid Cloud Enabling The Digital Enterprise Journey

Infrastructure choices directly affect a Financial Institution's ability to compete.

Technology leaders need to move away from complex infrastructure architectures that require disparate teams with specialized skills for operations and maintenance. In order to be sufficiently agile to meet changing business needs, enterprises should deploy software-defined infrastructure that automates most of the hardware-related management tasks in both the private and public cloud landscape.

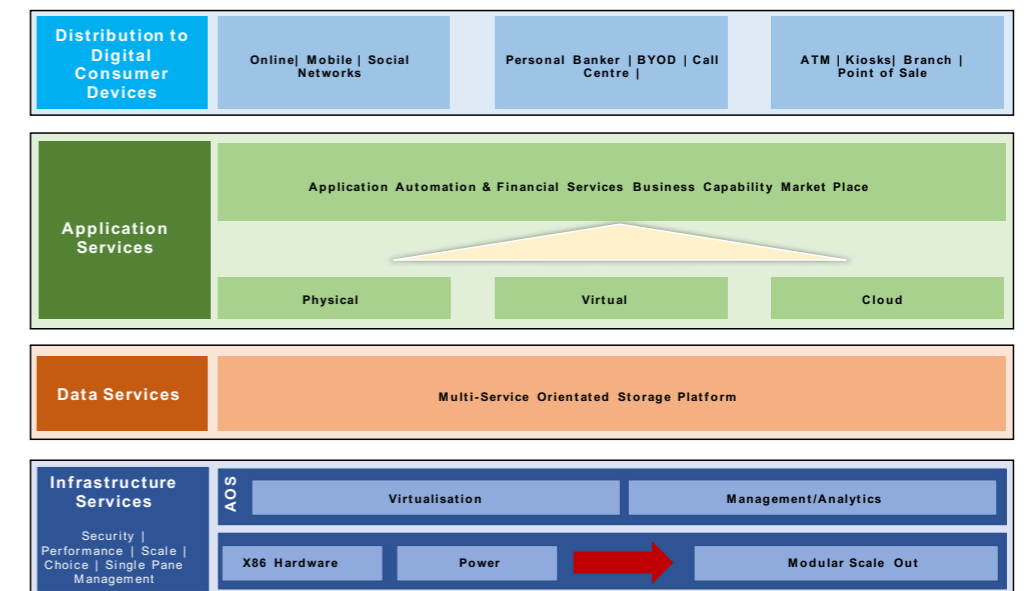
Nutanix solutions are rearchitecting each area of infrastructure, but unlike most technologies in the market, there is no need for a "rip and replace" approach. Technology leaders can approach the changes incrementally, focusing on infrastructure areas with the greatest need first. The ultimate objective of simplifying the architecture is to produce an enterprise infrastructure platform that supports multiple clouds—on-premise, public, and private—and that is easy to manage and change.

The agility, efficiency, and automation of a Nutanix hybrid cloud creates significantly lower TCO than 3-tier models lashed together with public clouds, which is another important advantage in a cost-constrained environment.

The Nutanix Enterprise Cloud is a full-stack solution that provides an architectural model for a range of different types of FIs, designed to integrate and manage public and private clouds to fit the requirements of each financial institution. These solutions deliver storage, compute, infrastructure management, and monitoring software through a highly virtualized, scale-out architecture. Nutanix solutions can act as a bridge between legacy systems, digital customer interactions, and new ways of working, purpose-built to accommodate the rapid change and innovation occurring throughout the financial services industry.

The following figure shows how Nutanix provides a holistic enterprise cloud stack using complete solutions in technology and business. Nutanix supports business and technology operations across infrastructure services, data services, application services, and distribution channels to digital consumer devices with superior performance.

**Figure 3. Nutanix Architecture: The FI's Building Blocks for Enterprise Cloud Platforms**

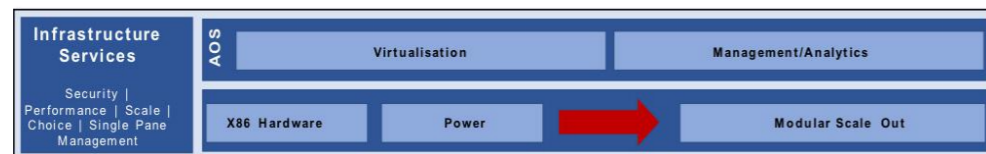


## I Infrastructure Services

Financial Institutions still struggle with aging, siloed, and incompatible legacy infrastructure systems. These systems are often difficult to scale, expensive to maintain, and require numerous teams of technology specialists to manage. Provisioning infrastructure in legacy environments of organizations can take anything from a few weeks to months to provision just a basic platform. This platform is usually designed for a costly 5-year growth cycle and would typically be siloed in a particular business unit. Security would then be wrapped around it and additional solutions built for availability, management, operations and access.

As shown in the figure below, Nutanix provides a resilient pool of abstracted x86 server resources that allow technology administrators to run mission-critical applications efficiently and cost effectively. Nutanix brings software-defined services, built using web-scale architecture, to deliver infrastructure that can be provisioned in minutes on the premises of a financial institution. This pure software technology is fueled by hyperconverged infrastructure, supplied by numerous vendors, engineered to scale incrementally and infinitely along all the core elements of compute, storage, networking, and virtualization.

Figure 4: Hybrid Infrastructure Services



This hybrid stack embeds security, a non-negotiable requirement for FIs, as part of the base design.

Additionally, FIs will benefit from performance and scale that supports redundancy, disaster recovery, application availability, and backups to enhance their risk posture, thereby minimizing downtime—a serious risk to the business. Excellent application availability adds maturity, trust, and lowers operational pressure. This is brought about by VM backups, non-disruptive upgrades, and high resilience, protecting against all forms of infrastructure failure, including a datacenter failure. Snapshots can be replicated to a local site, a remote site, and even to a strategic cloud provider. Synchronous replication is also possible via Metro Availability.

Financial institutions involved in trading and investments require extremely fast IT environments with minimal latency. Nutanix offers a reliable solution for use cases that demand low-latency clusters and scale-out performance, including market trading applications that need to be located close to an exchange.

The Nutanix management control plane provides low maintenance and smart, one-click operations, alongside full visibility and analytics for administrators and operators. This functionality allows the consumer to exploit the incremental modular nature of Nutanix and prevents waste in unused infrastructure, thereby lowering cost and optimizing the utilization of available compute and storage.

Nutanix exposes all its services via REST APIs, allowing them to access other data, application, and sales services, which act as building blocks for building modern distributed enterprise systems. Finally, it enables easy consumption and capacity management within the available compute on a cluster.

## I Data Platform Services

Financial institutions are riddled with different types of storage, all managed independently, with unutilized capacity, and in many cases separate data fabrics that are difficult to manage and control. Big data applications such as MongoDB, ELK, Splunk, and Hadoop all present scale problems on traditional infrastructures. Administrators have a hard time making the data available for developers and testers to consume, creating additional pressure on the operations teams to coordinate.

The following figure shows how Nutanix creates a virtualized, service-orientated storage platform; the simplified management plane eases operations and removes the SAN.

Figure 5: Data Platform Services Architecture



Big data applications like Splunk, Cloudera, NoSQL, Hadoop, and others are pushing the performance and scalability limits of traditional infrastructures. Database administrators and developers often need isolated database environments for testing or development purposes. In traditional FIs, database administrators (DBAs) deliver this complex and time-consuming function. Nutanix radically simplifies the process with the ability to not only create fully functional database copies, but also refresh existing ones, in minutes, giving developers the cloud-like agility they need to speed products to market.

Nutanix simplifies database administration and management even further with Era, database-as-a-service (DBaaS)—a single, high-density platform that can scale on demand. Big data applications like Splunk and Hadoop can be provisioned and managed in just a few hours, freeing big data experts to spend their time extracting insights from data.

Hybrid Cloud can resolve concerns about data privacy as well as concerns about data location—whether regulations allow data to leave the country or whether it must remain on-prem.

# I Application Services

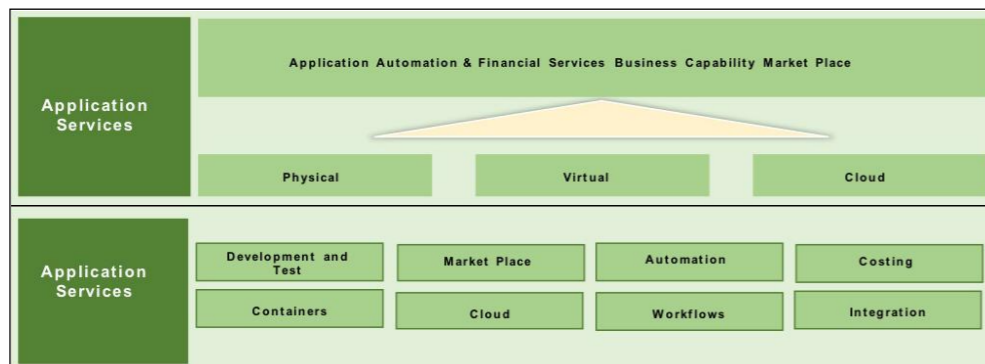
The pace of change in the financial services industry necessitates the need to move from a waterfall methodology to an agile approach. Accordingly, application architectures need to evolve to mimic DEA. A DEA is about breaking down large siloed applications into more manageable and fully decoupled pieces. This allows each DEA to be updated, refreshed, replaced, and rolled back without affecting other services.

No matter how compelling an FI application may be, its value is ultimately determined by backend operations, including storage, database transactions, analytics and more. Even non-cloud-native applications can become agile via application modernization, which can wrap these applications and expose them as easy-to-consume services. Nutanix software runs across different environments to harmonize IT operations and bring frictionless mobility to all applications.

As shown in the figure below, Nutanix has an application services layer with automation and provisioning capability that can streamline and automate business operations while giving application owners and developers on-demand IT services. It provides visibility into business application rules, along with powerful tools for updating and managing business policies.

To complement these capabilities, Nutanix melds private and public cloud operations. IT teams can seamlessly manage applications in Nutanix and across clouds, including Amazon Web Services (AWS), Google Cloud Platform (GCP), and Microsoft Azure.

Figure 6: Application Services Architecture



The Nutanix application automation tool (Calm) includes an application marketplace populated with simple to launch, prebuilt application blueprints. The marketplace provides self-service capabilities to developers who no longer need to waste time and resources relying on other teams for access to infrastructure services. Application automation also creates stronger governance while also enabling multicloud services. Launching a prebuilt build automates the entire process—including VMs, images, access, and setup. Provisioning from the marketplace has advantages beyond agility, as it always ensures execution in a repeatable way, removing error and versioning problems.

Developers and infrastructure teams are often at cross-purposes—software development teams are tasked with releasing new code and features as quickly as possible, while operations and infrastructure teams seek stability and consistency in the same infrastructure. These tensions have led to the rise of DevOps, as development teams have begun looking to cloud providers for the agility they demand.

The marketplace, which is also service enabled, offers a platform for DevOps and, ultimately, DevSecOps. Providing security to siloed teams slows down delivery. DevSecOps aspires to embed security tools in every part of the software development process and to automate core security tasks early in the DevOps workflow.

DevSecOps is a combination of culture and technology that aims to close the gap between development, security, and operations. No matter where you are in the process, Nutanix hybrid cloud platform solutions ensure infrastructure has the required agility and extensibility needed at all layers throughout the lifecycle. The benefits are simple—more security orchestration from the start reduces the chance of misadministration and mistakes, which often leads to downtime or attacks. This automation also reduces the need for security architects to manually configure security consoles.

### Automation and Systems Thinking

Nutanix solutions provide a variety of tools that gives administrators and developers direct access to infrastructure, enabling an easy way to manage virtual environments while maintaining control. With a built-in, self-service portal, users gain controlled access to resources and a true cloud experience. These tools are made available through a comprehensive API, allowing complete automation of the stack.

Combining this with storage-level snapshots and replication, developers can work on an independent copy of production data with no overhead in provisioning. Adding next-generation container technologies to the stack gives unprecedented mobility to VMs, enabling applications to run where it makes sense, not where they were provisioned.

### Container Services

Nutanix tools enable native management for containers with persistent storage to support DevSecOps-style workflows. Developers can rapidly spin up and spin down instances, without losing any data. Using this technology, development teams can iterate faster than ever and seamlessly move applications through the process—from development to the quality assurance stage, and finally to production.



# I Distribution Services

Optimized and service-enabled enterprises are better equipped to distribute omnichannel services to both clients and colleagues through digital interfaces, which can provide a differentiated and pleasing experience to the entire customer base. Financial Institutions can focus on design thinking and customer experiences rather than worrying about technology.

The following figure shows how Nutanix technology supports distribution services to create a channel-agnostic capability, allowing the business to craft an operating model that meets its objectives.

Figure 7: Distribution to Digital Consumer Devices

Distribution to Digital Consumer Devices	Online   Mobile   Social Networks	Personal Banker   BYOD   Call Centre	ATM   Kiosks   Branch   Point of Sale	
	End User	Devices	Mobile	Kiosks
Distribution to Digital Consumer Devices	BYOD	IOT	ATM	APIS
	Connected Banking	Interfaces	VDI	ROBO

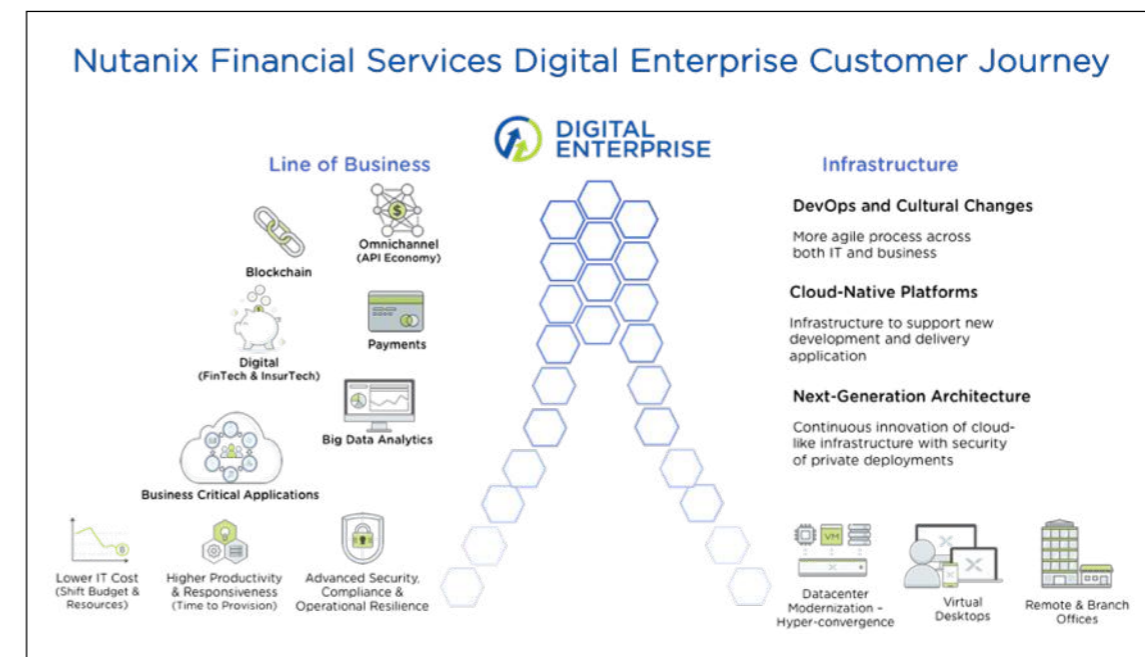
It is extremely powerful to have customers, branches, and colleagues all interacting with an omnichannel experience into Financial Institutions. The distribution channels and access capabilities that parties now have to business and technology services enhances the FIs competitive advantage. This combination allows prioritized, secure, and compliance-ready outcomes where both business and technology combine to drive a digital enterprise architecture that has the capacity to deliver transformation at all levels of the enterprise.

## CONCLUSION:

# The Journey To The Digital Enterprise Achieved

With Nutanix, FIs can modernize their infrastructure as the foundation of their digital enterprise architecture, positioning enterprises to achieve agility, efficiency, and, most importantly, industry-shaping innovation. Although every enterprise has its own particular cloud journey, the following figure depicts steps many Nutanix clients have taken as they transformed into a digital enterprise.

This paper has offered a reference framework for building a financial services digital enterprise, along with suggestions for how Nutanix can help co-create and enable that strategy. Ultimately, however, the success of any hybrid cloud platform rests both upon on how well it enables an enterprise to cost-effectively solve its most immediate and pressing business challenges while also positioning it to innovate and reshape the industry to its own advantage.



## About Our Collaborators

Digital technologies are changing the face of all businesses. These technologies are not only an enabler of business strategy, but also a competitive tool when used correctly can help organizations including those in the banking and financial services sector disruptive the market.

Virtually all businesses use digital technology in some form or another but driving the push to become a digital enterprise requires organizations to transform. This paper was developed in collaboration with the experts at Vaxowave to bring together decades of real-world experiences and proven digital transformations in the financial services sector with industry leading expertise, technologies and solutions.

## About Vaxowave

Vaxowave is a South African based all-inclusive, services-orientated technology company that aims to take organisations securely from yesterday to today, then to tomorrow and beyond. As a digital technology company specialising in multi-cloud solutions, technology transformations and consulting services, Vaxowave's core purpose is to digitally enable their clients using disruptive technologies enabled by new ways of working. They benefit from a combined 35 years of corporate experience, of which 20 years has been at an executive level driving business strategy and technology transformations within the technology, logistics, investment and financial services industry. For more information, visit: <https://www.vaxowave.com/>



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Nutanix makes infrastructure invisible, elevating IT to focus on the applications and services that power their business. The Nutanix enterprise cloud platform leverages web-scale engineering and consumer-grade design to natively converge compute, virtualization and storage into a resilient, software-defined solution with rich machine intelligence. The result is predictable performance, cloud-like infrastructure consumption, robust security, and seamless application mobility for a broad range of enterprise applications. Learn more at [www.nutanix.com](http://www.nutanix.com) or follow us on [Twitter @nutanix](https://twitter.com/nutanix).

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