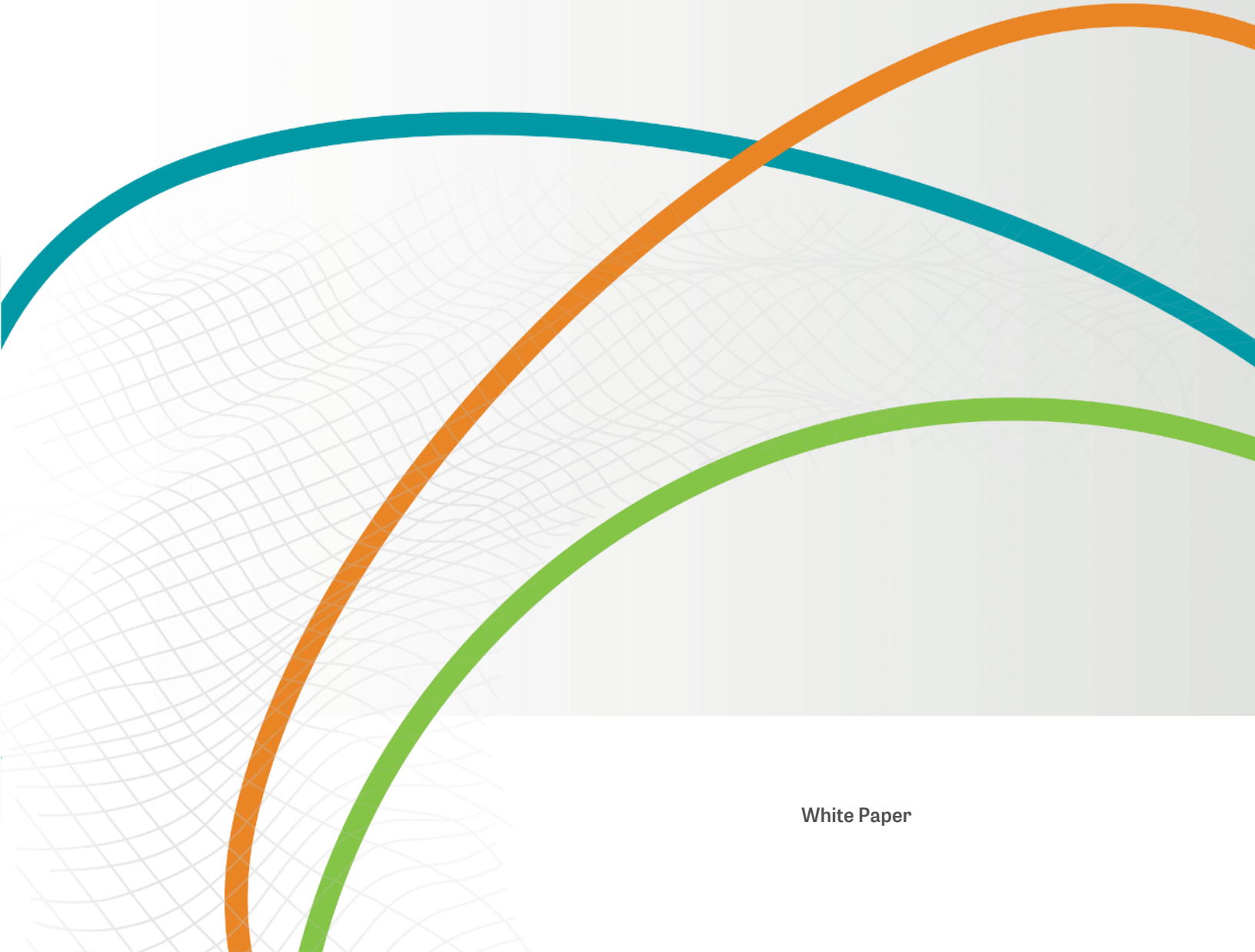
F5 Reference Architecture for VMware NSX

A software-defined data center architectural approach can meet demands for increased agility, faster deployments, and better data center economics.



White Paper

Introduction

Organizations want to increase the speed of innovation, reduce time to market, and drive the velocity of their businesses. However, existing network architectures are too complex and costly to manage and too brittle to withstand the demands being made upon them. They're also too static and slow to respond to dynamic environments dealing with an accelerating rate of change due to shifting data center traffic patterns and the explosion of users, devices, and applications. Furthermore, application architects and operations staff members often feel like the network is in the way, preventing them from achieving goals rather than enabling them. In short, organizations' networks are in need of change.

Change is required to drastically reduce lead times for deploying new applications and services, to eliminate down time due to unforeseen increases in workloads, and to speed recovery from disaster. This change cannot focus singularly on servers or their interconnectivity. Nor does it hinge on security or switching, routing and load balancing. The solution derives from a symbiosis across all elements of data center networking and application delivery architecture. A software-defined data center (SDDC) architectural approach is required to meet today's business expectations, help organizations transform data center economics, and increase application deployment agility.

Business Challenges

With society's increased reliance on technology as a means to do business comes the necessity for flexibility in how services are delivered and consumed.

To be successful—to be competitive while remaining efficient with resources—data center agility must be all encompassing. It must include storage, server, and network virtualization. The static, siloed, hardware-defined data center (HDDC) inhibits application delivery responsiveness. On the other hand, an SDDC architecture is better suited to meet today's challenges without unnecessary disruption to existing services or delay in the deployment of new ones.

Time to market

Enterprise applications don't run in a vacuum. Beyond the virtualized components of the server infrastructure, applications often require application delivery services, including local and global load balancing as well as encryption, optimization, acceleration, secure access, and security services. Typically, provisioning these services for a new application instance requires submitting a request to IT staff and enduring a process of back-and-forth clarification to define exactly what is needed. Once the service need is defined, the request enters the IT queue. This process can take anywhere from days to weeks before the application is delivered as a service. Every change, no matter how minor, goes through a similar process.

The simplification of network design and operation inherited from an SDDC architecture enables organizations to rapidly alter network configurations and behaviors. This results in the deployment of new applications and network services in a matter of hours, rather than weeks or months.

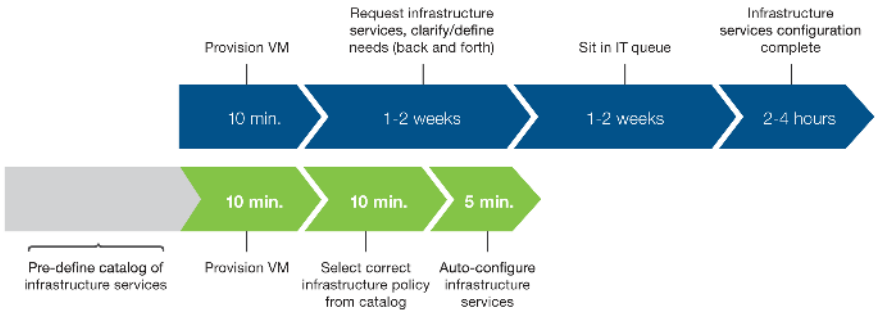


Figure 1: Application services provisioning doesn't have to take weeks.

Time to change

The diversity of application delivery requirements and broad fluctuations in production demand have made it increasingly difficult to plan for data center growth. This situation is further exacerbated by the pace at which Internet-based technologies are evolving and the demand for them is growing. Consequently, the need for business IT to be more agile has never been greater—not just for newly deployed services but also for existing services as they are faced with constant change.

Unforeseen demand on data center resources can come from successful marketing or sales campaigns, unpredicted company growth, or even cyber attack. In these and other circumstances, and given today's increased reliance on technology, data center agility and the resulting ability to react quickly are crucial for business continuity and brand protection.

The Shortfall of SDN

While software-defined networking (SDN) has the potential to provide compelling benefits to customers, application layer challenges are not addressed by today's SDN solutions.

SDN is typically focused on network-centric challenges (in Layers 2 through 4) but largely ignores application-centric challenges (Layer 7). Since the network exists to support the applications that use it, any new network architecture must address the network challenges without neglecting the application layer challenges.

Specific areas where current SDN architectures are not well aligned with application layer requirements include those that require:

- **Stateful networking.** Packet forwarding decisions at the network layer do not maintain a great deal of state awareness. However, application layer-aware technologies maintain state insight associated with application layer transactions in order to manage the exchange of data and application behavior between those end points.
- **Message-based, rather than packet-based, decisions.** SDN operates on “flows” (for example. a TCP connection). However, application layer decisions are often based on HTTP messages, and a single flow might contain many such messages. Therefore, SDN is not well suited to applications that involve message-based decision making.
- **Layer 4-7 context.** Simply put, many challenges cannot be met by simply focusing on Layer 2 and 3 data. Functions such as authentication, authorization, metering, message steering, cross-origin resource sharing, application attacks, performance, elasticity, fault isolation, SSL offload, and many others require application logic, state, and message-based decision making.
- **Adequate product implementations.** Due to the design constraints of SDN, current products are not being developed to handle application-centric (Layers 4 through 7) requirements, limiting computing power, addressing (flow) tables, and update frequencies, for instance.
- When evaluating a new architectural paradigm such as agile data center networking, it is important to consider how that networking can be influenced by the applications and services for which it exists.

Business Solution

The issues behind delays in time to market for new applications and services—and those inhibiting changes to the applications and services already deployed—can be solved through an application-centric SDDC.

While a hardware-free data center is not a real possibility, organizations should avoid building their architectures toward an HDDC, whose capabilities are defined by and hinge upon fixed, physical elements. Such an approach greatly reduces flexibility in how network resources are consumed.

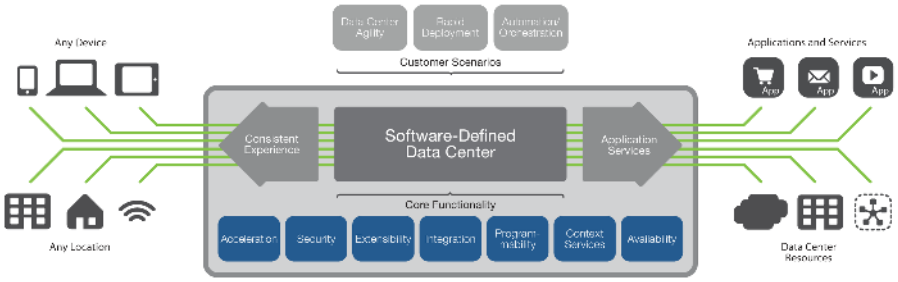


Figure 2: An SDDC approach delivers multiple benefits while increasing agility and speeding time to market.

SDDC architecture positions the physical elements of the data center as a reusable pool of resources that can meet computing, access, performance, availability, and security requirements.

Technology Solution

SDDC architecture is rooted in virtualization and defined by three pillars—server virtualization, storage virtualization, and network virtualization. VMware NSX provides the third critical pillar, network virtualization.

NSX, VMware's network virtualization and security platform, delivers logical network and security services and an operational model for the network similar to that delivered by VMware for computing virtualization. This means data center operators can create virtual networks on demand without having to reconfigure the physical network, enabling them to provision network and security services in minutes, increase network operations efficiency, and optimally use resources.

Together, F5 Networks and VMware have revolutionized repetitive and time-consuming processes by allowing IT staff to pre-define application delivery policies. The API integration between VMware NSX Manager and the F5 BIG-IQ management platform enables VMware administrators to provision the necessary application delivery services for an application's virtual machines (VMs) without leaving the NSX Manager console. The combination of a unified deployment workflow for virtual machines and services, along with the abstraction of complex application service configuration, simplifies and shortens the application deployment process.

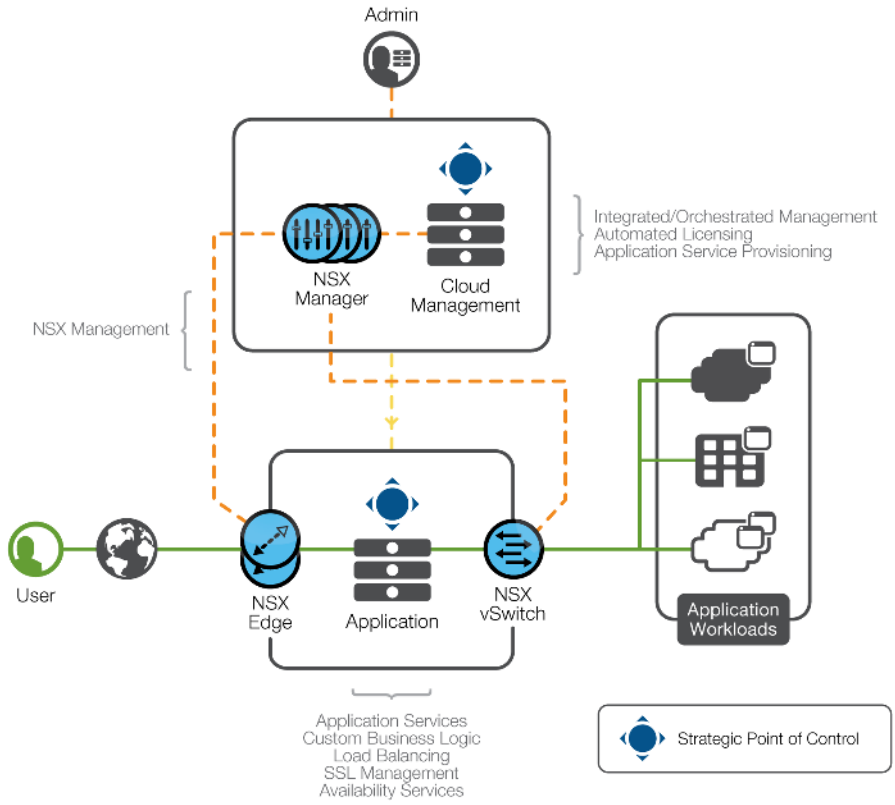


Figure 3: Using iApps, IT can maintain control over policies and provide self-service options for application owners to meet business needs faster.

BIG-IQ simplifies the provisioning of application delivery services using F5 iApps Templates, which provide wizard-like deployment of application services for rapid configuration of F5 BIG-IP devices or virtual editions and the associated policies for any application. As a result, application functions including acceleration, high-availability, security, and many others that require application logic, state, and message-based decision making are deployed with the virtualized network.

VMware NSX benefits

VMware NSX brings virtualization to existing networks and transforms network operations and economics. With it, administrators can programmatically create, provision, delete, restore, and take snapshots of complex networks, all in software. VMware NSX breaks through the barriers of current physical networks, enabling data center operators to achieve better speed, economics, and flexibility by orders of magnitude.

Just as server virtualization enables IT to treat physical hosts as a pool of computing capacity, NSX allows IT to treat the physical network as a pool of transport capacity that can be consumed and repurposed on demand.

A virtual machine is a software container that presents logical CPU, memory, and storage resources to an application. Similarly, a virtual network is a software container that presents logical network components—logical switches, logical routers, logical firewalls, logical load balancers, logical VPNs, and more—to connected workloads.

Logical networks are programmatically created, provisioned, and managed using the underlying physical network as a simple packet forwarding back plane. Network and security services are distributed and attached to VMs within a network. As a virtual machine is moved to another host, these services stay attached to the virtual machine and move with it. In addition, as new VMs are added to a network to scale an application up, policy can be dynamically applied to them.

NSX removes the operational barrier the network has become as IT strives to respond to business needs. Programmatic provisioning reduces service delivery times from weeks to seconds. NSX transforms the operational model of networking. This transformation, combined with compute and storage virtualization, delivers never-before-possible IT speed for the business.

Because virtual networks reproduce the networking model in software, existing applications and workloads operate unmodified, and operators use existing network monitoring tools. Troubleshooting tools can view and process virtual network traffic just as they would physical network traffic.

NSX traffic steering and distributed policy enforcement at the virtual interface allow security teams to define and deliver familiar security services in a virtual network environment. This dramatically increases operational efficiency and service quality while maintaining separation of duties between server, network, and security teams.

F5 Software-Defined Application Services

Network virtualization must be accompanied by changes in the provisioning of application delivery services. The deployment of Application Delivery Controller (ADC) functions must be based on data center automation and the adoption of cloud computing principles. In the case of availability, for instance, the standard high-availability (HA) pair today mitigates failure at the device or instance level, not the application level. Modern architectures and data center models require a more flexible approach to application services such as availability, one that better aligns with trends toward micro-services and API-based architectures.

More broadly, given increased user mobility, an expanding "Internet of things," and the reality of HTTP superseding TCP as the de facto transport protocol, service providers and organizations are reevaluating traditional architectural principles to determine how best to move forward with application delivery service provisioning that can keep up with, or at least catch up to, industry trends.

F5 Software-Defined Application Services (SDAS) is the next-generation model for delivering application services. SDAS takes advantage of F5 innovations in scalability models, programmability, and an intrinsic decoupling of the data and control planes to create a unique application service fabric capable of extending the benefits of F5 application delivery services to all applications, irrespective of location.

SDAS is the first fabric-based application delivery and control system. It enables service injection, consumption, automation, and orchestration across a unified operating framework of pooled resources. SDAS delivers:

- A fabric-based solution. F5 ScaleN technology powers an elastic, all-active application service fabric that dramatically lowers the cost of delivering application services by increasing utilization and service densities.
- Automation and orchestration. Intelligent service automation and orchestration APIs reduce OpEx and fill a critical gap in software-defined data center and network architectures. As a result, organizations with SDAS can streamline application deployment and support continuous delivery.
- A unified operating framework. A rich, extensible catalog of application services empowers application owners to address performance, security, and availability concerns in cloud, data center, service provider, and managed environments. The SDAS fabric provides a foundation for building elastic application services.

F5 BIG-IQ and VMware NSX, integrated

The BIG-IQ management platform integrates with NSX to expose the rich set of F5 application services to both network and virtualization operators, delivering SDAS and NSX network virtualization from a single administrative standpoint.

Conclusion

With the management integration of F5 BIG-IQ and VMware NSX, deployment times are reduced for all aspects of data center networking, including lower level switching, routing, and network firewalling as well as application layer acceleration, security, and availability services. This innovation eliminates the network as a stalling point in application deployment and management so that neither the network nor its application services stand in the way of meeting application delivery expectations.

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