WHITE PAPER

Making SDN Real for Enterprises

Sponsored by: Dimension Data, F5 Networks, Cisco

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IDC OPINION

In today's world, the Internet is bringing together people, processes, data, and things to form one holistic connected network that can provide value to everything that we do. Indeed, quickly deploying new applications and devices — while rapidly connecting users to realize business value — is the goal of every enterprise. However, the speed at which applications and devices come online is placing a huge burden on enterprise networks (hereafter referred to as 'the network'). It is becoming apparent that the network is too brittle, static, or unstable to support the demands of increasingly application-centric businesses.

IT consequently needs to shift from traditional methods of delivering applications to a "Fast IT" model. In a Fast IT model, IT infrastructure becomes more flexible, automated, simple, and secure. At the heart of Fast IT, software-defined networking (SDN) is the key technology that enables automated provisioning, network virtualization, and improved network programmability. While most organizations are ready to have a conversation about SDN, there are difficulties in understanding the trends and nature of the technology and making SDN work in real-life environments, among other challenges.

While SDN initially found favor — almost exclusively — in hyper-scale datacenters and with large-scale cloud service providers, there is rising interest from a growing number of enterprises across a wide range of vertical markets (typically in settings where virtualization is prevalent and a private or hybrid cloud environment is being adopted). Indeed, in these environments, SDN delivers agility, flexibility, and programmability capabilities that align closely with the requirements of increasingly critical applications.

Much of the confusion surrounding SDN, especially in the enterprise, is not about the merits of the technology. Rather, the confusion is about what SDN means for the enterprise, how SDN will impact the IT environment and culture, what business benefits can be derived, and when the transition or transformation of network environments to SDN architecture can begin.

SDN should be seen as a means to an end rather than as an end or solution in its own right. SDN is essentially an architectural model that can better align network infrastructure with the needs of application workloads through automated (thereby faster) provisioning, programmatic network management, application-oriented and network-wide visibility, and smooth integration with cloud orchestration platforms. These capabilities can translate into significant operational savings while providing adopters with the means of achieving faster time to market (and revenue).

For SDN to truly accelerate, engagements will primarily have to be consulting-led versus product or transactional in nature. Consulting services such as educational workshops and strategy sessions will help enterprises and cloud service providers align their business and application requirements to network architecture. These initial engagements should also include network assessment and inventory services to help mitigate risks and define the processes to be aligned with the move to a

new architectural approach. Many early-stage engagements may be part of larger deals or provided freely in the near term, but will quickly mature into paid, larger-scale engagements.

Enterprises will need to start making SDN decisions now in order to make their IT environments SDN ready. They will need help from partners to articulate their network vision, assess the operational readiness of their environments, and develop a transitional roadmap. These decisions should precede any SDN deployment to ensure a coherent and structured SDN transition. By immediately making their networks SDN-ready and not delaying such decisions unnecessarily, business will be able to improve agility faster and save on the associated costs.

IN THIS WHITE PAPER

This white paper offers an independent view of SDN's key business benefits. It also examines why it is imperative for enterprises to start investing in SDN solutions now, highlighting some use cases of SDN and providing essential guidance on the future outlook of the SDN market. There is a lot of hype across the industry about SDN, some of it justified and some of it not. This state of affairs is not particularly surprising for any new technology. Because this hype has led to confusion and a lack of clarity in the industry, some enterprises may miss the current opportunity to adapt their networks to fast-changing business circumstances and reap the benefits of SDN technology.

SITUATION OVERVIEW

Virtualization, cloud, mobility, and Big Data currently have the biggest effect on computing environments, but social networking and the relatively incipient Internet of Things (IoT) concept are also part of the picture. Big Data, IoT, and social business underscore the importance of cloud and datacenter computing performance, which requires faster scaling and improved flexibility from network architecture to carry differing and scalable traffic loads.

More enterprises and consumers are shifting some of their workloads and applications to the cloud, following similar adoptions that have occurred in the virtualization of storage and server environments. Enterprise dissatisfaction with current network architecture is due to its lack of flexibility to support virtualization, cloud, and mobility in an elastic and cost-effective way. At the center of the changing requirements in the datacenter networking space is the evolution of cloud applications. Unlike traditional client-server architecture, which predominantly generated north-south patterns of traffic, cloud generates more horizontal east-west traffic patterns that require more flexible and versatile datacenter networking infrastructure. The fast-growing number of mobile devices accessing the network has significantly contributed to this trend toward the cloud, as these devices not only increase the traffic load on the network but also generate their own usage patterns that require a level of application performance that is not supported by traditional network architecture.

SDN was first devised as a solution to the agility problems faced by large Web-based companies and cloud service providers. SDN's primary purpose was to ensure that the network became more flexible and responsive to virtualized application environments within the larger context of cloud computing. The SDN stack features clear layers of abstraction that provide southbound and northbound interfaces for enhanced management and programmability that extend all the way (up and down) from business-critical applications to network infrastructure.

With overall ICT infrastructure in the enterprise evolving toward heavily virtualized environments and cloud usage, it has become obvious to many players in the industry that state-of-the-art network architecture has to change accordingly. This change is needed to provide the flexibility required by virtualized computing environments and cloud applications, as well as facilitate

orchestration throughout the converged infrastructure stack. Essentially, without SDN, network infrastructure could become the weakest link within ICT environments.

What is SDN?

In the last few years, SDN has emerged as an architectural approach that enables organizations to accelerate application deployment and delivery and thus dramatically reduce IT costs through policy-driven workflow automation. This new technology supports a wide range of cloud architectures and enables scalable, automated, and on-demand delivery of mobility and applications. SDN adds additional benefits on top of datacenter virtualization by increasing network agility and utilization while reducing infrastructure costs and operational expenses. SDN provides levels of speed and agility which super charge network infrastructure, transforming traditional IT into Fast IT.

Software-defined networking is an architectural approach to networking that separates the data control and application planes. This separation enables the intelligence of a network device to be split from the packet-forwarding engine and controlled centrally while data transport is distributed. In addition, SDN allows applications to programmatically interface with the network for improved control, automation, and orchestration of network behavior.

Much of the confusion surrounding SDN, especially in the enterprise, is not about the merits of the technology. Rather, the confusion is about what SDN means for the enterprise, how SDN will impact the IT environment and culture, what business benefits can be derived, and when the transition or transformation of network environments to SDN architecture can begin.

While commercial offers are still relatively limited, SDN as a topic is gaining a lot of interest from enterprises. Most organizations, while ready to have a conversation around SDN, are struggling with understanding SDN better, appreciating the trends related to SDN, and making the technology work in real-life environments. A typical organization also struggles with making ICT more agile and responsive to fast-changing business requirements and orienting the delivery of services to business outcomes. There is demand for delivering more services from the cloud and a need to establish better workflows that accommodate more stakeholders across an organization.

Why Now? What Are the Limitations of Current Networks?

While networks exist to support applications, the changing nature of application workloads places unprecedented and increasing demands on network infrastructure. Furthermore, as virtualization and cloud computing technologies steadily advance, the limitations of traditional network architectures become exposed. In application environments that have embraced cloud and virtualization, the traditional network infrastructure in place becomes an operational impediment and inhibitor to business agility. This legacy infrastructure is too brittle, static, and inflexible to accommodate changing business and application needs, and limits the transition toward automated provisioning, programmatic management, comprehensive network visibility, and cloud orchestration systems integration. The networking community has answered the call for creativity and innovation in meeting the demands of new generations of application workloads by developing SDN. SDN has emerged as an innovative architectural model that is capable of delivering automated provisioning, network virtualization, and network programmability to datacenter and enterprise networks.

Although SDN initially found favor – almost exclusively – in hyper-scale datacenters and with large-scale cloud service providers, there is rising interest from a growing number of enterprises across a wide range of vertical markets, typically in settings where virtualization is prevalent and private or hybrid cloud environments are being adopted. Indeed, in these environments, SDN

delivers agility, flexibility, and programmability capabilities that align closely with the requirements of increasingly critical applications.

But why should enterprises start considering SDN architectures in their IT environments now, when so far only a few commercial deployments have been restricted to large datacenter and cloud environments? Most enterprises, especially those with large datacenter investments, run most of their applications from private or public clouds. However, such enterprises are already experiencing network bottlenecks and are seeking new methods to effectively run and manage their network environments. Similarly, the adoption of enterprise mobility solutions and social networking in the enterprise is increasingly putting pressure on existing network environments. The speed at which lines of business and consumers alike demand new applications and services puts a lot of pressure on IT to adapt the network to support these new services. IT, therefore, must provide the business agility required to respond to fast changing business requirements.

While all aspects of the network do not immediately need to transition to SDN architecture, enterprises will be better placed to start the SDN conversation immediately, particularly as most are in the midst of technology refresh cycles. By making their networks SDN-ready now and not delaying this decision unnecessarily, enterprises will quickly become more agile and able to save on the associated business costs.

Value of SDN to the Enterprise

It is important to bear in mind that SDN is a means to an end rather than an end or solution in its own right. SDN capabilities can translate into significant operational savings while providing adopters with the means of achieving faster time to market (and revenue).

SDN strives to achieve benefits in terms of OPEX and CAPEX. It seeks to achieve the former by providing better alignment between application workloads and the network infrastructure that supports them, which in turn allows for faster provisioning, policy-based, centralized, and programmable network reconfiguration and management, and close coupling with orchestration systems that manage other datacenter infrastructure (including servers and storage). It aims to provide CAPEX savings by paving the way for potentially less expensive network switches that handle only data forwarding, and by providing an automated programmatic model for virtualization and instantiation of higher-layer network and security services that today run on special-purpose appliances.

Making the network programmable using SDN also has the potential to reduce the risks associated with individually managing numerous point solutions. Additionally, SDN — with integrated security applications that can be dynamically provisioned and configured — manages security threats more efficiently, thereby reducing overall risk as networks and applications become more secure.

Any SDN solution should support open architecture to enable scale with multi-vendor integration. OpenFlow is representative of the wider movement toward open source and open systems networking, both within the SDN context and beyond. As with cloud orchestration, many SDN solutions will be built on open source software, including components from OpenStack, OpenDaylight, ONF's OpenFlow, and Linux-based network operating systems and automated configuration tools. Open SDN solutions that are supported by a wider ecosystem of vendors will provide the greatest flexibility with regard to automation and programmability. Amid this shift, vendors will have to find areas where they can add value to these open source SDN solution stacks for competitive differentiation and sustainable profit margins. Some vendors will target enhancements at the data plane while others will look to areas such as analytics and policy.

Enterprises are demanding that IT becomes simpler and more consolidated; as such, the network must offer the same characteristics that server and storage virtualization do today and perform as

flexibly as the rest of the ICT infrastructure. Organizations are looking for flexible technologies that allow them to quickly respond to fast-changing business requirements and rapidly provision new services and applications. SDN increases agility by:

- Enabling an organization to innovate, as proof-of-concept and prototype applications can be rapidly created and deployed without any networking barriers.
- Enabling the datacenter to be more responsive to the opportunities that mobile computing and Big Data provide, and increasing the capacity to chase outlier opportunities.
- Optimizing network assets. Organizations can "right size" their infrastructures, secure in the knowledge that they will neither overprovision nor run the risk of service degradation.
- Governing security and compliance from a central location rather than managing on a per-device basis. This increases efficiency and overall compliance.
- Allowing an organization to map its networking to its compute and storage, thereby making dynamic migration of workloads less problematic.
- Lowering both OPEX and CAPEX. SDN frees up finances to focus on core strategic initiatives.

In summary, SDN provides four key benefits to the business:

- Increases the speed of business.
- Lowers the total cost of ownership.
- Reduces risk by providing better security.
- Allows for operationalization of the network (less downtime, easier troubleshooting, and simplified operations via automation).

SDN Use Cases

IDC identifies a number of scenarios for SDN deployments and capabilities in cloud service provider rollouts and enterprise deployments, including:

- **Maximizing value from server virtualization:** Network limitations often prevent organizations from getting the most out of their server virtualization efforts. By creating a virtual and dynamic network fabric, an SDN-enabled network provides improved integration with a virtual server environment, enabling virtual machines to be provisioned, migrated, and decommissioned without requiring network reconfiguration. Network and security policies can follow virtual machine migrations automatically.
- **Web scaling for hosting/public cloud providers:** With its support of multi-tenant network environments, all of which are managed from a centralized interface, SDN is a good fit for hosting or public cloud providers. These providers can deploy and implement network resources for individual customers and rapidly provision or scale them up or down as required in a highly automated manner without needing manual intervention.
- **Private/Hybrid cloud deployments:** Similar to hosting or public cloud providers, enterprises deploying private or hybrid cloud implementations must manage multitenant environments and scale network resources up or down in each of those environments quickly and easily with minimal impact on IT staff time. SDN is well suited to satisfying these requirements.
- **Network programmability and customization:** Decoupling the data path and the control path lets organizations easily introduce scalable changes to their networks and customize the networks to suit particular applications. Financial services applications serve as one such example in which traffic flows in a network may need to be dynamically rerouted based on application-specific criteria — a scenario that presents a strong business case for SDN.

- **Security applications:** In an era when security concerns and threats continue to rise, IT managers are looking for security services and solutions (e.g., firewall, DPI [deep packet inspection], and VPN) that can be dynamically provisioned and configured. Where appropriate, special-purpose security platforms can be replaced with general-purpose server appliances that can protect against threats such as denial-of-service (DoS) attacks and quarantine suspicious traffic for further inspection.
- **Network analytics:** As the scale and complexity of networks within datacenters grows, so does the need for visibility, automation, and troubleshooting of traffic issues across infrastructure. IT managers would rather pre-empt traffic congestion issues or other bottlenecks than face situations in which applications are unresponsive or even unusable. Network analytics, when used within an SDN-enabled network, can allow IT to diagnose issues as they occur and address them in an automated manner via an application that propagates itself across the network.
- **Dynamically segmented networks (such as VLANs):** With SDN, administrators can easily partition their networks and provide specific users with access to their own isolated networks, just as VLANs do. However, unlike most VLAN topologies in which networks are static, SDN enables administrators to set up and tear down these segmentations dynamically via software, providing greater agility to organizations.
- **Multipath (LAN and WAN) networking:** Network demands are becoming more complex in the era of cloud computing and server virtualization. Many organizations are implementing multipath networks to address these requirements; however, traditional network approaches are not well equipped to handle such networks. SDN can enable multipath networks with custom-defined policies and continuous updates based on network resources and traffic conditions. SDN maximizes the use of network resources, optimizing the bandwidth available within the network.

FUTURE OUTLOOK

In aggregate, IDC estimates that the worldwide SDN market will exceed $8 billion by 2018, recording a compound annual growth rate (CAGR) of 89.4% between 2013 and 2018 (these historical data and forecast projections are based on "in use" estimates, meaning that IDC is including only those products, technologies, and services that are deployed, implemented, and used in actual SDN networks. This means that IDC excludes, for example, revenue from products with SDN features [e.g. OpenFlow] that could be used — but are not actually being used — in SDN deployments).

While SDN promises to deliver cost savings in terms of OPEX and CAPEX, most of the near-term cost savings will accrue to OPEX. Large cloud providers have reported that they have derived notable operational savings from SDN-type rollouts by improving control of virtual and physical resources through automated provisioning, configuration, and management of underlying network infrastructure. These providers have also gained unprecedented operational agility and service velocity. Moreover, SDN applications hold the promise of controlling WAN connectivity costs in multipath scenarios through a tiered approach to application-based policies for assigning data traffic routes.

SDN offers an opportunity for network service providers to deliver flexible resources to enterprise customers. Flexible resources (and the associated billing, provisioning, and monitoring technologies) go a long way toward realizing enterprise goals of increased use of OPEX as a financing avenue, reduced cost of network equipment, and increased flexibility in the network. As SDN-enabled networks can join servers and storage in the virtualization camp, network service providers that can offer such resources reliably and securely can reduce their enterprise

customers' total cost of ownership of network resources and maintain (or increase) profitability at the same time.

Providers that do not move forward, retreating from the fast-moving currents of SDN and network automation and orchestration, will be left behind. Networking providers have a future in a world marked by cloud and SDN; however, that future will look markedly different from the past.

IDC believes that SDN adoption will develop faster in communication service provider (CSP) networks than enterprise networks because the transformation needs of CSP networks are more pressing than those of mainstream enterprise networks, which are evolving relatively slowly. In addition, with many different parts of CSP networks undergoing this transformation, CSPs can implement SDN to support well-defined and non-critical network functions. In this way, different SDN solutions can be tested, and the experience gained can be applied to more critical functions in production networks.

Professional Services

Traditional management consulting expertise, as well as the expertise of different industry segments, will be needed to help enterprises develop optimal organization processes that support virtualization and improve agility. Unfortunately, traditional technology vendors are not typically strong in these areas. Systems integrators are more accustomed to dealing with process problems and industry-specific issues, and thus they will have an initial advantage over technology vendors.

The alignment of business, application, and technology requirements is a key driver of SDN deployments. As SDN deployments spread, underlying network expertise will become an essential requirement. Organizations that offer professional services surrounding SDN deployments, augmented by core capabilities and solid portfolios in network assessment and readiness services, as well as architectural services, will be more desirable to enterprises. Additionally, enterprises will need help with developing a clear strategic roadmap, including a business case, to support SDN decisions.

For SDN to truly accelerate, IDC believes that SDN engagements will need to be primarily consulting-led versus product or transactional in nature. Consulting services (such as educational workshops and strategy sessions) will help enterprises and cloud service providers align business and application requirements to network architecture. Such initial engagements should also include network assessment and inventory services to help mitigate risk and define the processes to be aligned with the move to a new architectural approach. While IDC believes that many early-stage engagements may either be part of larger deals or be provided gratis in the near term, they will quickly mature into paid, larger-scale engagements.

Managed Services

SDN is still a new area in which few market players can claim to have extensive experience. Most importantly, organizations will face challenges in managing their networks in this new world. SDN requires advanced software, networking, security, and systems skills, as well a cultural re-orientation to effectively manage the complex ecosystem. In addition, SDN itself is transformational, and as such IT environments require a step-by-step transition to attain the agility and cost benefits inherent in the concept. By using a managed services approach, enterprises can leverage the expertise of their managed services partners to transition IT infrastructure at a pace that suits and aligns to their business needs. This approach has the potential to greatly reduce risks to the enterprise and ensure access to the expert advice and guidance of the managed services partner. Therefore, choosing the right managed service partner with the right combination of skills and expertise to manage all aspects of the SDN ecosystem becomes even more critical to the success of SDN deployments. A move to SDN can potentially be disruptive and complex, but

with the right support and advice from a trusted managed services partner, the process can be made more beneficial and value-adding to the enterprise.

PROGRAMMABLE NETWORKS PARTNERSHIP BETWEEN DIMENSION DATA, CISCO, AND F5 NETWORKS

Looking at SDN architecture, it is clear is that there is no single vendor with a complete product or solution that can deliver all aspects of the SDN ecosystem. IDC believes that partnerships across the vendor community with services organizations should emerge to deliver best of breed, end-to-end SDN solutions.

One such partnership is Dimension Data's three way partnership with Cisco and F5 networks to deliver a complete SDN solution. This partnership is unique in the sense that it plays to the strengths of the partners — each contributes key core capabilities that are essential for offering an end-to-end SDN solution to the market. Dimension Data brings systems integration and multivendor networking capabilities, a managed services pedigree, and consulting services to the partnership. F5's L4–7 application and gateway services help organizations deliver applications using SDN architectures that are directly programmable and can be programmatically configured with open application programming interfaces (APIs). Cisco's Application Centric Infrastructure (ACI) offers an unmatched portfolio of IT solutions, together with leading IT technology partners, that address enterprise network needs through SDN capabilities, open APIs, IT orchestration tools, and greater automation.

The combined capabilities, assets, and technical expertise of the partnership promises to provide a complete and compelling SDN solution to the market. Enterprises can initially leverage Dimension Data's consulting services to make sense of SDN and create a strategic road map to SDN deployment; at the same time, they can benefit from superior SDN infrastructure enabled by F5 and Cisco should they decide to implement SDN in their IT environments.

Dimension Data's Consulting Approach to SDN

Although there is no doubt that programmable networks and SDN represent important paradigm shifts that will enable future networks to be more flexible, Dimension Data is of the opinion that these concepts must be approached with care. These technology breakthroughs are still nascent and have not yet achieved any sort of mass recognition or adoption that would lead to further maturity. Therefore, Dimension Data has rightly identified that what organizations need most at the moment is expert advice. The challenge facing enterprises is determining which entity would be best to offer such advice. Dimension Data's access to telecom and datacenter expertise through its strong links with NTT (a major Japanese telecom operator) and its investments in datacenters and Internet solutions puts it in a unique position to provide SDN guidance to enterprises. There are few organizations that possess Dimension Data's pedigree in the services and networking space and its experience with major networking vendors.

Dimension Data has consequently adopted a packaged consulting approach to SDN engagements that first seeks to help enterprises understand the potential advantages that SDN may hold for their operations. With this approach, Dimension Data assists clients in determining how their networks will be used in future. It assesses whether existing operations and infrastructure can meet future requirements, and thereafter uses this information to create a roadmap that details how to move to a new desired position from the current state. Dimension Data's "SDN Development Model" is at the core of its consulting services capability. This model provides a practical approach to SDN through a set of actionable recommendations that combine the company's market experience and extensive knowledge of network design and operation with the latest innovative thinking in the

industry, helping in turn to ensure that a client's network architecture will meet their current and future business objectives. The SDN Development Model helps enterprises to:

- Gain a deeper understanding of SDN.
- Gauge the impact of SDN on their operations.
- Refine their vision for SDN.
- Identify the current "as-is" and desired "to-be" SDN states.
- Further qualify their SDN requirements.
- Identify the next steps and provide a high-level road map.

Using this approach, Dimension Data works closely with a client to identify specific and less-critical areas of its network that could first be transitioned to SDN architecture as a test case. When successful, this transition can be replicated to more critical areas of the network at the client organization's own pace. With its repertoire of consultants that possess the appropriate technical and commercial credentials to provide clients with relevant insights and practical advice (through the SDN Development Model), Dimension Data believes it is better placed to guide enterprises on their SDN journey in a more structured and coherent manner than its competitors.

F5 Networks — The Network Exists for Applications

F5 believes that networks exist for applications, and as such any new network architecture must address network challenges as well as application layer deployment and management challenges. F5 is addressing the cloud challenge with what it calls "software-defined application services" (SDAS) which address the availability, performance, security, mobility, and access and identity requirements of applications. F5 is further pursuing a platform strategy that involves its BIG-IP and BIG-IQ offerings, as well as its Traffic Management Operating System (TMOS) software platform that provides programmability and management capabilities. F5's Synthesis fabric knits these platforms together to deliver high-performance, intelligent services orchestration, and support for simplified business models. F5's L4-7 application and gateway services help organizations deliver applications using SDN architectures that are directly programmable and able to be programmatically configured with open APIs.

The SDN ecosystem requires open and common standards that not only enable the integration of different approaches but also provide simplified orchestration and management of applications and services. F5's application and gateway services provide publicly documented APIs for complete programmable configuration, allowing its products to seamlessly integrate with a variety of orchestration and management systems. F5's Synthesis is also fully integrated with Cisco's ACI, enabling IT to operationalize critical datacenter network and Layer 4-7 services to meet application performance, security, and reliability demands in a compliant, standard, and repeatable way. F5 has a broad set of SDAS today with BIG-IQ as an architecture for managing F5's SDAS elements, which can be used to provide simplified abstractions to the control or orchestration plane. This can be useful when integrating a number of heterogeneous components. As a result, the F5 Synthesis partner ecosystem is presently broad and includes organizations such as Cisco.

F5's focus on enabling applications and services by providing centralized control for orchestration of functions and services positions the company to deliver software-defined applications and services. Such applications and services are required for seamless user experiences in enterprise and telco environments within the SDN ecosystem.

Cisco Application Centric Infrastructure — The Network Engineered for Applications

Cisco ACI was designed from the ground up to tightly integrate physical and virtual elements of IT infrastructure and simplify operations through application-based policies. With ACI, network complexity no longer dictates application deployment or operation. Instead, application requirements dictate network deployment and operation. In essence, ACI frees the application so it is no longer bound by network complexity.

With Cisco ACI, IT staff identify the application's key requirements and capture them in a policy, then use that policy to instruct the network fabric on what the requisite network services are for that application. ACI does this by decoupling the logical identity of the network from the physical infrastructure through an integrated overlay. This transforms the network fabric into a pool of shared resources that can be provisioned and re-coupled dynamically, based on the applications' needs. With ACI, the policy defines the desired state of the fabric and automates its provisioning. This results in an automated IT that is agile, open, and secure; ultimately, it results in an IT that is more responsive to the needs of the business.

ACI is the most comprehensive SDN solution in the industry that makes the application the focal point of infrastructure. ACI also enables the creation of an agile, open, and secure architecture as described below:

Agile

- **Automation:** The application-based policy model drives speed through automation, reducing errors and accelerating application deployment and IT processes from weeks to minutes.
- **Physical/Virtual Integration:** ACI seamlessly supports heterogeneous physical and virtual endpoints (e.g., bare-metal servers, virtual servers on any hypervisor, and Layer 4-7 services) with a consistent policy.
- **Visibility/Troubleshooting:** Centralized, application-level visibility with real-time application health monitoring across physical and virtual environments provides faster troubleshooting through increased visibility of the entire infrastructure.
- **Performance:** Within the fabric, every leaf switch is a hardware-based VXLAN gateway, delivering faster performance than other solutions requiring external gateways.
- **Scale:** The ACI environment can be scaled out easily without adding complexity as a result of the policy model. The fabric itself is also highly scalable with support for high-density and high-capacity speeds.

Open

- **Open APIs:** ACI maximizes customer choice by supporting open APIs, open source tools, and open standards, and by opening its ACI policies and protocols.
- **Comprehensive Partner Ecosystem:** ACI's open ecosystem delivers customer choice and interoperability while decreasing costs and increasing innovation.

Secure

- **"Whitelist" Approach:** ACI automatically disallows connectivity between devices until the policy specifically allows it.
- **Multitenant Aware:** Traffic, connectivity, and policies for each application and user can share the same infrastructure without leakage of information across tenants.
- **Compliance:** The automatic capture of all configuration changes smoothly integrates with audit and compliance tracking solutions.

A key architectural component of ACI is the Cisco Application Policy Infrastructure Controller (APIC) which provides a single touch point for all configuration, management, and operational tasks, including policy definition and health monitoring. By providing a common operational framework, it unifies applications, networking, cloud, and security teams in defining application requirements.

Cisco's ACI enables enterprises to incrementally migrate to SDN architecture by re-using some of their existing Cisco network infrastructure. ACI extends the network-specific approaches of SDN to datacenter infrastructure, incorporating servers, storage, application services, and security under one policy model. Cisco's ACI has developed a large, open multivendor ecosystem of interoperable datacenter solutions, with major partners such as F5, Symantec, Microsoft, and others. This is especially critical in an SDN ecosystem that requires integration in a multivendor environment to support orchestration and automation tools and compatibility.

Dimension Data — The Glue Between F5 and Cisco

Dimension Data is best positioned to lead SDN engagements due to its longstanding relationship with F5 and Cisco, which allows it to leverage F5's application pedigree and Cisco's networking leadership. Furthermore, the company's strong heritage in systems integration, its mature managed services skills, and its level of technical expertise make it perfect for providing best-of-breed SDN solutions to the market.

Dimension Data's global footprint extends to 60 countries, supported by a network of 16 Cisco ACI and F5 labs in key cities around the world. This number is set to increase in the near future. The company's heavy investment in datacenters, as well as its secure approach to programmable networks supported by the packaged SDN Development Model, could help organizations make sense of SDN and:

- Gain a deeper understanding of SDN concepts, technologies, and standards.
- Review the impact of SDN on infrastructure, operations, and IT strategy.
- Refine the vision for SDN use and future state network architecture.
- Identify a place to start in the SDN journey and provide a roadmap on how to get to a future state network.

ESSENTIAL GUIDANCE

SDN enables network infrastructure to deliver capabilities such as automated provisioning, programmatic management, service chaining, and integration with cloud orchestration. In short, SDN helps the network overcome longstanding limitations that inhibit business agility, IT efficiency, and overall productivity. With all of these in mind, IDC offers the following essential guidance:

- Just as new workloads and cloud services drove the need for SDN in hyper-scale datacenters, enterprises will look to SDN and other innovative approaches to network architecture as they embark on their cloud journeys. There is a definite market linkage between the advance of cloud, with its emphasis on IT as service, and the need for new approaches to network architecture such as SDN.
- SDN will not be limited to the datacenter. Indeed, it has already begun to extend across the WAN and the enterprise environment. While the datacenter was where the need for SDN first surfaced and was most keenly felt, SDN is applicable across the enterprise network.
- While networking hardware will continue to hold a prominent place in network infrastructure, SDN is indicative of a long-term relative value transition from hardware to software. Vendors and enterprise customers must be cognizant of this shift and respond

accordingly. For vendors, this will mean a gradual shift to software and service-based business models, and for enterprise customers, this will mean a move toward a more collaborative approach to IT and a more contextual and holistic view of how the network supports critical and evolving workloads.

- Vendors will find themselves up against non-traditional competitors as cloud and SDN adoption advances. This new competitive dynamic will fracture some partnerships and engender new ones. Partnerships that seek to deliver end-to-end SDN solutions by combining best-of-breed capabilities will flourish in the market, while vendor-specific approaches may diminish.
- SDN engagements will require management consulting-type skills to communicate the value of SDN to the enterprise. The ability to clearly communicate the benefits of SDN will be key to service portfolios, and the capacity of new architectural approaches to increase productivity, drive efficiency, and improve business agility while reducing risks will drive future success.
- Numerous enterprises will begin deploying SDN in their datacenter environments, separate from their legacy applications and infrastructure. They will validate SDN's value in these deployments before extending it to other datacenter applications and other facets of the enterprise network.
- Enterprises will need to start making SDN decisions now in order to make their IT environments SDN ready. They will need help from partners to articulate their network vision, assess the operational readiness of their environments, and develop a roadmap for transitioning to the future state. These decisions should precede any SDN deployment to ensure a coherent and structured SDN transition.

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