

# Comcast Charts the Way Forward for the Software Defined Services

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## Executive Summary

To remain competitive, companies have embarked on a digital transformation that is unprecedented in its scale and scope. Powering this transformation are software defined (SD) services, the first of which to be deployed on a massive scale is SD-WAN.

SD-WAN delivers operational efficiencies, enables application-level prioritization with visibility and reduces WAN costs. Companies are faced with a large array of choices for their SD-WAN and more generally SD services; however, they need to carefully consider important criteria in making their vendor selection. It is crucial to select a vendor that offers a platform that will enable SD-WAN, as well as future services, rather than a vendor with a single-point solution. Because the platform plays a mission-critical role in the enterprise, companies should insist on retaining a carrier-grade solution that provides the reliability they will need. Because of the complexity of migrating to software-based solutions, particularly from a legacy environment to hybrid solutions, it is important to look for a managed solution where the complexity of the migration and management are handled by an experienced provider. Of utmost importance is an underlay network that offers gigabit capabilities and unconstrained bandwidth.

The Comcast Business ActiveCore<sup>SM</sup> platform is a software-based solution that currently delivers SD-WAN and also has a rich roadmap of SD services such as advanced firewall, SD router, and virtualized unified threat management, integrated and service chained on the uCPE. ActiveCore is complemented by a comprehensive and intuitive digital service management capability with a true single pane of glass experience that provides an integrated view of the services and the underlying network. The rich functionality of the digital experience is supplemented by Comcast Business' full-service management capability, handling the complexity and providing the enterprise with the flexibility of various levels of co-management. Underlying ActiveCore is a high-capacity, high-reliability network that enables digital transformation and allows enterprises to maximize the revenue-generation potential of the branch offices.

## The Enterprise Digital Transformation

Companies of all sizes are going through a profound digital transformation. Business models are evolving to keep abreast of competition, often from emerging entrants; data have become a critical asset of the company, and delivering a superior digital experience is now an essential component of the competitive strategy. Consequently, the rigid network and business operating systems of yesterday are no longer adequate to power them forward in the digital age.

## Key Findings

- Companies should select a software-based platform to deliver the software defined services they need today and in the future.
- Organizations need the safety of a co-managed solution that is complemented by a comprehensive, intuitive digital experience with a single pane of glass. They should select a seasoned service provider to handle the complex installation process and one that has one of the best, fastest last-mile network.
- ActiveCore is a software-based platform that delivers a differentiated SD-WAN capability today and a host of SD services in the near future, complemented by an extensive digital experience and by the full capabilities of a major service provider.

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Software defined services have become an essential enabler of companies' digital transformation. This is because the IP networks of yesterday are ill-equipped to cope with the demands of enterprises today, which are increasingly mobile and rely on multicloud-based applications. The needs of enterprises are changing as their business environments evolve and business models change. Today, companies need the capability to optimize bandwidth utilization by prioritizing bandwidth at the application level while having visibility into consumption. They also require secure, cost-effective connectivity to the cloud where many applications run. Companies must optimize operations and reduce costs while gaining flexibility, which is a business imperative.

**Some of the major trends shaping the connectivity needs of the enterprise:**

- Increasingly mobile workforce.
- Business-critical applications running across multiple clouds, resulting in significant increases in branch-to-cloud and cloud-to-cloud traffic and escalating concerns about application performance, agility and security.
- Increased security risks.
- A more distributed enterprise but requiring disparate locations to perform as one. This creates complexities as manual procedures for developing configurations at different locations become expensive, cumbersome and prone to error.
- The branch office has become an important entity in revenue generation because of its proximity to the customer. It needs better connectivity to cloud-based applications and the end customer and requires a high level of security.
- Cloud computing, machine learning and data analytics, the Internet of Things, augmented reality applications and other technological innovations are changing customers' expectations regarding services. These technologies have connectivity needs that far exceed the capabilities of networks and have led the enterprises to reassess their enabling infrastructures and look to next-generation networks to fulfill the changing needs of their businesses.



Figure 1. Requirements for Connectivity Needs of Enterprises (Source: Comcast)

Traditional WAN architectures, which had satisfied the connectivity needs of enterprises in the recent past, are coming up short in meeting their current and developing connectivity requirements. These requirements are driving companies to fundamentally rethink their communications infrastructure and turn to software defined services to gain the flexibility, efficiency, reliability and cost that their businesses demand.

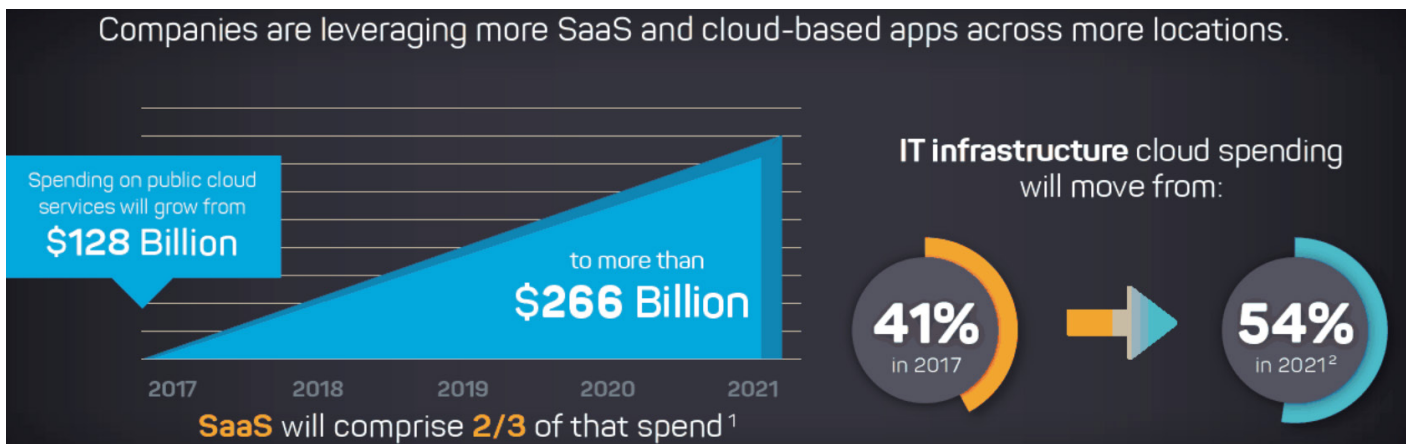


Figure 2. Enterprise Spend on SaaS and Cloud-Based Applications (Source: Comcast)

Many service providers and vendors are racing to address the needs of companies, creating a dizzying array of choices, many of which fall short of meeting the current and future needs of enterprises.

# Software Defined Services Power the Digital Enterprise

As a network infrastructure technology, software defined networking (SDN) offers numerous benefits that range from agility and cost saving to efficiency and security and brings significant simplifications to how customers run their networks by enabling them to efficiently program network configurations.

Some of the main benefits of SDN:

- **Centralized provisioning and management:** SDN separates the intelligence of the network from the data to enable network administrators to manage the devices on the network from one central site. Branch offices can be managed from a central facility, which leads to efficiency, error reduction, and lower cost. The centralized management enables better control over data traffic, which enables prioritization of applications for optimal performance.
- **Better security:** Centralized management ensures that uniform security policies are applied across the distributed enterprise, resulting in improved security and compliance.
- **Lower capital expense:** SDN is based on open-source software, which can run on common off-the-shelf hardware, thus reducing the dependence on purpose-built, application-specific hardware. Hardware can be repurposed to run other applications, resulting in lower capital expense and less waste.

## SD-WAN: A Major SDN Based Service

SD-WAN has emerged as an important SDN service that meets the new networking requirements of the enterprise. SD-WAN enables VPN between sites or between sites and data centers and allows application-specific control on a per-site basis across the network. It allows streamlined execution of firewall, router and other policies across the network. Some of the major benefits of SD-WAN:

- Application prioritization for optimal performance and bandwidth utilization.
- Visibility into bandwidth consumption at the application level and per site.
- Simplified network management that enables scaling across multiple locations whether local or cloud-based.
- Dynamic, intelligent, application-aware routing results in more uptime, better efficiency, and an improved user experience.
- Reduced bandwidth constraints, the leading cause of poor application performance and slow connections, enables fast, reliable performance for branch operations.

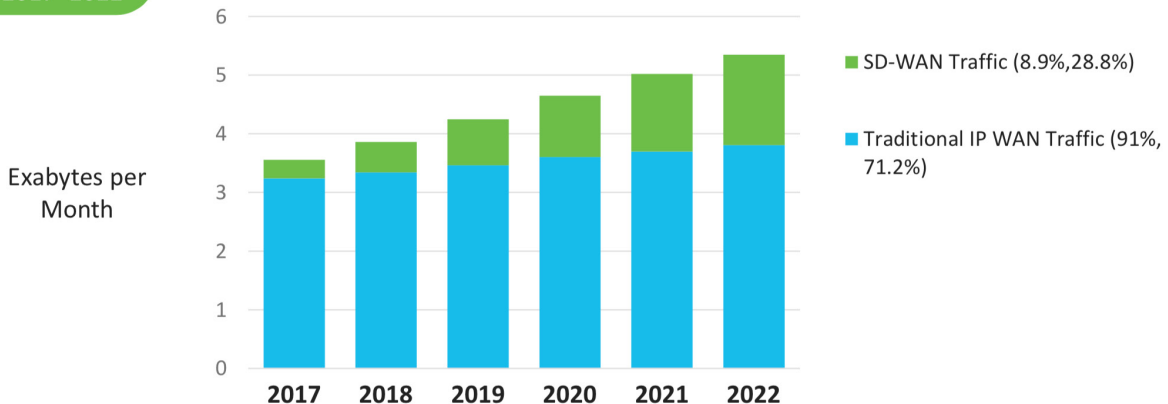
These capabilities can serve as a vehicle for business transformation, lead to new business opportunities, and significantly improve last-mile performance.

SD-WAN is undergoing significant growth. In 2018, SD-WAN traffic in the enterprise grew at a CAGR of 37% (compared to 3% for traditional MPLS based WAN). SD-WAN is predicted to increase five-fold and to account for 29% of WAN traffic by 2022.

### Global Enterprise SD-WAN Traffic

SD-WAN traffic will grow at a CAGR of 37% compared to 3% for traditional WAN SD-WAN will increase 5x and will be 29% of WAN traffic by 2022

9% CAGR  
2017–2022



\* Figures (n) refer to 2017, 2022 traffic share

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Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

The tremendous potential of SD-WAN has attracted many players, and the market is brimming with solutions from vendors, service providers, managed service providers, and others. However, these solutions are far from being comparable. Many vendors have repurposed their existing solutions as SD-WAN solutions. Others that offer purpose-built security are marketing themselves as SD-WAN vendors. Many vendors sell DIY solutions directly to the enterprise, and service providers offer managed solutions, DIY solutions, and everything in between. The proliferation of options can be overwhelming for companies that are already challenged with migrating to an entirely new paradigm.

## Framework for Selecting the Right SD-WAN Vendor

Although each company has its unique requirements for SD-WAN and other software defined services, a number of characteristics are salient and essential to consider. As the company takes stock of its requirements in the near and also longer term, the following criteria should serve as a guiding framework:

- **Platform, not single-point solution:** SD-WAN is one of the first virtual network functions (VNF) to be deployed, but the enterprise will be deploying a number of additional VNFs not necessarily from the same vendor that need to co-exist and often be integrated. Therefore, a flexible platform that will enable current and future VNFs is essential.
- **Carrier-grade:** Because SDN services are mission critical, the level of reliability and time to repair are essential.
- **Superior digital experience:** Enterprises need comprehensive and customizable visibility into network and application performance at various levels. This visibility should be provided through a user-friendly digital interface and should be accessible through a single pane of glass or on a mobile device.
- **Professionally managed:** Because of the complexity of the software-based environment, it is important to have the assurance and expertise of an experienced managed services provider to complement the self-management capabilities for these services.
- **Support for hybrid and multi-WAN:** Given that some companies will retain their MPLS circuits as they adopt SD-WAN, the ability of the vendor to support both environments with the expertise to dynamically direct traffic across both environments is essential.
- **Built-in security:** Because of the inherent vulnerability of software to security breaches, the right solution should come with embedded security.
- **Dynamic scalability:** As connectivity needs grow, the platform should support the expanding needs with minimal disruptions to the business and ideally without having to swap hardware.
- **High-throughput network:** The underlay network, preferably from the same vendor, should be high capacity, unconstrained and continuously evolving.

## ActiveCore: Leading Enabler of Software Defined Services

ActiveCore is a cloud-based, carrier-grade SDN platform that enables network functions and brings agility to the network environment. It is an enterprise-targeted, software defined, gigabit-ready networking platform, purpose built for the digital world. It was developed to meet the digital transformation needs of modern enterprises to deliver agile, secure, reliable and cost-effective network solutions that scale. ActiveCore is powered by the largest converged IP last-mile network in the US.

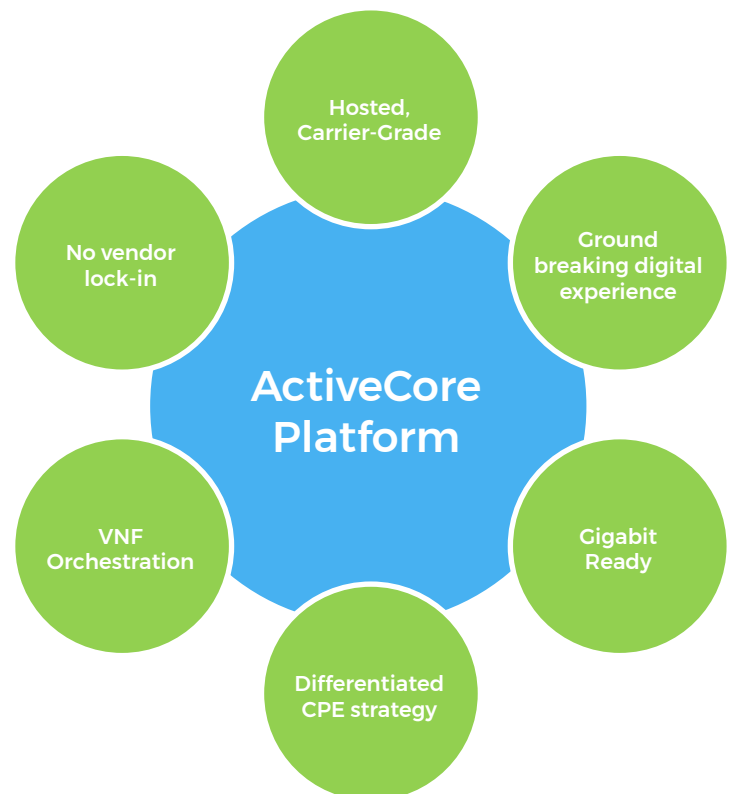


Figure 4. Pillars of ActiveCore

## Hosted, Carrier-Grade

Unlike prevalent one-point solutions, such as SD-WAN or firewalls, ActiveCore is a platform that powers services for enterprises today and is continuously evolving to support their transformation needs. Enterprises typically do not have a firm grasp on their needs and often do not have nor can they easily source the talent required to operate and support such technologies as software defined networking, which is a young and immature technology. This is why they require a solution that evolves with their needs and that can support them through their digital transformation journey.

Moreover, the vendor space for these services is very crowded and is slated for massive consolidation. Therefore, enterprises should avoid being locked-in with one vendor or one technology, particularly because their needs will continue to change and because some vendors may not be well-equipped to meet their future requirements. This is why a hosted solution with full management capabilities that powers best-of-breed services from an experienced Tier 1 service provider is the right solution.

Software defined services are mission critical in most organizations. It is essential that companies partner with a provider that can offer the highest level of reliability and support, that has an extensive network with connectivity options to suit their needs, and that has the expertise to provide the right level of service that is commensurate with the changing needs of companies.

Although there are numerous DIY solutions on the market, it is recommended that companies contemplating a migration to software-based services carefully take stock of their inherent capabilities and resources and consider their future needs to make the appropriate vendor selection.

## SDN Orchestration with Deep OSS/BSS Integration

An essential part of the ActiveCore platform is the unique SDN orchestration layer that powers multiple virtualized services, thus reducing hardware, lowering costs and delivering greater scalability all the way to the edge. Some of the capabilities enabled by the orchestration:

- Configure and deploy services on demand.
- Virtualize and orchestrate network services.
- Simplify provisioning through centralized policy management.
- Manage services at a single site or across multiple sites easily.
- Optimize performance.

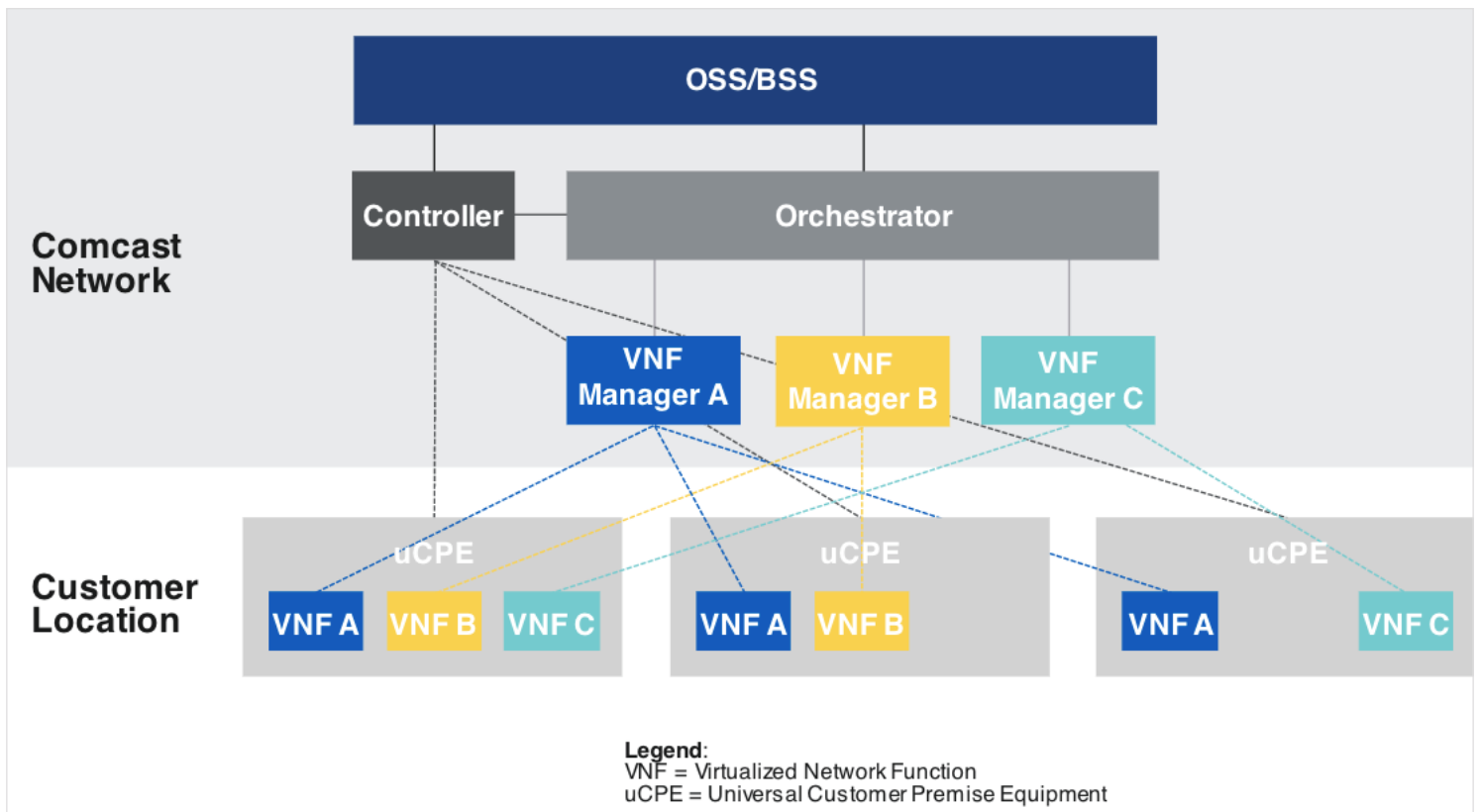


Figure 5. ActiveCore Delivers Orchestrated SDN (Source: Comcast)

The SDN orchestrator and controller are integrated with Comcast Business Office Support Systems/Billing Support Systems (OSS/BSS) that provide the orchestrator and controller with visibility into essential information such as network traffic, customer utilization and billing. This enables the controller to monitor the health of the entire network, including the virtual machines that each VNF runs, with insights down to the port and device level for all customers' sites and devices with notification when something is down or when performance is degraded because of jitter or another disruption.

The orchestrator provides users with the ability to manage, configure and execute policies based on information from the OSS/BSS and controller and on established rules/policies across the network and to take smart, appropriate action, such as adjusting traffic steering or other steps, to optimize network performance. For example, SD-WAN customers can intelligently monitor network paths and make changes in real time for functions such as path traffic steering and failover management.

Orchestration enables a software defined platform to understand and manage multiple services across the network, which eliminates service silos and vendors' dependence while delivering unprecedented network visibility and transparency.

The integration of the ActiveCore platform with Comcast Business OSS/BSS makes it a true carrier-grade solution that delivers an unprecedented level of visibility and control for applications and network traffic.

## Ground-Breaking Digital Experience

ActiveCore features an innovative and forward-looking self-service management capability designed from the ground up with the most advanced digital experience principles. It proactively delivers real-time actionable insights for better application and traffic management via a single pane of glass that enables the user to see, decide and act from one integrated view.

This management capability provides multiple levels of visibility across the customer's network, like a network on a map, via portal or mobile device. It enables the customer to look at each site, to see connections between sites, and to hover over a network map to observe the performance in any link. At each site, the customer can go deeper to pull out very detailed measurements and analytics. The customer has port-level visibility and packet-loss measurement even when the network underlay is from a third-party vendor (as long as it is provisioned through Comcast Business).

The digital experience offers a true single pane of glass. Unlike a traditional solution where the technician is monitoring a number of screens and correlating data from various screens, the ActiveCore portal offers a fully integrated and cohesive monitoring and management environment on a single screen, which leads to significant operation simplification. This experience caters to the network engineer that needs the ability to easily monitor the network from anywhere: a jumbo screen on a command center wall, a mobile phone or an Alexa-enabled device.

Highlights of the digital experience capabilities:

- Better visibility and control across the entire network from any device.
- Centralized management with push policies from one central location.
- Single pane of glass to manage all the customer's VNFs.
- Simplified policy management and control.
- Point, click, and deploy replaces costly on-site configurations and travel.
- Detailed, rich, site analytics that contain dynamic charts, enabling actionable insights into metrics such as capacity and performance, total VPN usage by transport type, VPN usage over time, most-used applications, top or bottom 10 sites by VPN utilization, WAN link utilization over time, latency, jitter, packet loss and comprehensive network statistics.
- Simultaneous provisioning of multiple network functions.
- Alexa skills for intuitive voice control.
- Smartphone application with network and application visibility on handheld devices.
- Ease of use throughout the experience.

The ActiveCore digital experience is available over a desktop portal or a mobile device and can be controlled via Alexa.

ActiveCore Web Portal	ActiveCore Mobile App
<ul style="list-style-type: none"> <li>• Insights: Personalized Notifications</li> <li>• Site Detail Pages with Rich Site-Specific Analytics</li> <li>• Site-to-Site Connections</li> <li>• Network Analytics</li> <li>• Service Automation</li> </ul>	<ul style="list-style-type: none"> <li>• Insights: Personalized Notifications</li> <li>• Site Detail Pages with Rich Site-Specific Analytics</li> <li>• Site-to-Site Connections</li> <li>• Network Map with Landscape View</li> <li>• Voice Activated Amazon Alexa Skill</li> </ul>

Table 1. ActiveCore Portal and Mobile App

The web portal provides a rich set of capabilities. Examples include site utilization, analytics on both the WAN and VPN capacity and performance, and administration and access-control of accounts.

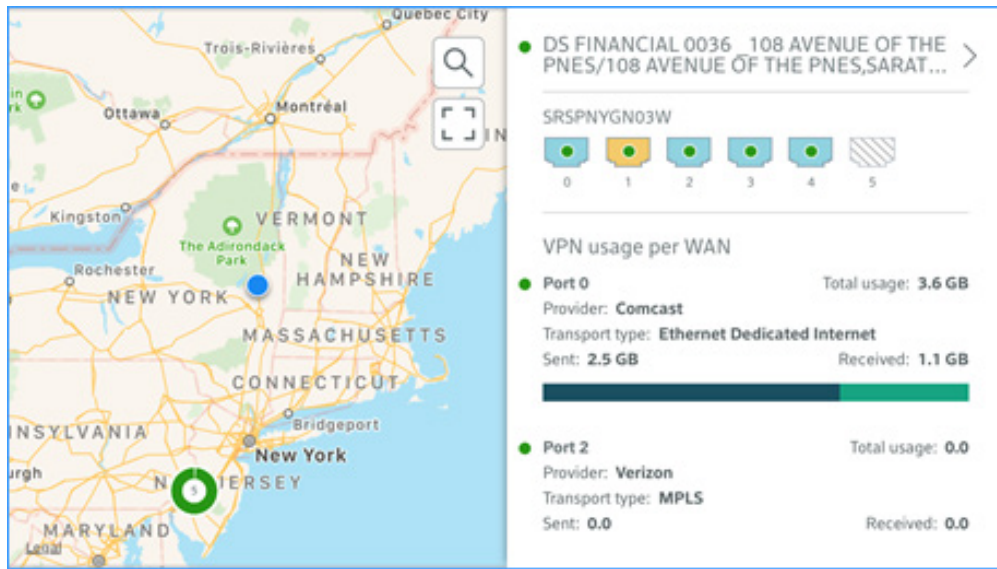


Figure 6. Visibility and Management Capability across the Entire Network in the Portal (Source: Comcast)

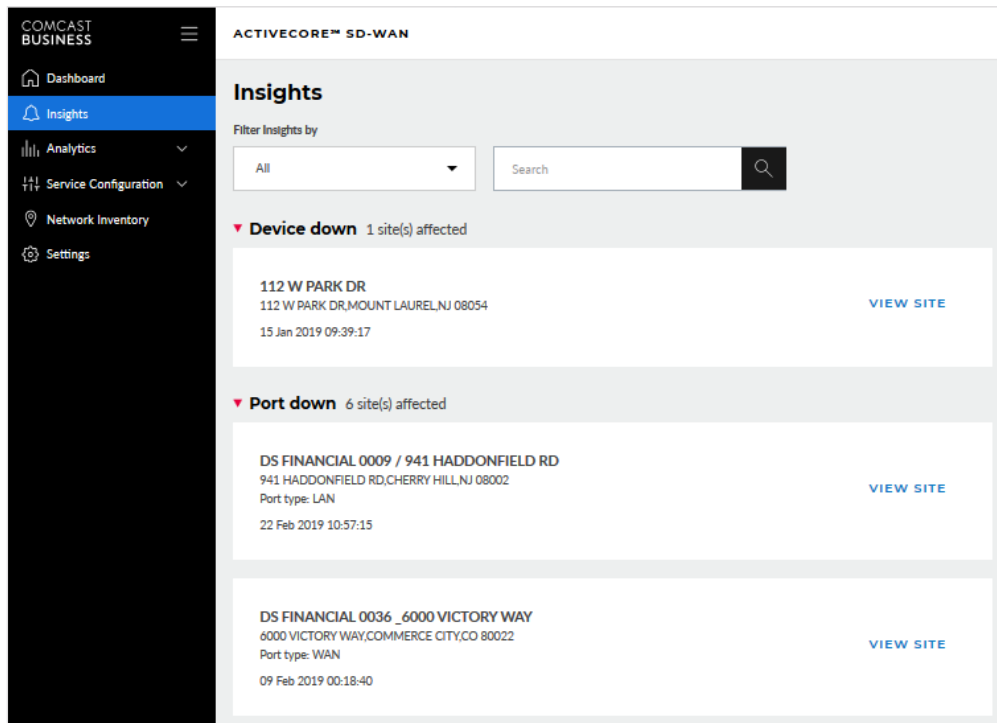


Figure 7. In-Depth Analytics in the Desktop Portal (Source: Comcast)

The mobile application also provides extensive monitoring capabilities, a network in the pocket. This includes an advanced network map in landscape mode with mini-site details and site-to-site connectivity.

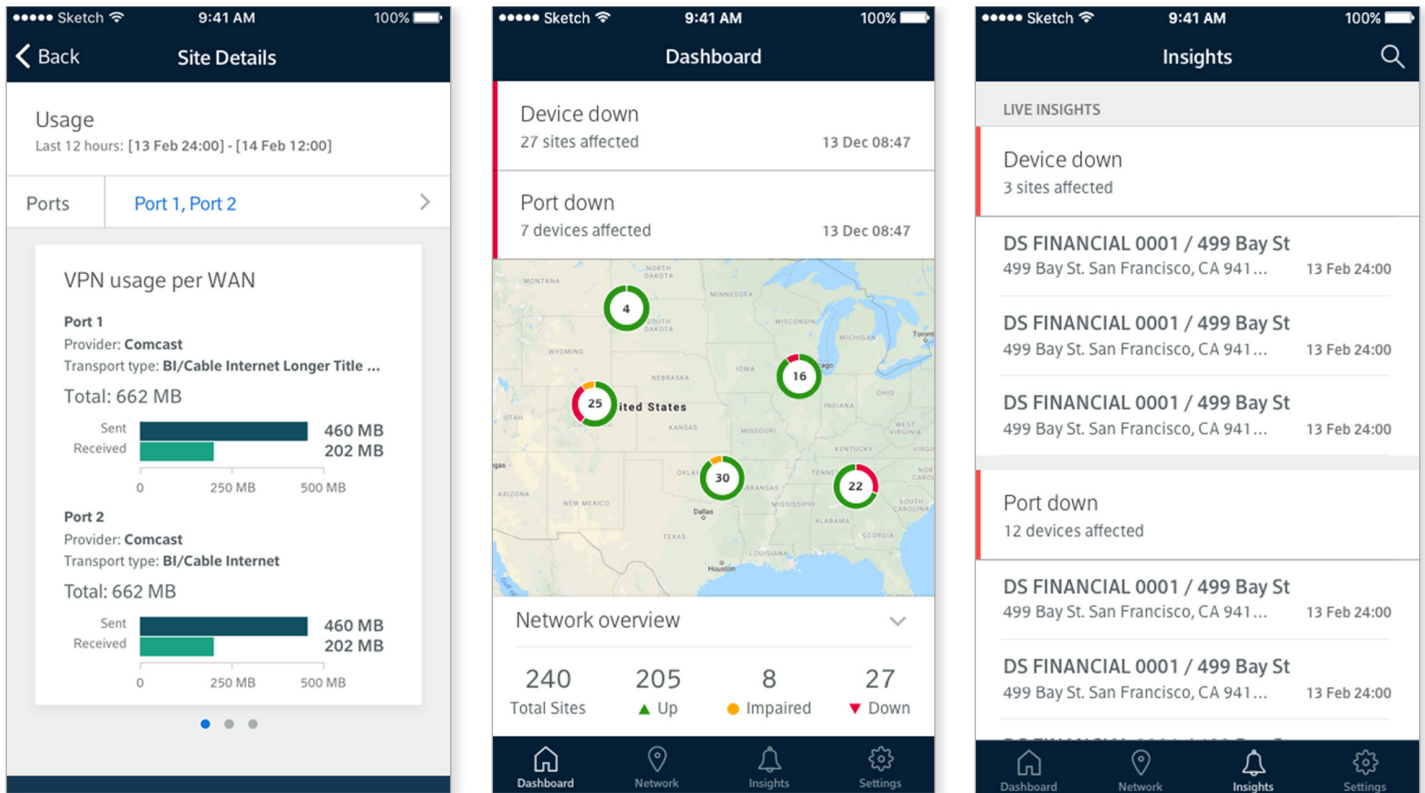


Figure 8. Network Insights, Accessible Anywhere on a Mobile Device (Source: Comcast)

## Differentiated CPE Strategy

The ActiveCore platform is complemented by a differentiated universal CPE (uCPE) at the customer's location. The most prevalent uCPE is an eight-core box with capacity to support multiple VNFs and to scale as the customer's needs grow. This enables the customer to increase its bandwidth consumption from 50 Mb/s to 1 Gb/s even with a Layer 7 firewall without the need to swap the uCPE and without a truck roll.

Comcast Business is leveraging its extensive experience in designing and developing CPE and its manufacturing partnerships to completely redesign the uCPE. The new Comcast Business uCPE will use the latest Intel chips and its expertise in design optimization to introduce a high-performance CPE at a very attractive price<sup>2</sup>. The Comcast Business designed uCPE will be introduced by mid-2019. In addition to its custom designed uCPE, Comcast Business is developing a vCPE solution with secure Layer 3 site to cloud. The vCPE will be introduced by mid-2019, offering another CPE alternative for enterprises.

## No Vendor Lock-In

In a crowded market ripe for consolidation and in an environment where the customer's needs are evolving, it is important not to be locked in a solution that may not meet future needs. ActiveCore offers such flexibility. It has an abstraction layer for all vendors underneath as their solutions are implemented as VNFs. If a vendor no longer meets the needs of a customer, a new VNF will be swapped, and the complexity of the change is hidden from the customer. In the near future, the customer will also be able to bring its own VNFs, which will also run over the ActiveCore platform. To ensure seamless performance and service chaining across the VNFs, the VNFs are tested and cross-checked against a list of supported VNFs.

## Built for the Gigabit Future

SD-WAN is the first service on the ActiveCore platform, but there is a continuum of services at various stages of the planning process with the goal of meeting the customers' transformation needs. In defining the roadmap, Comcast Business listens closely to its customers to better understand their current and evolving needs. Rather than replicate existing services in a software paradigm, the services and applications being planned are those that will carry customers into the digital future.



2018 was the year of fast-market adoption of SD-WAN. 2019 is the year of the VNF. Comcast Business will introduce a number of VNFs over the ActiveCore platform in 2019:

- Advanced firewall with planned support of 1 Gb of bandwidth.
- Software defined router.
- Virtualized unified threat management.
- WiFi.
- Virtualized SBC, which will enable ActiveCore to support unified communications.

## Leverages Comcast's Extensive Experience in Delivering Cloud-Based Solutions

Comcast has been delivering cloud-based solutions for over 10 years. Its X1 solution is a forward-looking, cloud-based entertainment platform that offers an integrated viewing experience and enables current and future pay-tv services. The X1 is widely deployed across North America and serves millions of customers for a number of service providers. The extensive experience gained in developing, deploying and managing the cloud-based infrastructure that underpins X1 across multiple networks provides the solid foundation that underpins ActiveCore.

## SD-WAN, First Service on the ActiveCore Platform

SD-WAN is the first service introduced over the ActiveCore platform; it engenders significant benefits to the enterprise as it brings more intelligence to the WAN.

- For companies that have branch offices or multiple locations, SD-WAN extends the benefits of SDN across a distributed enterprise. It brings intelligence to the network that does not exist in traditional WANs, enabling smarter, more efficient routing of traffic.
- SD-WAN enables application-aware routing, which allows IP administrators to determine the most intelligent path for their applications and to prioritize applications for bandwidth utilization; they can also dynamically update policies for optimal application performance across the business. This eliminates bandwidth constraints. SD-WAN is centrally managed; all provisioning and changes are done from one location, resulting in significant operational efficiencies and in a better managed, large-distribution enterprise network. Centralization leads to faster IT deployments.
- SD-WAN enables improved security because security policies are centrally managed and can be changed and propagated quickly to mitigate security risks. Comcast Business SD-WAN solution includes a stateful firewall to meet security needs, which is essential given the increasing number of security breaches<sup>3</sup>.
- SD-WAN mitigates the need to connect all branches to the headquarter, which leads to unnecessary traffic. As applications increasingly move to the cloud, SD-WAN offers secure cloud connectivity, thereby delivering better efficiencies and lower costs to the branch locations.
- SD-WAN frees the enterprise from the complexity and costs of MPLS. It allows the customer to use multiple broadband internet connections from various providers or to combine internet and private IP for enhanced business continuity, automatic failover, and digital performance monitoring.
- Comcast Business SD-WAN can be delivered over the Comcast Business network or over the top on the customer's own broadband. In both cases, the customer receives the same level of service from Comcast Business. Comcast Business also works with the third-party connectivity provider on behalf of the customer to resolve any connectivity issues when the third-party connectivity is acquired through Comcast Business.
- Comcast Business SD-WAN scales dynamically. The uCPE most broadly installed has eight cores and is attractively priced, making it suitable for customers that are starting out and allowing them to grow utilization without the need to swap the CPE. The same uCPE supports a customer's applications in addition to SD-WAN and enables service chaining for certain VNFs.

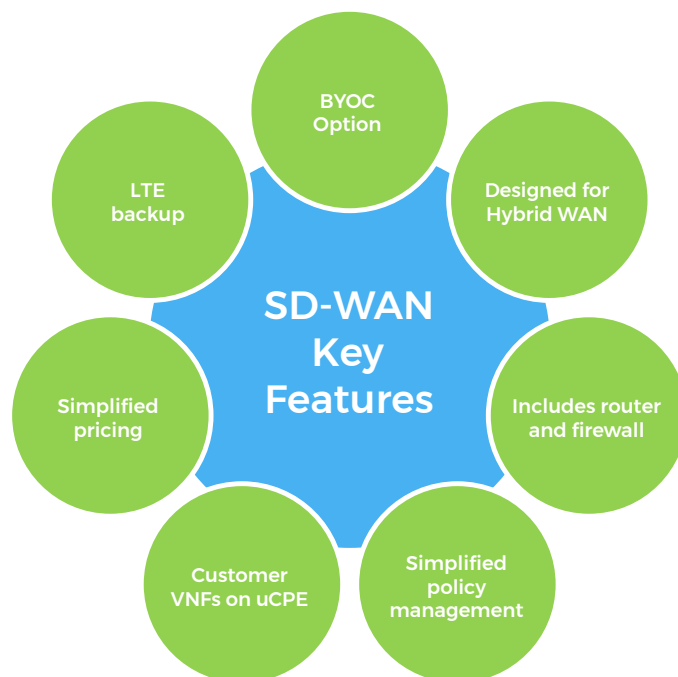


Figure 9. Comcast SD-WAN Key Features

## Disruptive Pricing

Unlike prevalent SD-WAN solutions that offer tiered pricing based on bandwidth consumption levels, Comcast Business SD-WAN service pricing is flat-rate, independent of consumption. This differentiated approach is customer friendly as it enables businesses to have a better grasp on their spending and simplifies the budgeting process.

## Wireless Backup

There is an LTE based backup solution for Comcast Business SD-WAN that consists of a professionally installed cellular router for auto-failover and fallback, has a universal power supply with battery backup, and an external antenna for best cellular coverage.

Wireless backup has a flat monthly pricing scheme and no added cost for cellular usage (throughput will be throttled beyond 5 gigabits/month). This eliminates the guesswork for companies that must rely on LTE in case of connectivity failure. The flat rate pricing is unique in the industry where customers are typically charged based on bandwidth consumption.

## Professionally Installed, Co-Managed

The SD-WAN installation is complex and touches all mission-critical applications. Customers sometimes do not have a good grasp on their existing networks, which are often over a decade old. A professional install from a provider with deep experience and extensive capabilities is an imperative. Although some enterprises with a deep IT bench elect the DIY approach, the majority of enterprises need the skill and expertise that a service provider brings.

Comcast Business SD-WAN service is professionally installed in all customers' locations. Customers are provided with a rich set of monitoring and management tools within the digital experience solution. Comcast Business also offers a deep level of support, empowering customers to make changes and to manage their service or to seek support from Comcast Business as needed. Comcast Business provides 24x365 support.

## The Option of Single Point of Contact

Customers that buy connectivity in addition to SD-WAN from Comcast Business have access to a single point of contact to manage SD-WAN and the underlying connectivity. This is true even when the connectivity is not provided by Comcast Business but is obtained through Comcast Business. Comcast Business works with the connectivity provider to shield the complexity from the customer and to mitigate the proverbial finger pointing in case of fault. For the customer that already receives other services from Comcast Business (example, voice), it reduces accounting and account management complexity and streamlines the service experience.

## One of the Fastest, Best Last-Mile Networks

SDN delivers significant efficiencies and security at a lower cost. However, the promise of SDN does not get realized if the underlay network does not have the throughput, reliability, flexibility and affordability. Companies that are looking to migrate to an SDN environment need to be sure that the networks that will power these services have a high level of throughput, reliability, security and flexibility and that it meets their bandwidth requirements today and in the future<sup>4</sup>.

The real game-changer is pairing a carrier-grade platform, ActiveCore, that combines virtualization and network orchestration with gigabit speed broadband. The gigabit network eliminates bandwidth barriers, the leading cause of application degradation, and enables companies to innovate faster, support new business endeavors better, and optimize resources throughout the enterprise. Gigabit speeds also result in price compression, enabling cloud-driven benefits and improved performance.

Comcast Business owns one of the largest converged IP networks in the United States, which reaches to the building level. It has invested extensively to build a broadband network that is bringing the fastest and most reliable Internet speeds to the most customers. Comcast Business fiber-based is continuously upgraded and during the last nine years, Comcast Business has boosted its available broadband speed numerous times, recently reaching the gigabit level.

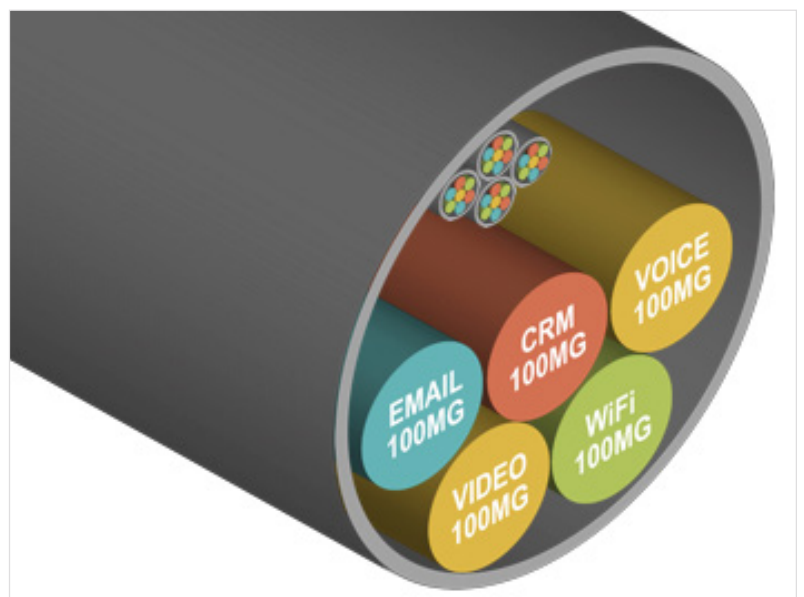


Figure 10. Gigabit Bandwidth Eliminates Bandwidth Constraints

# Powering the Branch of the Future

Branches are the power horse of revenue generation for most enterprises, and yet, for a long time, they were hampered by arcane technology, limited connectivity, and applications that often had to be hair-pinned through corporate headquarters.

Today, the branch can benefit from gigabit connectivity at about the same price of what a T1 circuit was not too long ago. It can benefit from running applications in the cloud (examples, UCaaS, Office365) with secure and reliable connectivity to the cloud. The branch now has the tools to prioritize applications and can garner much better visibility into the utilization of its bandwidth and systems, thereby gaining efficiencies and a better understanding of its customers' behavior and needs.

An essential application for the branch is unified communications, which now can be hosted in the cloud and can be managed by the SD-WAN capability. Another must in the branch is security, which is also be enabled via ActiveCore.

Given the new branch capabilities, companies will shift more revenue-generating tasks to the branch, which are typically closer to the end customer; this should improve revenue generation and lead to a better customer experience.

## Conclusion

To remain competitive, companies need new capabilities that are delivered over an SDN service architecture that has separate control (overlay) and data (underlay) planes. These capabilities should be delivered over a carrier-grade network and managed by a network operator that plays a major role in the installation process, particularly when the business is migrating from a legacy to a hybrid environment. The service provider can also take on the complexity of the management and upkeep of the services.

In the short term, companies are gravitating to SD-WAN as an essential capability to manage their networks and applications, but they are also already on-boarding myriad other SDN services. It is essential that SD-WAN and other SD services are delivered over the same platform to ensure seamless and integrated functionality and service chaining across the various VNFs. The service delivery platform should provide an intuitive and comprehensive service management capability that provides rich visibility and various levels of service administration.

Comcast Business offers this solution; its ActiveCore platform is the foundation for the software defined services of today and tomorrow. The platform is complemented by comprehensive service management capability, an advanced, high-throughput, high-reliability network, and the backing of a major service operator. ActiveCore was not born of legacy; software is its DNA, and it will power the networks of tomorrow.

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## Comcast Business

has the largest IP network in the nation, serving the needs of small business through large enterprise customers. Technology solutions range from fast, reliable Ethernet and Internet connectivity to voice, video, and Managed Solutions. Comcast Business is powered by an advanced Gig-ready network and 24/7 technical support. Comcast Business offers a secure, high-performance, scalable system designed for heavy data processing loads, enhanced application performance and secure access to cloud or data center. Advanced network solutions to help create those memorable experiences. Comcast Business – Beyond Fast. Data. Voice. Video. Managed Enterprise Solutions

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1 <https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white-paper-c11-741490.html>

2 Comcast does not derive profit from the CPE.

3 Cisco VNI study: DDoS attacks are projected to double to 14.5 million by 2022 globally.

4 Cisco VNI study reports that bandwidth speeds in the US will double by 2022.