Powering the Digital Economy

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Summary

The world economy is transforming at an unprecedented rate as newer technologies and interconnectedness drive profound changes in people's behavior, in how business is conducted, in how governments operate, and in every aspect of life. In early 2020, the entire world embarked on a crash course in digital engagement in response to the new environment brought on by the COVID-19 pandemic. This experience is likely to further accelerate the adoption of digital solutions at massive scales. Fundamental to the success of this transformation is an underlay connectivity infrastructure that is throughput intensive, reliable, flexible, automated, and secure.

Consumer and business applications are increasingly hosted in cloud environments and delivered as anything as a service (XaaS), requiring the right connectivity and security; the fast-changing market environment requires an agile, highly scalable operating environment with service velocity and continuous adaptability. Furthermore, as Internet connectivity permeates every aspect of life, Internet of Things (IoT) use cases expand to deliver the data insights provided by connected devices and sensors and enables new solutions, processes, and business models. Automation, already a fast-growing trend because of its impact on cost and agility, will be adopted at even higher rates and machines will increasingly run things, governed by humans. As digital technology increasingly shapes life in the personal and professional domain and enables a rapidly growing number of tasks and processes, artificial intelligence and machine learning will become engines of execution.

The adoption of these digital solutions on a wide scale is predicated on continued innovation in the fundamental network technologies and on the service provider's proficiency in adapting for real-world use cases. In the enterprise, high throughput connectivity needs to be complemented by applications such as SD-WAN, WIFI, security, UCaaS, and others; IoT needs to be enabled at a large scale. These solutions should not be considered in isolation but should be delivered over a common software defined networking (SDN) platform that provides orchestration and enablement for these capabilities as software applications or virtual network functions (VNF)s and provides the frameworks for the addition of other VNFs in the future. These solutions are complex and are evolving constantly, requiring dedicated resources and continuously changing skillsets. Therefore, it is recommended these solutions be managed by a service provider that has the depth and breadth of skillset and resources to provide continuous management, monitoring, and the flexibility to scale as the needs of the organization evolve.

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Trends Shaping the Digital Economy

The coronavirus health crisis has accelerated the bandwidth growth trends and spotlighted the digital era to come. Broadband networks have become the fabric keeping the world connected while enabling the delivery of essential services such as telemedicine, eLearning, virtual office, and others in the effort to facilitate social distancing to mitigate the spread of the global epidemic. Reports from Comcast show significant increases in conferencing and VPNs and a 32% overall rise in traffic (Figure 1) across its United States footprint. Although it is assumed that temporary intense usage will taper down over time, some of the new usage patterns are expected to persist, driving even larger increases in bandwidth consumption and adoption of digital services worldwide.

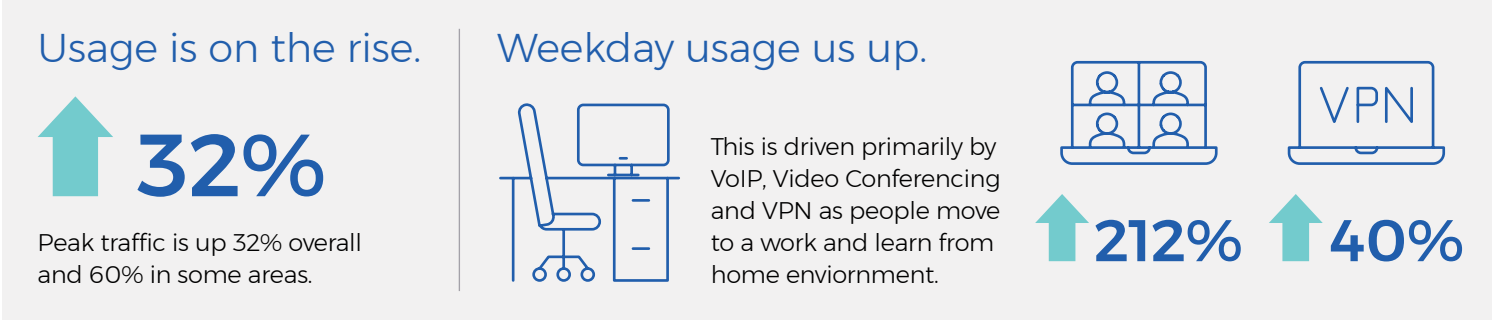

Figure 1. Comcast COVID-19 Network Stats

At the same time, new technologies are leading to unprecedented change across the world with far-reaching impact on people's lives and work: Augmented Reality (A/R), Mobile Internet, Internet of Things (IoT), Artificial Intelligence (AI) and Machine Learning (ML), Robotic Automation, Blockchain, Digital Experience and X as a Service (XaaS).

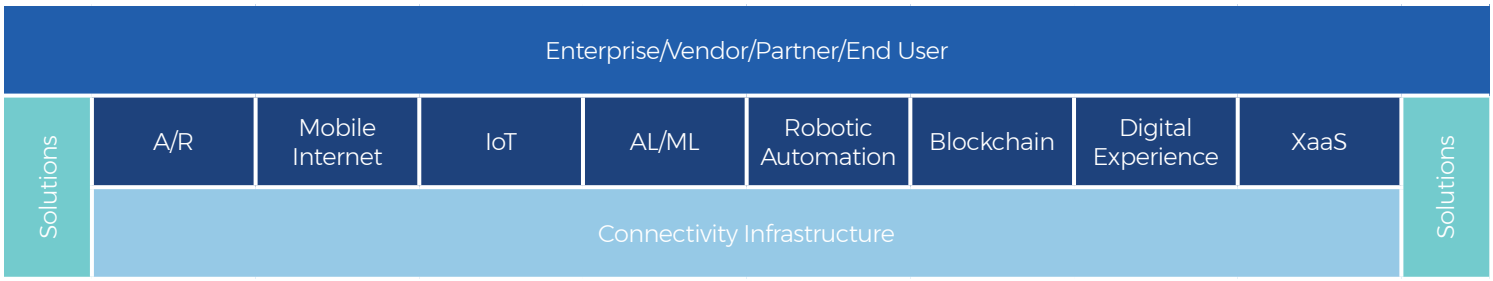

Figure 2. Enabling the Digital Economy

These technologies are having a profound impact in all verticals and leading to meaningful changes at a societal level, shaping consumers' behavior and thus both consumers' expectations and buying preferences that drive business to adapt. Never was a time where connectivity was more important to enable these fundamental capabilities; this phenomenon is likely to grow even more as the world becomes more digital, with service provider competition displacing legacy technologies and making next-generation alternatives more affordable, reliable, and mainstream.

The Digital Enterprise

The enterprise is transforming at a rate unprecedented in its history. This disruption will have long-term effects and will result in a significantly increased prevalence of information technology trends requiring reliable Internet connections. These trends vary based on the size of the enterprise, vertical, and other factors. However, common threads of these trends are finding their way into companies of all sizes and types as they show promise of creating economic value either by optimizing operations or by unlocking new revenue-generation opportunities. Figure 3 identifies some of the major trends in the enterprise.

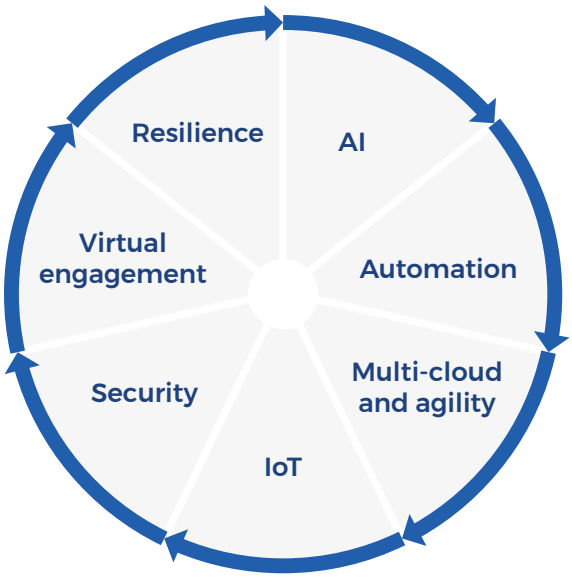

Figure 3. Major Trends in the Digital Enterprise[1]

Automation

Automation is making significant inroads into the modern enterprise as managers realize the opportunities for increased productivity, lower cost, and improved customer experience. Capgemini Research Institute predicts that wide-scale adoption of automation could result in up to $471 billion in cost savings by 2022 across the automotive, retail, utilities, and manufacturing sectors. For enterprises to realize the potential of automation, they need networks with low latency and high reliability.

Microservices-Based Services in Multicloud Environments

Business applications are often modularized into interconnected microservices, hosted in containers, and distributed to multicloud environments. Applications are developed and modified following Continuous Development/Continuous Delivery principles to meet the constantly evolving customers' needs and shifting market dynamics. To support such an environment, the enterprise requires a multicloud strategy and a resilient network that effectively and securely interconnects microservices and containerized applications and that enables continuous monitoring, assurance, and optimization. Furthermore, as enterprises become more distributed, branches need secure access to mission-critical applications hosted in multicloud and hybrid cloud environments; technologies such as SD-WAN enable such secure access. The recent trend toward work from home on a massive scale has further exposed the enterprise to cybersecurity attacks, leading many major SD-WAN vendors to provide business continuity solutions across the extended enterprise boundaries.

Internet of Things

Internet of things (IoT) has steadily generated cost savings and incremental revenue in the enterprise, and its penetration is projected to grow as it delivers operational efficiency, improves customers' experiences, resulting in further revenue opportunities while paving the way for machine learning and artificial intelligence. According to a study by McKinsey, IoT revenue will have a CAGR of 48% from 2018 to 2023.

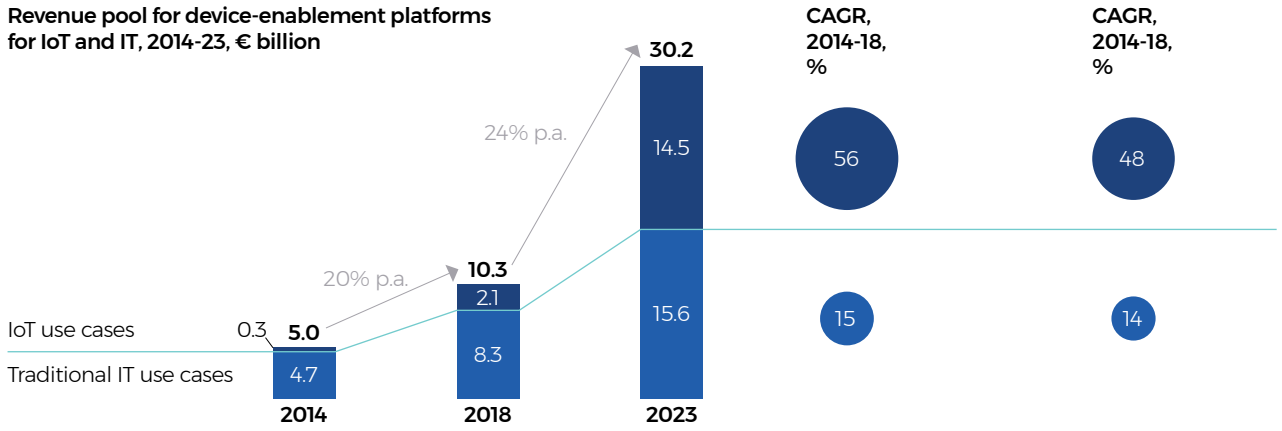

Figure 4. IoT Revenue Growth[2]

Virtual Engagement

The virus crisis has also demonstrated the importance for businesses to provide alternate means for its workers, customers, and other constituents to stay engaged. For example, companies mandated work from home arrangements, and schools hosted classes online. Firms and other institutions need to have the right connectivity, security, and other solutions to enable such engagements for business continuity.

Business Resilience

Many businesses operate globally. As businesses face the reality of disruption to global supply chains, and strive to support a mobile workforce, they require complex technologies and infrastructures. They need to create contingency plans and effective and agile response mechanisms to remediate any disruption in normal business operations. To this end, companies require an agile, resilient, secure network with backup capability and with sufficient capacity and throughput that 1) enables them to respond to changing market needs and business interruption; 2) enables them to connect with their workforce, customers, and other stakeholders virtually, if needed; and 3) quickly recovers any data losses and restores services. They also need the right visibility to understand how their networks are performing to improve resiliency and enhance application performance.

Machine Learning

Machine learning (ML) has been driving significant cost savings in the enterprise, leading to operational improvements and optimizing the use of automation. The global market for ML is expected to grow from $7.3 billion in 2020 to $30.6 billion in 2024[3], a CAGR of 43%.

Artificial Intelligence

AI is still a nascent technology, but many critical applications are building upon subcomponents of AI, such as speech recognition or statistical learning, to gain efficiencies and return on investment. As these subcomponents improve and are paired together, organizations come closer to harnessing the potential of AI. According to Satya Nadella, CEO of Microsoft, "AI is the runtime that is going to shape all of what we do." Nowhere is this truer than in the enterprise, and enterprises should be laying the foundation to enable AI to remain relevant.

Edge Computing

Edge computing enables a distributed network infrastructure. Processing is moved closer to the input devices thereby reducing latency, mitigating bandwidth consumption, which results in an improved customer experience and more efficient operations. This trend will further accelerate the displacement of legacy network architectures.

Solutions That Power The Digital Enterprise

The modern enterprise is at the heart of the digital economy and of the technology-enabled disruption happening worldwide. Powering this disruption are services and solutions delivered over a state-of-the-art platform, often managed by a service provider, and supported by high-throughput, reliable, and scalable connectivity infrastructure.

Managed Services

As the complexity of the IT environment in the enterprise grows, companies of all sizes are turning to specialized service providers to manage their evolving infrastructure, particularly as they often lack the expertise and bandwidth to manage this complex environment. The managed services market has grown significantly in recent years. The global market was valued at $185.98 billion in 2019 and is projected to grow to $356.24 by 2025[4]. Figure 5 shows managed services gaining traction in the enterprise today.

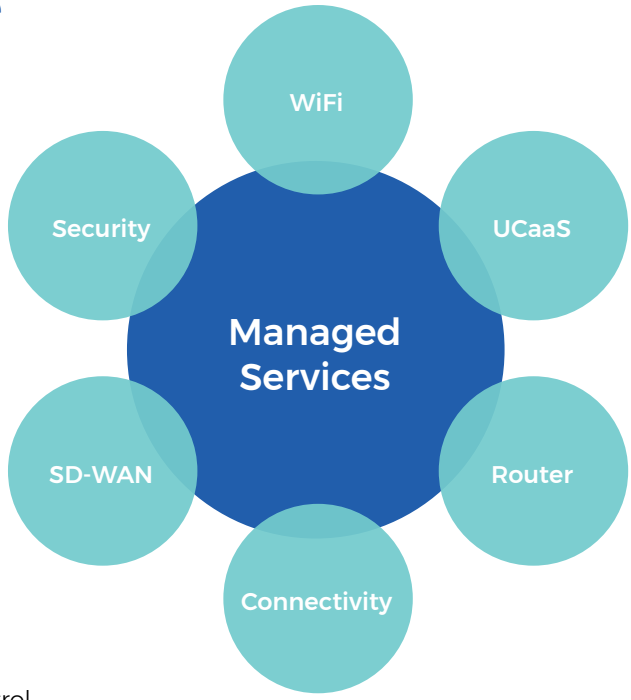

Figure 5. IT Managed Services

Software-Defined Wide Area Network

Software-Defined Wide Area Network (SD-WAN) relies on centralized control, abstraction, and automation to deliver the following capabilities:

- Policies-driven application prioritization for optimal performance and bandwidth utilization, irrespective of the underlay network.
- 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 that results in more uptime, better efficiency, and an improved user experience.

An SD-WAN solution should be agnostic to connectivity, giving customers the flexibility to select the optimal connectivity solution, such as Ethernet, broadband, MPLS or even 4G cellular.

SD-WAN is a complex solution. Although DIY solutions dominate in the enterprise, the market has been steadily shifting to managed solutions. In 2019, ACG Research estimated that service providers accounted for 47% of vendor SD-WAN revenue, and that share is expected to grow to 61% in 2023.

Managed WIFI

A superior WIFI experience is essential to attract, engage, and retain customers and to enhance employees' productivity. However, delivering such an experience requires managing and securing a private WIFI network, which necessitates significant resources to implement and maintain. Therefore, it is recommended to seek the resources of a managed services provider that can deliver the configuration, management, and monitoring on an on-going basis.

Managed Router

In the modern, distributed enterprise, routers play a fundamental role in keeping information flowing efficiently and securely. These routers need specialized expertise to configure and manage and for setting up virtual private networks and redundancy. Enterprises often lack this skillset or cannot afford to dedicate the right level of resources to this task.

Managed Security

Security is increasingly a strategic initiative in the enterprise, particularly as the workforce becomes more mobile and the network parameter expands, exposing the growing network to more security risks. Most enterprises lack the skills and resources to provide adequate high-availability levels of security, including firewall, intrusion detection, content filtering, anti-viral services, and others. The enterprises need an end-to-end Unified Threat Management (UTM) capability delivered by a provider that offers these state-of-the-art solutions with deep capabilities for configuration and continuous management and support.

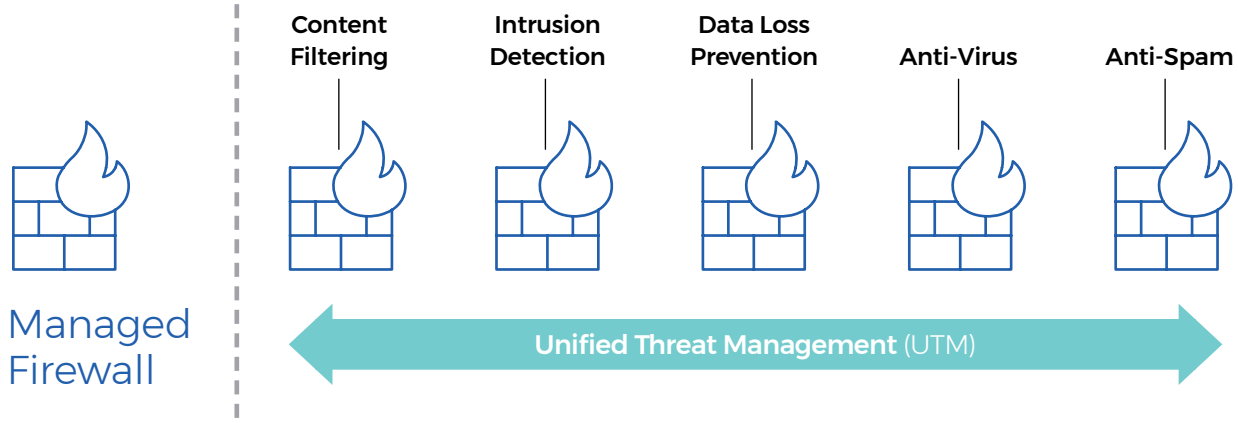

Figure 6. Managed Unified Threat Management

Managed UCaaS

Unified communications as a service (UCaaS) provides cloud-hosted, managed solutions for voice, instant messaging, video conferencing, file sharing, and others. As the communication needs of the enterprise evolve, retaining on-prem equipment results in stranded capital and obsolete equipment. Cloud-hosted solutions, combined with dedicated, skilled management enable scalability, high availability, reduced maintenance cost, and adequately support a mobile workforce.

Fast, Reliable, and Scalable Connectivity

None of these essential services are possible without a fast and resilient network backed by the full resources of a major service provider. Connectivity is the nerve center of any enterprise, and now more than ever, firms need redundant network connections that help minimize the impact of downtime to ensure resiliency of critical applications. Network redundancy can be achieved either through an additional (potentially lower cost) wireline option or by a wireless solution (4G Long Term Evolution and eventually 5G) or both. As the needs of a company change, managed connectivity enables it to adapt by quickly adding the needed connectivity, which could be delivered over fiber or Hybrid Fiber Coax.

Software Defined Networking to Power Managed Services

Software-defined networking (SDN) uses cloud computing principles to enable an intelligent, software-based, centralized control of the network and cloud-native orchestration (including cooperative orchestration with other cloud providers), leading to efficient, dynamic network management and improved performance. When paired with a reliable gigabit network, SDN reduces complexity, automates network functions, speeds up application deployment, and simplifies resource management, resulting in business agility and innovation velocity. To realize the full potential of SDN, a multi-touchpoint digital customer experience for management and monitoring of the platform is essential.

The right SDN solution is the ideal vehicle to deliver managed services as VNFs over a common platform. Managed services include SD-WAN, WIFI, router, and security. Rather than siloed solutions, a common orchestrated platform enables a comprehensive approach that optimizes the capabilities to best fit the needs of the business.

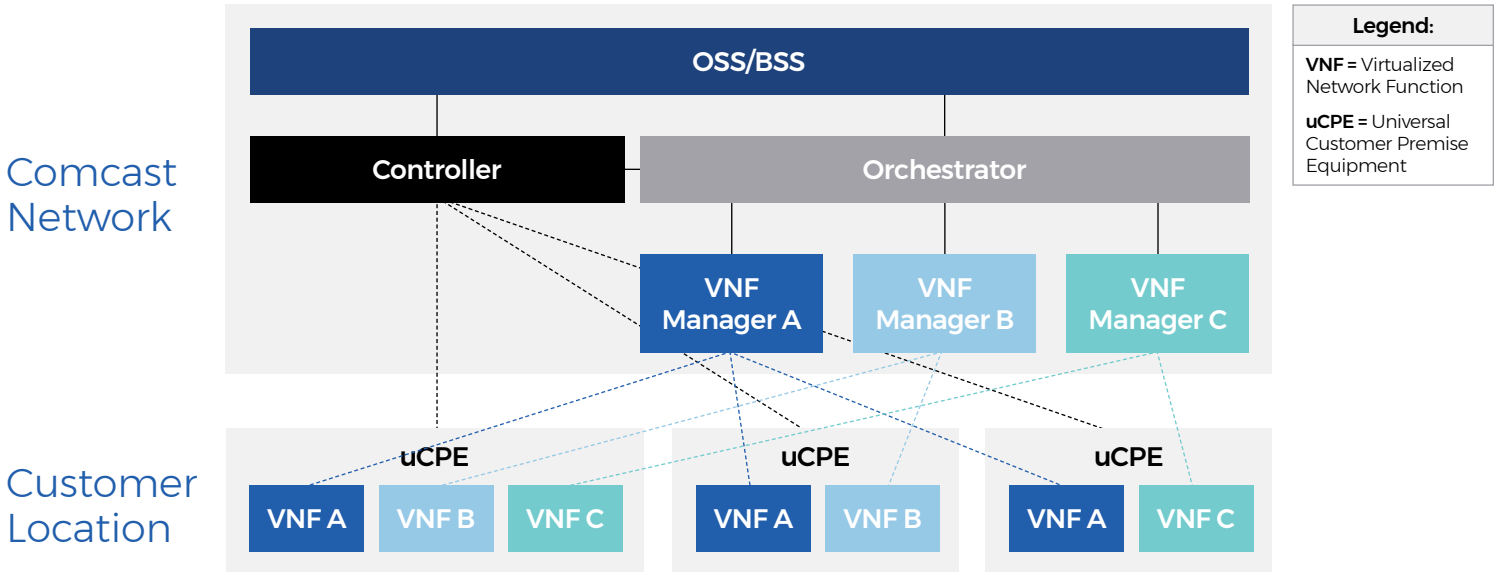

Figure 7. The ActiveCore SDN Platform (Source: Comcast)

An essential component of the SDN platform is a digital monitoring and management capability accessible via multiple touchpoints, including mobile devices and voice recognition.

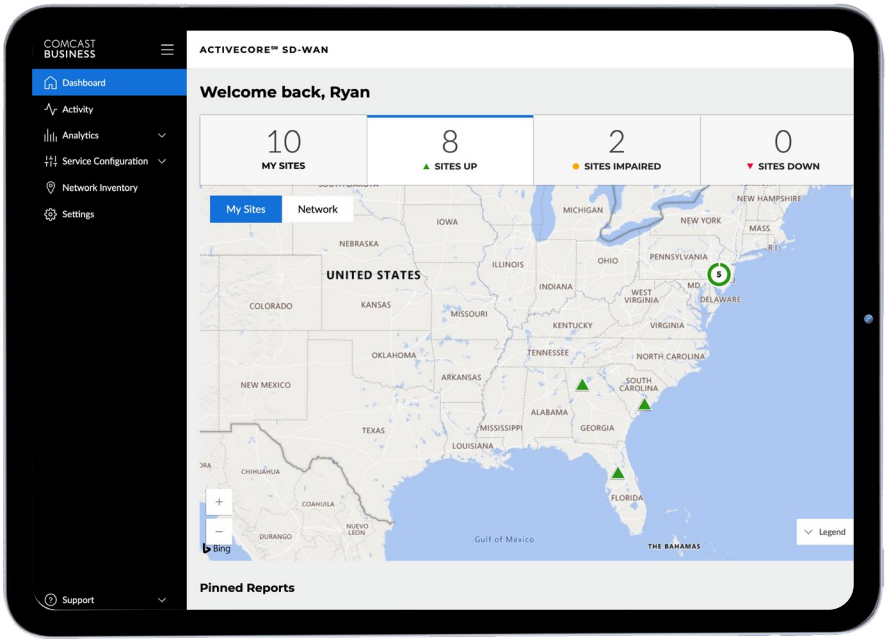

Figure 8. Example of a State-of-the-Art User Experience (Source: Comcast)

Digital Transformation in Major Industry Verticals

The following are real-life use cases that highlight how these solutions are gaining traction and creating value in major verticals.

Healthcare

Technology has brought a massive change in the healthcare industry, leading to improved diagnostics and treatments. Telemedicine had already been making inroads into conventional medical practices and saw further mainstream adoption as a result of the COVID-19 crisis. Telehealth benefits have been expanded to patients covered by Medicare, Medicaid, and other providers, enabling people to receive care at home or even remote ICU care in the hospital. This expansion of telehealth has profound implications in driving broader adoption of technology across the healthcare ecosystem.

National Healthcare Provider

A national medical solutions company with 600+ facilities across 50 states recently implemented a managed SD-WAN solution and managed broadband from Comcast Business. The managed solution includes:

- ActiveCore SDN platform.
- High-speed broadband connectivity.
- Enhanced digital experience for network management and control.

This implementation enabled the healthcare provider to streamline network management, increase network capacity, and to gain a greater ability to optimize performance and run new applications—all much needed when healthcare providers are under great strain to increase capacity and deliver new applications, such as telehealth, at scale and almost overnight.

Education

Educational institutions are integrating online learning tools in their delivery of education. The widespread adoption of eLearning has enabled digital classrooms and business as usual coursework to be sustained at massive scales with surprising efficiency. Although some of the measures seen at the end of the 2020 school year were a temporary response to the COVID-19 crisis, many of these experiments will certainly drive an increase in digital learning.

Texas Southern University (TSU)

TSU is located in Houston, Texas, and serves 9,000 students in 11 colleges and schools and has 1,400 faculty members. On a typical day, each student brings three to four connected devices and other technologies that need to be supported. The Internet and WIFI provide the essential fabric for research, classroom education, digital learning, and other campus services. The existing 1 Gbps connectivity was straining to keep up with demand.

TSU turned to Comcast Business to deploy 10 Gbps Ethernet Dedicated Internet line to serve 40 residential dorms and classroom facilities on the 150 acre campus. With bandwidth increased 10x, TSU has enough capacity to deliver the services its students, faculty, and staff need throughout its campus.

Consolidated High School District 230

Another key concern in education is security and particularly the rise of DDoS attacks. Consolidated High School District 230 in Orland Park, Illinois, with three high schools and more than 8,300 students is reliant on cloud-based applications and has a growing ecosystem of integrated systems and tools. The system was experiencing an increase in DDoS attacks. The district retained the Comcast Business DDOS Mitigation Service and Ethernet Dedicated Internet. These solutions enabled the system to proactively monitor, detect, and mitigate threat through a portal that provided automated notifications and event information that is remotely managed by Comcast Business.

Financial Services

Financial services firms need to improve their connectivity to provide an omni-channel experience to their customers; they also need cost-effective resilience, state-of-the-art security, application prioritization, and secure connectivity to cloud applications. During the pandemic, the financial industry, like most white-collar industries, was forced into a work-from-home arrangement, while at the same time shifting most of its services to virtual channels. This raises important security challenges for the industry in addition to the broad-based issues related to a sudden shift of their operating environment to a virtual one.

The Philadelphia Federal Credit Union

Has 11 locations, serving more than 118,000 members. Its infrastructure was MPLS based, making it expensive, difficult to maintain, and constrained in supporting high-bandwidth applications. The business selected Ethernet Dedicated Internet combined with SD-WAN from Comcast Business to increase bandwidth, provide greater network visibility, control, and significantly reduce the cost of delivering services.

A bank with over 2,600 branches

Needed to replace its legacy MPLS network to improve performance, improve resiliency with two connections per location, and enhance operational efficiency. Managed services from Comcast Business combined with DOCSIS connectivity enabled customer-defined priority maintenance services for all sites and improved connectivity, resulting in a reduction in costs and streamlined management.

Retail

Providing an omni-channel experience to its customers has been the modus operandi for the retail industry in recent years. However, the COVID-19 crisis has led to sudden shifts in consumers' behavior and product demand and to disruptions to supply chains and logistics. This is leading retailers to expand self-service technologies, to invest in automation, to explore the use of AI for better consumer targeting, and to use contactless payments, among other things.

A leading grocer and retailer

With over 2,500 locations across 35 states needed to improve customers' digital engagement and personalized experiences, increase bandwidth, and lay the groundwork for future innovative solutions. It turned to Comcast Business as a single provider for all locations nationwide for a full stack of managed services: broadband, connectivity, router, firewall, UTM, 4G business continuity, monitoring, and help-desk support, combined with deployment, maintenance, and professional services.

Government

Governments operate within a central mandate of protecting citizens and providing services. Although governments at all levels have been adopting technology in delivering their essential services, this process has increased in orders of magnitude during the COVID-19 pandemic. For example, everything from the Supreme Court to Congress to the presidential campaign have moved to a virtual format. Although some of these measures are temporary, the reliance on technology to reach citizens, to conduct business, and to deliver services will increasingly become an essential component of the long-term operating framework.

The US Department of Defense

Was directed to migrate to Ethernet-based services to reduce costs. The Defense Information Systems Agency needed to replace 17,000 legacy, point-to-point PSTN circuits with Ethernet connections across 48 states and the District of Columbia. The agency awarded Region 1 to Comcast Business to establish Commercial Ethernet Gateways in the Northeastern United States. Comcast Business will deliver its Ethernet Virtual Private Line service and a flexible Ethernet solution that will improve application performance across a network with a private, point-to-multipoint network design between several locations.

Hospitality

Delivering the right broadband experience has become an essential ingredient of a differentiated customer experience in the hospitality vertical.

Choice Hotels

Required a robust, high-bandwidth solution to satisfy the needs of its guests for streaming video, downloading large files, and running a myriad of bandwidth-intensive applications. It turned to Comcast Business for high-speed Internet solutions to meet guests' needs and to deploy an array of back-end, cloud-based operational systems. The solution includes Ethernet connectivity with symmetrical fiber-optic bandwidth, network monitoring, reporting, and 24/7 guest and hotel support.

Conclusion

As the world economy is transformed, the enterprise is transformed out of a necessity to compete. As such, channeling disruption into positive outcomes is essential to the long-term sustainability of the enterprise. The ability to sustain agile adaptation to market needs and to modify services or introduce new ones quickly is becoming a core competency required for the 21st century. With this agility predicated upon XaaS and a complex, interconnected digital technology environment, the importance of the fundamental networking technology that delivers application performance to end users is increasingly a competitive differentiator. Delivering, maintaining, and evolving these capabilities is a complex process, especially given the fast rate of change and technology innovation. Turning to a service provider with extensive capabilities to offer managed services with deep levels of support is the recommended approach to facilitate digital transformation.

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1 Reshaping the Future (automation use case survey), Capgemini Research Institute, 2018
2 https://www.mckinsey.com/industries/private-equity-and-principal-investors/our-insights/growing-opportunities-in-the-internet-of-things
3 https://www.marketresearchfuture.com/reports/machine-learning-market-2494
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