EBOOK

CenturyLink Adaptive Networking
Modernize the network. Transform the business.

IT Leaders: Empower your digital business with a modern and pragmatic network approach to achieve success in this application economy.
450,000 route miles of fiber across 60+ countries to deliver connectivity, cloud, security, voice and managed services for your needs.

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   • Solution choices
   • Expertise & experience
   • Global set-up and ready connectivity
Enterprises today are faced with two realities that mandate the modernization of their core network infrastructure.

First, there is the upcoming wave of massive connectivity from the acceleration of the industrial Internet of Things (IIoT), 5G and Wi-Fi 6 networks. These are opportunities for businesses to run modern workloads at edge locations, allowing them to be closer to their customers and market opportunities.

At the same time, network upgrades are also needed to support their lines of business, which are increasingly permitted to spend on technology, independent of their IT organization.

Both trends demand that the enterprise network be modernized to support business agility from the core to the edge, in alignment to three new fundamentals.

The 3 new fundamentals of network modernization

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<tr>
<td>As more enterprise applications and data get centrally hosted on the cloud or in the data center, enterprises need reliable and secure connectivity to meet demands for anytime, anywhere access.</td>
<td>In today’s expanded business ecosystem, digital continuity is a priority as it allows more stakeholders to effectively collaborate in support of the value chain.</td>
<td>Enterprises are generating more big data than ever, and the ability to collect, move, analyze and store it as close to real-time as possible, is becoming a strategic advantage.</td>
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Adaptive networking is an approach that can help enterprises meet these demands without a hefty overhaul. By transitioning the archaic physical infrastructure to software-centric architectures, the network becomes much more flexible and efficient at scaling to meet myriad granular demands, which it does easily with optimized network management and control, as well as frictionless protection of network and data.
A business-led future of connectivity

Against a backdrop of 5G and edge compute, you need to prepare for the business-led future of connectivity, by enhancing your existing network infrastructure on the three design principles of adaptive networking:

- **Programmable** – A software-based platform that can spin up, tear down and optimize network capabilities on demand, to control the way workloads are distributed, accessed and secured.
- **Autonomous** – A self-provisioning, self-diagnosing and self-healing global ecosystem that intelligently guides applications and workloads from their respective locations to a litany of devices and users.
- **Instantaneous** – A network built for reliable connectivity, improved security and low latency access to recent and relevant data used, which continuously adjusts workflows and processes while in motion.

The CenturyLink® Adaptive Networking approach defines the strategic augmentation of your current network capabilities, to help deliver the uninterrupted, always available connectivity that goes to the very heart of your customer experience.

What goes into an Adaptive Networking approach?

- **Embed expansive, proactive security** – to protect network and data against sophisticated cyberthreats increasingly prevalent across the hybrid network environment.
- **Introduce intelligent, centralized and automated control and management** – to easily manage and scale resources, as well as analyze and report network utilization via an online portal.
- **Augment network with customized solutions** – to boost network capabilities without changing physical infrastructure or adding proprietary hardware.
Supercharging your network upgrade

To accelerate your business growth, on-demand scaling of network is crucial. Adaptive networking allows you to evolve at your own pace, by providing you with a modern network infrastructure that gives you a competitive advantage.

Companies have already deployed a mix of adaptive networking technologies

![Chart showing percentages of companies using different networking technologies]

- **66%** for Software-Defined WAN
- **61%** for Hybrid WAN (MPLS + Broadband)
- **61%** for Ethernet WAN

Source: [IDG Market Pulse – How a Software-defined Network Advances Digital Transformation](source_url)

However, a network upgrade is a difficult endeavor, and it is one which you do not have to go at alone. You can free your internal IT teams from all the heavy lifting when you partner with a trusted network technology leader to leverage rich networking experience, certified experts, industry best practices and advanced tools.

CenturyLink can supercharge your network modernization with a comprehensive choice of adaptive networking solutions complemented by our IT consulting and managed services.

- **CenturyLink® SD-WAN** to evolve your network as your business transforms
- **CenturyLink® Content Delivery Network Services** to facilitate distribution of content worldwide
- **CenturyLink® Wavelength Services** to right-size and scale your network with up to 100Gbps connections

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1. [NetworkWorld white paper, WAN Transformation: Real-world Experience and Advice from IT Leaders](source_url)
SD-WAN to power up your hybrid network

Manufacturing | Logistics | Transportation | Retail | Energy

Keep your branch and remote offices connected, wherever they are located. That is the promise of today’s SD-WAN – the network overlay technology that aggregates multiple high-bandwidth connections to enable fast and low-cost Internet access with full redundancy.

SD-WAN helps you to enable and optimize both connectivity and cloud access to:

- Multiple branch and satellite offices
- Remote and offsite operations
- Industrial IoT and other distributed networks

CenturyLink® Managed Hybrid SD-WAN

<table>
<thead>
<tr>
<th>Network speed</th>
<th>Network availability SLA</th>
<th>Network response time</th>
</tr>
</thead>
<tbody>
<tr>
<td>80%</td>
<td>99.999%</td>
<td>milliseconds</td>
</tr>
<tr>
<td>performance improvements</td>
<td>consistent uptime</td>
<td>(down from 10-20 seconds)</td>
</tr>
</tbody>
</table>

Source: Network World, WAN Transformation: Real-World Experience and Advice from IT Leaders, April 2019

CenturyLink provides carrier-agnostic and end-to-end managed SD-WAN hybrid connectivity to deliver a secure, cloud-friendly and dependable user experience. Complemented by our depth of expertise in system architecture, network deployment and infrastructure management, you will be guided to shrink administrative overheads, reduce implementation risk and cut network complexity – without disrupting your existing WAN connectivity.

USE CASE | CenturyLink SD-WAN to connect 400 sites

<table>
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<tr>
<th>Customer: A reverse logistics company for medical waste and regulated substances that grew from a small start-up to become a leader in the specialized waste management business.</th>
<th>Challenge: Over 300 acquisitions in a 25-year history has weighed the customer’s network with more than 200 network vendors across 400 operational sites in the Americas. It needed depth of expertise and breadth of experience to transition to a modern network.</th>
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<tr>
<td>Solution: CenturyLink Managed Hybrid SD-WAN provided the overlay network for consistent business rules and capabilities. This is backed by 24/7 proactive monitoring and management, and a managed, multi-layered, network-based security solution. As a single source solution, it further aggregated and simplified management of network vendors to reduce network and administrative overheads.</td>
<td>Outcomes:</td>
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<tr>
<td></td>
<td>• IT staff freed to focus on driving core business value</td>
</tr>
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<td></td>
<td>• Improvement of network and admin cost with price consistency</td>
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<td></td>
<td>• Increased branch office site reliability for cloud apps, SAP, etc.</td>
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CDN for customer experience excellence

Online Gaming | Music Downloads | Rich Media Advertising | Video Streaming | eSports

Move and deliver your content and multimedia services with a Content Delivery Network (CDN) to manage content, resolve conflicting infrastructure demands and support more workloads. With an integrated platform to run workloads on and off the cloud, you can improve customer experience, hasten market penetration and expand your business portfolio.

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<tr>
<th>CDN PoPs</th>
<th>Peak capacity</th>
<th>Storage hosting</th>
<th>Web delivery</th>
</tr>
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<tbody>
<tr>
<td>120 in markets across 6 continents</td>
<td>&gt; 120TBps</td>
<td>IBM Cloud Object Storage</td>
<td>AWS, Google, Azure and more</td>
</tr>
</tbody>
</table>


CenturyLink® Content Delivery Network (CDN)

CenturyLink CDN is a web delivery platform that supports developer native interfaces and customizable solutions, with a rich ecosystem of microservices and the ability to run on major public cloud platforms.

Experience exceptional content delivery:

- **CenturyLink CDN Mesh Delivery** for peer assisted CDN on a distributed software mesh architecture. Support live linear and on-demand video delivery, and manage peak traffic loads, to enable access to hard-to-reach locations without increasing infrastructure.

Experience exceptional convenience:

- **CenturyLink CDN Edge Compute** is a fully transparent, customizable and controllable edge platform that enhances edge compute at all PoPs by accelerating app development with containers and open DevOps.

- **CenturyLink Media Portal**, the online portal with a self-service menu for network traffic and configuration management and reporting, on-demand assistance and help, secure and private access to network and billing data, and more.

**USE CASE | CenturyLink CDN to bring high-performance network to video content platform**

**Customer:** Mangomolo is a media platform company with plans to bring its platform to new markets, thus allowing online, broadcast and video content distributors to deliver high-quality content with better audience analysis and automation of the Video on Demand (VoD) delivery workflow.

**Challenge:** As an ecosystem-centric business, Mangomolo needed a CDN partner with a global footprint to ensure excellent performance levels to customers, even when faced with spikes in traffic volume. Critical to the relationship is provision of responsive and supportive customer service.

**Solution:** CenturyLink CDN provided a reliable, secure, high-performance platform that scales quickly and flexibly, to serve the changing and growing needs of its customers. Importantly, it could cope with the unpredictability of the online video market by serving content to thousands of concurrent viewers.

**Outcomes:**

- A strong global IP backbone to deliver content
- High and consistent levels of performance as demanded by customers
- Ongoing high level of support to break into new markets
Wavelength for secure lit fiber

Retail | Mining | Banking | Education

The time has come when commercial Internet services, conventional leased lines, and even dark fiber are unable to support the agility desired by your business. You need to meet digital ecosystem demands with high performance, high reliability, point-to-point fiber connectivity of up to 100Gbps on a custom designed fiber network that can help you to:

- Deliver fast, highly available services
- Scale your network
- Streamline operations and reduce
- Secure your data

CenturyLink® Wavelength Services

CenturyLink® Wavelength Services offers dedicated point-to-point fiber transport to meet your data demands with speeds from 1 to 100Gbps. This is complemented by our professional and managed services to right-size and scale your connectivity for more cost-efficiency but fewer network elements.

To enjoy added value, CenturyLink® Encrypted Wavelength Service provides bigger bandwidth with physical layer encryption for more scalability, performance and efficiency with the protection of data while in motion.

CenturyLink Encrypted Wavelength Service

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<tr>
<th>Line speeds</th>
<th>Inflight encryption</th>
<th>TCO</th>
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<tbody>
<tr>
<td>up to 100Gbps</td>
<td>100% protection of data moving across fiber connections*</td>
<td>30-50% reduction compared to DIY*</td>
</tr>
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</table>

Source:
*TechTarget white paper, Encrypted wavelengths accelerate and protect the application-driven network
*CenturyLink Encrypted Wavelength Service webpage

USE CASE | CenturyLink Wavelength to deliver fast and secure connectivity to data centers

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<tr>
<th>Customer: A leading banking organization in South America wanted to provide continuous access to customer data, innovative investment applications and electronic platforms, by upgrading its bandwidth capacity across regional data centers.</th>
<th>Challenge: Needed high speed, resilient connectivity between data centers and regional and remote offices, to enable digital initiatives such as legacy platform convergence, automation, digital innovation and cybersecurity. Also, to reduce cost and complexity of network ops and lessen reliance on inhouse IT.</th>
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<tr>
<td>Solution: An implementation of 20G wavelengths from CenturyLink Wavelength Services to various operational sites. Bandwidth is cost-effectively customized to the connectivity needs of each location and comes with Advanced Encryption Standard (AES) 256-compliant encryption at the optical layer, for in-flight data protection without interfering with the underlying security program.</td>
<td>Outcomes:</td>
</tr>
<tr>
<td></td>
<td>• Customizable connectivity to optimize cost per bandwidth ratio by route and location</td>
</tr>
<tr>
<td></td>
<td>• Fast upgrade of bandwidth capacity in response to evolving customer needs</td>
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<tr>
<td></td>
<td>• Powerful combination of flexibility, scalability and resiliency to keep the bank at the forefront of customer service</td>
</tr>
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<td></td>
<td>• Avoided capital outlay and ownership of new network infrastructure</td>
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Adaptive network management is optimized

The enterprise network will only escalate in complexity as your operations grow. Hence, adaptive networking also factors optimization of network management with centralized control.

Central management and control

CenturyLink’s online portal centralizes the control of how, who, where, and when applications and data are accessed, with tools that allow you to:

• Visualize and control the vast array of network devices on a single management console
• Control the way your customers, employees, and information interact with your business
• See information delivered to users across private network, Internet, or wireless
• Shorten time to acquire, analyze and act on network performance

The portal interface for programmed intelligence in the network is highly responsive and available, and ensures tasks perform to expectations with:

• Automated network connectivity
• Automated response to the changing demands of the business
• Speed up action to an individual’s requests

Dashboard views can speed up response and scale with on demand adjustment of program policies done automatically.
Embedded security for expansive protection

With your network enhanced and optimized, your next step is to secure it against an increase in threat vectors. Being a trusted Managed Security Service Provider (MSSP), CenturyLink understands your constraints and can help to proactively capture and address threats before they impact your business.

CenturyLink® Adaptive Network Security

1. CenturyLink® Managed Firewall Services
   Secure Internet connections to your remote offices via cloud firewalls to enable the first line of defense at different perimeter touchpoints. Options include:
   • SD-WAN’s built-in firewall
   • Managed on-premise firewalls
   • Adaptive Network Security (ANS)

2. Protection against external threats to manage availability of services
   Only network-based distributed denial of service (DDoS) mitigation solutions can provide realistic protection of enterprise resources. CenturyLink® DDoS Mitigation services deliver a multi-layered global defense and mitigation strategy with up to 4.5Tbps of attack ingestion capacity, to effectively protect you from various DDoS attack types.

3. Proactive detection of insider and external threats
   To identify potential security issues and respond to them Management uses both log and behavioral analytics monitoring to detect malicious insiders and external attackers infiltrating your organization.

   Offered as a consumption-based service, it combines Security Log Monitoring (SLM) and User and Entities Behavioral Analytics (UEBA) to provide thorough and effective threat detection, thus minimizing the dwell time for attackers to seed secondary malware, RATs, backdoors and other APTs for damaging activities.

Bridge your security gaps

Expanding your enterprise network raises the risk of cyberattacks. CenturyLink’s security consultants can augment internal teams with specialized expertise and resources to enable wider threat visibility and better threat detection. By enhancing your security posture at the speed of evolving cyberthreats, we help your teams enable the holistic and continuous protection you need to grow the business.

Read the CenturyLink 2019 Threat Report.
CenturyLink is your trusted technology partner

No network modernization exercise is the same. We provide you with choices.

Our selection of proven service offerings are customizable solutions to help you scale the capabilities you desire, on-demand. When you upgrade your network with CenturyLink, you gain the global set-up and the local expertise to immediately:

- Scale bandwidth to 3x your current capacity on demand, automatically, or by time-of-day
- Connect your data center to the cloud in real-time
- Customize instantly with virtual functions
- Secure your data internally and externally with UEBA, 24/7 Threat Intelligence, DDoS Scrubbing Centers, and SOCs

Don’t do it all alone. We have the experts and the experience you can rely on.

We are the experienced technology leader to guide you through every discovery, design and deployment. Leverage the experienced technical specialists, support managers and technical advisors from our Managed Services & IT Consulting offerings, and benefit from more knowledge and best practices to maximize your business on a fully managed network.

At-a-glance

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<th>Operating System Management</th>
<th>Infrastructure Management</th>
<th>Managed Network Services</th>
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<tr>
<td>CenturyLink maintains and manages your Windows &amp; Red Hat Cloud Servers, 24x7.</td>
<td>Streamline your IT organization with a single source for Hybrid IT Infrastructure Management.</td>
<td>Take the burden off your IT team so they can focus on growing your business.</td>
</tr>
<tr>
<td>Professional Services</td>
<td>Application Management Development</td>
<td>IT Consulting Services</td>
</tr>
<tr>
<td>Leverage our design, engineering and operations expertise for a custom-built solution with an ongoing, global support team.</td>
<td>Optimize the applications that you employ to run your business.</td>
<td>Leverage our hands-on IT expertise, our deep technology understanding and our knowledge of best practices, for your business.</td>
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450,000 route miles of fiber to deliver connectivity, cloud, security, voice and managed services for your needs.
You want your operations to be where the action is. We are set-up and ready.

Build a responsive, secure and scalable network that can quickly adapt to meet the needs of your digital business. We have invested in infrastructure set ups around the world to be close to where you are and where your business needs to be.

CenturyLink delivers the desired adaptive networking outcomes

1. Connect from virtually anywhere, on any device
2. Share available bandwidth
3. On-demand scaling
4. Network resiliency
5. Instantly add, delete and connect features and services
6. Automatically respond to change
7. Analyze and respond to application needs
8. Capture and eliminate cyber-attacks before they occur

CenturyLink network is everywhere you go next
5 reasons why CenturyLink in Asia Pacific

1. Customer experience is at the heart of what we do – We are relentlessly committed to improving and delivering the best customer experience in the industry.

2. Dedicated local resources with language, business hour support and in-region knowledge – Our dedicated local account and support teams, paired with the local operations center, understand the power of the digital world and how that translates to the challenges you are facing.

3. Service flexibility and expertise to help enable digital transformation – CenturyLink has the right level of service flexibility and expertise to support you — so you can focus on business growth.

4. Innovative, enterprise-grade product portfolio and end-to-end IT solutions – Our broad portfolio of adaptive networking, IT agility and robust connected security solutions allows us to help you overcome your business and technology challenges to transform for the digital future.

5. Extensive global network across Asia Pacific, EMEA, Latin America and North America – Leverage our extensive global network to connect securely to the digital world, and to effectively scale and accelerate your business growth. Today we are serving Fortune 500 customers globally and are a wholesale partner of top Tier 1 carriers across the world.

Learn more

- Adaptive networking for on-demand scale
- Transform your hybrid network with SD-WAN
- CDN delivery of video, applications and more
- Wavelength fiber velocity of digital infrastructure
- Comprehensive holistic approach to cybersecurity

Call us today.

800 101 3231