HUDSON FIBER NETWORK

Business Networking 101

Understanding and Selecting the Right Network to Satisfy Team and Customer Demands in Today's Fast-Paced World

Abstract

Tens of billions of devices are connected to the internet right at this moment, and each depends on a strong network to operate correctly. Businesses just like yours account for a majority of these devices, and your customers are becoming the most demanding segment on the planet when it comes to network access and reliability.

How do you ensure your ability to provide the service and connection that your customers demand and that your team needs to meet those product and service demands?

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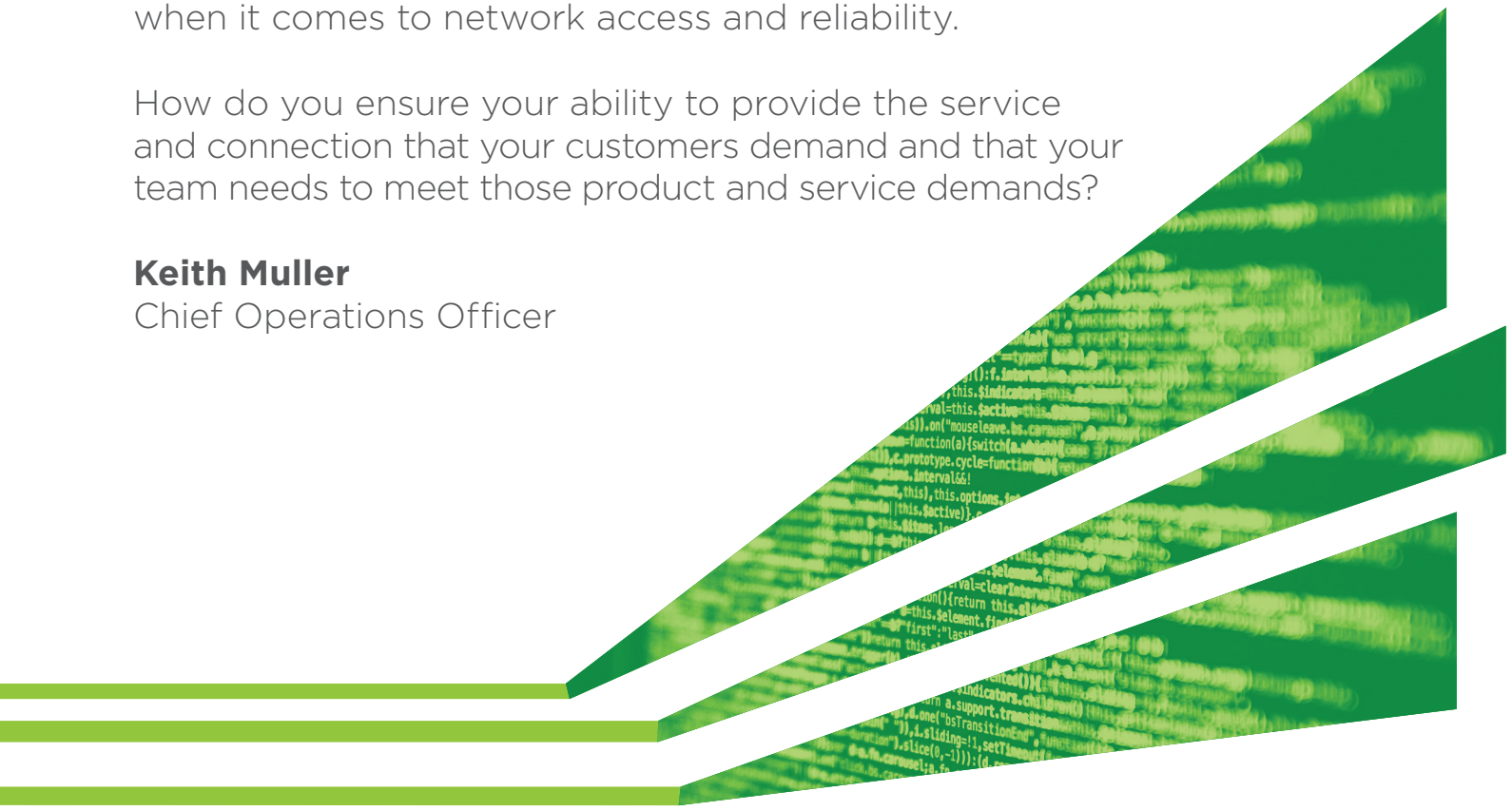

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Executive Summary

Tens of billions of devices are connected to the internet right at this moment, and each depends on a strong network to operate correctly. Businesses just like yours account for a majority of these devices, and your customers are becoming the most demanding segment on the planet when it comes to network access and reliability.

How do you ensure your ability to provide the service and connection that your customers demand and that your team needs to meet those product and service demands?

Purpose-built networks have become the most reliable model for businesses to use the latest in networking technologies, equipment, fiber, and wireless backhaul to meet the new economic models based on application delivery and overall connectivity.

Hudson Fiber Network has put together this report to look at some of the new advances that come with a purpose-built mindset, hoping it will empower you to choose the best network options to meet your unique circumstances.

Read on to understand our purpose-built philosophy, uncover new promises of Dedicated Internet Access, Colocation Data Centers, Dark Fiber, Software-Defined Networking, Ultra-Low-Latency Networks, and the unique capabilities of Private Networks.

Give your team the tools it needs to meet the demands of their applications and customer needs from social media and big data to custom architecture and other enormous data needs that exist today. It all starts with a little knowledge and understanding of what's available, what you need, and how to ask for it.

Custom, Purpose-Built Networks

Connecting your building to the internet to power your business applications has never been easier, and you've never had a greater number of choices for exactly how you want to get it done. It's a momentous time to be a customer, but there's a lot of complexity out there.

This report aims to help you understand the current state of affairs in building your best network, and we want to start with an overview of that network itself.

Gone are the days of a one-size-fits-all network build. You've arrived in the 21st century and now each network is built with a purpose, your purpose, in mind. You get to have the right network deployment that matches the speeds and reliability your equipment or customers demand while staying secure and strong so you can accomplish everything you need each day.

This purpose-built network design was created for IT managers, building owners, commercial realtors, office managers, and anyone else who might be responsible for the flow of data in their company or the building they own or manage.

Each section below will discuss a different aspect of the custom-built network you can have, from dedicated internet access and dark fiber to VPN support as well as when it's best to get a data center from a service provider.

To start with, though, we'll look at the overall benefits that companies just like yours achieve when they choose a purpose-built network design from a reliable service partner.

Where Does a Custom Network Design Benefit Me?

Tailoring your network to your needs and operations can help you maximize spend and get a network that can scale as you need it. Whether you have very fixed operations or your customers fluctuate and you want the ability to grow or shrink as needed, a custom network solution can help.

- Optimize your efficiency by customizing how your network operates, removing features and costs that aren't necessary, and freeing up your bandwidth to enable faster responses and smarter routing.
- Select the connectivity you need and whether max speeds can vary or if you needa consistent speed delivered at every moment.
- Choose the right equipment from server head-ends and routers to custom fiber, Ethernet over copper, wireless, and blended ISP solutions.
- Empower yourself with the security you need in a network that meets industry or federal requirements, such as those for healthcare companies or financial institutions.
- Safeguard everything you need and create with Layer 2 connections that minimize a hacker's ability to access your network.

Protect the data and functionality that you need to make your customers happy with a truly customized, purpose-built network.

What About Wireless Networks?

Carrier-class wireless networks are available as the main connection or as part of a larger networking plan so that you have access for all of your devices and backups in the event of an outage or damage to physical infrastructure.

Dedicated Internet Access for Businesses

When you make the jump from consumer-grade or small-business-grade internet access to a true business-class solution, you'll start to hear about a dedicated internet access (DIA) option for your connection. This contrasts with the standard "best effort" internet service.

It's important to note that these are business and service terms, not technological terms, so they aren't necessarily discussing equipment or delivery options like fiber optic cable. They're more about how a service provider is going to treat your business and traffic.

A DIA service is one where you get a specific amount of bandwidth that is dedicated for your use, and it is partitioned off so that no one else can use the bandwidth even if you're not using it at that moment. You get consistent speed, and you pay for a specific number, so you can plan business operations accordingly without a surprise that slows down your entire network.

A best-effort service is one where you subscribe to bandwidth with those "up to" speed promises, and you're getting a certain amount of bandwidth relative to what's available. Not everyone will be using all their bandwidth at the same time, so it means you generally get a good speed but it can vary significantly throughout the day — this is the commercial plan you have in your home.

You Shouldn't Risk Best-Effort

Sometimes the internet operates like an airline. When it comes to best-effort connections, service providers often oversubscribe the bandwidth they sell compared to what's truly available — just like how airlines overbook flights, and that means sometimes they must make someone take a voucher and get on a later flight.

Oversubscription can lead to customers not getting the bandwidth they think they're paying for from their provider. Peak traffic times come with congestion, especially when everyone is getting home from work or staying up late at night on Netflix, and that "up to 50 Mbps" service operates closer to 10 Mbps in reality.

That can be okay if it is just buffering the latest video or TV show episode. But, it's probably not okay if your core business functionality is delayed or even slowed down to a point where it can't operate. Downtime means lost revenue and angry customers, which few businesses can afford.

DIA Is a Smart Choice for Businesses and Buildings

A DIA service delivers consistent performance with guaranteed minimums and uptime, so your network is always performing properly. You buy a specific, rated speed, not a range or an "up to" qualifier. It's like getting your own private plane to take your data and traffic where it needs to go.

Don't get fooled by the business class seats; they get stuck just like everyone else when there's a big line or other congestion. DIA is a way for you to avoid all of that.

Most network operators can promise you a five-nine reliability (99.999%) thanks to delivery platforms like fiber optics or even high-capacity microwave networks in some areas. The service level agreement with your operator will spell out everything you need to know regarding speed, consistency, reliability, uptime, and maintenance or repair assistance.

Speeds You Will Want to Consider

Ethernet	**5mb-10mb** Right-sized for small and medium businesses who need reliable access and dedicated bandwidth but do not run intensive applications or have a large team.
Ethernet	**10mb-1000mb** Growing businesses that need high-speed, high-capacity access to support more robust applications and field services. Suitable for larger teams if your core operation does not involve delivering a high-traffic service.
Fiber	**10G to 100G** Ethernet is the go-to for large organizations as well as companies that are providing their own network to customers. It's ideal for data-intense applications including VoIP, web hosting, video, and highly interactive applications.

Data Centers: Understanding Colocation

You've heard a lot about data centers and they sound like an interesting prospect, but what does it exactly mean for your business and your building?

The biggest trend in data centers is colocation, where you or your business partners house networking equipment and servers you own within a third-party's building — the physical data center. Colocation is a common occurrence when you don't need your own entire facility, but many enterprises are also consolidating and building their own.

Colocation is the rental of space from a network service partner, so you own the server itself but are essentially paying for the space to house it in a secure environment. Your network partner provides the rest, including:

- Power for the entire system
- IP addresses
- Cooling systems
- Power backups
- Secure access
- And sometimes the cabinets that are used to hold your equipment.

Think of colocation as a way for you to benefit from the potential to scale your network and take advantage of cooling and other systems at a fraction of the cost it would take for you to install a server room in your own building.

Network latency also tends to be far lower, plus the trained professionals managing the equipment help to increase reliability and reduce downtime risks. Sometimes the risk mitigation is greater because a colocation area may have stricter controls for physically accessing the assets.

Essentially, you're taking full advantage of space and data center infrastructure, but you own the equipment and can control maintenance, upkeep and updates, configuration, and other aspects of your network that can be important in your industry.

Data Center Basics

If some of that went over your head, here's a quick primer on data centers.

A data center is a room or facility with networked computers, servers, and storage devices that can be used to process, store, and deliver enormous amounts of data, powering services from cloud applications to data analytics and streaming content from Netflix or YouTube.

Data centers have become modern focal points of businesses because they are often required for mission critical, daily operations.

Don't think of a data center as a specific, defined business or location. It is better thought of as a diverse collection of equipment that changes and adjusts dynamically based on the needs of your team and your customers. So, it includes all the connecting cables, power systems, switches, routers, firewalls, and much more.

That old thought of the internet like a web of connected computers has faded, but it rings very true with the data center.

With colocation and other services, your data center partner is also able to expand support beyond providing you with just this equipment. It can deliver managed services that work only within your network or help you connect to the public cloud to deliver more services and have greater options around storage.

Dark fiber, which follows this larger section on data centers, is another option you have to create a truly custom network designed to meet your business and building needs.

Speed and Cost Are Your Benefits

Speed is one of the chief reasons you might want to consider a data center if you're responsible for managing the internet and access for a building or a company.

It can be difficult to get a service provider to deliver 100 Mbps of bandwidth to each and every office, and sometimes it isn't cost effective. If your building's server room is not already set up, you would need a significant investment in renovations to properly prepare it for both speed and the ability to keep things cool.

And, once you fill up that space, you'd need to knock down a wall to expand further.

Data centers allow you to avoid these concerns by already having equipment and fiber to deliver high speeds to where your data is used, and all that equipment is resting in a properly controlled, safe environment.

The typical data center will also connect to multiple transit providers, so there's plenty of large-bandwidth pipes to deliver the speed you need. It'll be a better service for core functionality at a reduced cost compared to installing and running it all directly to your office building or suite.

Security on the Premises

Data centers need a design that specifically focuses on the best security and safety practices of the day. This covers everything from access points and security cameras to the need for large doorways and hallways, so your equipment has plenty of room to move throughout the facility during installation and upgrades.

Firewalls and monitoring should be a package with any of your hosted equipment, and your service provider should walk you through available options for intrusion-based security.

However, weather and accidents are also a factor. You know that keeping things cool is of particular importance, and resisting fire is another part of the same discussion. Fire suppression is an absolute must, but you also need a system that will operate safely with sensitive equipment.

Get a walkthrough of the chemical fire suppression systems —these starve a fire of oxygen — as well as backup generators and ask about other relevant natural disasters in your area, from floods to tornadoes and earthquakes.

There are a lot of threats to a data center, but leading networking support companies are building strong, reliable platforms that have protections and contingency plans for almost everything.

Working with the Cloud

Data centers operate in conjunction with cloud service providers, especially private cloud software. This allows you to get the best of multiple networking worlds.

Modern data centers rely on private cloud software for the virtualization of networked assets, allowing them to automate a variety of tasks from monitoring to traffic management, billing, and even giving you access to self-service tools for equipment management.

When you select an option that also has a cloud play, you'll be getting access to on-demand resources with interactions that won't always need an IT administrator to facilitate.

Public cloud services like Microsoft Azure are also making their way into data centers to create a new hybrid architecture. Ultimately this allows you to access a more robust network. Your data center partner is creating an environment that is fluid and facilitates better management of workloads, so you can run cloud instances when needed.

Dark and Lit Fiber: New Names and Deployments

If it's been a while since you've last put together a network or leased fiber from a provider, the terms lit and dark fiber could seem new and a little confusing. Thankfully, they're really just a new nomenclature for what you've already seen. The biggest revelation of dark fiber is that it is an option not previously available for most businesses looking to build out a network.

This section will look at the lit and dark ways of leasing fiber as well as benefits and drawbacks of each.

To start with, the difference between the two boils down to who owns the equipment on each end of the fiber and "lights" it, transmitting data across it.

A lit fiber lease means your service provider will own the equipment, so their assets will determine the bandwidth that can travel on the fiber. The service provider will also be required to maintain and operate the equipment, so you typically don't have that full cost plus you get more guarantees of reliability.

Dark fiber refers to the fiber optic cables that a service provider has already run in your area, but do not currently have in use so there's no customer traffic and no reason for the equipment to be lit. This agreement would have you make the most of the cables that are nearby – few providers will run a new cable just for your individual business.

So, dark fiber leases require you to provide and maintain the equipment that lights the fiber, taking away all the responsibilities of the service provider except for their maintenance of the fiber itself.

Benefits and Drawbacks of a Lit Fiber Lease

The chief benefit of a lit fiber lease is that you're paying for a full turnkey service. There's no need for you to maintain or operate the equipment — typically a WAN deployment — so that prices are fixed and overall operation is simple.

Speeds start at roughly 1G, and in some areas 10G, but typically can scale up in most metro areas or those with access to a fiber ring.

The peace of mind you get with a fully managed service does come with some drawbacks if you need or desire constant adjustments to your equipment. Changes will typically require the service provider to act, which may introduce delays into your plans.

Other challenges tend to be that upgrades to higher bandwidth allocations come with significant cost increases because you'll be paying for different equipment on both ends. Traffic can also slow down due to distribution on the fiber because it's hard to have edge site speeds equal hub speeds.

In some cases, lit fiber leases are subject to a greater number of outages because your service will be on a public network with multiple points of failure as your service provider changes, adds, or reduces their customers.

And, finally, you may need more space than your network alone would require at your installation space because of mandated equipment that often consumes more power and needs larger air-conditioning support.

Dark Fiber Benefits and Drawbacks

Dark fiber networks put the customer in greater control.

The core benefit of a dark fiber network is that you can increase the bandwidth of your network be changing the equipment you've got on each end of the fiber. Your cost to increase bandwidth comes from purchasing equipment only, so it's a one-time fee instead of a monthly increase in cost.

Dark fiber tends to be a more secure foundation for your network as well because the fiber route is accessible only at the two endpoints of the fiber run. You don't have public access points to deal with, so there are fewer opportunities for vulnerabilities that could allow malicious actors in — depending on your level of security already in place, this could mean a reduced need for additional firewalls.

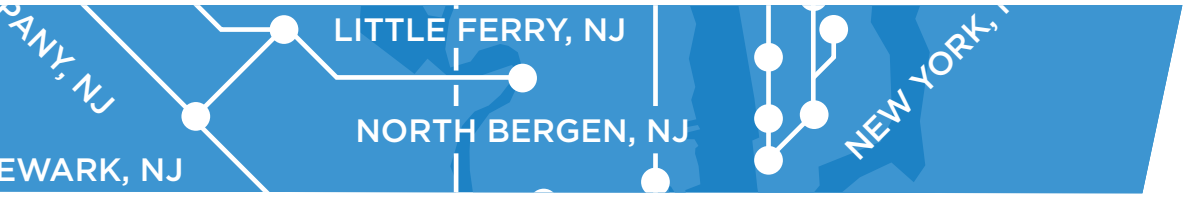
The security benefits are leading to a greater adoption of dark fiber networks by today's top healthcare, financial, and tech organizations.

Other major benefits are that you can make changes without needing the service provider, allowing you to minimize interruption and perform adjustments right when you need them. Many will tout this as "unlimited" growth — it does have a cap regarding achievable bandwidth, but this tends to be significantly higher than you can get through a traditional lit lease.

The downside is that not all service providers offer dark fiber, so its availability could be limited in your area. You'll also face a higher initial cost due to new equipment purchases.

You should expect additional costs for monitoring and to maintain this additional layer of your network. Sometimes this may mean new training or hiring depending on the size and knowledge of your IT team.

Low Latency: Understanding Why You Need It



In today's digital world, speed is money and security. That makes the currency of a robust digital network: latency.

Latency is the delay between when you give a system an input and when it performs the desired outcome. For networks, latency is specific to the time it takes for a packet of data with the instruction to get from one point to another. This speed is important because it limits what your network can do and how much strength or security it can give your team.

For your business's network, latency impacts how quickly your team can deliver a newsletter to thousands of subscribers, how quickly your IT team can identify and respond to threats or problems, or how smoothly a live-streamed demo of your new product goes.

Think of it like your garage door opener. You press a button while on the street, and it starts to open as you start driving into your garage. The door needs to be open before your car gets there. If your system has a high latency, it'll take longer for the garage door to start to open, and that could lead to an accident.

Today's Most Demanding Technology Requires Low Latency

The lower the latency, the faster things will run and fewer instances of delays or buffering you'll experience with network tasks.

The emergence of Web 2.0 technologies and services has increased the demand for rapid responses from gaming and video watching to stock options trading that happens in less than a second. Plus, there's tracking and adjusting entire networks of equipment for oil and gas production, broadcasting information, and managing your health record when you go to the hospital.

Today, the most current estimate of the impact of latency has determined that every millisecond of delay can cause $200 million per year in missed possibilities. Financial institutions are most at risk to experience these misses and losses, so they are often the most engaged in building out a low-latency network.

To help them and many other similar operations, a variety of specialty networks have been developed to meet specific requirements and use cases. You can benefit from these investments with cost-savings, support for unique services, and even error mitigation for large volumes of activity.

A robust action taken within a fraction of a second is no longer a problem or an impossibility.

Building an Ultra-Low-Latency Network

When you're considering a low latency network, you must find a provider who has experience with developing them for businesses like yours. There are a variety of unique characteristics of your business and daily operations that must be considered.

Thinking broadly, it is often smart to look at optical fiber bandwidth, ultra-low latency wireless, and hybrid solutions that are backed by fiber routes your provider owns. This range ensures that your partner will be well versed in managing low-latency networks and that you can trust their promise of delivery.

Based on today's current networking demands, ask your potential network provider about their work with the financial services industry. This industry has some of the highest needs and demands for ultra-low-latency networks. A proven track record here is a significant positive.

Here are some considerations you should have when requesting information on an ultra-low-latency network:

- Guarantees of uptime and performance reliability
- 24/7/365 network operations center controls and safeguards
- Access to up to 100G bandwidth
- Dark fiber and passive waves availability
- Lit bandwidth from 10MB to 100G
- Plus, wireless capabilities and backups for lower latency as well as a more diverse network

These features will allow you to ensure that you have a smart partner who understands your business needs and can deliver a variety of tailored service options.

Consider Low-Latency Storage

Part of your low-latency conversation should include a look at all the pieces you need to ensure you have a high-performing network. Storage is one of the often-overlooked aspects of such a network.

Traditional, hard-disk based storage has a variety of limitations around data transfer rates, rotational latency, access time, and other mechanical features. These issues can reduce your ability to take full advantage of your low-latency network.

Solid-state storage solutions could empower your network to make the most of a low-latency installation thanks to powerful, quick integrated storage. Plus, these storage units come in a variety of configurations from hard drives to PCI Express cards.

Costs continue to drop for solid-state storage options, and most mid-sized as well as small businesses who are looking for private networks can also afford pure or hybrid solid-state storage options. Their architecture allows them to operate in conjunction with your existing hard drives and networked storage, so you'll still be able to use existing assets and not have to bear the expense of a complete infrastructure overhaul.

SDN Services

Networking service providers should assist you with the latest in technological developments designed to accelerate the deployment and delivery of your applications, reducing overall IT costs.

One of the key supports you should look for from a partner is a software-defined network (SDN) which includes policy-enabled work-flow automation. The SDN technology your network could use will rely on cloud architectures for on-demand delivery of applications and the ability to mobilize at scale, automatically.

Today, SDN is a primary tool to improve function and efficiencies of data center virtualizations because it increases resource and network flexibility, for a significant reduction in overhead and infrastructure costs.

While initially developed and applied only with large enterprises in mind, SDN is now a common method for businesses of all sizes to improve their operations. Current development has removed significant barriers to adoption, from cost to infrastructure requirements.

SDN Simplified

Software-defined networking is a method to control devices on your network through a network-wide management tool. Your engineers could apply changes to network equipment, adjusting each element's behavior from a central location.

SDN allows your team to apply updates and adjusts network assets to respond to increases in traffic, malicious attacks, down nodules, and many other instances where flexibility is required.

One core benefit of SDN is that your team doesn't need to travel to each physical device to make changes, and some configurations can have significant adjustments without the need to swap out equipment.

SDN supports these and other features by working via two layers:

- The Control Layer is a management software layer that is responsible for switching and routing all your network traffic.
- The Infrastructure Layer covers the physical components themselves — so your switches and routers — that carry the traffic on your network.

Separating these two layers allows you to optimize traffic and perform specific routing tasks that may improve your network's capabilities when resources are limited, or demand is high.

Central Advantages of Applying SDN

A top lauded advantage of SDN is that it allows your network to be flexible and make changes fluidly after installation. No two networks are the same, so SDN allows you to have a network installed and then be made for how you actually run your operations.

Individual-level programming of your switches and routers remotely makes it easy to accomplish many tasks that used to take days or hours, such as providing a contractor access to part of your network, but also applying rules-based access so that they can also see what they need to do their work.

This security, profile, and policy management makes your network more robust, reliable, and secure. With SDN, you can more easily block malicious traffic from endpoints, allow normal traffic to flow, audit and quickly change your conflict detection and resolution practices, and centralize your security so that responses are applied to your entire network when needed.

Some of the other benefits your network and business can expect when utilizing SDN include:

- Reductions in operational costs by minimizing the time it takes your IT team to act or adjust your system as well as greater automation of network responses and administration.
- A centralized view of your entire network, simplifying enterprise management and provisioning for both virtual and physical network devices.
- Granular security enhancement thanks to better visualization.
- Abstraction of cloud resources so that they can be unified, improving efficiency and reducing costs for working with data center platforms.
- Hardware savings because existing infrastructure can be repurposed as needed, while new hardware can rely on intelligence from the SDN controller instead of needing it (and its cost) in every unit.
- A greater ability for you to guarantee content and service delivery, improving QoS you provide and enhancing your team and customer satisfaction.

At the heart of it all, SDN is now commonplace in today's networking environments. It's become a must-have in terms of optimizing your network almost regardless of industry, with the networking protocol spreading everywhere from your utilities and manufacturers to new apps and large enterprise service providers.

Private Networks

To make the most of the new functionalities like SDN, many companies are turning to private networks. This build gives you dedicated transport between locations so that your locations are secure, connections reliable, and intrusions are limited.

Private networks segregate your traffic from the public internet so that you are communicating securely between locations and devices, effectively reducing the security risks from unsecured networks and minimizing the overall number of access points where someone could breach your network.

By working with leading SLA, private networks can enable a robust connection between applications and internal systems without losing control or compromising your ability to manage your network from a central location.

Thanks to hybrid network architecture, you can also secure your mobile workforce, remote or in-field teams, as well as any IoT or machine-to-machine solutions that your business and your customers need. Physical sites no longer always need a hard-wired connection for proper functionality.

How Private Networks Operate

Private networks have a slightly different build because they work to avoid public networks and other customer equipment. So, your ISP will filter out unsolicited traffic and deliver a secure, reliable connection that needs its own set of equipment and provisioning support.

Your private network will function along the lines of the service provider created a direct connection between private network gateways and your on-premise routers. You will have an assigned, dedicated private network gateway that operates within your service providers' data network.

Traffic on your network is routed per your specific IP pools, taking paths such as direct point-to-point connections, moving over an IPsec virtual private network, or traversing via multiple private IP wireless gateways.

During all of this, devices on both ends of each packet are authenticated and authorized for your specific network. Only authorized data can move across your network, and only authorized equipment can send and receive it.

If you run a virtual private network (VPN) to mask traffic sources or encrypt your data, please note that most private networks and private lines will be able to properly transmit your information thanks to a reliance on IP and MPLS networking.

Private IP Network Benefits

Isolating your data helps protect your business. You get to avoid many of the inherent risks that come from unsolicited traffic on the public internet as well as unsolicited access, thanks to a system that allows you to authorize who and what can send and receive data.

Some of the other core benefits of having a private network include:

- Directly connect all enterprise locations in a single private network interface, allowing for greater reliability and inherent redundancy for data centers.
- Multiple networking technologies available with guaranteed last-mile diversity and robust delivery.
- Ability to use existing network topology to minimize interruptions.
- Global support so you can grow and operate wherever you need.
- Extends enterprise WAN infrastructure and support.
- Supports SDN, so device management is uncomplicated.
- Easy to scale and extend support to new device classes such as smartphones and tablets.

Private networks are always created with primary and secondary gateways so that you continue to have access and operational functionality in the event a gateway goes down. The redundancy keeps you working to prevent failures from impacting traffic — it must be built in because there is no public internet support to fall back on in the event of an outage.

Private Lines for Larger Jumps

If you need to build a secure connection that spans the globe, you'll need to look for a unique architecture often referred to as a private line.

These solutions are designed to link international locations into a cloud topology with multiple carrier endpoints. It builds a more secure network and limits the number of touchpoints, so your data is more secure.

Such a network can make use of dedicated PoP to PoP and premise-to-premise private connections, though you may seem some variation in bandwidth speeds and handoffs.

An Ethernet virtual private line also can give you a virtual option over a converged interface to keep your data off of public networks but minimize your need for direct physical connections between premises.

Multiprotocol Label Switching: Increased Speeds on Private Networks

When discussing private lines and private networks, many service providers will discuss MPLS as a smart inclusion for your network development. This “Multi-Protocol Label Switching” is designed to speed up your network by delivering additional features for the transportation of information across your network.

MPLS improves your network’s ability to move data between multiple locations. In the traditional OSI model, it is considered a layer 2.5 because it sits between layers 2 and 3, or switching and routing layers.

Consider your traditional IP network. When data reaches a router, it will perform an IP looking to find the next destination that the data will reach as it travels along a path to its final destination. Each router forwards the data packet to the “next-hop” location.

As your data packets move, each router takes a small amount of time to look at the source and destination of the data, making an independent decision of how to get the packet to its final location.

In an MPLS setup, there are fewer decisions. The first device that receives the packet will look up its origin and its final destination. But, instead of sending it to the next point in its journey, this initial device will create a complete path for the data packet. This route is mapped and included in a label that it applies to the packet.

As the packet moves through your network, each new router will read that label and send the data along the predefined path. MPLS increases data speeds because subsequent routers do not perform any additional IP lookups.

Advantages of MPLS:

1. Reduces the load on core routers where high-performance can be difficult to achieve due to volume.

2. Spread out demand to edge routers, so exact matching is often cheaper and easier to implement.

3. Facilitates the implementation of traffic engineering, giving you greater control of where and how traffic is routed on your network to manage capacity and reduce the risk of congestion.

4. Enables multi-service networks that can deliver data transport and IP routing services across the same packet-switched network infrastructure.

Overall MPLS tends to be more secure than a standard network because this network type is only accessible if you have a router with access to the MPLS network. This and its overall architecture make it more difficult to crack, but you will still need other encryption and security measures to keep your network safe.

Speeds and smart asset management are the core benefits of MPLS thanks to its advanced functionality. Let’s look at one such important benefit it offers.

Advanced Functions: Label Stacking

MPLS can introduce a variety of advanced network functionality, and we've elected to highlight label stacking because of its network safety features.

Label stacking allows your network to apply multiple labels to get data to its final destination along a specific route while making a dynamic decision about distinct parts of that route.

Think of it as driving 100 miles from city A to city C, but you know the interstate will take you near or through city B. When it isn't rush hour, your drive is faster going right through city B. But, if it is rush hour, your drive is faster by taking a loop, even though it adds a couple of miles to your journey.

So, your driving directions are made up of two things, an overall map with large portions that don't change, plus a small subset of directions that change depending on traffic.

With MPLS, your network can do the same thing with data. The first routing device will apply a top and bottom label to the data packet. When the top destination is reached, the label is peeled away, and the bottom label takes over to direct the packet further.

The top label is our directions either through or around city B, while the bottom label includes the rest of the directions to get us to city C. Your network can process these directions more quickly because it knows that the data should always move along a given path except for one small potential area of change.

Typically, we see VPN and network transport services will use top labels to map traffic to specific interfaces or instances, and the bottom label to route through the network.

Label switching paths use label stacking to bypass trouble spots in a network. One LSP can protect a group of other bundled LSPs by quickly redirecting traffic without needing to re-signal every LSP if a networked router fails.

Industry Specific Solutions

There is a wide range of industries that benefit from high-performance, low-latency networks designed to scale with traffic, security, and diverse access needs. Let's look at a few industries that are benefiting the most from purpose-built networks.

This section will discuss benefits of deployments for five key industries, but individual networks vary so significantly that an overall architecture cannot be provided. Each network, and often each element within a network, is unique.

Look for a services and solutions partner who has experience with multiple clients in your industry for the best chance of success when you construct or tap into a new network.

Healthcare

Medical decisions made in split seconds based on large volumes of data, so medical networks must be quick, able to process significant volumes, and always have a secure data exchange to meet HIPAA requirements.

Any custom network for healthcare providers will need to deliver support for patients and doctors in the room, nurse stations who must monitor equipment and respond to problems, healthcare data exchanges and electronic medical records, and secure billing practices.

These elements depend on network performance and security. Providers should be able to deploy PoPs options as well as Layer 2 private networks that incorporate wireless 4G bands to scale in a private network that can add new devices and support remote edge devices.

Purpose-driven networks that replaced existing systems with a private network have been able to achieve results including a 10x increase in bandwidth at every location and cost reductions of up to 19%.

Financial

In the financial sector, milliseconds of delay translate into millions of dollars lost. To combat this, financial businesses need secure networks as well as their own data centers — or a large presence in existing centers — to house their trading engines.

Members rely on financial exchanges to be able to handle all their traffic within those milliseconds, often requiring a combination of advanced options including dark fiber, passive waves, and 100 Gig connections.

Your fiber network should focus on reducing latency at the edge so high-frequency trading can prosper. Pairing data centers with colocation options can ensure robust access for partners and introduce redundancy that means uptime and latency will always be where you need them.

Finance is as much a reputation game as it is a speed business, so you need a network that is designed to be reliable and enhance your partners' trust in you.

Education

Cost and the dynamic ability to scale are the two core concerns for education networks. Speeds don't necessarily need to be as quick as other industries on our list, but service must work for an extremely large number of people with a very diverse set of needs and usage habits.

The education space has gone online from classes and tests to study groups and even to turn in work. If the network goes down, all of this can grind to a halt. Networks in this space must prioritize the ability to seamlessly scale and facilitate simplified sharing of resources for maximum efficiency at the lowest cost.

Network partners should have an eye for maximizing the business value of your specific network to control costs and ensure reliability through a smart combination of IP-based services and cloud assets while minimizing risks associated with network performance.

Tech & Telecom

Telecommunications and technology firms often lease equipment and bandwidth from larger network providers because it is more affordable and reliable. Large-tier providers run fiber to major metro markets and then split bandwidth among local ISPs and other service providers.

The local network is boosted thanks to a strong national or global network. As it grows more powerful, service providers can offer a greater number of next-gen services related to video, voice, VoIP, and data.

Partners need to be running the latest in assets, infrastructure, and market intelligence so that telecom providers can deliver their top performance and connectivity portfolio. Rely on a company who knows how to manage and reduce overall CapEx as well as keep expenses low for last-mile customer access.

Market-leading ultra-broadband connectivity is a must-have for connecting your key network aggregation points as well as new data centers designed to expand your reach.

Building Providers

Power the businesses that generate your revenue with a smart approach to ensuring network speeds and reliability.

Partners will enable building services and location providers to give each tenant a robust connection, but keep their traffic secure and separate when needed. Best-in-class networking solutions can ensure that your offerings enabled each customer to meet a wide range of their requirements and regulations.

The right network provider will give you the tools you need to house a private physician or dental practice and respect electronic health record requirements while also delivering the power that sales teams, CPAs, developers, and small businesses all need one floor down.

Find a smart partner by looking for someone with diverse clients, including both building services and government agencies. This ensures that you'll get a partner who understands the value and necessity of protecting mission-critical data, optimizing cross-department workflow, monitoring multiple networks separately, and selecting the best infrastructure and cloud combination to keep all your tenants happy.

These industries are just a small sample of what a custom network should focus on for you. Discuss your needs with a partner, and you'll be in the best position to see what's available, understand your risks, and discover the right blend of technologies to meet security, performance, reliability, and cost requirements.

How to Identify a Strong Networking Solutions Provider

Here's your checklist to get started in choosing the best networking solutions services for a robust, reliable, and fiscally smart network.

Business Practices

- Network offerings are easy to understand and presented in plain language.
- Simple buying terms that you can understand and bring to all stakeholders.
- Cost-efficient approach for enterprises and growing organizations.
- Ease troubleshooting and greater control over networks, with a willingness to hand control over to you as they support your operations.
- Consistently puts best practices into place, such as multiple redundancies and failover capacity protections.
- Connectivity to major metropolitan exchanges in the U.S.
- Builds completely redundant networks.

Fiber Network Offerings

- 100 MB through 100 Gig Waves or dedicated dark fiber.
- Fiber optic assets that are robust and adhere to best practices, such as being encased in concrete for optimum safety and reliability.
- Carrier-class wireless networks are available to compliment fiber networks.
- High-availability networks port to port.
- No one-size-fits-all approach to your equipment on the fiber.
- Multi-carrier management.
- Layer 2 and 3 available.
- Circuit monitoring and management as well as automated tools for your team to use.

Infrastructure and Physical Capabilities

- Data center options designed with current best practices in mind.
- Access to energy-efficient equipment with a focus on power usage effectiveness and smarter virtualization.
- Additional offerings such as managed services and interconnectivity with the public cloud.
- Colocation and hosted options.
- Dedicated connections from your colocation facility to major local and international hubs.
- DIA options with multiple types of access.

Customer Support

- 24/7/365 access to dedicated sales and support staff – never settle for anything less.
- Decades of experience, meaning they understand where the market has been, where it is today, and what you're going to need to grow with it tomorrow.
- Single point of contact when you need it.
- Network operations centers that provide a total view of your network and support maintenance and problem response.

Established in 2002 and headquartered in Paramus, New Jersey, HFN has quickly become a premier data transport provider, offering high-bandwidth, low-latency networking solutions for financial, content, carrier and enterprise customers.

HFN's suite of scalable solutions helps customers increase network efficiency and lower overall networking expenditures.

Services include Gigabit Ethernet, optical wave solutions and IP connectivity (10 MB through 100 Gig), and are delivered in and between key U.S. and global metropolitan markets, via HFN's fully owned and operated fiber network.

Backed by over 25 years of combined experience in the telecommunications industry, HFN's team of bandwidth architects are dedicated to helping you find the customized solution that fits your unique business needs.

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