



Streamlining The Internet For All Business Applications



The Enterprise LAN Has Been Subsumed into the Internet, But Problems Remain

As business operations move to the cloud, Small and Mid-sized Businesses (SMBs) are facing new difficulties ensuring that critical interactive communications and business applications get the network performance they need.

A decade ago, the business applications that SMBs relied on were hosted internally. If applications and services were running locally, users connected to them over a LAN. If they were running in a corporate data center, users connected over a WAN connection leased from a service provider. Through their LAN and WAN links SMBs ensured that users always had access to reasonably fast, reliable and secure networks.

Today, businesses are switching their mission-critical applications out of the corporate data center and into the cloud. Customer Relationship Management (CRM) applications such as salesforce.com led the charge, and now the movement of communication applications such as IP telephony and videoconferencing are following the same path.¹ Because users are connecting to services in the cloud, the Internet has essentially replaced the corporate LAN and WAN as the primary conduit for accessing essential services.

The Internet has essentially replaced the corporate LAN and WAN as the primary conduit for accessing essential business applications

¹ For example, [ShoreTel](#) and [RingCentral](#) offer cloud-based VoIP services, whilst [Zoom](#) and [BlueJeans](#) offer cloud-based videoconferencing solutions.

Of course, being a public network, the Internet is outside any one business's control. SMBs are limited in their ability to configure and manage the Internet the way they previously controlled their LANs; for example, administrators can't control how well the Internet treats their priority traffic, since the actual infrastructure is opaque to their management tools.

Nonetheless, to assure a reliable and high-quality experience, businesses need some way of streamlining Internet services. Even on a public network, they need a solution for shaping and managing critical traffic such as VoIP and videoconferencing so that those interactive services perform optimally for employees and customers, day after day.

Most SMBs lack the IT resources to embark on sophisticated network engineering projects, and no rational amount of investment in private WANs can solve performance problems for the growing volume of traffic leaving the internal LAN for the cloud.

So the question—a pressing question—remains: How can SMBs quickly, easily, and affordably streamline their Internet services?

Business Applications and Network Requirements

To understand the scope of this challenge, it's helpful to consider the business applications that SMBs have come to rely on.

SMBs increasingly rely on Unified Communications (UC), integrated services combining telephony, interactive video, presence, and collaboration to reach workers wherever they are: in corporate HQ, a remote office or a home office, and enable them to work quickly and productively.

Unfortunately, as interactive applications such as IP telephony/VoIP and videoconferencing have become more popular and have moved to the cloud, it has become more difficult for UC to be reliably delivered with high quality. Users now sometimes suffer from one-way audio, robot voice, low volume, clipping, difficult to understand speech, video freezing and video & audio being out of sync.

Similarly, as more and more business applications move to the cloud reliability of network connections becomes more important. It's now not uncommon to be hit with the spinning wait cursor/pinwheel/beach ball when accessing hosted applications. With the proliferation of sales, marketing, HR, supply chain and financial Software as a Service (SaaS) solutions, a business' productivity can be seriously affected by hung applications.

Today business services are breaking down in three key areas: IP telephony, videoconferencing and cloud applications

IP telephony / VoIP

Email and other online text-based communications remain important, but business still depends on telephony. And today, business telephony means VoIP.

Nearly 79% of American businesses use VoIP phones in at least at one location, up from 42% in 2009, according to In-Stat.² The global VoIP services market is projected to continue its impressive growth, rising from \$94.1 billion in 2016 to \$194.5 billion by the 2024, achieving a CAGR of 9.5% over 2016–2024. In comparison, non-VoIP on-premises services have plateaued. Traditional carrier-switched phone services have leveled off at 340 billion minutes/year, while VoIP traffic has roughly quintupled over the past decade, reaching 260 billion minutes/year in 2015.³

When VoIP call quality is poor, time is lost, productivity lags, and brand reputation is tarnished

While VoIP technology has improved over the past decade, it's still not reliable enough to provide clear, reliable communications all the time. Too often, conversations with prospects, customers, and colleagues are interrupted by jitter and latency, resulting in garbled speech or echoes.⁴ Callers have to disconnect and dial back into the call, hoping for a clear line. Time is lost, productivity lags, and brand reputation is tarnished.

Videoconferencing

The global videoconferencing market, including SaaS and on-premises services, grew 9.8% in 2015, reaching \$2.41 billion. This healthy growth is expected to continue: the analyst firm Frost & Sullivan projects a 5-year CAGR of 9.4% for the market, which will reach \$3.6 billion in 2020.⁵

As these numbers suggest, Web conferencing, including interactive videoconferencing, has become essential for today's distributed and mobile workforce. Leaders in the field such as BlueJeans, Zoom, Skype for Business, GoToMeeting and Google Hangouts facilitate employee collaboration but can also increase network traffic.

Videoconferencing can suffer from quality problems similar to those affecting VoIP. In the middle of a video call, frames might freeze, audio might become out of sync with video, and other problems might occur. Videoconferencing uses the same transmission protocol as VoIP and as such jeopardizes voice quality.

² VoIP Penetration Forecast, InStat

³ "The future of global telecommunications in view of the growth of OTT services: expected impacts on usage and prices," SCF Associates Ltd, April 2015

⁴ Jitter is variations in the delivery of network signals. Latency is the lag in the delivery of a signal from the moment it is sent to the moment it is received. Once latency reaches 300 milliseconds, call quality has noticeably degraded.

⁵ 2016 Global Web Conferencing Market Forecast, Frost & Sullivan

Business Applications

Business applications as varied as CRM, payroll, benefits and demand generation have moved from corporate data centers to the cloud and are delivered using a SaaS model. To use these applications remote offices used to connect over a dedicated link to the corporate data center, but now they connect over the Internet to a virtual server in the cloud.

By 2020, SaaS will comprise 25% of the total software market.⁶ Spending on SaaS products is expected to hit \$50 billion by 2024, up from \$12 billion today, and 78% of firms say they're planning to expand their SaaS usage within the next three years.⁷ With this increased dependence on the cloud comes an inherent requirement to have reliable and secure connections to hosted applications.

Employee productivity is diminished by sluggish or even unresponsive applications. Increasingly the spinning wait cursor is influenced by network congestion as the application's connection has to traverse the access, backbone and core portions of Internet, all ripe areas for congestion and disruption. Users want a predictable high quality experience when using any application, especially mission-critical business applications.

Today's Solutions: Too Costly and Complex, or No Longer Applicable

Until recently, to meet these performance challenges SMBs had to invest in expensive leased lines, MPLS connections and/or deploy complicated WAN Optimization/Software Defined-Wide Area Network (SD-WAN) solutions. Today, however, the justification for these investments is breaking down. This breakdown has several causes, specifically:

- Price sensitivity has become more of an issue
- More users are migrating to cloud services
- Businesses discovered that adding more bandwidth just postpones the problem
- Complexity has mounted both in installation and management

Let's examine each of these in turn.

Consumer Internet Pricing has Inadvertently Changed the Game for Enterprises

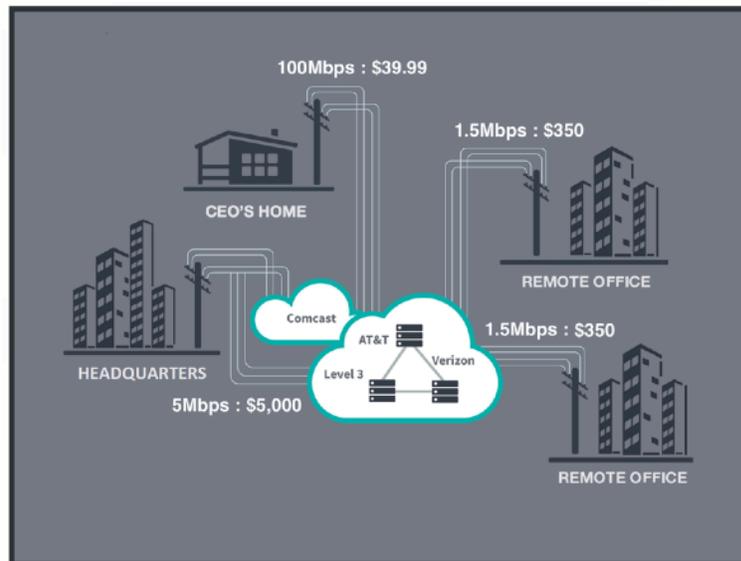
When the CEO/IT Director of an enterprise can pay \$39.99/month for 100Mbps home Internet⁸, he questions why he should pay \$350 for a 1.5Mbps MPLS connection at his office. 1.5Mbps or a T1 connection is quickly filled up by a videoconference for example, leaving little bandwidth for

⁶ IDC 50th Anniversary, Transformation Everywhere

⁷ The State of SaaS in 2016, BetterBuys

⁸ Performance 25+ Package, Comcast Xfinity

voice or any other traffic. If he upgrades to a 5Mbps MPLS connection he'll now pay \$5,000, but still may not have enough bandwidth for his office. If he chooses to go with a basic Internet service there are of course inherent issues with reliability and Quality of Service (QoS).



Large Disparity: Home Internet vs. MPLS

The Migration to Cloud Services

Private networks to corporate data centers are less useful now that users are increasingly relying on cloud services for their daily work. The typical large enterprise is now running over 1,100 different cloud services, few of which run in an organization's own data centers.⁹

Large enterprises aren't the only organizations adopting cloud services. The cloud market for SMBs has been growing 40% CAGR for several years and is expected to reach \$55 billion by the end of 2016.¹⁰ By 2020, 78% of small businesses will be fully adapted to the cloud, up from 34% in 2014, according to Intuit.¹¹

The migration to cloud services has three profound effects:

- First, because employees are accessing the Internet rather than internal IT resources, optimizing traffic from a branch to a central corporate data center provides little benefit to users. In fact, requiring users from branch offices to backhaul Internet-bound traffic over a WAN to the corporate backbone usually degrades performance of cloud-based services by requiring additional travel along a long, hairpin-shaped route.

⁹ Essential Findings, Skyhigh's Cloud Report

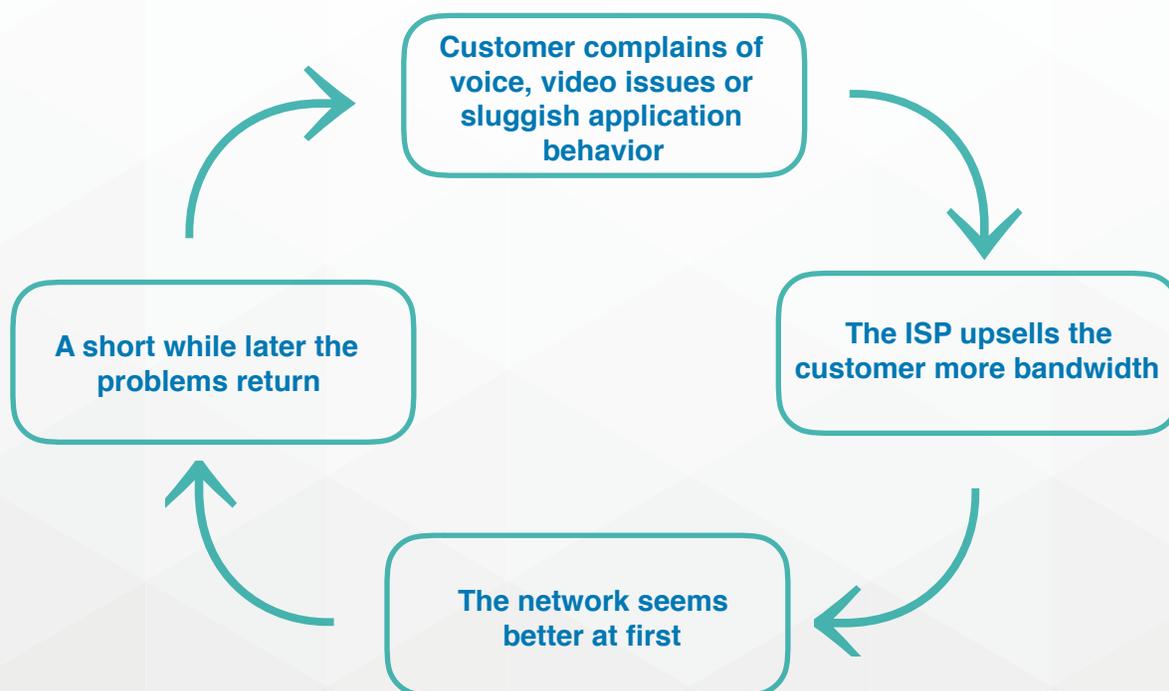
¹⁰ Roundup Of SMB Cloud Computing Forecasts And Market Estimates, Forbes

¹¹ Small Business Success in the Cloud, Emergent Research & Intuit

- Second, as users abandon local applications for cloud-based ones, they increase the volume of traffic on the WAN. This growing volume of application traffic, along with other bandwidth-intensive content such as streaming video for training or entertainment, creates more competition for interactive and business applications that can degrade their performance.
- Third, today's SaaS solutions could be delivered from the application provider's data center, a third-party data center or even somewhere else in the cloud. Additionally, at different times the application might not even be served from the same location, since third-party providers often host in disparate locations for service continuity and capacity planning reasons. Thus, it's difficult, expensive or even impossible to connect to an application via a dedicated circuit such as MPLS. In a distributed company the complication of connections would grow exponentially, especially if different carriers were involved.

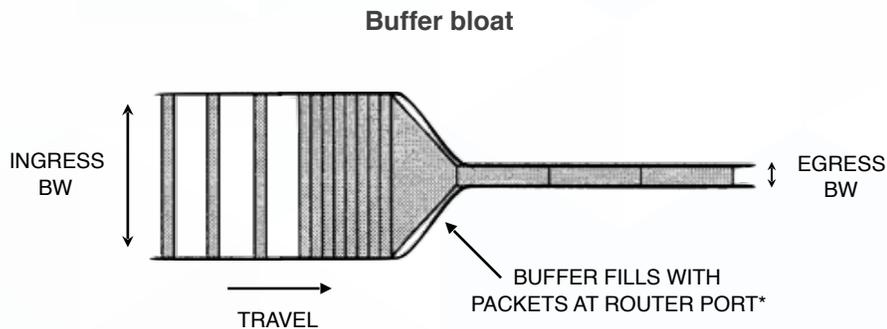
The Limitations of Improving Performance with Additional Bandwidth

The traditional model for improving network performance is also breaking down, because ISP customers are learning from experience that adding bandwidth to ensure QoS is ultimately ineffective. Now they're looking for a way to escape the vortex of purchasing ever-increasing bandwidth:



Many network performance problems, especially having to do with VoIP and videoconferencing, are caused by improper queue management and prioritization, not network bandwidth shortages. Buying additional bandwidth does nothing to correct suboptimally configured queuing structures in routers or buffer bloat. Buffer bloat is latency and jitter caused by excessive

buffering at routers in the network. With the advent of cheap memory in the 1990s, router manufacturers loaded up the ports of their switches with large RAM. When the egress from a switch is less than the ingress, packets quickly fill up the buffer and cause future incoming packets to be discarded. Retransmission in TCP/IP exacerbates the problem resulting in reduced network throughput and inconsistent quality.



* Adapted from: Congestion Avoidance and Control, Van Jacobson, Proc. SIGCOMM '88, Vo11:8 No. 4, August 1988

On the other hand, when implemented properly, traffic shaping and queue management can improve call quality and video transmissions not only over dedicated WAN links, but also over conventional Internet connections as well, obviating the need for SMBs to invest in dedicated circuits or MPLS solutions in the first place.

High TCO: Complex to Install and Difficult to Manage

In the halcyon pre-cloud days, engineers built out corporate networks using routers that required arcane skills at the Command Line Interface (CLI). Routing equipment manufacturers offered, and still offer, specialist training courses on the CLI so solutions engineers could design and configure networks using the manufacturers' proprietary operating systems.

Network management configuration was a time-consuming manual process, where policy was set using CLIs at each discrete connection point in the system, such as at routers, switches and firewalls, etc. The IT group had to perform these configurations over the entire path. The process could last days.

“When VoIP call quality is poor, time is lost, productivity lags, and brand reputation is tarnished.”

- Mark Guyer, Sr. ShoreTel Support Engineer, IP Tech

“The addition of the InSpeed service took my phone service from barely acceptable to very good.”

- Howard Clark, VP Sales, KTS Networks

“Our InSpeed service removed quality issues that were occurring while running company-wide video conferencing. We now have improved productivity in both internal and external communications.”

- Ken Zrobok, Director of Operations, LANtelligence

With the advent of MPLS, things did not get any easier. It, too, relied on a heavily manual process and, worse still, at scale it proved to be time-consuming even for carriers to maintain. The high cost was not equipment driven, rather it was management driven. Total Cost of Ownership (TCO) was skewed high by how labor intensive it was to consistently deliver QoS, the main tenant of MPLS.

Over the last few years SD-WAN manufacturers have promised a new paradigm, where a central *orchestrator* controls policy Over The Top (OTT) across different network nodes. Although it was a noble idea, SD-WAN has evolved into a bag of tools (features, settings, policies) that the solutions engineer has to put together himself, yet another time-consuming and often error-prone process.

Perhaps the most important issue with current solutions is that they assume that the underlying traffic will remain steady, so that the static nature of CLI and orchestrator programming will work. But when network topology or conditions change, as they do all the time in real world scenarios, the solutions engineer has to go back and reprogram. The only scalable solution is to provide *management by measurement*. The only *truth* you know is the actual capacity of the network at any give point in time. The right way to manage network performance and QoS is to measure and control the flow of traffic at the points where it enters and leaves a network, and adjust the load according to actual ever-changing capacity in real time.

Business Application Requirements for SMBs

To improve VoIP and videoconferencing quality and to optimize the performance of all business-critical applications, SMBs need a solution with the following attributes:

- **End-to-end application QoS**
Management of applications' connections from their source, e.g. the desktop, to where they are hosted in the cloud.
- **Affordability**
- **Scalability**
- **Plug & Play**
Integrates with networking products already deployed by the enterprise.
- **“Set & Forget”**
Once installed, no additional maintenance or configuration is required, even when network traffic patterns change substantially.
- **Evolution not “Rip & Replace”**
SMBs networking infrastructure can remain the same — no forklift upgrade.

Streamlining the Internet with InSpeed Quality Service

InSpeed Networks is the leading provider of SaaS solutions that Streamline the Internet. InSpeed fixes network reliability problems once and for all, enabling IP telephony, Unified Communications and hosted business applications to work as promised over *every* connection, *all* the time. Clear voice calls, reliable videoconferencing, and responsive applications become routine after deploying InSpeed Quality Service™ (IQS), the first networking solution developed to address interactive communications.



IQS Architecture

IQS Explained

IQS affords the user a high quality experience when running business critical applications over any enterprise connection, including low cost commodity business or consumer broadband. Traffic is streamlined both in to and out of any enterprise location, whether it's the headquarters, a branch office, a single-site office, or even the home office of an employee. IQS manages the end-to-end connection of the application - that is the traffic between the source at the user's location (the VoIP call, videoconference, etc), and the server where the application's software is actually running, i.e. the cloud or the enterprise's data center.

IQS provides a high quality experience by:

- Eliminating network congestion,
- Reducing delays for all traffic types,
- Prioritizing interactive traffic:
 - Voice first,
 - Limiting jitter,
- Enabling reliability through a fully meshed network with active/active uplinks, and
- Encrypting traffic.



Designed for rapid deployment and ease of use, the InSpeed solution comprises a small on-premises device and a proprietary cloud element:

- **InSpeed On-prem:** About the size of a hardcover book, the on-premises unit is installed in-line with the site’s Internet connection(s). Streamlining involves shaping packet traffic and in order to do the shaping, the packets must pass through and between the On-prem and Cloud elements.
- **InSpeed Cloud:** The Cloud and On-prem elements together enable IQS. InSpeed Cloud also provides real-time analytics, reporting, and management for configuring IQS. The separation between Cloud and On-prem elements is between 25ms and 30ms.
- **Access network:** IQS supports any last mile solution access technology: fiber, cable, DSL and wireless.
- **Internet backbone:** All ISPs and carriers work with IQS. Traffic is routed to minimize network congestion, eliminating the need for lengthy troubleshooting projects.
- **Hosted applications:** InSpeed Cloud runs adjacent to hosted VoIP, videoconferencing, UC and other popular business critical applications.

IQS Benefits

IQS delivers the high quality and security of dedicated networks with the cost and flexibility of the open Internet:

Criteria	Benefit
User Experience	VoIP is High Fidelity
	Videoconferencing is Smooth
	Hosted Apps are Lightning Fast
Deployment	Plug & Play makes Deployment Easy
	Go live Quickly in minutes not months
Maintenance	Set & Forget means Negligible Maintenance
Cost	Low Cost to license and maintain
Connectivity	Operates over Any WAN Link , even consumer broadband
Reliability	High Reliability through fully meshed network and active/active uplinks
Visibility	Identify sources of network congestion, Eliminating lengthy troubleshooting problems
Security	Secure encrypted VPN tunnels out of the box



InSpeed Networks' solution was created by the founders and senior engineering team from ShoreTel, Network Computing Devices and Ridge Computers. The InSpeed team has a deep understanding of VoIP technology, network optimization, and the daily IT requirements of SMBs. At InSpeed, this team is applying its considerable knowledge and experience to create affordable, high-performance networking solutions for SMBs. The founding team holds 36 patents in IP telephony, DSL and networking.

To learn more about IQS for critical interactive communications and business applications, please contact InSpeed Networks at partners@inspeednetworks.com or (650) 597-6430.