

Take the Frustration Out of VoIP

Talari's SD-WAN Solution Ensures a Superior VoIP Experience



Table of Contents

Five Common Network Pitfalls for VoIP	3
Deliver High-Quality, Reliable VoIP	5
Build an Intelligent WAN	5
Seven Capabilities for Business-Ready VoIP	5
Talari THINKING WAN Usage Scenarios	7
Deliver a Superior Experience with Talari	8
Step Up to an Intelligent WAN	9
Learn More	9

Introduction

If first impressions really do last a lifetime, your business communications, especially phone communications, must be consistently exceptional and reliable. Callers need to think “knowledgeable,” “responsive” and “friendly” when they interact with your business, but they won’t remember the good if they experience dropped or choppy calls and distorted conversations.

As voice over IP (VoIP) has moved into mainstream business thanks to its known cost savings and flexibility, organizations often grapple with poor reliability and quality of VoIP calls. Too many of us have had conversations with people who sound like they are underwater or have been on calls that drop mid-sentence. The burden falls to IT to find a way to deliver a superior voice experience while holding the line on costs.

VoIP needs a better network—a thinking, intelligent WAN that ensures superior call quality by improving quality of service (QoS) and eliminating packet loss, high jitter, high latency, congestion and link failure.

Five Common Network Pitfalls for VoIP

These five features are the most common network pitfalls that damage VoIP and unified communications (UC).

- **Packet loss** causes a choppy or broken voice that dramatically degrades the call experience and is unacceptable in business situations. A high packet loss rate severely impacts the caller’s experience, and the impact is even higher when a compressed codec is used. Even though most codecs apply a packet loss concealment (PLC) algorithm to regenerate lost packets, the reconstructed packet is only the best guess and the listener still experiences a broken or synthetic voice. In a network with packet loss, voice quality is not the only annoyance that callers experience. Call setup and registration also suffer. Calls won’t connect or the phone system doesn’t respond when a user presses a hold button or forwards a call. This lack of response brings user and business productivity to a grinding halt.
- **Latency** creates awkward gaps in conversations. With a one-way latency greater than 150 ms or 300 ms round trip, people interrupt each other and experience talk-over effects that can easily stop a conversation and create frustration between the two parties that could extend beyond the one call. Remaining within the acceptable latency budget throughout the call is crucial to successful communications.



- High packet **jitter** increases distortion and makes it difficult for people to understand one another. To reduce jitter, packets are usually buffered in the network devices, which further increases packet latency in VoIP calls.
- **Congestion** occurs in networks that do not have sufficient bandwidth and proper QoS to support appropriate concurrent number of VoIP calls alongside other business applications on the network. With each call taking up 24 Kbps to 80 Kbps of bandwidth, depending on the codec used, voice traffic can easily eat up a significant portion of an expensive T1 MPLS circuit.
- It goes without saying that a **failed network link** cannot carry a voice call. Traditionally, an individual call is routed via a single WAN circuit, and when that link fails, the call drops, end of story. While the underlying network routing protocols and IP phone system may automatically attempt to reroute and reconnect the call on a backup WAN link, the call usually experiences a significant and noticeable gap. The delay is due to the time needed for network route convergence and phone system re-registration times. Callers often have to re-establish dropped calls, which is not a positive experience. The failed attempt may even lead to a customer deciding to abandon the communication.

THE HIGH PRICE OF LOW-QUALITY VOIP

Poor VoIP performance can crush business results and lead to:

- ✓ *Unhappy customers*
- ✓ *Lost revenue*
- ✓ *Slow order processing*
- ✓ *Decreased employee productivity*

For the IT team, a badly executed VoIP strategy causes:

- ✓ *Increased call volume to the service desk*
- ✓ *Fire drills to troubleshoot the network*
- ✓ *Stress-ridden reactive mode vs. proactive workflow*
- ✓ *Lack of visibility means the IT team is flying blind*
- ✓ *Wasted time finger pointing between telecom and network teams*

Deliver High-Quality, Reliable VoIP

Organizations no longer need to compromise when it comes to VoIP quality. Businesses can build a better network foundation to deliver a superior voice experience.

To overcome voice traffic challenges and enforce network QoS, organizations can purchase high-cost, private WAN links such as MPLS. Or, they can opt for lower cost, higher bandwidth Internet links for VoIP, but these lack the guaranteed end-to-end QoS that is a requirement for a successful VoIP call. Even with an MPLS WAN, VoIP calls can still be a challenge, and they leave the IT organization open to a double hit. First in price, as the cost for private WAN/MPLS links is high, and second in service guarantee. Even with a service-level agreement (SLA) for end-to-end QoS, the value of an SLA dips considerably with every dropped call. Restitution from the service provider does nothing toward correcting poor call quality. The damage is already done.

Build an Intelligent WAN

There is a better way to WAN, especially when you have VoIP on your network. Talari's intelligent SD-WAN solution creates a responsive overlay network that adapts in real time to bandwidth demands and network conditions so that VoIP traffic gets the QoS it needs. With Talari, the WAN, whether comprised of MPLS, MPLS and broadband, or all-broadband, is ready to deliver a superior experience for VoIP.

In an intelligent WAN, Talari appliances are deployed in the headquarters and in the branches or remote offices, which creates a meshed, virtual network of secure connections among sites. Talari ensures high quality, reliable VoIP calls throughout the organization by intelligently controlling, steering and prioritizing the individual packets across the network resources. Businesses that rely on a thinking WAN from Talari can guarantee a superior call experience for everyone who interacts with them.

Seven Capabilities for Business-Ready VoIP

Talari has defined seven critical network advancements for no-compromise, enterprise-grade VoIP. These advancements intelligently and automatically manage IP voice traffic when typical network architectures can't and when WAN optimization solutions won't.

1. Resilient multipath connectivity delivers exceptional caller experiences.

The Talari solution monitors the network quality across all available paths and sends VoIP traffic along the network path with the least one-way packet loss, one-way jitter and one-way latency. At the start of a call, Talari's real-time intelligence automatically picks the path with the best quality for the call setup and the voice call. It monitors these characteristics on each path, and when the quality of the path degrades (for example, packet loss is detected), it quickly redirects the VoIP packets within a fraction of a second to a new, better quality path with minimal disruption in call quality. Talari adapts to loss, latency and jitter "network events" within about 250 milliseconds for domestic connections or about 500 to 600 milliseconds for longer distance international connections. This sub-second response ensures a better VoIP experience for callers as calls do not drop, and they have minimal, if any, degradation during failover.

2. Classes of service give voice packets top priority.

Talari categorizes application traffic into 16 classes of service, allowing VoIP packets to be assigned to the appropriate priority relative to other applications, such as email or file transfers. Class-of-service prioritization guarantees that VoIP packets are not delayed across the WAN due to congestion from lower priority traffic. To determine which traffic is VoIP and deserves real-time priority, the Talari appliances honor the already-set IP DSCP markings and make the classification decision based on flow characteristics such as port number and source or destination IP address.

3. Packet duplication improves VoIP resiliency and voice quality.

Packet duplication improves voice quality by reducing latency and dropped packets. Talari replicates voice packets over two disparate paths across the network and suppresses duplicates at the receiving appliance, hiding packet loss or excessive delay on either of the paths. Each packet traverses the absolute lowest latency path, and dropped paths are virtually eliminated, drastically improving VoIP resiliency and voice quality.

4. Packet loss mitigation minimizes voice distortions and choppy conversations.

Talari can be configured to retransmit lost VoIP packets—a feature not available with UDP traditionally used for voice. Additionally, since the wait time before requesting the retransmit for an incoming packet is user-configurable, this feature will minimize voice distortions without exceeding the maximum tolerable packet latency for the VoIP call.

5. Bandwidth augmentation adds power when and where it's needed.

Talari makes increasing available bandwidth for high-quality VoIP calls easy. Talari appliances augment existing broadband or WAN circuits with additional links,

immediately increasing usable and reliable bandwidth for remote sites. The additional bandwidth is often Internet links that are currently used as VPN backup connections or redundant WAN links. By combining multiple paths into a single connection, Talari creates a virtual, software-defined WAN from multiple physical links.

6. Dynamic bandwidth management keeps voice traffic flowing seamlessly.

When voice traffic spikes at one site, Talari technology dynamically reallocates bandwidth to the busy center reducing bandwidth at less busy sites. Talari technology recognizes and adapts sub second to the bandwidth usage changes and congestion at both ends of a path. Bandwidth is managed based on local congestion measurement, static setup and the remote-end's instantaneous use of bandwidth.

7. Data reduction decreases network congestion.

In networks with a high volume of voice calls, the Talari solution reduces overall congestion using optional data reduction features. Packet aggregation, for example, combines multiple small packets into one larger packet, which reduces the overhead that's associated with the numerous

WHY WAN OPTIMIZATION DOESN'T IMPROVE VOIP

Many organizations rely on WAN optimization solutions to keep bandwidth demand (and costs) down. But the growth in VoIP and other real-time applications degrade the effectiveness of WAN optimization, because many optimization techniques don't apply to real-time traffic and often voice traffic passes through the WAN optimization appliance untouched. In terms of reliability and redundancy, WAN optimization does nothing, so voice calls are vulnerable to link outages and poor quality.

	WAN Optimization	Talari THINKING WAN
Packet Duplication		✓
Loss Mitigation		✓
Failover		✓
QoS	✓	✓
Bandwidth Augmentation		✓
Dynamic Bandwidth Management		✓
Packet Aggregation	select vendors only	✓
Quality-Based Routing		✓

voice packets. Header compression, another data reduction capability, shrinks the header information on each packet, reducing the overall amount of data and decreasing congestion.

Talari THINKING WAN Usage Scenarios

Keep customer communications flowing with a Talari THINKING WAN. Talari ensures a superior voice experience in multiple ways.

In Figure 1, Mary, a worker, in Branch 1 makes a VoIP call to Tom in Branch 2. At a start of the call, Talari prioritizes the call registration session and assigns it to the best quality path in the conduit. The call setup session flow

from Branch 1 to Branch 2 is routed to the data center where the VoIP servers are located. Then the IP phone session is established directly between Branch 1 and Branch 2.

As shown in Figure 2, Talari continuously monitors the network and path quality in each direction, and if packet loss occurs or if a link fails, the session is moved to a better quality path in a fraction of a second without terminating the session to avoid VoIP call quality degradation or disconnect. In this example, the MPLS link goes down, and the voice packets are automatically routed over the broadband Internet connection, and the users don't notice anything.

Figure 1: With a Talari THINKING WAN, when Mary in Branch 1 places a call to Tom in Branch 2, the call is routed across the network using the best path to reach the data center where the VoIP servers are located. Then the voice session is established directly between Branch 1 and Branch 2, again using the fastest path.

Call Setup and Voice Call with Talari

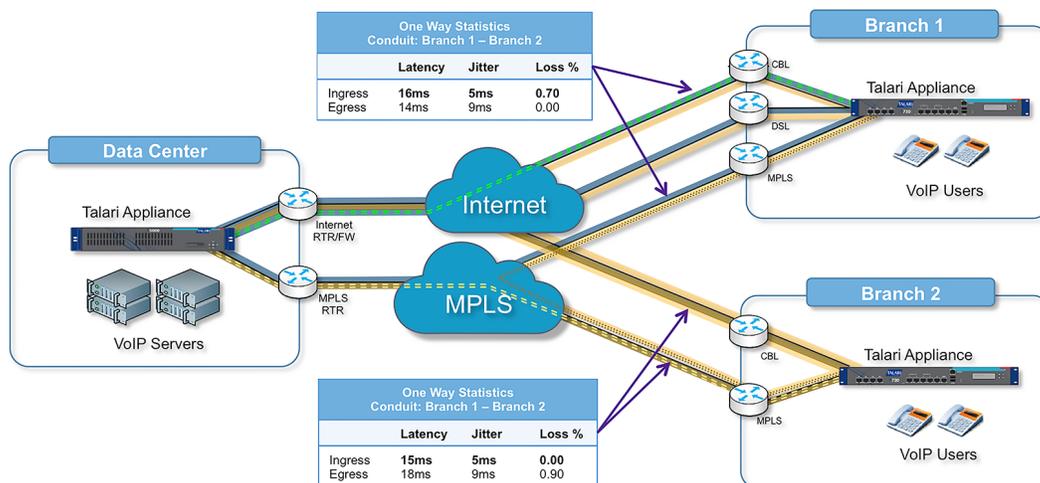
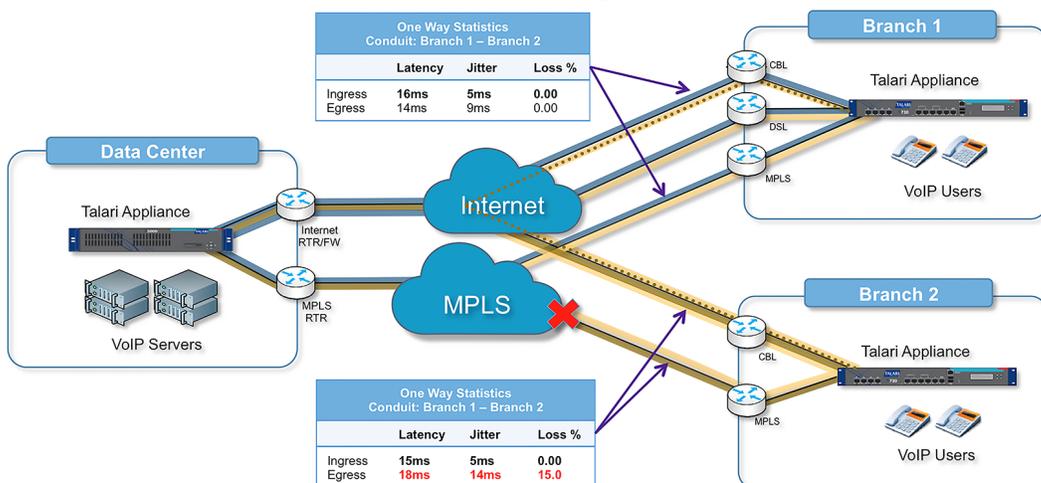


Figure 2: Talari continuously monitors the WAN, so that if a circuit fails or voice or other application packets are lost, then the packets are automatically routed over another WAN link without the users noticing. In this example, when the MPLS link fails, the broadband Internet connection takes over without any application interruption.

Packet Loss or Link Failure in a Talari Intelligent WAN



As Figure 3 shows, Talari selects the best available path for VoIP. Asymmetric best path selection means that in some situations, the VoIP call packets travel to their destination over one carrier's WAN link path, but the return flow will travel over a different path.

Deliver a Superior Experience with Talari

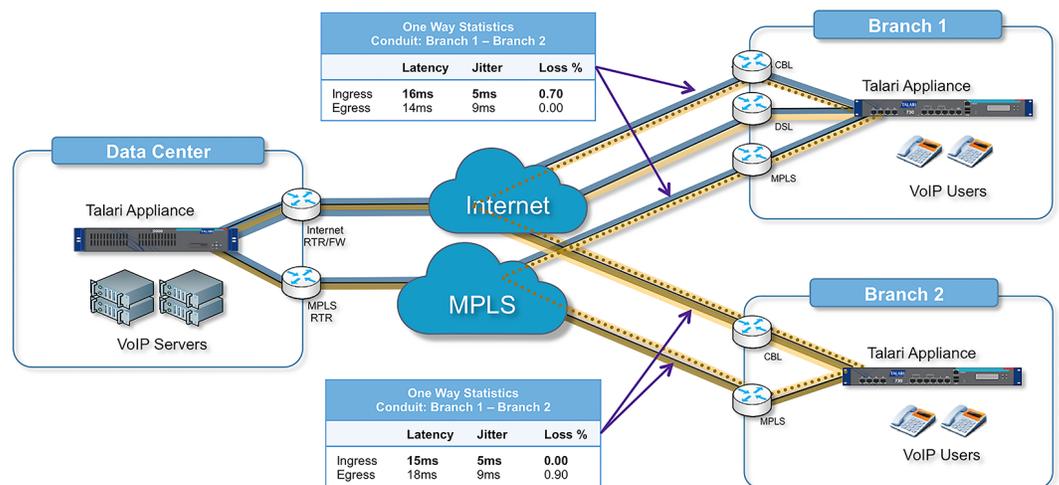
Talari's patented technology constantly measures the factors that impact VoIP quality, intelligently adapting in real time to the network conditions in response to the changing factors, providing a resilient, thinking network to support VoIP. And that results in a better user experience.

Organizations can use Talari to:

- **Assess network health for VoIP** – Talari continuously monitors each path to collect detailed metrics on one-way latency, jitter, packet loss and bandwidth. Each path's health is monitored from end to end and decisions are made based on the path quality, not just if the WAN link is up or down as today's routing protocols do.
- **Optimize the use of network resources** – Talari's dynamic bandwidth reservation is based on congestion prediction and constantly adapting to instantaneous bandwidth availability. Talari also performs traffic shaping to remove burstiness with prioritization based on application class (e.g. real-time VoIP) defined by configuration policies.
- **Improve network visibility** – Talari Aware, a network monitoring system, gathers all statistical data from the Talari intelligent
- **Eliminate dropped calls** – Talari performs sub-second path changes if any issue such as low performance or link failure is

Figure 3: Talari makes path decisions on a packet-by-packet basis—not the application flow—to deliver the highest possible quality and reliability and an ensuring that no call is dropped during a path change.

Talari Uses Asymmetry Best Path Selection



detected. Adding Talari appliances to the network ensures VoIP calls work without interruption—even in the case of link failure or network impairments such as high jitter, latency or packet loss. Only Talari makes path decisions on a per-packet basis—not the application flow—to deliver the highest possible quality and reliability, ensuring no call is dropped during a path change. Calls experience reliable QoS even over best effort networks.

Step Up to a Thinking WAN

In a typical WAN, VoIP is at the mercy of the underlying network and resiliency depends on routing protocols and network convergence times. Workers, customers and others suffer through dropped calls and phone re-registration issues that make for a poor user experience and business disruption. WAN optimization platforms cannot deliver the QoS and continuous voice operations that VoIP demands.

Businesses are turning to Talari to deliver a better VoIP and application experience at a lower cost. Essex County Fire and Rescue Service, a first-responder service in the UK, leverages Talari's solution in

its mobile incident command centers to ensure that communications are reliable and are guaranteed bandwidth during an emergency.

Many banks and credit unions also depend on Talari to deliver a superior user experience for applications and communications. United Federal Credit Union in St. Joseph, MI, stayed available to members and avoided a service outage when an MPLS connection went down at a branch office. With Talari's THINKING WAN overlaid onto the credit union's network, access to phone calls, applications, and ATMs continued without interruption and no one at the branch even noticed the network was down!

Organizations must be highly responsive to their customers, and with a Talari THINKING WAN, businesses can provide a superior experience for voice and other applications with a highly reliable, intelligent network.

Learn More

Learn more about how Talari's THINKING WAN can improve the application experience and network reliability. Request a custom demo at <http://www.talari.com/company/request-custom-demo>.



550 S. Winchester Blvd.
Suite 500
San Jose, CA 95128 USA
+1 408 689 0400 phone
+1 408 864 2124 fax
www.talari.com

About Talari™ Networks

Talari Networks is improving WAN reliability, capacity and affordability to enable a network that supports the growing demands of mission-critical applications. By aggregating multiple diverse networks into a virtual WAN and continuously adapting traffic based on the availability and real-time quality of the network paths, Talari ensures applications that rely on a WAN are not affected by underlying network issues. Talari's patented technology delivers significant cost savings over single-provider networks while also increasing reliability and quality. Talari has received numerous industry awards, including Best of Interop-Performance Optimization, Techworld Awards-Networking Application Product of the Year; and named Gartner Cool Vendor, CRN 2013 Emerging Vendors and CRN Data Center 100 List. For more information, visit www.talari.com.