Software Defined WAN Decreases Costs While Improving Network Performance, Availability, and Reliability

A Network and Business Analysis by a Leading Healthcare Managed Services Provider

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March 11, 2015

This use case provided by Talari.

1. Executive Summary

Benevis LLC ("Benevis"), a leading healthcare practice services company, has deployed Talari Networks equipment at roughly 25% of the 130 Kool Smiles dental offices nationwide. The rationale for this deployment was to address low-performing T1 MPLS network infrastructure that was impacting office connectivity and productivity. The resulting improvements in network availability, performance, and reliability have justified the minimal incremental costs. Offices that previously had been the worst in the network became the best, and the overall network value to the business and its stakeholders (patients, staff, management) improved as a result. Talari's ease of configuration, use, and technical support has resulted in a valued partnership.

2. Introduction

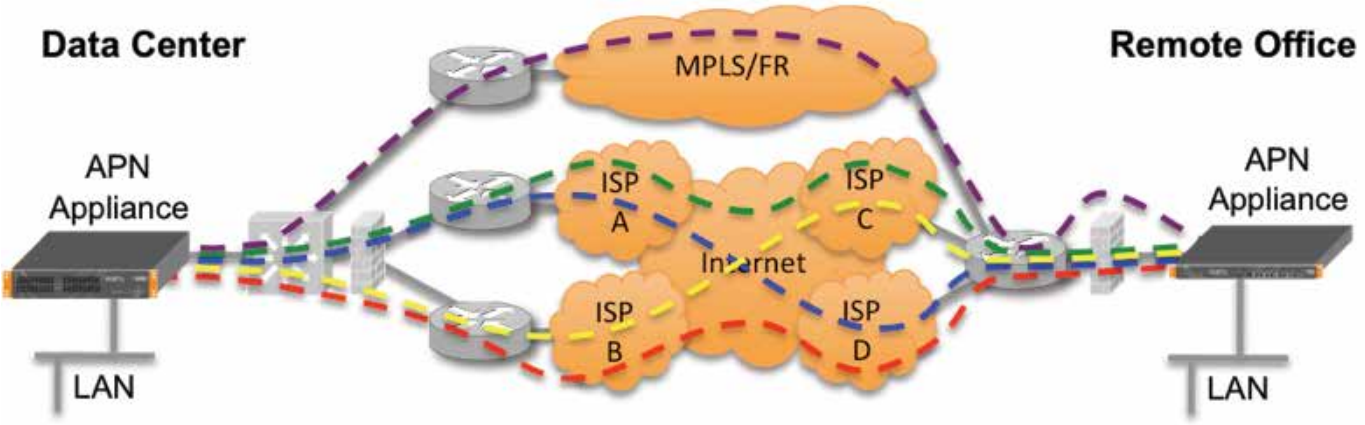
Benevis, LLC ("Benevis") is a leading healthcare practice management company, providing non-clinical support to over 130 dental offices nationwide. Kool Smiles, one of the largest networks of dental clinics serving pediatric patients in the US, depends upon Benevis to provide IT support services, including VoIP phone and data network connectivity. With an award-winning thin-client (Citrix-based) network architecture, and the world's single largest digital database of dental images, maintaining connectivity to clinics is essential. The network supports a medium-sized (100+ seats) bilingual call center that includes both centralized and virtual agents handling calls for multiple brands in a seamless blended (inbound/outbound) environment. Patient histories, dental charts, appointments, insurance and payment information all need to be accessible in real-time in order to make appropriate treatment decisions and ensure the provision of efficient, quality care. The cost of network downtime is measured in hundreds of dollars per hour, not to mention staff aggravation and patient dissatisfaction/defection. Therefore, maintaining a reliable and high-performance network is of paramount importance to the business.

Kool Smiles, the flagship Benevis-affiliated brand, provides dental treatment to under-served communities, often in less affluent urban and rural areas. The network infrastructure in these areas is typically substandard, with many offices experiencing recurring network outages, circuit flapping, and general poor performance. It is also more difficult to obtain higher-bandwidth alternative broadband connections such as cable or DSL in these areas.

3. Talari Pilot at Benevis (March, 2012)

In early 2012, Benevis sought out Talari to pilot the deployment of its Talari Appliance T510 (Adaptive Private Networking) appliances in the field to help address its network downtime issues at certain dental clinics which had a poor uptime record. The "worst of the worst" sites were chosen to determine if there would be substantial benefit in deployment of Talari appliances. Fortunately, all of the pilot sites had two alternative broadband circuits available (cable, DSL, and/or fixed wireless) to form the Talari "Adaptive Private networking (APN) conduit" in place of the existing T1 MPLS circuit.

Figure 1: Talari Adaptive Private Networking (APN) infrastructure diagram



The result was that the pilot sites had more stable connections with better throughput (due to higher bandwidth), performance (e.g., reduced latency and jitter), and lower cost. Two cheaper broadband connections, leveraging Talari's advanced WAN aggregation and WAN virtualization capability led to an improved 'circuit' with inherent reliability. In addition, traffic shaping using Talari's advanced QoS (Quality of Service) tuning capabilities led to better user perception of system speed and quality, as well as improved handling of complex traffic (e.g., VoIP telephony, Citrix transactions, large dental image transfers) that was not possible with standard carrier MPLS QoS capabilities.

4. Talari network at Benevis today (December, 2014)

Given that the pilot was a success, we expanded the Talari deployment to more offices (including the Benevis headquarters in Marietta, GA) to more fully address poor T1 MPLS network circuits and boost WAN performance/availability. The deployment sites were more or less evenly split between dual and single alternate broadband circuits, with a carrier T1 DIA (Direct Internet Access) circuit forming one 'leg' of the conduit in places where a second alternate broadband connection was simply not available or viable. Despite the additional cost of keeping the T1 and adding another cheaper broadband circuit, the benefit of increased up-time (and therefore patient satisfaction and clinic revenue) more than offset the incremental cost, while providing a higher-performance, inherently reliable redundant "last mile" circuit. Alternatively, in areas where dual broadband circuits were readily available, there was a cost savings to deploying Talari along with the added benefit of much higher speeds than T1 could deliver, resulting in both performance and cost benefits.

Today, we have a total of 30 sites, approximately one-quarter of all 130 sites, using the Talari virtual network overlay solution. The availability standard for network sites is 99.90% ("three nines"), which is equivalent to less than half an hour (30 minutes) of downtime per month.[1] Historically, our worst 30 sites averaged 99.0% availability (280 minutes per month unavailability), and some were as low as 97.0%. The impact of high network unavailability on patients and dental staff is significant. Not only does patient experience and cycle time suffer, but the lack of network availability can lead to decreased revenue and patient retention. In other words, direct costs of thousands of dollars a month, not counting indirect costs of poor patient satisfaction and retention, have justified our investment in Talari's network overlay solution.

[1] Site availability is measured based on a 6 am to 12 midnight schedule (18 hours per day) for 6 days per week (excludes Sundays when offices are closed). Therefore, 18 hours x 60 minutes/hour x 6 days/week = 6,480 minutes of potential availability per week. Unavailability should be 6,480 minutes/week x (1-.999) = 6.48 minutes of downtime per week, or roughly 6.48 x (52/12) = 28 minutes per month.

5. Network Performance Improvement

"Network Performance" is measured via several different but related metrics:

- Availability (% of time the site is available)
- Throughput (e.g., average speed of network connection)
- Quality (e.g., degree of latency, jitter, or other issues impacting connection quality)

As mentioned previously, the availability standard for Benevis-supported sites is "three nines" (99.90% availability). Prior to the introduction of Talari devices, the overall network availability (for 130 sites) was 99.70%, significantly below the target of 99.90%. The reasons for this miss:

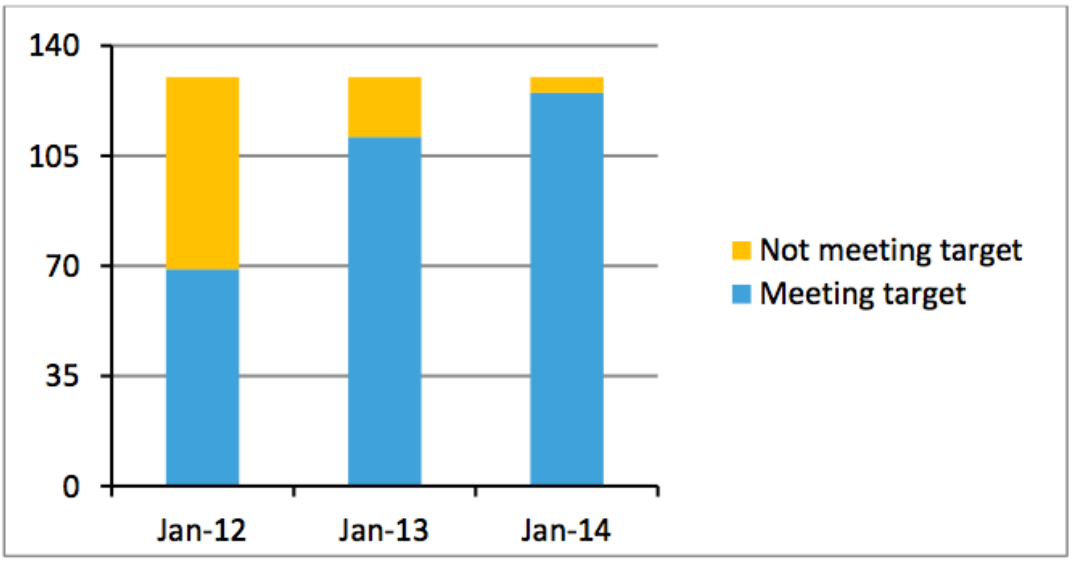
- Many (almost half) of sites were out of target (below 99.90% availability)
- High variability in site availability (some as low as 97.06%)
- "30 worst sites" with a disproportionate amount of unavailability, skewing total downward

Note that the number of sites meeting target improved dramatically as Talari devices were introduced into the network, enabling overall site availability to increase as well.

Figure 2a: Benevis network site compliance (2012-2014)

Sites meeting network availability target (99.90% availability)	Jan. 2012 (pre-Talari Phase 1)	Jan. 2013 (during Talari Phase 1)	Jan. 2014 (post-Talari Phase 1)
Total Sites	130	130	130
Talari Sites	0	14	20
Sites meeting target	69	111	125
Sites not meeting target	61	19	5
% meeting target	53.1%	85.4%	96.2%

Figure 2b: Benevis network site compliance (2012-2014)

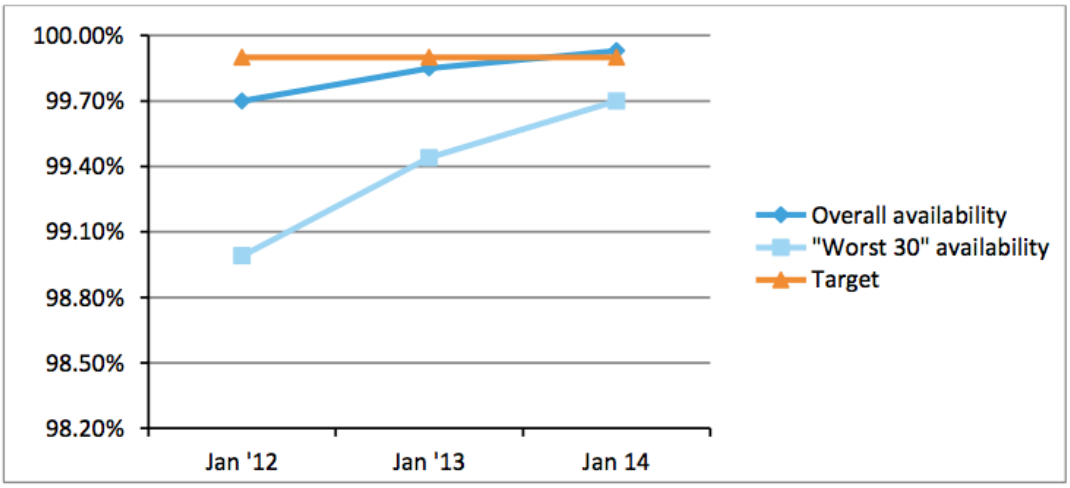


Interestingly, the introduction of Talari devices made the "worst 30 sites" availability equivalent to the overall network availability pre-Talari (99.70%) and allowed the overall availability to meet target (99.90%+). Availability for Talari sites alone is typically 99.97%, far above the target.

Figure 3a: Benevis network availability (2012-2014)

Site availability	Jan. 2012 (pre-Talari Phase 1)	Jan. 2013 (during Talari Phase 1)	Jan. 2014 (post-Talari Phase 1)
Total Sites	130	130	130
Talari Sites	0	14	20
Overall availability	99.70%	99.85%	99.93%
"Worst 30" availability	99.00%	99.44%	99.70%
Talari Site availability	N/A	99.97%	99.97%

Figure 3b: Benevis network availability (2012-2014)



The fact that more sites (on average) are meeting target availability of 99.90% uptime means less system-wide disruption and a more manageable network for limited IT resources to troubleshoot and maintain.

As alternate broadband circuits are introduced into the network to create Talari "conduits", available network bandwidth typically increases from 1.5 Mbps down/up (T1 speed) to much higher speeds. For instance, certain sites were chosen for Talari implementation not because of availability issues, but due to high patient volume, which led to traffic bottlenecks with the existing T1 service. By adding cable circuits with up to 50 Mbps down / 5 Mbps up bandwidth (at a fraction of the price of a groomed T1 MPLS connection), this bottleneck was resolved. Furthermore, through the prioritization of traffic using Talari's enhanced QoS capabilities, the perceived delays were reduced. By using T1 or DSL for real-time VoIP or Citrix session traffic, and the higher-bandwidth cable connection for large dental image transfers, Talari optimizes the channel, providing improved throughput at reduced cost. Other network metrics such as jitter and latency are also optimized, and no "choppiness" on voice or data communications is observed any longer for Talari sites.

6. Application Performance Improvement

While network performance (availability, throughput, quality) are important for maintaining a solid IT infrastructure, the ultimate measure of any new technology is the extent to which it benefits actual users and the applications they use. In order for users to observe a positive benefit, they must perceive improved performance in areas such as application response time.

Talari allows for more sophisticated traffic prioritization than is permitted using standard T1 MPLS circuits. Typical carrier QoS only allows 3 classes of traffic to be identified and prioritized. Talari QoS has the ability to create many more classes of traffic and treat them differently based on rules and real-time feedback from the underlying data circuit performance. An example would be that VoIP traffic is always prioritized first and the link with the lowest latency and least jitter is used as the primary pathway. As an additional precaution, Talari can be configured to ensure that VoIP packets are duplicated and sent across the both links (at the same time in parallel) to guarantee the VoIP stream will arrive at the other end uninterrupted even in the case of a circuit outage. Unless the same packet is lost on both links, packet loss goes to zero and the latency is always the fastest of the two links at any given time. In this manner, using Talari's real-time enhanced QoS capabilities, the user experience is enhanced through the more finely-tuned, packet-by-packet prioritization of voice and data traffic across the network.

Figure 4: Dentist showing child patient a digital x-ray image of their teeth:

7. Ease of configuration/use

One concern when implementing a powerful new technology is the ease of configuration and maintenance overhead on the IT staff. Many questions come to mind, including:

- "Will the technology be easy to use and deploy?"
- "Will the technology be compatible with my existing infrastructure?"
- "Will the technology be easily configured and managed by my IT staff without significant additional cost/time incurred?"

In our experience with Talari, the answer to these questions is "Yes". While the initial pilot sites required some retooling of routing tables, once a template for these routes was created, subsequent implementations went smoothly. This was even true for conduits making use of converted T1 circuits (single alternate broadband + T1 DIA circuits). All Talari sites coexist with our existing Cisco router network and core router infrastructure in our data center.

The core Talari Appliance T3000s at our data center run in a high-availability (HA) pair. The appliances are easy to configure and hot-swappable. The Talari T3000 fail-over occurs within seconds, and the Talari network does not miss a beat during this fail-over, which has been invoked intentionally during firmware upgrades, never as a result of core unit failure. The Talari Appliance T3000 core pair accommodates up to 128 field devices, which means that we could support practically our entire field office network on the pair we have today.

While two Talari Appliance T510 field units have failed (over three years of continuous use), the "fail to wire" feature has resulted in no impact on production since the site operated on the primary broadband circuit over a VPN from the on-site Cisco router. In these two cases, Talari provided replacement Talari Appliance

T510 units configured and ready for deployment within 24 hours. Talari support has been knowledgeable, efficient and friendly, resulting in a positive experience the handful of times we have required their assistance with a new deployment or an issue at a production site.

8. Financial impact/advantages of Talari vs. T1 MPLS

Of course, cost is always a consideration, particularly when introducing new technology into the network.

The advantages of a Talari "adaptive private networking (APN) conduit" over a traditional T1 MPLS connection are fairly evident from a performance point of view: inherent redundancy, higher total bandwidth, more granular QoS tuning—all leading to increased reliability, throughput, and flexibility. However, what are the cost considerations? How do all these technical operating advantages impact the "bottom line"?

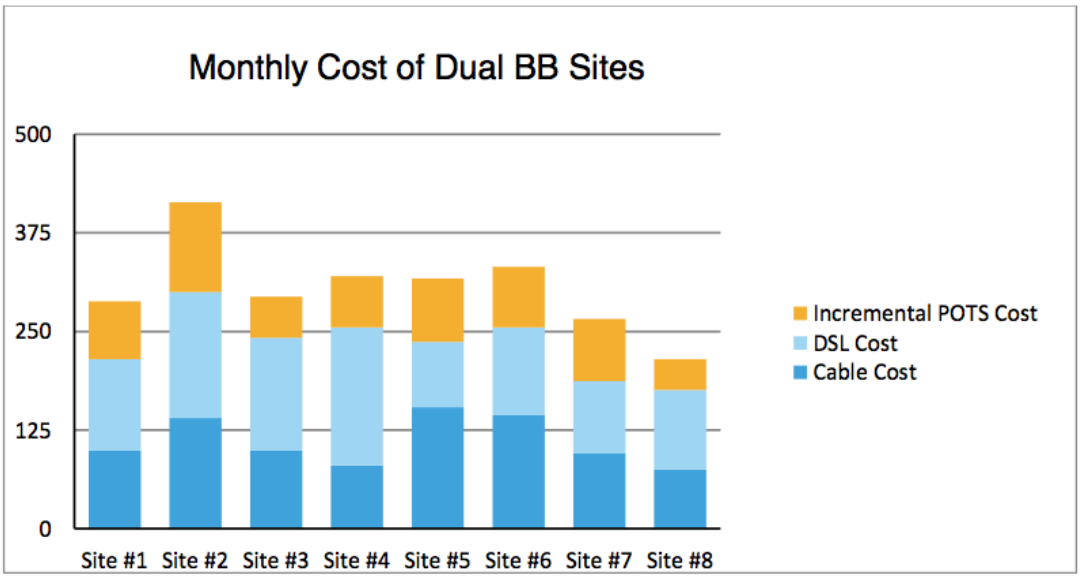
A major Talari selling point is that it can actually decrease circuit costs while improving performance. We have found this to be the case in our experience. The cost of alternate broadband circuits (for example a cable connection with 5 Mbps down / 1 Mbps up speeds and a 0.768 Mbps DSL connection) is typically less than $125 per month each, with a small one-time installation charge of $100-$250. This cost includes at least one static IP, which is required for routing purposes. When you compare the $250/month cost for two broadband circuits against the $505/month for a single T1 MPLS connection, it is fairly easy to see how this pays off financially.

For example, 8 out of the 30 offices implemented had true dual broadband circuits available (Cable and DSL), completely eliminating the need for a T1 connection. In these cases, the monthly cost savings for circuit costs was 39% on average ($306 vs. $505), net of incremental POTS line costs. When using dual broadband connections, there is additional cost for traditional analog (POTS) phone lines to provide "backdoor" communications in case of circuit outages and/or power failure. These incremental costs have been added to make the (OpEx) comparison valid. (Talari device CapEx costs are not included).

Figure 5a: Dual Broadband vs. T1 MPLS Monthly Circuit Costs

Monthly Circuit Costs	Cable Cost	DSL Cost	Incremental POTS Cost	Total Dual BB Cost	T1 MPLS Cost
Average for 8 Dual Broadband sites	$111	$123	$72	$306	*$505*
Range for 8 Dual Broadband sites	$75 - $144	$83 - $175	$39 - $114	$215 - $414	*$505 - $505*

Figure 5b: Monthly Cost of Dual Broadband Sites



However, in many cases, we have had to convert the T1 MPLS circuit to a T1 DIA circuit to get a second "alternate" broadband circuit to complete a Talari conduit (the other circuit is typically a low- cost cable or DSL connection). In this case, the monthly circuit cost typically increases, since the cost savings of converting the T1 (less than $50/month) does not make up for the additional cost of the alternate broadband circuit (always more than $50/month, closer to $100).

All of this does not include the additional cost for the Talari hardware (a Capital Expense that can be amortized over 5 years). Also, the use of dual broadband circuits for the Talari conduit means that some analog POTS lines need to be retained for special-purpose office communications (e.g., fax/credit card line, fire alarm signaling). In T1 offices, these lines can sometimes be run over IAD lines off the T1, saving the cost of POTS lines (typically $50/mo. each). Therefore, Talari can result in approximately $75 (amortized CapEx) plus $100 (2 POTS lines) additional monthly expense vs. T1 MPLS. These costs reduce the financial benefits of the alternate broadband circuit costs, but only for dual alternate broadband circuit conduits.

Figure 6: Financial Cost/Benefit of Talari Implementation

Circuit Cost Item	T1 MPLS connection (1.5 MB up/down)	Dual Broadband connection (cable 5 MB up / 1 MB down + DSL 768 KB up/down)	Single Broadband connection (T1 DIA + cable/DSL)	Comments
First circuit	$505/mo.	$123/mo.	$480/mo.	Requires Static IP (Cable)
Second circuit	N/A	$111/mo.	$123/mo.	Requires Static IP (DSL)
Incremental POTS line cost	N/A	$72/mo.	N/A	Required for special purpose lines ("backdoor", fax, etc.)
TOTAL OPEX MONTHLY COST	**$505/mo.**	**$306/mo.**	**$603/mo.**	
OpEx Cost differential (vs. T1 MPLS)	$0	-$199/mo.	+$98/mo.	$100-$250 one-time charge (per circuit) for alternate broadband installation
Talari T-510 cost (CapEx)	N/A	$75/mo.	$75/mo.	CapEx amortized over 5 yrs.
TOTAL CAPEX MONTHLY COST	**$0/mo.**	**$75/mo.**	**$75/mo.**	
CapEx Cost differential (vs. T1 MPLS)	$0/mo.	+$75/mo.	+$75/mo.	

However, since downtime is costly (lost revenue, lost patients, staff frustration, etc.), the financial benefit of improved network availability should be taken into consideration. This benefit is significant for sites suffering from low availability, so we targeted those sites for Talari deployment. The "break-even" availability for the dual broadband sites was 99.70%--if the site was "above average" pre-Talari, we left it alone; however, if it was "below average" availability and net cost savings was possible, we explored site conversion Unfortunately, where Talari was needed the most, the local broadband infrastructure was the worst, and we were lucky to find a workable single alternate broadband circuit, much less two. We did find dual broadband at some target sites, but only a handful.

For single alternate broadband sites (with a complementary T1 DIA circuit completing the Talari conduit), the unavailability standard was higher (99.35%). While there were fewer sites meeting this lower number, there were still enough (18 in January, 2012 alone) to justify the launching of the Talari Phase 1 program, resulting in the implementation of 20 Talari offices. The subsequent 10 offices targeted for the Phase 2 program have been a combination of "opportunistic" cost savings via dual broadband availability, bandwidth improvement for extremely busy offices, and resolution of newly-problematic T1 offices with 99.35% or lower network availability.

As a result of our Talari deployments, we estimate that we have at least broken even regarding cost, given the boost in network availability (and resulting revenue) for Talari sites. There are other financial "externalities" that include (1) reduced time spent by IT help desk and Telco staff on down site resolution, (2) improved bandwidth, resulting in reduced patient cycle time, and (3) improved connection quality, resulting in fewer bad VoIP calls and Citrix session errors.

A particularly significant illustration of the benefits of Talari is the sending/receiving of large, diagnostic quality dental images, which are stored on a central server in the data center. These images are critical to patient care, insurance review, and dentist compliance, since they are the basis for not only treatment but billing and procedure audits by regulators. The fact that the communication of these images can be made more efficient (and reliable) via the Talari QoS fine-tuning and enhanced bandwidth afforded by redundant, larger network circuits enables dentists (the most valuable and expensive labor in the field) to be productive and to see a full schedule of patients on a daily basis.

9. Conclusion

Our experience with Talari Adaptive Private Networking (APN) has been positive. Not only are the devices easy to configure and deploy in production sites, they are reliable as hardware and the handful of equipment issues we have faced in the last three years have been gracefully handled without significant impact on our operations due to Talari's outstanding customer support. No incremental network downtime has been incurred as a result.

The real benefit has been two-fold: cost savings and improved network availability/reliability/performance. We have shown with our own data how both of these areas have benefited through the presence of Talari devices in our network. The only real limitation to our Talari deployment is the availability of alternate broadband access to our sites, which is at times a challenge due to clinics being located in less-served areas where carrier investment has lagged. However, this situation is improving, and we are now completing "Phase 2" of Talari deployments bringing our count of Talari sites in production up to 30, or roughly 25% of our network.

In short, we have taken the worst-performing offices (from a network availability and performance perspective) and made them into the best-performing, improving the overall value of our network as an asset to our clients. Our clients rely on our network working properly every day in order to efficiently and compassionately treat thousands of patients, many of whom would not be able to find care if not for Benevis clients such as Kool Smiles.

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About Talari

Talari, the leading provider of Software Defined WAN (SD-WAN) solutions is changing the way companies think about, create and manage their WAN by giving the network brainwidth. Only Talari's THINKING WAN proactively manages capacity, reliability and performance, packet by packet—to keep critical applications running, reduce costs, and liberate IT to innovate new ways for the company to be brilliant.

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