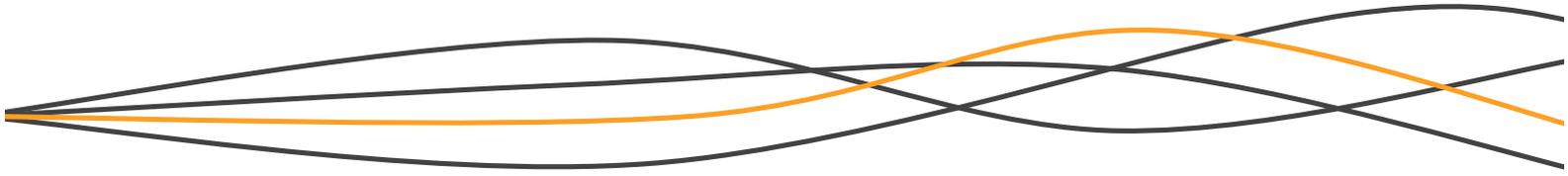


A Talari Networks White Paper

## Adaptive Private Networking – Reliably Enabling Next-Generation MSP / VNO / Outsourcing Services



A Talari White Paper



## Executive Summary

Innovative MSPs, VARs, ISPs, hosting/colo players and other outsourcers have begun to outsource network and application services for enterprises. Hosting for public-facing web servers, and SaaS providers like Salesforce.com are the most obvious success stories here. Other service providers are beginning to see success targeting the SMB (small/medium business) market, with services such as VoIP and hosted telephony, hosted Microsoft Exchange and SharePoint, as well as more traditional Managed VPN services.

Enterprises large and small are excited by the possibilities of “cloud computing” and the cost savings and productivity benefits they can get from technologies like VoIP and Unified Communications. Despite this tremendous potential, however, MSPs and SaaS providers are having difficulty penetrating the large enterprise market, and some parts of the SMB market, owing to limitations in the ability to provide application reliability over the public Internet, and/or sufficient bandwidth or performance at a reasonable cost.

Lacking bandwidth, some enterprise applications (like videoconferencing) can't be deployed. Because Internet-based services lack reliability and performance predictability, most conservative IT organizations are unwilling to consider outsourcing applications like VoIP services, ERP, or even email. And of course, this very lack of Internet reliability/predictability means that most large enterprises are not taking advantage of inexpensive public Internet and broadband connectivity for their internal WAN Intranet needs.

In a manner similar to how RAID leveraged PC hard disk technology to revolutionize storage cost, capacity and reliability, **Talari Networks' Adaptive Private Networking (APN) technology enables MSPs, VNOs and other outsourcers to securely adapt broadband Internet connections to business quality**, thus allowing enterprises to get 15x – 50x bits/dollar and greater reliability and application predictability than expensive private Frame Relay or MPLS WANs. APN solves the chicken-and-egg problem of securely providing reliability and sufficient bandwidth to **all** customer locations from a service provider's well-connected facilities.

With an APN solution, MSPs can now provide business-class service reliability for outsourced applications. **By solving the issue of reliable, secure and cost effective connectivity, next generation service providers can** leverage their economies of scale, proven expertise and credibility in hosting and managing data centers to **outsource and provide far more services**, including services until now exclusively the province of the corporate Intranet, **to a far broader swath of enterprises – SMBs, large enterprises and government organizations alike.**

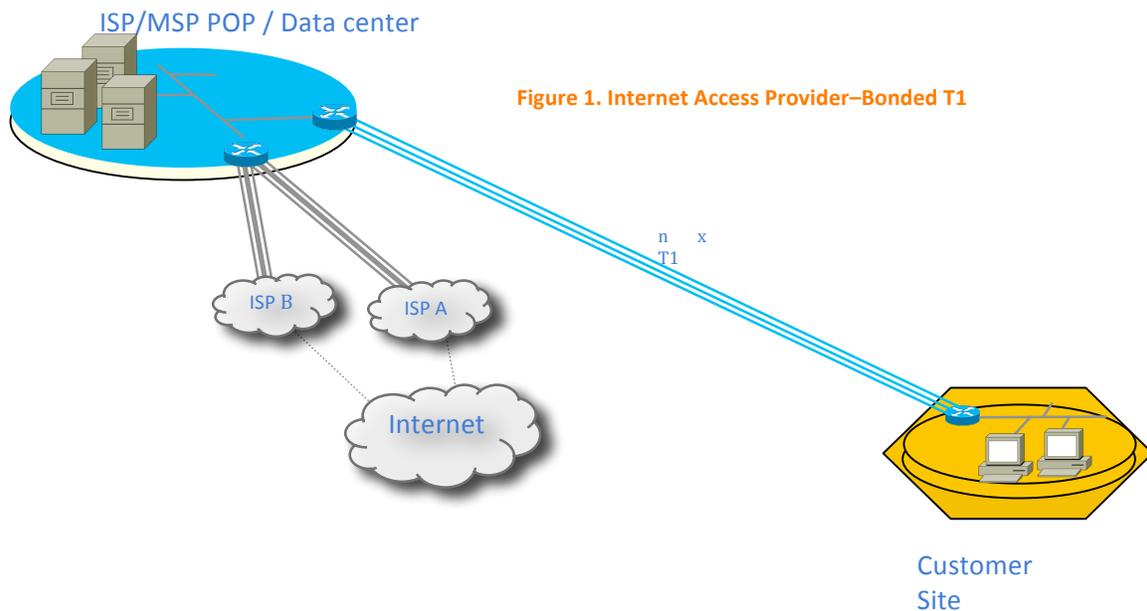
Talari's APN technology also enables next generation service providers to become Virtual Network Operators (VNOs), owning no networks of their own, and yet delivering more bandwidth and greater reliability at far lower cost to the customer than private network providers owning substantial network infrastructure assets. And APN lowers providers' ongoing operational costs, by providing a true “self-managed” adaptive network fabric.

## Background

The ISP market is well established. The telcos and some newer providers offer nationwide, and sometimes global, Internet access services, at speeds ranging from 1.5Mbps/384Kbps DSL up to Gigabit Ethernet MAN and multi-gigabit colo connectivity. The cable companies offer consumers, and increasingly more businesses, inexpensive Internet access with downstream and upstream bandwidths typically in the range of 2 – 16 Mbps and 512Kbps - 3 Mbps, respectively.

Many next generation service providers offer a variety of lower cost Internet access technologies. Metro Ethernet services, with bandwidths ranging from 1 Mbps to 1 Gbps, have been available in some locations for many years now, while Metro WiFi and WiMax are rapidly emerging as wireless solutions for last-mile connectivity.

Some next generation IP service providers lease/resell parts of the telco/cable network (typically DSL and T1) to offer those ISP services to their customers. To deliver more bandwidth to a customer location than a single copper connection can carry, many of these same providers have recently begun offering bonded T1 services (see Figure 1). These typically deliver 3 Mbps to 12 Mbps of service to the customer, but at fairly significant cost, due primarily to the high rents that monopoly RBOCs charge for T1 circuits.



Beyond Internet access, innovative MSPs, VARs, ISPs, hosting/colo players and other outsourcers have begun to outsource network and application services for enterprises (Figure 2).

Web hosting and colo services are used by enterprises large and small for their public-facing web servers. SaaS is also starting to emerge, again primarily served from these same well-connected hosting or secure colo facilities, with a few examples which don't require fully "4 9's" reliability (e.g. Salesforce.com) having success even with large enterprise. Other services are beginning to see success targeting the SMB (small/medium business) market, especially hosting of applications like Microsoft Exchange and SharePoint.

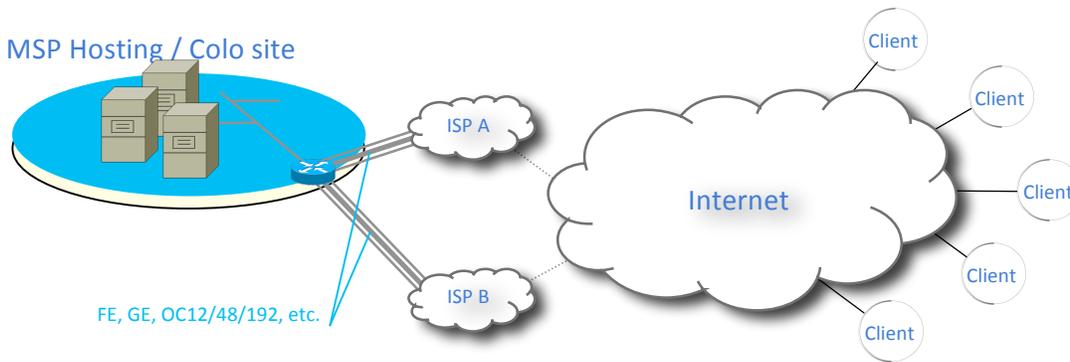
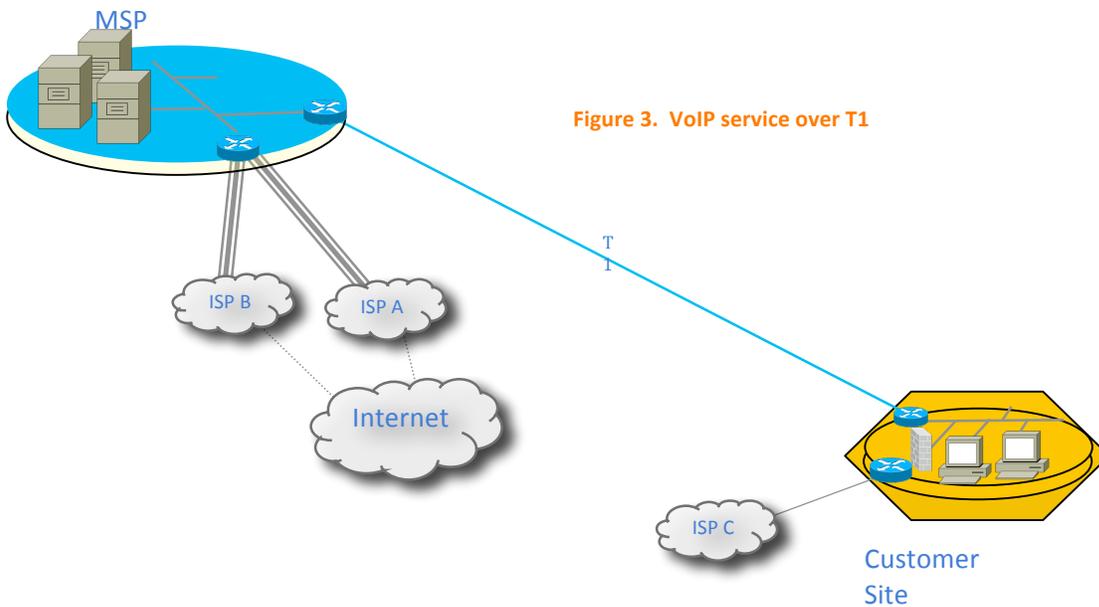


Figure 2. Hosting/Colo center

Some MSPs focus on delivering centralized VoIP services, largely targeting the SMB market. Some deliver these services via a dedicated T1 (Figure 3) to maximize service quality and reliability, possibly providing the customer with low-bandwidth Internet access over the same T1 as well. Other providers, optimizing for lowest recurring costs, provide the service with the connectivity to the customer site occurring completely over the customer's standard Internet connection (Figure 4).



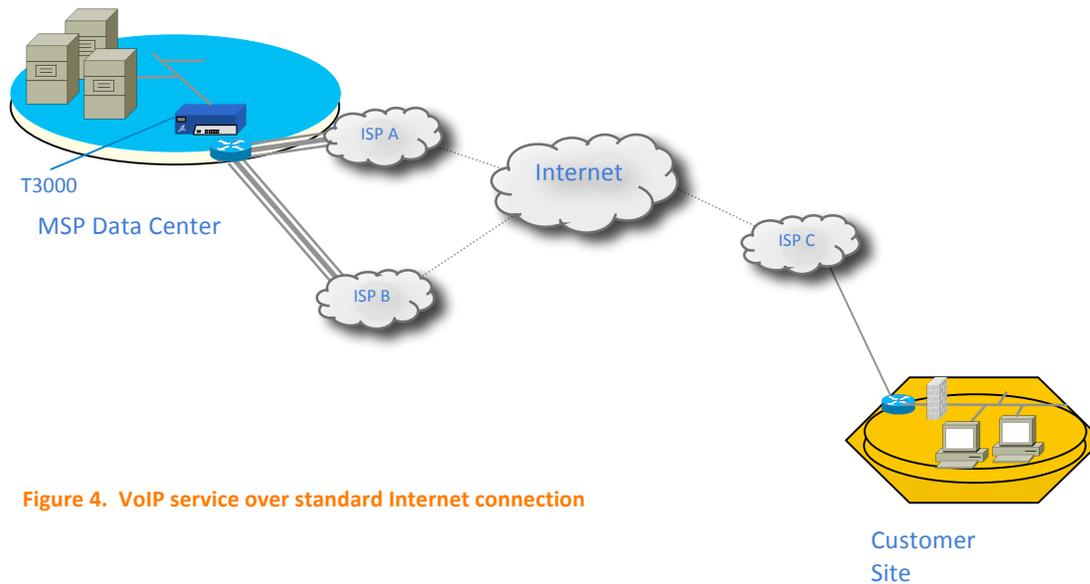


Figure 4. VoIP service over standard Internet connection

Coming to the MSP market from a different starting point, providers who may have started out as VARs or consultants have for some time now been offering more traditional Managed VPN services. In these cases, the MSP manages the IPsec-based VPN and router equipment at the customer premises, while the Internet service is provided by traditional ISPs (Figure 5).

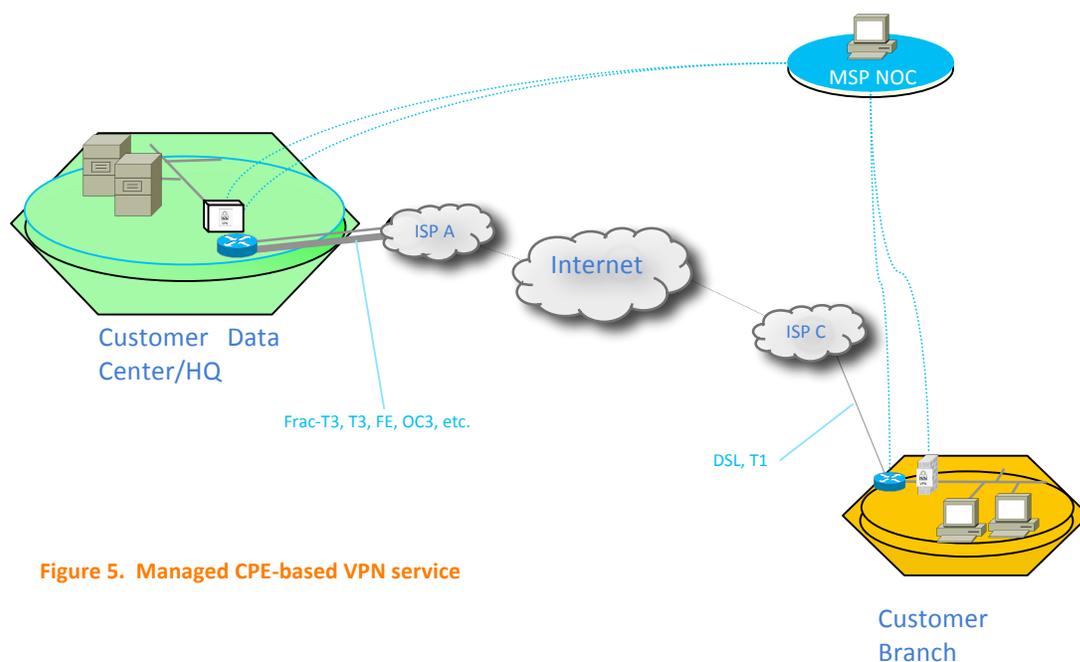


Figure 5. Managed CPE-based VPN service

## Problem Statement – How can MSPs expand their market reach and offerings?

While these services have met with varying degrees of success with early customers, it has been difficult for such service providers to penetrate the large enterprise market, and some parts of the SMB market, owing to limitations in the ability to provide application reliability and/or sufficient bandwidth or performance at a reasonable cost.

Enterprise WAN data services (e.g. Frame Relay, MPLS, ATM) are a combined \$25 Billion annual market, and the last bastion of high-margin, oligopoly carrier services. The Internet is widely used for almost every other purpose **except** as the primary mechanism of delivering the WAN for larger corporate Intranets. Meanwhile broadband (e.g. DSL, Cable) has become widely available and highly competitive, offering more bandwidth than Frame Relay/MPLS connections at radically lower cost.

While MSPs are having initial success among SMB customers, and while SaaS has become successful in certain application segments, penetration into many other segments of enterprise applications has been limited by the lack of reliability and predictability of running applications over the public Internet.

From the customer's perspective, enterprise IT departments face pressures to control costs while meeting increasing demands on the network. As applications' thirst for bandwidth ever increases, centralizing servers and services reduces some costs, but places increased pressure on network reliability and response. New services such as VoIP and videoconferencing only further increase the pressure on network reliability and predictability.

Again from the enterprise customer's perspective, while LAN bandwidth has grown by a factor of 1000x in the last dozen years, WAN bandwidth for Intranet services and applications at most locations has grown by barely 10x, to ~1.5 Mbps. For enterprises yoked to expensive Frame Relay and MPLS services, buying more bandwidth is usually not a viable option, however, as the RBOC last mile monopoly, combined with the oligopoly of 2 ½ credible nationwide data service vendors in the U.S. (and similar monopolies/oligopolies in Europe/Asia) have kept the pricing of these private enterprise data services stubbornly high. In fact, per Mbps private WAN pricing for sites not connected by fiber has barely come down at all over the past 8-10 years, even as Moore's Law and competition have delivered massive improvements in price/performance in almost all other areas of networking and IT. The cost/Mbps at a branch location for Frame Relay/MPLS is typically \$600 - \$1,500+ a month. By contrast, DSL or cable connectivity has a cost/Mbps of only \$10 - \$15/month.

Enterprises large and small are excited by the possibilities of "cloud computing", and can get cost savings and productivity benefits from technologies like VoIP and Unified Communications. Yet lacking bandwidth, some enterprise applications (like videoconferencing) can't be deployed, while others cannot be easily centralized at reasonable performance. Lacking reliability and performance predictability, most conservative IT organizations are unwilling to consider outsourcing applications like VoIP services, ERP, or even email. And while many SMBs, and a small number of larger businesses, build their private WAN via VPNs over the public Internet, and many more large enterprises leverage public Internet-based VPNs for backup connectivity, the lack of reliability and application predictability means that most large enterprises do not take advantage of inexpensive public Internet connectivity for their WAN Intranet needs.

MSPs have built up a great deal of expertise and economies of scale in building and managing hosted data centers and colo facilities. These facilities offer excellent, multi-homed, high bandwidth connectivity, via the Internet, to all locations across the country, and indeed the world. Virtualization technologies further benefit the data center provider in terms of economies of scale and the efficient use and of management of expensive capital equipment. "Cloud computing" is hot for good reason.

The question now is: how can MSPs overcome the connectivity obstacles preventing them from taking advantage of these resources to expand their market opportunity?

## Solution: Talari Networks' Adaptive Private Networking

RAID technology revolutionized the storage industry by allowing customers and a new generation of vendors to take advantage of ultra low cost PC hard disk technology to deliver next generation storage solutions which were 2 orders of magnitude better in terms of price/performance, while actually exceeding the reliability of traditional single disk systems. Talari Networks' **Adaptive Private Networking (APN)** technology similarly enables MSPs, VNOs and other outsourcers to securely adapt multiple broadband Internet connections to business quality, thus allowing enterprises to get 15x – 50x bits/dollar **and** greater reliability and application predictability than expensive private Frame Relay or MPLS WANs.

With Adaptive Private Networking, Talari is pioneering a new class of solution with a unique strategy to leverage VPN technology and the inherent diversity of the public Internet to deliver reliable next-generation network solutions for MSPs, outsourcers and their enterprise customers. APN employs a **RAID-like approach** to the reliability and predictability issues associated with the Internet, combining diverse sources of bandwidth to enable high-bandwidth WANs at **radically** lower cost while delivering true **business quality** "four nines" reliability.

APN does for WAN connectivity what RAID did for storage. Where RAID wrapped a layer of hardware and intelligent software around the Seagate PC hard disk, the intelligent software in an APN appliance-based solution does something similar with multiple WAN connections – via standard high speed Internet connections (T3, Metro Ethernet, OC3/OC12/OC48/OC192, Fast Ethernet, Gigabit Ethernet, etc.) at MSP/outsourcer/colo data centers, as well as at the larger sites of enterprise customers, and by leveraging any type of broadband Internet links for branches / smaller locations / SMB customers.

RAID leveraged PC hard disk technology to revolutionize business storage cost, capacity and reliability. Talari's APN technology leverages the most powerful, ubiquitous, low cost communications network ever created – the public Internet – to deliver WANs that are far lower cost, far higher bandwidth, **and** with greater reliability than the best proprietary single service provider WANs available today.

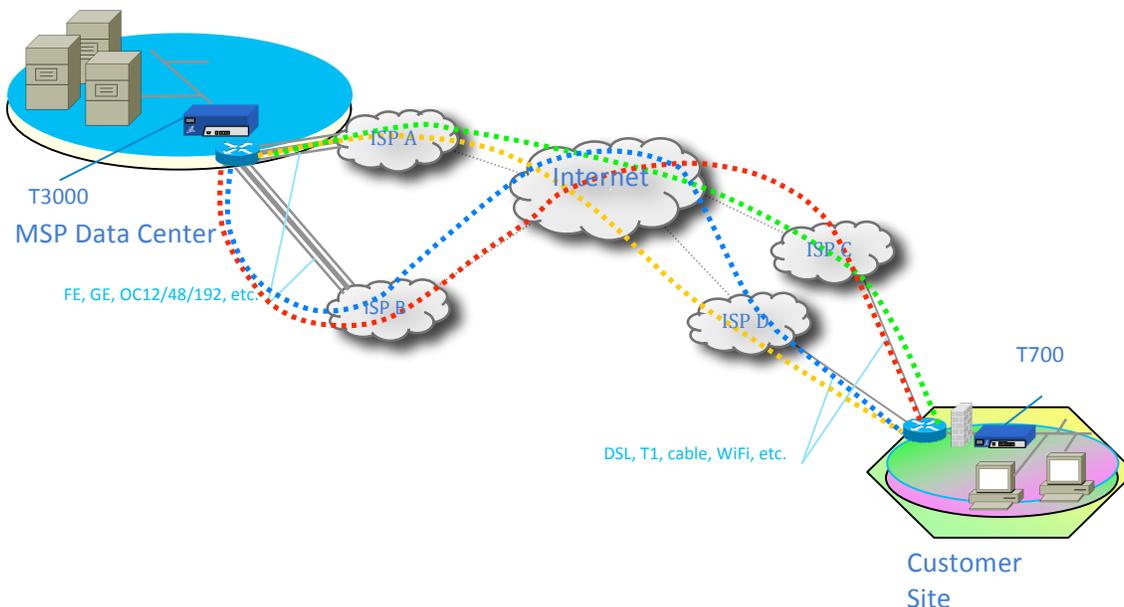


Figure 6. Reliable connectivity between MSP location and customer site via APN

As can be seen in Figure 6, the connectivity between the MSP's data center and a customer site happens via all possible Internet paths, and using all available links, between the two locations. In the example here, 2 high bandwidth links at the MSP data center (perhaps Gigabit Ethernet connections within the colo facility where the data center is located) plus two broadband ISP links at the customer location (perhaps a DSL connection combined with a cable connection) mean there are 4 possible paths between the sites. This is scalable to as many as 8 connections at either location. So long as there is diversity, several of the links can come from the

same provider. So, e.g., a 30 Mbps downstream, 3.8 Mbps upstream connection could be attained by leveraging three 8 Mbps / 1 Mbps cable connections plus one 6 Mbps / 768 Kbps ADSL connection at the customer site.

The two orders of magnitude, 50x difference in the price of network bits at smaller locations vs. the prices that the old guard carriers charge for their private WAN services is part of what Talari technology is exploiting. The other part is the network diversity inherent in the network-of-networks that is the public Internet. By leveraging multiple last-mile Internet network providers, APN's per-packet, sub-second, real-time ability to switch between networks (and away from networks with congestion/loss/latency/jitter issues) allows service providers to solve the reliability and predictability issues which have limited enterprise WAN flexibility **and** enterprises' willingness to leverage outsourced services much beyond colo and hosting for public-facing Internet servers.

By solving the chicken-and-egg conundrum of reliable, secure and cost-effective connectivity, next generation service providers can outsource and provide far more services, including services until now exclusively the province of the corporate Intranet, to a far broader swath of enterprises – SMBs, large enterprises and government organizations alike. APN technology allows MSPs to leverage their existing infrastructure, economies of scale, and proven expertise and credibility in hosting and managing data centers to successfully address a much larger market opportunity.

## APN Product and Technology

Talari Networks' APN equipment is a new kind of device for the WAN edge for MSPs, outsourcers and enterprises, deployed at MSP/outsourcer data centers/colos and as CPE at enterprise locations. It provides the ability to reliably combine multiple broadband circuits from different IP providers or to augment (or even replace) traditional WAN services at branch/remote locations.

Talari's Adaptive Private Networking technology uses end-to-end algorithms to do dynamic, real-time, per-packet traffic engineering. For VoIP and videoconferencing applications, APN will replicate traffic across multiple (least related) network paths, suppressing duplicates at the receiving Talari appliance, enabling "platinum quality" voice and video calls even in the face of sudden loss/latency congestion incidents which might occur.

Talari's APN software – embedded in the Talari T3000 and T700 hardware appliances – combines a control layer similar to PVCs (Permanent Virtual Circuits) to provide alternate paths and information on end-to-end performance, RAID-like functions to adapt to the operating state of each network path between locations, and VoIP gateway-like abilities to adapt the network to support the needs of applications. This network-based solution supports all IP applications, no matter whether they are encrypted, pre-compressed, or simply not amenable to application-specific caching and compression tricks.

## APN Benefits for ISPs / MSPs / VNOs / Outsourcers

APN enables next generation service providers to become Virtual Network Operators (VNOs) owning no networks of their own, and yet delivering more bandwidth and greater reliability at far lower cost to the customer than private network providers owning substantial network infrastructure assets (Figure 7).

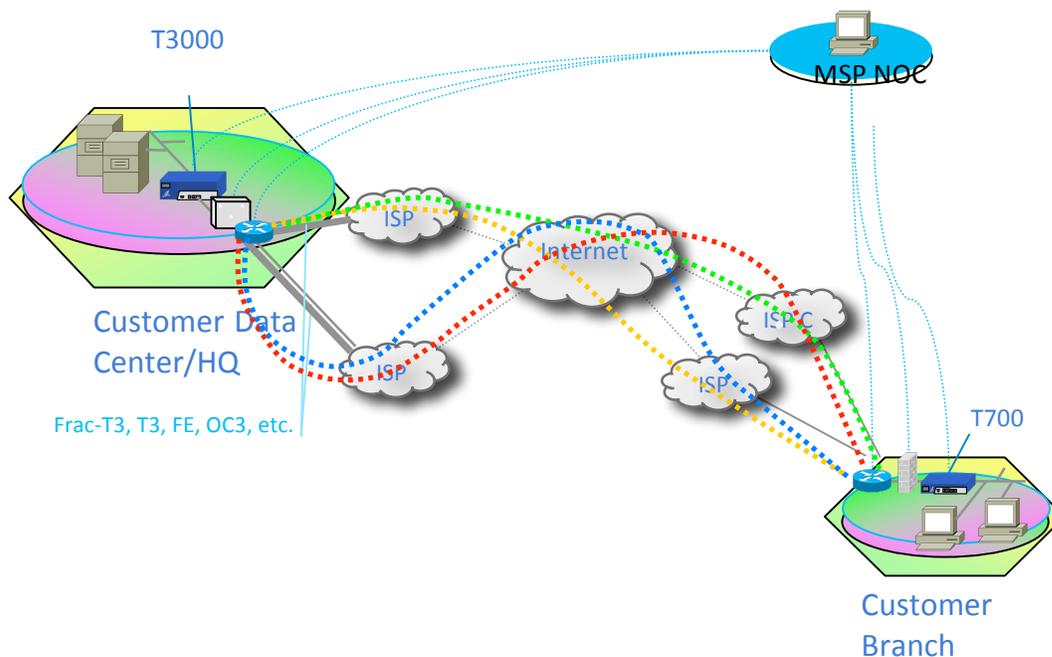


Figure 7. Managed VPN Service → Managed APN Service: MSP becomes a VNO

**The overall benefits for ISPs / MSPs / VNOs / Outsourcers include:**

- **Greater reliability than the best single provider MPLS network, while being able to offer customers a 15x – 50x bandwidth/dollar advantage** over MPLS, for those today offering Managed VPN services, or who would like to become Virtual Network Operators (VNOs).
- **Ability to offer “better-than-bonded” Internet access services** than the single DSL or bonded T1 services offered today – with 8x – 30x the downstream bandwidth **and** greater network reliability **and** lower operating costs **and** lower monthly service tribute to the incumbent telecom SPs.
- **Highly reliable hosting or colo services for corporate Intranet applications**, with high and expandable bandwidth at low cost, enabling MSPs/outsourcers to expand beyond public-facing web applications, as well as expand the addressable portion of the SMB market to customers demanding higher application reliability and predictability.
- **Reduced provider ongoing operational costs**, by providing a true “self-managed” adaptive network fabric, which requires less “heroic effort” troubleshooting when network connectivity problems arise. Think remote monitoring taken to the next level – the MSP doesn’t just tell the client about the problem, or send someone out to fix it – WAN issues are resolved automatically, sub-second. Again, the analogy to RAID is appropriate – when a hard disk fails, you are notified and know to replace it, but the application continues running unimpeded.

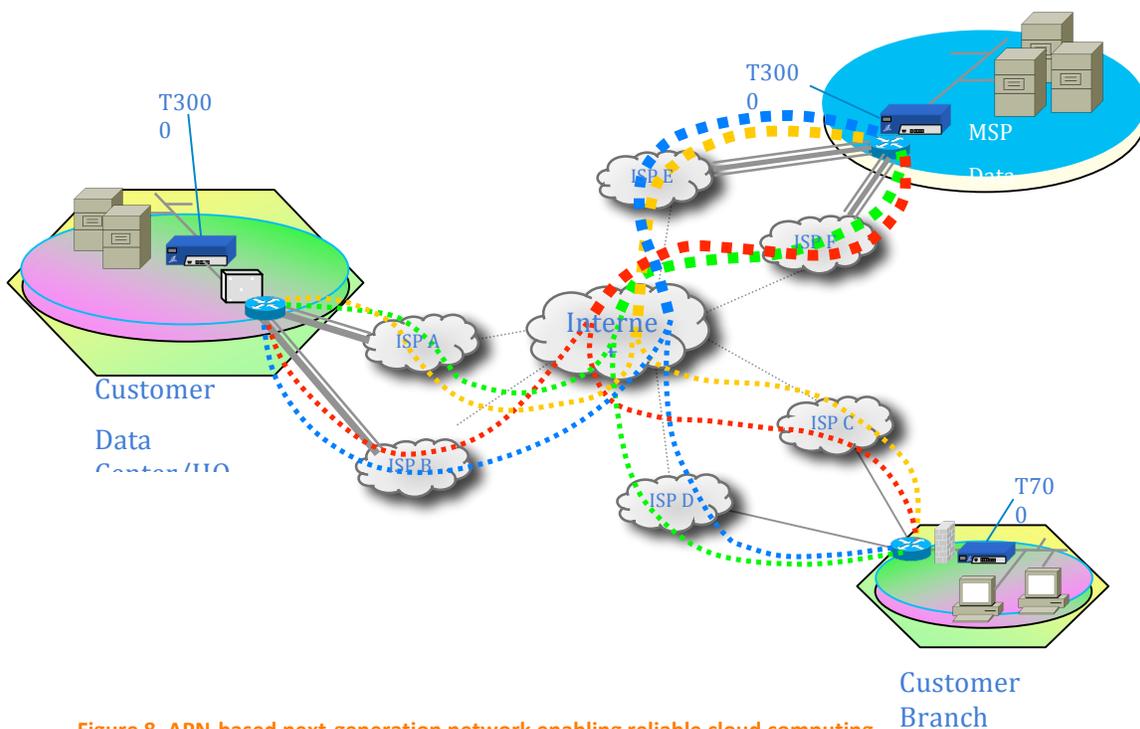


Figure 8. APN-based next-generation network enabling reliable cloud computing

## Specific benefits

In addition to the overall benefits that an APN-based solution provides for ISPs / MSPs / VNOs / outsourcers, here is a quick look at additional specific benefits for some of today's different providers.

### For Regional ISPs:

- **Expanded reach** beyond where the ISP has infrastructure assets today
- **Sell more than just Internet access** by selling VNO connectivity service
- **Sell more corporate locations** by leveraging APN and selling managed service to add bandwidth to an existing private network from another carrier, rather than having to force an all-or-nothing replacement strategy

### For Metro Ethernet ISPs:

- **Expanded reach** beyond where network infrastructure assets already exist (by enabling deployment of high bandwidth connectivity even at those locations where SP doesn't have assets)
- **Add value to service / sell at more corporate locations** by enabling it as active bandwidth as part of existing corporate Intranet, rather than being limited to selling only as Internet access connectivity

### For Wireless ISPs (WISPs):

- **Add value to service** by enabling it as active bandwidth in addition to an existing private network, rather than being limited to selling only as backup service or locations where wired service doesn't exist

### For ISPs offering bonded T1 services:

- **Offer higher bandwidth customer service** with much higher downstream bandwidth – easily to 30Mbps+...
- **...with lower recurring costs than paying for T1s**, as MSP recurring costs per line for DSL, cable, wireless ISP connections will be 30% - 50% of the cost of paying the incumbent telco monopoly for T1 circuits
- **...and greater network reliability**, because of diverse network connectivity
- **Lower hardware costs at data centers/POPs** through reduced channelized T1 needs
- **Ability to mix cheap Internet access circuits with T1 lines** for best-of-both-worlds maximum reliability and cost/performance as well as low latency, low jitter connectivity

### For Managed VPN service providers / MSPs wanting to become Virtual Network Operators:

- **Ability to “instantly” become a VNO** offering a reliable network service, not just a service managing boxes connected to the Internet
- **Easily offer scalable bandwidth to all customer sites**, not just those connected via fiber
- **Provide as much last mile diversity / reliability as customer desires**, per location
- **Ability to leverage new last mile connectivity technologies**, as they become available, per location, for greater reliability and/or better price/bit.

### For Hosters:

- **Highly reliable hosting services for corporate Intranet applications**, with high and expandable bandwidth connectivity at customer locations at low cost
- **Expand beyond public-facing web applications** to outsourcing corporate Intranet applications for large enterprise customers demanding higher application reliability and predictability than traditional “plain old Internet connectivity” provides.

- **Expand the addressable portion of the SMB market** to those more conservative customers demanding higher application reliability and predictability, or simply higher performance connectivity at their “main” site than a single DSL connection provides.
- **Leverage existing skills/assets** across a larger addressable market.

**For Colo providers:**

- **Increased value of well-connected colo facilities** as more corporate Intranet servers move to these facilities
- **Expand the enterprise market for colo connectivity beyond public-facing web applications** to Intranet applications the enterprise customer run themselves, retaining the high application reliability and predictability expected over private WANs, while leveraging the high bandwidth connectivity, disaster recovery, etc. that colos provide.

**For VoIP service providers** (*connecting to customers today over T1s*):

- **Lower recurring costs than paying for T1s**, as MSP recurring costs per line for DSL, cable, wireless ISP connections will be 30% - 50% of the cost of paying the incumbent telco monopoly for T1 circuits
- **...and greater network reliability**, because of diverse network connectivity
- **Faster deployment** of reliable service than waiting for incumbent monopoly telcos to provision T1 circuits
- **Ability to offer “better-than-bonded” Internet access services** much more cost effective and higher bandwidth than T1 or bonded-T1 service.
- **Lower hardware costs at data centers/POPs** through reduced channelized T1 needs
- **Ability to mix cheap Internet access circuits with T1 lines** for best-of-both-worlds maximum reliability and cost/performance as well as lowest latency, lowest jitter connectivity
- **Ability to offer additional services requiring more bandwidth** e.g. videoconferencing, Unified Communications
- **Ability to offer additional hosted services**

**For VoIP service providers** (*connecting to customers today over public Internet connections*):

- **Far greater application reliability and predictability of VoIP service**, because of diverse network connectivity and Talari APN technology
- **Ability to offer “better-than-bonded” Internet access services** much more cost effective and higher bandwidth than T1 or bonded-T1 service.

## APN Benefits for Customers

In addition to the benefits that an APN-based solution provides to the ISPs / MSPs / VNOs / outsourcers, there are also direct benefits for the providers' end customers, including:

- **15x – 50x bandwidth/dollar advantage** over private MPLS offerings.
- **Much greater (and scalable) bandwidth** over MPLS offerings for the large number of locations which are attached to the network via copper connections.
- **Greater reliability than the best single provider MPLS network**, and of course far greater reliability than traditional managed public Internet-based VPN services.
- **Ability to run applications over the WAN which require high bandwidth and reliable connectivity** such as videoconferencing and Unified Communications.
- **Ability to leverage MSPs for cloud computing, outsourcing additional services** demanding higher application reliability and predictability than “plain old Internet connectivity” provides, thus realizing the lower IT operational costs and capital costs which SaaS and cloud computing provide.
- **Ability to leverage colo connectivity** for services which for security or other reasons the enterprise customer chooses to continue to run themselves, retaining the high application reliability and predictability expected over private WANs, while leveraging the high bandwidth connectivity, disaster recovery, etc. that colos provide for the servers.

## Conclusion

By solving the issue of reliable, secure and cost effective connectivity, next generation service providers can outsource and provide far more services, including services until now exclusively the province of the corporate Intranet, to a far broader swath of enterprises – SMBs, large enterprises and government organizations alike.

APN enables next generation service providers to become Virtual Network Operators (VNOs) owning no networks of their own, and yet delivering more bandwidth and greater reliability at far lower cost to the customer than private network providers owning substantial network infrastructure assets. APN also lowers providers' ongoing operational costs, by providing a true "self-managed" adaptive network fabric.

If you are an MSP, ISP, colo/hosting provider, or outsourcer interested in growing your top line and delivering more "cloud computing" services to enterprises, providing greater reliability and application predictability for existing service offerings, and/or improving your bottom line by reducing recurring monthly telco spend and operational costs, please contact Talari Networks to find out more about how we can help you better serve your customers.

### ***Adaptive Private Networking – Reliably Enabling Next-Gen MSP/VNO/Outsourcing Services***

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