BROADBAND TESTING

Enterprise Level WAN Performance Over Public Internet Test Report

A Broadband-Testing Report
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EXECUTIVE SUMMARY

- Traditional MPLS-based networks are often expensive, limited in performance and inflexible when it comes to adds and changes.
- As a realistic alternative, Talari Networks is looking to provide Enterprise-level performance and quality at broadband Internet prices, taking the virtues of optimisation, rationalisation, better economies of scale and better use of resource and putting them into a Wide Area Network (WAN) environment.
- Key to the benefits of the technology is taking mitigating actions on a per packet level, not flow level, with a view to alleviating the evils of latency, loss and jitter, thereby dramatically improving the quality and reliability of application delivery.
- The Talari technology performs sub-second path decisions on a per-packet basis, taking into account the data collected on the paths, class of traffic and policies established by configuration settings to provide the highest network performance possible.
- There are two key components to the underlying technology. The first is what Talari calls Multipath Network Spectrometry. This provides the real-time information for what Talari calls Adaptive Private Networking or APN. The second component is Resilient Multipath Connectivity which is designed to deliver end-to-end reliability and protected application performance, for both TCP-based and real-time applications.
- Putting the technology to the test we found, first, that deployment options become very flexible indeed, with no reliance on single service providers and the ability to make adds and changes, quickly and easily.
- In our evaluation of a live, customer environment, we saw immediate benefits in terms of visibility, reliability, performance and cost savings by effectively replacing an existing MPLS-based WAN deployment with one consisting of three different service providers, all based around low-cost DSL connections.
- Ongoing, those costs savings will continue to rise, while adapting and changing the WAN deployment is now quick and easy, rather than slow and expensive.

INTRODUCTION: ENTERPRISE LEVEL WAN PERFORMANCE OVER PUBLIC INTERNET?

To date, there has always been something of a trade-off when it comes to WAN connectivity.

Despite the proliferation now of WAN optimisation technologies, the basic premise has been: if you want reliable performance go "private WAN", otherwise go public Internet. The problem with this approach is simple - private lines still cost significantly more than public; hugely more so in some parts of the world. So, here's the million dollar question: how do you get true enterprise-class network quality and reliability at Internet broadband prices?

This is the conundrum that Talari is seeking to solve with its technology. By performing sub-second path decisions on a per-packet basis, taking into account the data collected on the paths, class of traffic and policies established by the device configuration, the aim is to provide the highest network performance possible, even on a public Internet service. The argument is that, by taking mitigating actions on a per packet - not per flow - level, the Talari technology can alleviate latency, loss and jitter - all major problems commonly associated with the Internet - while dramatically improving the quality and reliability of application access.

Key here is visibility - knowing exactly what is passing across your WAN connections and how to manage that data. Very few companies really understand their application and data loads and basic tools do not provide the level of visibility required. Having then understood what applications and data are flying across your WAN connections, there is the small issue of actually optimising the bandwidth usage and ensuring optimal delivery of those applications and services. Unfortunately, it's not as simple as buying a "fat" data pipe, regardless of budget, either from a performance or resilience perspective. Talari is looking to provide the resilience that comes with using multiple networks from different providers and adding performance to the equation when aggregating those networks. In this way, low-cost bandwidth in what is a very competitive market can be truly taken advantage of.

But this is far from trivial to achieve, hence the focus here on what Talari is doing in taking the per packet based approach to decision making on the WAN link and how that works. From a user perspective, it's all about improving their own experience and this comes with minimising bandwidth congestion and latency. But in order to do this, there has to be a mechanism in place to perform congestion prediction and continuously adapt to instantaneous available bandwidth, bearing in mind that, on the public Internet, the actual available bandwidth can - and does - vary from one second to the next.

Reliability is just as important as performance - allowing applications to work without interruption, even in the event of one or more link failures (and they do happen). However, the last thing you want with expensive bandwidth is to have links sitting in standby mode, in the event of a link failure, without being used around the clock. So, by combining Quality of Service (QoS) for networks that have no inherent QoS features with the ability to enable each application session to use all WAN links concurrently provides the best of all worlds.

Such is the mission of the Talari technology. Sounds like a big ask? Especially given the vagaries of the public WAN (AKA Internet), the idea of improving application performance and service availability while reducing costs seems something of a pipedream. However, Talari's approach makes a lot of sense.

The basics of the Talari approach are giving companies the ability to use multiple WAN link of almost any kind - private WANs (point-to-point or MPLS based, for example), DSL, cable, fibre or Ethernet based Internet connections - in combination to provide overlays to traditional private WANs or simply replace them altogether. The aim here is to use those multiple links to provide both performance and availability benefits. Performance, not simply in terms of pure bandwidth, but also in terms of reducing congestion and latency, combined with providing multiple levels of resilience in the event of link failures and downtime.

Talari claims its technology delivers a solution that is at least comparable to, and generally better than, a single-vendor MPLS network. Given the amount of noise currently being made about WAN optimisation technology being used as MPLS replacement technology, this makes a lot of sense. The company sees its technology as being totally complimentary to existing WAN optimisation solutions out there - there is very little overlap - which further strengthens its case.

The other aspect to this argument, as we mentioned earlier, is cost. Private WAN connections are still prohibitively expensive in most parts of the world. And even when they are relatively competitive, the cost of a public alternative in comparison is always significantly less - hugely so in some cases. Hence, the argument of Talari - enable the addition of inexpensive network links to supplement WAN connections, improving performance at a low cost.

So just how do you take advantage of the pricing while bringing performance and reliability of Internet-based connections up to and even beyond the standards associated with private WANs? First, the 'health' of each link is monitored end to end with QoS decisions made on the basis of the quality of the link itself, not just whether that link is up or down. And link change decisions are made within a sub-second time frame, on a per packet basis. Meantime, bandwidth reservations are dynamic and constantly changing, based on available bandwidth, something we have already identified as being fundamental in a public Internet environment. Ultimately, every application session is load-balanced across all available WAN links with the balance changing dynamically based on a combination of quality, link status and bandwidth availability for each path.

Talari claims its solution provides 30-100 times the bandwidth per pound spent, while monthly WAN costs are typically reduced by 40-90%. These are very significant claims. So let us first look into the Talari technology itself and then see it in action over a live customer network.

TALARI NETWORKS: PRODUCT OVERVIEW

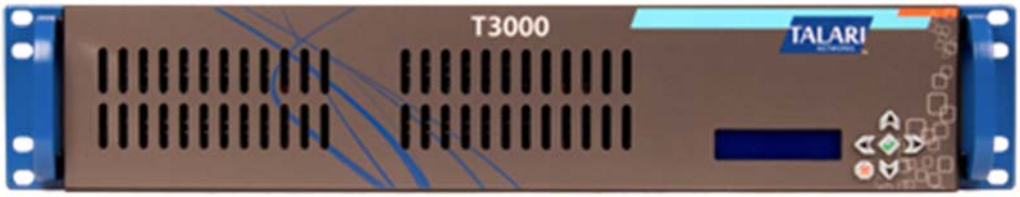

Figure 1 – Talari T3000 Appliance

The Talari technology sits on a range of appliances, all rack mountable, scaling from a small office device (T510), designed to support up to three WAN connections and 24Mbps/4Mbps (downstream/upstream), through a mid-sized/remote office option (T730) supporting up to eight WAN connections and 120Mbps/60Mbps (downstream/upstream), up to HQ/Data Centre devices (T750/T3000) supporting up to eight WAN connections and 500Mbps full duplex. The T3000 is designed to support 25 remote sites or beyond, the mid-sized T730 up to eight remote sites.

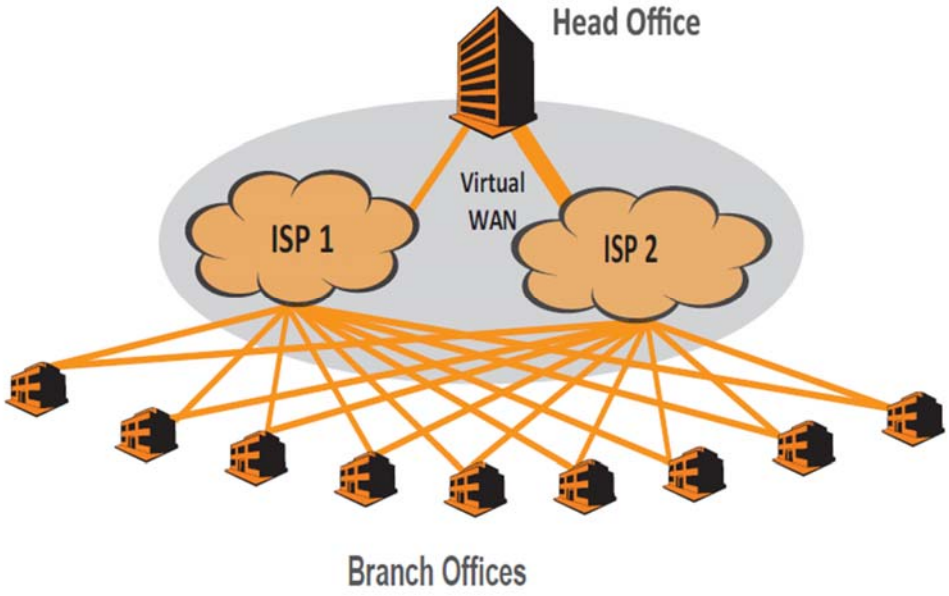

Figure 2 – Talari Head Office To Branch Office Deployment Example

Security wise, the appliances support 128-bit AES encryption. For both data centre and remote office locations, the appliances include a fault-tolerant fail-to-wire feature, automatically enabling a passive pass-through mode even in case of interruptions in a device. In terms of port configuration, the appliances feature auto-sensing 10/100/1000 Ethernet ports, plus two pairs of fail-to-wire ports for added redundancy. Management wise, both serial and Ethernet management ports are provided with a management GUI available for all configuration options.

Optional Packet Replication - Optimising Voice and Video

To offer the highest possible call quality it is possible to trade additional and inexpensive bandwidth for best quality voice. By replicating voice and/or video packets over two disparate paths across the network, suppressing duplicates at the receiving appliance, the destination APN appliance will use the most timely of two VoIP or video packets and be able to hide packet loss or excessive delay on either of the paths.

For video-conferencing applications, for example, this replication also can be set to occur only when sufficient bandwidth is available for the replicated traffic, and/or could be set for the voice portion and not the video portion of the call.

TALARI IN ACTION

In order to see the Talari technology in action, we looked at a live deployment, hosted by consultancy IT-Agenda in the UK for its client Allparts, an automotive parts supplier.

As we will see later, Allparts had issues with their existing WAN deployment that Talari technology was able to solve and significantly improve upon, while actually saving the company money - the fundamental proposition of Talari that we are evaluating in this report. But in addition to looking at the live, already-deployed Allparts network, we also put ourselves in the position of a new customer, looking to deploy the technology from scratch, using the Allparts network as our basis for this.

Configuration & Deployment

We began with the management GUI, simulating an install. The Allparts network deployment features three separate network providers - Eclipse, Talk Talk and FastNet. Here immediately we begin to see some of the benefits of the Talari approach: by using multiple service providers we are able to mix and match different qualities and costs - for example, we found FastNet to be quick (as the name implies!), Eclipse to be very reliable and Talk Talk cost effective with the benefit that we know it is a completely different underlying network to the other two providers. While not a shrink-wrap type product and installation, the Talari devices are not overly complicated to set up. For the Allparts example, we were looking at a T3000 at the head office and T510s in the branch offices. With all the relevant information to hand, it is simply a case of setting up each link/network and then making decisions on prioritising links, this depending entirely on the case in point.

Deployment is made easy since all devices can be centrally configured with configurations pushed out to the end devices. Also, the core device holds the software for the network, so the correct version is always available and delivered to the satellite devices - a real management benefit. In this example we were working with Cisco ISR routers, connected via a switch to the Talari devices at each end of each connection.

A configuration editor provides both the configuration capabilities for each link - described as a "conduit" in Talari terminology - and overview of the total network and service, including per conduit.

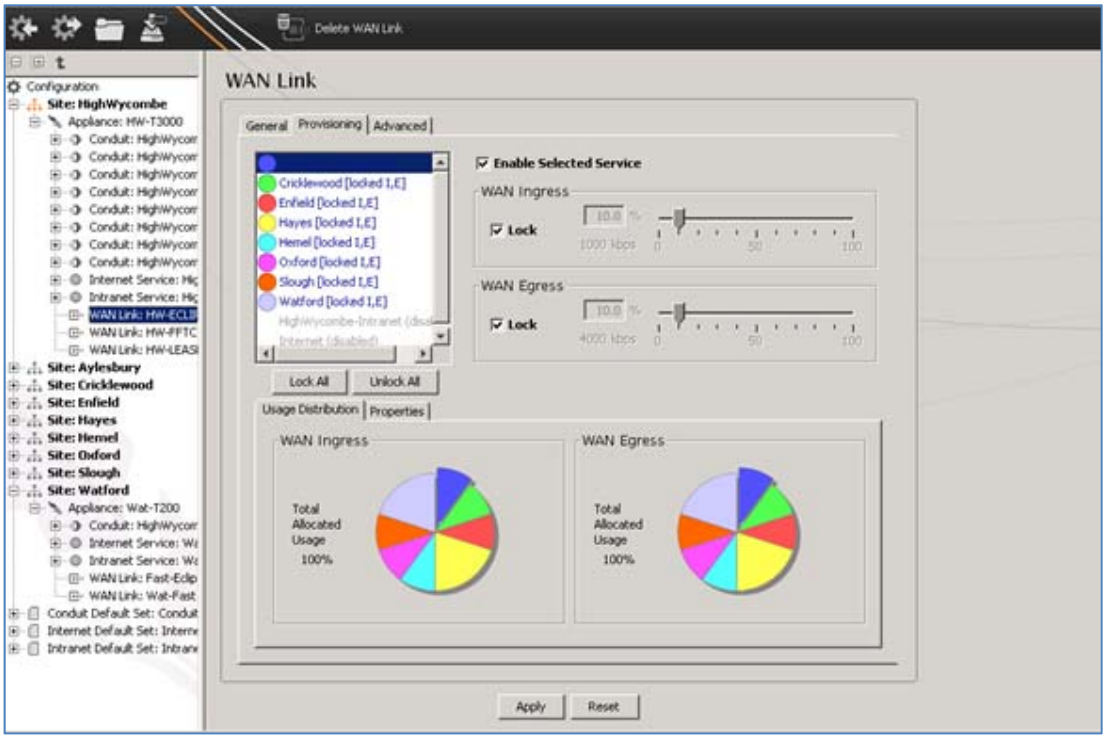

Figure 3 – Talari Management GUI: Configuration Editor

Observing & Monitoring

Once installed, the networks can be monitored 24x7 with every aspect of each link visible, including current bandwidth achieved as well as more fundamental checks such as device and link up/down status, for each and every WAN link.

Reports can also be generated showing this information as and when required or as scheduled - for example, daily, weekly and monthly. As well as being useful to the customer, it is also invaluable information in the event of problems arising with a service provider where often they will look to point the blame elsewhere.

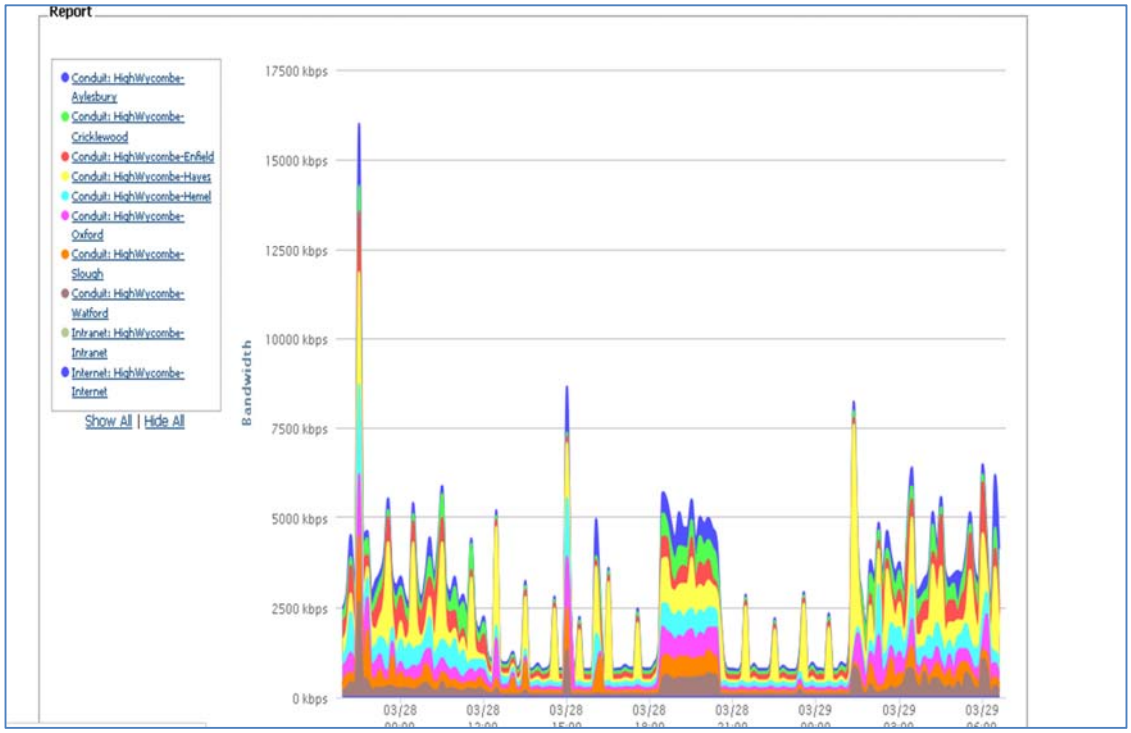

Figure 4 – Talari Management GUI: Reported Bandwidth Per Link

Reliving The Allparts Experience

In order to fully appreciate what we were seeing on the live Allparts network, it was necessary to understand the starting point here, in order to then see the benefits.

The company had established a centralised network HQ feeding email, Internet and terminal services to nine remote locations. To do this it deployed an MPLS-based network with a single ADSL based tail circuit connecting each remote site, with an Internet-based VPN for backup. But there were problems. Allparts had a situation where the nine remote sites were struggling to cope with significant bandwidth limitations such as 1.5Mbps to 512Kbps ADSL links with 5:1 contention. There were also failover issues, with 30 seconds failover at best and almost zero network visibility. The reality was even worse. Failover from the MPLS circuits was managed through a Border Gateway Protocol (BGP) on the router, which polled the links every five minutes. This meant that a link could be down for five minutes before a backup circuit was activated.

Since Allparts customers expect delivery within an hour of placing an order, that downtime was proving costly - see later. When a failover was involved - and these occurred too regularly for Allparts' liking - there was no alert mechanism to their IT staff. So when - as often happened - the link didn't fail-back when the MPLS came back up, users were left on the slow, backup link for days on end. And when that failed, they were totally stranded.

There were also specific application issues that had no workaround, such as Citrix terminal sessions disappearing when links went down; so the screen freezes the session may be completely lost, which equated to very unhappy users. It was also a less than

happy IT department, not least because, when a problem arose, with networks supplied by Thus and BT, plus a third party provider of their Cisco router hardware, there were always three parties to point the finger at, and none of those - unsurprisingly - wanted to take lead responsibility for the problem - a classic scenario.

Creating a new, triple network as described earlier, based on higher speed DSL links, with Talari hardware at each end of every link, produced immediate benefits. Visibility was an obvious one; for example there had been printing issues with some thin client applications that were suddenly easy to see and resolve. Traffic types were able to be prioritised by Talari, rather than having to rely on the Cisco routers, with traffic conditions being evaluation 2.5 times a second to ensure real-time adjustment of the networks as required.

From Site	To Site	State	Latency BOWT (mS)	Mean Data Jitter (mS)	Receive Rate(kbps)
HighWycombe	Aylesbury	GOOD	11	2	120.36
Aylesbury	HighWycombe	GOOD	11	2	76.25
HighWycombe	Cricklewood	GOOD	12	4	171.91
Cricklewood	HighWycombe	GOOD	8	5	89.55
HighWycombe	Enfield	GOOD	11	4	279.90
Enfield	HighWycombe	GOOD	8	4	148.07
HighWycombe	Hayes	GOOD	5	2	230.82
Hayes	HighWycombe	GOOD	5	2	138.68
HighWycombe	Hemel	GOOD	11	3	213.52
Hemel	HighWycombe	GOOD	10	3	144.03
HighWycombe	Oxford	GOOD	12	4	232.31
Oxford	HighWycombe	GOOD	12	4	104.98
HighWycombe	Slough	GOOD	8	3	243.94
Slough	HighWycombe	GOOD	8	5	215.94
HighWycombe	Watford	GOOD	6	2	112.20
Watford	HighWycombe	GOOD	6	3	74.27

Statistics calculated over the last 60 seconds.

Figure 3 – Monitoring Links Between Sites

As well as providing additional resilience with the three independent networks deployed concurrently, with an effective bandwidth increase of 4-6 times and guaranteed performance, Allparts was able to secure the network running VPNs through every site, giving them secure, redundant routes at all times, even in the event of a Talari appliance failure. Adding EFM - Ethernet in the First Mile - in some locations has provided yet more bandwidth, as required, without impacting on the configuration in place. Any configuration changes involving adding or changing a circuit on the old MPLS network took at least 30 business days. Now that has been reduced to less than a week, and with a completely open choice of providers.

In addition to the obvious performance and reliability benefits the Talari solution gave Allparts, it also provided them with immediate cost savings of around £10,000, rising to £80,000. Factor in Allparts' best case scenario during downtime of £4,000 an hour or more business losses and the real savings are significantly higher still.

SUMMARY & CONCLUSIONS

With our evaluation of the Talari Networks technology here, we showed that an MPLS-based network can be successfully replaced with a lower-cost solution that is, at the same time, significantly better in terms of both performance and reliability.

In our evaluation of a live, customer environment, we saw immediate benefits in terms of visibility, reliability, performance and cost savings by effectively replacing an existing MPLS-based WAN deployment with one consisting of three different service providers, all based around low-cost DSL connections. Ongoing, those costs savings will continue to rise, while adapting and changing the WAN deployment is now quick and easy, rather than slow and expensive.

The Talari APN approach adds significantly flexibility, easier management, real network visibility and ongoing cost savings. It removes the reliance on a single network service provider, while offering real choice of provider moving forward, so you can always take advantage of the best deals.

It also provides specific QoS features to optimise troublesome, real-time applications such as voice and video while generally improving access to all applications and services, 24x7.

Anyone looking to add significant flexibility to their WAN environment, while maximising bandwidth and low-cost connections, should take a serious look at the Talari Networks solution.