

Enterprise WAN Agility.

**Introducing the network that's
quick to deploy, simple to manage,
and delivers unparalleled performance.
Macquarie Telecom SD-WAN.**

Executive summary.

Today's enterprise employees are consuming more and more wide area network (WAN) bandwidth as they stream video, download large files, collaborate online, and perform other bandwidth-intensive activities.

Employees who work in branch offices need the same speed and reliability from their network as those working at the head office, when accessing data and applications in private and public clouds. Unfortunately, when enterprise IT teams try to provide WAN access to branch offices, they face challenges of complexity, poor performance, and cumbersome network management.

The vast majority of branch office WAN traffic is carried over inflexible leased lines or unpredictable connections like DSL, neither of which is ideal on its own. Deploying leased lines for all bandwidth needs is cumbersome and time-consuming. Adopting the public Internet — with its lack of uptime, reliability and performance guarantees — results in a poor user experience.

Both these approaches require multiple appliances like routers, firewalls and switches, at every branch office. It's a disparate approach that makes managing a network complex and time consuming.

Macquarie Telecom SD-WAN enables application growth, network agility and simplified branch deployment. It also delivers optimized access to cloud services, private data centres and enterprise applications simultaneously, using ordinary broadband Internet and private links.

SD-WAN automatically steers traffic across the best links and most optimal path. Internet transport quality is improved by up to 24% to make it enterprise grade, thanks to our patented error correction technology. SD-WAN implements concepts from software-defined networking (SDN), which are at the core of Macquarie Telecom's customer-premises equipment (CPE) and cloud service gateways.

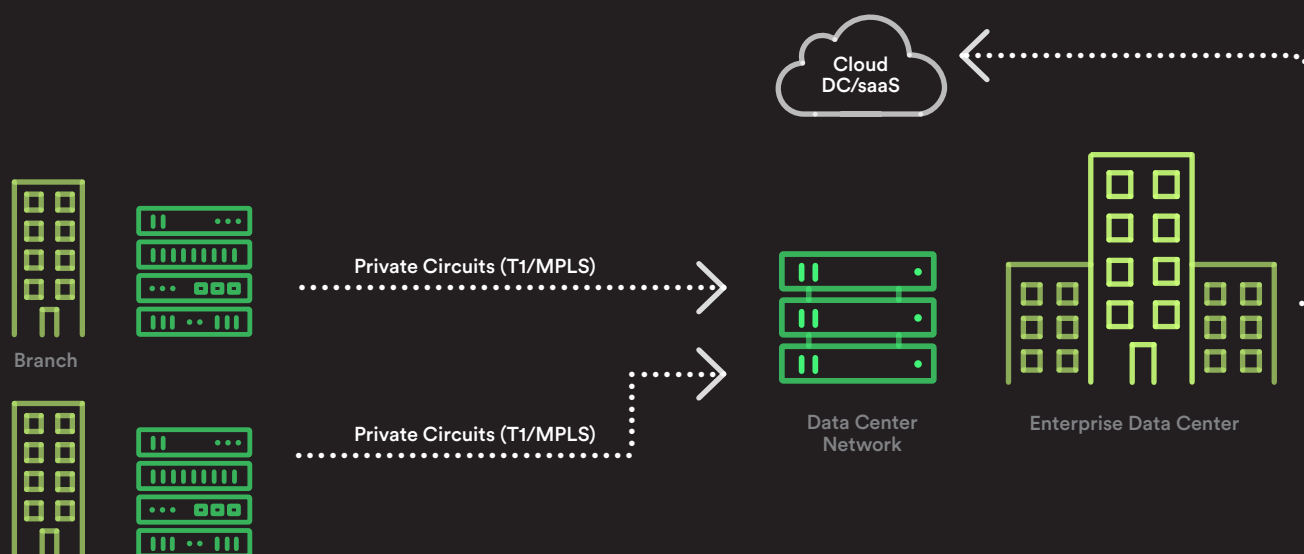


Figure 1. Traditional Branch Office WAN

Challenges with branch networks.

WAN technologies used in most branch offices today have barely changed since the 1990s, according to Ashton, Metzler, and Associates. Many traditional service providers have failed to integrate cloud computing, Software-as-a-Service (SaaS), virtualisation, and other industry advances. As a result, branch office WANs using only private-circuit connections need to have their cloud application and Internet traffic backhauled through an enterprise data centre. This adds latency and degrades application performance.

Although traditional networks provided functional service, they are complex and have limited capacity. They also demand long lead times for new or upgraded site installations. Here are some of the challenges created by networks of the past:

- **New application adoption** is held back by complex and costly bandwidth upgrade requirements
- **Branch network deployments** are slow due to IT complexity and installation wait time
- **Cloud migration** isn't supported by traditional branch network architecture

To overcome the limitations of traditional WANs, new enterprise WAN transport solutions are emerging, including the hybrid WAN, which uses a mix of public Internet with private circuits. The hybrid WAN, suggests Andrew Lerner at Gartner, is emerging as “the elusive “killer” software defined network (SDN) use-case, supporting the utilisation of multiple access technologies to achieve optimal cost and performance for the enterprise.

Compelling reasons to adopt hybrid WAN.

- The need for branch offices to have reliable and direct connectivity to cloud services
- The use of broadband Internet, which is more cost-effective and scalable than traditional links
- The need for critical applications to have greater availability than individual private circuits deliver
- The high speed of deployment offered by broadband, compared to the long lead times private circuits require

At Macquarie Telecom, we've integrated all these benefits - and then some - into our SD-WAN service.

“Other than performance and cost, everything is fine with today's WANs.”

Gartner.

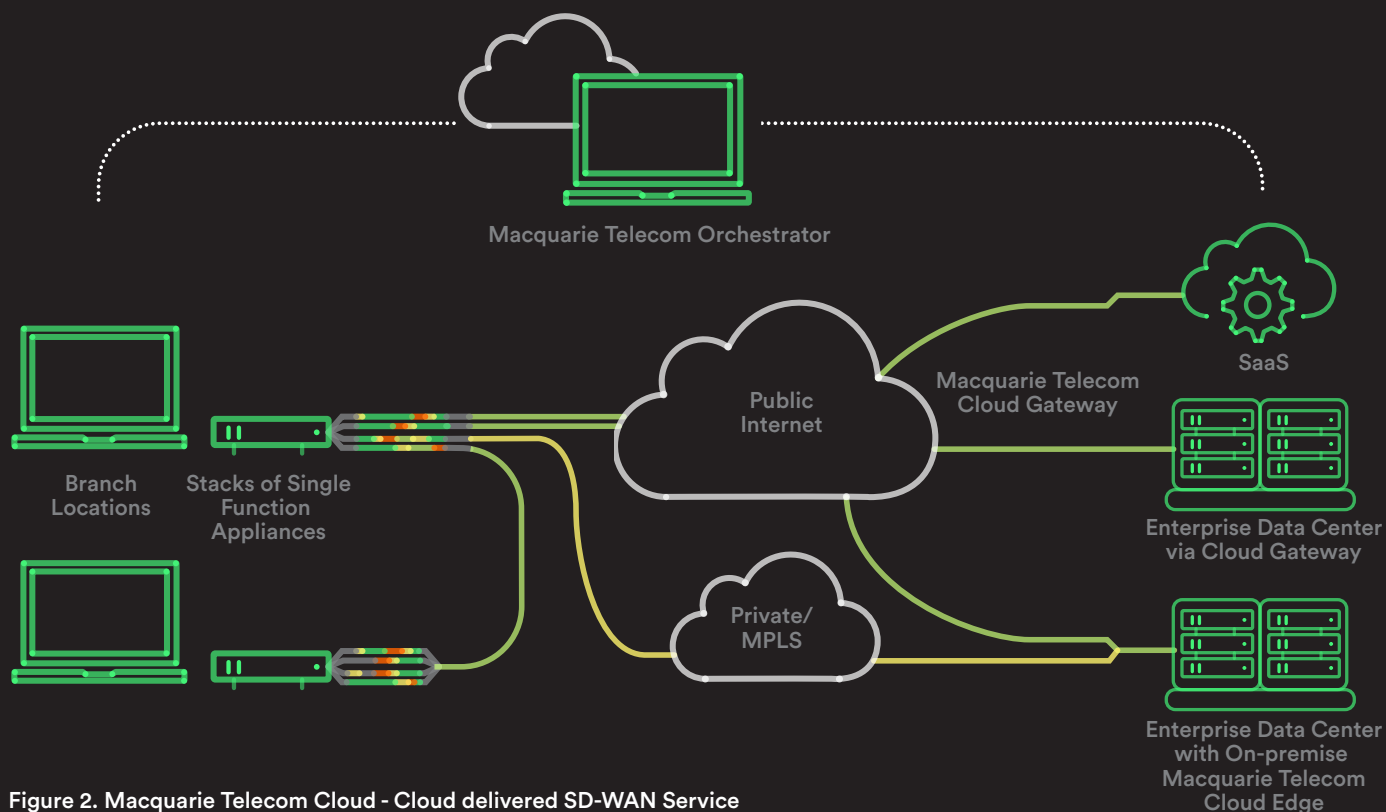


Figure 2. Macquarie Telecom Cloud - Cloud delivered SD-WAN Service

SD-WAN solution overview.

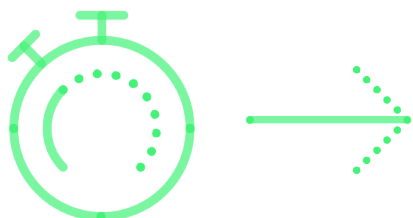
Macquarie Telecom SD-WAN combines the performance and flexibility of a hybrid WAN with the fast deployment and low maintenance of a cloud-based service. It includes policy-based network-wide application performance, visibility and control while dramatically simplifying the WAN by delivering virtualised services from the cloud to branch offices.

The Macquarie Telecom Edge appliance is a compact, thin edge device that is low-touch provisioned from the cloud for secure, optimised connectivity to applications and data. Edge is also available as a VNF (virtual network function) for instantiation on a virtual CPE platform.

The Macquarie Telecom Edge uses Dynamic Multi-Path Optimization (DMPO) and deep application recognition to aggregate multiple links (such as EFM, ADSL and 4G) and steer traffic over the optimal links to other on-premise Macquarie Telecom Edges in branch offices, private data centre, campuses, and headquarters. The Edge can also optionally connect to the system of global Macquarie Telecom Gateways (which we've shown in Figure 2, above) to provide performance, security and visibility for cloud services like SaaS and IaaS.

This system of Macquarie Telecom Gateways is deployed nationally at top-tier data centres to provide scalable and on-demand network services. Macquarie Telecom Gateways implement DMPO, VPN and Quality of Service within each Macquarie Telecom Edge, allowing multiple broadband and private leased lines to function as a single, high-performance WAN.

At the heart of Macquarie Telecom's SD-WAN service is the Orchestrator, which is used to provision network-wide business policy, perform realtime monitoring, and analyse application performance.



One screen, complete control.

SD-WAN takes activities that usually require an on-site technician, and moves them to the cloud. Activation, configuration and ongoing management are all handled remotely using the Macquarie Telecom Orchestrator.

Continuous monitoring.

SD-WAN uses automatic circuit profiles to deliver low-touch deployments. Manual site by site adjustments of configuration parameters are suddenly history. Continuous monitoring of link and path quality and available capacity provide the realtime feedback you need for dynamic optimisation.

Real-time analytics.

The Macquarie Telecom Orchestrator displays network and application performance that can be used to make traffic control decisions, such as treating realtime interactive and bulk streams differently. The service classifies over 2,500 applications, and gives you granular control of applications when optimising Quality of Service (QoS).

Easy policy settings.

Macquarie Telecom SD-WAN makes setting and updating policies as simple as a click. Using the Orchestrator, you can remotely define business rules such as prioritising collaborative applications over social media. Plenty of other business application policies, such as the exact QoS mechanism, resource allocations, link steering, and error correction are also configurable. Deployment options, like branch-to-branch and branch-to-data centre, are flexible and easy to set.

What's up? Your network. All the time.

Macquarie Telecom SD-WAN boosts the uptime and performance of standard broadband links by implementing unique technologies.

Dynamic multi-path optimisation.

Dynamic Multi-Path Optimisation steers packets to the optimal link based on performance metrics, application requirements, business priority of the application, and link cost. In Figure 3, on the next page, we've shown how Multi-Path (the upper green line) remediates the performance issues experienced when service provider links 1 and 2 operate independently. This technology can create a virtual, high bandwidth pipe from multiple, inexpensive broadband links to deliver improved WAN economics and quality.

Forward error correction.

When realtime traffic (like VOIP) with higher business priority is identified, forward error correction can be performed to reduce or eliminate packet loss. In tests on approximately six million anonymous data records, an Internet connection had performance issues that impacted voice quality (dropped segments of calls) about 25% of the time. A combination of packet steering and forward error correction reduced voice degradation to less than 1% of the time.

Dynamic application steering.

SD-WAN automatically recognises applications and steers them to the optimal link (or links) based on business priority, built-in knowledge of application network requirements, and real-time link performance

and capacity metrics. Dynamic per-packet steering can move a session, such as a voice call, mid-stream to avoid link degradation, without a call drop or even a voice quality glitch. Single high bandwidth flows utilise aggregated bandwidth across all links, for faster response times.

On-demand remediation.

Remediation including error correction, jitter buffering and local re-transmits are applied on demand when only a single link is available or concurrent link degradations cannot be steered around. Remediation is only applied for priority applications that are network sensitive, and only when brownout link degradations occur.

Macquarie Telecom quality of experience (QoE).

On the next page, Figure 3 shows the application specific quality of experience delivered by the SD-WAN overlay with Dynamic Multi-Path Optimisation (the uppermost horizontal bar). The multiple underlying individual WAN circuits and link quality are shown below. This illustrates how application performance is assured, delivering a high quality and high capacity WAN via a virtual overlay across multiple links, including private and Internet broadband.

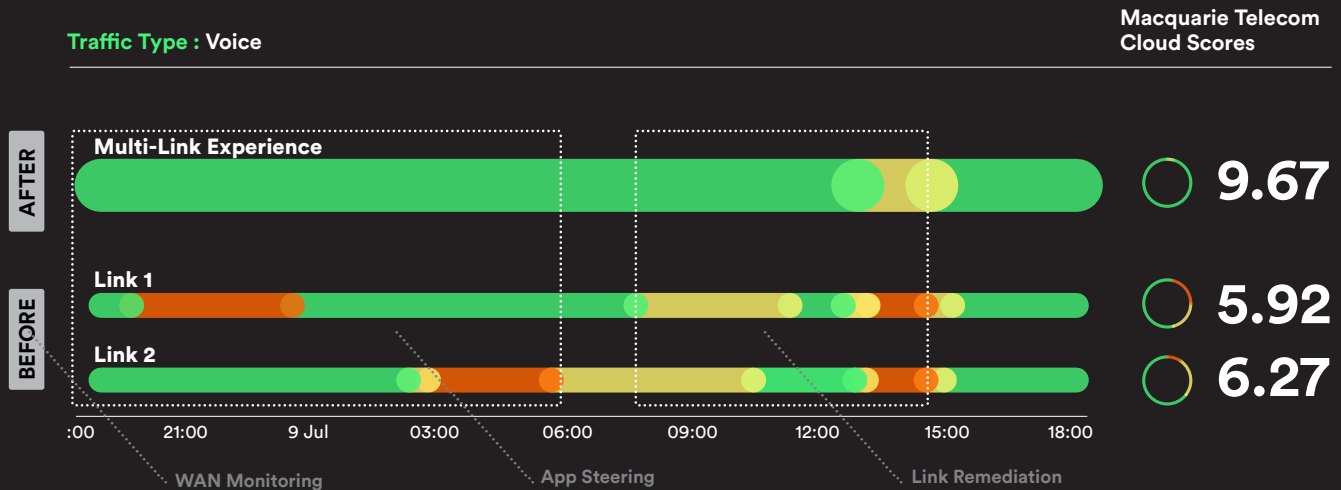


Figure 3. Dynamic Multi-Path improves quality of individual links

Straight-forward deployment.

Deploy without delays.

Macquarie Telecom SD-WAN service is quick to install at new sites, with low-IT-touch branch deployment. We ship an Edge device to your branch office, where anyone - even someone who's not technical - just plugs in a few cables. Activation, configuration, and ongoing management are all handled in the cloud.

Security.

Macquarie Telecom SD-WAN uses standard IPSec site-to-site tunnels, encrypted using either AES-128 or AES-256 bit. All keys are protected by a built-in Certificate Authority process that automatically refreshes periodically without any user intervention. Total tunnel protection is ensured as standard.

Flexibility of a hybrid network.

VPN Cloud (VPNC) provides site-to-site virtual private networks (VPNs) to secure traffic. If IPsec VPN is already available, you won't need any additional data centre equipment. The cloud VPN services are interoperable via a one-time configuration of standard VPNC-compliant IPsec to existing headquarter sites. The IP address manager enables unique blocking of IP addresses per site with a single click, and the dashboard displays the realtime status and health of VPN sites.



#1 for SD-WAN

Since 1992, Macquarie Telecom (ASX-MAQ) has worked with some of Australia's most well-known local and international companies and government agencies. We are the number one supplier of SD-WAN networks in Australia, with over 55 enterprise installations to date.

Along the way, we've achieved the highest Net Promoter Score in the industry, showing that our clients aren't just delighted - they're telling others how delighted they are too.

Michael Davies
Customer & Emerging
Technologies Director

The SD-WAN platform.

Macquarie Telecom Edges provide low-touch SD-WAN deployments in branches, and scalable on-premises hub deployments for headquarter and data centre locations. On top of that, all the benefits of SD-WAN - assured performance, security, and policy control - are available directly to the doorstep of cloud SaaS and IaaS locations via Macquarie Telecom Gateways. The cloud-based Macquarie Telecom Orchestrator provides enterprise-wide business policy configuration, troubleshooting and at a glance monitoring.



Macquarie Telecom Edge.

Macquarie Telecom Edges are available as easy to install appliances for remote branches with a range of throughput ports for WAN and LAN connectivity, and integrated wireless LAN. Dynamic routing enables policy-based overlay insertion for both inline and out-of-path deployments. High availability deployments are supported, too.



Macquarie Telecom Gateways.

Multi-tenant Macquarie Telecom Gateways are deployed by Macquarie Telecom around Australia, to support the full range of SD-WAN features. Macquarie Telecom Gateways provide a scalable and distributed infrastructure with the advantages of a hosted network and service flexibility. Our Gateways provide the ideal architecture for optimized access to cloud applications and data centres, as well as access to private network backbones and legacy enterprise sites.



Macquarie Telecom Orchestrator.

The Macquarie Telecom Orchestrator provides centralised enterprise-wide installation, configuration and realtime monitoring, as well as orchestrating the data flow through your network. Controllers collect and distribute enterprise-wide routing information, and are distributed alongside Gateways as a service.

Services catalogue		
Secure Overlay <ul style="list-style-type: none"> ON Hybrid VPN IPsec VPN via Internet and MPLS ON VPN IPsec VPN between Gateways and 3rd party devices. 	Assured WAN Performance <ul style="list-style-type: none"> ON Dynamic Multi-Path Optimization Application steering & link remediation and 3rd party devices. ON Business Policy Application prioritization and network service intersection 	Comprehensive LAN Services <ul style="list-style-type: none"> ON IP Address Management By sites and profiles ON DHCP, DNS, WLAN... LAN network services
Automated Monitoring <ul style="list-style-type: none"> ON Deep Application Recognition Packet inspection for application recognition ON Application & Link Visibility IPsec VPN and MPLS ON Application Performance Application network performance statistics 	Security Services <ul style="list-style-type: none"> ON Application Firewall L7 stateful firewall ON Web Security 	3rd Party <ul style="list-style-type: none"> OFF Ecosystem Partner Access

Software defined networking principles.

Macquarie Telecom SD-WAN brings SDN concepts to the enterprise branch WAN Edge. One of the key principles of SDN is the separation of control and data planes to provide valuable flexibility. For example, this architectural approach enables different packet and flow handling techniques to be implemented as an overlay, which supports link aggregation and service provider abstraction. Macquarie Telecom SD-WAN allows for a highly distributed and inherently redundant data plane. The service also dramatically simplifies the WAN with low-IT-touch deployment providing centralized visibility to replace traditional routing.

Aligned with SDN concepts, the CPE is virtualized internally so it can run services at the edge, where they can be more effectively operated and scaled out. In addition, virtualization future proofs the CPE and enables quick delivery of services.

Solution benefits.

The branch office WAN has entered a true transition phase, as new solutions help improve the economics and quality of WAN connections. Leading the way, Macquarie Telecom SD-WAN offers enterprise-grade performance, security, visibility, and control over both Internet and private networks, combining the cost effectiveness of the Internet with the flexibility of the cloud.

macquarie

TELECOM



**To find out more about what we can do for you,
please call us on 1800 789 999 or visit
macquarietelecom.com.**

