Singtel Software-Defined Networks

Simplify your network with actionable network intelligence

In today's fast-moving digital landscape, the demand for network agility and bandwidth continues to expand exponentially. Enterprises are growing their digital footprint by adding new applications, network fabrics and services. Having an end-to-end view of performance, actionable network intelligence, and comprehensive network monitoring capabilities are crucial for the workforce.

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1. Executive Summary

Modern enterprise networks have been designed, assembled, modified, merged, and rationalised over decades of continuous use. Many of these networks need to support a range of applications across private wide area networks (WANs) and the public internet. They need to provide connectivity to data centre resources and cloud services; to headquarters and branch offices; and to remote and mobile workers.

For enterprise IT managers, getting a comprehensive view into and across the network stack end to end is critical. In a recent global survey of more than 450 enterprise decision-makers, Ovum found that the top networking challenge for executives – even topping security concerns – is gaining better visibility over applications performance.

This ebook discusses how enterprises benefit from comprehensive visibility into and across the network stack.

Section 1
Explores enterprises' current situation and the importance of mapping relationships among network, applications, and cloud services.

Section 2
Examines visibility into key aspects of the enterprise network: private WAN, public Internet, applications layer, and cloud connectivity.

Section 3
Looks at additional ways end-to-end visibility can be used to benefit the enterprise.

Together, the series shows how enterprises benefit from visibility and insights across end-to-end networks, reaching on-and off-net, and incorporating applications and cloud connectivity.

2. Wide and deep network visibility is critical for applications performance

How does the modern enterprise handle network management? From Ovum's discussions with large multinational enterprises, the answer is: not always efficiently.

Large enterprises depend on a mix of monitoring, management and analysis tools collected over years. Management software has a way of getting into the organisation and staying there. It is not unusual for a large enterprise to have a half dozen or more ICT monitoring and management platforms. This does not count service provider portals, IT- and cloud-specific management, and security monitoring and management. Large enterprises have institutional IT processes tied to these monitoring platforms for incident monitoring, response and review.

These installed tools and processes provide much network management data to large enterprises. But it is not always the right kind of information to glean insights and plan response actions. Without the right data sources, the enterprise also lacks the insights to make better decisions. The enterprise of today has many platforms; the enterprise of tomorrow needs better tools for smarter decision-making and greater agility.

WAN partnerships have been a way to outsource network complexity. Telcos are experts at working across multiple providers, networks and services. Enterprises have plenty of in-house monitoring tools; still, they turn to their telco partners to understand what is happening in the network. Telcos help large enterprises by simplifying complex network events: They detect a problem, issue an alert, identify the problem source, and resolve the issue or query.

Advanced telcos go further. They offer real-time monitoring, correlation, management tools and network intelligence. This new type of customer portal supports actionable network intelligence. It works with telco management systems built for real-time, virtualised and on-demand services. Even if the enterprise has a conventional network, such a customer portal gives a wide and deep view, vertically across layers and horizontally across geographies. If an enterprise adds managed services such as software defined WAN (SD-WAN), a portal supporting actionable network intelligence can correlate application views to networks, and network views to circuits. The network becomes a rich source of understanding for end-to-end applications performance.

Deep network insight is becoming critical for IT managers to understand the relationships between enterprise applications, network performance and cloud services. In this research conducted by Ovum and sponsored by Singtel, enterprise executives note how important they consider such a single integrated portal view (see Figure 1). Enterprises also highly value other key portal features such as comprehensive network analytics and automated trouble resolution.

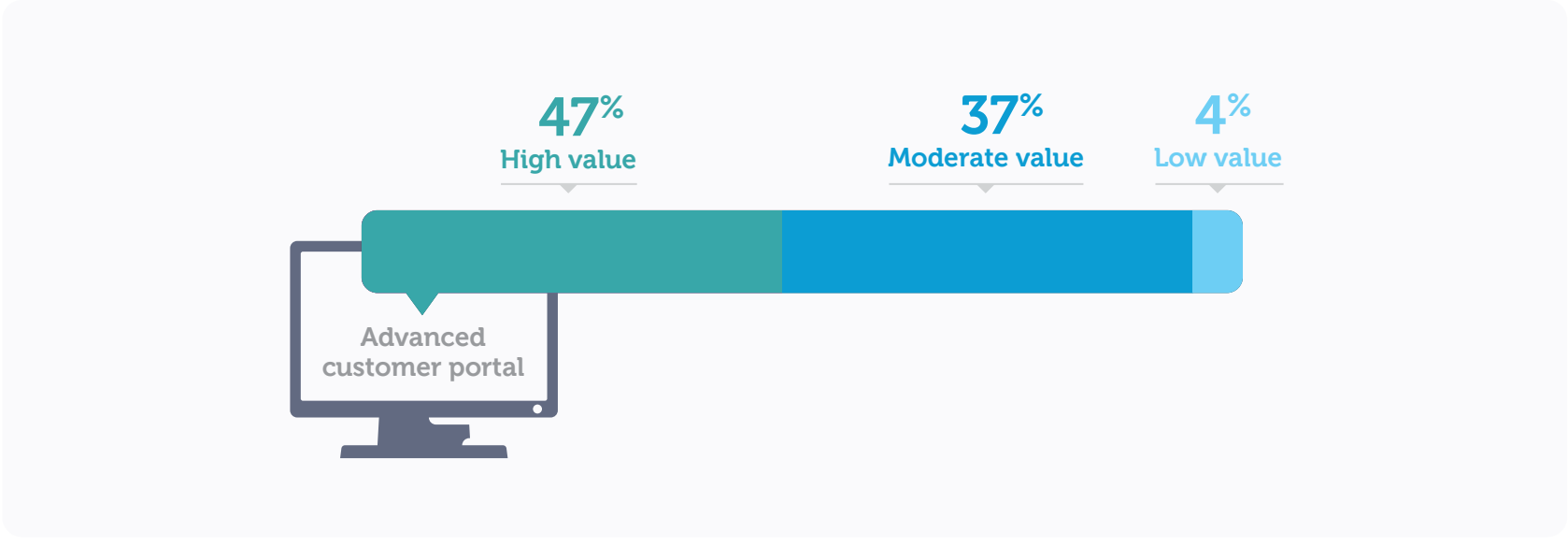


Figure 1 *Importance of a single applications, network and circuit customer portal view to enterprise*

As enterprises add new digital applications, network fabrics and cloud services, they need to understand how these changes affect their network. Leading network providers have built customer portals supporting actionable network intelligence that collect information across network topology, network services and software-defined applications management. An advanced customer portal offers end-to-end visibility that goes broad and deep, both across the network stack and across network segments. When there is an issue, an administrator can quickly find out whether or not the issue involves the network. Over time, enterprises can draw on a rich portal for deeper understanding, to make smarter decisions. And best of all, the partner portal does not require the enterprise to add to its sprawl of in-house management tools or make its current processes obsolete.

3. The power of merging network-wide insights with applications and cloud visibility

What does it mean for a telco to offer a new type of customer portal that has actionable network intelligence?

With the rise of hybrid networking, enterprise networks are becoming more complex. Large enterprises are shifting away from highly reliable private IP VPNs to more flexible hybrid networks. With a hybrid network, an enterprise might use dual MPLS VPN circuits for its largest locations; mix MPLS VPN and Internet VPN at mid-sized locations; and connect its smallest locations with Internet-only VPNs. With hybrid networking, it is critical for enterprises to know what is happening across all network aspects: In applications, on their private IP VPNs and public Internet VPNs, and at connectivity points to cloud resources. Below we look at each of these in turn.

WAN visibility

Enterprises need tools to monitor their private IP VPNs. This includes comprehensive network topology and traffic performance information across MPLS BGP routes. Private WAN visibility is a mature segment, and telcos are well-known for operating customer portals for MPLS VPNs, supporting these services with performance guarantees.

Internet visibility

Hybrid networking widely mixes public Internet VPN into the enterprise network, expanding options such as broadband access. The enterprise needs similar network topology and performance information for its Internet IP routes as it has for MPLS VPNs. How is that possible? The telco draws on a distributed system of probes for detailed, near-real-time information about traffic conditions, and passes that visibility along to its customers. Probes are deployed at key points in global Internet backbones and key locations in the telco network, giving enterprises actionable network intelligence across both public Internet and private WAN.

Applications visibility

A managed software-defined WAN (SD-WAN) overlay complements public Internet and private WAN visibility. SD-WAN gives enterprise administrators a view into applications delivery and performance, to understand applications delivery. By putting network-layer and applications-layer insights together, the administrator uses network insights to change applications policies; and after making applications policy changes, tracks how those changes are reflected in its hybrid networks.

Cloud visibility

Cloud services are now part of enterprises' critical infrastructure, whether traffic travels over private WAN or public Internet routes of the hybrid network. Administrators need visibility to extend to their subscribed cloud services, to know whether traffic delivery and applications transactions meet requirements.

When they are brought together in a managed service, WAN, Internet, applications, and cloud visibility provide insightful, actionable network intelligence. If there is a performance issue in hybrid networks, the administrator looks at utilisation, latency and packet loss, as well as applications delivery. Administrators can quickly isolate and address network issues; if the network is not at fault, the administrator can also quickly rule it out, using views that span MPLS VPN and Internet VPN, end-to-end applications and cloud services destinations. Finally, the enterprise administrator can draw on all these information sources for trending analytics, generating deep insights about connectivity and performance.

Enterprises are adopting hybrid WAN assembled from different network providers and segments. When an enterprise mixes network services, consistent, deep end-to-end visibility across key network points becomes more important than ever. It is critical to have a complete view over circuits and network performance, to bring together with higher-layer views of applications- and policy-centric SD-WAN services. When presented as actionable network intelligence, enterprises have a complete understanding of performance. They have source data they need to locate, isolate and re-route around trouble; and to generate deep analytics insights. Such a portal provides assurance that the enterprise WAN is getting the service levels it needs across all network layers and segments. Gathering this information together under one portal also prepares for an automated future where networks act as closed-loop systems, troubleshooting and even resolving some issues to become self-correcting and self-healing without needing the time and effort of human intervention.

4. Gathered insights become a high-value tool to manage enterprise operations

Hybrid WAN is already a major force to enterprises in Asia and worldwide, but hybrid WAN and SD-WAN also increase the complexity of the network. When an enterprise moves from an all-MPLS fabric to a mix of Private VPN and Internet VPN, it becomes more important than ever to have an end-to-end view of performance at key network points that support the enterprise WAN. In the research, half of enterprise executives report they already use some mix of private IP VPN and Internet VPN services in their networks.

A new type of portal that supports actionable network intelligence offers this kind of comprehensive network monitoring, across both conventional WAN and SD-WAN services. There are many obvious ways that these deep insights help enterprises monitor and manage their end-to-end networks. Below are some additional variations of how this type of comprehensive portal helps enterprises solve specific operations, isolate trouble, and resolve business challenges.

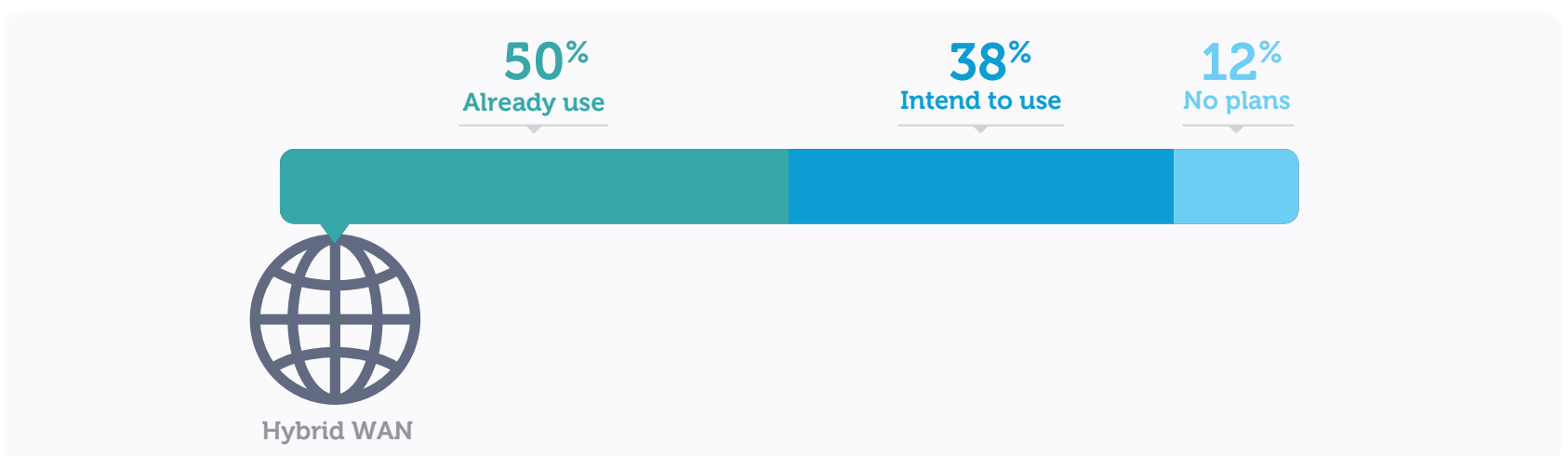
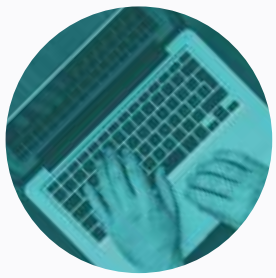


Figure 2 *Half of enterprises have adopted some measure of hybrid WAN, mixing Private IP VPN and Internet VPN services*



Remote and home office support

Normally, an enterprise would have no visibility into Internet segments that connect single-device endpoints and mobile/remote users. A portal that mixes probes inside networks with agents which enterprises may embed in their own devices offers a single view end-to-end, both inside the network and at the remote site. The enterprise administrator has end-to-end visibility from its remote users to the cloud services they consume, including key network points in between. Enterprise remote access traffic may never touch the enterprise's private IP VPN. But with such a comprehensive view, when a remote user has trouble, the enterprise IT department can see in detail whether and where in the network there are issues that affect the user experience to craft a response.

Performance showback

The enterprise IT department may need to prove to internal divisions or external partners that it is delivering specific applications performance levels on a per-circuit, per-application or per-site basis. For internal reporting, applications related to digital transformation are frequently driven by the lines of business inside the enterprise. SD-WAN service monitoring provides information to prove applications delivery met performance levels between SD-WAN managed endpoints. A portal that also shows underlay visibility adds proof that performance levels are met, and hones in on the source of performance issues so the IT staff can respond quickly when something goes wrong. Enterprise IT may use the information to convince the internal department or external client to optimise its network underlay, which might even mean replacing network services or upgrading class of service.

Forensics

When the enterprise WAN experiences a mystery event, a portal that collects data across the SD-WAN and within the network layer is extremely valuable to investigate how an intermittent issue was triggered, to address the problem and prevent it from happening again. Comprehensive collected data combined with analytics and visualisation lets the enterprise IT department research a mystery network event. The portal views WAN topology and applications performance, including segment-level visibility of the enterprise network. These tools isolate the trouble, identify affected users, and let the enterprise contact any involved underlying WAN providers with detailed evidence when and where the issue occurred, to keep it from happening again.

A customer portal with actionable network intelligence provides comprehensive data and deep insights across both SD-WAN overlay and WAN underlay. This data is also accessible through analytics and visualisation tools. There are many ways enterprise IT departments put these powerful network monitoring and management tools to use. The portal may support off-site cloud locations, office endpoints and remote users; it may show internal stakeholders or external clients whether applications and network service levels are being met; and it may provide detailed data to turn back the clock to investigate and resolve anomalous network activity.

Where enterprise IT still drives these sorts of use cases manually today, future automation such as closed-loop systems will enable networks to detect, troubleshoot and resolve some of these detected network issues proactively, without the time and effort of human intervention.

5. Summary

Enterprise networks are complex. IT executives are challenged to have a clear, consistent view across private and public networks, reaching all locations, including data centres and cloud services. Digital transformation puts new application strains on enterprise networks.

IT managers need to understand how changes they make to applications, across networks, and in cloud services affect the whole enterprise network. The right kind of advanced management portal provides this much-needed visibility, graduating the enterprise into actionable network intelligence.

An advanced management portal gives enterprise IT administrators a holistic view compared to fragmented in-house monitoring and management tools, to help make smarter decisions. Such a portal helps IT administrators pinpoint and resolve issues quickly across network infrastructures. It is a base for analytics, to investigate past network events holistically, and to model a future trajectory.

Adopting an advanced management portal also puts the enterprise on a long-term track to benefit from new automation and self-healing networks. These new intelligent tools, which can proactively detect and resolve network issues, depend on a strong base of network intelligence. Just like human administrators, the tools need timely and accurate information to take the right actions.

Whatever the plans of the enterprise, there are immediate, powerful benefits to having visibility and insights across end-to-end networks, reaching on- and off-net locations, and incorporating performance visibility for applications and to cloud services.

About Singtel

Singtel is Asia's leading communications technology group, providing a portfolio of services from next-generation communication, technology services to infotainment to both consumers and businesses. For consumers, Singtel delivers a complete and integrated suite of services, including mobile, broadband and TV. For businesses, Singtel offers a complementary array of workforce mobility solutions, data hosting, cloud, network infrastructure, analytics and cyber-security capabilities. The Group has presence in Asia, Australia and Africa and reaches over 710 million mobile customers in 21 countries. Its infrastructure and technology services for businesses span 21 countries, with more than 428 direct points of presence in 362 cities.

Enabling digitalisation with deep capabilities

- **Cyber security**
- **Analytics /AI**
- **Digital capabilities**
- **Software Defined Networks/ Cloud**
- **Robotics and IoT**

Our award-winning services

- **Carrier Community Global Awards 2020** — Best WAN Solution Provider
- **Frost & Sullivan Asia-Pacific Best Practices Awards 2019** — Asia-Pacific Telecom Group of the Year
- **Asia Communications Awards** — Best Enterprise Service – Singtel Software-Defined Hybrid Network (2018)
- **IDC MarketScape: Asia/Pacific Next-Gen Telcos: Telecom Services 2018 Vendor Assessment** — Leaders Position
- **World Communication Awards 2019** — Best Enterprise Service – Singtel Liquid Infrastructure
- **2018-2019 Gartner Magic Quadrant for Managed Security Services, Worldwide**[1] — Trustwave Named a Leader
- **Frost & Sullivan APAC Best Practices Awards 2018** — SG Data Center Competitive Strategy Innovation & Leadership Award
- **Telecoms World Awards 2018** — Virtualisation and Cloud Infrastructure

[1]Gartner, "Magic Quadrant for Managed Security Services, Worldwide" by Toby Bussa, Kelly Kavanagh, Sid Deshpande, Pete Shoard, May 2, 2019.

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