

WAN technology –
Creating a paradigm
shift in the total
cost of ownership



WAN and its components

For an enterprise, WAN is an enabler for them to run their business across multiple geographic locations. WAN (Wide Area Network) utilizes IP-based technology to connect two or more geographically dispersed corporate sites. It provides a reliable and secure way to

interconnect multiple sites and enables centralization of IT resources that can be made available to any site. Typical enterprise WAN infrastructure is a conglomeration of the following components as given in the table:

Sr. no.	WAN components	Remark
1	Last mile connectivity	Ethernet, Optical, ADSL, Microwave, WiFi, 4G/LTE
2	Administrative domain	Enterprise/WAN provider circuit demarcation point
3	WAN circuits	Routers, passive optical components, modems (ADSL, 4G, LTE), microwave base station, etc.
4	WAN technology	Frame relay, ATM, MPLS, Internet, Ethernet, IPsec VPN, Carrier Ethernet, DWDM, etc.
5	WAN tools	Configuration, monitoring, service ticketing, reporting, logging, database, change management
6	Resources	Technical + non-technical staff: Helpdesk, procurement, field, skilled, OEM TAC

Table 1: TCO contributors

Although not comprehensive, it certainly gives a general sense here that each of the components has a cost and effort attached to it. The TCO (Total Cost of Ownership) calculation for WAN infrastructure has different implications for

enterprise, service provider, telco providers, data centers, public cloud provider and cloud brokerage. In this paper, we will focus on TCO calculation from an enterprise perspective.

WAN TCO parameters

The table below lists key factors that impact overall TCO:

Selection of provider	The selection of a provider is based on their global coverage, which should be close as possible to the global spread of the business of the organization. Usually, it would be a mix of global and the regional providers.
Local access provider	The best approach would be to have regional/global provider themselves providing the last mile to the site like metro Ethernet, DSLAM, etc.
Selection of the product	Several options, i.e., DIA, MPLS VPN, EVPN, IP VPN, are available. Arriving at a right mix of these options can give lower TCO. However, DIA for all the sites has always been a cheaper option compared to VPN (IP VPN or MPLS VPN)
CPE Model	The contribution of the CPE cost has been substantial in the overall WAN infrastructure cost.

Reference: <http://blog.telegeography.com/cloud-wan-trends-sdwan-mpls-ip-vpn>



Due to rising cost and high bandwidth requirement, enterprises have begun looking for Direct-Internet-Access (DIA) as an alternative option.

WAN technology trends and challenges

Let us compare the previous WAN deployment models:

WAN TCO Model #	Enterprise pays for	Service or WAN Provider
Model 1 – Dedicated circuits	<ul style="list-style-type: none"> • IPLC, NLD • CPEs, tools & skilled resources 	Last-mile & WAN backbone circuits
Model 2 – Shared circuits	<ul style="list-style-type: none"> • Frame-relay, ATM, and MPLS with QoS • CPEs, tools & skilled resources 	Last-mile & WAN backbone circuits
Model 3 – Managed	<ul style="list-style-type: none"> • As-a-Service model tied with application QoS requirements 	CPEs, tools & skilled resources Last-mile & WAN backbone circuits

Table 2: WAN deployment models

MPLS VPN is a mature network product, and it is by far the most widely available international enterprise network service due to its capability to provide different CoS to match the application performance requirements. IPsec VPN remains a critical piece in the global WAN, as there is a growing number of enterprises who are rerouting some of their corporate traffic to the public Internet. However, due to rising cost and high bandwidth requirement, enterprises have begun looking for Direct-Internet-Access as an alternative option:

- » Addressing the need for growing bandwidth requirements within the limited budget for the networks, enterprise network managers must be efficient in bargaining the contracts and optimizing the WAN design.
- » Migrating the corporate traffic from VPN to public internet is complex because the

application performance requirements must be mapped to the right connectivity, which can provide proper service levels and traffic flow.

- » Security is inherent in the VPN connectivity, and it becomes a significant concern when moving corporate traffic over to Public Internet. However, this has reached a certain level of comfort and trust with the advent of alternate security solutions and assurances.
- » WAN in Model-1 & Model-2, was complex to design, operate and troubleshoot. It had a high dependency on the skilled resources, had a repeat procurement cycle of the hardware devices. Also, the change was time-consuming and error-prone.

The graph below depicts how the WAN TCO changed due to evolving WAN technology trends.

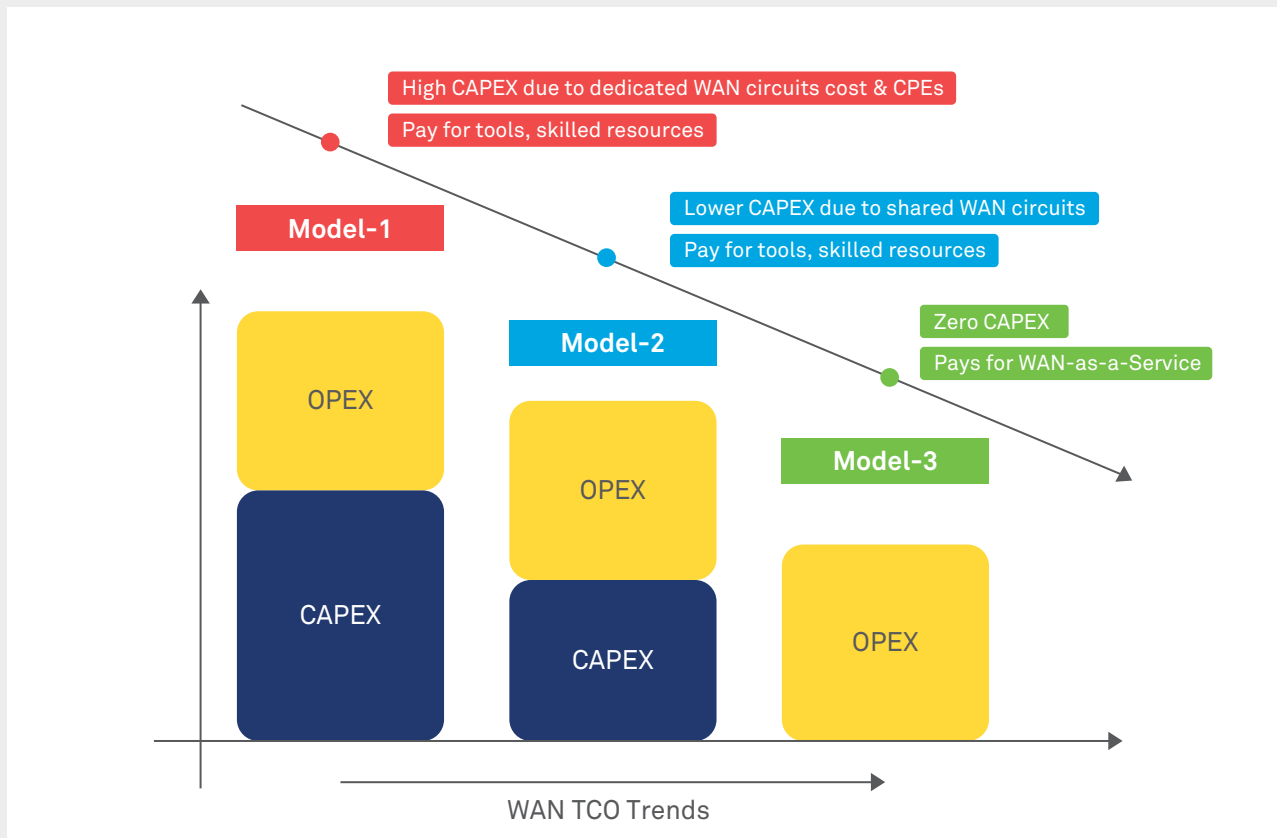


Figure 1: WAN TCO trend

In Model-3, CAPEX is zero, and the entire WAN service has only OPEX model. This was made possible by having the same requirement with the only Internet as the WAN technology whose performance was at par with the MPLS technology. This created total disruption in the WAN market, which impacted many of the service providers. Enterprise narrowed down their choices to:

- » Basic MPLS
- » Internet
- » Hybrid (MPLS + Internet)

Enterprises are now not required to make decisions on CPEs, tools or even to hire skilled resources.

SD-WAN

Model-3, which is Software-Defined WAN, helped the enterprise network managers to address all

the challenges mentioned above in Model 1 & 2, by leveraging the hybrid WAN solutions bringing positive impact to the overall TCO. The key concept in SD-WAN was on making **WAN aware of application**, which gave rise to following additional benefits:

- » Agnostic to the underlying WAN technology
- » Dynamically routes traffic across hybrid WAN in real-time based on SLA profile of the various applications
- » Centralized configuration management
- » 40% reduction in WAN transport spend with hybrid WANs layers & multi-service provider platform

Conclusion: WAN TCO disruption

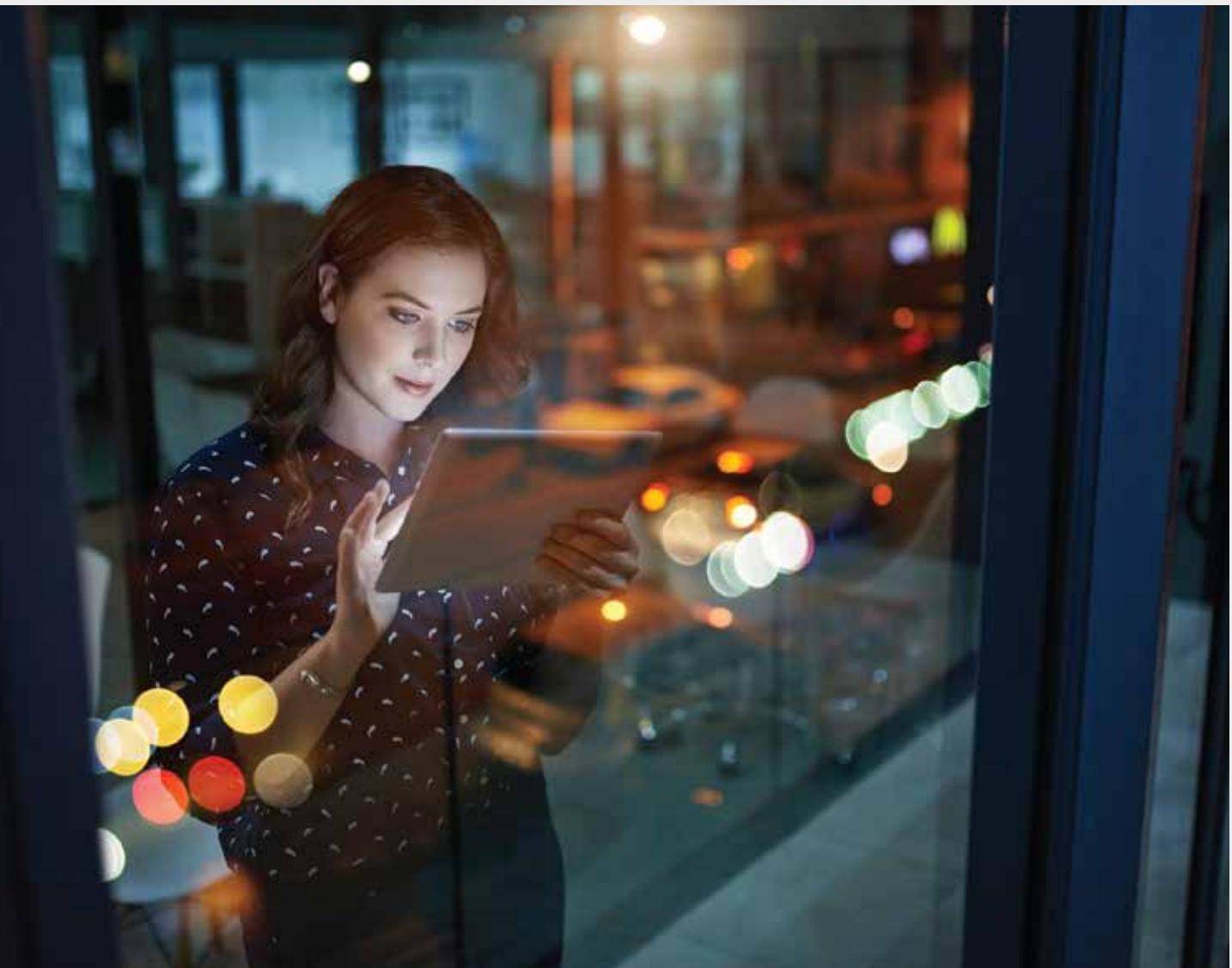
As the Internet is getting more robust, more resilient and cheaper, in the coming years, we will see that WAN-as-a-Service is being looked upon as the most preferred among small, medium and large enterprises because of the attractive TCO and ROI it brings in.

Also, the rising adoption of the Cloud-1st strategy by several enterprises is one of the critical reasons why WAN-as-a-Service model is gaining such traction. The Cloud-1st adoption also raises the crucial need for secure interconnectivity with the various clouds to branch offices. Using the Internet for interconnectivity suffices for the low bandwidth requirements, but not for high

bandwidth and business-critical applications, due to security concerns and the low reliability of the performance of the public Internet. These gaps are now being fulfilled by the cloud service brokers, acting as a hub to connect to all the public clouds.

Following agents are playing a catalytic role in bringing out the disruption in the overall WAN TCO:

- » Application-awareness
- » Automation
- » Centralized management and operations
- » Availability of cheaper bandwidth



About the author

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Infrastructure Services: Ravindra K. Botkar has 15+ years experience in N&S, encompassing several project deliveries. He is currently a part of GIS SDx team, as Principal Consultant. He has made key contributions to network automation of legacy and ACI via Python and Ansible, in addition to integration use cases around

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