Deloitte.
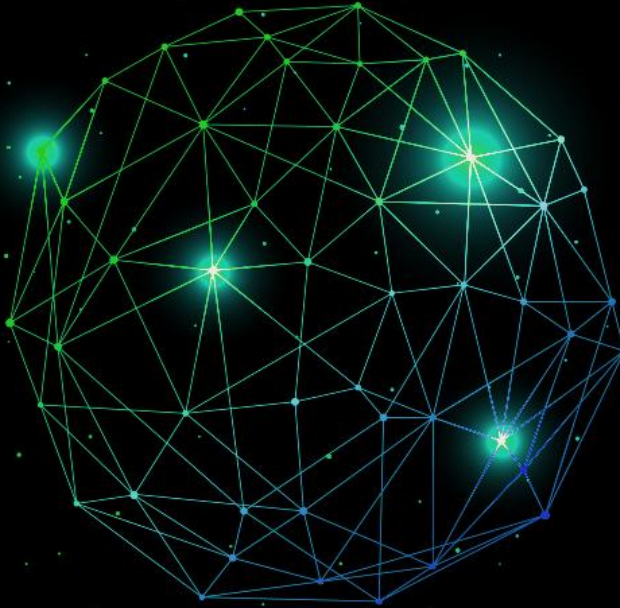
Implementing
and operating an
SD-WAN network

Global Telecom Engineering
Centre of Excellence (gTEE)

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Introduction

Over the past years, enterprises have been transitioning their on-premises network infrastructure to the cloud and have embraced the use of cloud-based applications. This evolution has created challenges for traditional WAN architecture, which is inadequate to support the new network demands. Traditional WAN lacks quick scalability and flexibility, and its high complexity results in high costs for connectivity.

SD-WAN is a solution that addresses the challenges of modern network infrastructures. It offers an overlay architecture that provides centralized management tools, enabling organizations to build secure, scalable, and cost-effective networks. This brings benefits such as improved quality of service for applications, increased network resiliency, centralized real-time network monitoring, integrated security and enhanced network visibility.

To maximize the benefits of SD-WAN, a well-defined operating model is crucial. The SD-WAN solution can gather valuable network performance information to identify areas for improvement, optimize network performance, and ensure that the organization can fully leverage its capabilities.

This paper outlines an end-to-end process for implementing and operating an SD-WAN solution on a global scale. It provides a comprehensive overview of the key activities for enterprises through their journey towards a digital and cloud-oriented WAN environment.

Journey towards SD-WAN

The journey towards an SD-WAN network must consider the current network landscape of the organization. Depending on its WAN maturity profile, there are a set of recommended next steps to help the organization reaching the target SD-WAN setup.

	LEGACY PROFILE	HYBRID PROFILE	DIGITAL PROFILE
Typical Topology	Organizations with legacy network infrastructure, MPLS-based connectivity, low levels of network automation and majority of services running on-premises	Organizations with several types of WAN connectivity, creating an operational challenge, and limited or no segregation between WAN and LAN	Organizations with high WAN maturity, typically with an SD-WAN solution already in place but that needs to be refreshed and optimized

DC
MPLS
Site #1   Site #2
Service Provider Edge

DC
INET   MPLS   Mobile
Site #1   Site #2
Service Provider Edge

SD-WAN Orchestrator   DC
INET   MPLS   Mobile
Site #1   Site #2
SD-WAN

Typical Characteristics

LEGACY PROFILE	HYBRID PROFILE	DIGITAL PROFILE
MPLS-based underlay connectivity	**Hybrid WAN (i.e. different access technologies used)**	**Hybrid WAN (i.e. different access technologies used)**
No segregation between WAN and LAN environments	**Limited segregation between WAN and LAN environments**	**Complete segregation between WAN and LAN environments**
Low levels of automation, mostly manual processes, high costs	**Medium levels of automation, manual processes are still common**	**High levels of automation with SD-WAN in place, low maintenance costs**

Starting Points [1]

LEGACY PROFILE	HYBRID PROFILE	DIGITAL PROFILE
➢ Perform **assessment of the current network**	➢ Perform **assessment of the current network**	➢ Perform **assessment of the current SD-WAN** infrastructure
➢ **Define WAN standards** in the enterprise	➢ **Benchmark** and **select SD-WAN** solution & provider	➢ **Analyze SD-WAN market** and **select new solution** as per business needs [2]
➢ **Plan roadmap** for SD-WAN implementation	➢ **Leverage SD-WAN capabilities for automated network monitoring** and integration with other enterprise applications	➢ **Plan for adoption of pure internet-based** underlay
➢ Start planning the adoption of a **hybrid WAN**	➢ **Start migrating** the network to SD-WAN	➢ **Decommission legacy VPN connections**
➢ **Start migrating** the network to SD-WAN		

(1) Non-extensive list; (2) Necessary only if there is a need for infrastructure refreshment

SD-WAN Rollout Process Overview

The process of SD-WAN rollout can be divided into 4 main phases, each one constituted by several key activities. The process starts with an assessment to the current network and selection of the SD-WAN provider, followed by a phase of design and preparation for the SD-WAN deployment. After everything is set up, the actual deployment is initiated. The last phase of the process consists in the operation of the new SD-WAN network, which is a continuous phase that aims to maximize network performance.

1. Assessment

The first phase of the process has three main objectives. First one is to clearly understand - or even support developing - the strategy for the organization's WAN. Second goal is to select the most suitable SD-WAN solution for the organization. Finally, the third objective is to perform an assessment to the as-is network, which will be critical to plan the migration to SD-WAN.

2. Design

The Design phase includes the development of the target network design, both global and per site. It also includes the definition of the specific SD-WAN equipment as well as the underlay connectivity that will be in place in each site. Additionally, a step-by-step runbook is developed to facilitate the actual migration in phase III.

SD-WAN Rollout

3. Implementation

The focus of this phase is to deploy the SD-WAN solution selected as per the design developed in the previous phase. The third phase also includes technical quality assurance to validate the implementation as well as a hypercare period to monitor the new SD-WAN location after the transition. A top priority at this phase is to perform the migration in a seamless manner for the users.

4. Operation

The Operation phase is a continuous phase of the process, which aims to ensure a proper operation of the new SD-WAN network. At this phase, specific KPIs related to network performance are constantly being monitored and any incident is handled and reported. Furthermore, this phase also includes network optimization activities that are determined based on the performance up to that point.

SD-WAN Rollout | Assessment Phase

The Assessment phase is divided into three main steps. The first one consists of an analysis to the organization's strategy, which serves as a basis for the vendor analysis step. Finally, an assessment to the network is performed – this will be critical to understand the gap between the as-is and the target state being defined in the Design phase.

Strategy Analysis [1]

The Assessment phase starts with an analysis to the organization's strategy in order to understand the vision that has been delineated to the network, including the main drivers, requirements and transformation roadmap. These aspects create the basis for the upcoming activities in the SD-WAN rollout process.

- Roadmap
- Requirements
- Drivers

Vendor Analysis

This first phase also includes the selection of an SD-WAN provider. In this step, there are several areas of analysis that are considered and evaluated according to the organization's requirements in order to select the most suitable solution. For instance:

- Technical capabilities
- Customer support
- Pricing
- Market visibility

Network Assessment

The last step in the Assessment phase consists of an actual as-is WAN assessment, both physically (i.e. underlay) and logically (i.e. overlay).
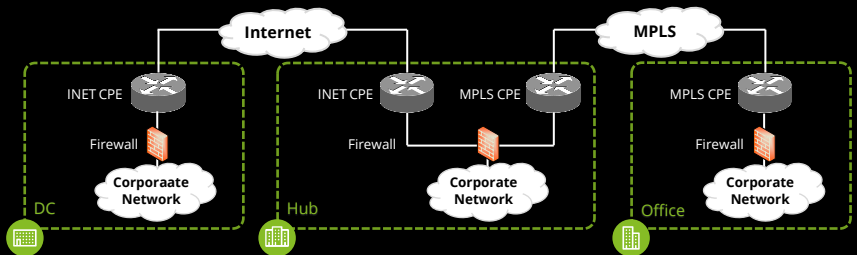
Conducting an as-is assessment is crucial for a successful SD-WAN deployment, even for organizations with a strong understanding of their network. **The as-is assessment helps identify risks and enables proactive preparation**.

SD-WAN Rollout | Design Phase

The design phase of SD-WAN rollout starts with the decision about the underlay infrastructure to be in place. This is followed by the definition of business overlays based on the applications that run on the network and their criticality. Finally, the target network setup for each site and the overall future architecture are determined, taking into account the network assessment and the defined underlays and overlays.

Network Setup

The network setup for each site is defined based on the underlay and overlay setups and technical requirements defined for each site. The overall to-be network and requirements for the organization are defined to meet all current and future business needs.

Target Network Setup Example
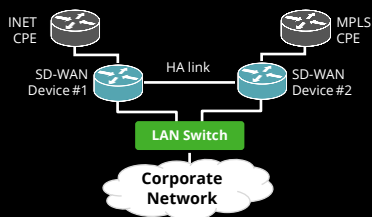
Overlay

The overlays to be configured are defined based on a criticality analysis to the different applications used by the organization. The key objective is to ensure that critical applications are prioritized and that the network meets their demanding requirements.
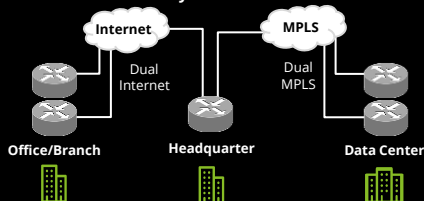
Overlay #1 | Critical apps

Overlay #2 | Non-critical apps
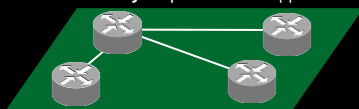
Underlay

The types of underlay connections to be used depend on both the organization's WAN strategy and on the local telecom providers' offers. The technical characteristics of the connections, such as bandwidth, are determined based on the current and future requirements of each site.

Hybrid WAN

Consider the **unique requirements of the applications** running on the network and **factor in expected bandwidth growth** when defining the **network overlays** and the **underlay infrastructure**

SD-WAN Rollout | Implementation Phase

The Implementation phase is focused on the deployment of the SD-WAN solution in each organization's site as per the design developed in the previous phase. It starts with the actual migration to SD-WAN, where the appliances are installed. It is then followed by a set of site acceptance tests for a technical quality assurance. Finally, the site enters in a hypercare period until the handover to the organization's network operations team.

1. SITE MIGRATION

Refers to the installation of the SD-WAN appliances in each site according to the defined target architecture and it follows four main stages:

| Preparation Steps | SD-WAN Connection | Failover Testing | Fall-Back Plans |

2. SITE ACCEPTANCE TESTS

Concerns the execution of site acceptance tests (SATs) for technical quality assurance to confirm the proper behavior of the network. It analyzes:

| Routing Configuration | Connectivity | Application and User Experience |

3. HYPERCARE PERIOD

This is a monitoring period to ensure the required network performance and fast reaction to failure in the early stages of new SD-WAN sites, aiming to reduce business impacts. Network stability reports are produced until the handover.

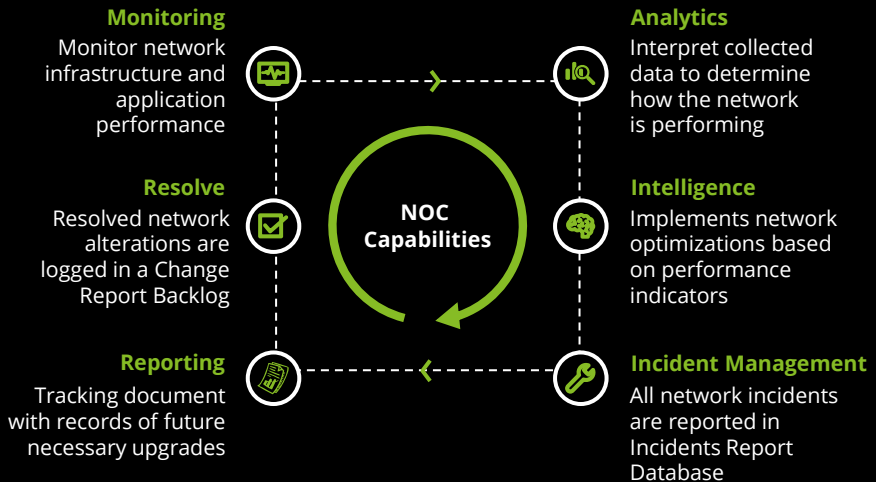**Close Monitoring** → **Stability Report** → **Site Handover**

The definition of an **implementation runbook** and of a detailed **list of acceptance tests** is very important to *guarantee that the implementation is performed in a **standard and effective manner***

SD-WAN Rollout | Operation Phase

The Operation phase focuses on monitoring the network according to the defined target operating model and agreed scope of service, gathering important insights that later allow to identify improvement areas and make adjustments to optimize the SD-WAN's performance.

MONITORING, INCIDENT MANAGEMENT & OPTIMIZATION

Network monitoring is carried out with the goal of identifying and implementing potential network optimizations in accordance with business requirements and the TOM established guidelines

NOC Capabilities

Monitoring
Monitor network infrastructure and application performance

Analytics
Interpret collected data to determine how the network is performing

Resolve
Resolved network alterations are logged in a Change Report Backlog

Intelligence
Implements network optimizations based on performance indicators

Reporting
Tracking document with records of future necessary upgrades

Incident Management
All network incidents are reported in Incidents Report Database

It is important to highlight that, for the Operation phase to run smoothly, it is critical to have a Target Operating Model (TOM) in which the organizational structure to operate the SD-WAN service is defined.

Defining stakeholders and their roles

Creating Escalation Levels for incident resolution

Describing Business and Technical service view

A well-defined operating model is **critical to ensure a consist and standard** network operation, **to improve operational efficiency** as well as **to maximize visibility and control** over network performance

Use Case of an SD-WAN Rollout

Deloitte successfully demonstrated the effectiveness of its proposed approach by applying it to a real client with a Legacy profile. Deloitte conducted a comprehensive as-is network assessment and developed a strategic plan to support the migration to an SD-WAN network across all client's sites. The outcome was a successful deployment of SD-WAN, which provided the client with improved network performance and a more cost-effective infrastructure.

CLIENT PROFILE

Manufacturing Company

+60 Countries

+300 Locations

+35.000 Employees

Rollout Main Objectives

➢ Deploy of SD-WAN across all client's locations worldwide

➢ Decommission legacy connectivity solutions such as VPN, and MPLS

➢ Prepare for future underlay optimization based on Internet connectivity

High-Level SD-WAN Architecture Implemented

SD-WAN Cloud Portal

SD-WAN Orchestrator

Site #1 Site #2 ··· Site #N

EMEA
EMEA Hub
MPLS INET

LATAM
LATAM Hub
MPLS INET

INET

Hub DC
MPLS

APAC Hub
APAC
MPLS INET
Site #1 Site #2 ··· Site #N

CIS Hub
CIS
MPLS INET
Site #1 Site #2 ··· Site #N

NA Hub
NA
MPLS INET
Site #1 Site #2 ··· Site #N

SD-WAN Device   Router   Firewall   Security Cloud Service
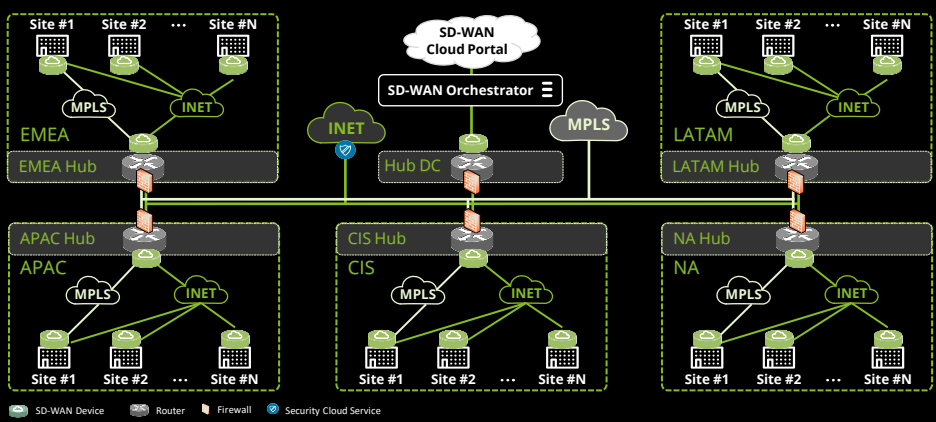
WHAT HAVE WE LEARNED?

Region parallelization to speed up the SD-WAN integrations

Shadowing concept and coaching sessions to guide the rollout process

***Gamification* concept to communicate results and trigger evolution**

Global success ensured by conferring autonomy to regional implementers

How can Deloitte help?

Deloitte's Global Telecom Engineering Centre of Excellence in EMEA (gTEE) combines the strengths of Engineering background and multidisciplinary teams bridging high technical expertise with strategic consulting skills to provide thought leadership, talent and global reach. This allows the firm to provide clients with unique insights, leading edge methods, actionable analysis, recommendations and extensive hands-on implementation experience – all firmly grounded in deep industry knowledge and focused on business impact.

Developing a business case for a WAN transformation
Deloitte has successfully supported the development of a broad set of business cases related to WAN evolution, being able to evaluate several options and recommend the one that is most suitable for its clients

Defining the WAN strategy and performing an as-is assessment
As a result of a wide experience in network transformations, Deloitte is well positioned to define a customized strategy for companies to adopt SD-WAN solutions as well as to perform network assessments

Designing the global and per site SD-WAN architecture
Deloitte's extensive knowledge on WAN networks and on SD-WAN technologies places it as the ideal partner to design the target network architecture and to properly prepare the actual migration

Deploying the SD-WAN solution across all site types
Deloitte can efficiently manage the deployment of SD-WAN solutions, from both a project management and technical perspective, in all types of sites – from offices/branch sites to headquarters and DCs

Operating the SD-WAN network
Over the past years, Deloitte developed capabilities to support organizations operating their networks. These capabilities include both the definition of a TOM as well as the actual network operation
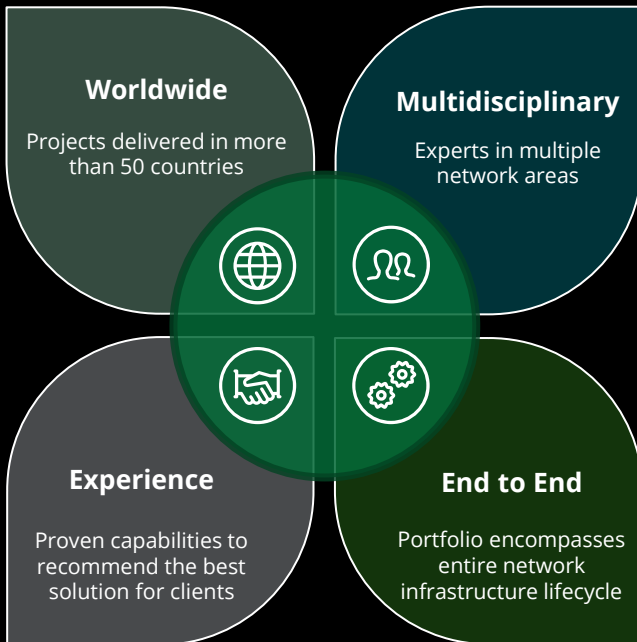
Who We Are

Deloitte's Global Telecom
Engineering Centre of Excellence

The Global Telecom Engineering Centre of Excellence (gTEE) has a footprint
spanning 4 continents and has delivered projects in over 50 countries being
currently supported by 1 headquarters and 3 branches with +100 telecom
engineers.
We deliver professional telecommunications engineering consulting services
worldwide supporting our customers via a global network of offices from
Europe to Australia, having delivered more than 200 projects globally.

Deloitte has a unique combination of expertise in
various network domains, being **a trust-worthy advisor**
for every step of the network transformation journey

Worldwide

Projects delivered in more
than 50 countries

Multidisciplinary

Experts in multiple
network areas

Experience

Proven capabilities to
recommend the best
solution for clients

End to End

Portfolio encompasses
entire network
infrastructure lifecycle

Glossary

API – Application Programming Interface
AI – Artificial Intelligence
CPE – Customer Premises Equipment
DC – Data Centre
INET – Internet Links
LAN – Local Area Network
MPLS – Multi Protocol Label Switching
SAT – Site Acceptance Tests
SASE – Secure Access Service Edge
SD-WAN – Software Defined WAN
TOM – Target Operating Model
WAN – Wide Area Network
KPI – Key Performance Indicator

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