# Verizon Service Designer.

## Network Topology Design.

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## Section 1. Executive summary.

Verizon Integrated Service Design Module (VISDM) is a unified platform that provides enterprise customers with an intuitive visual design tool for creating complex legacy and next generation networks, such as Software Defined Networks (SDN) and Network Functions Virtualization (NFVs). It perfectly binds business support (BSS), operating support (OSS) and is the driving force in end-to-end automation, helping increase network agility, elasticity, reliability and security, while controlling operating and capital expenses.

Enabling a simple, visually oriented platform that customers can use to design and order complex network services is an important strategy to drive digital transformation and improve the customer experience. It is also a challenging task to achieve. These complex network services are difficult to provision, configure and activate using traditional IT services.

VISDM provides a modular framework to design network topology, interconnect virtual network functions (VNFs) and physical network functions (PNFs), and provide desired configuration information in a standard format to Orchestrator to provision network service (Fig 1.1). This module provides a medium for operators to change policies and configurations at run time for self-managing and auto scaling networks.

VISDM provides a framework for Sales, Solution Architects, Design Engineers, Implementation Engineers and Operators to capture details of the network in a single design repository. This module intelligently connects to business and operations IT systems and processes, makes the provisioning journey a seamless experience for customers and improves time to market.

### VISDM: Graphical network design & configuration tool.

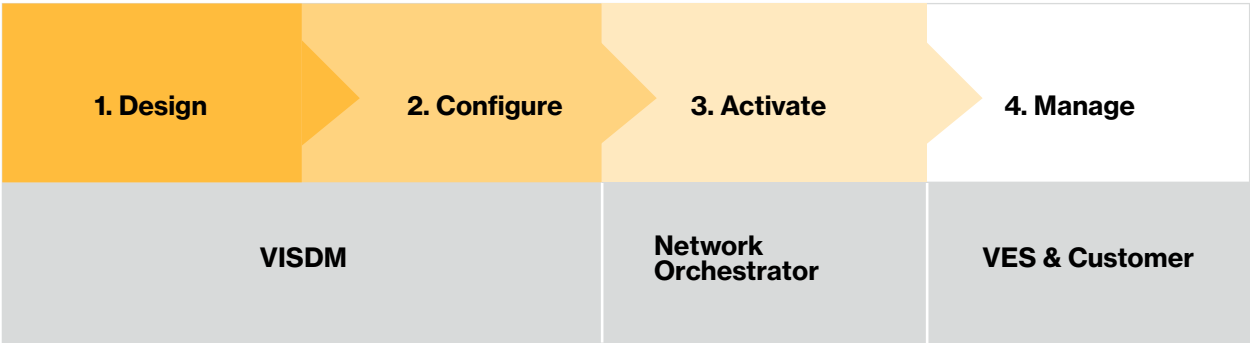| 1. Design | 2. Configure | 3. Activate | 4. Manage |
|---|---|---|---|
| VISDM | | Network Orchestrator | VES & Customer |

Fig 1.1 – VISDM's role in ecosystem from service inspection to provisioning.

## Section 2. Overview.

Designing and provisioning a new network for service providers and operators has always been a fairly slow and static affair. Customers have to carefully discuss business needs with their service providers, explain every detail of their network and plan way ahead for what they need. The process is long and cumbersome, and provisioning can take not just a few weeks, but sometimes months.

Service providers and operators are looking for a different way to design the network and dynamically activate and orchestrate customers' end-to-end network services via an on demand network service creation and fulfillment platform.

Service providers want to empower customers to create their own network design, letting them stitch multiple VNFs, PNFs and cloud services into a single network solution and get it provisioned on the fly. Customers are looking for a dynamic and fast paced approach to get their services delivered.

Graphically designing a network service is key to ensuring business outcomes can be achieved. This is because the intent of the network solution can be depicted. In this white paper, we will focus on the reasons why Verizon's Service Designer application is an important module in current BSS and OSS architecture, and how it helps to solve some of the unforeseen challenges we have in the world of physical, virtual and cloud environments.

## Section 3. The challenges.

Service providers and customers have to account for designing, provisioning and activating complex networks. With the rapid changes in customer behavior, and innovative business models and technologies, automation has become more and more challenging. There is not a single solution that can make customer experiences flexible and simple.

### Complex enterprise networks.

A typical enterprise customer's network supports multiple services and consists of thousands of locations spread out geographically. End-to-end solutions start at the customer premise with a multitude of applications with WAN edge routers and firewalls connecting their business/hub locations on different transports, like MPLS, Internet Broadband, E-Line, E-LAN, Internet dedicated, Fiber, VPN, and Wireless. Network service spans multiple domains, like optical, IP, DC and Mobile. Network solutions might also consist of VOIP, security solutions and networking in data centers and branch locations. Amidst all these complexities, with the advent of SDN, NFV and IOT, network complexity has reached another level. For example, solutions like SDWAN with policy controllers sitting on either the customer's cloud or service provider's cloud, VNFs service chained either in universal CPE at the customer premise or in the cloud or data center. Graphical representation of thousands of locations with complex networks is a huge challenge in itself, let alone the provisioning aspect (Fig 1.2).
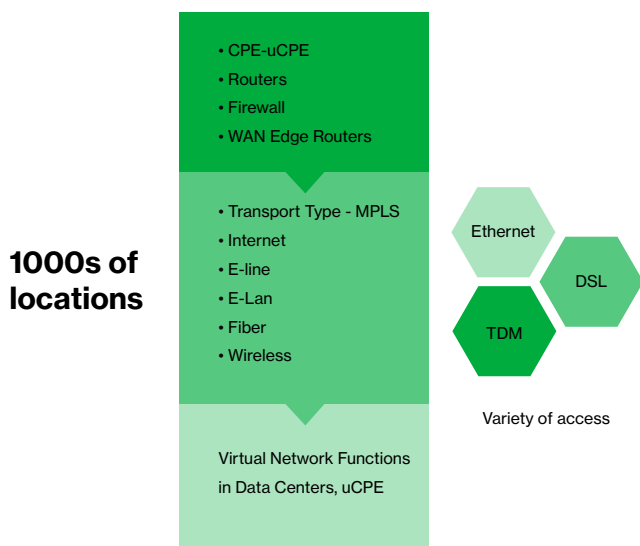
**Complex enterprise WAN network.**



- CPE-uCPE
- Routers
- Firewall
- WAN Edge Routers

**1000s of locations**

- Transport Type - MPLS
- Internet
- E-line
- E-Lan
- Fiber
- Wireless

Ethernet

DSL

TDM

Variety of access

Virtual Network Functions in Data Centers, uCPE

Fig 1.2 – Complexity of Today's Enterprise WAN Network.

### Manual provisioning.

Currently, automation is not that widespread and is done sporadically. In many cases, service providers have to manually provision, manage and operate complex network services for their enterprise customers. There is very little coupling between provisioning and service assurance. Enterprises and carriers are in need of unprecedented programmability, design, automation and network control, which would enable them manage highly scalable, flexible networks that readily adapt to changing business needs.

### 'As a service' - customer's experience.

Customer satisfaction and self-experience is a top priority for service providers. Enterprise customers' behavior, needs and expectations are changing very rapidly. They want everything on-demand and are expecting their network services to be built with the click of a button. With rapid changes in business models due to cloud, virtualization, SDN, NFV and IOT, customers want flexible automation for provisioning and activation of their network services. They want to create their own network design without worrying about underlying complexities of BSS, OSS and network. Similarly, service providers want to operate their network with ease of use.

### Network design process is still informal.

The process of creating a network service design is still unsophisticated and manual. The detailed network topology, design and descriptions for enterprise solutions are usually captured in multiple platforms like VISIO, Word/text Documents, Excel and PowerPoint. These informal documents are shared amongst Sales, Solution Architects, Order Managers, Design Engineer, Network Engineers, Implementation Engineers and Operations, including BSS, OSS and Inventory systems. Often, duplicate information is being captured. There is no single tool, application or placeholder to provide a unified repository for all the network designs, which would improve the process and drive automation (Fig 1.3).
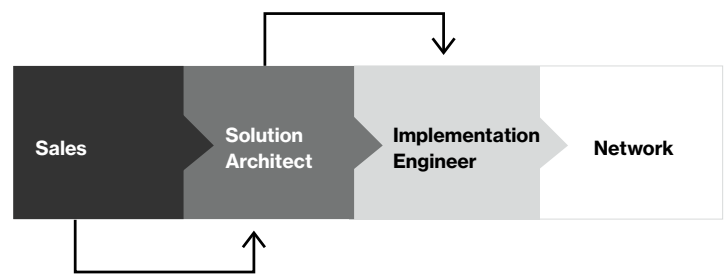
**Multiple design and configuration handoffs.**



Sales

Solution Architect

Implementation Engineer

Network

Fig 1.3 – Today's Informal Network Design process.

### Multiple orchestrators with embedded UI module.

The principles of SDN/NFV enable service providers to automate the process of design and deployment of not just virtual network services but also physical networks by using an orchestrator. Today, there is no single orchestrator equipped for all types of PNFs and VNFs in market. This inherently means service providers have to choose multi-orchestrator architecture to automate provisioning of complex network services for their enterprise customers. Designing and automating multiple network services in different domains, integrating with OSS and BSS, and provisioning the final solution for customers is a challenging task.

### Section 4. The solution - Service Designer Tool.

Designing and delivering complex network services can be a challenge, as enterprise customers want seamless consumption, on-demand functions and agile delivery that can keep up with the needs of their business. Service providers are building solutions to deliver network agility, rapid provisioning -- such as zero-touch, and the ability to manage the complexities of brownfield networks. VISDM bridges the gap between the customer's business requirements and service provider's capabilities with a unified portal. The portal provides users with the ability to graphically create and maintain heterogeneous network services, while simplifying the process of network provisioning using BSS, OSS and multiple Orchestration systems.

VISDM allows Solution Architects and Network Engineers to design complete end-to-end network services using simple, drag and drop network elements and dynamically service chain them to create network services. This tool is capable of intelligently producing the network design templates and configurations to create network services, which are consumed by one or more Orchestrators to automate the deployment of their portions of the overall solution within their infrastructure domain (Fig 1.4).

The Network Functions Virtualization Orchestrator (NFVO) takes a template (the business intent) as input describing the network service. The template itself is a model of the network service and includes all the network components, for example, virtual networking functions, the connectivity and links between the network elements and the deployment details for the individual network functions.

Fig 1.4 – VISDM in Verizon's Overall Detailed Architecture.

The Verizon Service Designer application supports the following main features (Fig 1.5):

- Onboard different networking elements (PNFs/VNFs) and network services as the building blocks for designing the end-to-end service. Onboarding involves incorporating Topology and Orchestration Specification for Cloud Applications (TOSCA) based deployment templates for each of the designelements with their Virtual Network Function Descriptors (VNFDs), Network Service Descriptors (NSDs) and Virtual Network Link Descriptors (VNLDs).

- Drag and drop hybrid networking elements and connect them together to design the overall end-to-end network. This design is described in a TOSCA based template, which is created as an output of this activity.

- Enables product owners to create standardized and pre-validated templates for any products or combination of products, which are ready to be offered to any enterprise customers as network solutions.

- Includes virtual network services and physical network services. VISDM integrates with Orchestrator to provision any virtual network services and VISDM generates network configurations for physical network services.

- Enables users to create dynamic service chaining for network elements with associated validations, which tells users which universal customer premise equipment (uCPE) or Hosted Network Services (HNS) location is available or appropriate for the type/vendor of VNFs in the network service.

- Allows users to enter details for Day 0, Day 1, Day 2 and policy configurations, for any physical or virtual network element in network services. For example, integration of VISDM with Viptela controllers for device and policy configurations.

- Integrates with billing systems, quoting, ordering, inventory and operations systems.

- Allows users to pull in existing network designs and services, and modify, add or delete those services dynamically.

- Provides workflow to scale the network design to thousands of locations in a simplified manner. For example, Fortune 500 companies - multiple SDWAN solution.

- Outputs business artifacts like Word, PDF, Visio, Excel and PowerPoint.

- Allows users (solution architects, designer engineers and network engineers) to create an instance of a given network service template by filling in the network level attributes, for example, IP addresses, VLAN tags, etc., for each element that makes up the service. This again leads to creation of a TOSCA based template, except that it has all the networking and deployment information for an NFVO to be able to automatically deploy and configure all the elements of the network service.
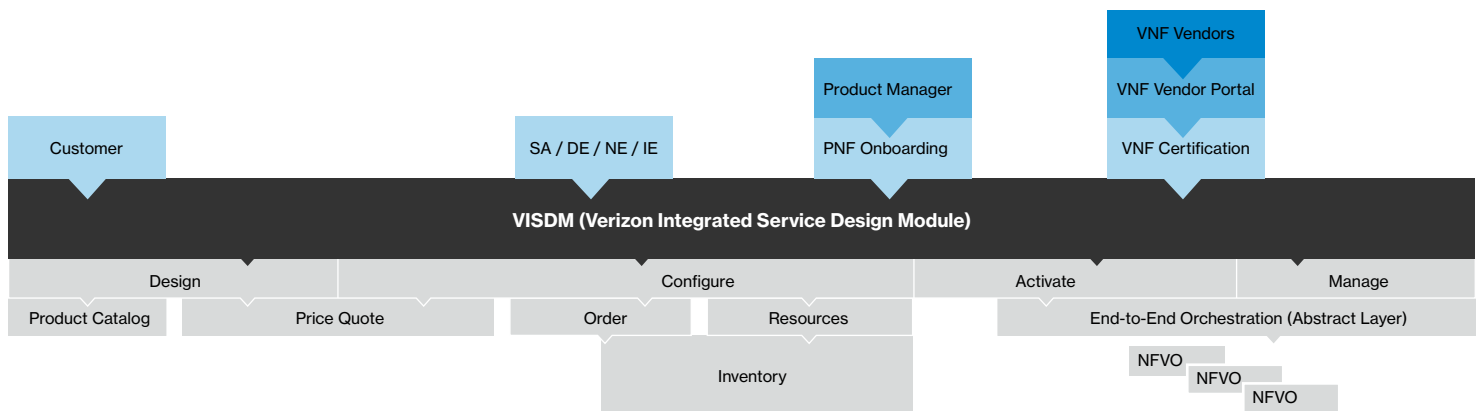
## VISDM: Functional view.



Fig 1.5 – VISDM Functional view.

## Section 5. Benefits.

### Unified user experience:  customer/service providers.

- Provides single platform, which adheres to standards (ETSI MANO), to create, maintain and manage E2E network service designs for legacy, wireless and IOT SDN/NFV network services.

- Delivers customers/users end-to-end visibility to network solutions.

- Hides complexities of underlay network configurations.

### Functional & operational improvements.

- Manages lifecycle from service design to service configuration by tying together BSS and OSS stack.

- Provides business process improvements, including single repository for service creation and delivery.

- Integrates with Verizon domain orchestrators and provisioning tools by abstracting the complexities to the users.

### Network agility.

- Helps improve and automate end-to-end provisioning of hybrid networks for better TTM, while controlling Opex and Capex.

- Increases network agility for customers network services.

## Section 6. Conclusion.

Service providers' business depends upon the network they provision for their customers - its speed, scalability, reliability, efficiency, and flexibility, elasticity and operations.

As customer demands are increasing, there is a greater need for automation of complex networks. To make automation successful, there is greater need of adopting innovative GUI tools and self-service portals to create and manage network designs. Customer satisfaction is a key success factor for service providers and by leveraging the Verizon Service Designer, customers can take their ability and confidence to the next level in their journey to service completion.