Dynamic Enterprise Services

Combine IP and optical networking with SDN, NFV and service orchestration to deliver innovative enterprise services

• Deliver agile, assured and automated services to enterprise customers
• Enhance the customer experience with flexible service options, reduced time-to-market and improved TCO
• Protect and increase revenues with innovative enterprise services

Enterprises are moving into the dynamic world of the cloud and the Internet of Things (IoT). Their communication requirements and purchasing decisions are influenced by cloud-based applications, mobile users and devices, increased access network capacity, and security concerns. Enterprises want to run their applications over on-demand, location-independent network services between headquarters, branch offices, data centers, remote users and partners. They want the ability to scale services when and where needed, and to pay accordingly for those services.

Market demand for adding these dynamic attributes to existing enterprise services presents an opportunity as well as a challenge for communications service providers (CSPs). The opportunity is to offer service innovations that will attract enterprises embracing cloud and IoT technology, thereby helping enterprises adapt their businesses and processes to address new opportunities and sustain profitability. The challenge lies in enhancing the network and evolving network services and operations to be able to quickly deliver dynamic enterprise services cost-effectively.

Dynamic Enterprise Services overview

Nokia offers CSPs a suite of products and solutions for delivering dynamic enterprise services that help address increasing enterprise networking demands for choice and flexibility.

With dynamic enterprise services, CSPs leverage network connectivity to dynamically connect enterprises to cloud services and applications, when and where they need it. With managed services, CSPs expand revenue and differentiate services through compelling enhancements tailored to meet enterprise networking requirements.

Nokia’s offering combines existing IP and/or optical networking with software-defined networking (SDN), network functions virtualization (NFV) and service orchestration and infrastructure control, enabling CSPs to improve network total cost of ownership (TCO), and deliver innovative services to a much greater number of multinational and large enterprises as well as small and medium-sized businesses.
Dynamic Enterprise Services framework

Technological advances such as SDN and NFV, combined with catalog-driven service orchestration, give CSPs the ability to evolve networks to an on-demand service delivery model. Nokia enables CSPs to take a dev-ops approach to managing service life cycles for new dynamic services using automation for provisioning and verification.

The framework shown in Figure 1 highlights the services and solution components CSPs can combine to enable a full suite of dynamic enterprise services. CSPs can offer any or all of these services (network connectivity, cloud and managed services) depending on market position, business goals and enterprise customer needs. The framework ensures accelerated service development cycles and delivery times with increased reliability.

The Nokia networking solution components at the bottom of Figure 1 are the foundation of dynamic enterprise services. These components are enhanced with SDN, NFV and service orchestration combined with infrastructure control elements (domain management and carrier SDN) to automate the delivery and assurance of enterprise services. End-user experience is enhanced with a user service portal, which provides the ability to request or modify services and monitor service performance on demand.

Nokia offers professional Cloud Wise Services support to help CSPs with the transformation of their networks toward cloud-based dynamic network services.

Figure 1. The Dynamic Enterprise Services framework
Carrier SDN-enabled services

Increasingly, enterprises are requesting the ability to order and make changes to their network connectivity services on demand and have these services deployed in minutes or hours instead of days or weeks. CSPs can ensure customer retention and future revenue growth by offering dynamic capabilities with the ability to request bandwidth changes on demand (i.e. bandwidth on demand) or to vary bandwidth during specific time-of-day-intervals (i.e. bandwidth calendaring). They can also offer dynamic access control lists (ACLs) or support new application deployments using quality of service (QoS) profile configuration. All this can be initiated through a customer service interface portal to self-manage their services.

CSPs can deliver dynamic network connectivity enhancements to IP, Carrier Ethernet, wave and data center interconnect (DCI) services, leveraging Carrier SDN technology built into the Nokia Network Services Platform (NSP). The Nokia NSP is designed to meet evolving enterprise requirements by providing service automation, assurance and optimization across Wide Area Networking (WAN) services. The NSP uses network awareness, real-time flow redirection and adaptive routing to ensure the best use of network resources, with integrated assurance to speed verification. The NSP builds dynamic services that span multiple network layers (IP or optical) as well as physical and virtual infrastructures. The NSP is fully capable of provisioning services over equipment from multiple vendors.

The benefits of Carrier SDN automation and optimization can be realized when combined with an open and flexible network architecture, including service orchestration, service management, IP routing and optical networking infrastructure.

Several CSPs implement fiber to the premises (FTTP) solutions as part of their overall network infrastructure for dynamic enterprise services, and it is crucial for the access infrastructure to be provisioned quickly. For CSPs implementing GPON FTTH, the Nokia ONT Easy-Start FTTH provisioning solution to help reduce truck rolls and provisioning costs.

2. OVUM. “IP VPN services forecast”, May 2015.
**NFV-based branch connectivity services**

The existing managed services deployment model, which uses physical customer premises equipment (CPE) with its associated challenges, is often a showstopper in the overall CSP business case for new or expanded services. These challenges include deployment complexity and higher TCO due to the need for multiple and frequent CPE churn, typically one per value-added service (VAS), plus multiple variants depending on the scale of the service and features being offered. To overcome these challenges the CSP can leverage NFV to move local CPE functions, and offer them centrally within a central office, point-of-presence and data center.

Traffic from a thin CPE (i.e. a layer 2 device) may be tunneled to and terminated on the Nokia VSR/7750 SR, which supports PE-based CPE virtualization. This can be combined with the Nuage Networks data center solution to steer specific traffic to a data center where virtualized network functions (VNFs) are applied to enable value-added services.

**SD-WAN-based services**

SD-WAN makes the WAN service independent of the underlying transport and relies on IP connectivity, which can be delivered over a range of access technologies: copper, fiber or wireless. This provides enterprises with the flexibility to combine a mix of broadband internet and MPLS-based connections across their enterprise WAN.

A key advantage of SD-WAN is the ability to support policy-based automation enabled by a centralized data center SDN controller and distributed CPE (i.e. SD-WAN CPE). For SD-WAN services, IDC predicts CSPs’ revenue will rise from $48.1M USD in 2016 to more than $2.2B USD in 20204. SD-WAN is gaining mindshare due to its ability to support an overlay model.

A Nokia Bell labs TCO study compared the present mode of operation (PMO) model, which uses physical CPE at the customer premises, to SD-WAN using On-net (i.e. IP connectivity within the CSP’s network footprint) and Off-net (i.e. IP connectivity extending beyond the CSP’s network footprint) deployment models.

For the On-Net model, the study revealed that the SD-WAN offers 46 percent TCO savings compared to the PMO model for the CSP. The SD-WAN model offers significant OPEX savings due to its automated provisioning model, which does not need truck rolls for service deployment or maintenance.

In the Off-Net model, the study revealed SD-WAN offers 45 percent TCO savings compared to the PMO model. This model enables the CSP to provide the services globally, vastly extending the service footprint. Key considerations here are access connectivity costs paid to a third-party partner and SLA and service guarantees, such as type of service tier, provisioning, repair times and performance. Many CSPs plan to use this model in combination with the On-Net model and/or for extending an MPLS-based VPN to support off-net locations.

SD-WAN based branch connectivity can be combined with VNFs hosted in an SDN-enabled data center (using Nuage Networks data center products) to enable value-added services.

The Nuage Networks Virtualized Network Services™ (VNS) is an SD-WAN platform that integrates the data center network of private and public clouds with the enterprise WAN to offer seamless networking from the branch to the data center.

**Application-assured services**

For enterprises, maintaining visibility to optimize application performance and detect application issues over the VPN services they purchase is a huge challenge. CSPs can solve these challenges for enterprises by enhancing their network connectivity services with application assured (AA) services. AA services are a network-based approach to provide enterprises with detailed Layer 3 to Layer 7 visibility, analytics, reporting and intelligent control of their applications. AA services may be combined with a VPN or internet access service to create added value and stickiness for existing or new enterprise customers.

In the network-based Nokia AA solution, Application and Detection Control (ADC) functionality may be integrated into the Virtualized Service Router (VSR)
and/or 7750 Service Router (SR). This integrated approach greatly simplifies, automates and reduces the operator’s cost of providing this service compared to alternative approaches, which may require dedicated appliances or probes to be deployed at various points in the enterprise network.

The NSP provides analytics, reporting and enforcement of control functions for AA services. The NSP has full view of application flow throughout the network and is the key to unleashing end-customer value from the network.

**Data center interconnect services**

Cloud DCI services are widely used to link and transport traffic between enterprise data centers. “Enterprise customers are looking for multi-cloud interconnect services to reach the typically ten or more cloud-based data centers enterprises are averaging today” (Michael Howard, Senior Research Director and Advisor, Carrier Networks at IHS).

DCI is the fastest growing application for optical transport. It is projected to grow at twice the rate of the global optical network market (Optical Networks Forecast Report: 2015–20, Ovum TE0006-001182, February 2016).

The rise of cloud-enabled data centers and simplifying interconnect features such as mobility between multiple data centers is driving the need for IP DCI applications. IP DCI extends connectivity between SDN-enabled data centers and end users connected via IP/MPLS-based VPNs (Carrier Ethernet or IP VPN). Michael Howard says he, “estimates that routers for DCI will make up to 9-15 percent of the overall edge router market over the next several years.”


**Cloud services**

The focus of enterprise IT in the cloud era is no longer simply connecting physical locations; it’s about connecting users on any network access technology to applications residing anywhere in a cloud—public, private or both. CSPs can leverage their trusted relationship with enterprises by extending existing network connectivity to offer dynamic cloud services with secure access and improved performance. CSPs may partner with and establish direct connection to public cloud providers or partners to offer on-demand and secure connectivity to public cloud-based applications with service level agreements. CSPs can also implement SDN-enabled data centers to deliver private cloud and/or hybrid services, such as infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS), to enterprises requiring on-demand access to public cloud resources (i.e. hybrid cloud).

According to the TBR Carrier Cloud Market forecast 2014-2019, CSPs may partner with public cloud providers to offer secure, direct cloud connection to their enterprise customers. (The TBR report notes partnering as the focus of public cloud services for CSPs). CSP public cloud services are forecast to reach nearly $6 billion US in 2019. CSP private cloud service (services offered from CSPs private data centers) revenue is forecast to reach more than $4 billion US in 2019.

The Nokia solution includes the [Nuage Networks Virtualized Services Platform™ (VSP)](https://www.nokia.com/solutions/enterprise-clients/data-networking), which supports a data center and private cloud framework called Virtualized Cloud Services (VCS). With VCS, CSPs can implement SDN-enabled data centers to automate the configuration, management and optimization of data center virtual networks, to decrease operational costs. This includes security services that provide tenant isolation and access controls to individual applications and workloads along with comprehensive analytics and visualization that allow enterprises to detect, respond to and prevent security issues. Because cloud computing has become the standard model for enterprises
and CSPs to offer IT services, it is critical to have an effective network virtualization platform to complement solutions such as VMware vSphere® and Open Stack®.

To support CSPs and enterprises building their own private data centers, Nokia offers a complete AirFrame Data Center solution that includes design and build, and ensures transfer capability using our in-house technologies. The AirFrame solution includes all the necessary hardware (servers), software and services required to implement cloud data centers for delivery of dynamic enterprise services.

Managed services
Several CSPs offer managed services to differentiate their enterprise services portfolio. Managed services include managed WAN services (sometimes referred to as managed router services) and managed value added services (VAS). Managed VAS may include security services and managed collaboration services.

Managed WAN services
CSPs currently offer a range of connectivity services to their customers. These include IP VPN, SD-WAN, Internet access, Carrier Ethernet and optical wave services. To avoid commoditization, CSPs offer managed WAN services with enhancements that range from simple monitoring and reporting to complete outsourcing of the corporate network.

Managed value-added services
Managed VAS can include security, firewalls, IP collaboration (voice, video conferencing, unified communications), Network Address Translation (NAT) and WAN optimization services. CSPs can benefit from the significant opportunity by offering managed value-added services, which are quickly provisioned with on-demand and self-serve capabilities.

TBR predicts managed VAS revenue will rise from $80.6 billion USD in 2016 to more than $92.4 billion USD in 2018³. The TBR IT service definition includes hosted applications, cloud computing, security, machine-to-machine, IoT, managed routing, SD-WAN and professional services.

The Nokia solution includes the Rapport Enterprise Communications platform. It simplifies VAS enhancements, making them an easy add-on to network connectivity services. Nokia NetGuard secures enterprise cloud service offerings to add value and build trust, while partners such as Fortinet™ can offer enterprise value-adds such as email anti-spam and antivirus services. The enterprise move to IoT offers additional opportunities for CSPs. Nokia worldwide IoT network grid (WING) enables operators to offer managed connectivity to their enterprise customers worldwide, and Nokia IMPACT enables customers to manage their deployed devices.

Service orchestration and infrastructure control
Service orchestration and infrastructure control is integral to and a key element for enabling dynamic enterprise services. Nokia offers a solution for Service Orchestration, which is focused on software for dynamic enterprise service delivery and operational-related use cases. Nokia also offers a solution for Virtual Networks Orchestration (VNO) that enhances automation for Nuage Networks solutions. It works in combination with Carrier SDN to ensure infrastructure control, and focuses on providing rapid deployment of domain control for dynamic enterprise service connectivity-related use cases.

Service orchestration
Orchestrating a set of commercial services requires coordination of workflows, business processes and network and IT systems—old and new—across many domains and disciplines. CSPs must be able to see and quickly assess faults across complex physical and virtual service infrastructures. As a result, CSPs face service rollouts taking six months to a year, when new cloud service providers are rolling out services in a matter of weeks.

The Nokia Service Orchestration solution for Dynamic Enterprise Services provides end-to-end, top-to-bottom commercial services delivery by combining a wide range of Nokia and third-party components to create a turn-key deployment and service ordering and delivery experience. Time to revenue for new and existing services is reduced, and human resource efficiency and service quality are improved. Moreover, the solution creates a more dynamic environment for service development and innovation for the CSP.

At the heart of the solution is a Smart Aggregation and Integration Layer, which integrates all elements included in delivering key enterprise services, and makes easy work of integrating with existing network elements, and OSS/ BSSs. The Nokia CloudBand portfolio is also integral to the solution, making it simple to reliably host, automate and manage SDN, SD-WAN and VNF-based services.

Operational elements necessary for commercial service delivery are also pre-integrated. Nokia VitalSuite performs data center management for data center inventory as well as process, performance and fault-monitoring functions.

The Nokia Service Orchestration includes a breakthrough Decision Support System user interface for service operations teams that makes the work of monitoring and managing large and complex hybrid networks simple. The 3D user interface provides an easy to understand metaphor of the services infrastructure, including data center network elements and compute resources, organized by location, cloud infrastructure and virtual machines, and deployed VNFs—all in a single view.

The commercial model for the Nokia Service Orchestration solution aligns CSP orderable items with CSP customer orderable items. Solution costs factor in required components and are aligned with service revenue. This approach, coupled with the pre-integrated nature of the solution, can dramatically alter the CSP business case.

For additional information, please refer to the ACG paper “Orchestrating Dynamic Enterprise Services-Oct 2016” and the CloudBand brochure.

Virtual networks orchestration

Nokia and Nuage Networks together enable CSPs to maximize total network return on investment (ROI) and increase the average revenue per branch through virtual networks orchestration and carrier SDN automation across the WAN, SD-WAN and data center.

With broader automation than its individual components, the Nokia VNO solution leverages Nuage Networks VNS-delivered SD-WAN services to dynamically connect existing WAN services and new hybrid services to branches faster. This is especially valuable for expanding to out-of-region markets where infrastructure footprint is limited. For branches connected through off-net clouds or the internet, VNO can automate IPsec VPN creation dynamically.

VNO enhances Nuage Networks VCS to further automate setup for the delivery of value-added cloud services to branches, for example, to extend WAN services through data center service chains with: virtualized firewalls, NAT, anti-distributed denial of service (Anti-DDoS) protection, access control, WAN optimization, load-balancing, mail scanners, other VAS and even virtualized routing with the Nokia VSR applications.

In addition, VNO provides a comprehensive tool set that enables expert quality deployment with best practices at significantly lower time and cost than comparable solutions. It also provides the flexibility and open architecture to leverage third-party northbound operations solutions, ETSI MANO components and VAS software. This enables CSPs to avoid vendor lock-in and expensive ongoing professional services engagements, and allows for the flexibility of choice between Nokia VNO developer services and outsourced or do-it-yourself development models (whichever is deemed best to achieve goals for highest speed or least cost when augmenting or deploying new use cases for service offerings).
Carrier SDN
Carrier SDN enables dynamic network and service provisioning, optimization and assurance through the Nokia NSP in coordination with VNO, which further increases automation for the WAN. NSP provides infrastructure control across multiple network layers, physical/virtual infrastructure and equipment from multiple vendors. Its intelligent service instantiation ensures services are mapped to the best available network assets, while its real-time network path computation and optimization is continually driven by KPIs and metrics so it can adapt quickly to changing network conditions.

Service portals
The end-user experience is enabled through a customer service portal. This allows the enterprise to order and activate services, change service profiles, and monitor service and application performance attributes using a self-serve approach. The CSP can also implement a service provider portal to simplify service-related operational workflows.

Learn more
For more information about Nokia products and solutions, please visit the Dynamic Enterprise Services webpage and:

- IP Routing Portfolio
- Optical Networking Portfolio
- CloudBand Portfolio
- Network Services Platform
- Virtual Networks Orchestration
- Nuage Networks Portfolio
- Rapport Enterprise Communications
- AirFrame servers
- Ultra-Broadband Fixed Access Portfolio
- Cloud-Wise Services