Today, more and more enterprises want connectivity to one or more clouds via their Communication Service Provider (CSP) managed networks. When connecting to SaaS, PaaS and IaaS clouds, many medium to large enterprises intend to utilize CSP managed networks to provide performance guarantees, security postures and application performance assurance. As per Ovum, CSP managed networks are growing by leaps and bounds as the market for MPLS global networks is close to $40 billion and Carrier Ethernet is about to surpass $50 billion.

This new demand by enterprises wanting to connect to clouds via CSP managed networks provides new set of service opportunities, and Tata Communications Transformation Services (TCTS) is better positioned to offer Virtual Cloud Exchange (VCX), which is part of a bigger platform called Overlay Network-as-a-Service.

Let’s look at how practically enterprises are connecting to cloud today using their managed networks. The major cloud providers usually utilize a layer 3 model in which basic connectivity between the enterprise and cloud is provided using a layer 2 Ethernet model. This results in the layer 3 provisioning, administration and management getting pushed to the enterprise directly instead of being managed by the service provider, leading to asymmetrical routing issues with Internet and managed networks.

TCTS’ VCX offering delivers a new approach to this dilemma by utilizing Software Defined Networks (SDN), Network Function Virtualization (NFV) and Lifecycle Service Orchestration (LSO) with global 24/7/365 operational support that includes monitoring, remediation and IPv4/IPv6 address management – all delivered via a fully turnkey white label solution for CSPs worldwide. Utilizing an all virtualized approach, layer 3 and other virtualized services can be offered to a given CSP’s subscriber – all being managed as part of their managed network offering.
A virtual cloud exchange can be implemented in any of the CSP's Point of Presence (PoP) in which a given CSP's subscriber can have their own instance of a layer 3 peering session for any given SaaS, PaaS or IaaS cloud provider. This can all be managed by the CSP directly, thereby extending the managed network services to include cloud connectivity with Network Address Translation (NAT) from private to public address namespaces, including invoking optional various Virtualized Network Functions (VNFs) as a Service Function Chain (SFC).

**TCTS Microsoft overlay network-as-a-service**

Virtual cloud exchange use-case

![Diagram of TCTS Microsoft overlay network-as-a-service](image)

The uniqueness of TCTS' VCX approach is that it utilizes a solution that is all software driven where as a LSO, SDN Controller and an NFV infrastructure (NFVI) can fully deliver a virtual cloud exchange leveraging commodity general purpose commute.

Each CSP subscriber has their own instance of a layer 3 virtualized function that connects to a given cloud provider. VNFs are instantiated by the LSO that allows a given tenant to self-provision via a portal their intentions to connect to a given cloud provider. The LSO instantiates a set of VNFs for the given tenant automatically, on an already established NFV Infrastructure that is shared between all CSP subscribers. The LSO sends the necessary commands to configure a set of BGP routers and NAT VNFs in which a customer facing BGP router faces the given tenant and another BGP VNF router faces the cloud provider. A NAT VNF is placed in between these two routing VNFs to convert private to public addresses from the enterprise to the cloud where needed.

**TCTS Microsoft overlay network-as-a-service**

Virtual cloud exchange logical connectivity model

![Diagram of TCTS Microsoft overlay network-as-a-service](image)
The LSO further provides the ability to specify layer 3 route policies on what IP routes get advertised from the cloud provider into the enterprise. As IP routes are advertised from the cloud provider, the LSO via its IP route policies, orchestrates what IP routes gets redistributed into the enterprise via the enterprise facing BGP VNF router. In the opposite direction, routes from the enterprise are mostly private addresses. Since most cloud providers ignore private IP routes, the NAT cloud facing interface public IP address(es) are instead advertised to the cloud provider.

**TCTS Microsoft overlay network-as-a-service**
Virtual cloud exchange logical layer 3 model

Additionally since the VCX offering utilizes a full virtualized software approach, additional VNFs can be inserted on behalf of the tenants for various functions (e.g., monitoring, security, WAN acceleration, etc). A common issue facing many enterprises, service providers and cloud providers is figuring out the problem during outages or degradation. Since the ecosystem of interconnected automatic networks is complex, automating trouble shooting and providing automated insights to which automatic network might be at fault can have tremendous advantages.

Various monitoring software agents can be distributed and orchestrated to test various segments of the E2E path to automate and pinpoint any faults.

**TCTS Microsoft overlay network-as-a-service**
Virtual cloud exchange monitoring model
An important part of the TCTS solution is that each subscriber has the ability to self-provision themselves via a portal from the LSO system hosted within the service provider’s network. There is no need for any staff from the given service provider to manually insert any workflow processes, but instead the CSP subscriber directly places their intent into the LSO portal, for which the LSO orchestrates and automates the E2E workflow including E2E testing and activation. The subscriber at any given time can access how well their managed network connection to a given cloud is performing and/or the topology and configuration that was automated via the LSO system.

**TCTS Microsoft overlay network-as-a-service**

Virtual cloud exchange portal tenant experience

The TCTS VCX solution is based on an all software instantiation of commonly utilized general purpose compute and white box switches. In order for this to occur, scale and multi-tenancy have to be provided by a common virtualized infrastructure. Utilizing industry SDN and NFV standards, TCTS VCX solution provides connectivity into existing MPLS, CE or WAN technologies for a given subscriber. With SDN and NFV approach, CSPs can deploy an NFV Infrastructure (NFVI) and Virtual Infrastructure Manager (VIM). A shared SDN infrastructure switch is put to use at the customer and cloud facing direction. This SDN switch implements a virtualized layer 2 over a layer 3 tunneling technology like VXLAN or NVGRE. The SDN switch is a shared switch that belongs to the shared PoP NFV fabric and only needs to press into service a single port in each direction for the tenant and cloud provider.

**TCTS Microsoft overlay network-as-a-service**

NFV model
Finally, to deliver on massive hyperscale capability, an underlay fabric needs to be accommodated, shared by all subscribers for a given PoP. Again the TCTS VCX solution coordinates this underlay leaf/spine fabric for correct performance and connectivity for understanding how a given tenant connects through the leaf/spine fabric including all the VNF that are positioned in a Service Function Chain (SFC).

In conclusion TCTS’s VCX solution is an advanced software solution that is part of a broader Overlay Network-as-a-Service solution from TCTS for CSPs worldwide. It runs on SDN, NFV and LSO platform to deliver cloud connectivity at the layer 3 level as well as other service virtualised functions. The TCTS VCX solution is a fully white label solution with optional 24/7/365 operational support.

About Tata Communications Transformation Services (TCTS)
Tata Communications Transformation Services (TCTS), a 100% subsidiary of Tata Communications Ltd, provides leading business transformation, managed network operations, network outsourcing and consultancy services to telecommunication companies around the world. TCTS delivers operational efficiency, cost transformation and revenue acceleration solutions for all the stages of the carrier process lifecycle including but not limited to network engineering and design, implementation and operations functions.

TCTS is a part of the USD $100+ billion Tata group. Tata group comprises of over 100 operating companies in seven business sectors. TCTS leverages the market expertise of Tata group’s global telecom operation capabilities and globally established IT, process and consulting skills. It carries the rich traditions and business ethics of the Tata companies. TCTS is head quartered in Mumbai, India with global offices in Europe, North America and Middle East.

TCTS has two world class India delivery centers in Pune and Chennai. These facilities operate completely independent from its parent affiliate, preserving full confidentiality in managing all customers’ business processes.