Integrating 5G networks with Microsoft ExpressRoute Circuits for High Quality WaaS

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Executive Summary

StratusWorX is working with Telecommunications Service Providers (TSPs) to take advantage of the Azure ExpressRoute technology to create dedicated end-to-end highspeed encrypted channels between customer offices and virtual desktops in the cloud. This effort works toward the goal of making the physical distance between the user and the desktop imperceptible. Working with 5G equipment manufacturers, such as Ericsson, TSPs unlock a new way for StratusWorX to reach customers at large scale and overcome local network bottlenecks.
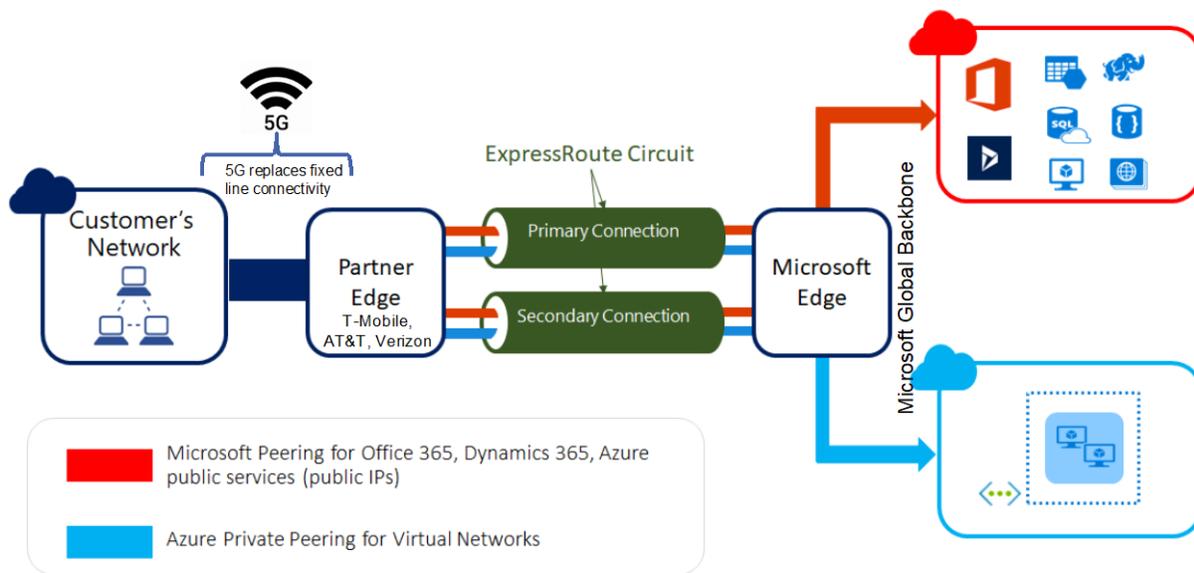

Figure 1: End-to-End QoS path from Customer Premises to Azure Data Centers, over Microsoft Global Backbone (ExpressRoute), transiting over 5G and fiber backhaul to Peering Point where Provider Edge and Microsoft Edge interconnect

Key Benefits

- Reserving a low latency network channel with consistent bandwidth availability all the way between the user and the remote desktop in the cloud will ensure a consistently positive user experience.
- Azure ExpressRoute, as well as special traffic handling in 5G equipment, allow for an extra layer of security for traffic destined to the remote desktop. StratusWorX can advertise this as a security benefit to customers.
- By controlling the end-to-end path between the user and the virtual desktop, StratusWorX can ensure good performance at all times. Local network issues such as congested WiFi will not be allowed to hurt the user's perception of the virtual desktop.

A consistent end-to-end performance is critical for many industry verticals. For example, in the film and media world where trained artists use compute services to edit, modify, and update media content, such customers use cloud services because of its ability to provide on-demand computing for design and rendering – rendering being extremely compute intensive – but both tasks being relatively tolerant of fluctuations in network quality. However, when an artist wants to review his or her work in this domain, through playback and fast scrolling, the equation reverses itself and network performance becomes critical while compute requirements take a backseat. Unlike traditional video services, such as YouTube and Netflix, which use buffering to compensate for variable network performance, this approach cannot be used in the film and media domain which prizes interactivity (real-time response to every mouse click) and buffering is the exact anti-thesis of interactivity. By guaranteeing end-to-end network quality over engineered 5G last-mile circuit peered with the Microsoft Global backbone, StratusWorX can deliver high compute with real-time playback to flawlessly meet the demanding requirements of this highly challenging domain.

Explaining the Technology Components

Azure ExpressRoute

ExpressRoute creates a dedicated network circuit between an Azure datacenter and a target location which could be at a network exchange or even on the customer premises. ExpressRoute offers speeds up to 100 Gbps with reserved capacity to ensure connections into the Azure datacenter are always available with consistent performance for critical business needs. Additionally, ExpressRoute adds another layer of security for the network traffic by enabling encryption between ExpressRoute endpoints through either MACsec or IPsec. Azure works with top-tier ISPs to make sure ExpressRoute circuits use optimized network paths that keep latency at a minimum. Both low latency and consistently high bandwidth availability are key requirements for a good remote desktop experience.

5G Networks

Adding 5G networks to the mix, StratusWorX can extend the ExpressRoute capability to the customer office or campus without requiring pricy network gear on the customer premises as well as eliminating multi-week delays associated with activating and provisioning a fixed line connection from the customer premises to a peering point where the Provider Edge and the Microsoft Edge interconnect. 5G delivery further means that high speed connectivity into a peering point can be made available throughout the customer campus without additional wiring. Furthermore, there is a tendency for users to blame poor performance due to local network conditions on the cloud application they are using because it is the visible effect of the problem. In some cases, congested WiFi or other network conditions may cause users to perceive StratusWorX as slow or unreliable. By controlling the end-to-end path and delivery over 5G, StratusWorX can overcome the limitations of the local network and ensure reliable performance for all users.

Stitching 5G paths to Microsoft ExpressRoute and to putting it together

To stitch together a dedicated end-to-end path with bandwidth and performance guarantees, as shown in Figure 1, StratusWorX uses available APIs from the different components. From 5G networks, it will use the network slicing capabilities that extract specific performance guarantees on delay, jitter, and throughput into the access and edge ISP network. From there, it is possible

to leverage Microsoft Azure's ExpressRoute mechanisms that provides a dedicated pathway all the way into the Azure datacenters, thereby creating seamless integration.

Consider a CPE hosted in the customer network that is placed for the 5G access and advertises a WiFi service to allow devices to access Internet services through it. The end-to-end architecture will involve this CPE, working in tandem with functionality located in the Provider Edge of the cellular provider's network where connectivity is established directly to Microsoft Azure datacenters, via ExpressRoute, and with services that are running in the Azure datacenters, including Azure Resource Manager, StratusWorX cloud controllers and application servers.

The QoS requirements for the end-to-end path will be established by the CPE working in tandem with StratusWorX cloud-hosted controllers. In particular, the system identifies specific flows that map to different StratusWorX cloud-hosted virtual desktop instances. Depending on the range of actual applications being used by a user or a group of users, appropriate QoS parameters can be established.

At the edge peering site, a valid ExpressRoute circuit needs to be set up between the 5G network operator and the Azure data centers, essentially 5G network operator needs to interconnect its Provider Edge with the Microsoft Edge at the peering site, with Microsoft Edge providing direct connectivity to the Microsoft global backbone and eventually to the Azure datacenters. Then, using tools available through the Azure portal, the QoS requirements will be mapped to parameters for setting up an ExpressRoute pathway. Important parameters include the peering location, the VLAN IDs, the /30 subnets on which the primary and secondary connections will be established, and the AS numbers for peering. If the 5G operator provides managed Layer 3 services, some of these configurations can be further simplified through pre-configured services.

Thus, ExpressRoute provides a private path for necessary performance isolation to traffic from any network. Similarly, 5G networks have mechanisms that allow for similar isolated performance to various flows. In particular, the CPE, working in tandem with StratusWorX cloud-hosted controllers, will identify desired QoS properties for the 5G network. Then, the 5G CPE can map these QoS requests to specific PDU sessions as deemed necessary. The scheduling functions in the 5G infrastructure will manage these resource requests from various workspaces to meet individual needs. The 5G base station supporting the customer CPE will need to map its QoS parameters to fiber transport connecting the 5G base station to the edge peering point, for example to VLANs or MPLS headers in the case of Layer 2 or DSCP in the case Layer 3 fiber transport. The Provider Edge can then communicate these QoS requests to the Microsoft Edge.

Overall, the entire end-to-end path bypasses the use of the public Internet, and establishes a dedicated channel connecting enterprise users to cloud-hosted virtual desktops providing a unique value-added service not possible in other alternatives.