Lumen® Cloud Connect: MPLS / IP VPN to Microsoft Azure

Direct, secure, private connection to Microsoft Azure using Azure portal and Azure Resource Manager (ARM)

LUMEN®

Purpose

- The purpose of this document is to provide an end-to-end walkthrough to set up ExpressRoute for the first time using Lumen Cloud Connect.
- Information contained is provided to serve as a supplement to Microsoft documentation linked throughout this document. Be sure to check the provided links to obtain the most up-to-date information and for more details pertaining to Microsoft processes.

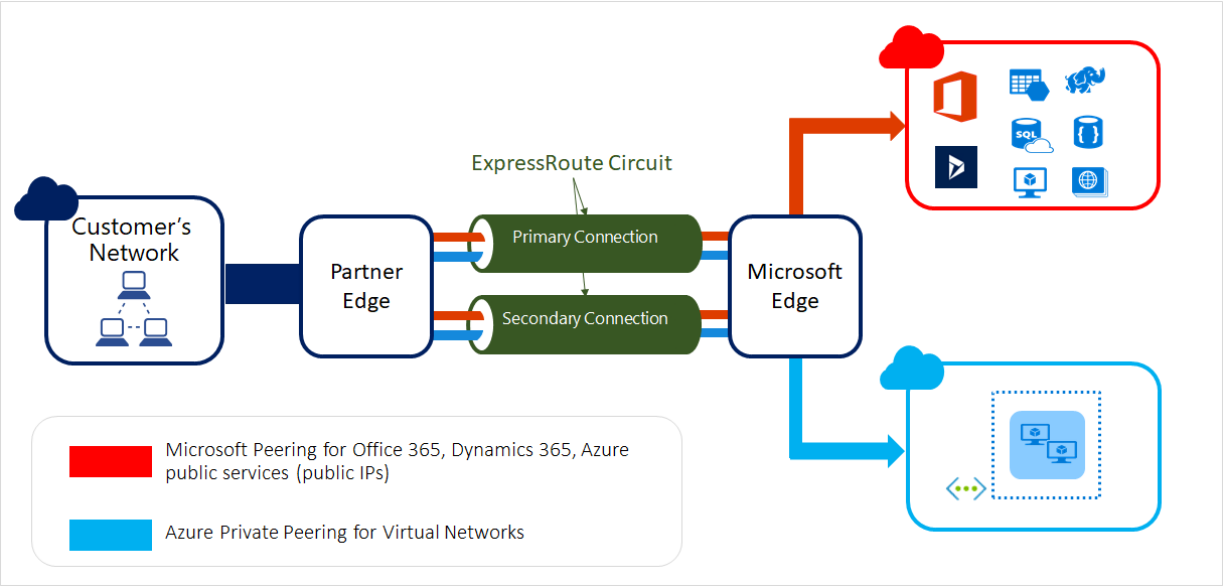
Disclaimer: The material in this guide is for informational purposes only and is taken from Microsoft Azure's website material. All Microsoft related configuration information is based off of the Azure Resource Manager (ARM) portal environment

Roles and responsibilities

Steps required to set up Azure ExpressRoute connectivity	End customer	Lumen	Microsoft Azure (automated using portal)
Set up physical connectivity to Azure ExpressRoute location			
Decide on the type of BGP peering required (Azure private peering-IaaS or Microsoft peering-PaaS/SaaS)	X		
Order Layer 3 (MPLS) Cloud Connect service to Azure ExpressRoute location from Lumen representative	X		
Order Microsoft Azure ExpressRoute connection using Microsoft Azure portal, using **"Level 3 Communications – IPVPN**" as the service provider name, with the appropriate bandwidth and location. *see your Cloud Connect Solutions Architect for more details or direction.	X		
Provision layer-3 (MPLS) service device with BGP, connecting to Microsoft Azure ExpressRoute		X	
Provision ExpressRoute circuit and provide the ExpressRoute service key to Lumen			X
Set up BGP peering between Lumen provided customer edge and Azure edge device			
Configure BGP peering on Lumen PE routers		X	
Configure BGP peering on Azure side		X	
*** Configure BGP route filtering (required for Microsoft peering PaaS/SaaS)	X		
Link services on Azure to the dedicated circuit			
Link virtual network(s) to the dedicated circuit*	X		
*Connectivity to services hosted on public IPs is enabled as soon as the dedicated circuit has been enabled			

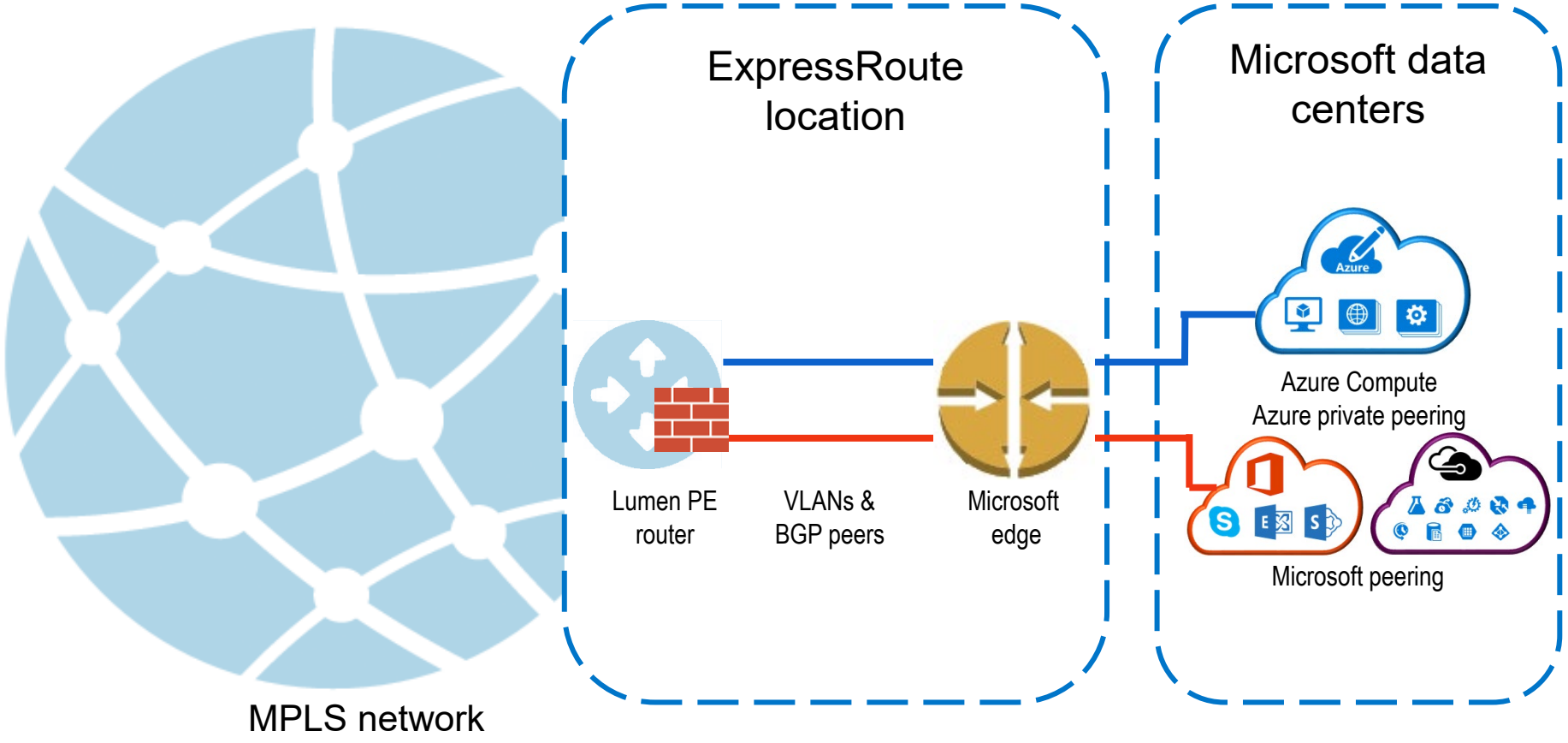
Background information

- Microsoft Azure ExpressRoute lets you create private connections between Microsoft data centers and the infrastructure that's in a co-location environment. ExpressRoute connections offer higher security, more reliability, faster speeds and predictable latencies than typical connections over the Internet. In some cases, using ExpressRoute connections to transfer data between your on-premises network and Azure can also yield significant cost benefits.
- Azure offers circuit bandwidths from 50 Mbps to 10 Gbps (50Mbps, 100Mbps, 200Mbps, 500Mbps, 1Gbps, 2Gbps, 5Gbps, and 10Gbps).
- Azure compute services, namely virtual machines (IaaS) and virtual networks (VNETs) deployed within a virtual network can be connected through the Azure private peering domain.
- PaaS services such as Azure Storage, SQL databases and Web Apps are offered on public IP addresses. You can privately connect to services hosted on public IP addresses, including VIPs of your cloud services, through the Microsoft Peering routing domain. You can connect the Microsoft Peering domain to your extranet and connect to all Azure services on their public IP addresses from your WAN without having to connect through the Internet
- Learn more about Microsoft ExpressRoute



	Private Peering	Microsoft Peering
Max. # prefixes supported per peering	4000 by default, 10,000 with ExpressRoute Premium	200
IP address ranges supported	Any valid IP address within your WAN.	Public IP addresses owned by you or your connectivity provider.
AS Number requirements	Private and public AS numbers. You must own the public AS number if you choose to use one.	Private and public AS numbers. However, you must prove ownership of public IP addresses.
IP protocols supported	IPv4 and IPv6	IPv4 and IPv6
Routing Interface IP addresses	RFC1918 and public IP addresses	Public IP addresses registered to you in routing registries.
MD5 Hash support	Yes	Yes

Topology: Cloud Connect for Microsoft ExpressRoute



Private Peering
Microsoft Peering

- You are responsible for ExpressRoute costs and configuration
- Lumen will provide firewall / NAT services when accessing Microsoft peering for PaaS/SaaS services

High-level step review

- Sign in to Azure portal
- Create a new ExpressRoute circuit
- View the circuits and properties
- Request Lumen Cloud Connect service
- Send the service key to your Lumen technical design engineer for Cloud Connect provisioning
- Lumen provisions Cloud Connect to Microsoft ExpressRoute
- Complete Azure configuration, attaching any VNETs and/or accessing any Public/Office365 resources

Source: https://azure.microsoft.com/en-us/documentation/articles/expressroute-howto-circuit-portal-resource-manager/

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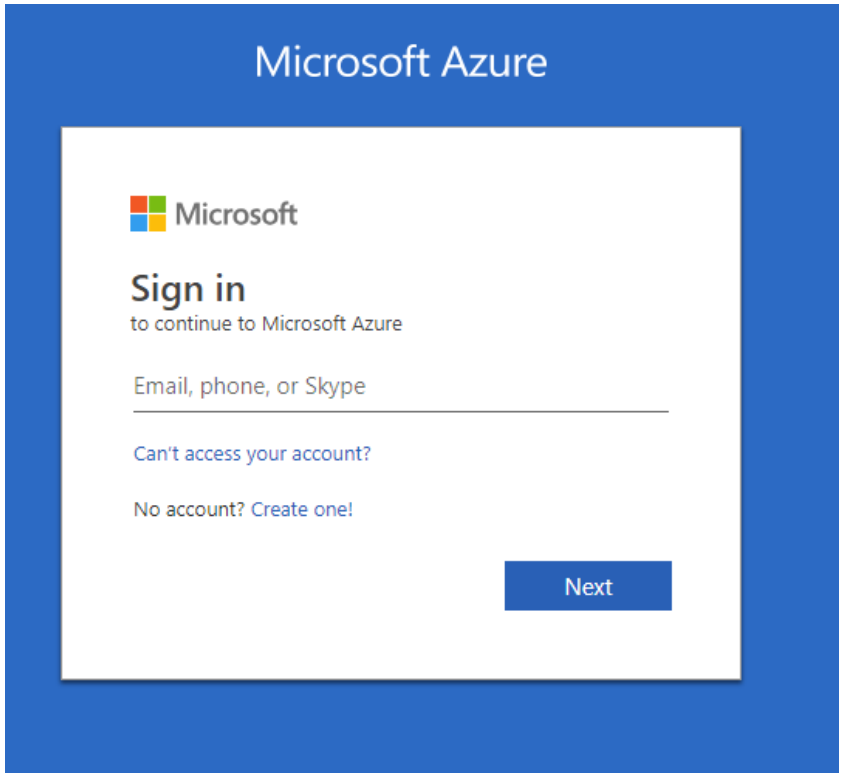
Sign in to Azure portal

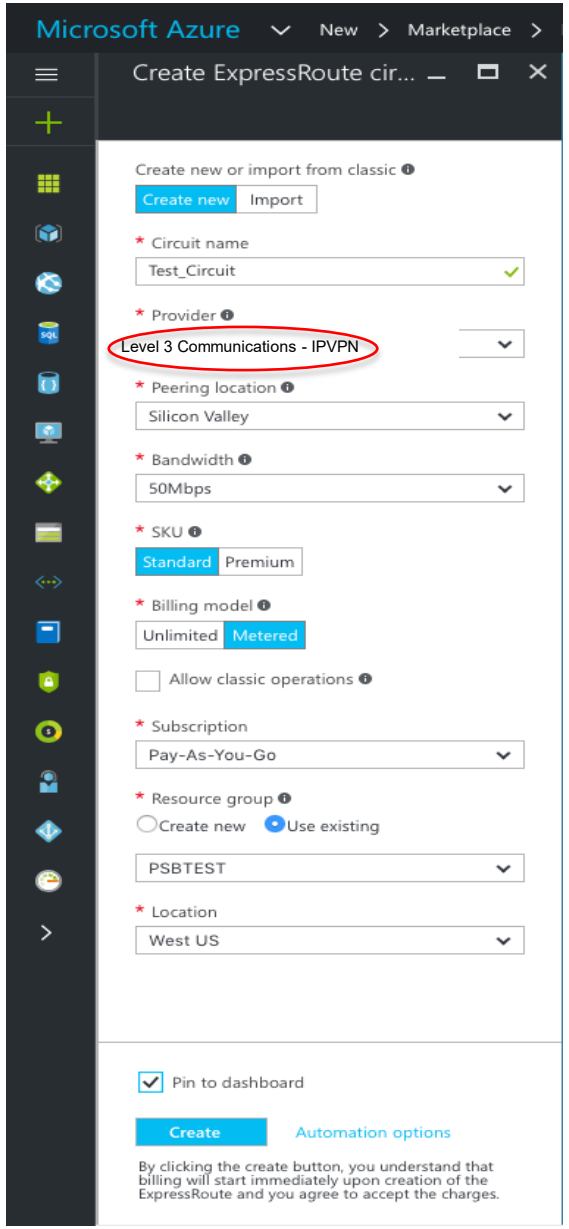
- http://portal.azure.com/



Create a new ExpressRoute circuit

After clicking ExpressRoute, portal shows ‘Create ExpressRoute circuit’ blade. When filling in the values on this blade, here are some helpful tips:

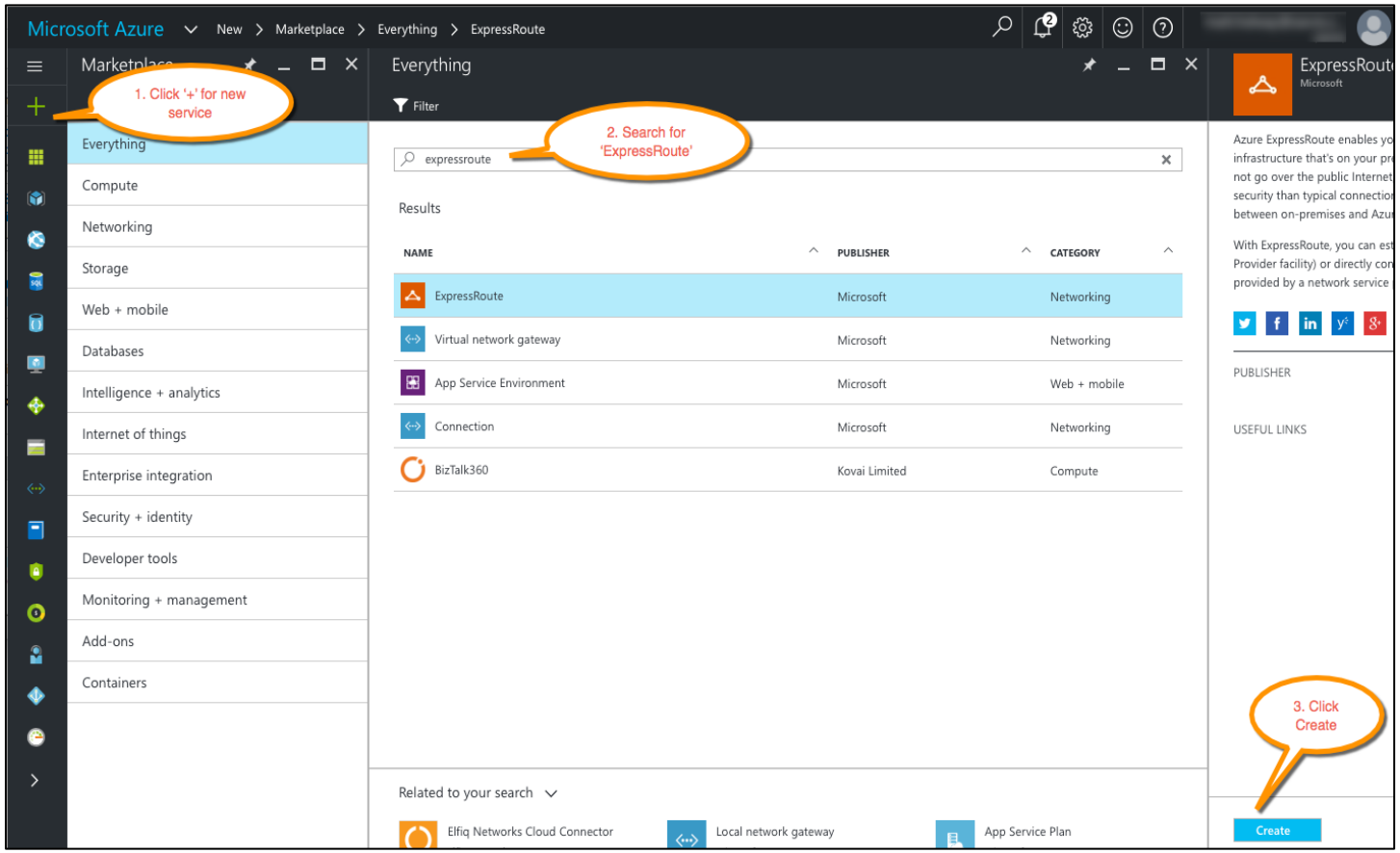
- Select the Provider as Level 3 Communications – IPVPN
- Select the appropriate ExpressRoute location. (Note: Silicon Valley = San Jose; Washington DC = Ashburn.)
- Specify the correct SKU for Tier and Data Metering:
  - SKU / Tier determines whether an ExpressRoute standard or an ExpressRoute premium add-on is enabled.
  - Billing model / data metering determines the billing type that Microsoft will use to bill you directly for ExpressRoute.
  - Note that the billing type can be changed from Metered to Unlimited, but may not be changed from Unlimited to Metered
- Select the appropriate subscription and resource group
  - You must have a subscription type set, such as Pay-As-You-Go
  - A resource group is a collection of resources that share the same lifecycle, permissions, and policies. (Learn more about resource groups)



Important: The ‘**Peering Location**’ indicates the physical location where you are peering with Microsoft. This is not linked to "**Location**" property, which refers to the geography where the Azure network resource provider is located.

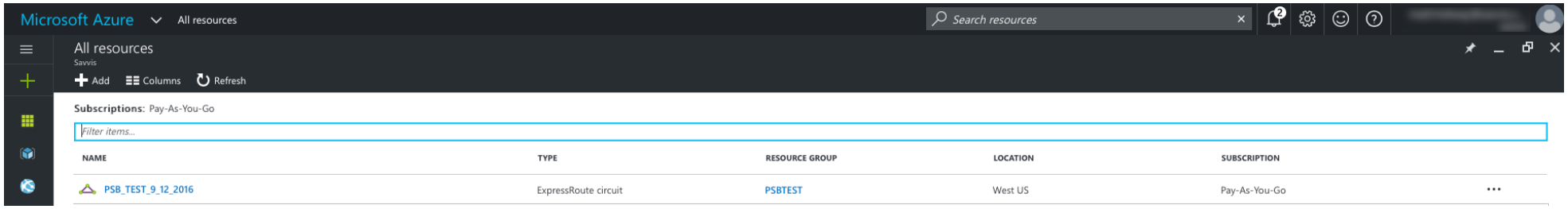
Create a new ExpressRoute circuit, cont.

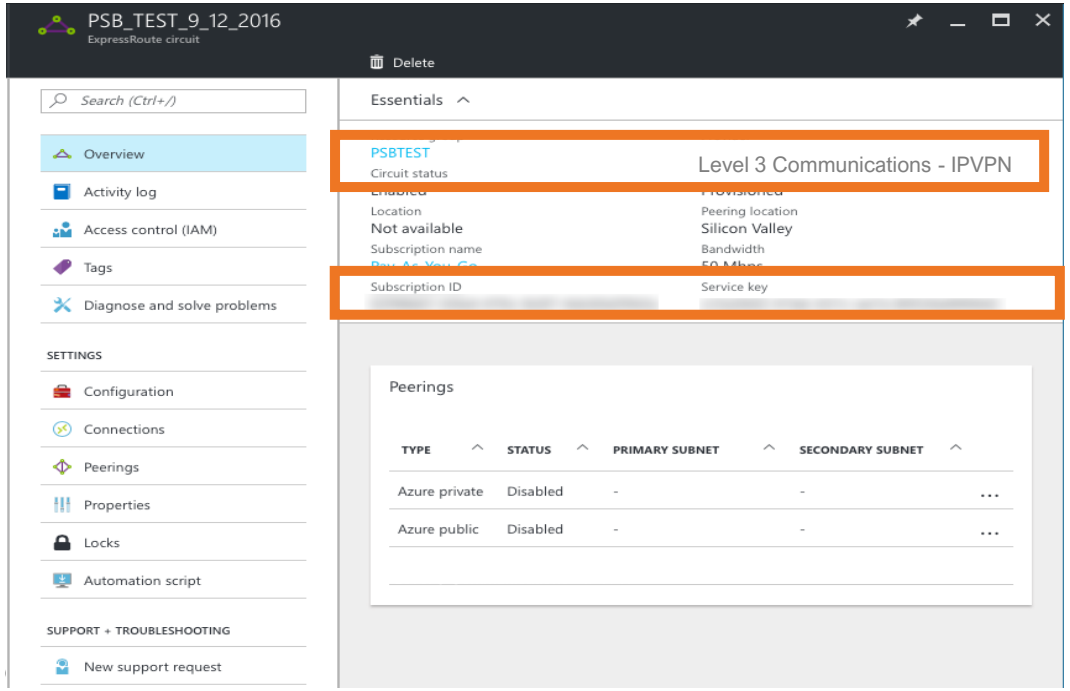
- Create an ExpressRoute circuit by selecting the option to create a new resource.



Views the circuits and properties

- View all created ExpressRoute circuits by selecting All resources on the left-side menu.



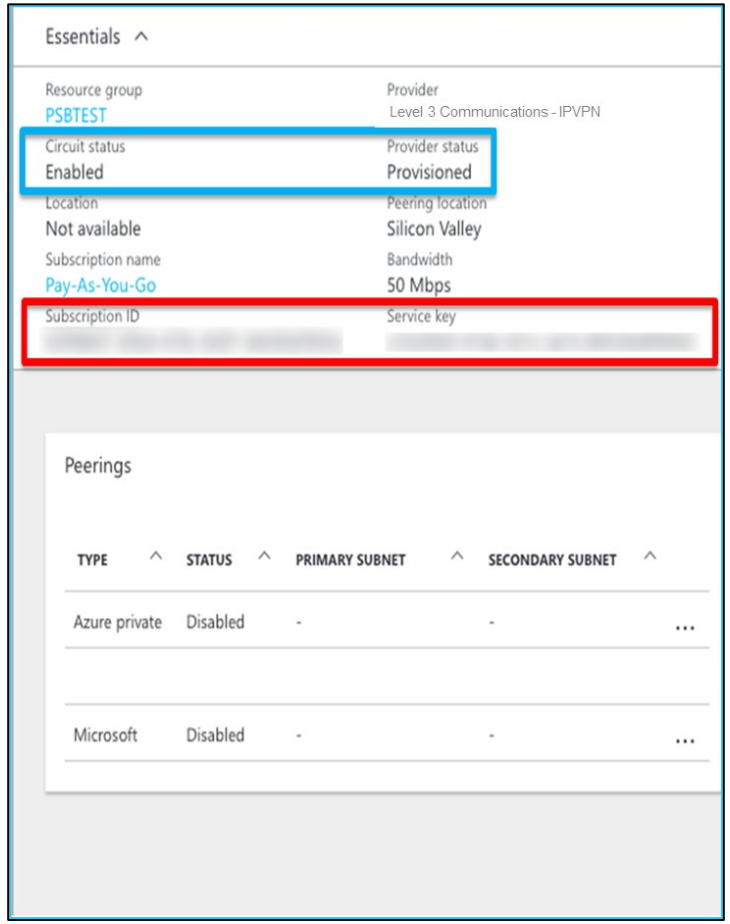


Request Lumen Cloud Connect service

- To order a Lumen Cloud Connect, contact your Lumen representative. Information needed by Lumen to complete connection:
  - Microsoft Azure ExpressRoute service key completed during Lumen provisioning steps
  - Customer requests Cloud Connect to the appropriate Azure ExpressRoute Location
  - Bandwidth of MPLS Connection requested (typically matches ExpressRoute speed)
  - What Azure service(s) are you connecting to:
    - Azure private peering (Compute/IaaS)
    - Microsoft peering (Azure PaaS, Office 365, Dynamics 365, etc.)
  - Cloud Connect contractual term length: 1 year, 3 years, etc.

Sends the service key to Lumen for Cloud Connect provisioning

- The Lumen technical design engineer will request the ExpressRoute service key from you before provisioning but after order entry.
- On this blade, Provider status provides information on the current state of provisioning on the service-provider (Lumen) side. Circuit status provides the state on the Microsoft side.
- When creating a new ExpressRoute circuit, the circuit will be in the following state:
  - Provider status: Not provisioned
  - Circuit status: Enabled
- The circuit will change to the following state when the connectivity provider (Lumen) is in the process of enabling it:
  - Provider status: Provisioning
  - Circuit status: Enabled
- To be able to use an ExpressRoute circuit, the circuit must be in the following state:
  - Provider status: Provisioned
  - Circuit status: Enabled



Lumen provisions Cloud Connect to MS ExpressRoute

Upon network order submission, Lumen provisions a layer-3 IP VPN/MPLS connection to the requested ExpressRoute location

- Turn up of Layer 3 IPVPN/MPLS service to local ExpressRoute interconnect point
  - Layer 3/BGP will be configured on Lumen side and on Azure side
  - Layer 2 VLAN(s) between Lumen and Microsoft will be configured by Lumen.

Lumen completes configuration, and provides you with necessary information that was configured on Azure side per environment, for your records.

- primary and secondary IP subnets
- autonomous system number (ASN) Info
- VLAN ID

Microsoft Peering now supports Azure Public (PaaS) services

- Microsoft has announced they are combining both their PaaS/SaaS services over a single pair of BGP peers: Microsoft peering
- Before April 1, 2018, ExpressRoute had three peering connections:
  - **Azure Private** (IaaS) peering for connecting to Azure VNETs
  - **Azure Public** (PaaS) peering to reach Azure PaaS services
  - **Microsoft Peering** (SaaS) for Office 365 and Dynamics 365
- To simplify ExpressRoute management and configuration Microsoft has merged Azure Public routes into the Microsoft Peering connection. You can now access Azure PaaS and Microsoft SaaS services via the Microsoft peering connection
  - You now have two peering types available: Private and Microsoft peering
  - Learn more about moving from Public to Microsoft peering
- **Note:** While you can receive all PaaS/SaaS services over Microsoft peering, the Office365 service still requires you to apply for approval directly with Microsoft to enable the Office365 service via ExpressRoute. All other services can be accessed via the Microsoft peering VLAN without a prior approval.
- Learn more about **Azure ExpressRoute for Office 365** and **Network connectivity to Office 365**

Workflow for Microsoft peering

To be able to successfully connect to services through Microsoft peering, you must complete the following configuration steps:

- You must have an active ExpressRoute circuit that has Microsoft peering provisioned You can use the following instructions to accomplish these tasks:
  - Create an ExpressRoute circuit and have the circuit enabled by your connectivity provider before you proceed. The ExpressRoute circuit must be in a provisioned and enabled state.
  - Have your connectivity provider provision Microsoft peering for your circuit.
- You must create and configure a route filter
  - Identify the services you want to consume through Microsoft peering
  - Identify the list of BGP community values associated with the services
  - Create a rule to allow the prefix list matching the BGP community values
- You must attach the route filter to the ExpressRoute circuit

Source: https://azure.microsoft.com/en-us/documentation/articles/expressroute-howto-circuit-portal-resource-manager/

Microsoft ExpressRoute resources

Introduction	https://azure.microsoft.com/en-us/documentation/articles/expressroute-introduction/
FAQ	https://azure.microsoft.com/en-us/documentation/articles/expressroute-faqs/
Pricing	http://azure.microsoft.com/pricing/details/expressroute/ • Use Exchange Provider Pricing • There is a Premium if you need >4k routes or ability to reach other global regions
Prerequisites	https://azure.microsoft.com/en-us/documentation/articles/expressroute-prerequisites/
Circuits and routing domains	https://azure.microsoft.com/en-us/documentation/articles/expressroute-circuit-peerings/
Partners and peering locations	https://azure.microsoft.com/en-us/documentation/articles/expressroute-locations/
Azure regions	http://azure.microsoft.com/en-us/regions/
Designing materials	• https://azure.microsoft.com/en-us/documentation/articles/expressroute-routing/ • https://azure.microsoft.com/en-us/documentation/articles/expressroute-nat/
Configuration materials	• https://azure.microsoft.com/en-us/documentation/articles/expressroute-howto-circuit-arm/ • https://azure.microsoft.com/en-us/documentation/articles/expressroute-howto-routing-arm/ • https://azure.microsoft.com/en-us/documentation/articles/expressroute-howto-linkvnet-arm/ • https://azure.microsoft.com/en-us/documentation/articles/expressroute-howto-vnet-portal-arm/
Diversity	• Single port includes diversity from IQ+ edge to Microsoft • PE/Path diversity available by ordering 2 IQ ports which would require only a single Express Route Subscription • Full diversity achieved by ordering at 2 separate locations which would require multiple Express Route Subscriptions
Notes	• Azure Datacenter Public IP Blocks: http://www.microsoft.com/en-us/download/details.aspx?id=41653 • Dynamic routing via BGP • Azure Compute supports bring your own private IP

Microsoft Office365 resources

Microsoft Office365 via ExpressRoute approval form	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbRyOZxByRF1dLgv7k6ye5z8pUQkdLRTQ5QkcyOTU3VkNEOFdOWk9IRDZTUy4u
Overview	https://support.office.com/en-us/article/Azure-ExpressRoute-for-Office-365-6d2534a2-c19c-4a99-be5e-33a0cee5d3bd?ui=en-US&rs=en-US&ad=US
O365 traffic management	https://support.office.com/en-us/article/Office-365-network-traffic-management-e1da26c6-2d39-4379-af6f-4da213218408?ui=en-US&rs=en-US&ad=US
Client connectivity	https://support.office.com/en-us/article/Client-connectivity-4232abcf-4ae5-43aa-bfa1-9a078a99c78b
QoS	https://azure.microsoft.com/en-us/documentation/articles/expressroute-qos/
Office 365 locations	https://www.microsoft.com/online/legal/v2/?docid=25 • O365 has a primary & DR site for each tenant. • Internet access will be proxied through the closest O365 location and backhauled on MS backbone
Address blocks	https://support.office.com/en-us/article/Office-365-URLs-and-IP-address-ranges-8548a211-3fe7-47cb-abb1-355ea5aa88a2
CDN usage	https://support.office.com/en-us/article/Content-delivery-networks-0140f704-6614-49bb-aa6c-89b75dcd7f1f
Network planning	https://support.office.com/en-us/article/Network-planning-and-performance-tuning-for-Office-365-e5f1228c-da3c-4654-bf16-d163daee8848
Implementing ExpressRoute for Office 365	https://support.office.com/en-us/article/Implementing-ExpressRoute-for-Office-365-77735c9d-8b80-4d2f-890e-a8598547dea6
O365 step-by-step installation	https://support.office.com/en-us/article/Download-and-install-or-reinstall-Office-365-Office-2016-or-Office-2013-on-your-PC-or-Mac-4414eaaf-0478-48be-9c42-23adc4716658?ui=en-US&rs=en-US&ad=US
Route filters	https://docs.microsoft.com/en-us/azure/expressroute/how-to-routefilter-portal