

CenturyLink® Cloud Connect: eLink to Microsoft Azure via Azure Portal Azure Resource Manager (ARM)

Direct, Secure, Private Connection to Microsoft Azure

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January 28th, 2020



Purpose

The purpose of this document is to provide an end-to-end walk through for a customer setting up ExpressRoute for the first time via CenturyLink's Cloud Connect.

Information contained is provided to serve as a supplement to Microsoft documentation linked throughout this document. Users should check the provided links to obtain the most up-to-date information and for more details pertaining to Microsoft processes.

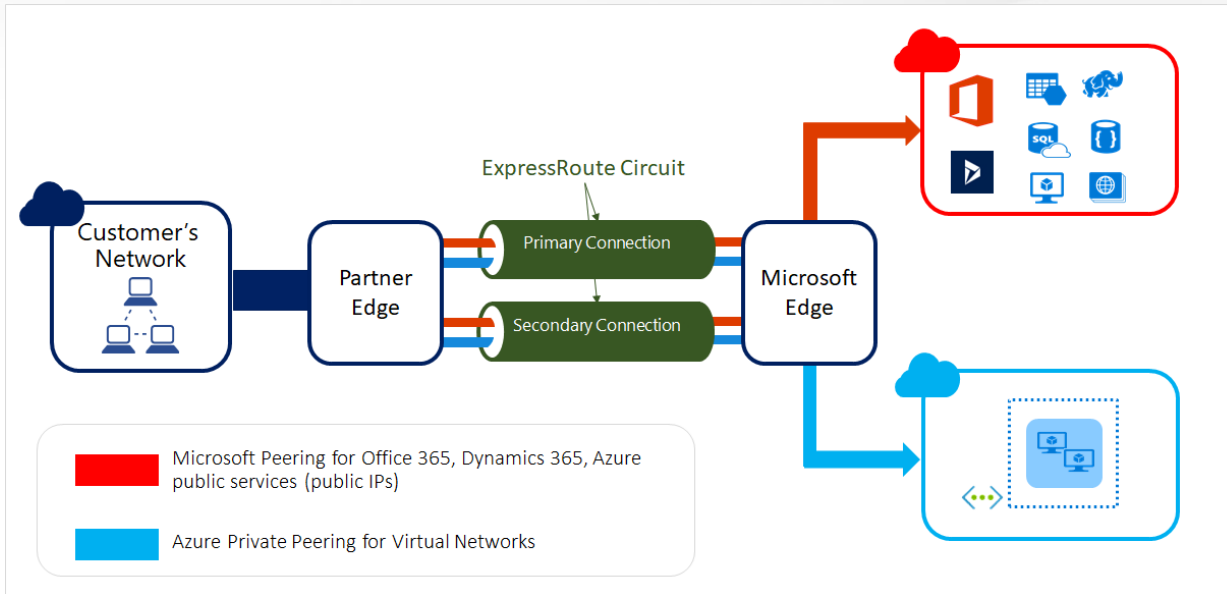
Disclaimer: The material in this guide is for informational purposes only and is taken from Microsoft Azure's website material. All Microsoft related configuration information is based off of the Azure Resource Manager (ARM) portal environment.

Roles and Responsibilities

Roles and Responsibilities			
STEPS REQUIRED TO SET UP AZURE EXPRESSROUTE CONNECTIVITY	End Customer	CenturyLink	Microsoft Azure (Automated via 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 2 eLynk Cloud Connect service to Azure ExpressRoute location from CenturyLink Account Team	X		
Order MSFT Azure ExpressRoute connection via MSFT Azure Portal, using “ CenturyLink Cloud Connect ” 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 2 eLynk Service device with VLAN Tag, connecting to MSFT Azure ExpressRoute		X	
Provision ExpressRoute circuit and provide the ExpressRoute Service Key to CenturyLink	X		X
SET UP BGP PEERING BETWEEN CUSTOMER EDGE ROUTER AND AZURE EDGE DEVICE			
Configure BGP Peering on Customer 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

What is Microsoft ExpressRoute (<https://azure.microsoft.com/en-us/documentation/articles/expressroute-introduction/>)



	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.
MDS Hash support	Yes	Yes

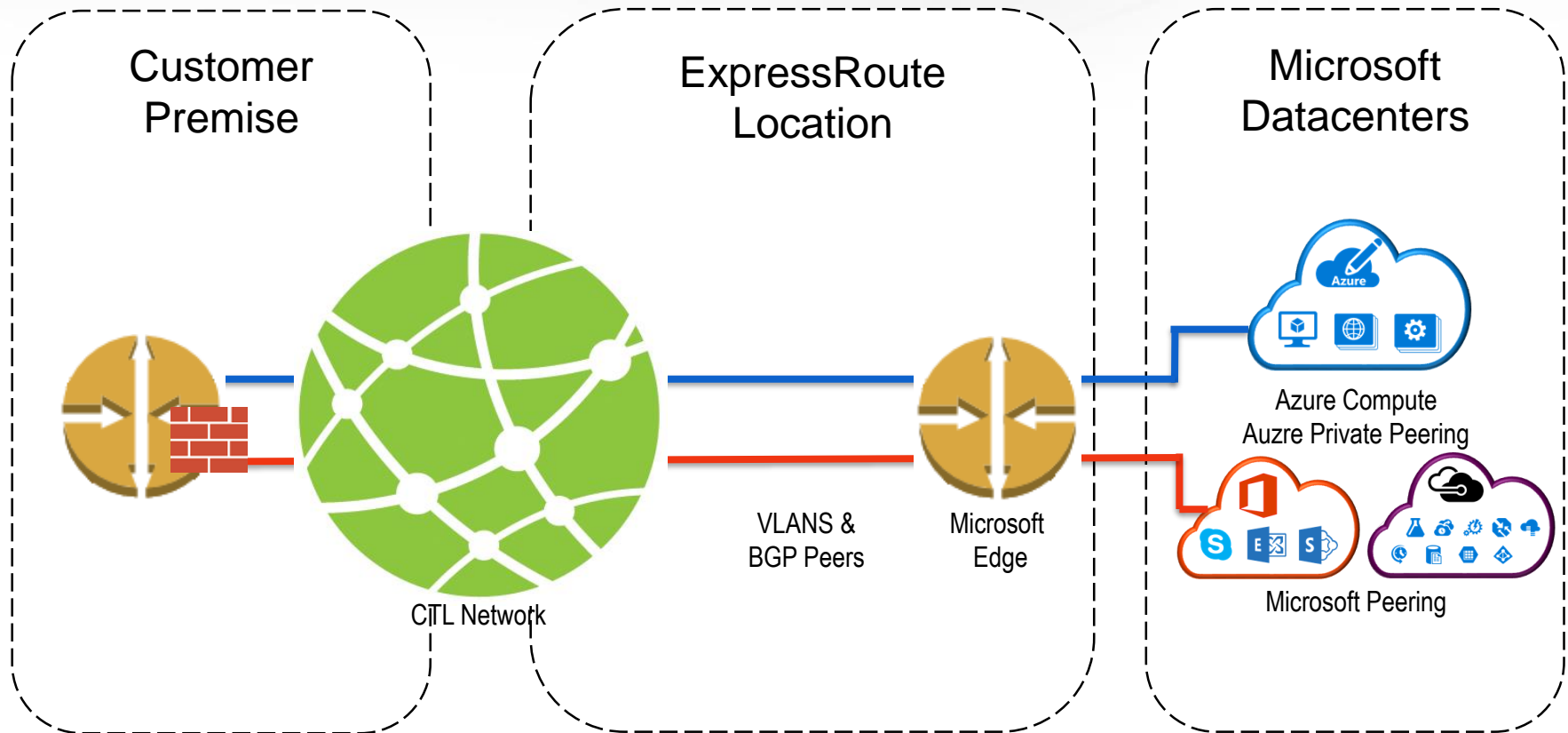
Microsoft Azure ExpressRoute lets you create private connections between Microsoft datacenters and the infrastructure that's in a co-location environment or at a customer premise. ExpressRoute connections offer higher security, more reliability, faster speeds and predictable latencies than typical connections 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, 200 Mbps, 500 Mbps, 1 Gbps, 2 Gbps, 5Gbps, and 10 Gbps).

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 location without having to connect through the Internet

Cloud Connect for Microsoft ExpressRoute



- For connections to Microsoft Azure, your equipment must support Q-in-Q (see page 14).
- Customer is responsible for express route costs and configuration
- Firewall / NAT services must be provided by Customer when accessing Microsoft Peering for PaaS/SaaS Services

Private Peering 
Microsoft Peering 

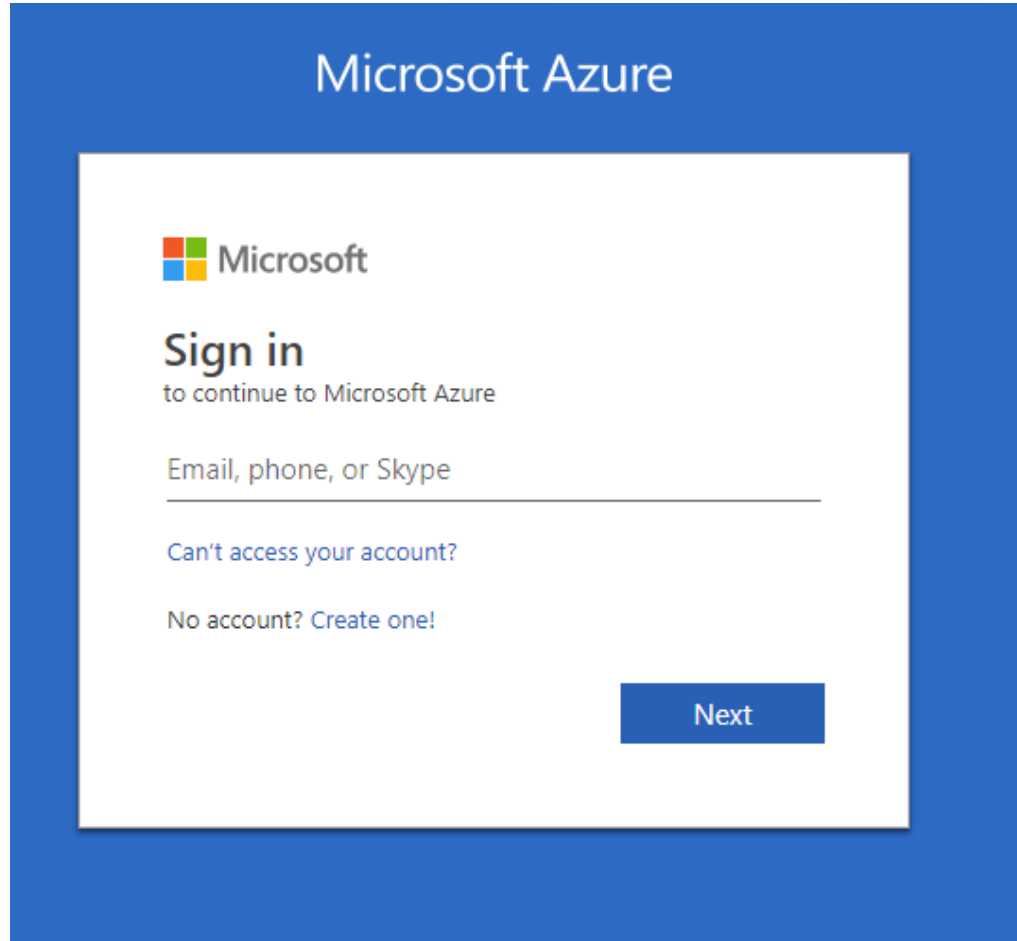
High Level Step Review

1. Customer signs into Azure portal
2. Customer creates a new ExpressRoute circuit
3. Customer views the circuits and properties
4. Customer requests CenturyLink Cloud Connect service
5. Upon request, customer sends the service key to CenturyLink Technical Design Engineer for Cloud Connect provisioning.
6. CenturyLink provisions Layer 2 from Customer to MS ExpressRoute
7. Customer completes Layer 3 configuration, attaching any VNET's and/or accessing any Public/Office365 resources

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

1) Customer signs into Azure portal

Sign into Azure @ <http://portal.azure.com/>



2) Customer creates a new ExpressRoute Circuit

After clicking ExpressRoute, portal will display 'Create ExpressRoute circuit' blade. When filling in the values on this blade, here are some helpful tips:

- Select the Provider as **CenturyLink Cloud Connect**
- Select the appropriate ExpressRoute location.
 - Note: Silicon Valley = San Jose
- 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 the customer 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
 - User 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, an policies.
 - Additional information can be found here:
<https://azure.microsoft.com/en-us/documentation/articles/resource-group-portal/>

Important:

Please be aware that 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.

The screenshot shows the 'Create ExpressRoute circuit' blade in the Microsoft Azure portal. The interface is dark-themed. At the top, it says 'Microsoft Azure' and 'New > Marketplace >'. The main heading is 'Create ExpressRoute cir...'. Below this, there are two buttons: 'Create new' (highlighted in blue) and 'Import'. The form contains several fields with asterisks indicating they are required:

- Circuit name:** 'Test_Circuit' with a green checkmark.
- Provider:** 'CenturyLink Cloud Connect' (circled in red).
- Peering location:** 'Silicon Valley'.
- Bandwidth:** '50Mbps'.
- SKU:** 'Standard' (selected) and 'Premium'.
- Billing model:** 'Unlimited' and 'Metered' (selected).
- Allow classic operations.
- Subscription:** 'Pay-As-You-Go'.
- Resource group:** 'PSBTEST'. Radio buttons for 'Create new' and 'Use existing' (selected).
- Location:** 'West US'.

At the bottom, there is a 'Pin to dashboard' checkbox (checked), a blue 'Create' button, and a link for 'Automation options'. A disclaimer at the very bottom states: 'By clicking the create button, you understand that billing will start immediately upon creation of the ExpressRoute and you agree to accept the charges.'

(cont) 2) Customer creates a new ExpressRoute circuit

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

The screenshot shows the Microsoft Azure Marketplace interface. The breadcrumb navigation at the top reads "New > Marketplace > Everything > ExpressRoute". The left-hand navigation pane is open, showing various service categories. A callout bubble points to the "+" icon at the top of the navigation pane, with the text "1. Click '+' for new service". The search bar in the center contains the text "expressroute", with a callout bubble pointing to it that says "2. Search for 'ExpressRoute'". Below the search bar, a table of search results is displayed. The first result, "ExpressRoute", is highlighted in blue. To the right of the search results, there is a sidebar with a description of Azure ExpressRoute, social media icons, and a "PUBLISHER" section. At the bottom right, a "Create" button is visible, with a callout bubble pointing to it that says "3. Click Create".

Microsoft Azure

New > Marketplace > Everything > ExpressRoute

Marketplace

Everything

1. Click '+' for new service

2. Search for 'ExpressRoute'

Filter

expressroute

Results

NAME	PUBLISHER	CATEGORY
ExpressRoute	Microsoft	Networking
Virtual network gateway	Microsoft	Networking
App Service Environment	Microsoft	Web + mobile
Connection	Microsoft	Networking
BizTalk360	Kovai Limited	Compute

ExpressRoute
Microsoft

Azure ExpressRoute enables you to connect your on-premises infrastructure that's on your private network to Azure services. Traffic does not go over the public Internet, providing more security than typical connections between on-premises and Azure services.

With ExpressRoute, you can establish a connection to Azure services (through a network service provider or a network service provider facility) or directly connect to Azure services.

PUBLISHER

USEFUL LINKS

3. Click Create

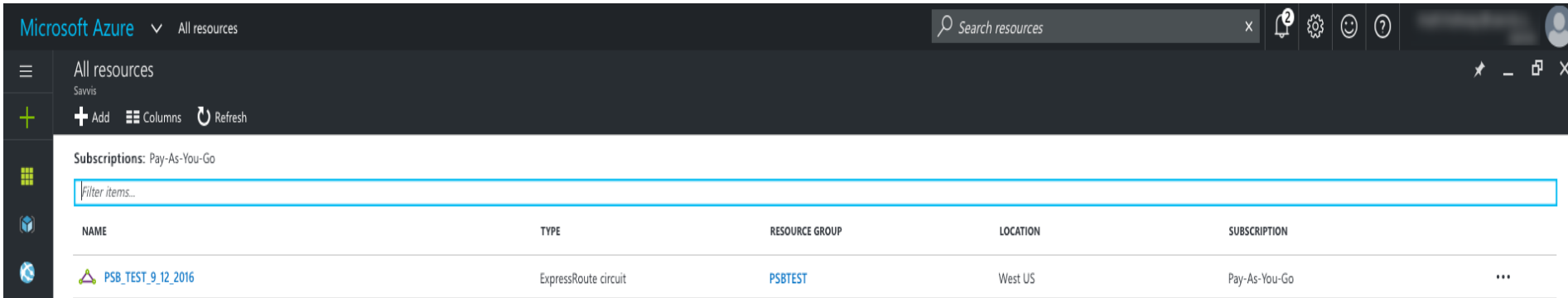
Create

Related to your search

- Elfiq Networks Cloud Connector
- Local network gateway
- App Service Plan

3) Customer views the circuits and properties

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



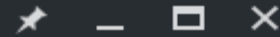
The screenshot shows the Microsoft Azure portal interface. At the top, it says "Microsoft Azure" and "All resources". There is a search bar with the text "Search resources". Below the search bar, there is a navigation menu with "All resources" selected. The main content area shows a table of resources under the subscription "Pay-As-You-Go". The table has columns for NAME, TYPE, RESOURCE GROUP, LOCATION, and SUBSCRIPTION. One resource is listed: "PSB_TEST_9_12_2016" of type "ExpressRoute circuit" in the "PSBTEST" resource group, located in "West US", under the "Pay-As-You-Go" subscription.

NAME	TYPE	RESOURCE GROUP	LOCATION	SUBSCRIPTION
PSB_TEST_9_12_2016	ExpressRoute circuit	PSBTEST	West US	Pay-As-You-Go

(cont) 3) Customer views the circuits and properties



PSB_TEST_9_12_2016
ExpressRoute circuit



Delete

Search (Ctrl+/)

- Overview
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems

SETTINGS

- Configuration
- Connections
- Peerings
- Properties
- Locks
- Automation script

SUPPORT + TROUBLESHOOTING

- New support request

Essentials ^

Resource group	PSBTEST	Provider	CenturyLink Cloud Connect
Circuit status	Enabled	Provider status	Provisioned
Location	Not available	Peering location	Silicon Valley
Subscription name	Pay-As-You-Go	Bandwidth	50 Mbps
Subscription ID	[REDACTED]	Service key	[REDACTED]

Peerings

TYPE ^	STATUS ^	PRIMARY SUBNET ^	SECONDARY SUBNET ^	
Azure private	Disabled	-	-	...
Microsoft	Disabled	-	-	...

4) Customer requests CenturyLink Cloud Connect service

- **To order a CenturyLink Cloud Connect, contact your CenturyLink Account Representative**
 - Contact your CenturyLink account rep to assist in ordering a Cloud Connect to ExpressRoute.
 - Information needed by CenturyLink to complete connection:
 - MSFT Azure ExpressRoute Service Key completed during CenturyLink Provisioning steps
 - Customer requests Cloud Connect to the appropriate Azure ExpressRoute Location
 - Bandwidth of eLynk Connection requested (typically matches ExpressRoute speed) ** Note: eLynk Cloud Connect has max bandwidth of 3Gb. If your eLynk is 3Gb you would configure ExpressRoute for 5Gb (the next higher increment).
 - 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
 - i.e. 1year, 3year, etc.

5) Upon request, customer sends the service key to CenturyLink for Cloud Connect provisioning

- The CenturyLink Technical Design Engineer will request the ExpressRoute Service Key from the customer prior to provisioning but after Order Entry.
- On this blade, Provider status provides information on the current state of provisioning on the service-provider (CenturyLink) 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 (CenturyLink) 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

Essentials ^

Resource group	Provider
PSBTEST	CenturyLink Cloud Connect
Circuit status	Provider status
Enabled	Provisioned
Location	Peering location
Not available	Silicon Valley
Subscription name	Bandwidth
Pay-As-You-Go	50 Mbps
Subscription ID	Service key

Peerings

TYPE	STATUS	PRIMARY SUBNET	SECONDARY SUBNET	
Azure private	Disabled	-	-	...
Microsoft	Disabled	-	-	...

6) CenturyLink provisions Cloud Connect to MS ExpressRoute

- Upon network order submission, CenturyLink will provision a Layer 2 eLink connection from the customer premise to the requested ExpressRoute Location
 - Turn up of Layer 2 eLink service to local ExpressRoute interconnect point
 - Layer 2 VLAN(s) between CenturyLink and Microsoft and between CenturyLink and the Customer will be configured by CenturyLink.

7) CenturyLink completes configuration and provides Customer with necessary layer 2 VLAN information for CPE and Azure configurations to be completed by the customer.

- Customer to configure appropriate Layer 2 VLAN tagging on CPE utilizing Q-in-Q tagging configuration. It is important to note that the CenturyLink EtherType specification of double-tagged frames is for both inner and outer tags to be 0x8100.
- Turn up of Layer 3 BGP/routing between customer and Azure
 - Layer 3/BGP will be configured by the customer on the customer router and on Azure side via the customers Azure portal account.

Microsoft Peering (SaaS) 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
 - Customers can now access Azure PaaS and Microsoft SaaS services via the Microsoft peering connection
 - Customers no longer have to have 3 separate peering types to MSFT (Public / Private / MSFT Peering), but rather 2 peering types going forward (Private / MSFT Peering)
 - Refer to the following to **move** Public peering to Microsoft peering:
<https://docs.microsoft.com/en-us/azure/expressroute/how-to-move-peering>
- **Note:** While customers can receive all PaaS/SaaS services over MSFT Peering, the Office365 service still requires customers to apply for approval directly with Microsoft to enable the Office365 service via ExpressRoute. All other services can be accessed via the MSFT Peering VLAN without a prior approval.
- Please reference these links for additional guidance and direction from Microsoft. [Azure ExpressRoute for Office 365](#) and here [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.
 - Customer can then provision Microsoft peering for the circuit.
 - You must create and configure a route filter
 - Identify the services you wish 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/ <ul style="list-style-type: none">• 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 & routing domains	https://azure.microsoft.com/en-us/documentation/articles/expressroute-circuit-peerings/
Partners & peering locations	https://azure.microsoft.com/en-us/documentation/articles/expressroute-locations/
Azure Regions	http://azure.microsoft.com/en-us/regions/
Designing Materials	<ul style="list-style-type: none">• https://azure.microsoft.com/en-us/documentation/articles/expressroute-routing/• https://azure.microsoft.com/en-us/documentation/articles/expressroute-nat/
Configuration Materials	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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's 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 Mgt	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 <ul style="list-style-type: none"> • 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