CenturyLink IQ+ Cloud Port to AWS Direct Connect

Direct, Secure, and Private Connections to AWS Cloud

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Roles and Responsibilities

Roles and Responsibilities			
STEPS REQUIRED TO SET UP AWS DIRECT CONNECT CONNECTIVITY	END CUSTOMER	CENTURYLINK	AWS
SET UP PHYSICAL CONNECTIVITY TO AWS DIRECT CONNE	CT LOCATION		
Order Layer 3 connection to AWS Direct Connect location	X		
Provision Layer 3 device with BGP		Х	
Decide on the type of BGP peering required (public or private)	x		
ORDER VIRTUAL CIRCUITS(S) ON EQUINIX CLOUD EXCHAI	NGE TOWARDS AWS CLOUD EXCHANGE		
Create Virtual Circuit to AWS		X	
Monitor Virtual Circuit to AWS		X	
SET UP BGP PEERING BETWEEN CENTURYLINIK PROVIDED	OCUSTOMER EDGE AND AWS EDGE DEVI	CE	
Configure BGP Peering on Customer Edge		X	
Configure BGP Peering on AWS side via Portal	X		
LINK SERVICES ON AWS TO THE DEDICATED CIRCUIT			
Accept Hosted Connection via AWS Portal	X		
Create & link Virtual Interface	x		
Create & attach Virtual Private Gateway to VPC	x		



Purpose

The purpose of this document is to provide an end-to-end walk through for a customer setting up an AWS Direct Connect for the first time for use with CenturyLink's IQ+ Cloud Port service.

Please note, information contained in this document should serve as a supplement to AWS documentation linked throughout this document. Users should check the provided links to obtain the most up-to-date information.

- Please work with your account teams for questions not answered in this document or associated links:
 - For Amazon AWS, please contact your AWS account representative
 - For CenturyLink IQ+ Cloud Port, please contact your CenturyLink account representative



Background Information

What is AWS Direct Connect (http://docs.aws.amazon.com/directconnect/latest/UserGuide/Welcome.html)



AWS Direct Connect links your internal network to an AWS Direct Connect location. One end of the connection is connected to your network, the other to an AWS Direct Connect router. With this connection in place, you can create virtual interfaces directly to the AWS cloud services, bypassing the public Internet. An AWS Direct Connect location provides access to Amazon Web Services in the region it is associated with, as well as access to other US regions. For example, you can provision a single connection to any AWS Direct Connect location in the US and use it to access public AWS services in all US Regions.

CenturyLink Supported AWS Regions and Interconnect Points				
AWS Direct Connect Location	AWS Region			
Equinix DA1, DA2, DC6 & DC10	US East (Virginia)			
Equinix CH1, CH2 & CH4	US East Ohio (Chicago)			
Equinix SV1 & SV5	US West (Northern California)			



IQ+ Cloud Port for Amazon Direct Connect



Private Peering

Public Peering



High Level Step Review

- 1. Capture your AWS account information
- 2. Customer requests CenturyLink IQ+ Cloud Port
- 3. CenturyLink provisions IQ+ Cloud Port
 - (Optional) Create Redundant Direct Connect Connection
- 4. CenturyLink requests Virtual Circuit over the Cloud Exchange
- 5. Accept the Direct Connect Hosted Connection
- 6. Configure the AWS BGP Peering to either VPC or AWS Public



Capture your AWS account information

http://docs.aws.amazon.com/IAM/latest/UserGuide/AccountAlias.html

- Finding Your AWS Account ID
 - To find your AWS account ID number in the AWS Management Console, click on Support in the navigation bar in the upper right, and then click Support Center. Your currently signed in account ID appears below the Support menu.





Customer Requests CenturyLink IQ+ Cloud Port

- To order a CenturyLink IQ+ Cloud Port, contact your CenturyLink Account Representative
 - Contact your CenturyLink account rep to assist in ordering an IQ+ Cloud Port
 - Cloud Service Provider (CSP) Information needed by CenturyLink to complete connection
 - AWS Account ID
 - AWS service(s) they you connecting to
 - Public
 - Virtual Private Cloud (VPC)
 - Note: Maximum connection size per VPC is 500megs
 - Each VPC requires a separate VLAN from IQ+ Cloud Port
 - Tell your account team how many VPC's you are connecting to
 - Determine the connection size needed to each VPC
 - Note: AWS limits connections of 500Mbps or less per VPC



CenturyLink Provisions Cloud Port to AWS

- Upon network order submission, CenturyLink will provision a Layer 3 VPN connection to the requested interconnect point
 - Turn up of Layer 3 VPN service to local AWS interconnect point
 - Layer 3 will be configured on CTL side; Customer will complete Layer 3 turn up on AWS side in later step
 - Extension of Layer 2 VLAN(s) between CenturyLink and AWS
- CenturyLink completes configuration, and provides Customer with necessary information required to complete Layer 3 turn up on AWS side per environment
 - Appropriate IP subnet(s)
 - Autonomous System Number (ASN) Info
 - AS Number
 - BGP Authorization Key
 - VLAN ID



Customer Steps – Accepting & Configuring AWS Environment

NOTE: To simplify and speed up activation of service with CenturyLink (Activation Call), the following steps should be taken prior to using your CenturyLink Reservation to activate the connection. Full provisioning steps within the AWS environment can can take up to 1 hour to complete.

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Accept the Direct Connect Hosted Connection

http://docs.aws.amazon.com/directconnect/latest/UserGuide/getstarted_sub1g_provider.html

- 1. Open the AWS Direct Connect console at <u>https://console.aws.amazon.com/directconnect/</u>
- 2. If necessary, change the region. From the navigation bar, select the region that meets your needs
- 3. In the navigation pane, click Connections

11

4. In the Connections pane, select a connection, and then click the arrow to expand details about the connection





Upon accepting the Hosted Connection, " the State field will cycle from "pending acceptance", to "pending", to "down" and finally to "available"....it can take up to 20 minutes for service to fully activate

5. Select I understand that Direct Connect port charges apply once I click "Accept This Connection", and then click Accept Connection



(Optional) Create Redundant Direct Connect Connection

http://docs.aws.amazon.com/directconnect/latest/UserGuide/getstarted_sub1g_provider.html

To configure redundancy, a second Direct Connect link must be created by repeating the same steps from above.



There are different configuration choices available when you provision two dedicated connections:

Active/Active (BGP multipath). Network traffic is load balanced across both connections. If one connection becomes unavailable, all traffic is routed through the other. This is the default configuration.

Active/Passive (failover). One connection is handling traffic, and the other is on standby. If the active connection becomes unavailable, all traffic is routed through the passive connection.

How you configure the connections doesn't affect redundancy, but it does affect the policies that determine how your data is routed over both connections. We recommend that you configure both connections as active. AWS will treat return traffic on those links as Active/Active.



Customer Steps - Configuring to AWS VPC Environment

NOTE: To simplify and speed up activation of service with CenturyLink (Activation Call), the following steps should be taken prior to using your CenturyLink Reservation to activate the connection. Full provisioning steps within the AWS environment can can take up to 1 hour to complete.

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Create a Virtual Private Gateway (VPG)

http://docs.aws.amazon.com/directconnect/latest/UserGuide/getstarted_sub1g_provider.html

Under VPC Dashboard \ VPN Connections, select "Create Virtual Private Gateway" •

🎁 Services 🗸 Resource G	iroups 🗸 🛠	3. Select Create	Matthew Holway 👻 N. Ca	lifornia 👻 S	Support 👻
	/irtual Private Gateway	Virtual Private Gateway VPC Detach from V		2 \$	0
None	rch Virtual Private Gatewa 🗙			Private Gate	eway≻≫
Virtual Private q ud	Create Virtual Private Gateway	,	×		
Your VPCs Subnets 1. VPC Dashboard Route Tables	A virtual private gateway is the router on the Ama Name tag	zon side of the VPN tunnel.	4. Enter user-define name for VPG	ed	
Internet Gateways					
DHCP Options Sets		Cancel Yes, Cre	ate 5. F	Press 'Yes,	
Elastic IPs				Create'	
Endpoints					
NAT Gateways					
Peering Connections					
Security					
Network ACLs					
Security Groups 2. Y	Virtual Private Gateways				
VPN Connections					
Customer Gateways	virtual private gateway above			L	
Virtual Private Gateways		14			

Configure the AWS-Side BGP Peering for VPC Connectivity (1 of 4)

http://docs.aws.amazon.com/directconnect/latest/UserGuide/getstarted_sub1g_provider.html

1. Before you begin, the following parameters are required:

- CenturyLink Provided
 - A new, unused VLAN tag that you select
 - Provided by CenturyLink
 - A public or private BGP ASN. If you are using a public ASN, you must own it. If you are using a private ASN, it must be in the 65000 range
 - Private provided by CenturyLink
 - Public provided by Customer
 - BGP MD5 Hash Key for authentication
 - Provided by CenturyLink
- AWS Environment pre-requisite
 - A VPC environment created to attach to the Direct Connect
 - A Virtual Private Gateway to connect between the VPC and the Virtual Interface
 - See previous page



Create the Virtual Interface: AWS-Side BGP Peering for VPC Connectivity (2 of 4)

http://docs.aws.amazon.com/directconnect/latest/UserGuide/getstarted_sub1g_provider.html

- Open the AWS Direct Connect console at https://console.aws.amazon.com/directconnect/
- In the Connections pane, select the connection to use, and then click Create Virtual Interface
- Fill in appropriate information provided by CenturyLink (see below)

🎁 Services 🗸 F	Resource Groups 🗸 🔭			Mat	thew Holway 👻	N. California 🗸	Support 👻
Connections Virtual Interfaces	Create a Virtual Interface You may choose to create a private o Private - A private virtual interface Public - A public virtual interface c	Public virtual interface. should be used to acces an access all AWS publi	. Select the appropriate option beloss an Amazon VPC using private IF c services (including EC2, S3, and	ow. P addresses. I DynamoDB) using publi	ic IP addresses.		
1. Select Private for VPC Connections	Define Your New Private Virtua Enter the name of your virtual interface about virtual interface ownership, see	I Interface e. If youre creating a vir 'Hosted Virtual Interfac	tual interface for another account, es' in the AWS Direct Connect 2.	youll need to provide th cuide. User defined	e other AWS acc	count ID. For more	e information
	Connection:	dxcon-fg0kbv50 (PSB-DE	EFAU-22423-Pri) 🔉 i in	iterface name			
	Virtual Interface Name:	e.g. My Virtual Interface	1				
	Virtual Interface Owner:	My AWS Account	OAnother AWS Account	 Select appropriat Virtual Gateway 	le		
	VGW:	vgw-562d7113 ᅌ 🚺		(created in previous steps)			
	Enter the VLAN ID, if not already supp	lied by your AWS Direc	t Connect partner, and the IP Addr	resses for your router int	erface and the A	WS Direct Conne	ct interface.
	4. Uncheck	[VLAN number pr populated	'e-		
	Auto-generate peer IPs:	220					
	Your router peer IP:	10.0.0.1/30	0	5. CenturyLink	side IP		
	Amazon router peer IP:	10.0.0.2/30] 0	6. AWS side) IP		
<	Before you can use your virtual interfa BGP session. We can generate one fo 7. Uncheck BGP ASN:	ace, we must establish a or you, or you can suppl 65000	a BGP session. You must provide a y your own.	an ASN for your router. Y 8. ASN Provi CenturyL	ou will also need ded by .ink	I an MD5 key to a	uthenticate the
16	Auto-generate BGP key:			9. BGP	MD5 Hash Key		
	BGP Authentication Key:	xxxxxxxxxxxxxxx	0	Provided	by CenturyLink		

Configure the Virtual Interface: AWS-Side BGP Peering for VPC Connectivity (3 of 4)

http://docs.aws.amazon.com/directconnect/latest/UserGuide/getstarted_sub1g_provider.html

- When creating a new Virtual Interface for Private (VPC)
- Under Define Your New Private Virtual Interface, do the following:
 - 1. Select Private for VPC Connections
 - 2. In the Interface Name field, enter a name for the virtual interface
- In Interface Owner, select the My AWS Account option if the virtual interface is for your AWS account ID
 - 3. In the VGW list, select the virtual gateway to connect to
- The VLAN # field will already be filled in and grayed out
 - 4. To specify the CenturyLink provided IP addresses yourself, clear the Auto-generate peer IPs check box
 - 5. In the 'Your Router Peer IP' field, enter the CenturyLink side IP address that Amazon will send traffic to.
 - 6. In the 'Amazon Router Peer IP' field, enter the AWS side IP address you will use to send traffic to AWS
 - 7. To enter the CenturyLink-provided BGP key, clear the Auto-generate BGP key check box
 - 8. In the BGP Authorization Key field, enter the BGP MD5 key provided by CenturyLink
 - 9. In the BGP ASN field, enter the CenturyLink provided Border Gateway Protocol (BGP) Autonomous System Number (ASN) of your gateway; for example, a number between 1 and 65534

Create a Virtual Interface

You may choose to create a private or public virtual interface. Select the appropriate option below. Private - A private virtual interface should be used to access an Amazon VPC using private IP addresses. Public - A public virtual interface can access all AWS public services (including EC2, S3, and DynamoDB) using public IP addresses.

Define Your New Private Virtual Interface

Enter the name of your virtual interface. If youre creating a virtual interface for another account, youll need to provide the other AWS account ID. For more information about virtual interface ownership, see 'Hosted Virtual Interfaces' in the AWS Direct Connect Getting Started Guide.

Connection:	dxcon-fg0kbv50 (PSB-DEFAU-22423-Pri) 🗯 🚺				
Virtual Interface Name:	e.g. My Virtual Interface	0			
irtual Interface Owner:	 My AWS Account 	Another AWS Account			
VGW:	vgw-562d7113 🔉 🚺				

Enter the VLAN ID, if not already supplied by your AWS Direct Connect partner, and the IP Addresses for your router interface and the AWS Direct Connect interface.

VLAN:	220	0
Auto-generate peer IPs:	□ ①	
Your router peer IP:	65.125.0.1/30	0
Amazon router peer IP:	65.125.0.2/30	0

Before you can use your virtual interface, we must establish a BGP session. You must provide an ASN for your router. You will also need an MD5 key to authenticate the BGP session. We can generate one for you, or you can supply your own.

BGP ASN:	1234	0
Auto-generate BGP key:	□ ()	
BGP Authentication Key:	XXXXXXXXXXXXXXX	0



Create the AWS-Side BGP Peering for VPC Connectivity (4 of 4)

http://docs.aws.amazon.com/directconnect/latest/UserGuide/getstarted_sub1g_provider.html

- 5. View the Router (BGP) Configuration
 - · In the Virtual Interfaces pane, select a virtual interface, click the arrow to show more details
 - State will go from pending, to down, to available (this step can take up to 20 minutes to complete)

🎁 Services 🗸	Resource Grou	ips 🗸 🍾				Matthew Holway 👻	N. California 👻 Support 👻
Connections	Create Cor	Create Vi	rtual Interface Dele	te Connection			 2
Virtual Interfaces	Filter: Q, Se	earch for a Connection	×			Viewing 1 of	1 Connections
		Provided By	Name	Location	· Bandv	vidth - # VIs	· State ·
	 – 	EQUINIX NNI	PSB-DEFAU-22423-Pri	Equinix SV1 & SV5	, San Jose, CA 50Mbp	os 1	available
		Connection Name:	PSB-DEFAU-22423-Pr	i	Connection ID:	dxcon-fg0kbv50	
		AWS Account:	800079084491		Location:	Equinix SV1 & SV	5, San Jose, CA
		Provided By:	EQUINIX NNI		Port Speed:	50Mbps	
		Туре:	Hosted Connection		VLAN Assigned:	220	
		State:	available		Virtual Interfaces:	1 View Virtual In	nterfaces
	Create	/irtual Interface					



Attach a Virtual Private Gateway (VPG) to VPC

http://docs.aws.amazon.com/directconnect/latest/UserGuide/getstarted_sub1g_provider.html

Under VPC Dashboard \ VPN Connections, select your Virtual Private Gateway

🧊 Services 🗸 Re	source Groups 👻 🔭	Matthew Holway 🗸	N. California 🗸	Suppor	t •
VPC Dashboard	Create Virtual Private Gateway Delete Virtual Private Gateway Attach to VPC Detach from VPC		C	•	9
Filter by VPC: None	Q Search Virtual Private Gatewa X	< 1 to 1 of 1	Virtual Private G	ateway	> >>
Virtual Private Cloud	Name ID State VPC 1. Select 'Attact to VPC'	h			
Your VPCs	TEST VPG vgw-562d7113 detached ipsec.1				
VPC Dashboard	Create Virtual Private Gateway Delete Virtual Private Gateway Attach to VPC Detach from VPC		2	¢ (9
Filter by VPC:	Q Search Virtual Private Gatewa X	≪ < 1 to 1 of 1	Virtual Private O	Gateway	
Virtual Private Cloud	Attach to VPC	×			
Your VPCs	TEST VPC				
Subnets	Select the VPC to attach to the virtual private gateway 2. Press 'Yes,				
Route Tables	VPC vpc-d25dd3b7 + Attach'				
Internet Gateways	1. Select the				
DHCP Options Sets	Cancel Yes.	Attach			
Elastic IPs					

Note: It can take up to 20 minutes for VPG to show state of 'Attached' to the VPC



Customer Steps - Configuring to AWS Public Environment

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20

Configure the AWS-Side BGP Peering for VPC Connectivity (1 of 3)

http://docs.aws.amazon.com/directconnect/latest/UserGuide/getstarted_sub1g_provider.html

- **1.** Before you begin, the following parameters are required:
- CenturyLink Provided
 - A new, unused VLAN tag that you select
 - Provided by CenturyLink
 - A <u>Public</u> BGP ASN. The Public ASN can either be customer provided, or if one is not available, CenturyLink will utilize its own Public ASN for peering with AWS
 - Public owned provided by Customer
 - If no Public owned, then provided by CenturyLink
 - BGP MD5 Hash Key for authentication
 - Provided by CenturyLink
- AWS Environment pre-requisite
 - None



Create the Virtual Interface: AWS-Side BGP Peering for Public Connectivity (2 of 3)

http://docs.aws.amazon.com/directconnect/latest/UserGuide/getstarted_sub1g_provider.html

- Open the AWS Direct Connect console at https://console.aws.amazon.com/directconnect/
- In the Connections pane, select the connection to use, and then click Create Virtual Interface
- Fill in appropriate information provided by CenturyLink (see below)



Configure the Virtual Interface: AWS-Side BGP Peering for Public Connectivity (3 of 3)

http://docs.aws.amazon.com/directconnect/latest/UserGuide/getstarted_sub1g_provider.html

- When creating a new Virtual Interface for AWS Public
- Under Define Your New Public Virtual Interface, do the following:
 - 1. Select Public for AWS Public Services
 - 2. In the Interface Name field, enter a name for the virtual interface
- In Interface Owner, select the My AWS Account option if the virtual interface is for your AWS account ID
- The VLAN # field will already be filled in and grayed out
 - 3. In the 'Your Router Peer IP' field, enter the CenturyLink side IP address that Amazon will send traffic to.
 - 4. In the 'Amazon Router Peer IP' field, enter the AWS side IP address you will use to send traffic to AWS
 - 5. In the BGP ASN field, enter either your Pubic ASN, or if unavailable, the CenturyLink provided Border Gateway Protocol (BGP) Autonomous System Number (ASN) of your gateway
 - 6. To enter the CenturyLink provided BGP key, clear the Auto-generate BGP key check box
 - 7. In the BGP Authorization Key field, enter the BGP MD5 key
 - 8. In the Prefixes You Want To Advertise field, enter the NAT pool IP's provided by CenturyLink (typically these will be the IP's used in the previous step in this process)

Create a Virtual Interface

You may choose to create a private or public virtual interface. Select the appropriate option below.

Private - A private virtual interface should be used to access an Amazon VPC using private IP addresses.

Public - A public virtual interface can access all AWS public services (including EC2, S3, and DynamoDB) using public IP addresses.

Define Your New Public Virtual Interface

Enter the name of your virtual interface. If you're creating a virtual interface for another account, you'll need to provide the other AWS account ID. For more information about virtual interface ownership, see "Hosted Virtual Interfaces" in the AWS Direct Connect Getting Started Guide.

Connection:	dxcon-ffs3dp1s (Far E	ast Offices)	٠	Ð.,
Interface Name:	e.g. My Virtual Interface	0		
nterface Owner:	My AWS Account	C Anothe	r AV	VS Account

Enter the VLAN ID, If not already supplied by your AWS Direct Connect partner, and the IP Addresses for your router interface and the AWS Direct Connect interface.

VLAN:	e.g. 100	0
Your router peer IP:	e.g. 8.18.144.1/31	0
Amazon router peer IP:	e.g. 8.18.144.2/31	10

Prefi

Before you can use your virtual interface, we must establish a BGP session. You must provide an ASN for your router, and any prefixes you would like to announce to AWS. You will also need an MD5 key to authenticate the BGP session. We can generate one for you, or you can supply your own.

BGP ASN:	e.g. 65000	0
Auto-generate BGP key:	Ø (i)	
xes you want to advertise:	e.g. 8.18.144.0/24, 8.18	0

It may take up to 72 hours to verify that your IP prefixes are valid for use with Direct Connect.





AWS Direct Connect Resources

Overview	https://aws.amazon.com/directconnect/
Details	http://docs.aws.amazon.com/directconnect/latest/UserGuide/Welcome.html
VPC Endpoints	http://docs.aws.amazon.com/AmazonVPC/latest/UserGuide/vpc-endpoints.html
Pricing	 <u>https://aws.amazon.com/directconnect/pricing/</u> There are different price rates for traffic to the local AWS region and remote AWS regions
FAQ	https://aws.amazon.com/directconnect/faqs/
How to configure	http://docs.aws.amazon.com/directconnect/latest/UserGuide/getstarted_sub1g_provider.html
AWS Locations	See FAQ
Diversity	 Single port is single path all the way to AWS PE/Path diversity available by ordering 2 IQ ports & 2 Direct Connect instances Full diversity achieved by ordering at 2 separate locations
Notes	 Traffic to/From AWS is rate limited to 500 mbit/sec when using an exchange provider Higher bandwidths are available at following locations via DCI circuits + cross connects. 21701 Filigree, Ashburn VA (Equinix DC5 / US East - Virginia) 11 Great Oaks Blvd, San Jose CA (Equinix SV1 / US West – Northern California) 350 E Cermak Rd, 7th Floor Transport, Chicago, IL 60616 (Equinix CH1, CH2, and CH4) Dynamic Routing via BGP VPC support bring your own private IP

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