CenturyLink IQ+ Cloud Port to AWS Direct Connect

Direct, Secure, and Private Connections to AWS Cloud
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<tr>
<th>Roles and Responsibilities</th>
<th>END CUSTOMER</th>
<th>CENTURYLINK</th>
<th>AWS</th>
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<td>SET UP PHYSICAL CONNECTIVITY TO AWS DIRECT CONNECT LOCATION</td>
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<td>Order Layer 3 connection to AWS Direct Connect location</td>
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<td>Provision Layer 3 device with BGP</td>
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<td>Decide on the type of BGP peering required (public or private)</td>
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<td>ORDER VIRTUAL CIRCUITS(S) ON EQUINIX CLOUD EXCHANGE TOWARDS AWS CLOUD EXCHANGE</td>
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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


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.

<table>
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<tr>
<th>CenturyLink Supported AWS Regions and Interconnect Points</th>
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<tr>
<td><strong>AWS Direct Connect Location</strong></td>
</tr>
<tr>
<td>Equinix DA1, DA2, DC6 &amp; DC10</td>
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<tr>
<td>Equinix CH1, CH2 &amp; CH4</td>
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<tr>
<td>Equinix SV1 &amp; SV5</td>
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</table>
IQ+ Cloud Port for Amazon Direct Connect

AWS Direct Connect Location

Equinix Cloud Exchange

IQ+ Cloud Port

Transit VLANS

Direct Connect Router

AWS Region

VPC

AWS

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


- **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 take up to 1 hour to complete.
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 https://console.aws.amazon.com/directconnect/
2. If necessary, change the region. From the navigation bar, select the region that meets your needs
3. In the navigation pane, click Connections
4. In the Connections pane, select a connection, and then click the arrow to expand details about the connection
5. Select I understand that Direct Connect port charges apply once I click "Accept This Connection", and then click Accept 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
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 take up to 1 hour to complete.
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”
Configure the AWS-Side BGP Peering for VPC Connectivity

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)
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
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)
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

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

- CenturyLink Provided
  - A new, unused VLAN tag that you select
    - Provided by CenturyLink
  - A **Public** 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  

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)

![Diagram of Create a Virtual Interface form]

1. Select Public
2. User defined interface name
3. CenturyLink side IP
4. AWS side IP
5. Public ASN Provided by Customer
6. Uncheck
7. BGP MD5 Hash Key Provided by CenturyLink
8. Nat Pool Prefixes provided by CenturyLink (typically the IP block from step 3/4 above)

It may take up to 72 hours to verify that your IP prefixes are valid for use with Direct Connect.
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
  3. In Interface Owner, select the My AWS Account option if the virtual interface is for your AWS account ID
  4. The VLAN # field will already be filled in and grayed out
  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. 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)
## AWS Direct Connect Resources

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