HKNOG 13.0

A-Field Tech
DIGITAL SERVICES

ULTRA LOW LATENCY NETWORK

"The Importance of Low Latency Networks and Edge Computing in Web 3.0"

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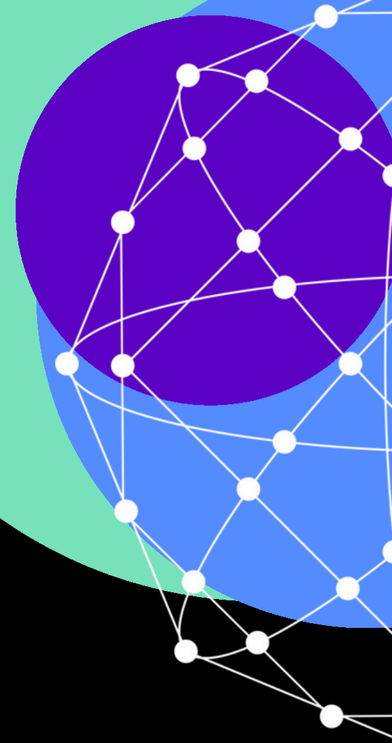
A-Field Tech

Web 3.0 and the Metaverse

The need for low latency networks to support Web 3.0 applications

Growing demand for seamless and immersive digital experiences

Why Low Latency is Critical in Web 3.0



01 **Decentralized Cloud Computing**

- Global distribution of computing resources
- High bandwidth, low latency networks for efficient data transfer

02 **Multiplayer Gaming**

- Seamless cross-region gameplay
- Real-time interactions without lags

03 **Financial Eco-System on Cloud & Edge**

- Real-time processing of transactions and asset transfers
- Secure, low latency cross-border backbone networks for DeFi applications

Why Low Latency is Critical in Web 3.0

- Immersive virtual collaboration spaces
- Minimized lag in audio/video streams for natural remote meetings/interactions

Remote Collaboration

04

- Distribution of Web 3.0 content across a global network of nodes
- Low latency backbones for optimized data routing

Decentralized Content Delivery

05

Key Requirements for Low Latency Web 3.0 Backbones

High Bandwidth & Ultra Low latency Fiber Optic Networks

- Robust infrastructure to handle increased data traffic
- Fast and reliable data transfer

Optimized Routing Protocols

- Efficient routing algorithms for quick data transmission
- Minimization of network congestion and delays

Edge Caching

- Distributed content caching for faster retrieval
- Reduced latency by bringing data closer to end-users

Quality of Service Management

- Prioritization of critical data packets
- Ensuring smooth and uninterrupted user experiences

How to Establish True Resilience

Cloud Native Network Utilization

Ensure top-tier cloud networking to reduce hop counts

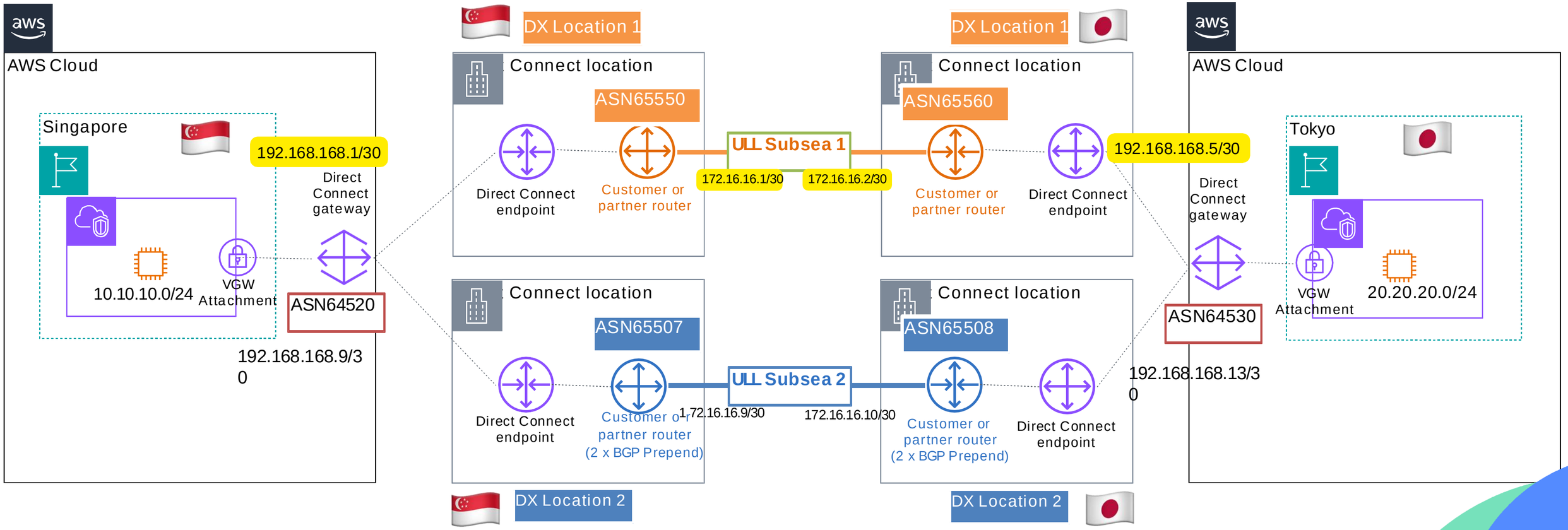
Diverse DX and ULL Subsea Systems

Ensure robust and versatile network resilience and diversity

Scalable Deployment

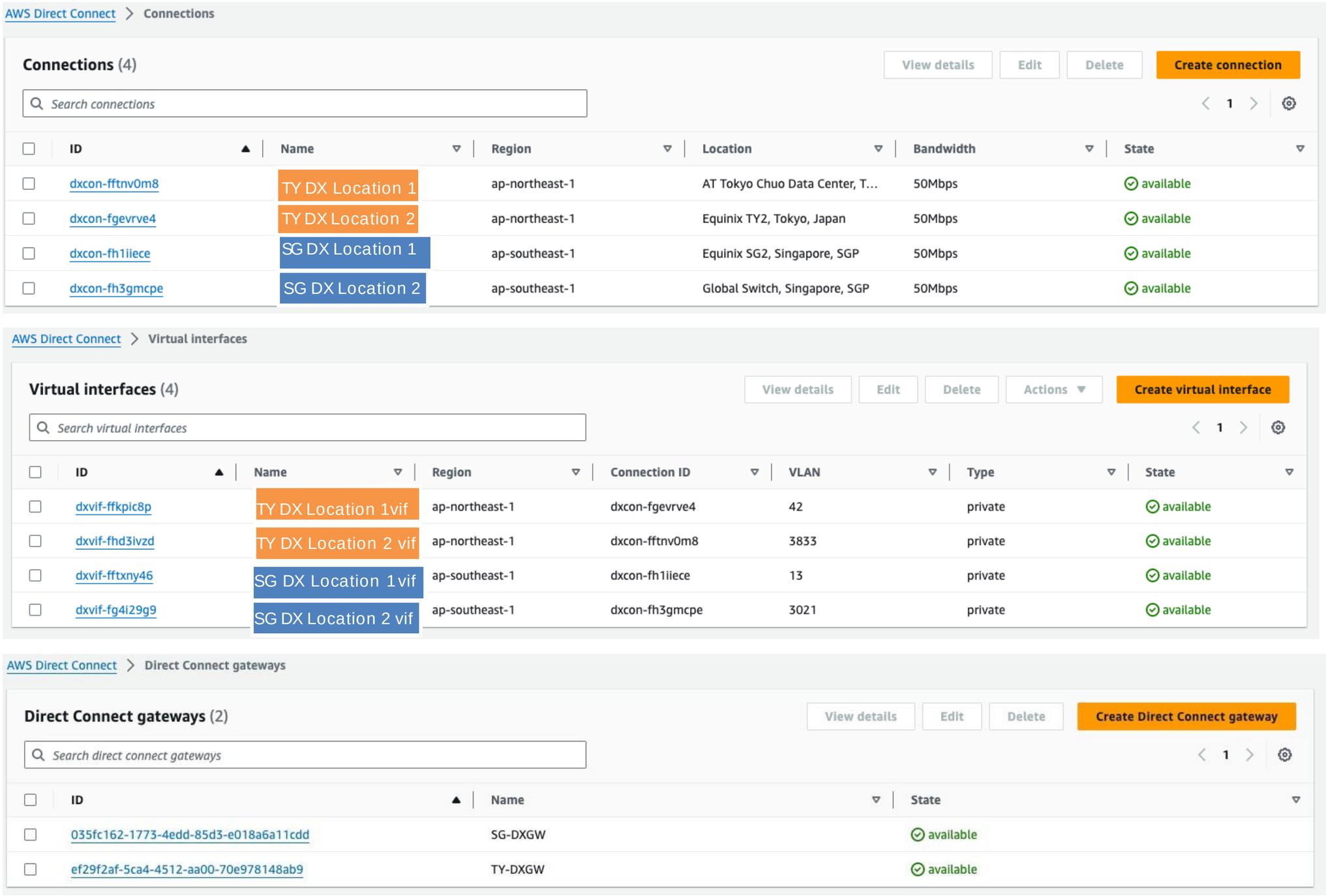
Support more than 30 VIFs and hence multiple routes!

BGP Active/Standby Setup

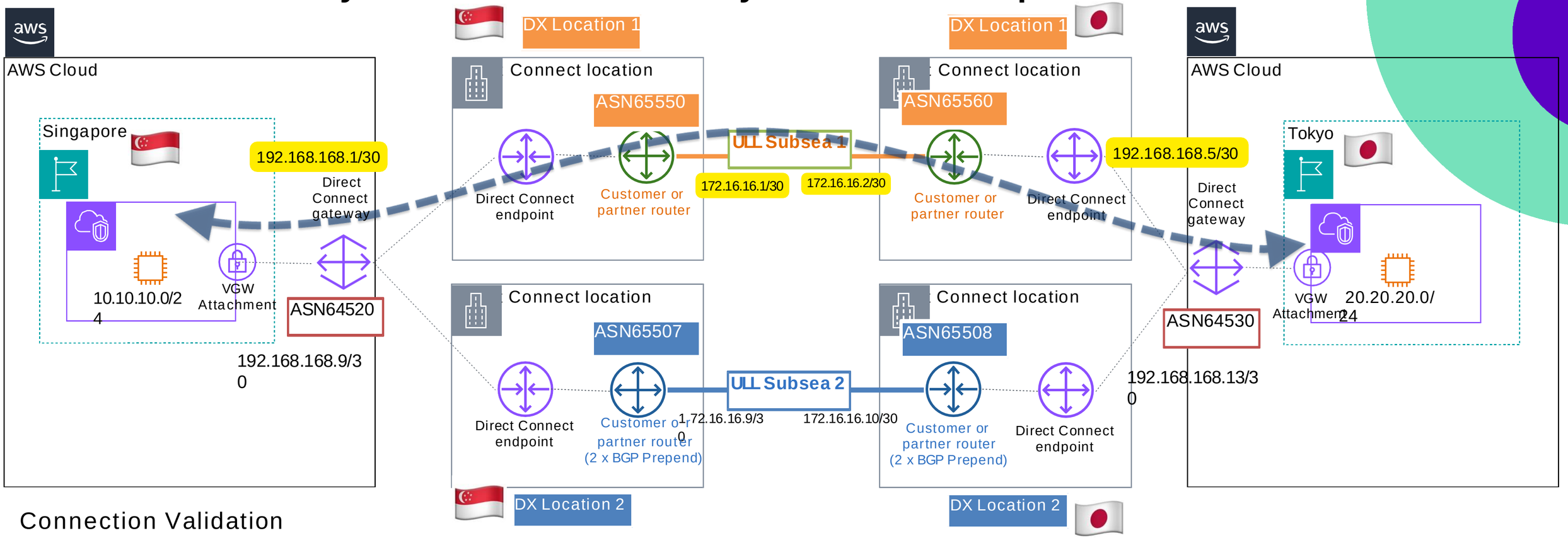


Once the configuration is completed

1. 2 x DXGWs
2. 4 x DX Connections (2 for each regions)
3. 4 x VIFs
4. Each DXGW associated with 2 x VIFs & 1x VGW


AWS Direct Connect > Connections
Connections (4)
View details
Edit
Delete
Create connection
Search connections
1
ID
Name
Region
Location
Bandwidth
State
dxcon-fftnv0m8
TY DX Location 1
ap-northeast-1
AT Tokyo Chuo Data Center, T...
50Mbps
available
dxcon-fgevrve4
TY DX Location 2
ap-northeast-1
Equinix TY2, Tokyo, Japan
50Mbps
available
dxcon-fh1iiece
SG DX Location 1
ap-southeast-1
Equinix SG2, Singapore, SGP
50Mbps
available
dxcon-fh3gmcpe
SG DX Location 2
ap-southeast-1
Global Switch, Singapore, SGP
50Mbps
available
AWS Direct Connect > Virtual interfaces
Virtual interfaces (4)
View details
Edit
Delete
Actions
Create virtual interface
Search virtual interfaces
1
ID
Name
Region
Connection ID
VLAN
Type
State
dxvif-ffkpic8p
TY DX Location 1vif
ap-northeast-1
dxcon-fgevrve4
42
private
available
dxvif-fhd3ivzd
TY DX Location 2 vif
ap-northeast-1
dxcon-fftnv0m8
3833
private
available
dxvif-fftxny46
SG DX Location 1vif
ap-southeast-1
dxcon-fh1iiece
13
private
available
dxvif-fg4i29g9
SG DX Location 2 vif
ap-southeast-1
dxcon-fh3gmcpe
3021
private
available
AWS Direct Connect > Direct Connect gateways
Direct Connect gateways (2)
View details
Edit
Delete
Create Direct Connect gateway
Search direct connect gateways
1
ID
Name
State
035fc162-1773-4edd-85d3-e018a6a11cdd
SG-DXGW
available
ef29f2af-5ca4-4512-aa00-70e978148ab9
TY-DXGW
available

BGP Active/Standby Dual Ultra Low Latency Providers Setup



Connection Validation

Condition: Both DX Location 1& 2's are UP

10.10.10.0/24 goes via **DX Location 1** 's path to reach out 20.20.20.0/24

My traceroute [v0.95]

ip-10-10-10-7.ap-southeast-1.compute.internal (10.10.10.7) -> 20.2024-03-05T07:44:04+0000

Keys: Help Display mode Restart statistics Order of fields quit

Host	Packets Loss%	Snt	Pings Last	Avg	Best	Wrst	StDev
1. 169.254.251.17	0.0%	28	2.0	1.1	0.3	5.9	1.5
2. 192.168.168.1	0.0%	28	1.5	3.2	0.6	14.4	4.1
3. 192.168.168.2	0.0%	28	0.8	0.8	0.7	0.9	0.0
4. 172.16.16.2	0.0%	27	73.3	73.2	73.1	73.4	0.1
5. 192.168.168.5	0.0%	27	74.1	74.0	73.3	83.0	1.8
6. 20.20.20.254	0.0%	27	77.4	76.7	76.5	78.1	0.3

My traceroute [v0.95]

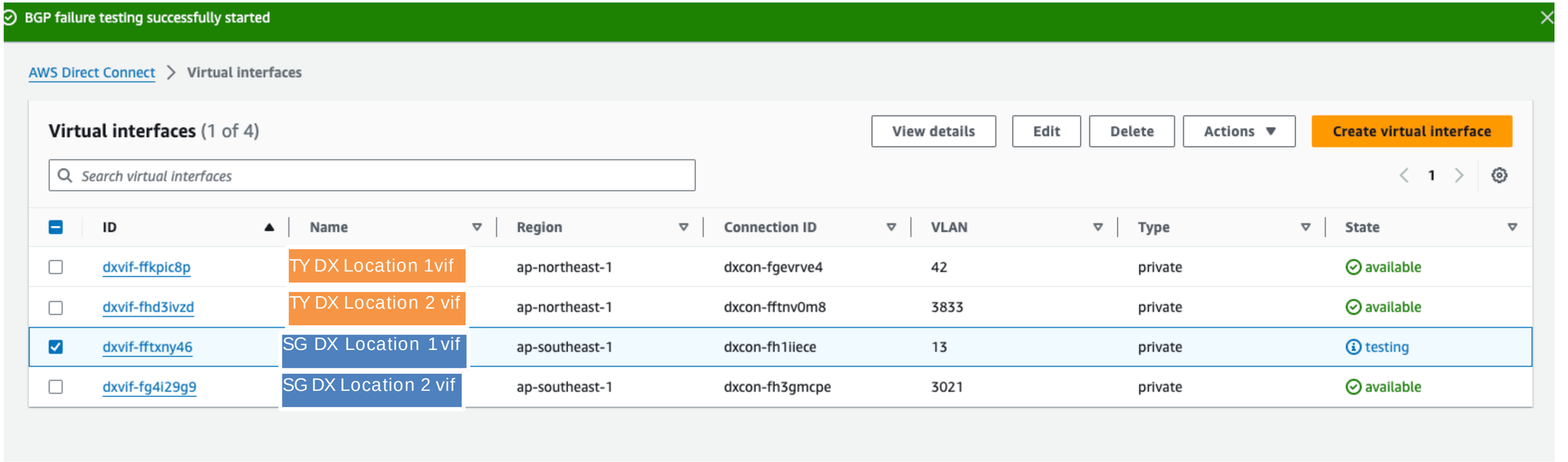
ip-20-20-20-254.ap-northeast-1.compute.internal (20.20.20.2024-03-05T07:44:04+0000

Keys: Help Display mode Restart statistics Order of fields quit

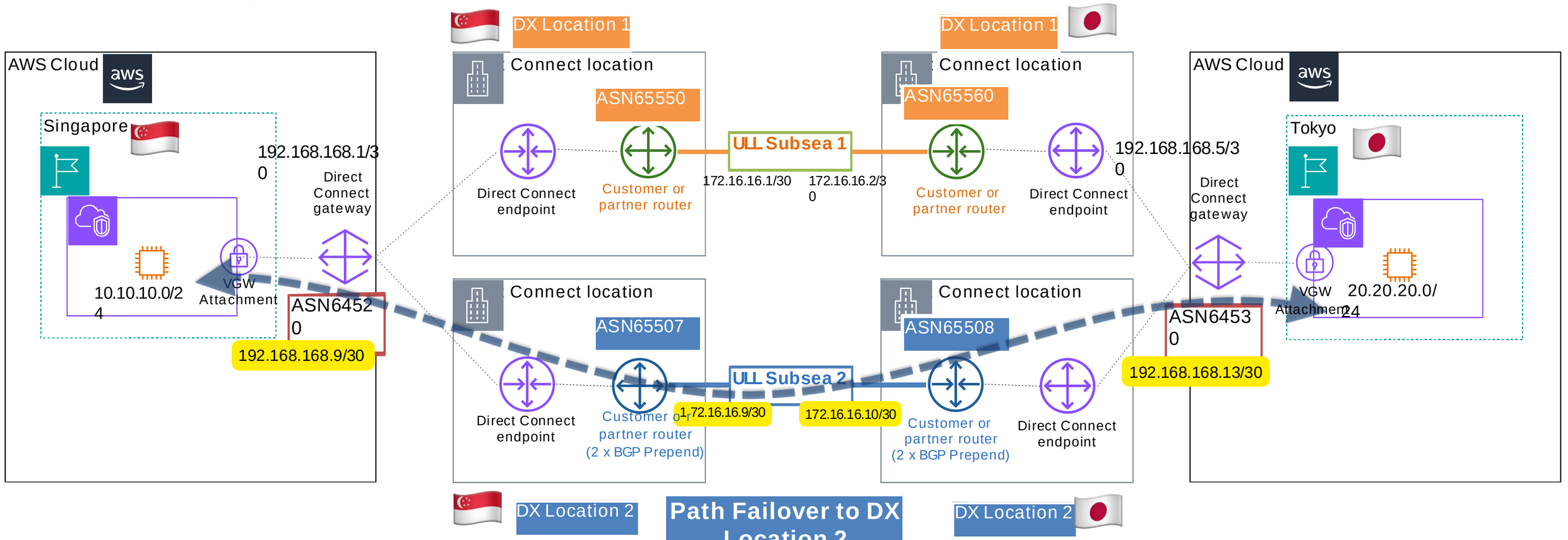
Host	Packets Loss%	Snt	Pings Last	Avg	Best	Wrst	StDev
1. 169.254.252.1	0.0%	31	0.4	0.6	0.3	2.1	0.5
2. 192.168.168.5	0.0%	31	3.6	5.1	3.6	25.8	4.5
3. 192.168.168.6	0.0%	31	3.6	3.6	3.5	4.0	0.1
4. 172.16.16.1	0.0%	31	76.0	76.0	75.9	76.1	0.0
5. 192.168.168.1	0.0%	31	77.2	77.7	76.2	103.1	4.9
6. 10.10.10.7	0.0%	30	76.6	76.7	76.5	77.7	0.2

Failover Test 1– Let’s Turn down the connection for Telco1

Go to AWS Console and Shutdown the SG DX Location 1vif ‘s BGP



Failover Test 1– Result



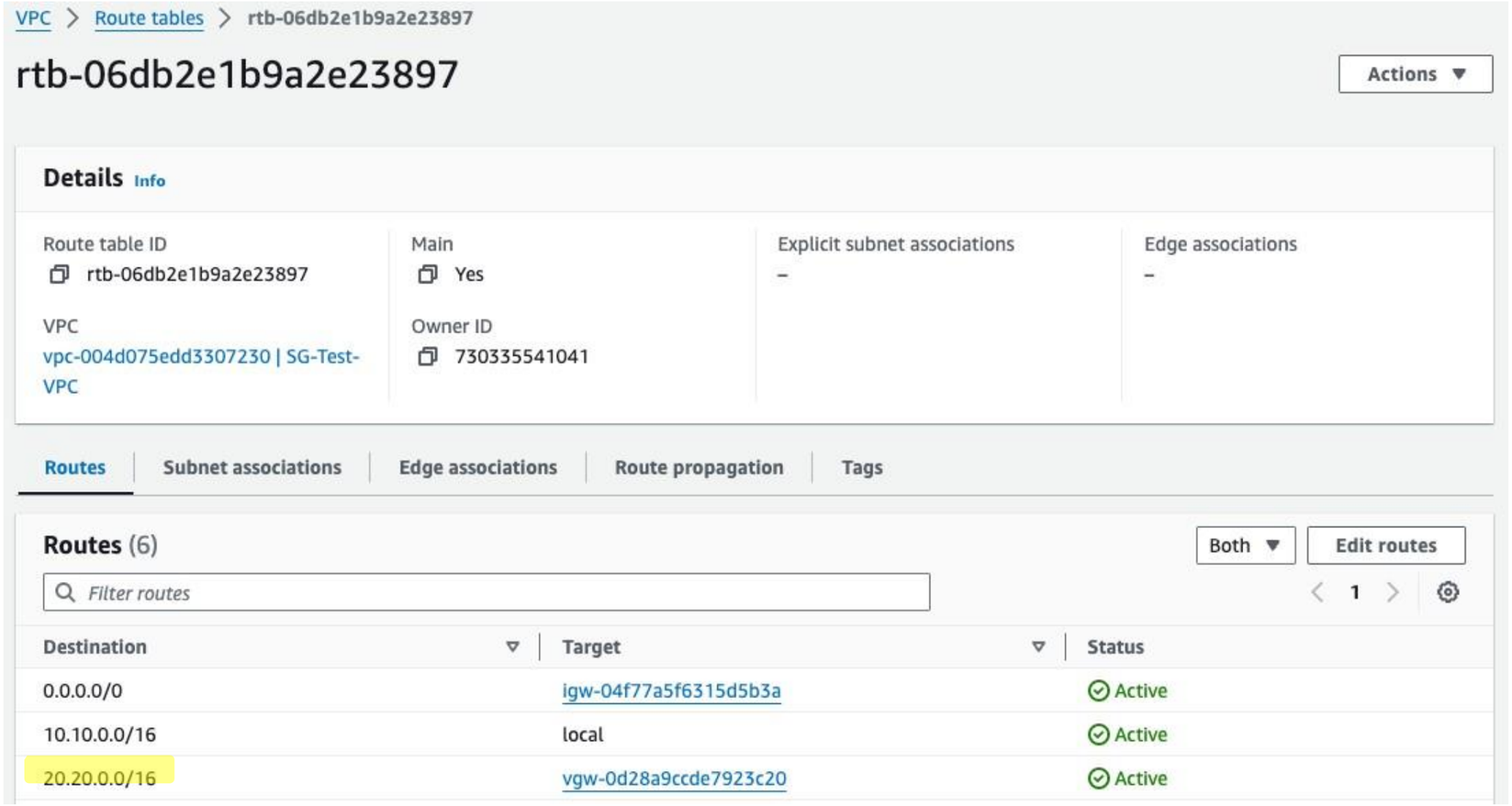
Path Failover to DX Location 2
0% Packet Drop

```
64 bytes from 20.20.20.254: icmp_seq=185 ttl=121 time=84.5 ms
64 bytes from 20.20.20.254: icmp_seq=186 ttl=122 time=81.3 ms
64 bytes from 20.20.20.254: icmp_seq=187 ttl=122 time=81.3 ms
64 bytes from 20.20.20.254: icmp_seq=188 ttl=122 time=81.4 ms
^C
--- 20.20.20.254 ping statistics ---
188 packets transmitted, 188 received, 0% packet loss, time 187327ms
rtt min/avg/max/mdev = 76.483/76.794/84.635/1.037 ms
[ec2-user@ip-10-10-10-7 ~]$ traceroute 20.20.20.254
traceroute to 20.20.20.254 (20.20.20.254), 30 hops max, 60 byte packets
 1  169.254.251.17 (169.254.251.17)  0.613 ms 169.254.251.21 (169.254.251.21)  0.589 ms  0.574 ms
 2  192.168.168.9 (192.168.168.9)  1.243 ms  1.227 ms  1.224 ms
 3  192.168.168.10 (192.168.168.10)  1.210 ms  1.942 ms  1.918 ms
 4  172.16.16.10 (172.16.16.10)  81.415 ms  81.395 ms  81.377 ms
 5  192.168.168.13 (192.168.168.13)  81.455 ms  81.559 ms  84.799 ms
```

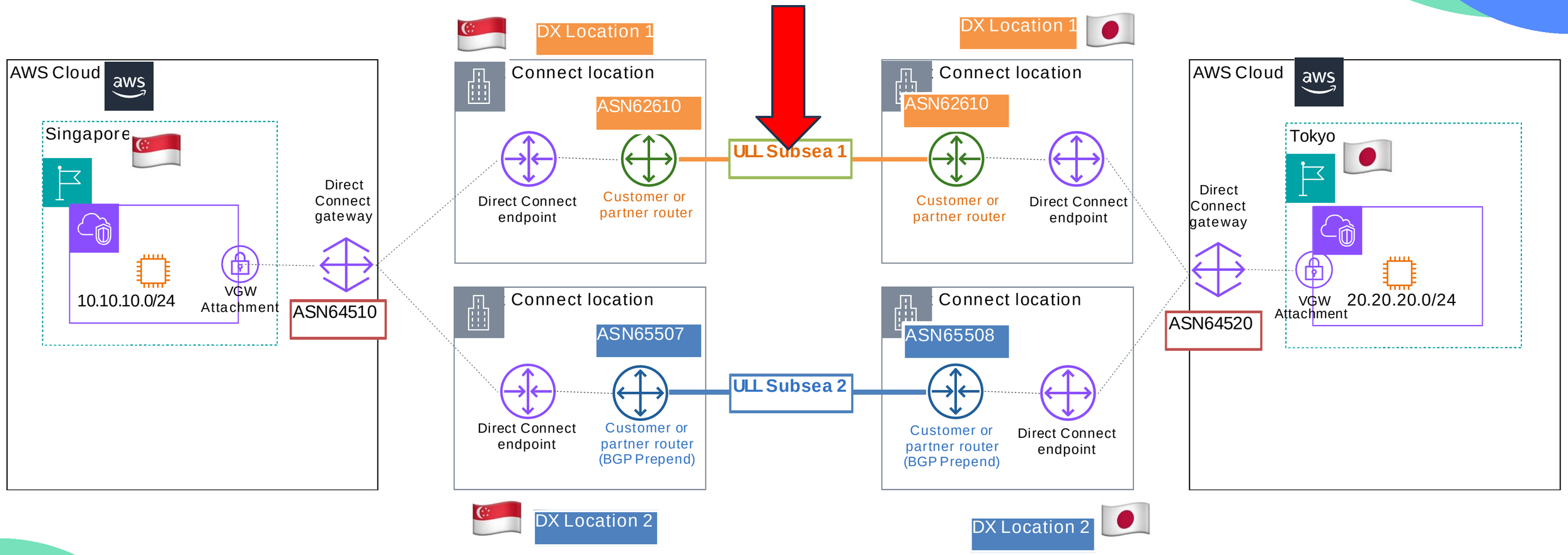
```
s from 10.10.10.7: icmp_seq=177 ttl=122 time=84.6 ms
s from 10.10.10.7: icmp_seq=178 ttl=122 time=81.4 ms
64 bytes from 10.10.10.7: icmp_seq=179 ttl=122 time=81.3 ms
^C
--- 10.10.10.7 ping statistics ---
179 packets transmitted, 179 received, 0% packet loss, time 178198ms
rtt min/avg/max/mdev = 76.453/76.742/84.704/0.979 ms
[ec2-user@ip-20-20-20-254 ~]$ traceroute 10.10.10.7
traceroute to 10.10.10.7 (10.10.10.7), 30 hops max, 60 byte packets
 1  169.254.252.5 (169.254.252.5)  0.498 ms 169.254.252.1 (169.254.252.1)  0.539 ms  0.502 ms
 2  * 192.168.168.13 (192.168.168.13)  1.396 ms  1.392 ms
 3  192.168.168.14 (192.168.168.14)  1.311 ms  1.343 ms  1.278 ms
 4  172.16.16.9 (172.16.16.9)  80.733 ms  80.715 ms  80.725 ms
 5  192.168.168.9 (192.168.168.9)  80.826 ms  80.858 ms  121.031 ms^C
```

Failover Test 1– Result

When we terminate the BGP with DX Location 1, Singapore VPC route-table can still maintain the DX Location 2 connection still UP as Location 2 connection still UP

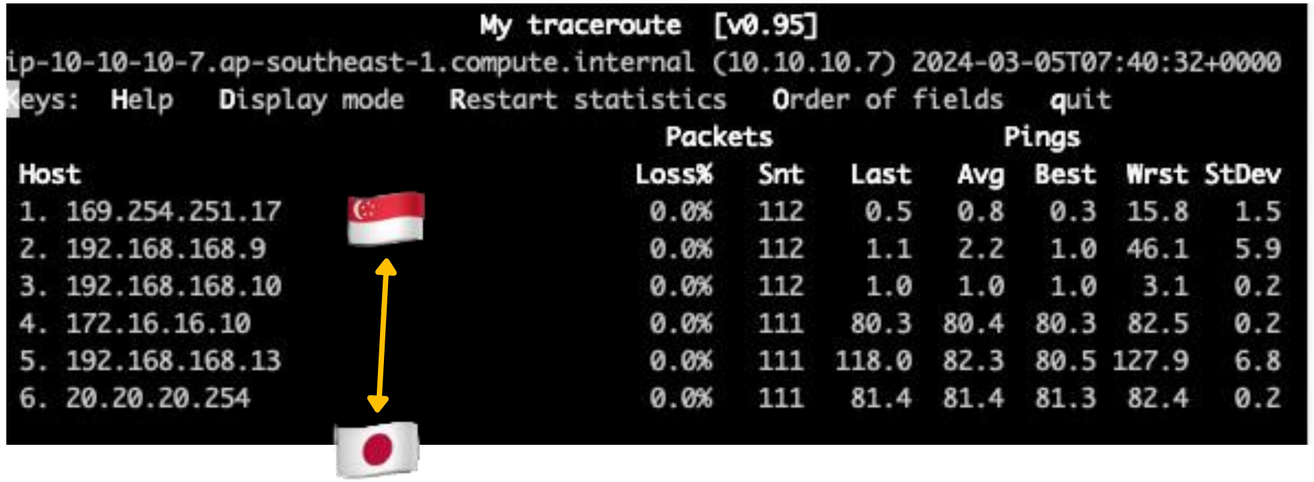


Failover Test 2 – What if the connection on ULL Subsea1 is break?

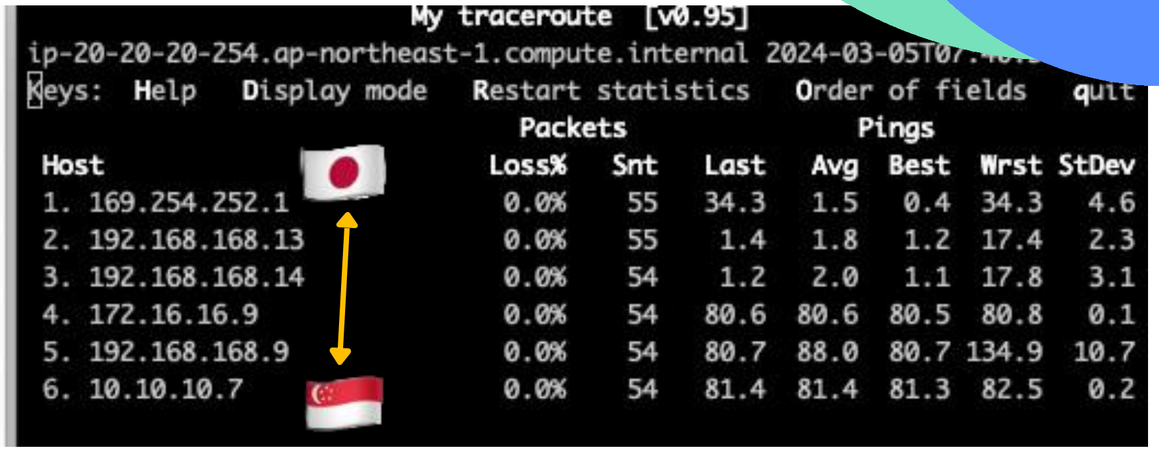


We simulate that the **ULL Subsea 1** is **down**, causing the BGP at DX Location 1to go **down**.
BFD should be enabled to improve BGP convergence time.

Failover MTR Test Results (Before the ULL 1link recover)



```
                                My traceroute  [v0.95]
ip-10-10-10-7.ap-southeast-1.compute.internal (10.10.10.7) 2024-03-05T07:40:32+0000
Keys:  Help   Display mode   Restart statistics   Order of fields   quit
                                                 Packets                               Pings
Host                                          Loss%   Snt   Last   Avg  Best  Wrst StDev
1. 169.254.251.17                              0.0%   112    0.5   0.8   0.3  15.8   1.5
2. 192.168.168.9                               0.0%   112    1.1   2.2   1.0  46.1   5.9
3. 192.168.168.10                              0.0%   112    1.0   1.0   1.0   3.1   0.2
4. 172.16.16.10                                0.0%   111   80.3  80.4  80.3  82.5   0.2
5. 192.168.168.13                              0.0%   111  118.0  82.3  80.5 127.9   6.8
6. 20.20.20.254                                0.0%   111   81.4  81.4  81.3  82.4   0.2
```



```
                                My traceroute  [v0.95]
ip-20-20-20-254.ap-northeast-1.compute.internal 2024-03-05T07:
Keys:  Help   Display mode   Restart statistics   Order of fields   quit
                                                 Packets                               Pings
Host                                          Loss%   Snt   Last   Avg  Best  Wrst StDev
1. 169.254.252.1                               0.0%    55   34.3   1.5   0.4  34.3   4.6
2. 192.168.168.13                              0.0%    55    1.4   1.8   1.2  17.4   2.3
3. 192.168.168.14                              0.0%    54    1.2   2.0   1.1  17.8   3.1
4. 172.16.16.9                                 0.0%    54   80.6  80.6  80.5  80.8   0.1
5. 192.168.168.9                               0.0%    54   80.7  88.0  80.7 134.9  10.7
6. 10.10.10.7                                  0.0%    54   81.4  81.4  81.3  82.5   0.2
```

Failover MTR Test Results (After the ULL 1link recover)

```
                                My traceroute  [v0.95]
ip-10-10-10-7.ap-southeast-1.compute.internal (10.10.10.7) -> 20.2024-03-05T07:41:57+0000
Keys:  Help   Display mode   Restart statistics   Order of fields   quit
                                                 Packets                               Pings
Host                                          Loss%   Snt   Last   Avg  Best  Wrst StDev
1. 169.254.251.17                              0.0%   197    0.4   0.8   0.3  26.1   2.3
2. 192.168.168.1                               0.0%   197    4.4   2.0   0.6  46.1   5.4
   192.168.168.9
3. 192.168.168.2                               0.0%   196    1.0   0.9   0.7   3.1   0.2
   192.168.168.10
4. 172.16.16.2                                 0.0%   196   73.2  78.2  73.1  82.5   3.3
   172.16.16.10
5. 192.168.168.5                               0.0%   196   73.5  80.5  73.4 127.9   6.8
   192.168.168.13
6. 20.20.20.254                                0.0%   196   76.6  79.9  76.5  82.4   2.2
```

```
                                My traceroute  [v0.95]
ip-20-20-20-254.ap-northeast-1.compute.internal (20.20.20.2024-03-05T07:41:57+0000
Keys:  Help   Display mode   Restart statistics   Order of fields   quit
                                                 Packets                               Pings
Host                                          Loss%   Snt   Last   Avg  Best  Wrst StDev
1. 169.254.252.1                               0.0%   140    0.4   1.1   0.4  34.3   3.3
2. 192.168.168.5                               0.0%   139    3.9   5.0   1.2  31.8   5.8
   192.168.168.13
3. 192.168.168.6                               0.0%   139    3.6   2.8   1.1  19.2   3.0
   192.168.168.14
4. 172.16.16.1                                 0.0%   139   76.0  78.5  76.0  80.8   2.3
   172.16.16.9
5. 192.168.168.1                               0.0%   139   76.2  82.0  76.2 134.9   8.6
   192.168.168.9
6. 10.10.10.7                                  0.0%   139   76.7  79.3  76.5  84.1   2.4
```

ULL Network Deployment

1

Deployment Details

Optimize deployment details to reduce hop counts and hence latency

2

Establishing Rescilience

Seek for resilience on critical components on your network such as DX locations & critical routes to ensure your ULL network is always up

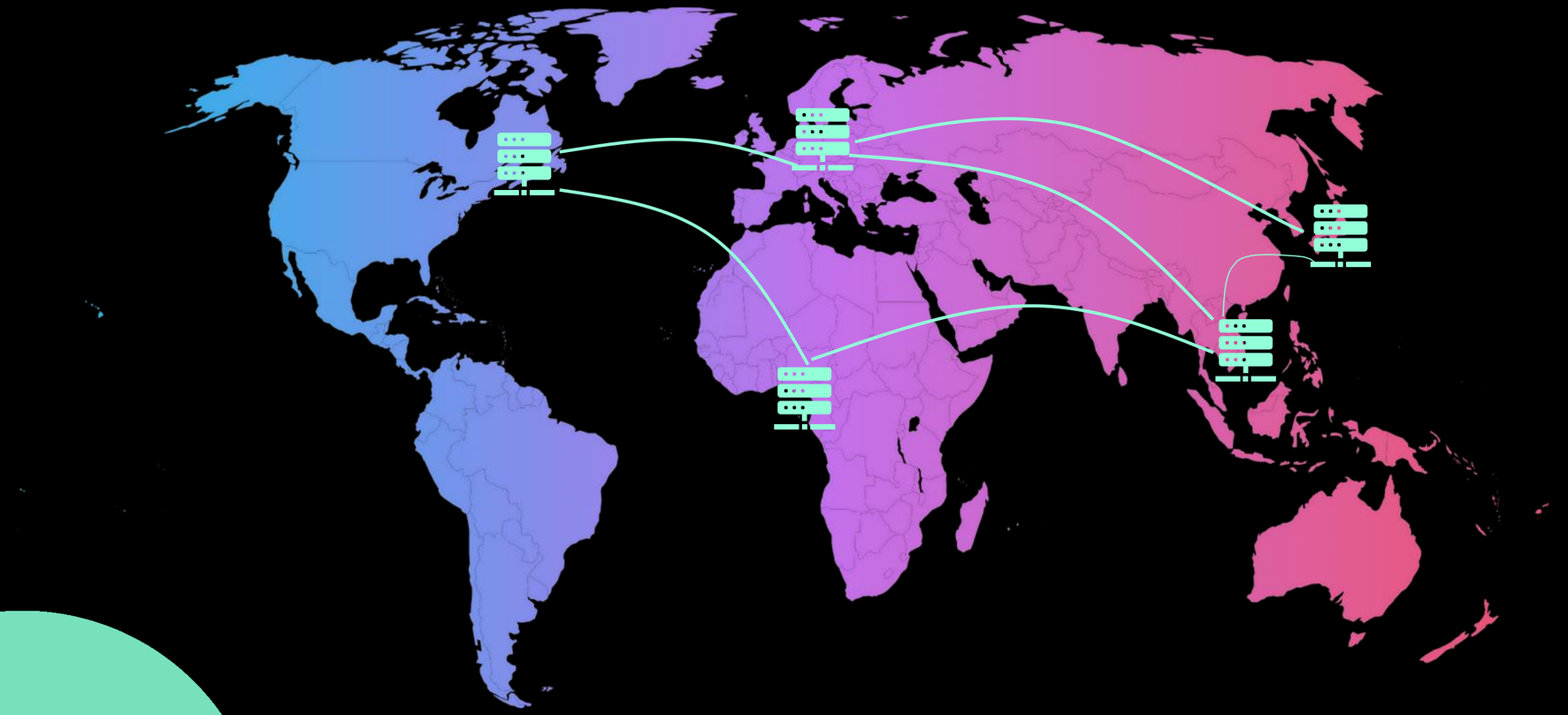
3

Cloud Native Network Utilization

Make use of cloud native Direct Connect product to establish Active/Standby solution

And..

Supercharging Web3 and Crypto Trading with
Edge Compute + ULL Network



- **Reduced Latency**
- **Global Edge Presence**
- **High-Performance Infrastructure**
- **Abundant IPv4 Resources**
- **Cost-Effective**
- **Enhanced Security**

Empowering Web3 and Crypto Trading: Real-World Applications

High-Frequency Trading (HFT)

- Ultra-low latency for split-second trade executions
- GPU acceleration for complex algorithmic trading

DeFi Platforms

- Efficient routing algorithms for quick data transmission
- Minimization of network congestion and delays

Decentralized Exchanges (DEXs)

- Distributed infrastructure for faster retrieval
- Reduced latency by bringing blockchain nodes closer to end-users

Web3 Gaming and Metaverse

- Prioritization of critical data packets
- Ensuring smooth and uninterrupted user experiences

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DIGITAL SERVICES

THANK YOU

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