INTERNET2

2022 TECHNOLOGY exchange

Resilient Connectivity Architectures for Your Cloud Environment

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Networking For Cloud

Note: I have the most experience with AWS; most examples will reference AWS

If we don't keep this interactive it's going to be a tedious 3 hours

I'm still n

Danger! : I reserve the right to be completely wrong!

Storytime

Storytime

Table of Contents

Goals

- Inventory of *Your* cloud services
- Understanding Resiliency options
- Expert on Internet2 “Networking for Cloud”
- Apply your knowledge to your cloud environment
- Gain feedback from all of you

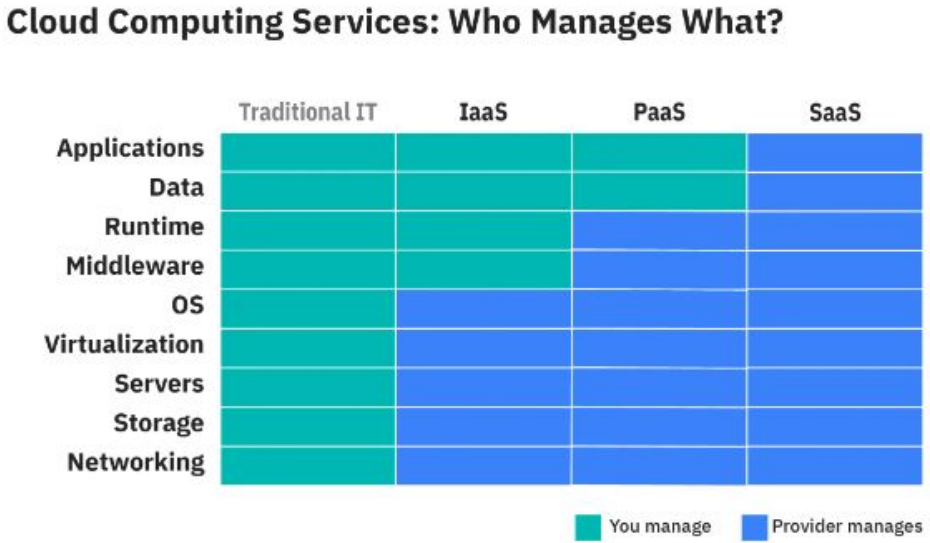
Cloud Service Models

Know your cloud service models

IaaS can be thought of as the original 'as a service' offering: Amazon Web Services, Google Cloud, IBM Cloud, Microsoft Azure - began by offering some form of IaaS.

Examples of **PaaS** solutions include AWS Lambda, Google App Engine, Microsoft Windows Azure

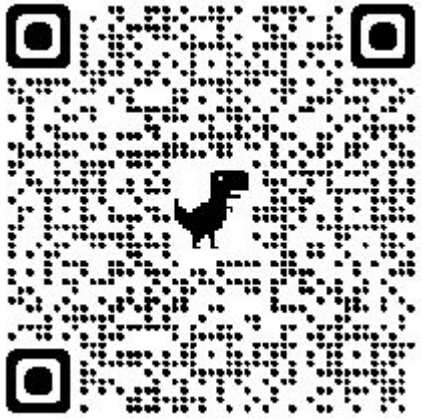
Examples of **SaaS** solutions include Salesforce (CRM software), Box/Dropbox (cloud storage), Trello (workflow management), Slack (collaboration and messaging), and Office 365 (productivity apps).



Cloud Services Inventory

Cloud Service	Cloud Service Model (Traditional IT, IaaS, PaaS, SaaS)	How do users reach the service? Internet -or- Private Connection
AWS VPC	IaaS	Private Connection (IPSEC/VPN)
O365	SaaS	Internet
Box	SaaS	
Windows Azure	PaaS	

Cloud Services Inventory



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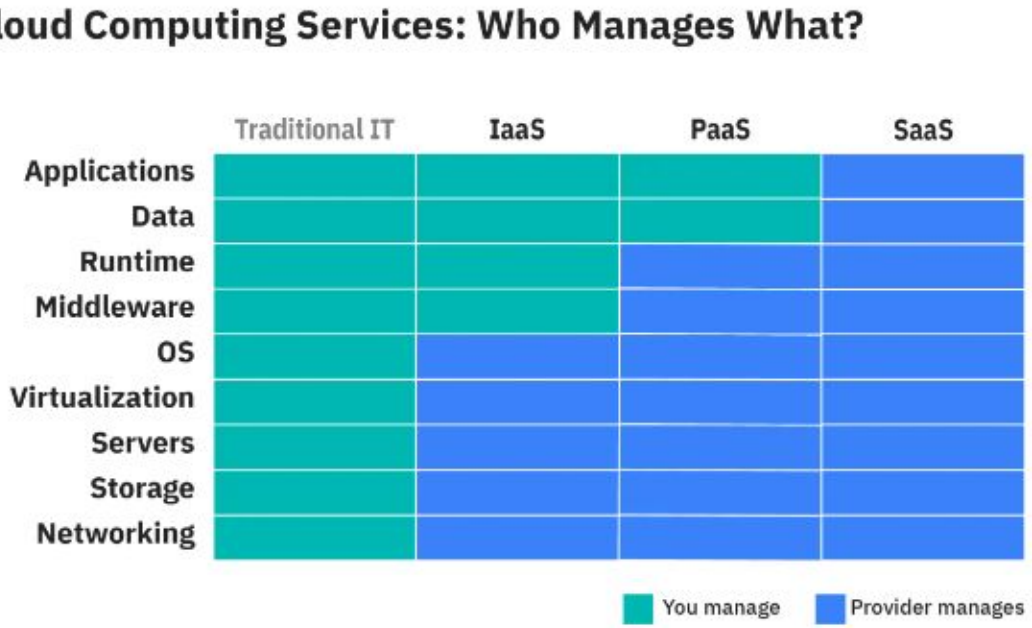


https://docs.google.com/spreadsheets/d/1y3KTmGPRIrws21N_Ey6qQn4352O7dKNcAPaDD_1LKH8/edit?usp=sharing

Cloud Connectivity Strategies

Cloud Connectivity Strategies

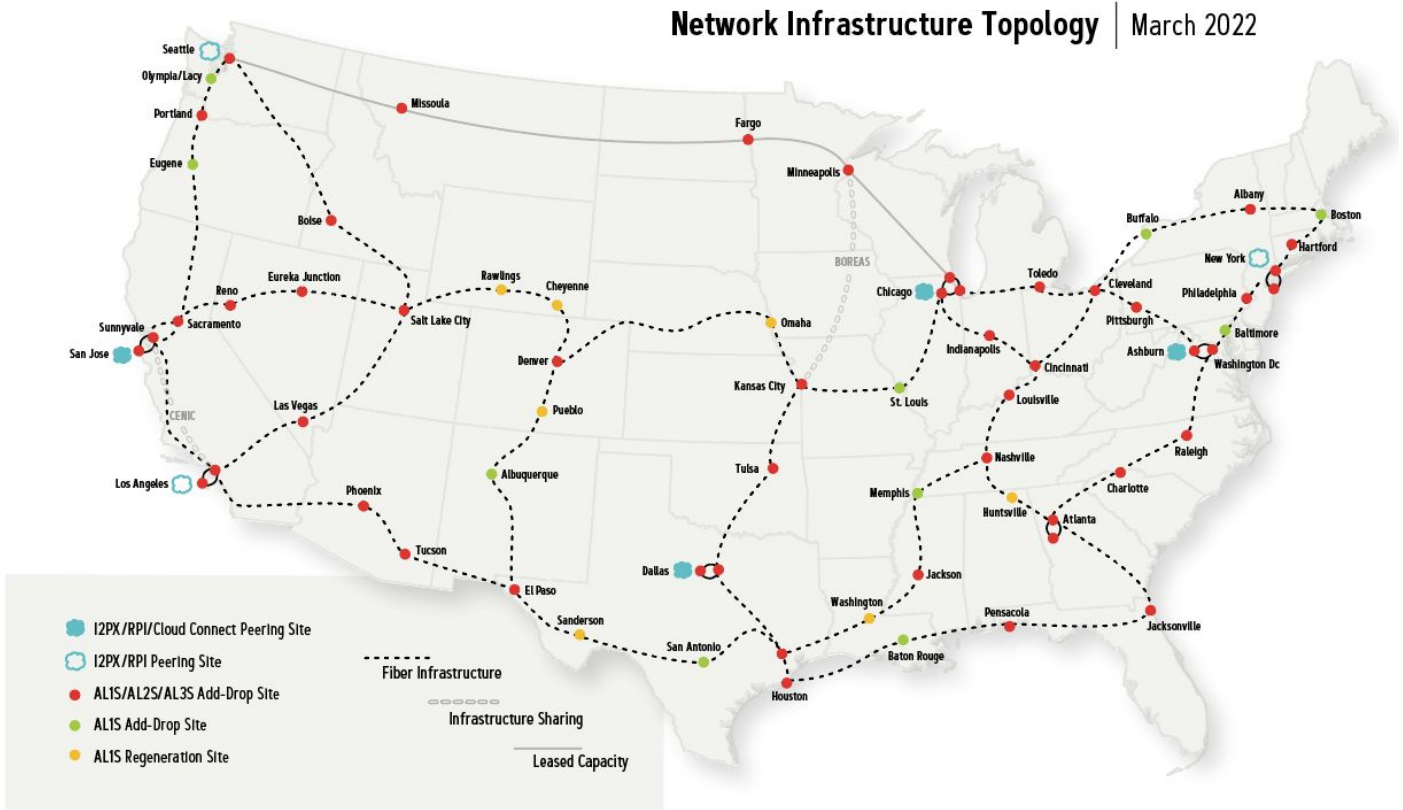
- VPN Tunnels
- Public Internet
- Private MPLS circuits
- Dedicated Connectivity (Direct Connect, Express Route, etc.)

Public Internet for Cloud Connectivity

I2 Peer Exchange (I2PX): for SaaS cloud services

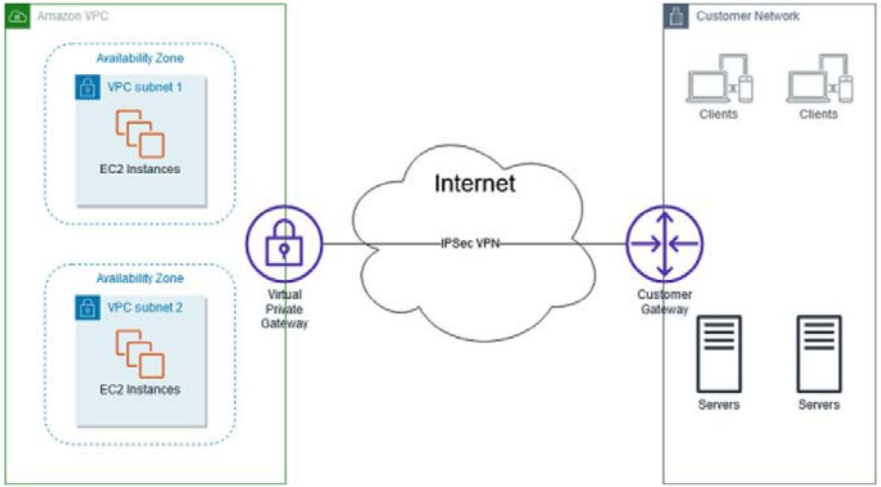
- > 3 Tbps peering capacity with major providers for access to cloud SaaS services
- Available to all Internet2 Connectors at no extra cost
  (not necessarily passed on to participants behind connectors)
- Large capacity paths to many cloud providers. Mostly 100G interconnects with AWS, Microsoft, Google, Oracle.
- CDN Access: Used by many cloud services for hosting bulk content
- I2PX gives access to everyone's public cloud hosted services.
- Access to all of the US cloud regions for the big 4 cloud providers.
- Access to smaller cloud providers (compute, storage, etc)

I2 Peer Exchange (I2PX): for SaaS cloud services



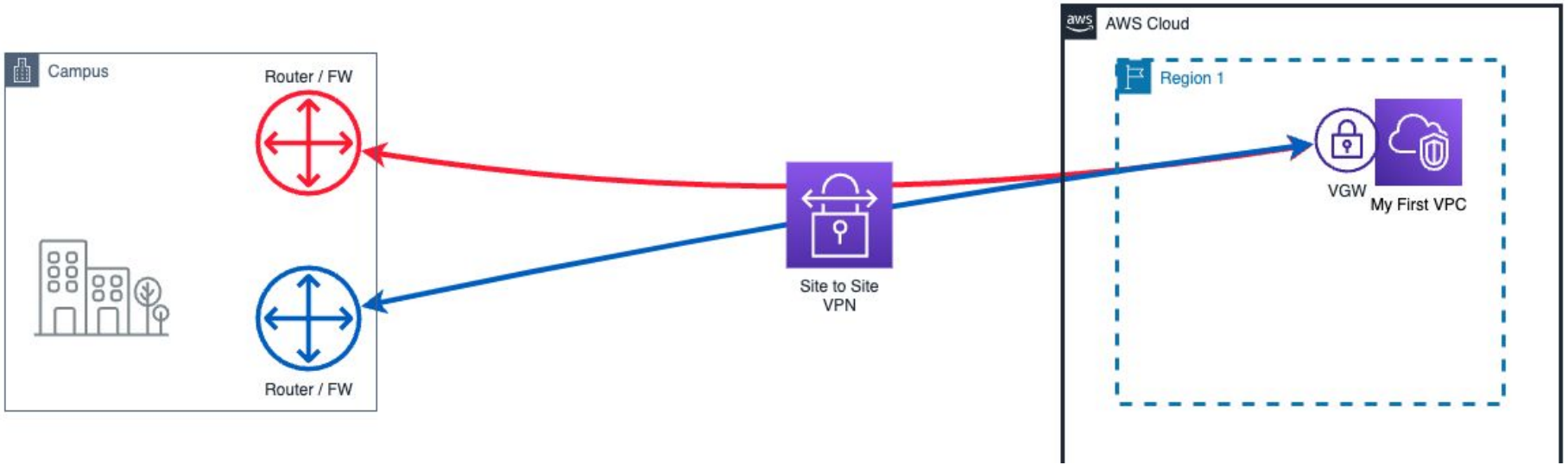
VPN Tunnels for Cloud Connectivity

Common Cloud Network Architectures: VPN

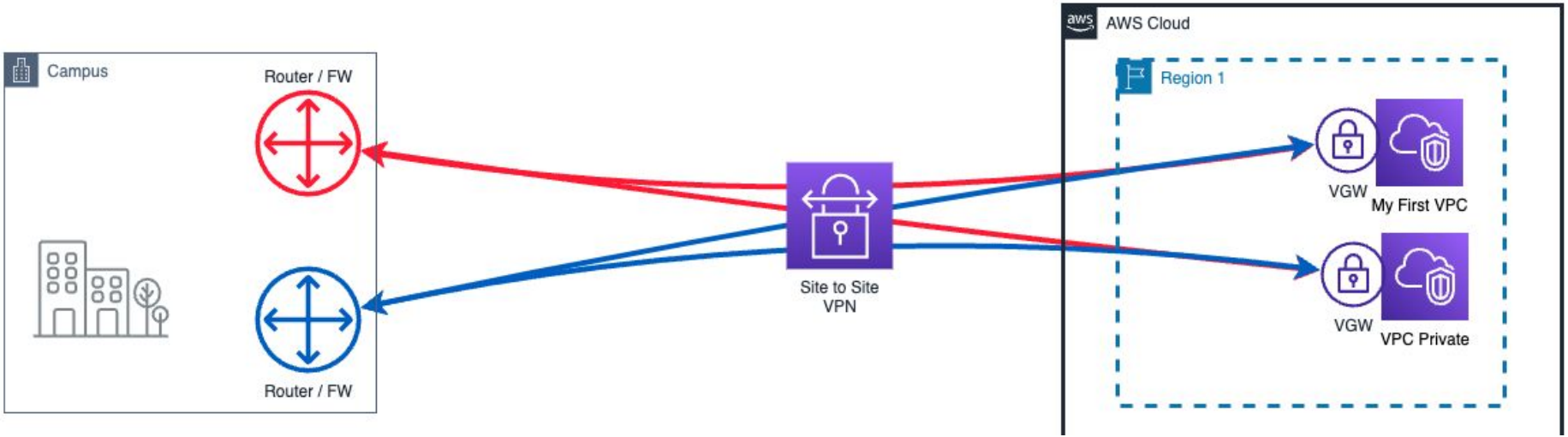


- Performance up to 1.25Gbps per tunnel
- Fully encrypted from campus to cloud
- Uses your existing Internet connections
- Can be cost effective for lower bandwidth needs
- Quick and Easy way to establish private connectivity to the cloud

VPN Tunnels


Campus
Router / FW
Router / FW
Site to Site
VPN
aws
AWS Cloud
Region 1
VGW
My First VPC

VPN Tunnels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VPC Private

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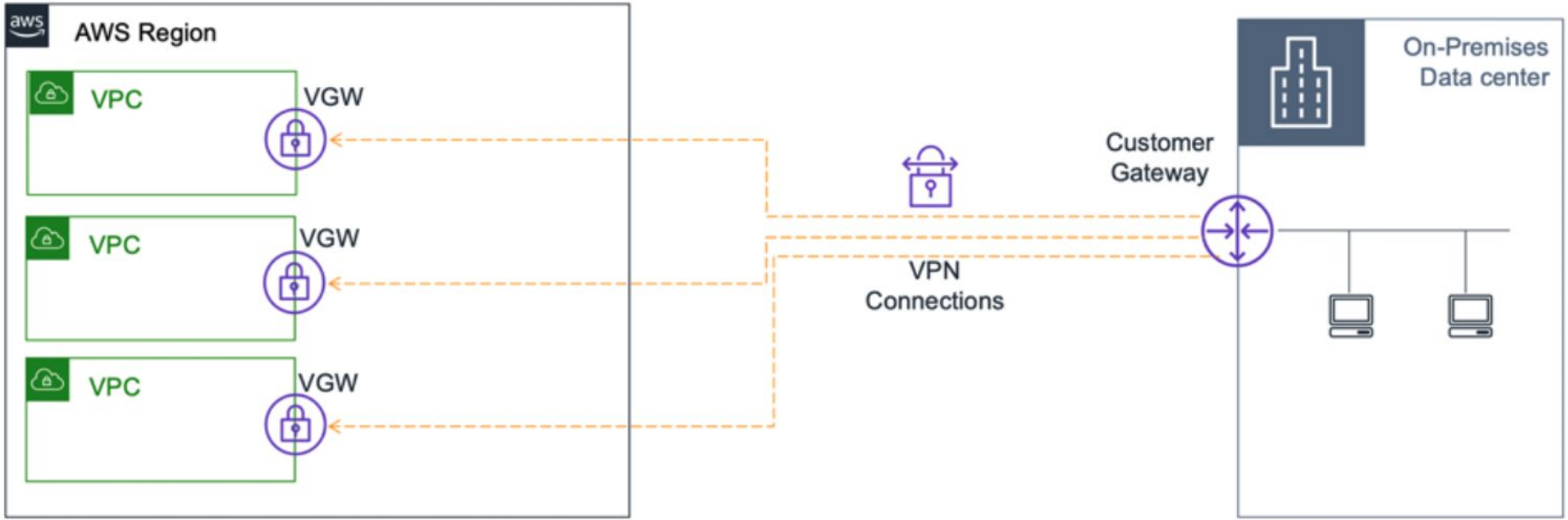

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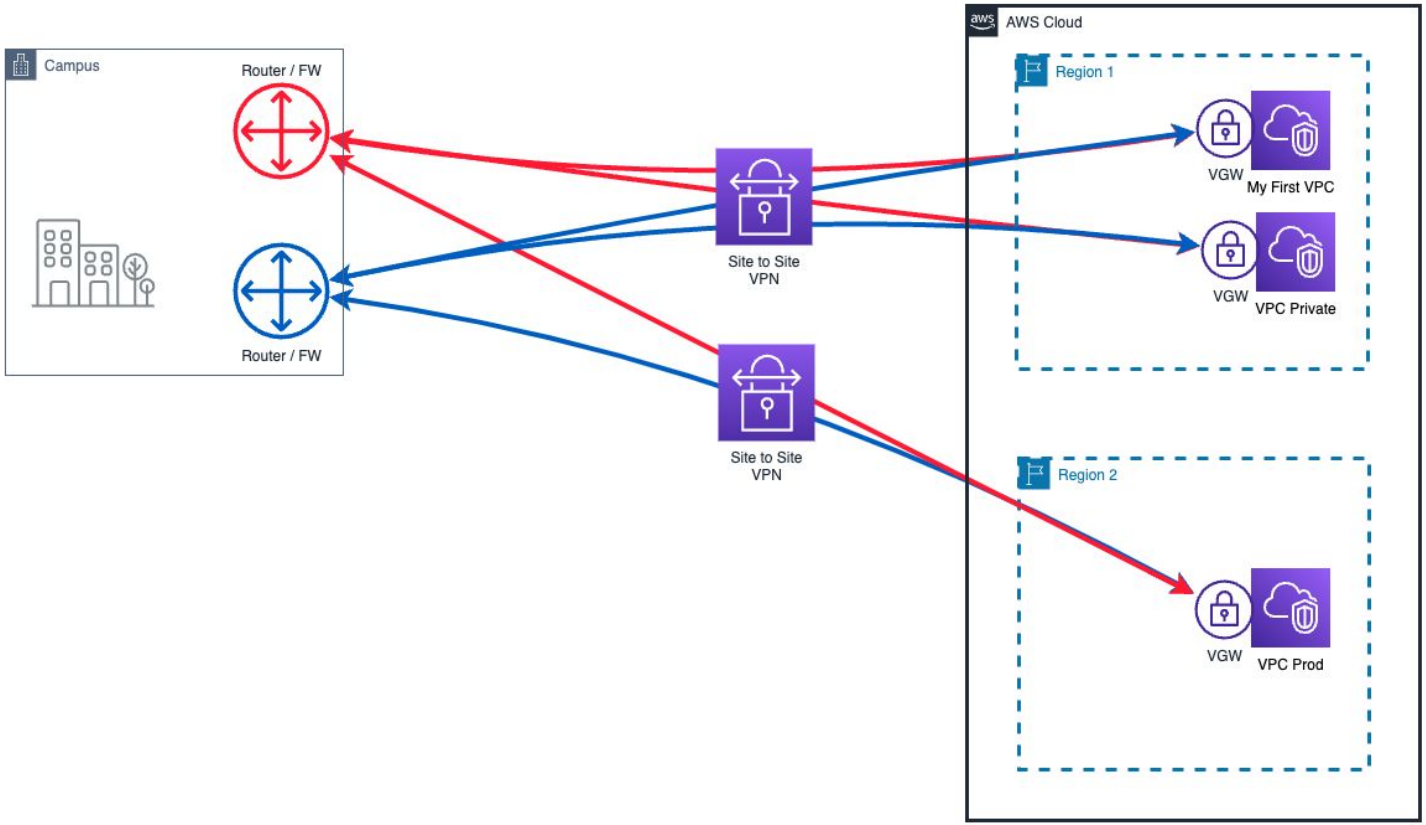
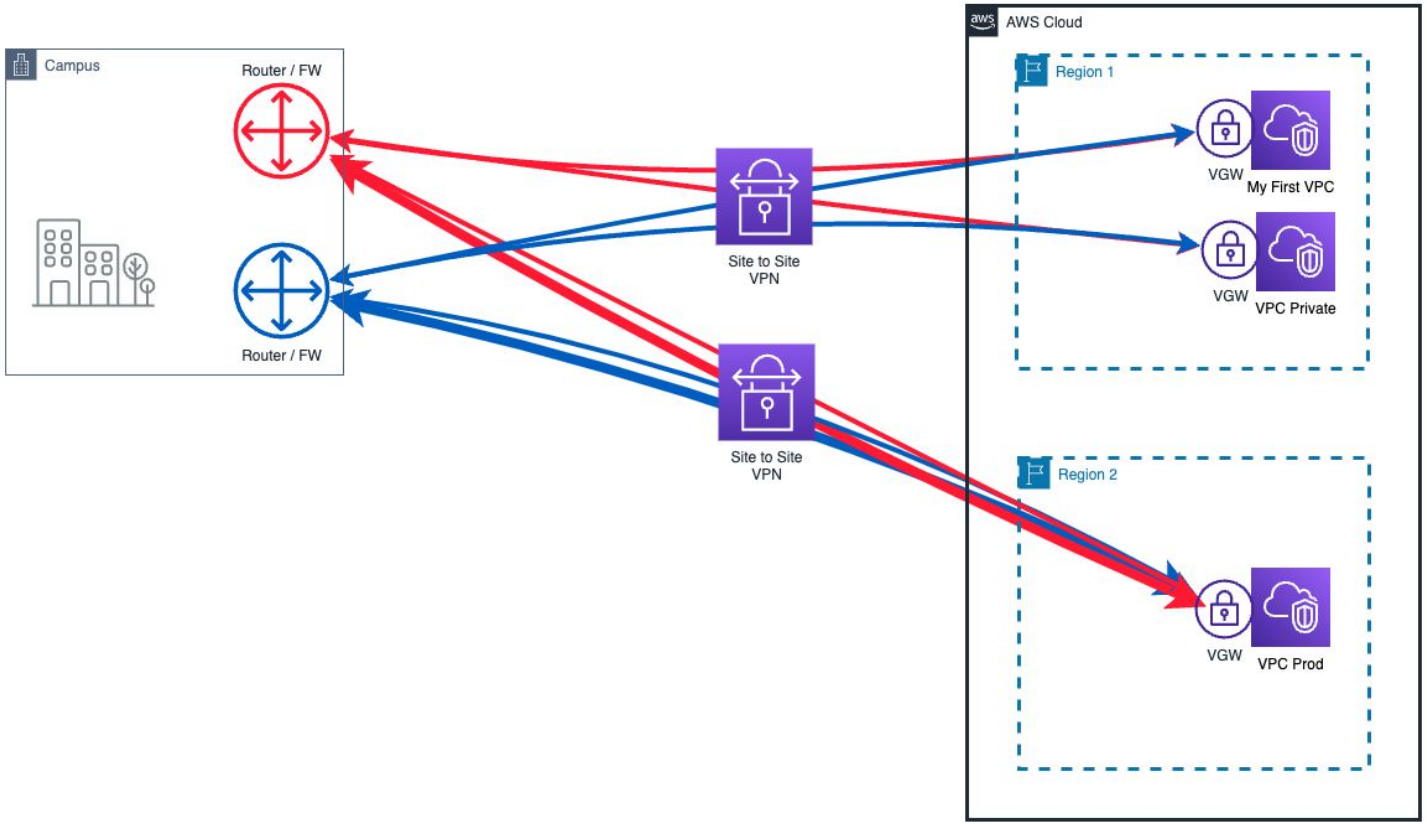

Campus
Router / FW
Router / FW
Site to Site VPN
Site to Site VPN
AWS Cloud
Region 1
VGW
My First VPC
VGW
VPC Private
Region 2
VGW
VPC Prod

VPN Tunnels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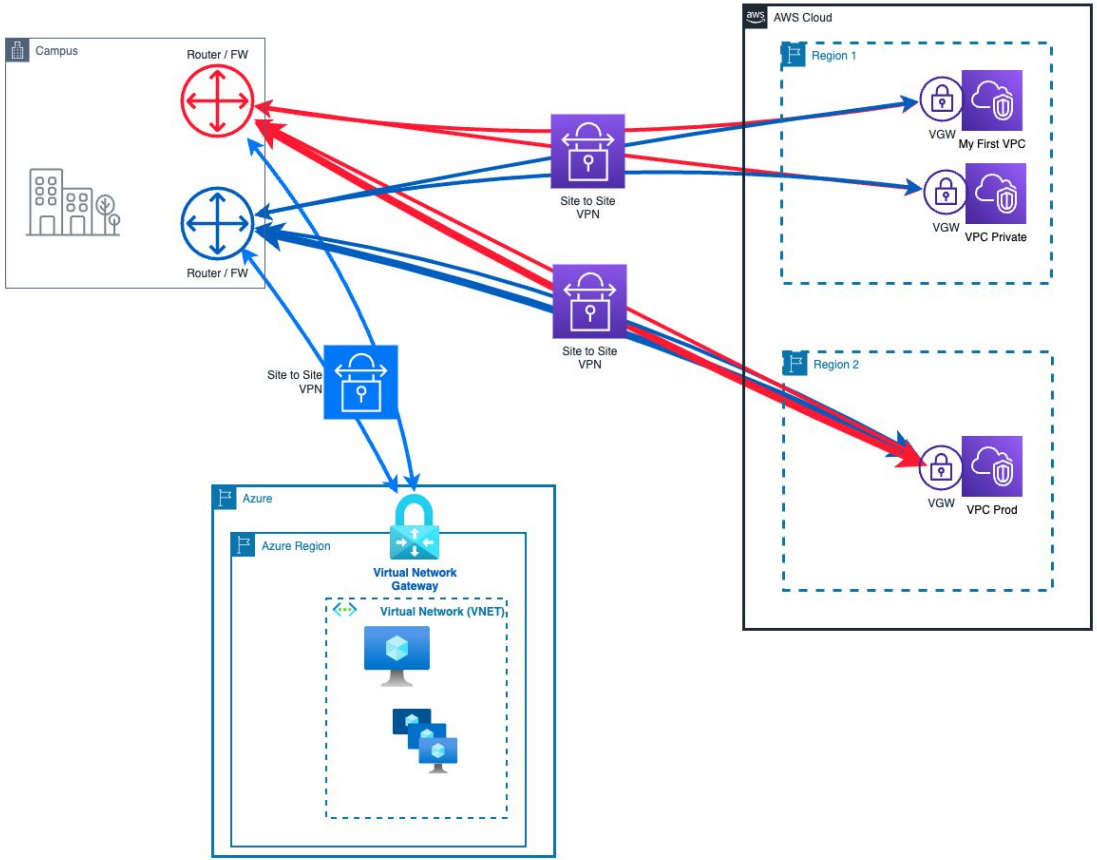
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VGW
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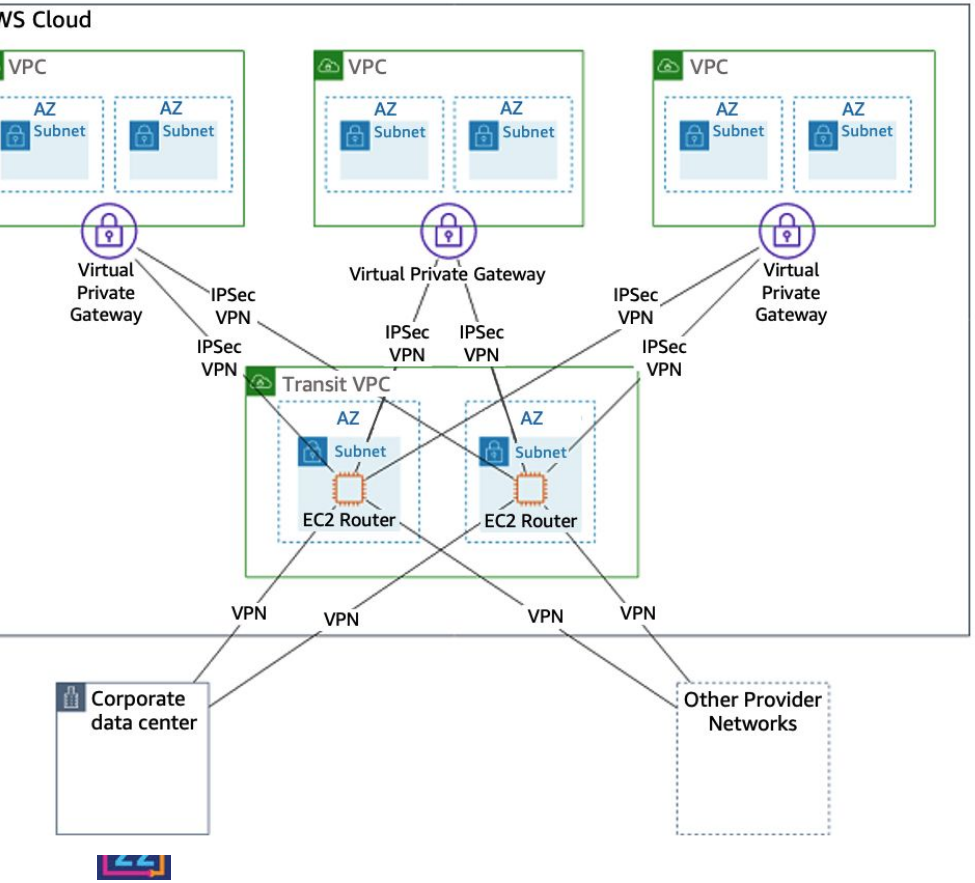
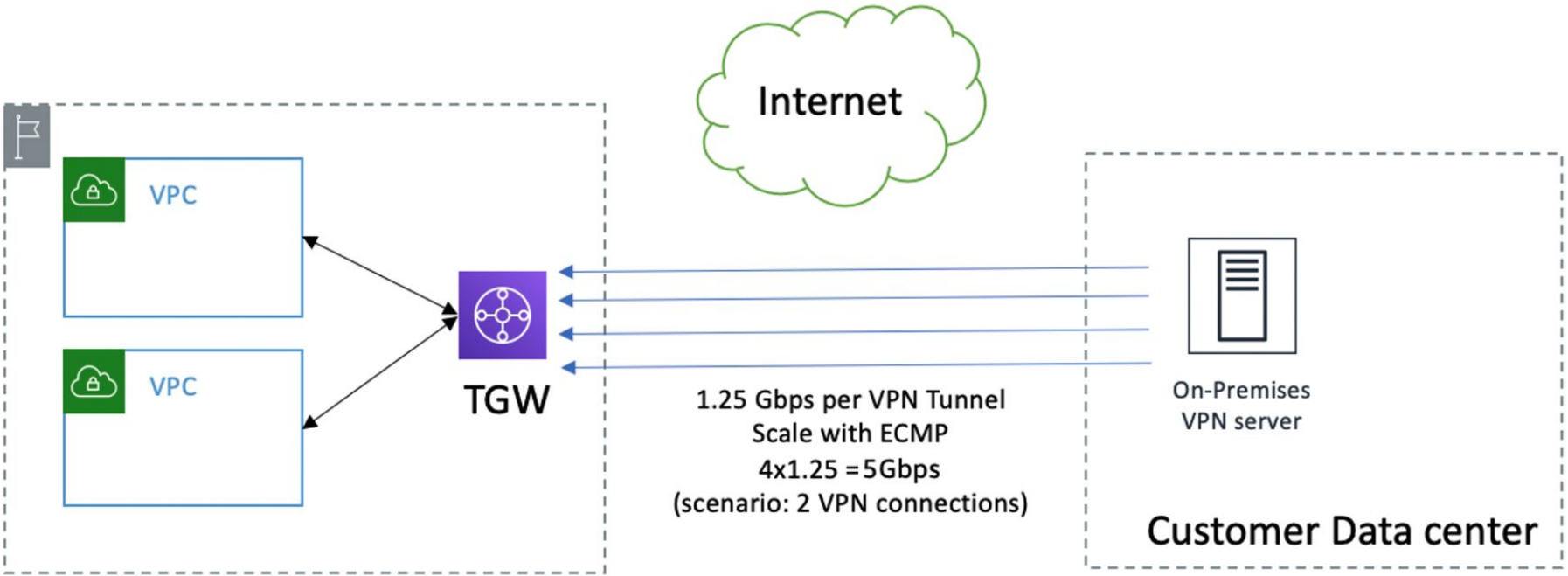
Site to Site VPN
Site to Site VPN
Site to Site VPN
Region 2
VGW
VPC Prod
Azure
Azure Region
Virtual Network Gateway
Virtual Network (VNET)

VPN Tunnels - Transit VPC Model



VPN Tunnels - Transit Gateway Model



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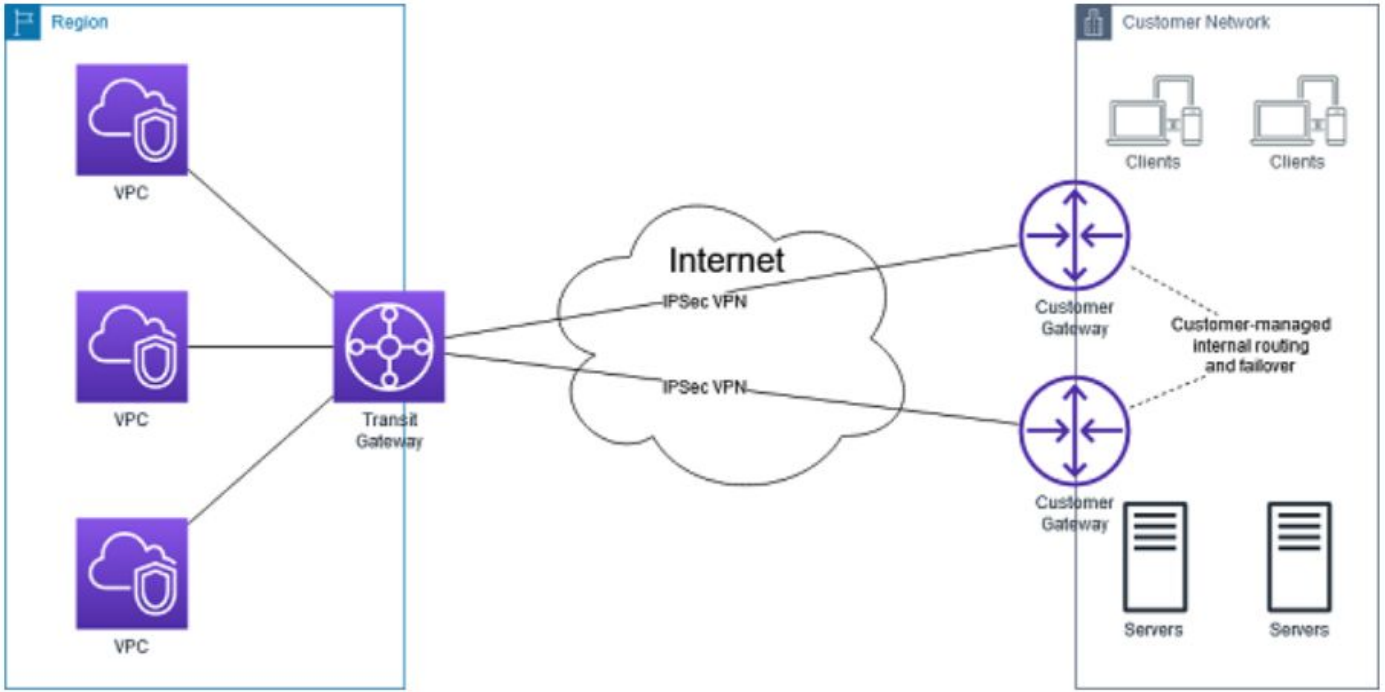
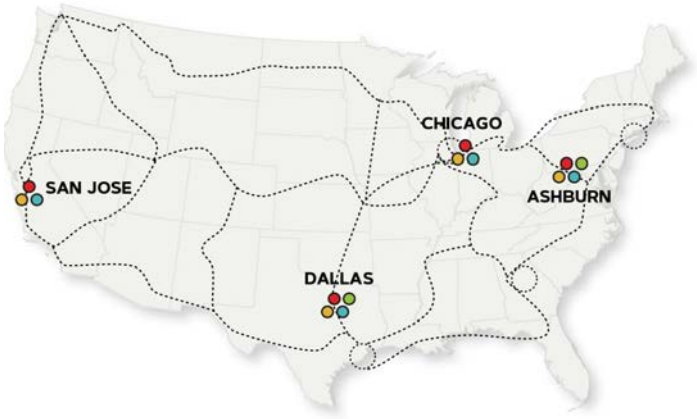


Networking For Cloud

I2 Cloud Connect (I2CC)

Four cloud service providers *(cloud provider fees apply)*
Up to 5G dedicated circuits *(no additional fee)*
Now Supporting(!!) 10G connections *(will include additional fee)*

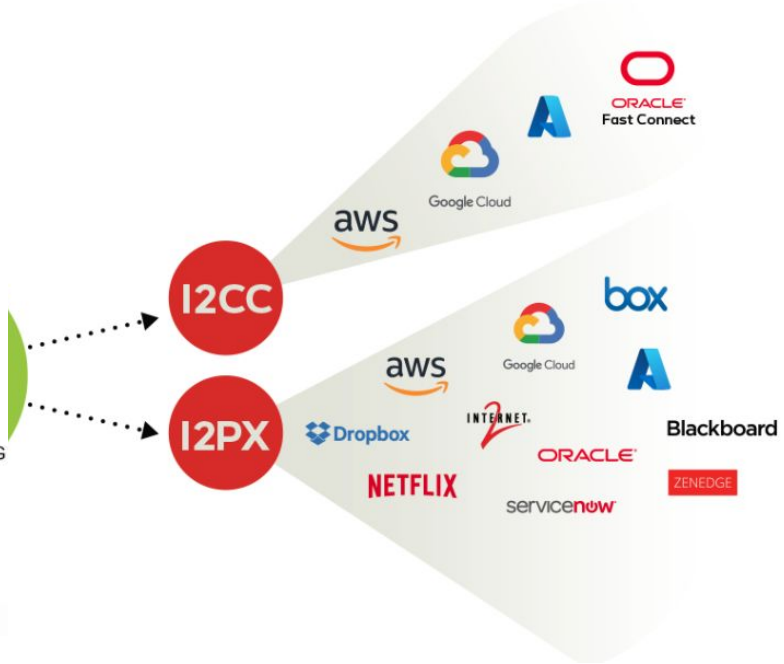


Amazon Direct Connect
Ashburn: 11x10G
Chicago: 4x10G
Dallas: 4x10G
San Jose: 4x10G

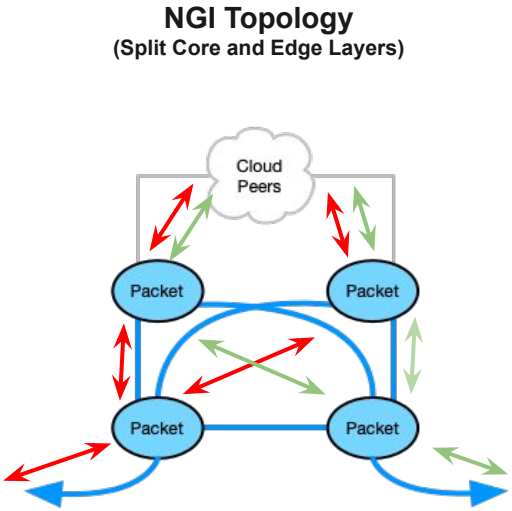
Google Cloud Interconnect
Ashburn: 1x100G, 1x2x10G
Chicago: 1x2x10G
Dallas: 1x2x10G
San Jose: 1x2x10G

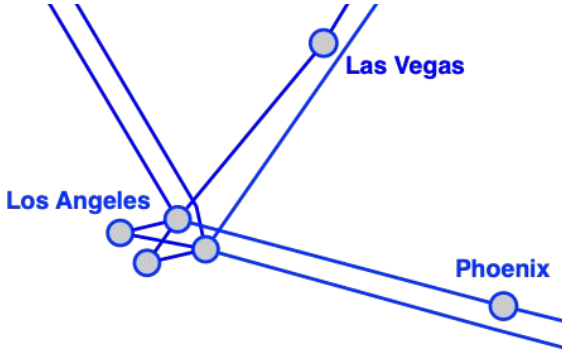
Microsoft ExpressRoute
Ashburn: 1x2x100G, 2x2x10G, 1x2x10G GovCloud
Chicago: 1x2x10G
Dallas: 1x2x10G, 1x2x10G GovCloud
San Jose: 1x2x100G, 1x2x10G

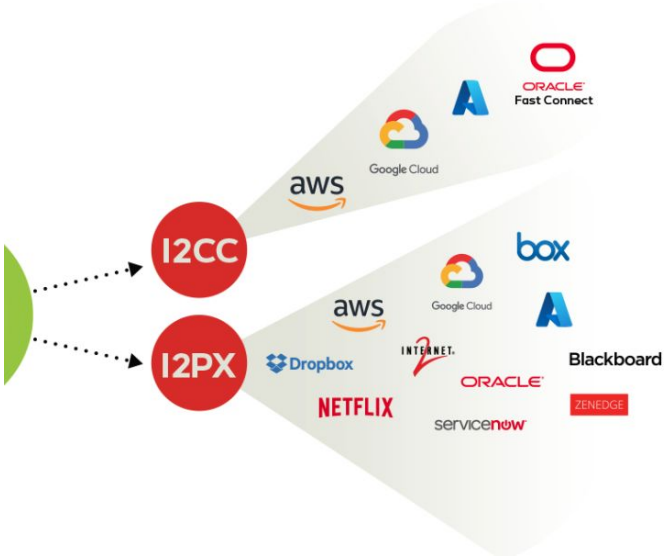
Oracle Fast Connect
Ashburn: 2x100G
Dallas: 2x100G



I2 Cloud Connect (I2CC)





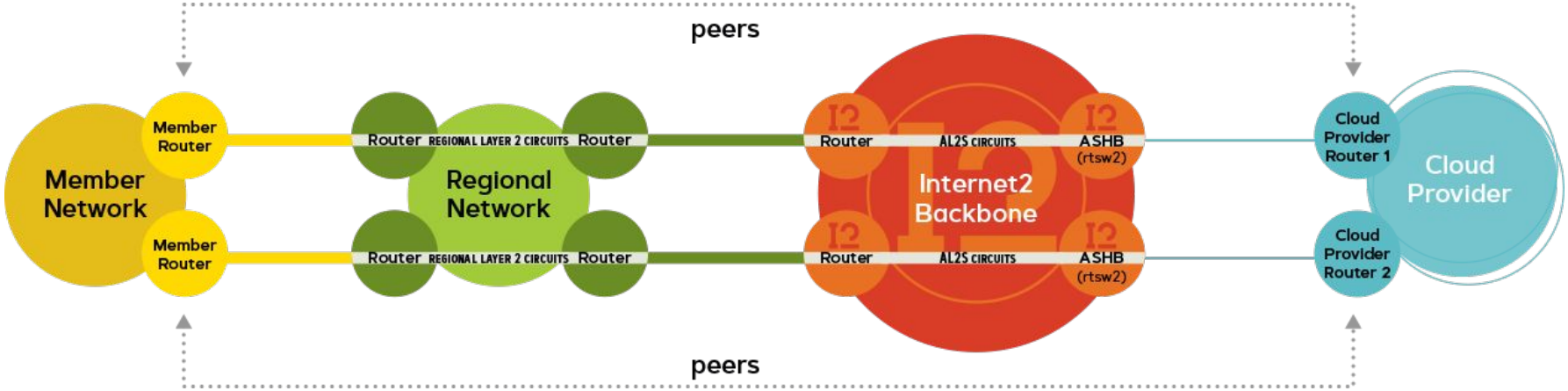


Dedicated Connections for Cloud Connectivity

I2CC Layer2 Connectivity

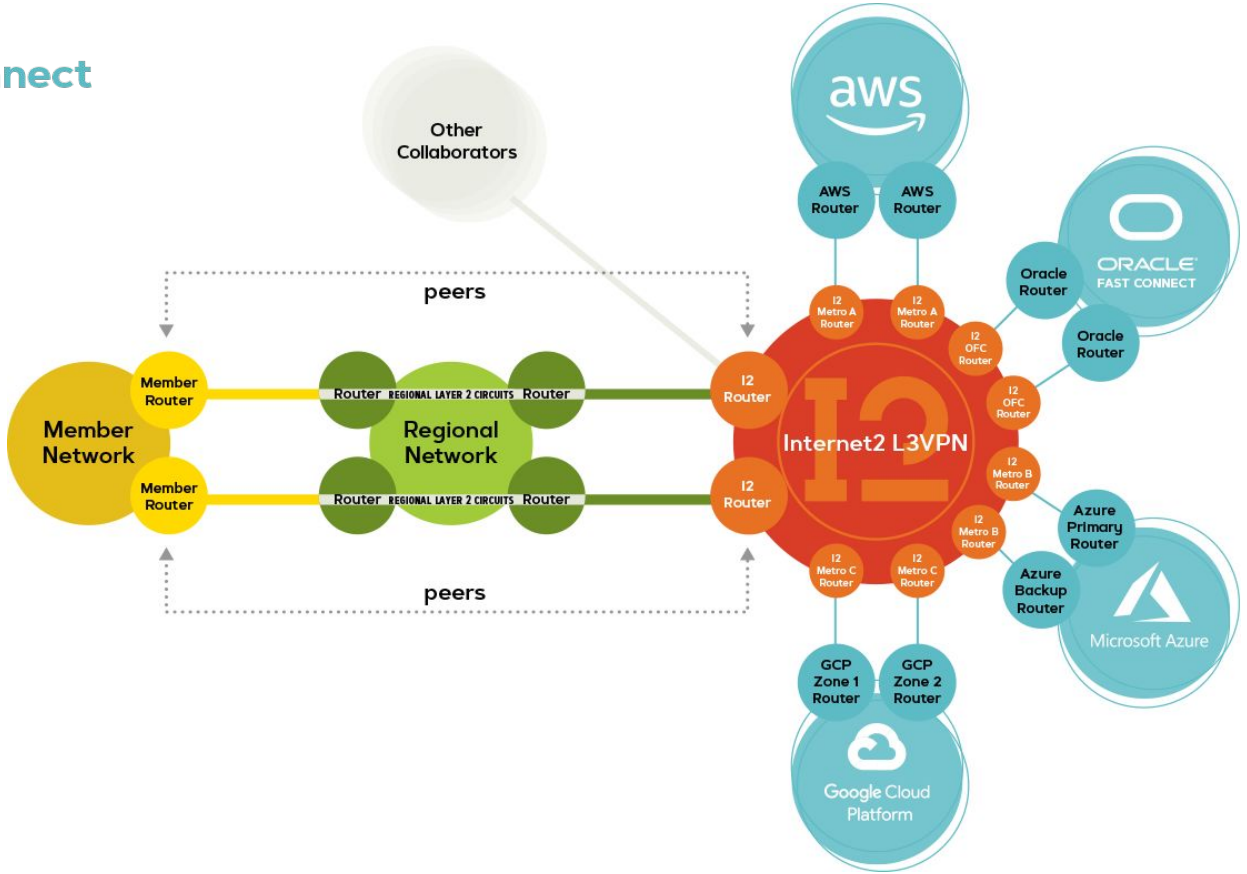
Internet2 Cloud Connect

I2CC



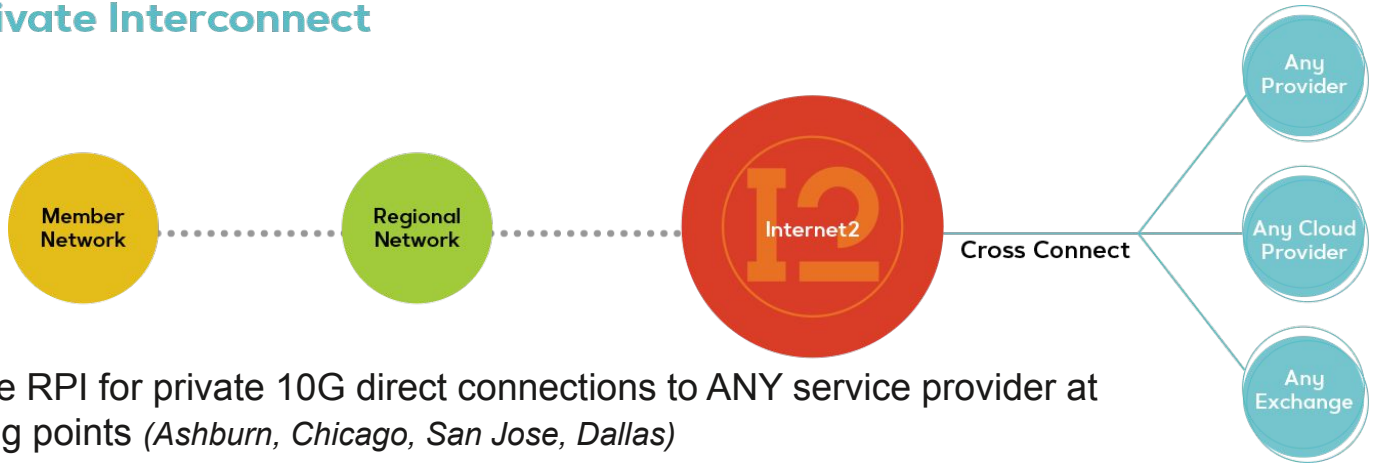
I2CC Layer3 Connectivity

Internet2 Cloud Connect
I2CC



I2 Rapid Private Interconnect (RPI) - Niche Cloud SP's

Internet2 Rapid Private Interconnect
I2RPI



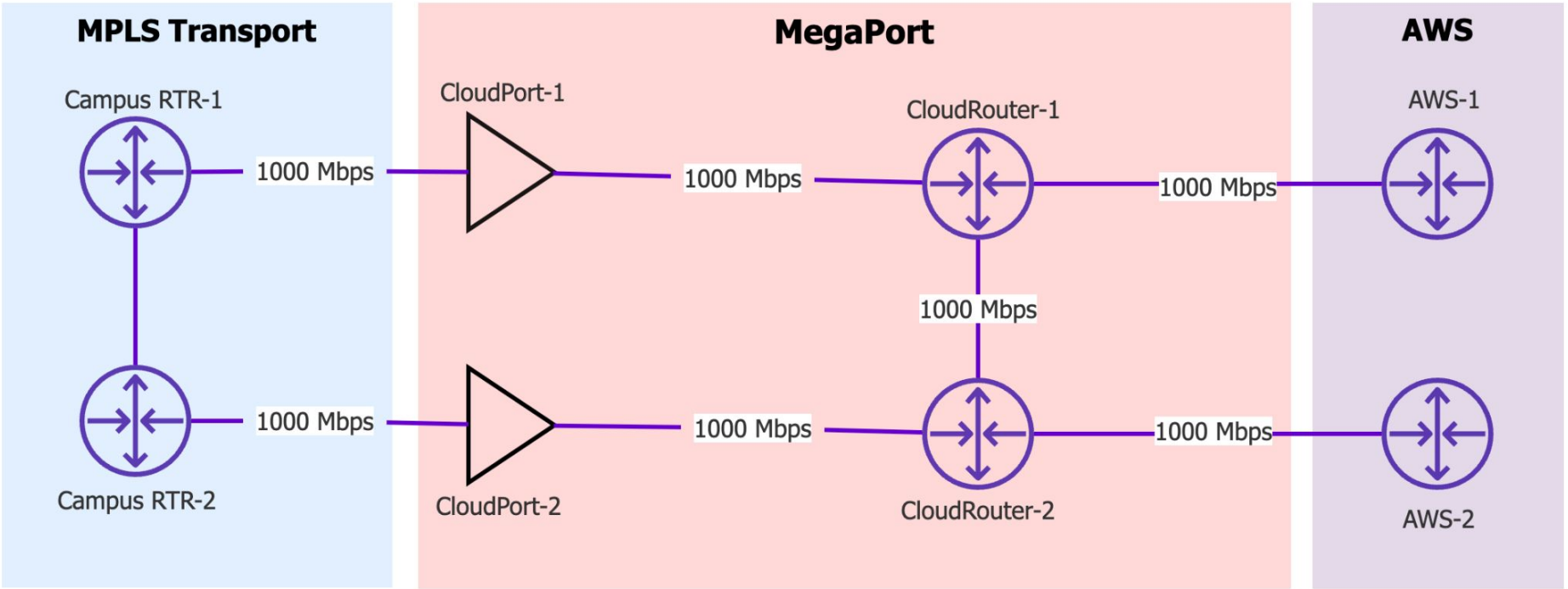
- Members can use RPI for private 10G direct connections to ANY service provider at four major peering points *(Ashburn, Chicago, San Jose, Dallas)*
- Members can use RPI for private 10G direct connections to Amazon Direct Connect, Google Cloud Interconnect, Microsoft Azure ExpressRoute, or Oracle Fast Connect services
- Can connect to peers at Layer 2 or Layer 3
- Available through your regional network today for an additional fee

Why, How and When to use I2CC

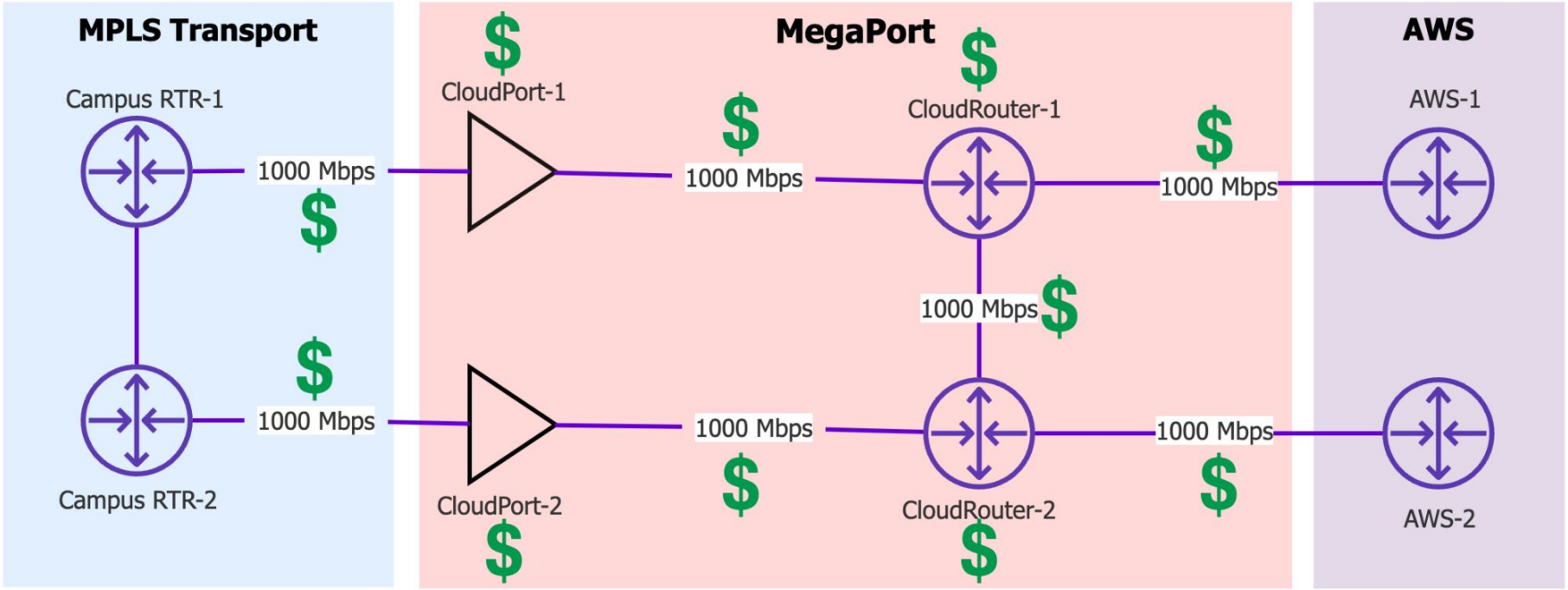
Why, how and when to use I2CC

- Boost Network Performance
- Architect for Resiliency
- Simplify Connectivity
- Better Supportability
- Reduce Cost

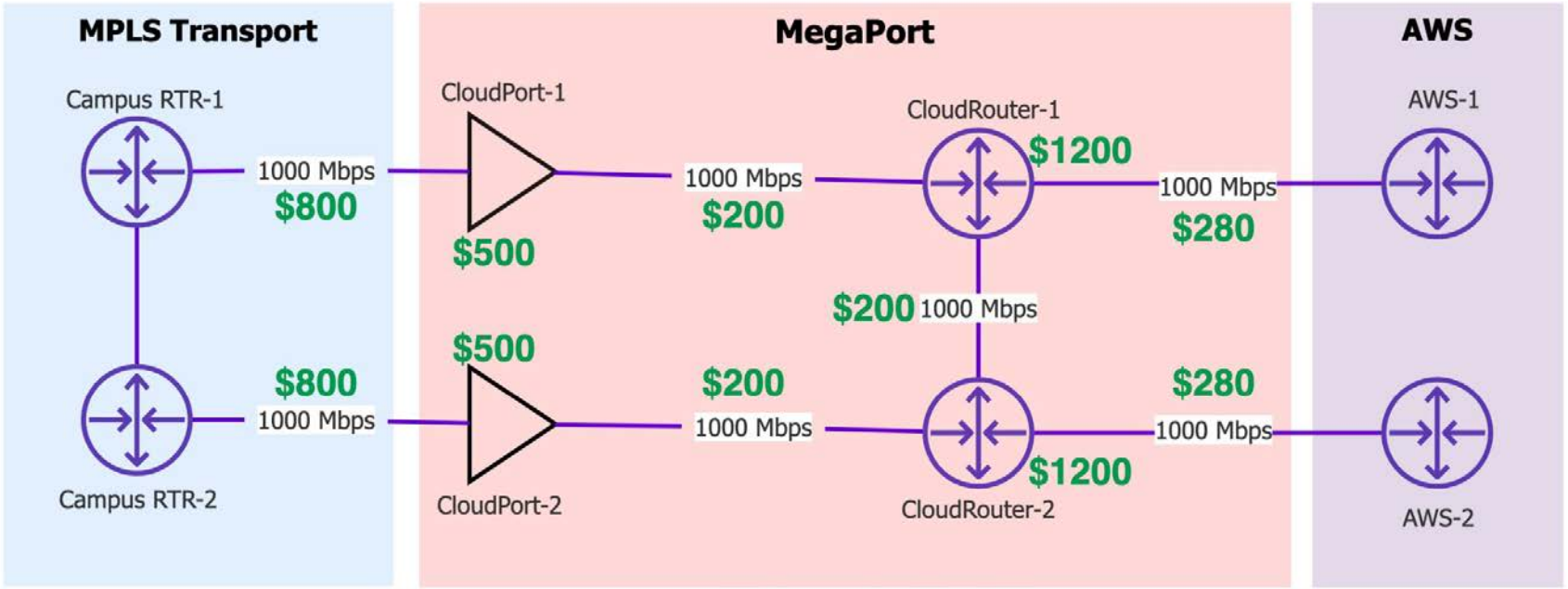
Let's talk Cost



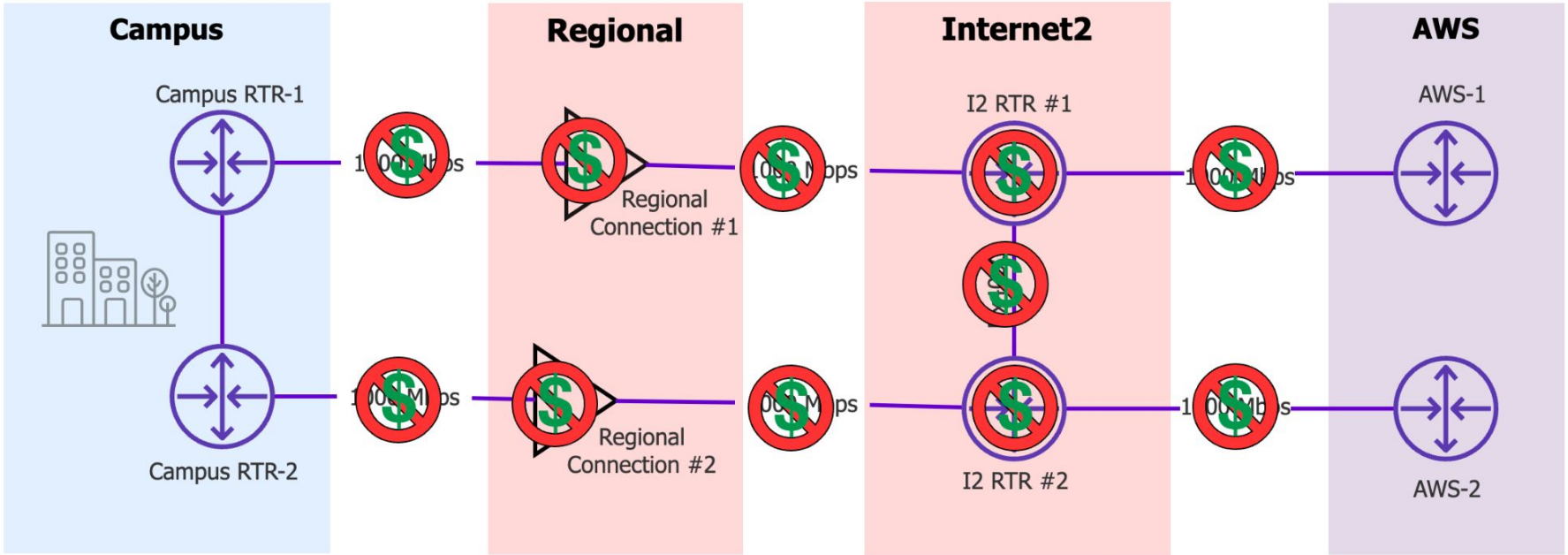
Megaport Example



Monthly Expense Example



I2CC Monthly Savings

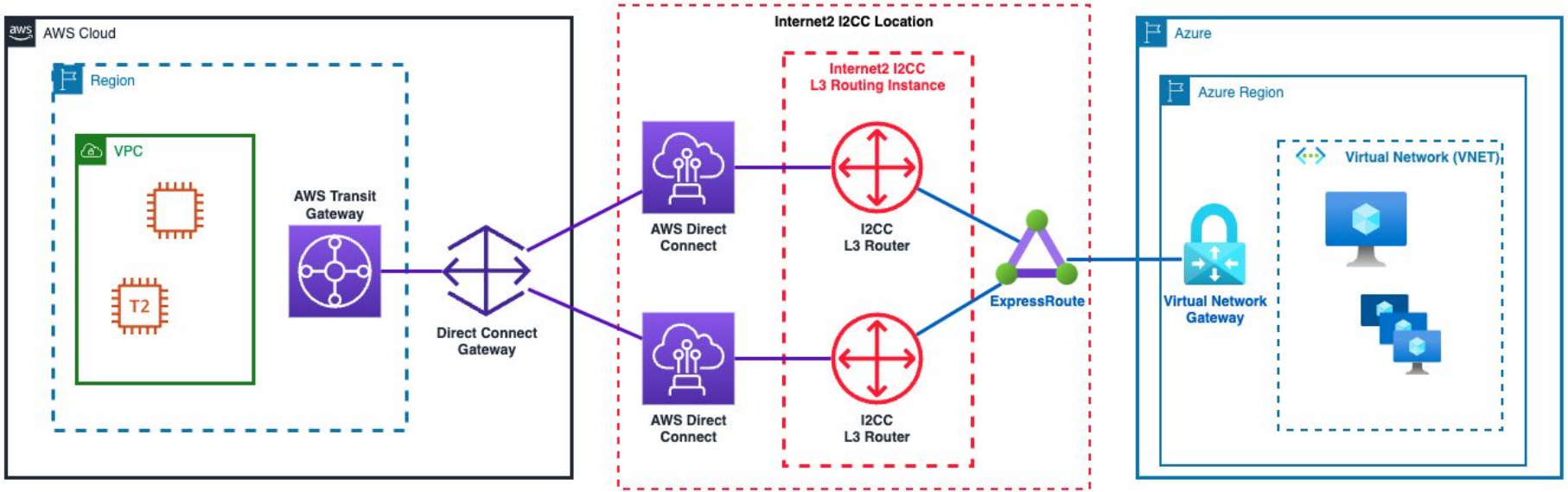


Total Monthly Savings = $6160

Putting it all together

Putting it all together - Build your own network

Cloud to Cloud Connectivity
Leverage I2CC so you are not hairpinning traffic back to campus
Could do this with VPN connectivity between clouds or leveraging Dedicated Connections



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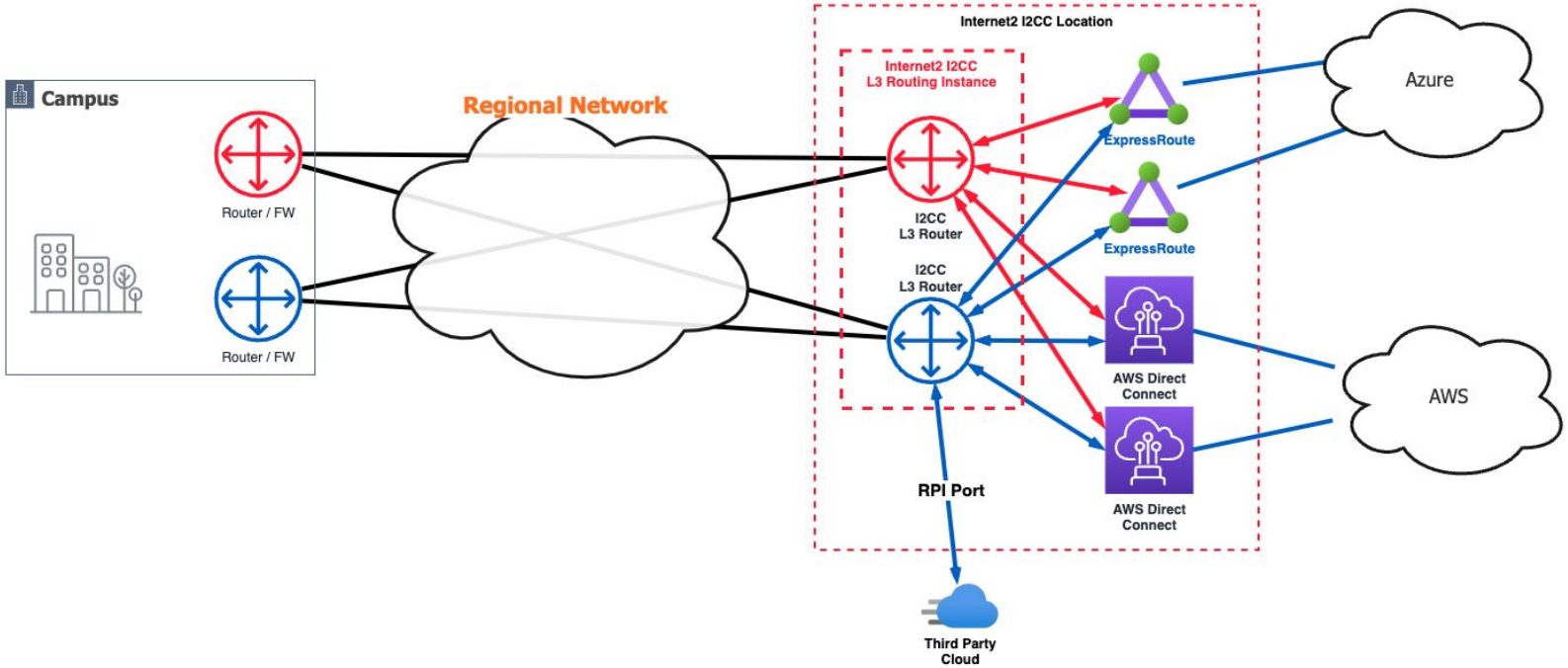

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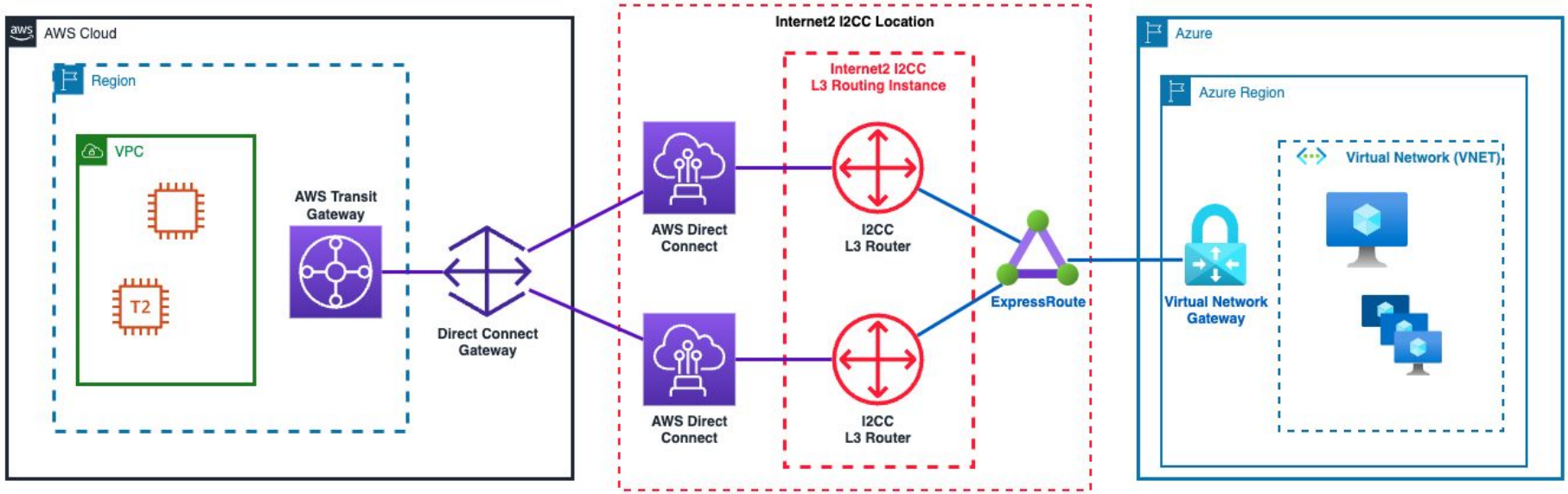


Cloud Services Inventory

Cloud Service	Cloud Service Model (Traditional IT, IaaS, PaaS, SaaS)	Primary Connectivity Strategy	Resiliency Strategy
AWS VPC	IaaS	I2CC	IPSEC / VPN: (I2PX + Commodity IP)
O365	SaaS	I2PX	Commodity IP (Internet)

http://bit.ly/3iuis5P

https://docs.google.com/spreadsheets/d/1CYIo6X8gOTf4vQiiO1etllF_Yx1pP70f5UgpL6xZd0M/edit?usp=sharing

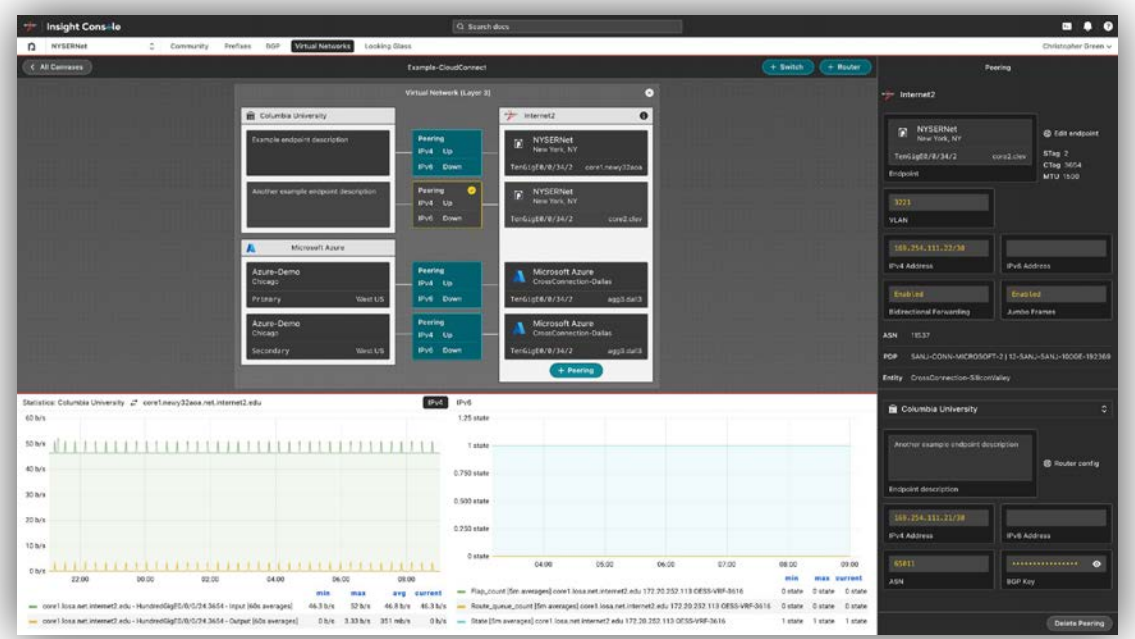
What’s Next?!

What's Next?!

- Internet2 Insight Console
- Regional Networking for Cloud Workshops
  - Hands on Labs
- What else do you want to see?
  - Best Practices
  - Templates
  - ???

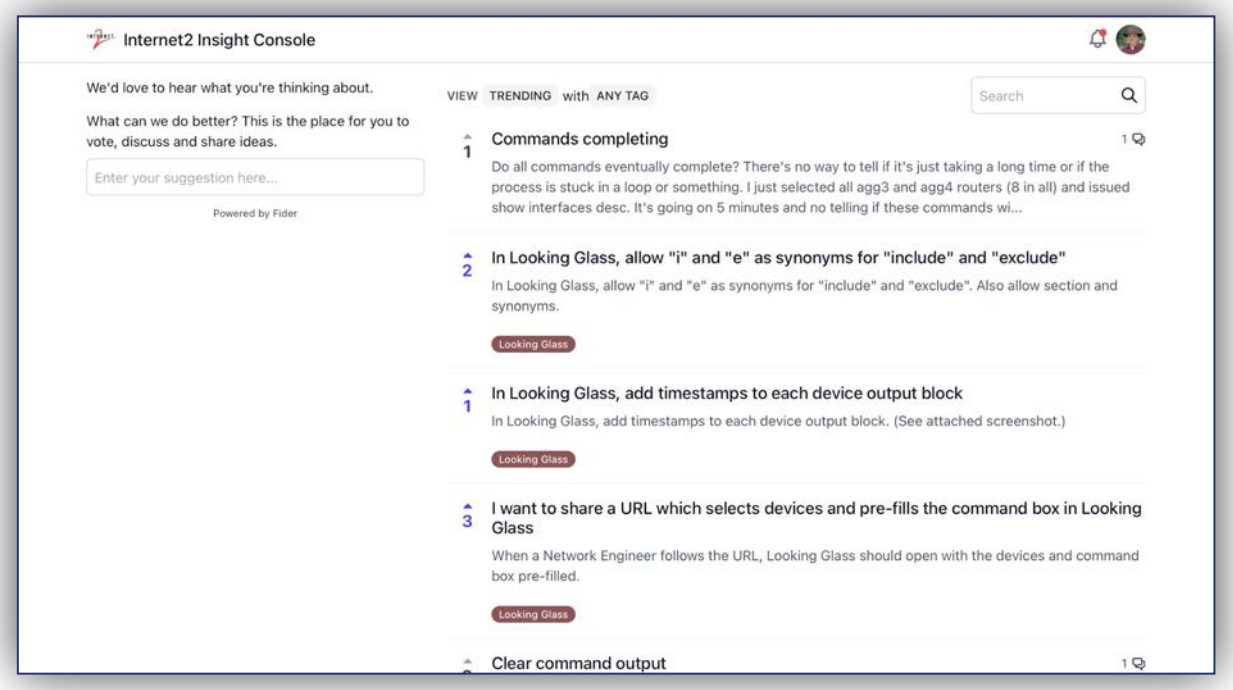
Take Insight Console for a test drive

usability.ns.internet2.edu



Plaza Room 5
Drop-in or schedule in advance

feedback.ns.internet2.edu



What should Insight Console do?

How can it be improved?

Share and vote on ideas.

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- ☑ Understanding Resiliency options
- ☑ Expert on Internet2 “Networking for Cloud”
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Feedback - Discussion - Questions?

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