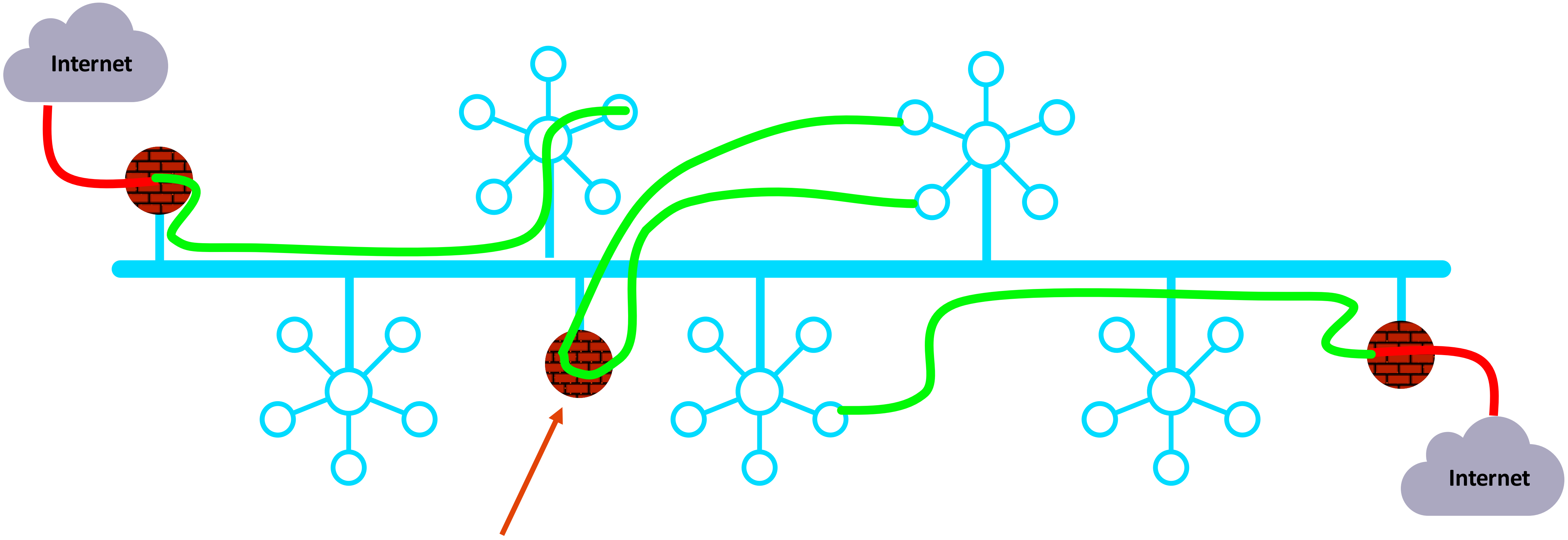
Distributed Cloud Firewall

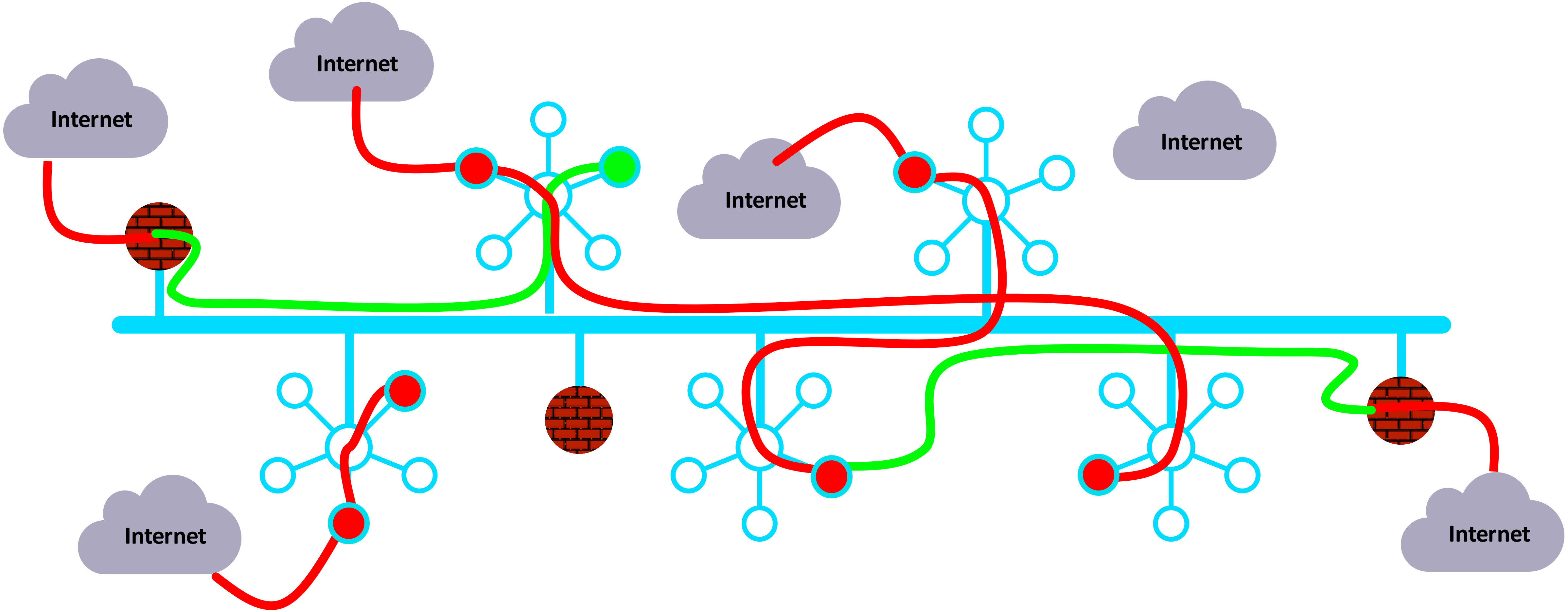
ACE Team

As Architected with Lift-and-Shift, Bolt-on, Data Center Era Products…



“Last Generation Firewalls”

In Reality...


Internet
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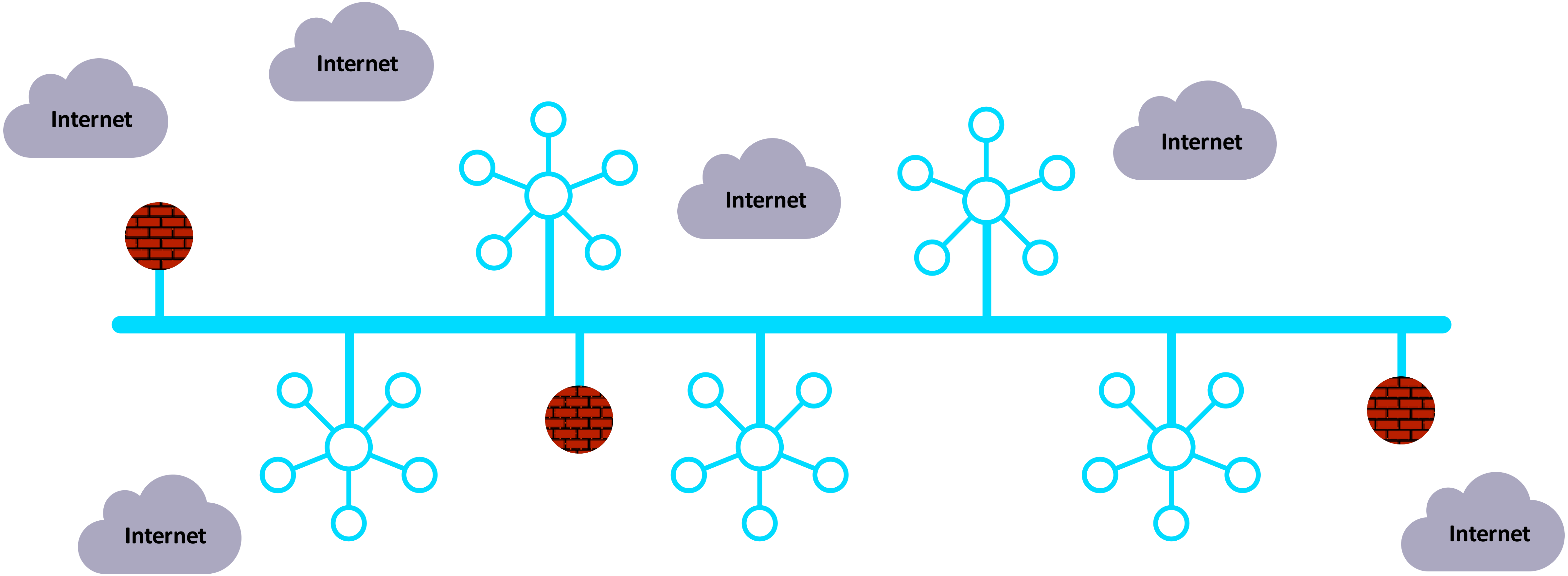
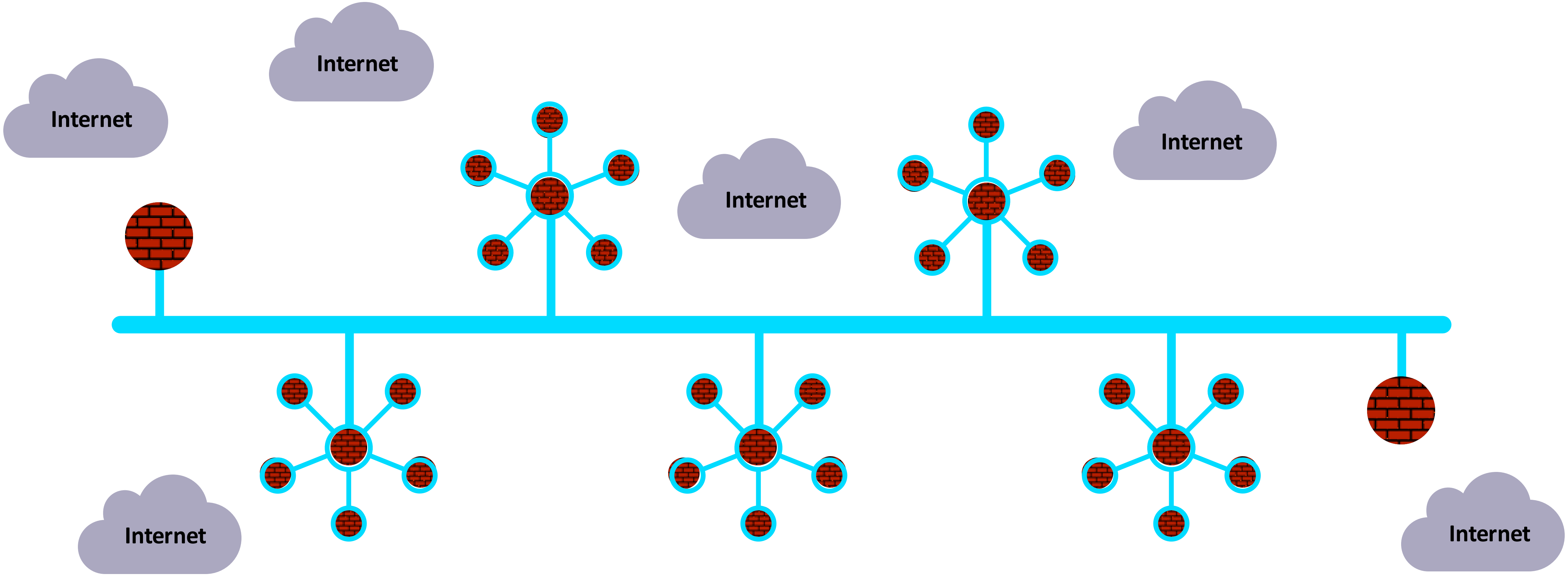
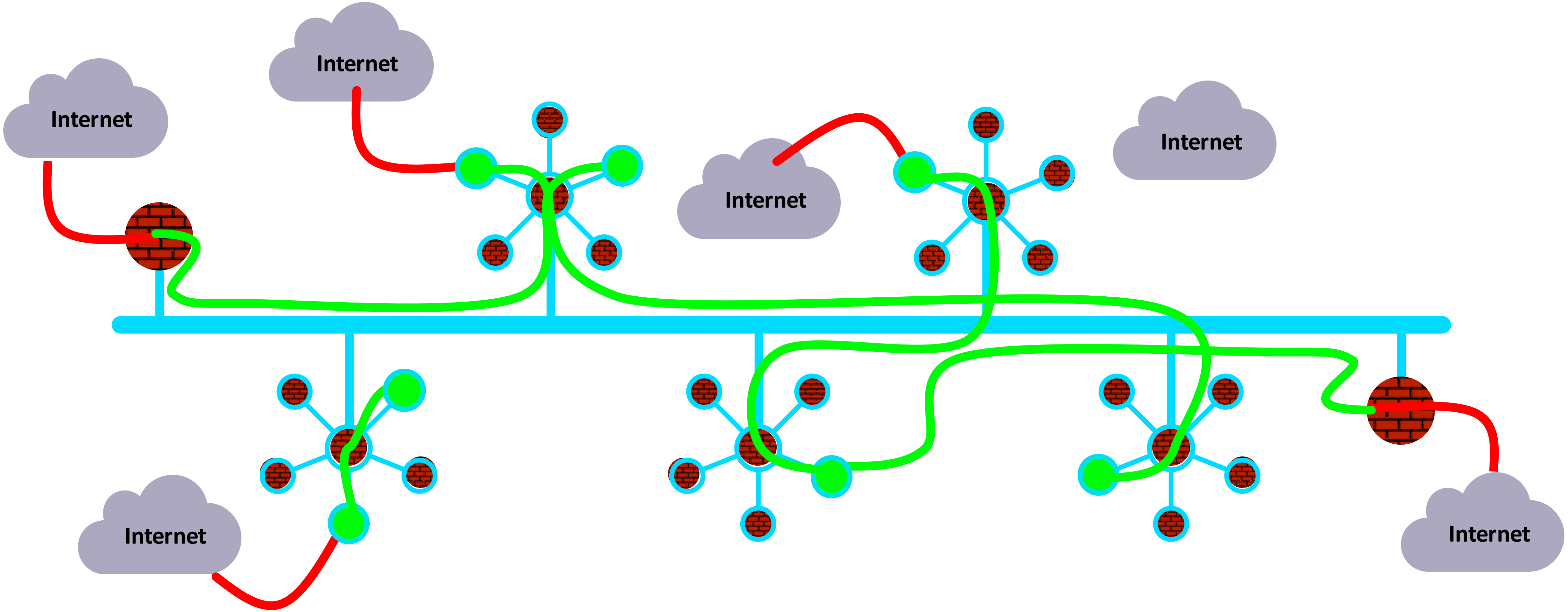
What If… the architecture was built for cloud



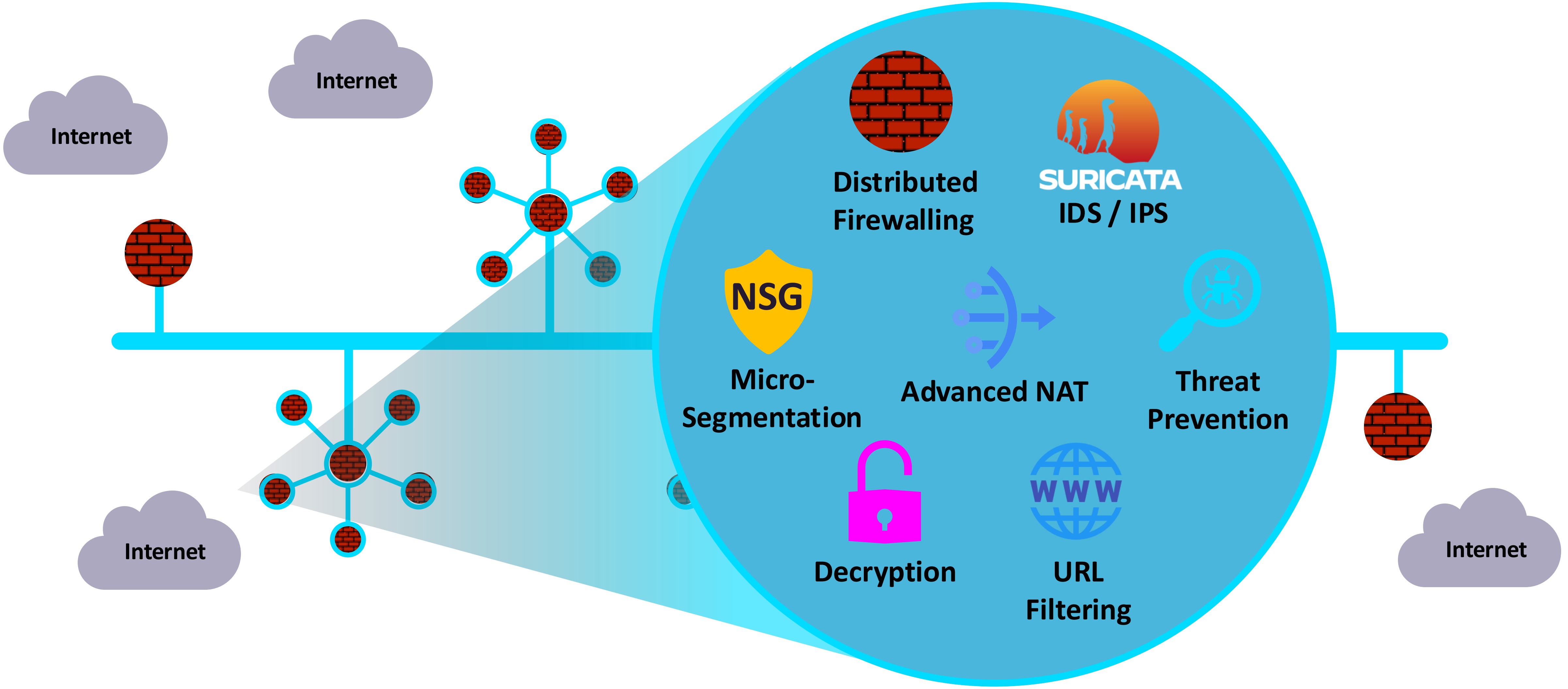
Firewalling Functions were Embedded in the Cloud Network Everywhere…



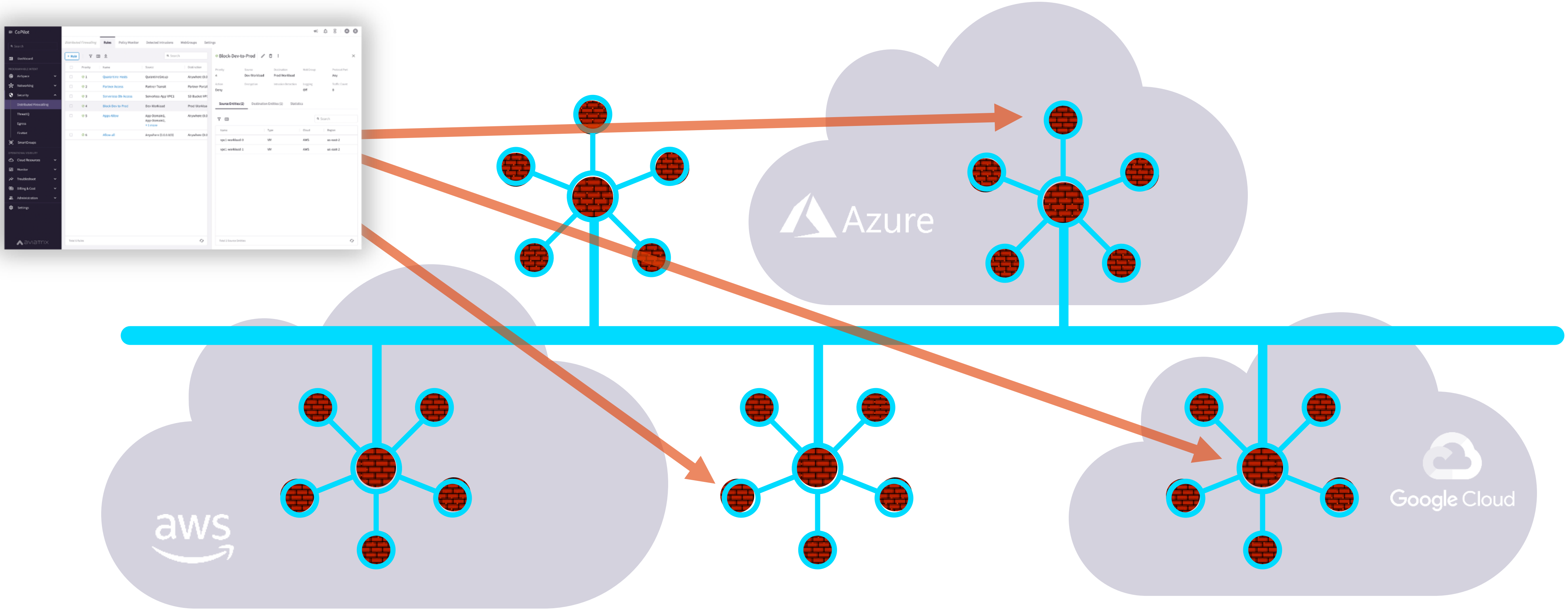
Centrally Managed, with Distributed Inspection & Enforcement…



And, What If it was more than just firewalling…



Policy Creation Looked Like One Big Firewall … A Distributed Cloud Firewall…



Priority	Name	Source	Destination
1	Quarantine Hosts	QuarantineGroup	Anywhere (0.0
2	Partner Access	Partner Transit	Partner Portal
3	Serverless Db Access	Serverless App VPC1	S3 Bucket VPC
4	Block Dev to Prod	Dev Workload	Prod Workloa
5	Apps-Allow	App-Domain1, App-Domain2, +1 more	Anywhere (0.0
6	Allow-all	Anywhere (0.0.0.0/0)	Anywhere (0.0

Total 6 Rules

Block-Dev-to-Prod

Priority	Source	Destination	WebGroup	Protocol Port
4	Dev Workload	Prod Workload		Any

Action	Encryption	Intrusion Detection	Logging	Traffic Count
Deny			Off	0

Source Entities (2) Destination Entities (1) Statistics

Name	Type	Cloud	Region
vpc1-workload-0	VM	AWS	us-east-2
vpc1-workload-1	VM	AWS	us-east-2

Total 2 Source Entities

Where and How Policies Are Enforced Is Abstracted…

SmartGroups: Definition

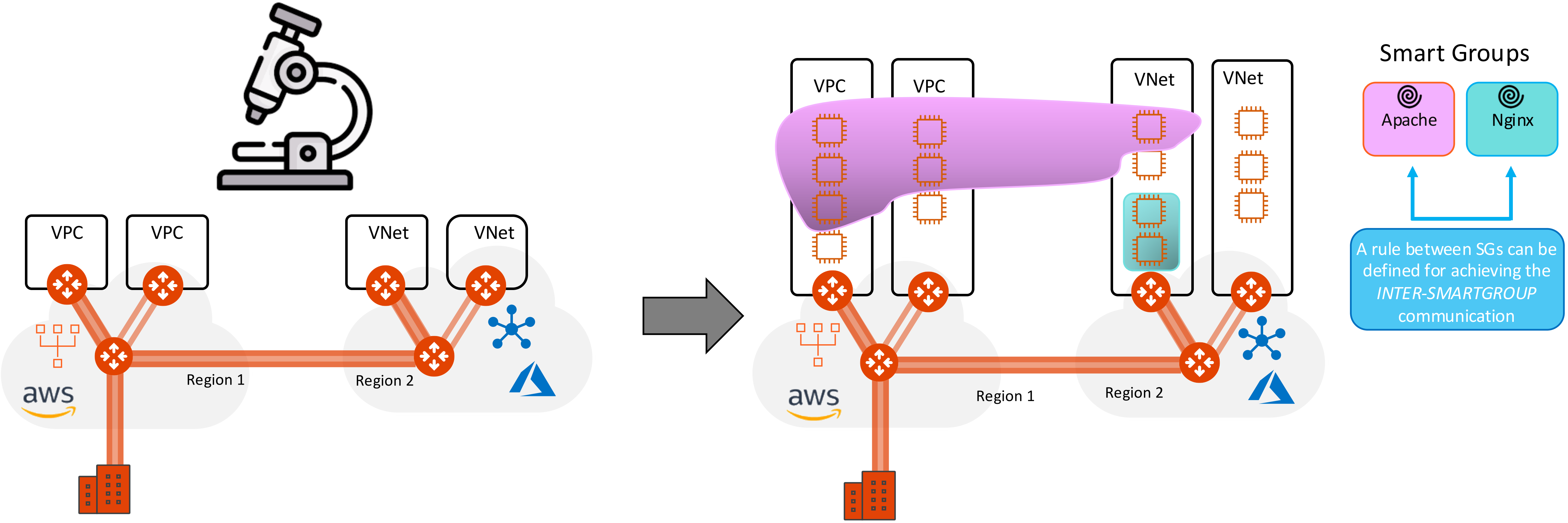
- A firewall rule consists of two important initial elements (i.e. *L3 info*):
  - **Source**
  - **Destination**

- **What is a SmartGroup?**

A SmartGroup identifies a group of resources that have similar policy requirements and are associated to the same *logical container*.

- The members of a SmartGroup can be classified using *different* methods:
  - Virtual Machines
  - Subnets
  - VPC/Vnets
  - Kubernetes
  - Hostnames
  - External Connections (S2C)

Distributed Firewalling: Intra-rule vs. Inter-rule

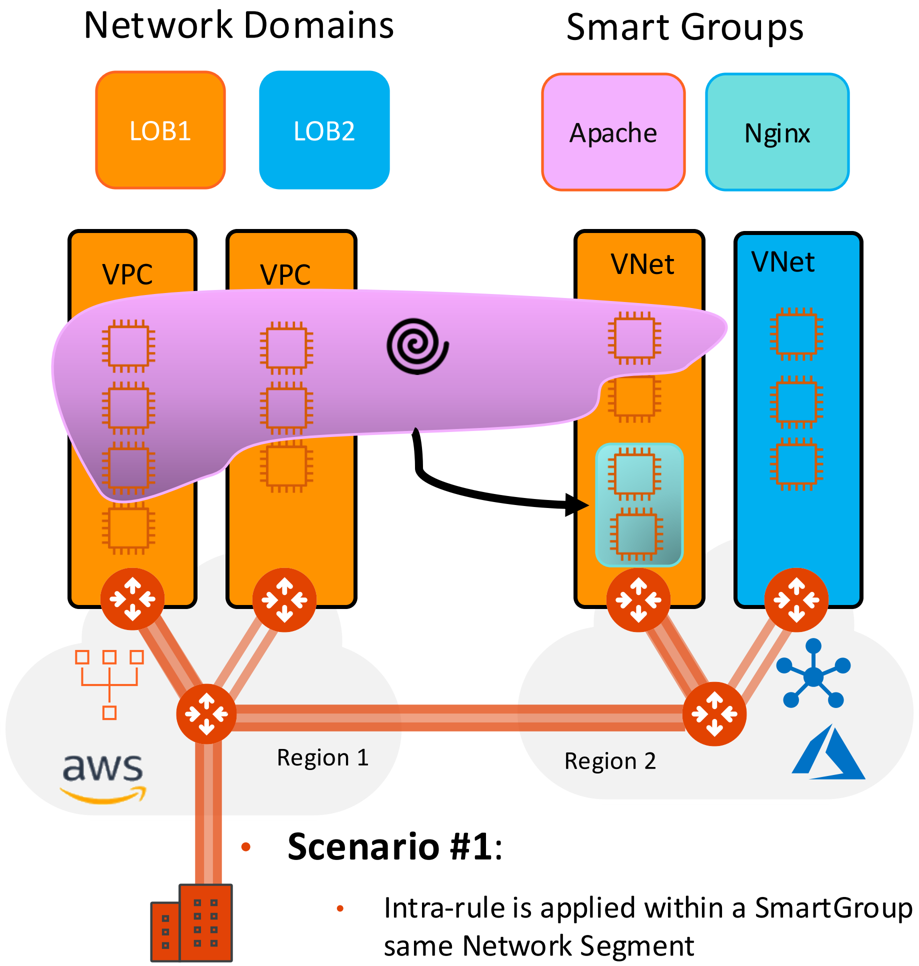


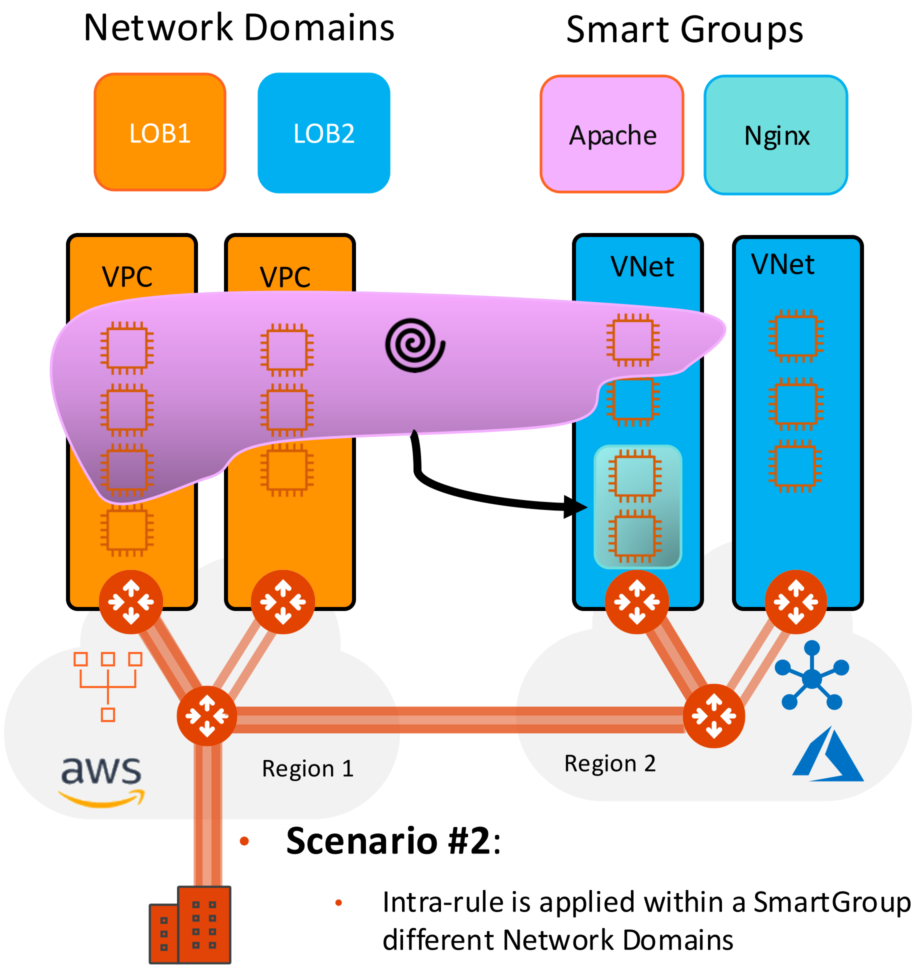
A rule between SGs can be defined for achieving the *INTER-SMARTGROUP* communication

- **INTRA-RULE**: is defined within a Smart Group, for dictating what kind of traffic is allowed/prohibited among all the instances that belong to that Smart Group

- **INTER-RULE:** is defined among Smart Groups, for dictating what kind of traffic is allowed/prohibited among two or more Smart Groups.

Network Segmentation & Distributed Cloud Firewall Rule





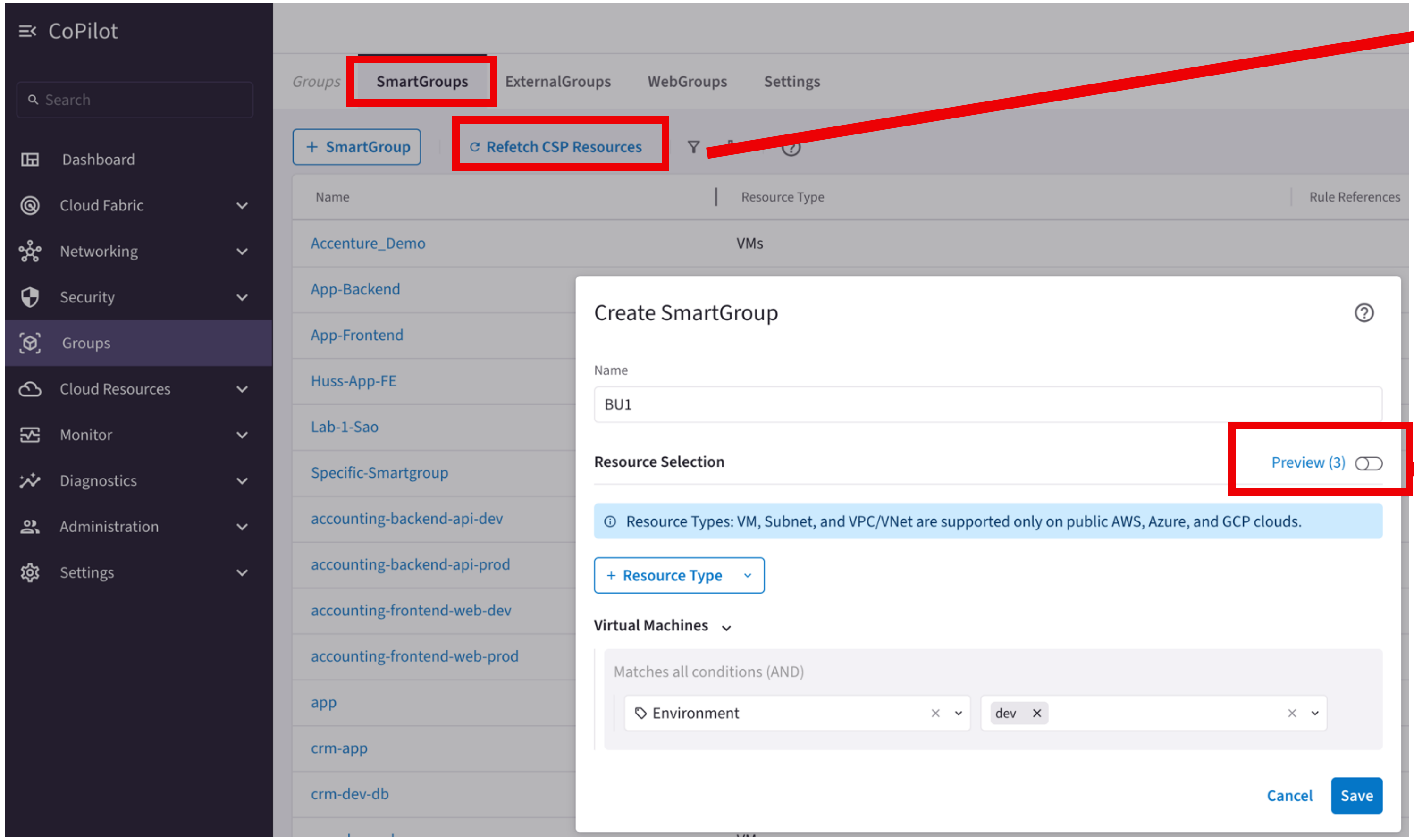
- **Scenario #1**:
  - Intra-rule is applied within a SmartGroup defined in the same Network Segment
  - Inter-rule is applied between SmartGroups within the same network Domain

- **Scenario #2**:
  - Intra-rule is applied within a SmartGroup defined across two different Network Domains
  - Inter-rule is applied between SmartGroups defined across two different network Domains

Caveat:

- Network Segmentation and Distributed Firewalling are **NOT** mutually exclusive!
- Network Segmentation takes **precedence** over the extent of a SmartGroup

Smart Groups Creation



Name	Resource Type	Rule References
Accenture_Demo	VMs	
App-Backend		
App-Frontend		
Huss-App-FE		
Lab-1-Sao		
Specific-Smartgroup		
accounting-backend-api-dev		
accounting-backend-api-prod		
accounting-frontend-web-dev		
accounting-frontend-web-prod		
app		
crm-app		
crm-dev-db		

Create SmartGroup

Name: BU1

Resource Selection — Preview (3)

Resource Types: VM, Subnet, and VPC/VNet are supported only on public AWS, Azure, and GCP clouds.

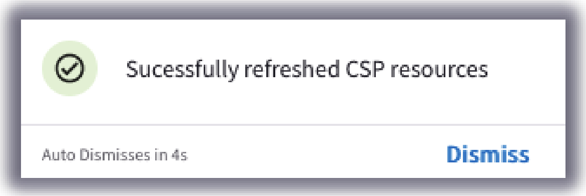
+ Resource Type

Virtual Machines

Matches all conditions (AND)

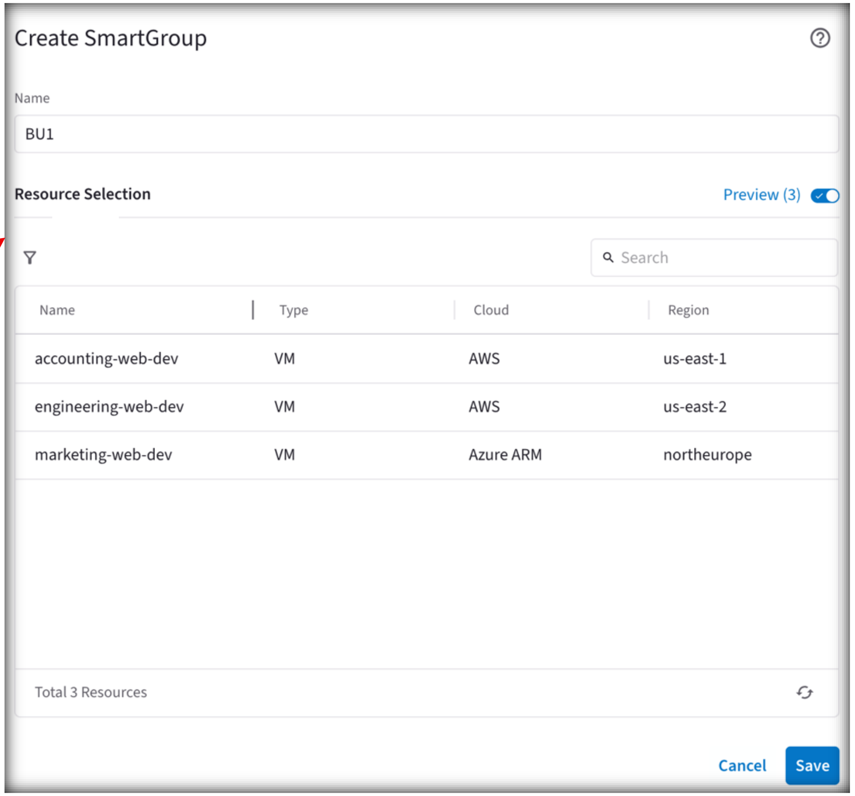
Environment — dev

Cancel Save



Sucessfully refreshed CSP resources

Auto Dismisses in 4s — Dismiss



Create SmartGroup

Name: BU1

Resource Selection — Preview (3)

Search

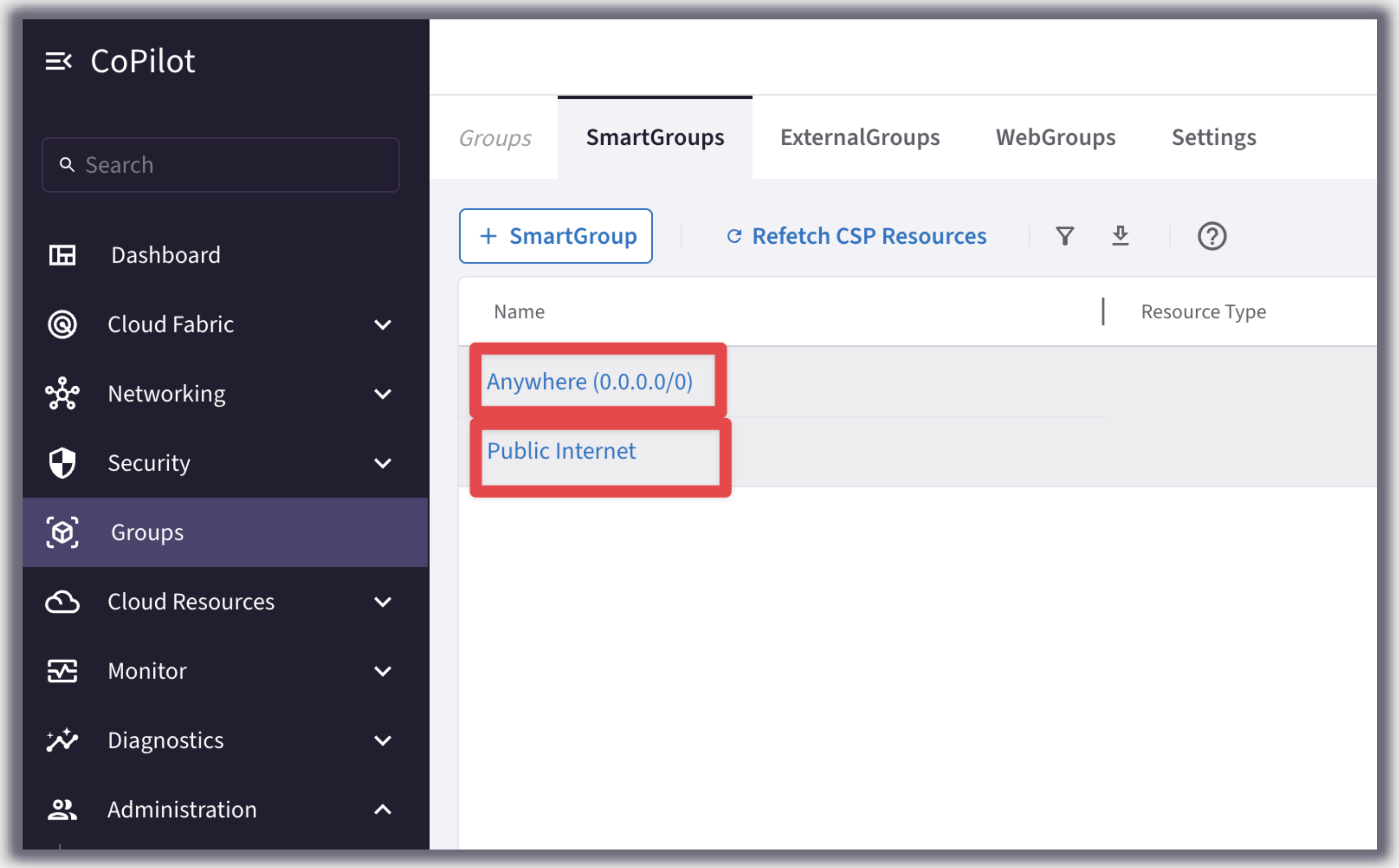
Name	Type	Cloud	Region
accounting-web-dev	VM	AWS	us-east-1
engineering-web-dev	VM	AWS	us-east-2
marketing-web-dev	VM	Azure ARM	northeurope

Total 3 Resources

Cancel Save

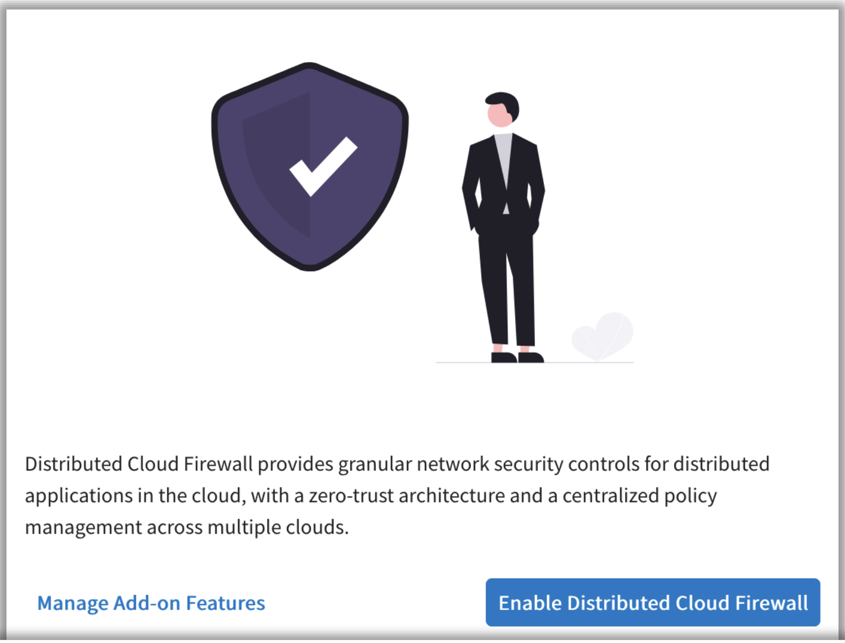
- Controller polls the CSPs to retrieve inventory (about VPCs, instances etc.) every **15 minutes** (can be modified)
- CoPilot queries Controller every **1 hour** (can be modified)
- On-demand refresh of tags is available

Pre-defined Smart Groups



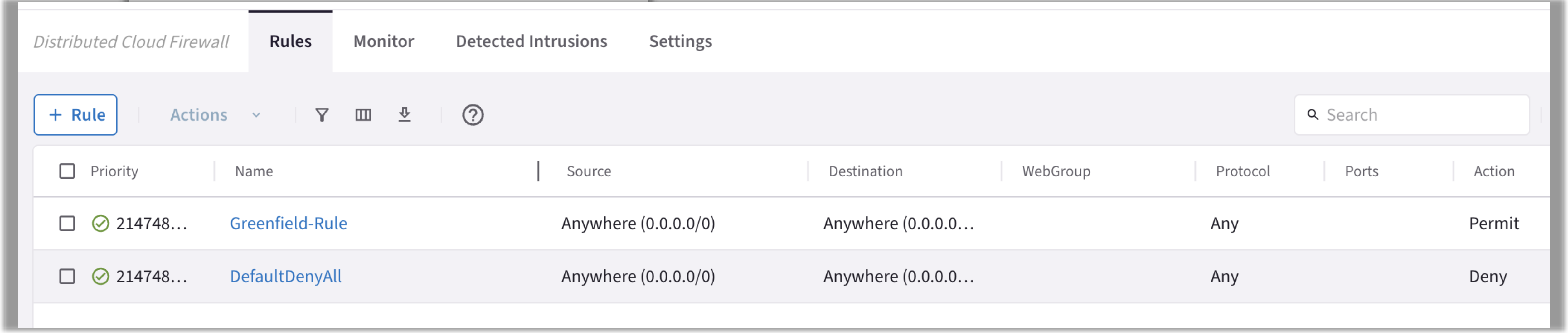
- **Anywhere (0.0.0.0/0)** → RFC1918 routes + Default Route (IGW)
- **Public Internet** → Default Route (IGW)

Enabling Distributed Cloud Firewall



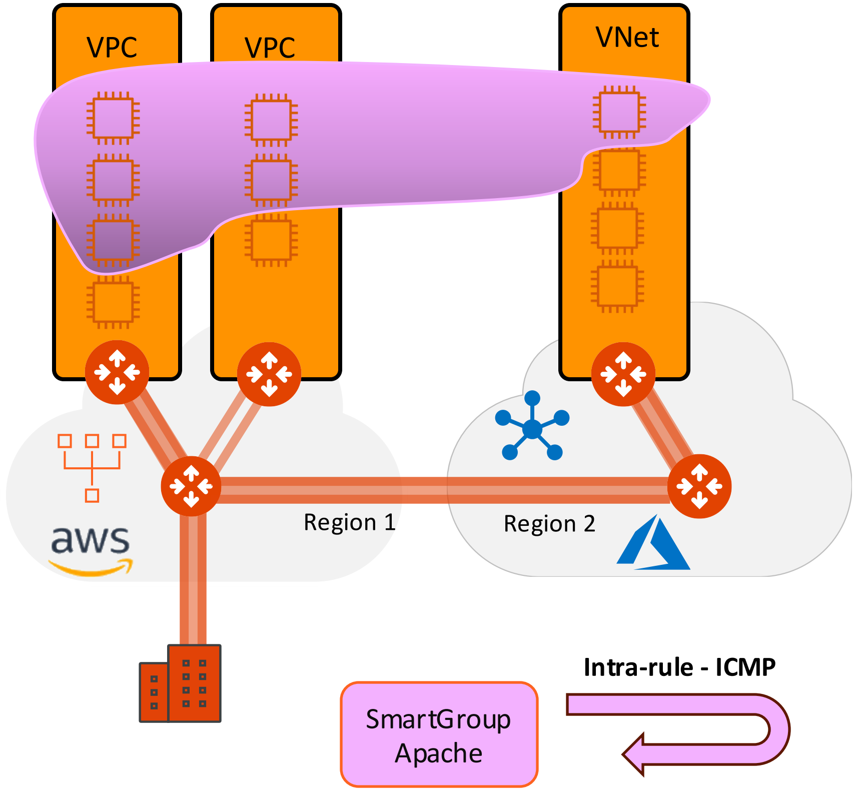
Distributed Cloud Firewall provides granular network security controls for distributed applications in the cloud, with a zero-trust architecture and a centralized policy management across multiple clouds.

- Enabling the Distributed Cloud Firewall without configured rules will deny all previously permitted traffic due to its implicit Deny All rule.
- To maintain consistency, a **Greenfield Rule** will be created to allow traffic that maintains the current state, facilitating the creation of custom rules for specific security needs.



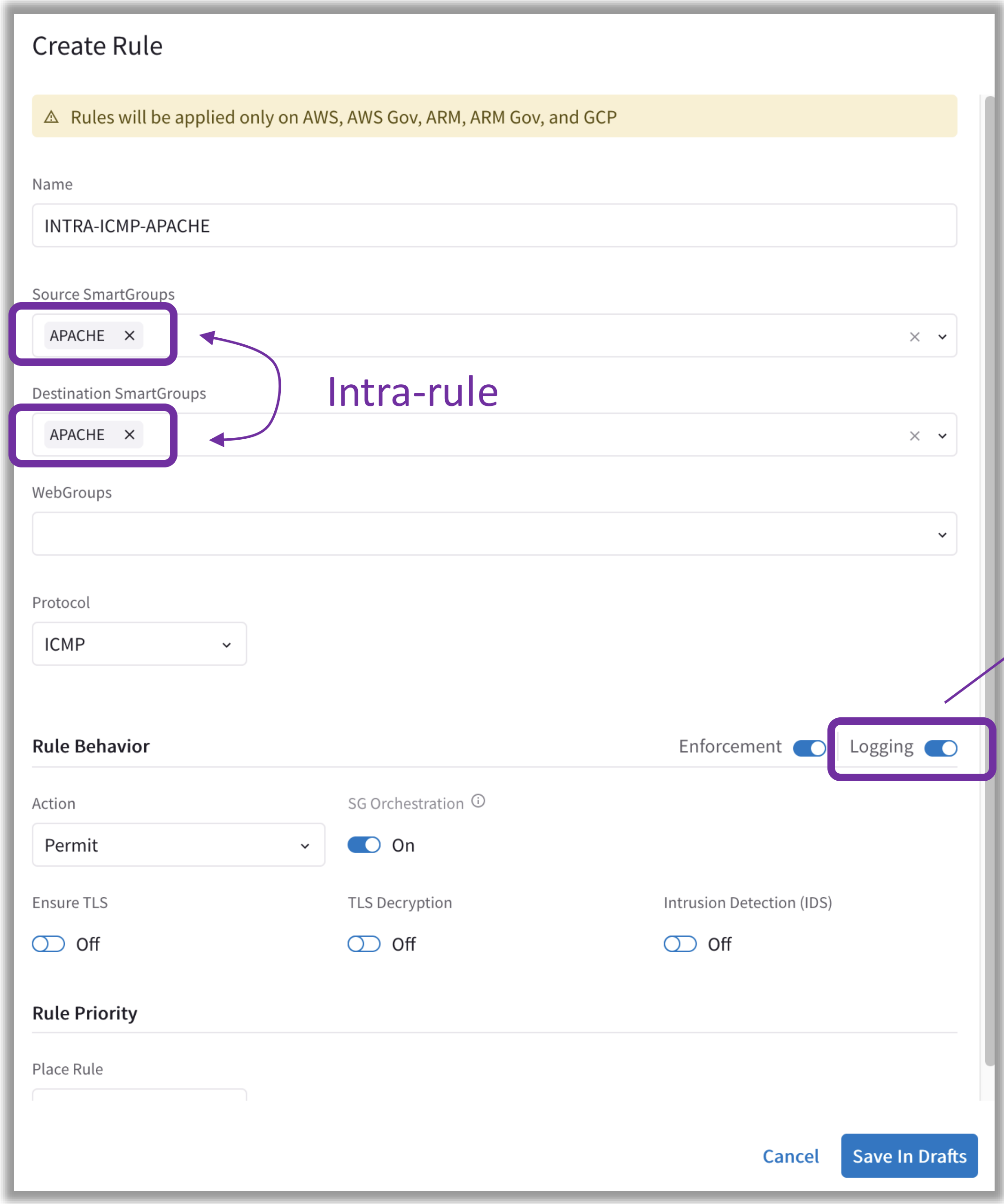
□	Priority	Name	Source	Destination	WebGroup	Protocol	Ports	Action
□	✓ 214748…	Greenfield-Rule	Anywhere (0.0.0.0/0)	Anywhere (0.0.0.0…		Any		Permit
□	✓ 214748…	DefaultDenyAll	Anywhere (0.0.0.0/0)	Anywhere (0.0.0.0…		Any		Deny

Micro-Segmention: SmartGroups, Intra-Rules and Inter-Rules (1)



Scenario #1

- ❑ **Create a DCF rule for the APACHE SmartGroup with the following requirements:**
  - Permit ICMP traffic internally
  - Enable the Logging feature



Create Rule

⚠ Rules will be applied only on AWS, AWS Gov, ARM, ARM Gov, and GCP

Name: INTRA-ICMP-APACHE

Source SmartGroups: APACHE ×

Destination SmartGroups: APACHE ×

WebGroups:

Protocol: ICMP

Rule Behavior — Enforcement: On — Logging: On

Action: Permit

SG Orchestration: On

Ensure TLS: Off

TLS Decryption: Off

Intrusion Detection (IDS): Off

Rule Priority

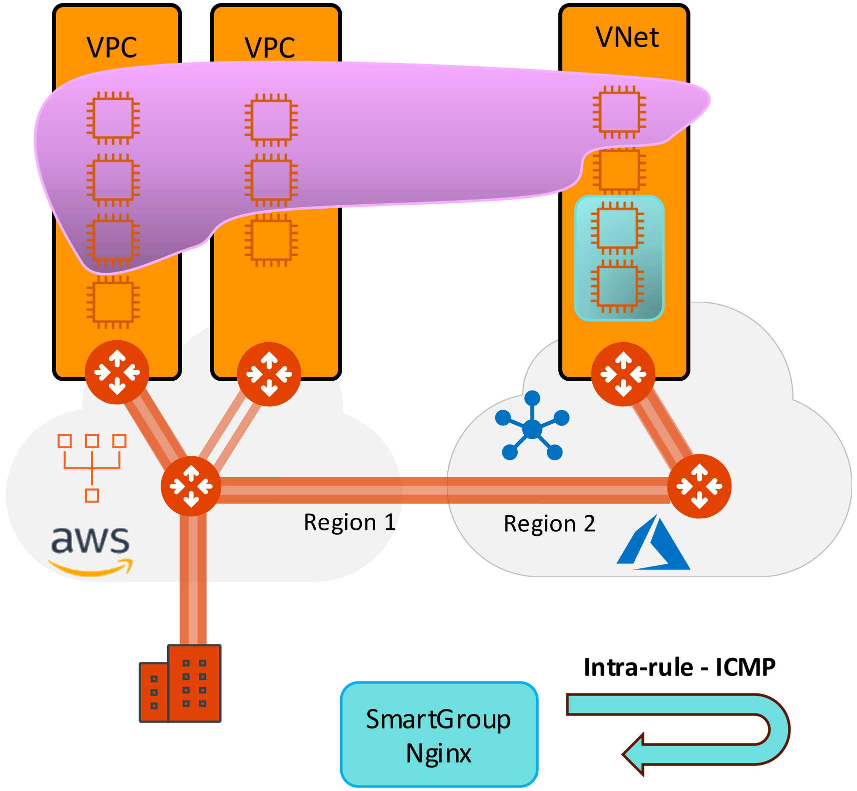
Place Rule

Cancel | Save In Drafts

Intra-rule

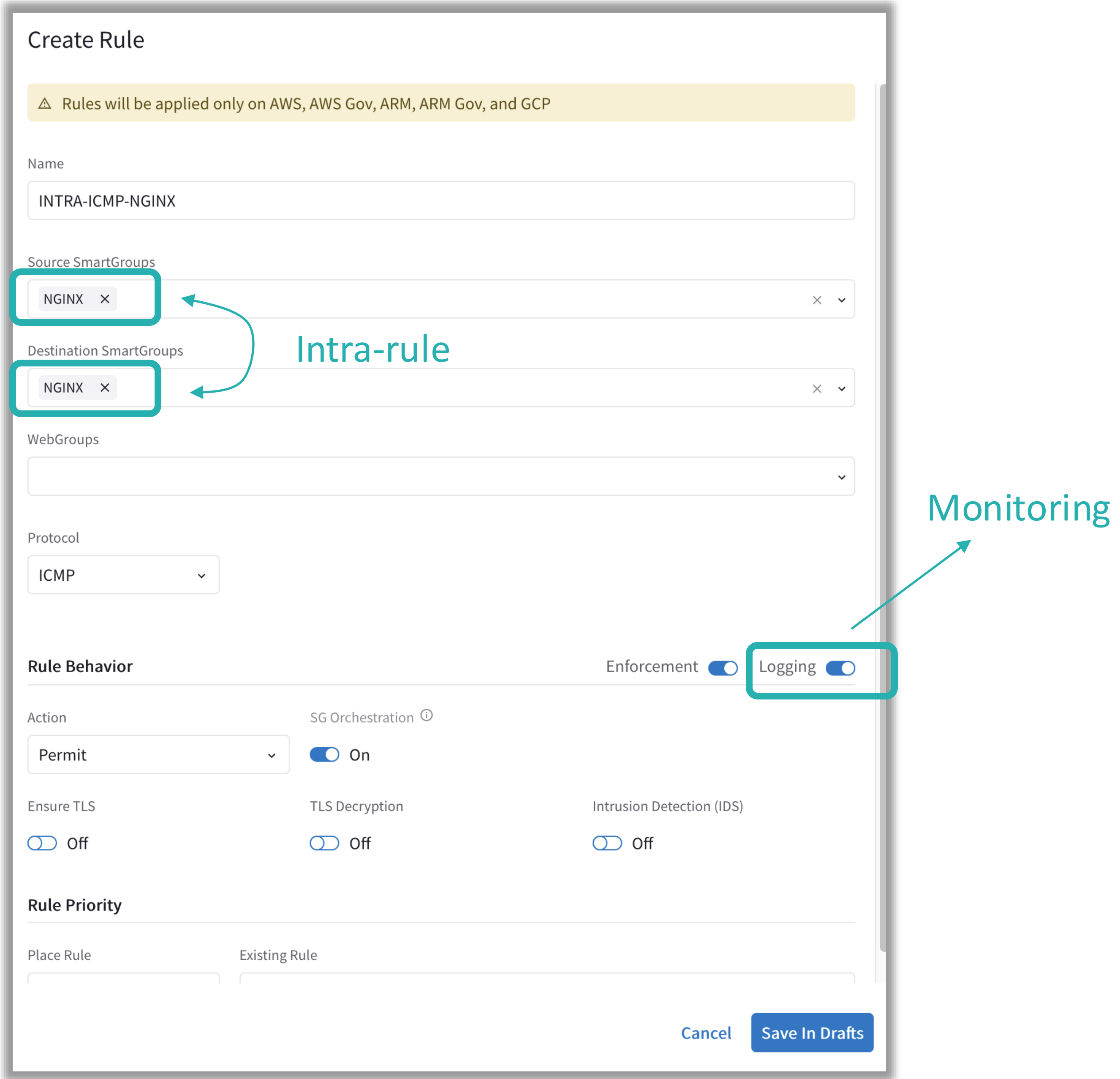
Monitoring

Micro-Segmention: SmartGroups, Intra-Rules and Inter-Rules (2)



Scenario #2

- **Create a DCF rule for the NGINX SmartGroup with the following requirements:**
  - Permit ICMP traffic internally
  - Enable the Logging feature



Create Rule

⚠ Rules will be applied only on AWS, AWS Gov, ARM, ARM Gov, and GCP

Name: INTRA-ICMP-NGINX

Source SmartGroups: NGINX ×

Destination SmartGroups: NGINX ×

WebGroups:

Protocol: ICMP

Rule Behavior

Enforcement: On

Logging: On

Action: Permit

SG Orchestration: On

Ensure TLS: Off

TLS Decryption: Off

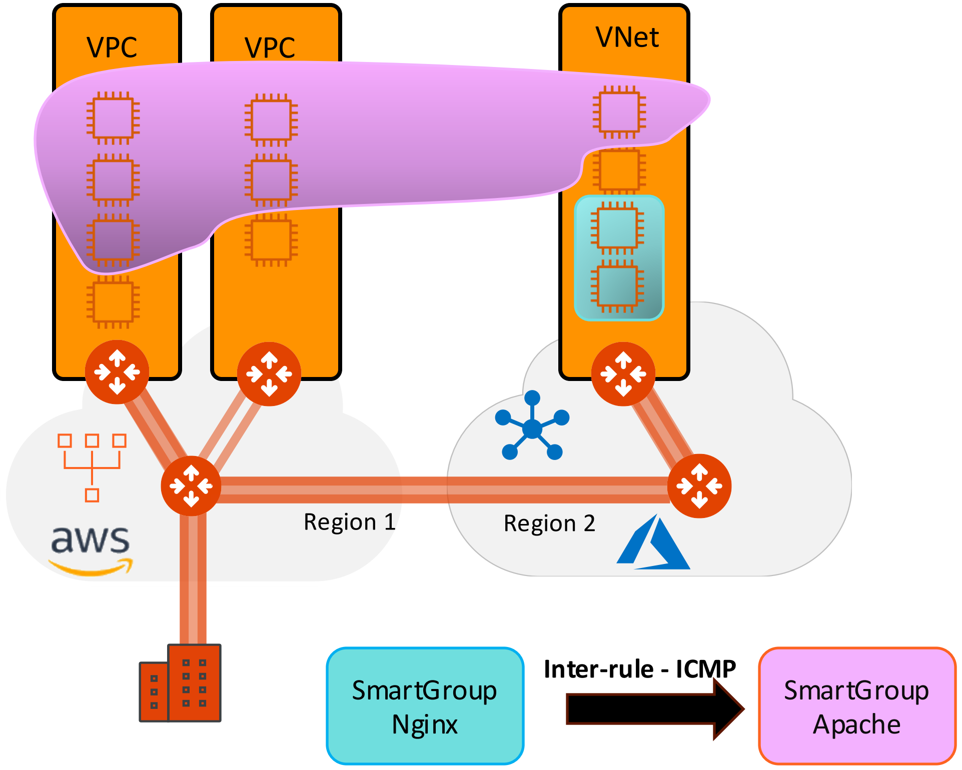
Intrusion Detection (IDS): Off

Rule Priority

Place Rule

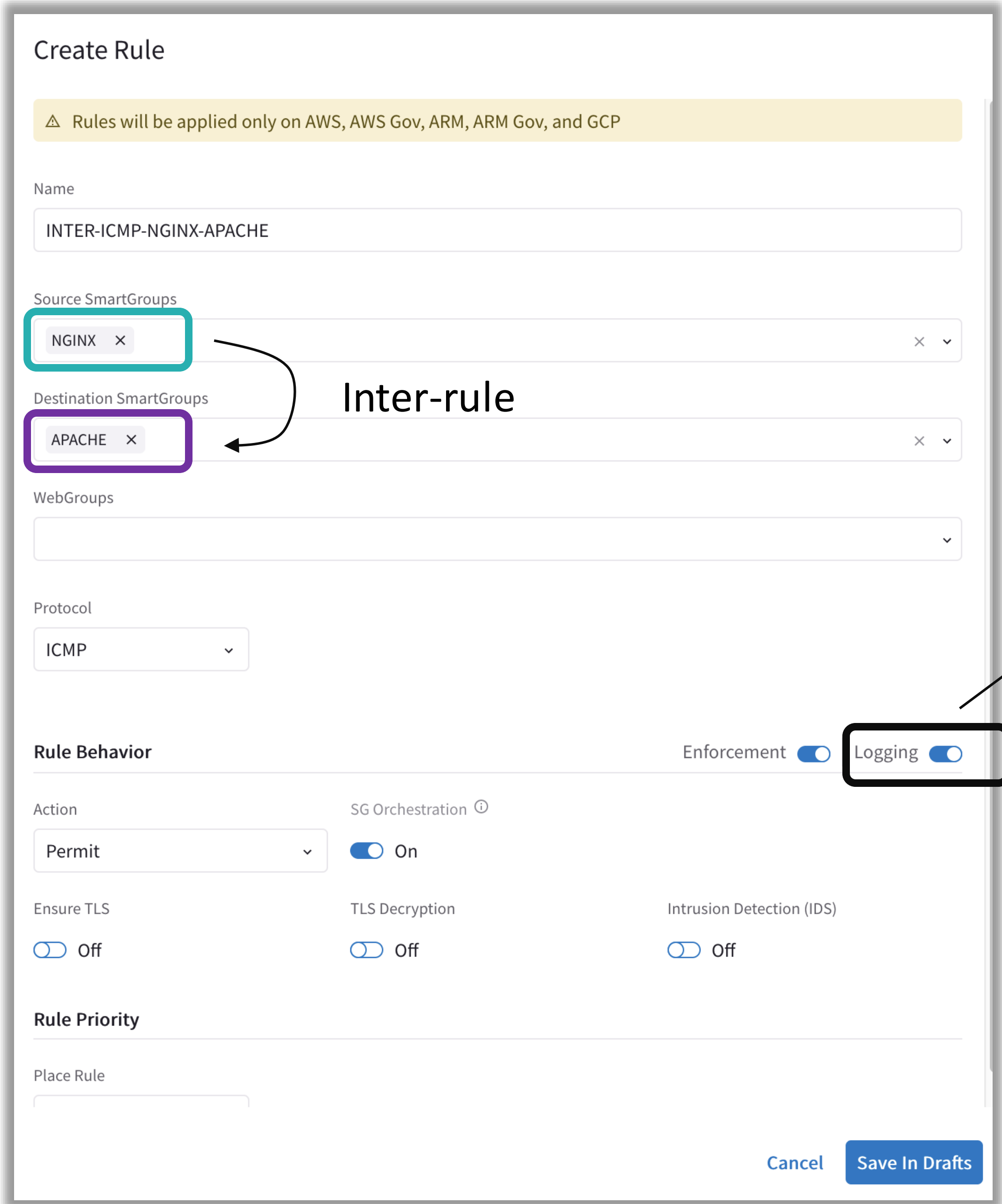
Existing Rule

Micro-Segmention: SmartGroups, Intra-Rules and Inter-Rules (3)



Scenario #3

- **Create a DCF rule from the NGINX SmartGroup towards the APACHE SmartGroup, solely, not the inverse (NO bidirectional!), with the following requirements:**
  - Allow ICMP traffic between the two SGs
  - Enable the Logging feature



Create Rule

⚠ Rules will be applied only on AWS, AWS Gov, ARM, ARM Gov, and GCP

Name: INTER-ICMP-NGINX-APACHE

Source SmartGroups: NGINX

Destination SmartGroups: APACHE

WebGroups:

Protocol: ICMP

Rule Behavior — Enforcement: On — Logging: On

Action: Permit

SG Orchestration: On

Ensure TLS: Off

TLS Decryption: Off

Intrusion Detection (IDS): Off

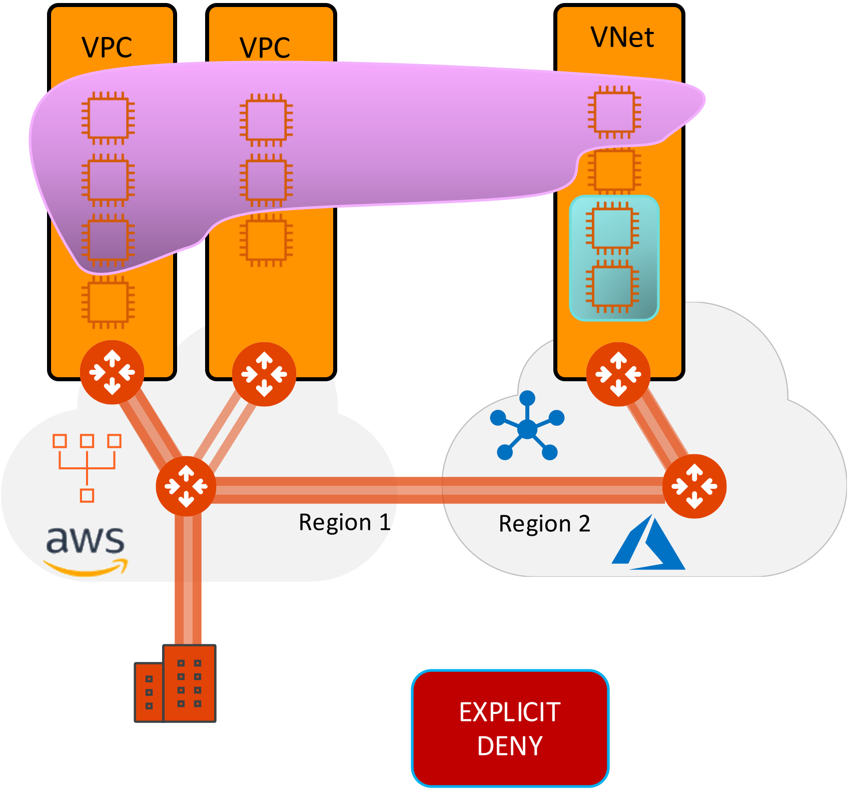
Rule Priority

Place Rule

Inter-rule

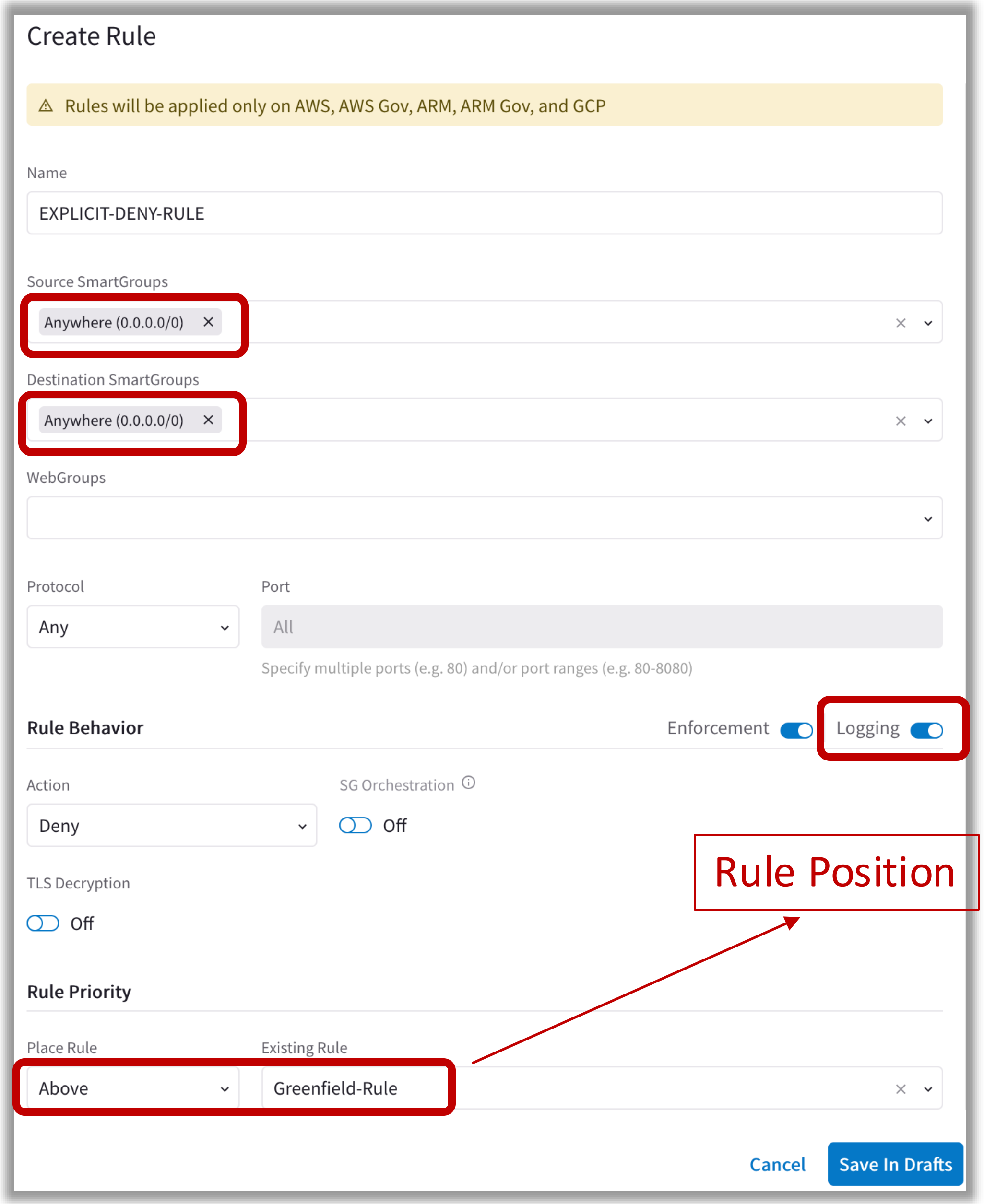
Monitoring

Micro-Segmention: SmartGroups, Intra-Rules and Inter-Rules (4)



Scenario #4

- ❑ **Create a DCF rule that explicitly deny any kind of traffic based on the following requirements:**
  - Insert the rule below the previous created rules and above the Greenfield-Rule
  - Enable the Logging feature



Create Rule

⚠ Rules will be applied only on AWS, AWS Gov, ARM, ARM Gov, and GCP

Name: EXPLICIT-DENY-RULE

Source SmartGroups: Anywhere (0.0.0.0/0) ×

Destination SmartGroups: Anywhere (0.0.0.0/0) ×

WebGroups:

Protocol: Any

Port: All

Specify multiple ports (e.g. 80) and/or port ranges (e.g. 80-8080)

Rule Behavior

Enforcement ● Logging ●

Action: Deny

SG Orchestration ⓘ: Off

TLS Decryption: Off

Rule Priority

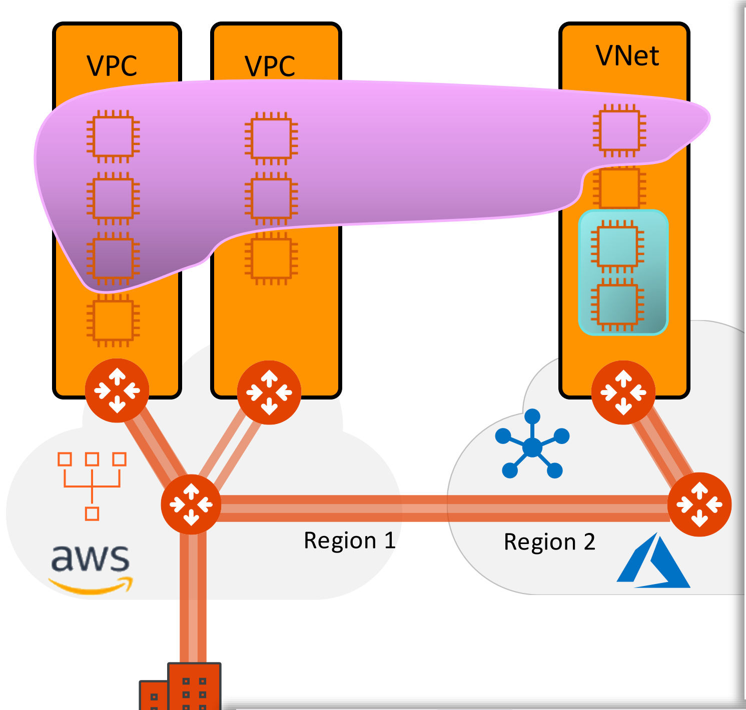
Place Rule: Above

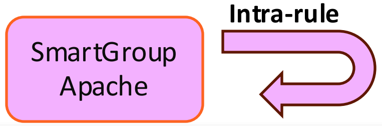
Existing Rule: Greenfield-Rule

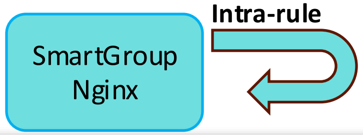
Monitoring

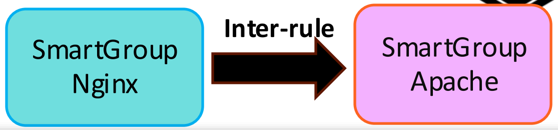
Rule Position

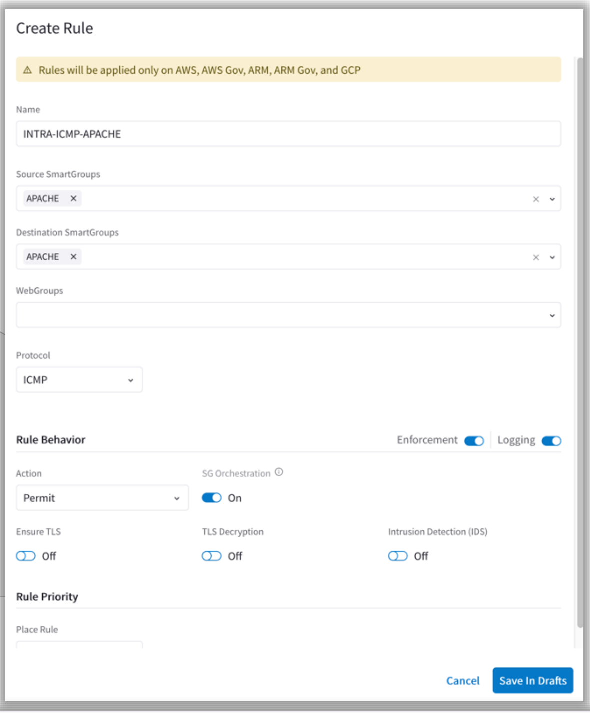
Micro-Segmention: SmartGroups, Intra-Rules and Inter-Rules (5)










Create Rule

⚠ Rules will be applied only on AWS, AWS Gov, ARM, ARM Gov, and GCP

Name: INTRA-ICMP-APACHE

Source SmartGroups: APACHE ×

Destination SmartGroups: APACHE ×

WebGroups:

Protocol: ICMP

Rule Behavior — Enforcement ● Logging ●

Action: Permit

SG Orchestration: On

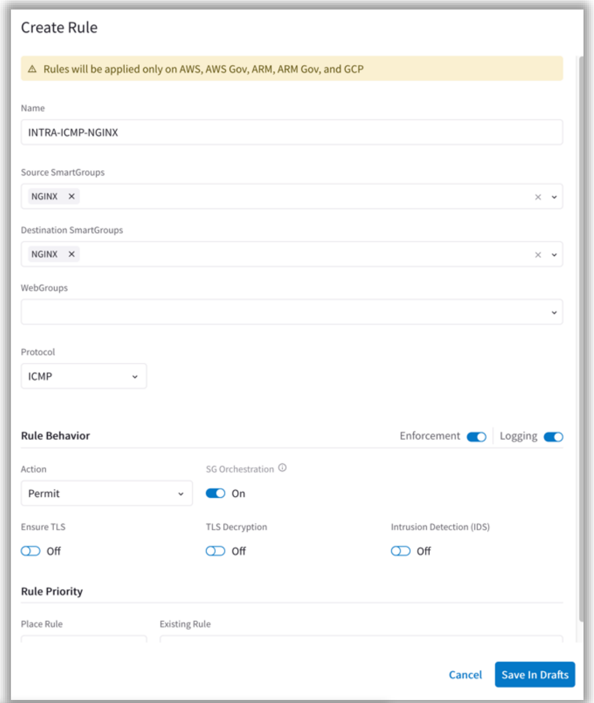
Ensure TLS: Off

TLS Decryption: Off

Intrusion Detection (IDS): Off

Rule Priority

Place Rule


Create Rule

⚠ Rules will be applied only on AWS, AWS Gov, ARM, ARM Gov, and GCP

Name: INTRA-ICMP-NGINX

Source SmartGroups: NGINX ×

Destination SmartGroups: NGINX ×

WebGroups:

Protocol: ICMP

Rule Behavior — Enforcement ● Logging ●

Action: Permit

SG Orchestration: On

Ensure TLS: Off

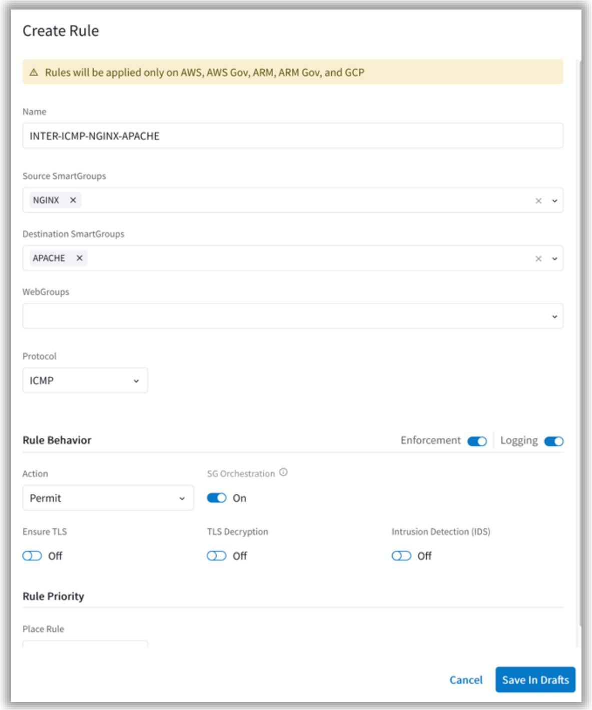
TLS Decryption: Off

Intrusion Detection (IDS): Off

Rule Priority

Place Rule

Existing Rule


Create Rule

⚠ Rules will be applied only on AWS, AWS Gov, ARM, ARM Gov, and GCP

Name: INTER-ICMP-NGINX-APACHE

Source SmartGroups: NGINX ×

Destination SmartGroups: APACHE ×

WebGroups:

Protocol: ICMP

Rule Behavior — Enforcement ● Logging ●

Action: Permit

SG Orchestration: On

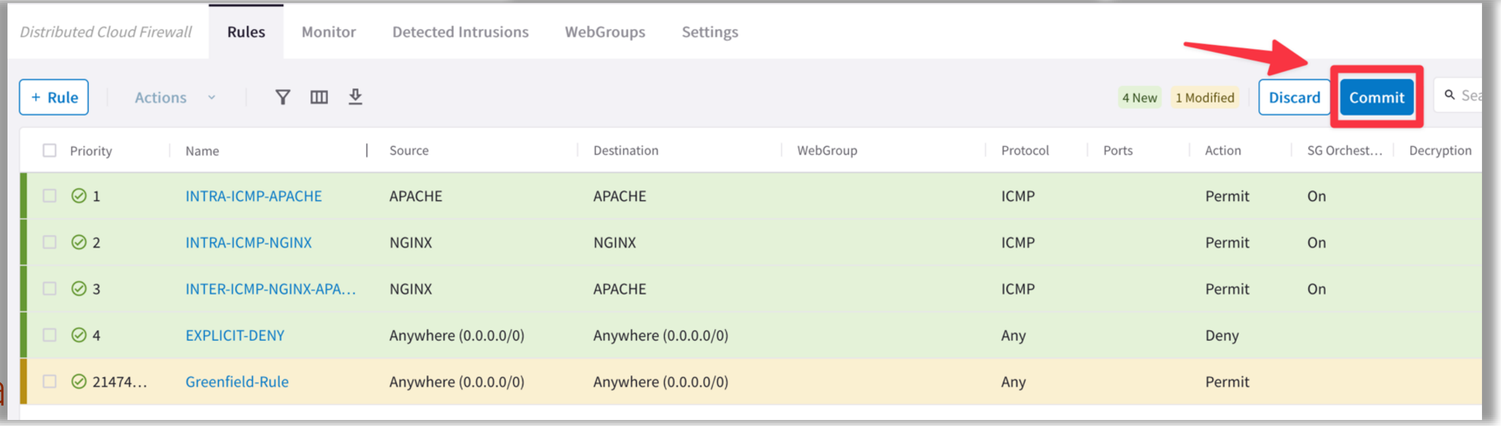
Ensure TLS: Off

TLS Decryption: Off

Intrusion Detection (IDS): Off

Rule Priority

Place Rule

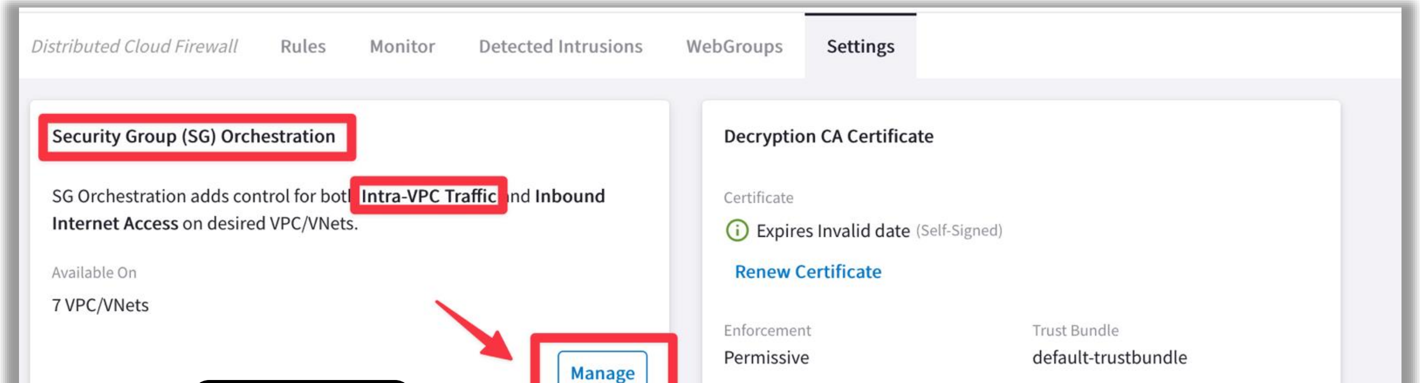


Priority	Name	Source	Destination	WebGroup	Protocol	Ports	Action	SG Orchest...	Decryption
1	INTRA-ICMP-APACHE	APACHE	APACHE		ICMP		Permit	On	
2	INTRA-ICMP-NGINX	NGINX	NGINX		ICMP		Permit	On	
3	INTER-ICMP-NGINX-APA...	NGINX	APACHE		ICMP		Permit	On	
4	EXPLICIT-DENY	Anywhere (0.0.0.0/0)	Anywhere (0.0.0.0/0)		Any		Deny		
21474...	Greenfield-Rule	Anywhere (0.0.0.0/0)	Anywhere (0.0.0.0/0)		Any		Permit		

- **What is the Micro-Segmentation?** It's a combination of SmartGroups and DCF Rules
- Rule changes are saved in **Draft** state
- When you apply a rule to a SmartGroup, please keep in mind that there is an **Invisible Hidden Deny** at the very bottom.
- To save the changes click on "**Commit**"
- **Discard** will trash the changes
- Rule is **stateful**, this means that the return traffic is allowed automatically

Intra VPC/VNET Distributed Firewalling (available on AWS/Azure)

❑ Enable the feature on the relevant VNets



Security Group (SG) Orchestration

SG Orchestration adds control for both **Intra-VPC Traffic** and **Inbound Internet Access** on desired VPC/VNets.

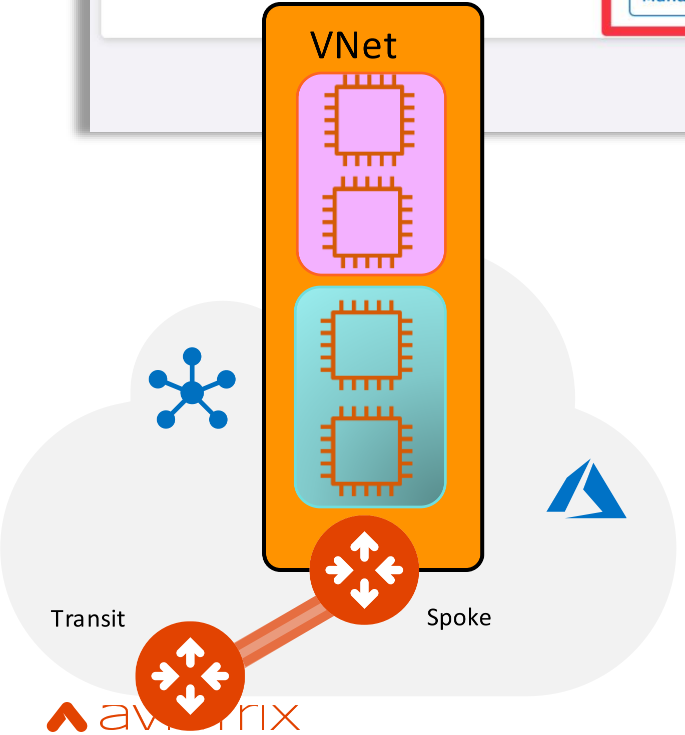
Available On: 7 VPC/VNets

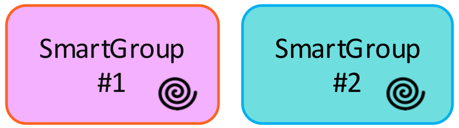
Decryption CA Certificate

Certificate: Expires Invalid date (Self-Signed)

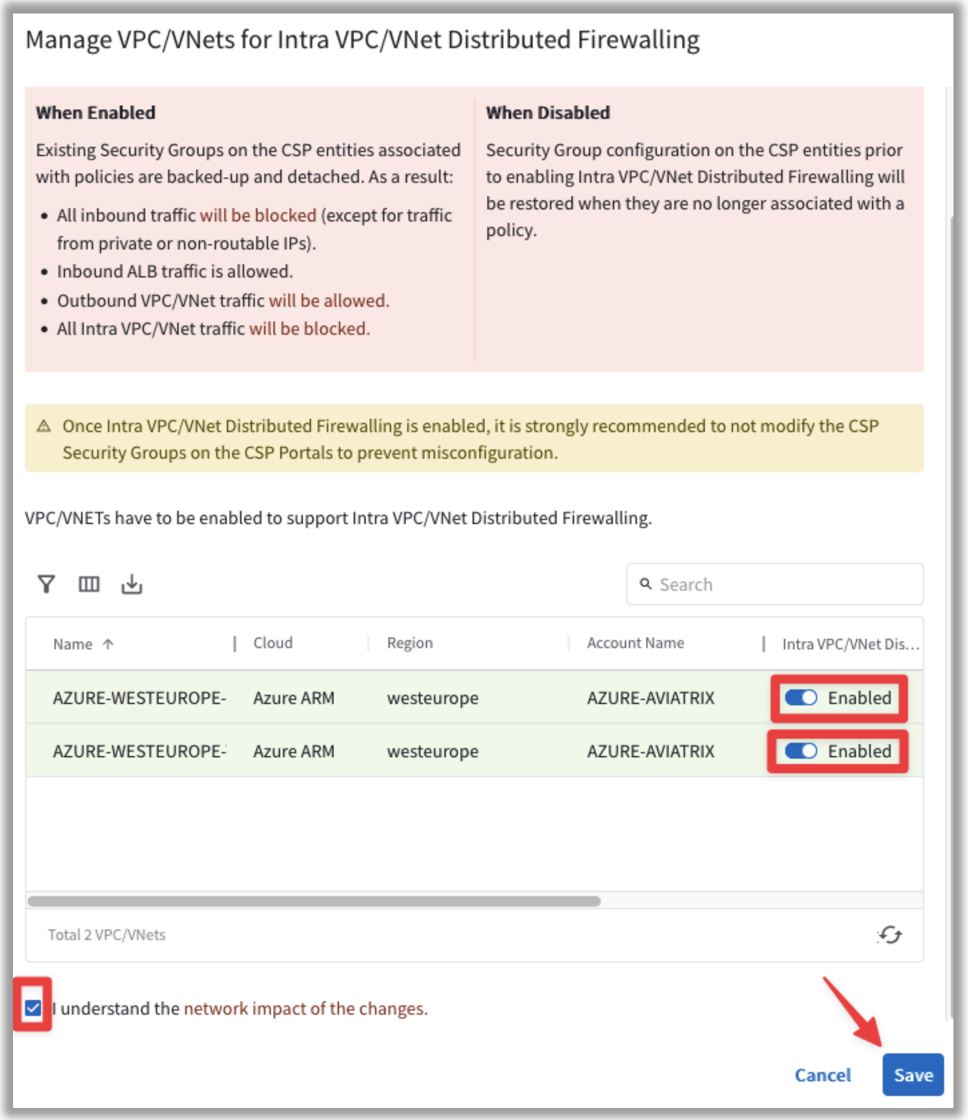
Enforcement: Permissive

Trust Bundle: default-trustbundle





- If you enable the Security Group orchestration (*aka Intra-VPC Traffic Control*), the SmartGroups will not be able to communicate with each other unless an inter rule is applied between them.
- This is pure L4 separation using the Native Cloud Constructs (such as SG, NSG and ASG). This is not L7 inspection.
- **Future Implementation**: traffic will be diverted to the nearby Spoke GW for the L7 inspection



Manage VPC/VNets for Intra VPC/VNet Distributed Firewalling

When Enabled

Existing Security Groups on the CSP entities associated with policies are backed-up and detached. As a result:

- All inbound traffic will be blocked (except for traffic from private or non-routable IPs).
- Inbound ALB traffic is allowed.
- Outbound VPC/VNet traffic will be allowed.
- All Intra VPC/VNet traffic will be blocked.

When Disabled

Security Group configuration on the CSP entities prior to enabling Intra VPC/VNet Distributed Firewalling will be restored when they are no longer associated with a policy.

⚠ Once Intra VPC/VNet Distributed Firewalling is enabled, it is strongly recommended to not modify the CSP Security Groups on the CSP Portals to prevent misconfiguration.

VPC/VNETs have to be enabled to support Intra VPC/VNet Distributed Firewalling.

Name ↑	Cloud	Region	Account Name	Intra VPC/VNet Dis...
AZURE-WESTEUROPE-	Azure ARM	westeurope	AZURE-AVIATRIX	Enabled
AZURE-WESTEUROPE-	Azure ARM	westeurope	AZURE-AVIATRIX	Enabled

Total 2 VPC/VNets

☑ I understand the network impact of the changes.

AVIATRIX ACE ★★★ OPERATIONS SPECIALTY

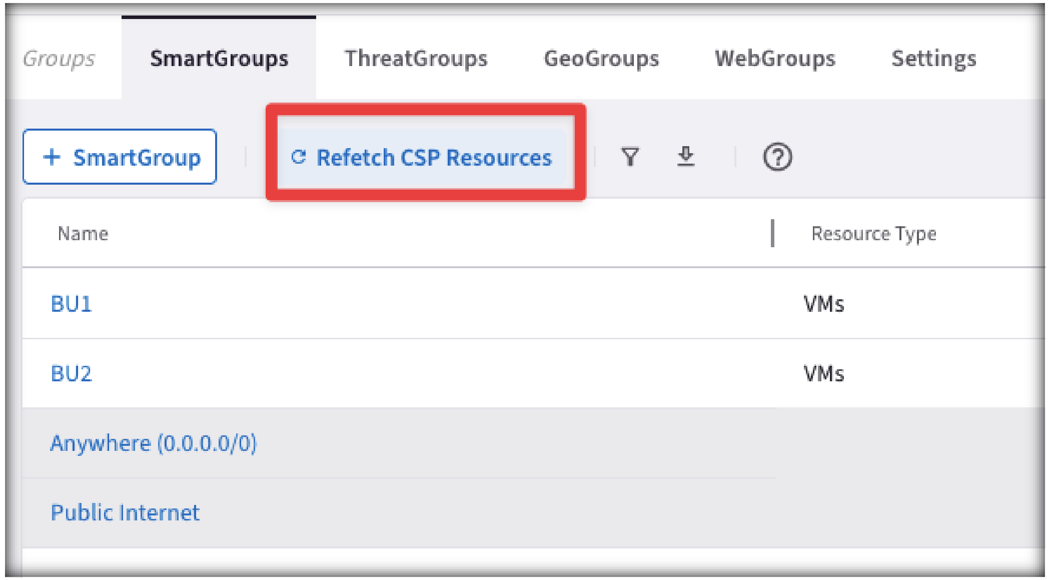
Tools for troubleshooting Distributed Cloud Firewall

Creation of the SmartGroup: the right matching criteria dilemma

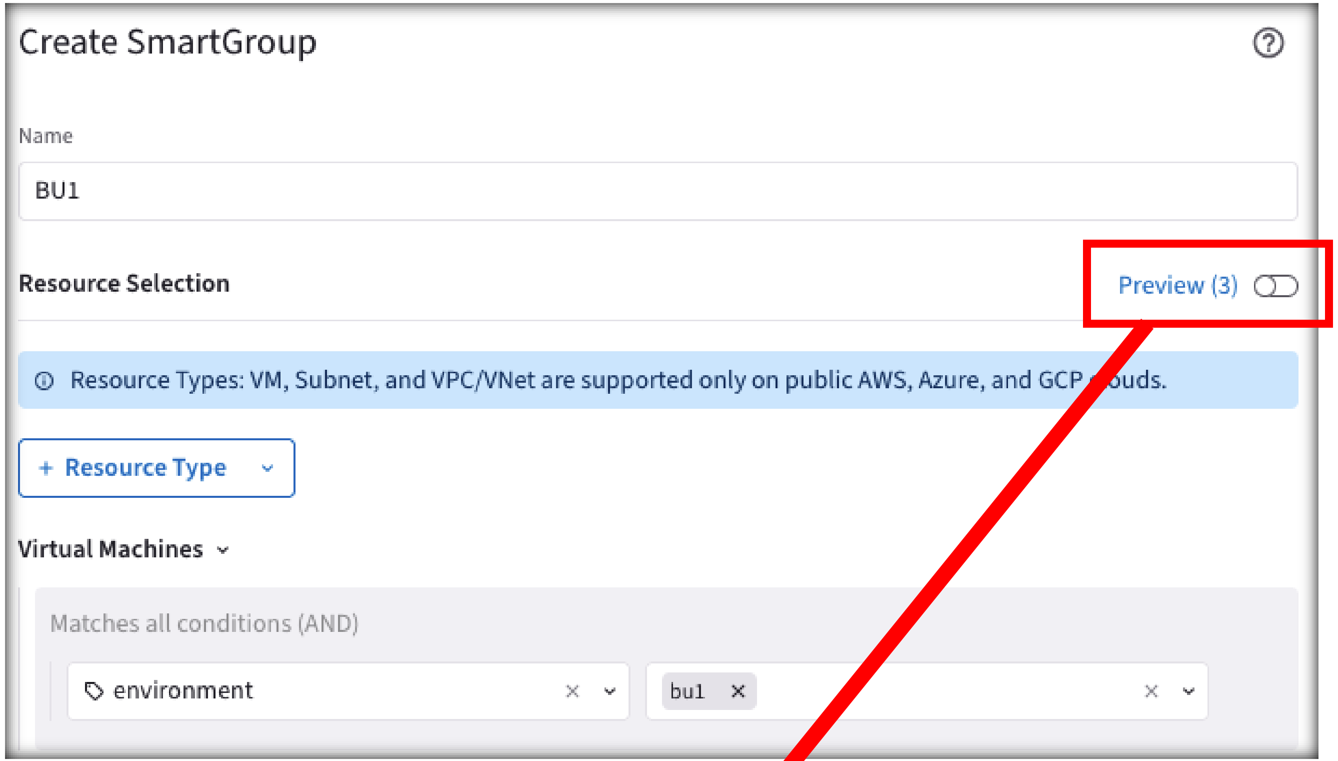
1) Choose the right matching criteria for resources that you want to see assigned to a specific SmartGroup:

2) Use the **Preview Resources** toggle switch to verify the selected resources that have been mapped to the Smart Group

3) Use the On-Demand **Refetch CSP Resources** button to retrieve the most recent inventory



Name	Resource Type
BU1	VMs
BU2	VMs
Anywhere (0.0.0.0/0)	
Public Internet	



Create SmartGroup

Name: BU1

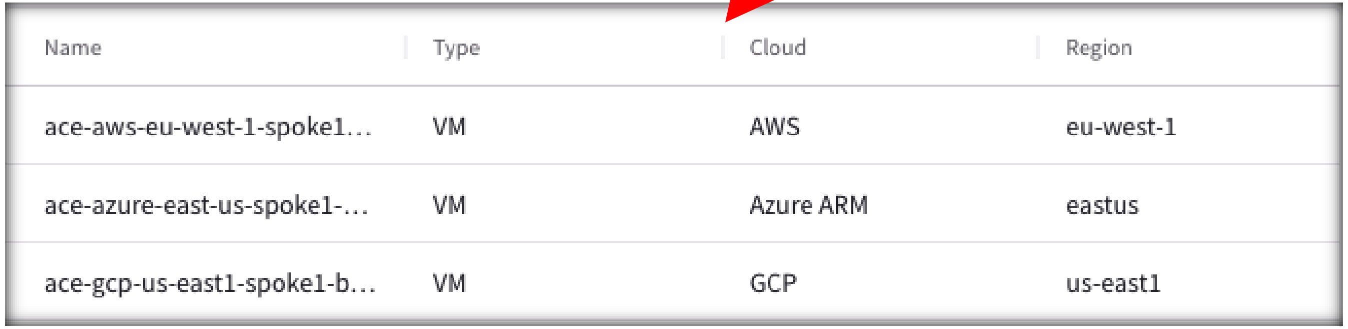
Resource Selection

Preview (3)

Resource Types: VM, Subnet, and VPC/VNet are supported only on public AWS, Azure, and GCP clouds.

Matches all conditions (AND)

environment — bu1



Name	Type	Cloud	Region
ace-aws-eu-west-1-spoke1…	VM	AWS	eu-west-1
ace-azure-east-us-spoke1-…	VM	Azure ARM	eastus
ace-gcp-us-east1-spoke1-b…	VM	GCP	us-east1

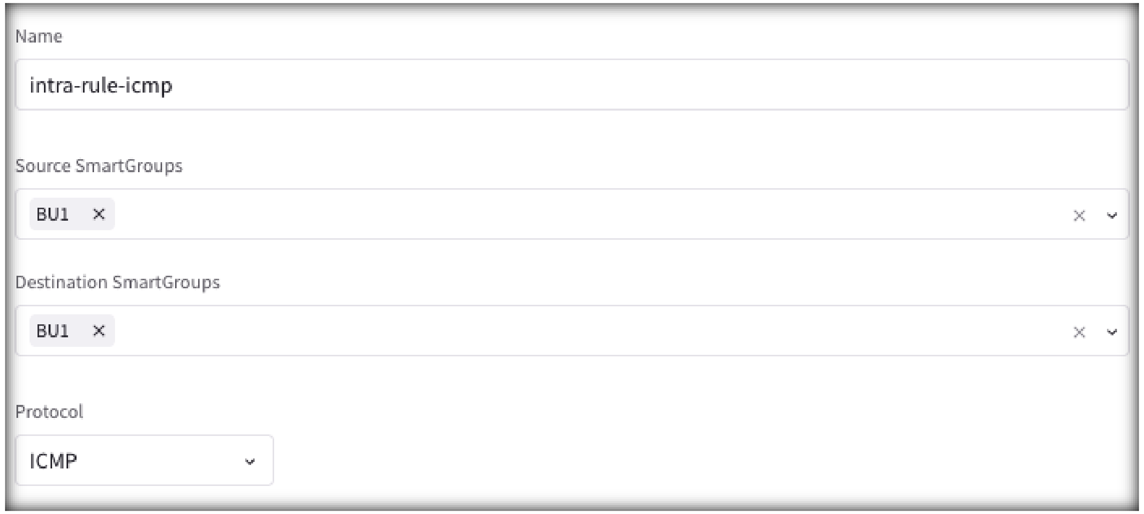
Creation of the Rules: intra-rule vs. inter-rule

1) **Intra-rule** will affect the traffic WITHIN a Smart Group

- ❑ Source Smart Group and Destination Smart Group must be the same

2) **Inter-rule** will affect the traffic BETWEEN SmartGroups

- ❑ Source Smart Group and Destination Smart Group must differ

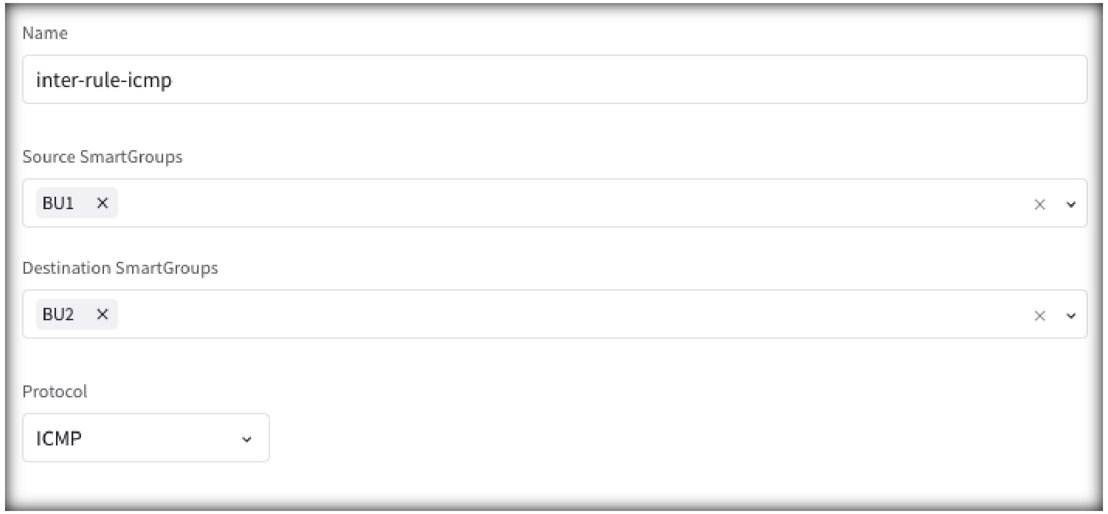


Name: intra-rule-icmp

Source SmartGroups: BU1 ×

Destination SmartGroups: BU1 ×

Protocol: ICMP



Name: inter-rule-icmp

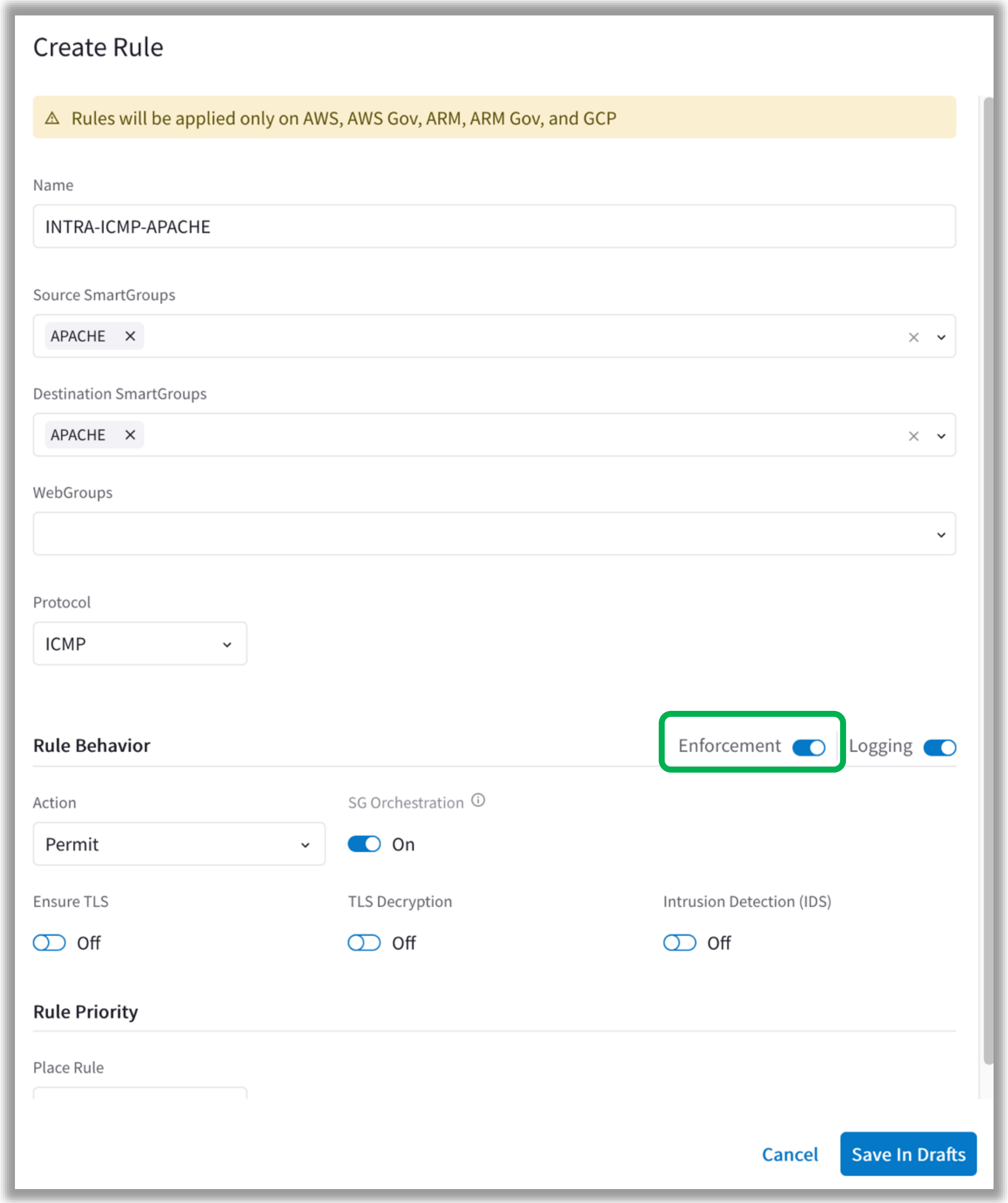
Source SmartGroups: BU1 ×

Destination SmartGroups: BU2 ×

Protocol: ICMP

CAVEAT – The Invisible Implicit Deny: as soon as a Rule is committed (either intra-rule or inter-rule) a hidden deny is applied at the bottom of your Rules list. The implicit deny is really an “invisible deny”; you won’t see a “deny any” line automagically added! Since you don’t see it, it’s easy to forget about. Forgetting about the implicit deny is the #1 reason for Distributed Firewalling Rule not giving you the desired results.

Rule Enforcement



Create Rule

⚠ Rules will be applied only on AWS, AWS Gov, ARM, ARM Gov, and GCP

Name: INTRA-ICMP-APACHE

Source SmartGroups: APACHE ×

Destination SmartGroups: APACHE ×

WebGroups:

Protocol: ICMP

Rule Behavior — Enforcement: On, Logging: On

Action: Permit

SG Orchestration ⓘ: On

Ensure TLS: Off

TLS Decryption: Off

Intrusion Detection (IDS): Off

Rule Priority

Place Rule

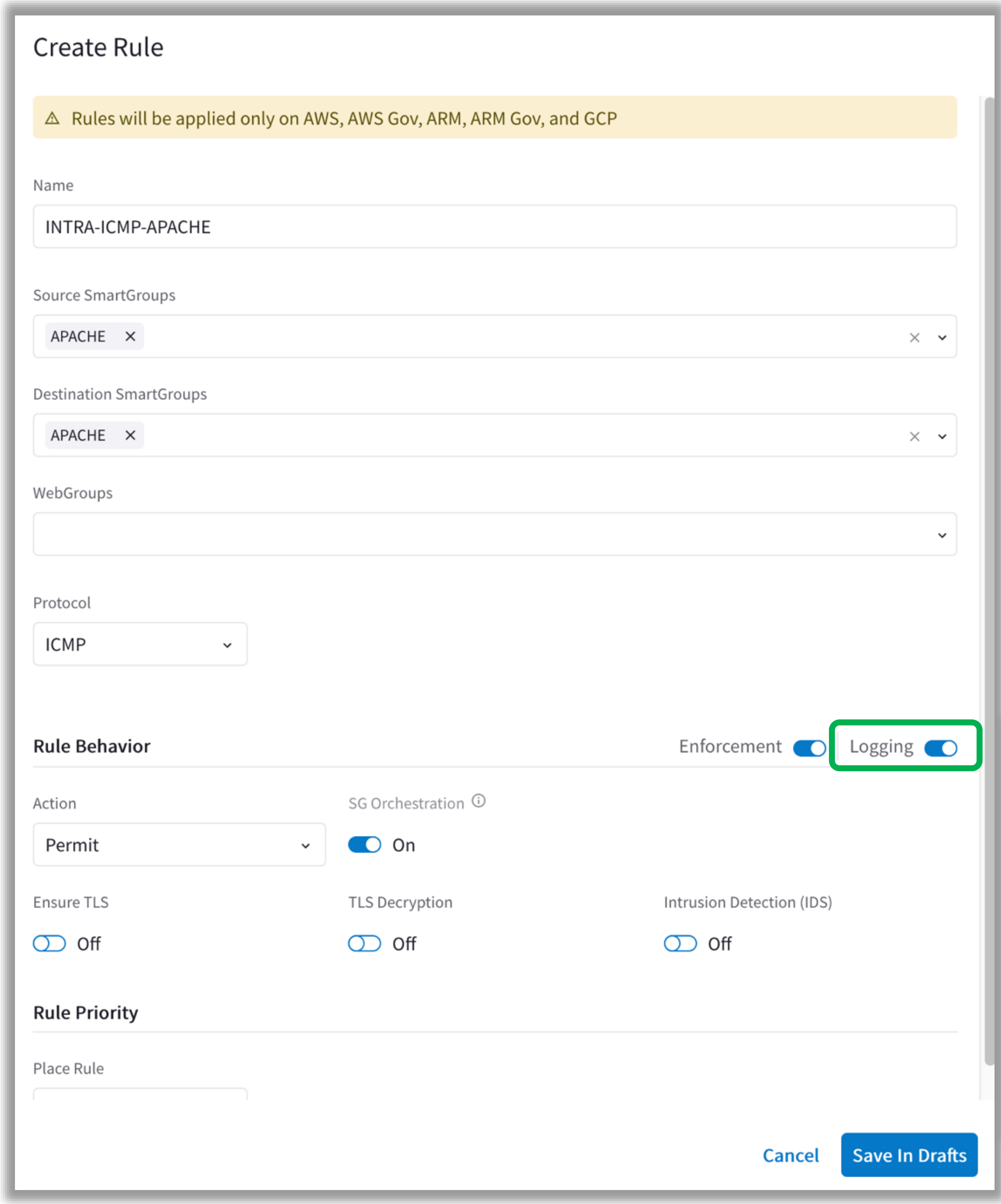
❑ Enforcement ON (enabled by default)

- Policy is enforced in the Data Plane

❑ Enforcement OFF

- Policy is NOT enforced in the Data Plane
- The option provides a *Watch/Test* mode
- Common use case is with deny rule
- Watch what traffic hits the deny rule before enforcing the rule in the Data Plane.

Rule Logging



Create Rule

⚠ Rules will be applied only on AWS, AWS Gov, ARM, ARM Gov, and GCP

Name: INTRA-ICMP-APACHE

Source SmartGroups: APACHE ✕

Destination SmartGroups: APACHE ✕

WebGroups:

Protocol: ICMP

Rule Behavior Enforcement ● Logging ●

Action: Permit

SG Orchestration ⓘ: On

Ensure TLS: Off

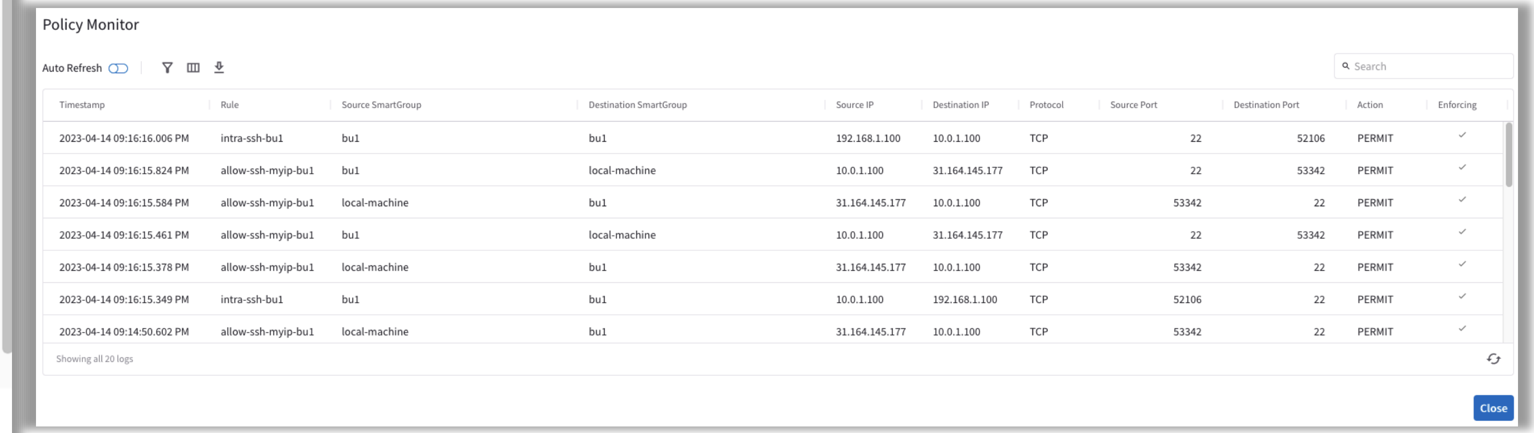
TLS Decryption: Off

Intrusion Detection (IDS): Off

Rule Priority

Place Rule

- Logging can be turned ON/OFF per rule
- Configure Syslog to view the logs
- To configure how many days to keep your Distributed Cloud Firewall logs, in CoPilot navigate to Settings > Resources > Disk Utilization and scroll down to Distributed Cloud Firewall Logs. Use the slider to select the number of days to retain your logs (<u>default is five days</u>).



Policy Monitor

Auto Refresh ○

Timestamp	Rule	Source SmartGroup	Destination SmartGroup	Source IP	Destination IP	Protocol	Source Port	Destination Port	Action	Enforcing
2023-04-14 09:16:16.006 PM	intra-ssh-bu1	bu1	bu1	192.168.1.100	10.0.1.100	TCP	22	52106	PERMIT	✓
2023-04-14 09:16:15.824 PM	allow-ssh-myip-bu1	bu1	local-machine	10.0.1.100	31.164.145.177	TCP	22	53342	PERMIT	✓
2023-04-14 09:16:15.584 PM	allow-ssh-myip-bu1	local-machine	bu1	31.164.145.177	10.0.1.100	TCP	53342	22	PERMIT	✓
2023-04-14 09:16:15.461 PM	allow-ssh-myip-bu1	bu1	local-machine	10.0.1.100	31.164.145.177	TCP	22	53342	PERMIT	✓
2023-04-14 09:16:15.378 PM	allow-ssh-myip-bu1	local-machine	bu1	31.164.145.177	10.0.1.100	TCP	53342	22	PERMIT	✓
2023-04-14 09:16:15.349 PM	intra-ssh-bu1	bu1	bu1	10.0.1.100	192.168.1.100	TCP	52106	22	PERMIT	✓
2023-04-14 09:14:50.602 PM	allow-ssh-myip-bu1	local-machine	bu1	31.164.145.177	10.0.1.100	TCP	53342	22	PERMIT	✓

Showing all 20 logs

Next:

Lab 8 Distributed Cloud Firewall