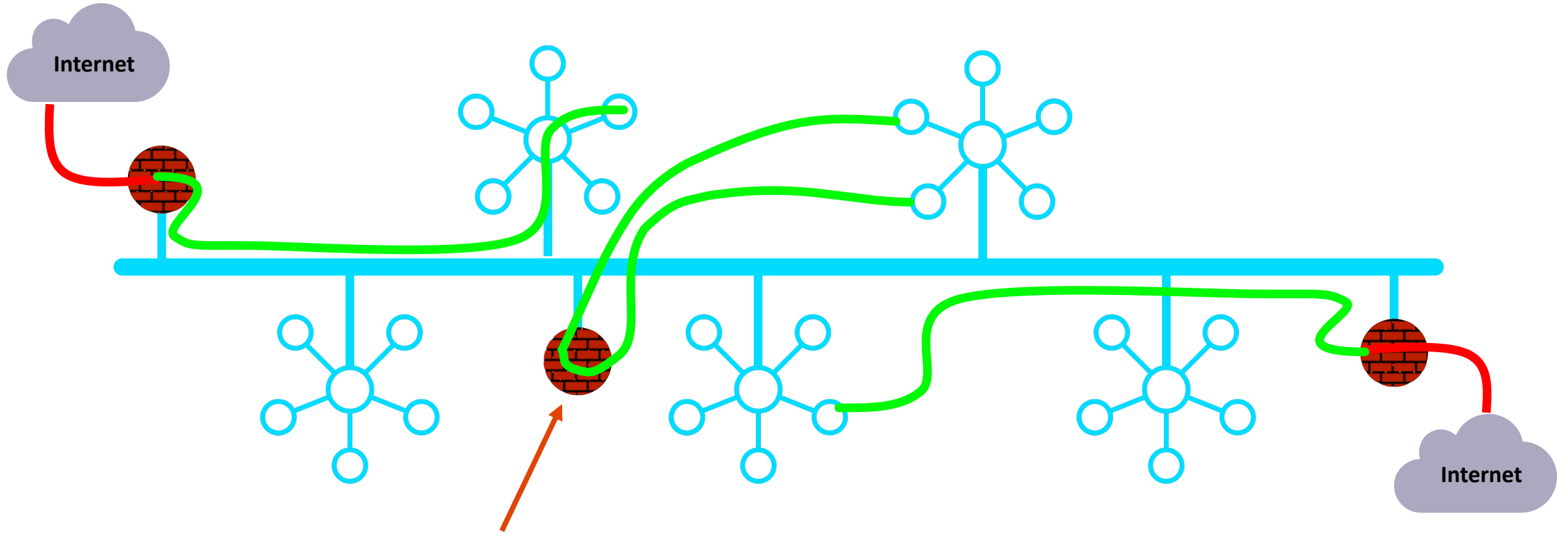




Distributed Cloud Firewall

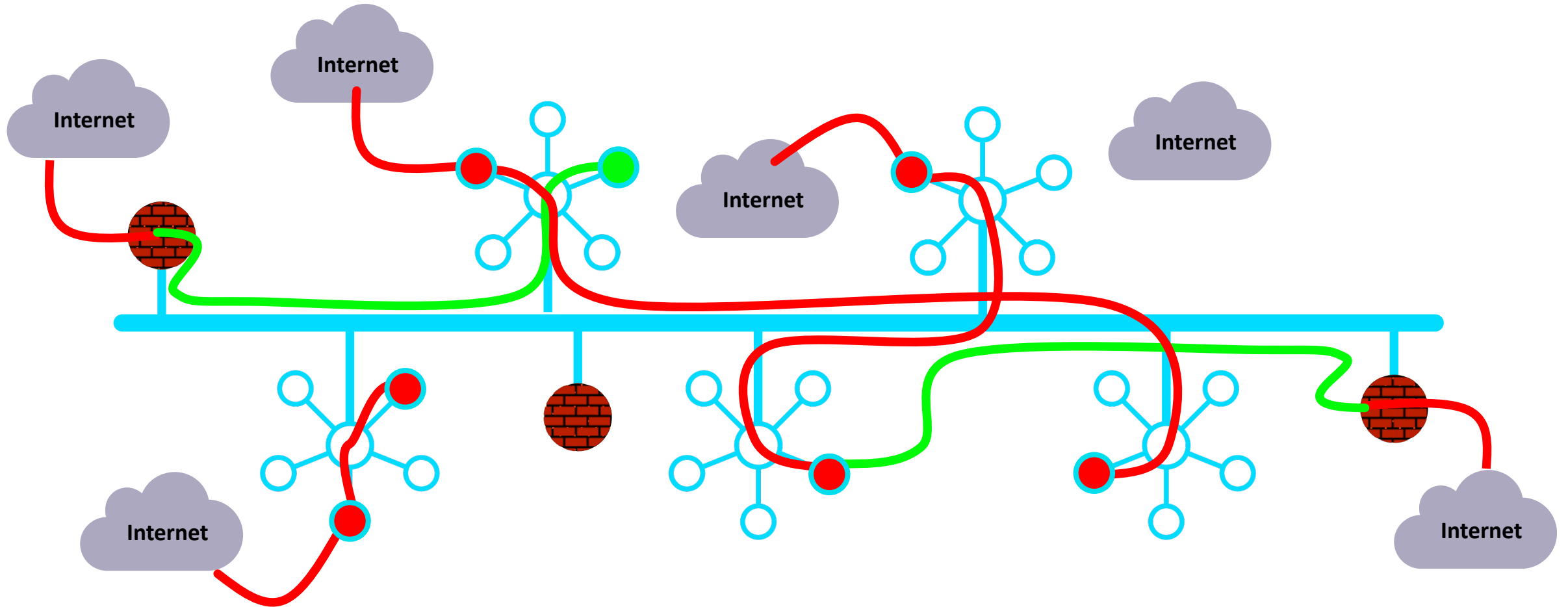
ACE Solutions Architecture Team

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

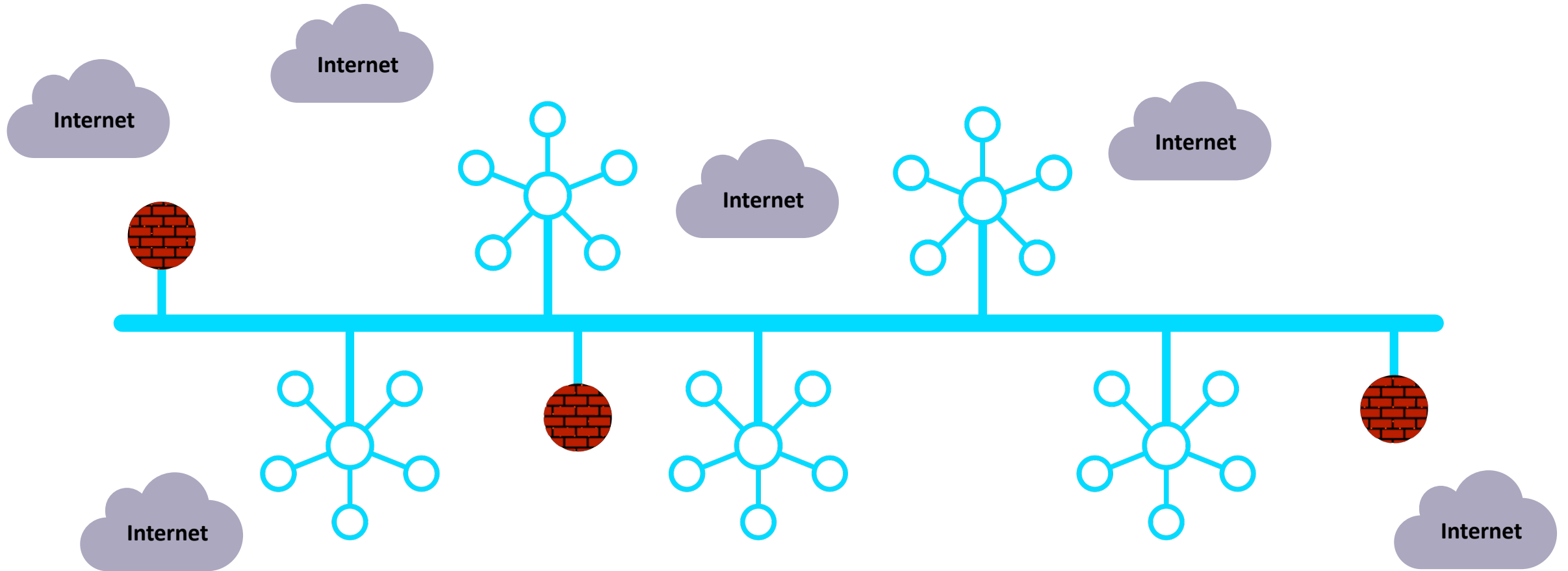


“Last Generation Firewalls”

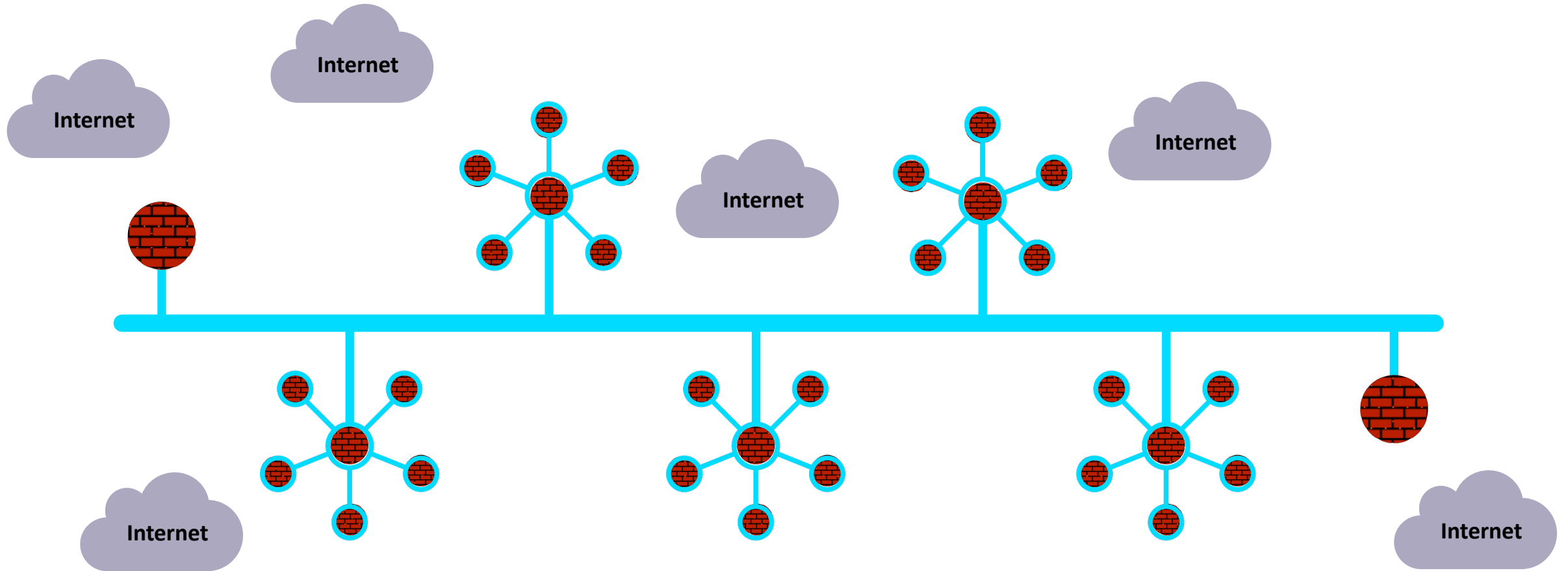
In Reality...



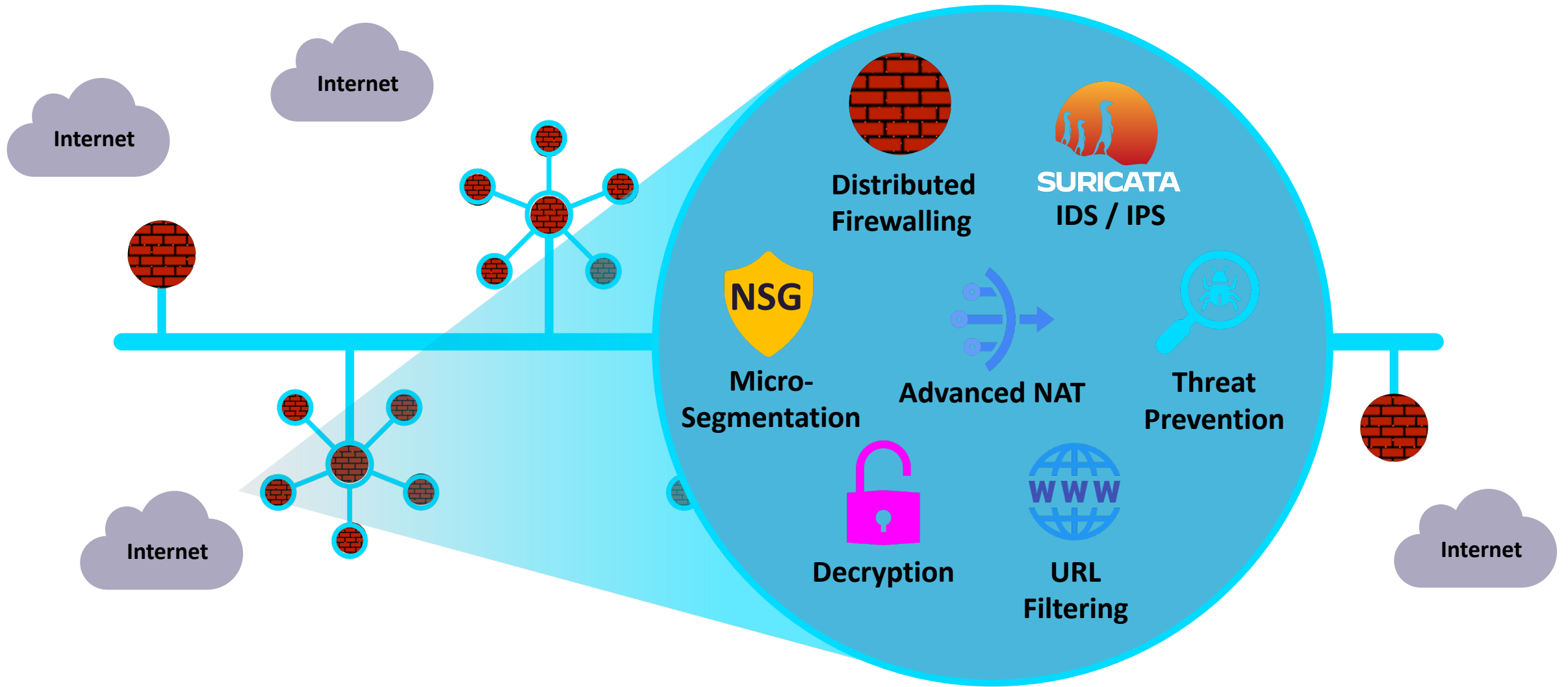
What If... the architecture was built for cloud



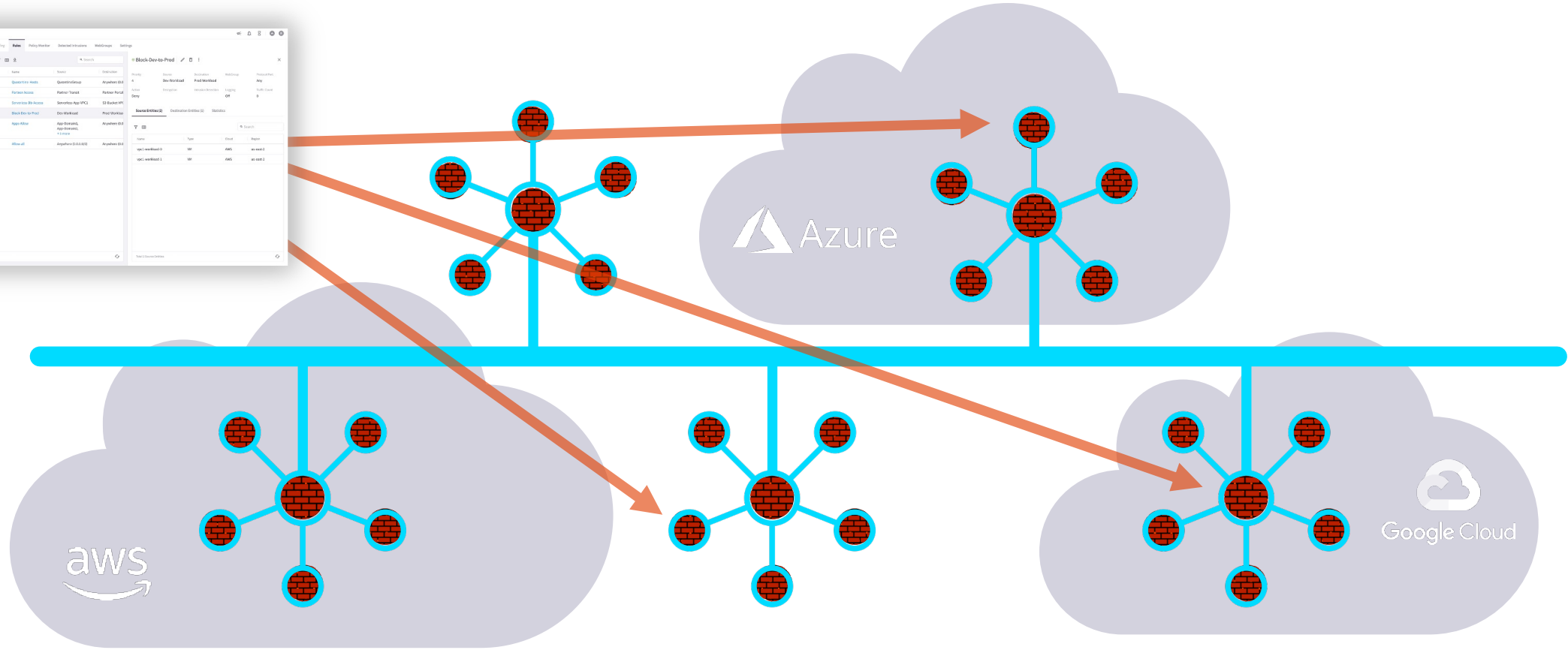
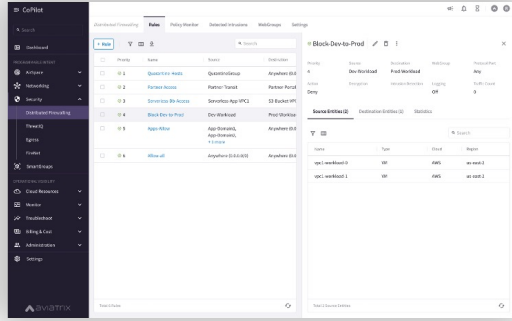
Firewalling Functions were Embedded in the Cloud Network Everywhere...



And, What If it was more than just firewalling...



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



Where and How Policies Are Enforced Is Abstracted...

Smart Group

- **What is a Smart Group?**

A Smart Group identifies a group of resources that have similar policy requirements, that are confined in the same logical container.

- The members of a Smart Group can be classified using *three* methods:

- CSP Tags
- Resource Attributes
- CIDR



Classification Methods



CSP Tags (recommended)

- Tags are assigned to:
 - Instance
 - VPC/VNET
 - Subnet
- Tags are {Key, Value} pairs
- Eg: A VM hosting shopping cart application can be tagged with:
 - {Key: Type, Value: Shopping cart app}
 - {Key: Env, Value: Staging}

Resource attribute

- Region Name, Account Name

IP Prefixes

- CIDR

Instance: i-0380038ff7d66b66f (shopping cart app)

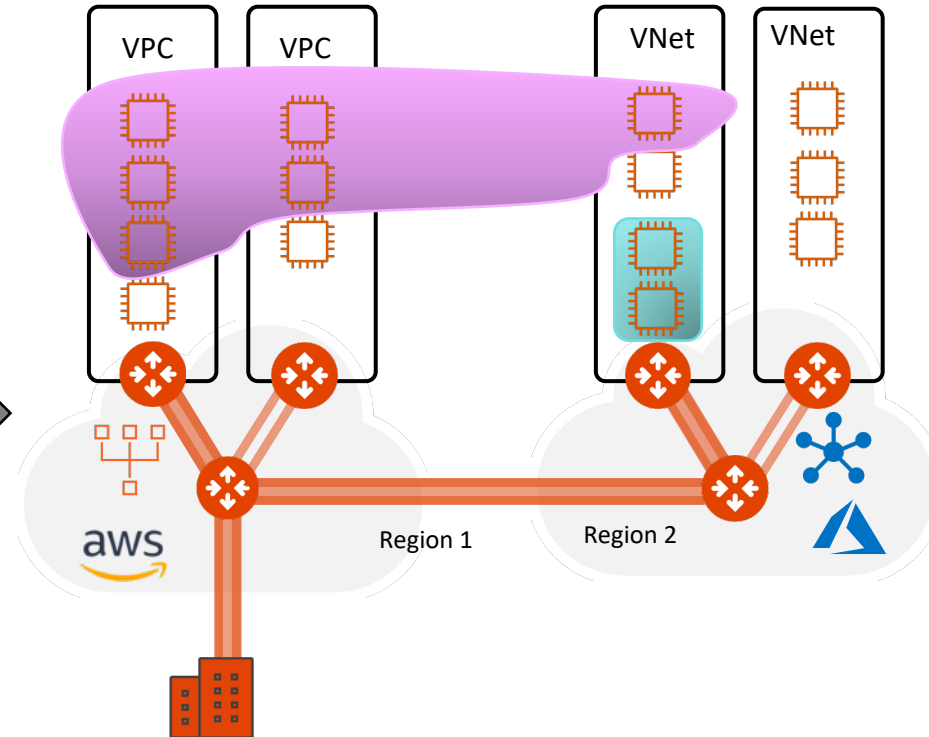
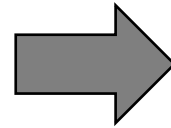
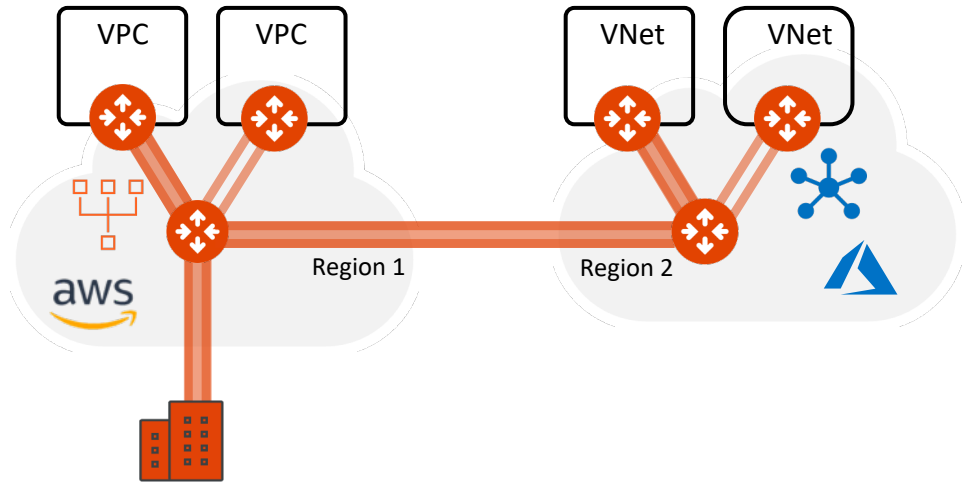
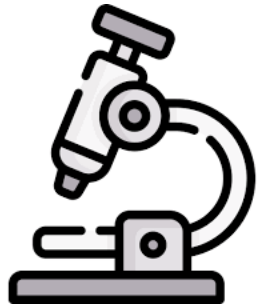
Select an instance above

Details | Security | Networking | Storage | Status checks | Monitoring | **Tags**

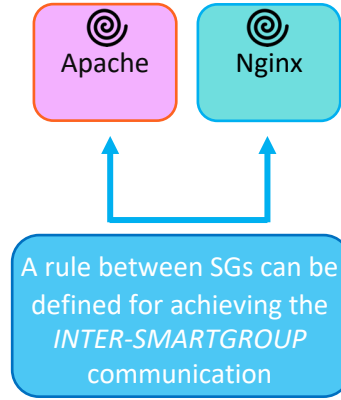
Tags

Key	Value
Env	Staging
Name	shopping cart app

Distributed Firewalling: Intra-rule vs. Inter-rule



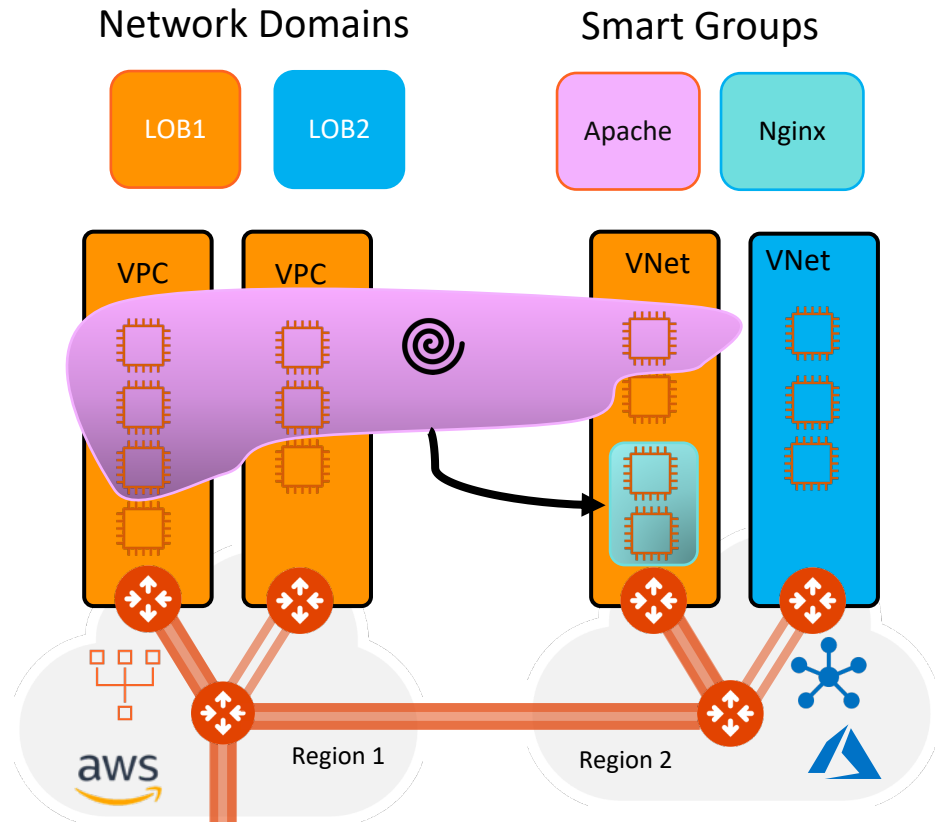
Smart Groups



- **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

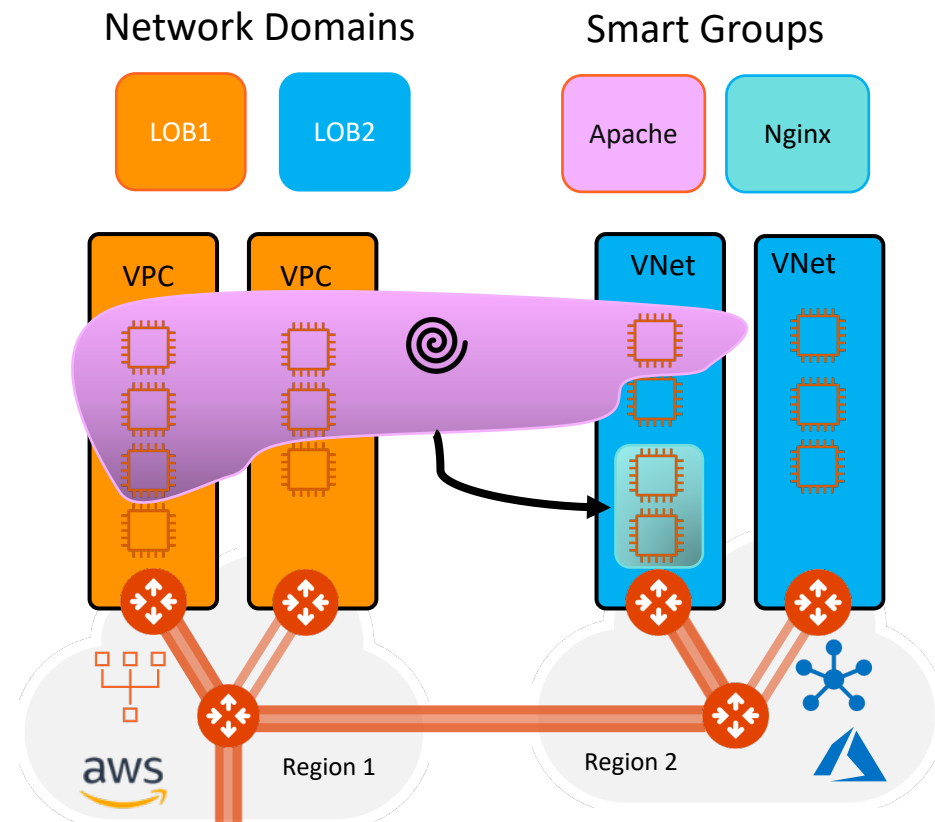
- **INTER-RULE:** is defined among Smart Groups, for dictating what kind of traffic is allowed/prohibited among two or more Smart Groups.

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



CoPilot

SmartGroups

+ SmartGroup Refresh CSP Resources

Successfully refreshed CSP resources
Auto Dismisses in 4s Dismiss

Create New SmartGroup

Name: APACHE

Resources: Resource Selection (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)

Type APACHE

Create New SmartGroup

Name: APACHE

Resources: Resource Selection (3)

Name	Type	Cloud	Region
PROD1-APACHE	VM	AWS	eu-central-1
PROD2-APACHE	VM	AWS	eu-central-1
prod3-apache	VM	Azure ARM	westeurope

- 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


SmartGroups

+ SmartGroup | Refresh CSP Resources | Filter | Download | Help

Name	Resource Type
Anywhere (0.0.0.0/0)	
Public Internet	

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

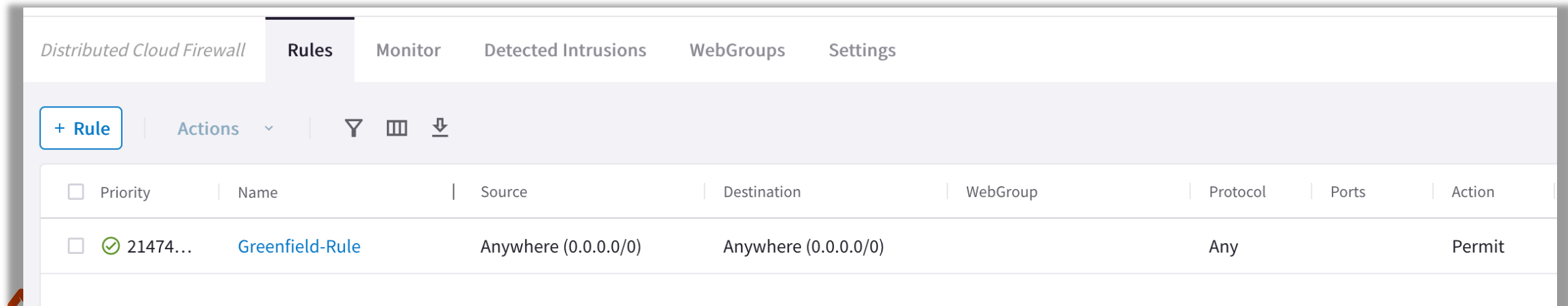
Enabling Distributed Cloud Firewall



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.

[Manage Add-on Features](#) [Enable Distributed Cloud Firewall](#)

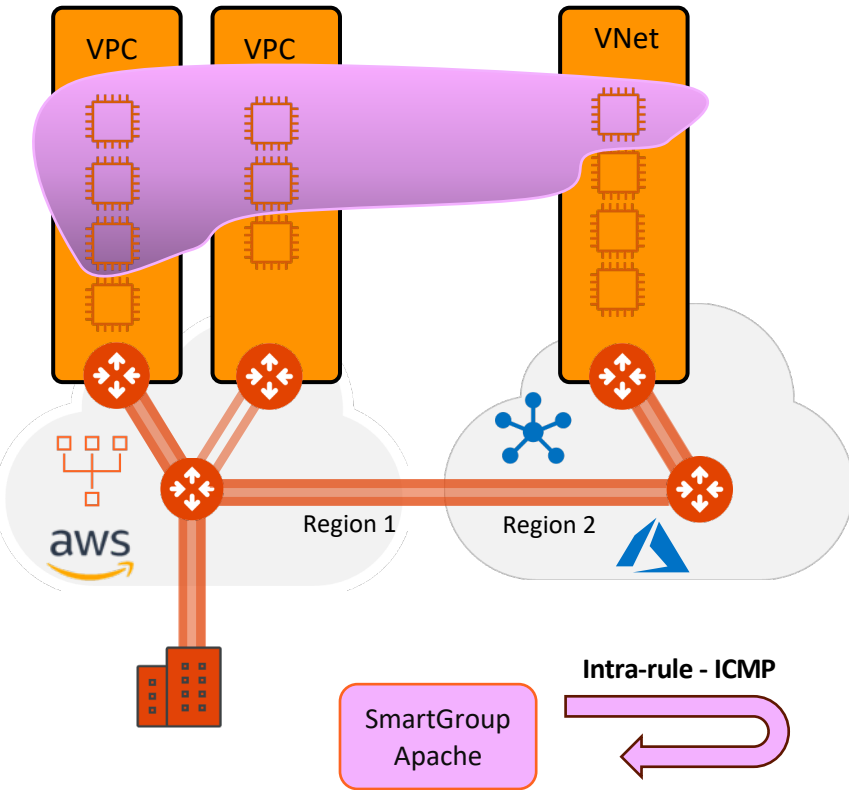
- Enabling the Distributed Cloud Firewall without configured rules will deny all previously permitted traffic due to its implicit Deny All rule.
- To maintain consistency, a **Greenfield Rule** will be created to allow traffic that maintains the current state, facilitating the creation of custom rules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



The screenshot shows the 'Rules' tab in the Distributed Cloud Firewall interface. The table below displays the configuration for a 'Greenfield-Rule'.

Priority	Name	Source	Destination	WebGroup	Protocol	Ports	Action
<input type="checkbox"/> 21474...	Greenfield-Rule	Anywhere (0.0.0.0/0)	Anywhere (0.0.0.0/0)		Any		Permit

Micro-Segmentation: 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: [Empty]

Protocol: ICMP

Rule Behavior: Enforcement Logging

Action: Permit | SG Orchestration On

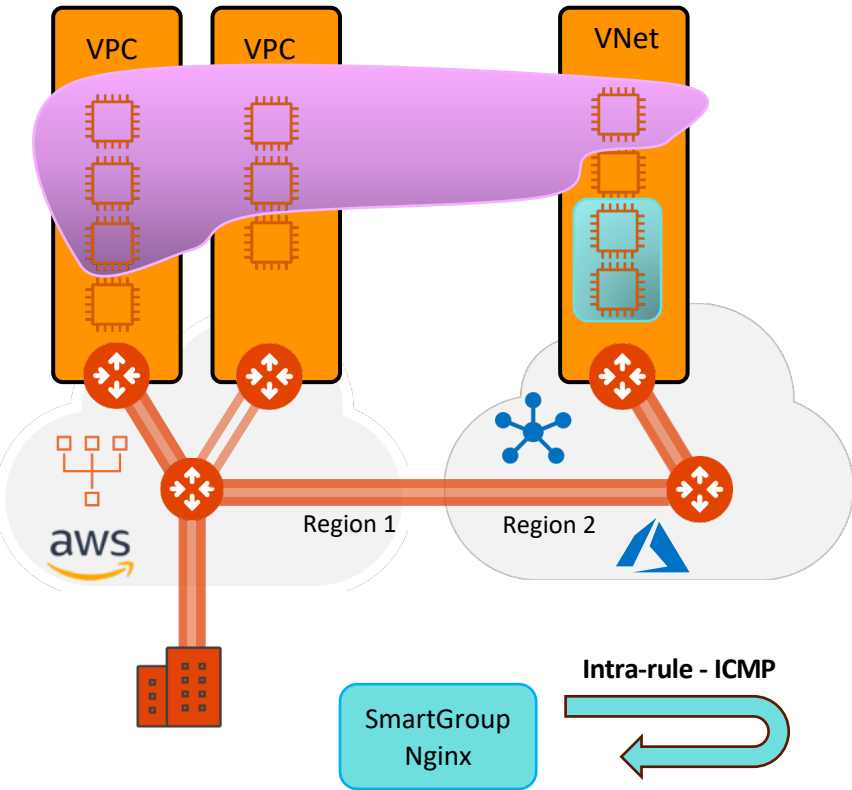
Ensure TLS: Off | TLS Decryption: Off | Intrusion Detection (IDS): Off

Rule Priority: [Empty]

Place Rule: [Empty]

Buttons: Cancel | Save In Drafts

Micro-Segmentation: 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: [Empty]

Protocol: ICMP

Rule Behavior: Enforcement Logging

Action: Permit SG Orchestration On

Ensure TLS: Off TLS Decryption: Off Intrusion Detection (IDS): Off

Rule Priority: [Empty]

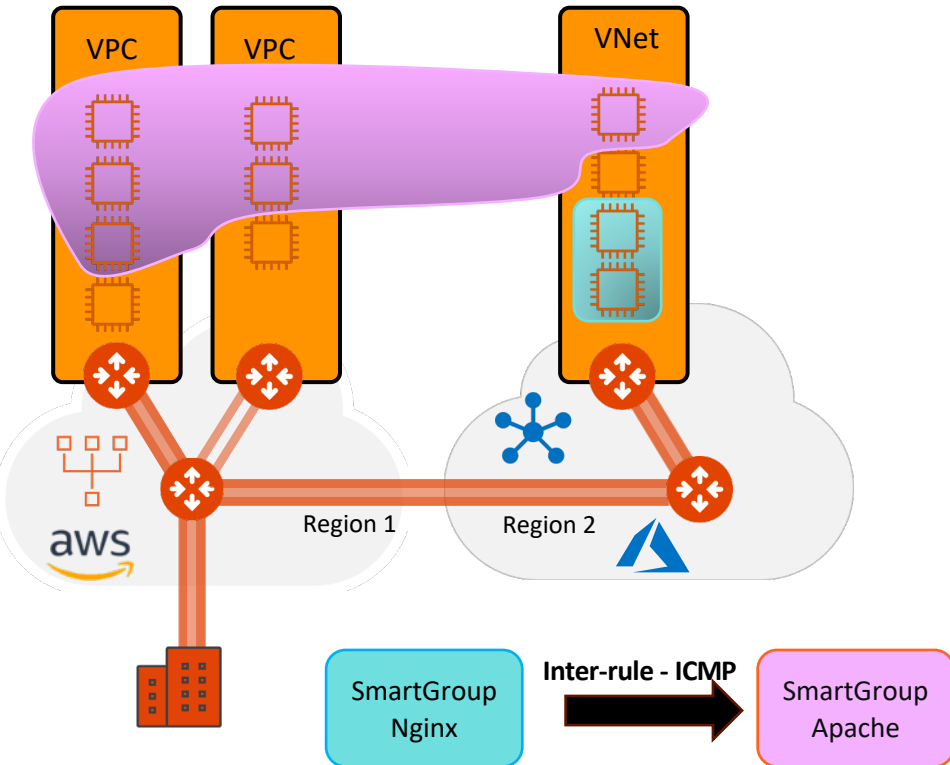
Place Rule: [Empty] Existing Rule: [Empty]

Cancel Save In Drafts

Intra-rule

Monitoring

Micro-Segmentation: 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: [Empty]

Protocol: ICMP

Rule Behavior: Enforcement Logging

Action: Permit | SG Orchestration On

Ensure TLS: Off | TLS Decryption: Off | Intrusion Detection (IDS): Off

Rule Priority: [Empty]

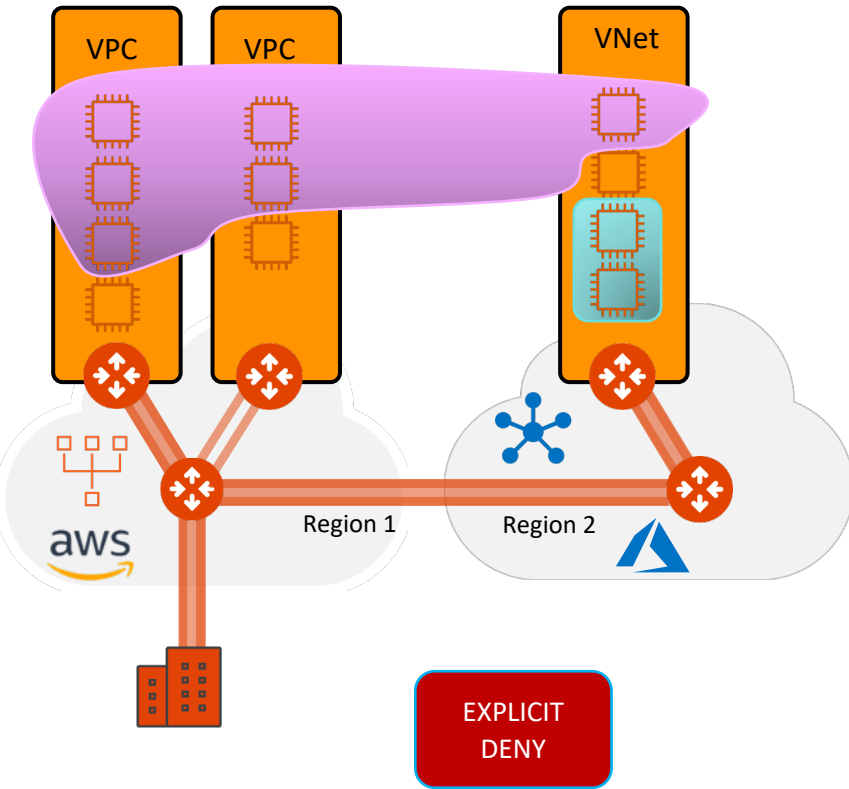
Place Rule: [Empty]

Buttons: Cancel | Save In Drafts

Inter-rule

Monitoring

Micro-Segmentation: 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: [Empty]

Protocol: Any | Port: All

Rule Behavior: Enforcement | Logging

Action: Deny | SG Orchestration Off

TLS Decryption: Off

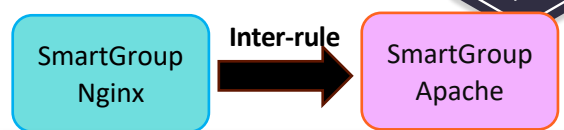
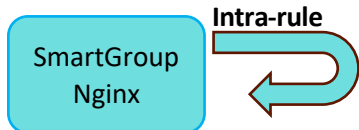
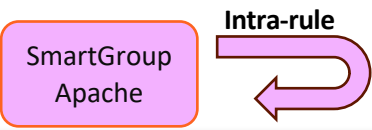
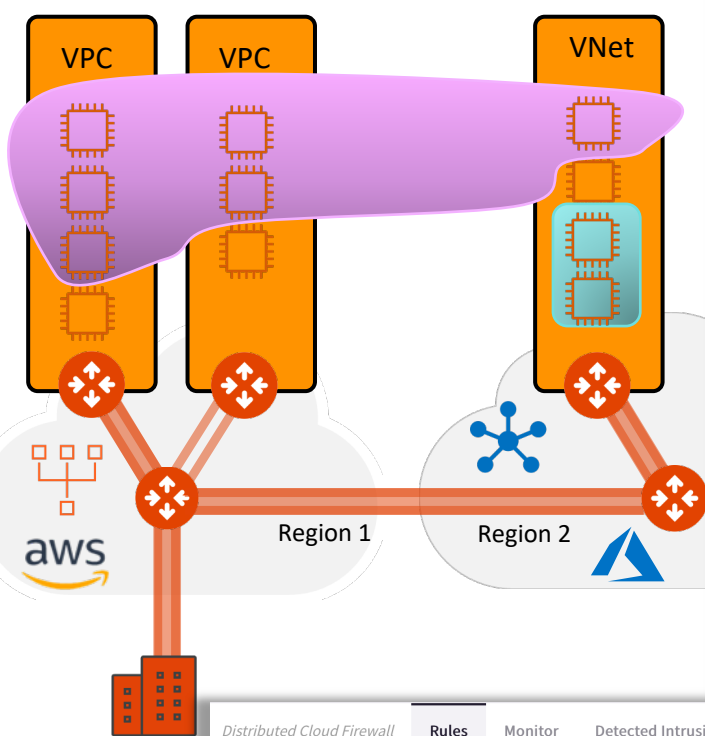
Rule Priority: Place Rule: Above | Existing Rule: Greenfield-Rule

Buttons: Cancel | Save In Drafts

Monitoring

Rule Position

Micro-Segmentation: 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

Enforcement: On Logging: On

Action: Permit SG Orchestration: On

Ensure TLS: Off TLS Decryption: Off Intrusion Detection (IDS): Off

Place Rule: Existing Rule

Buttons: Cancel Save In Drafts

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

Enforcement: On Logging: On

Action: Permit SG Orchestration: On

Ensure TLS: Off TLS Decryption: Off Intrusion Detection (IDS): Off

Place Rule: Existing Rule

Buttons: Cancel Save In Drafts

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

Enforcement: On Logging: On

Action: Permit SG Orchestration: On

Ensure TLS: Off TLS Decryption: Off Intrusion Detection (IDS): Off

Place Rule: Existing Rule

Buttons: Cancel Save In Drafts

Distributed Cloud Firewall Rules Monitor Detected Intrusions WebGroups Settings

+ Rule Actions [Filters] [Search]

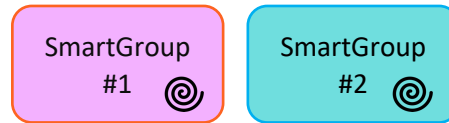
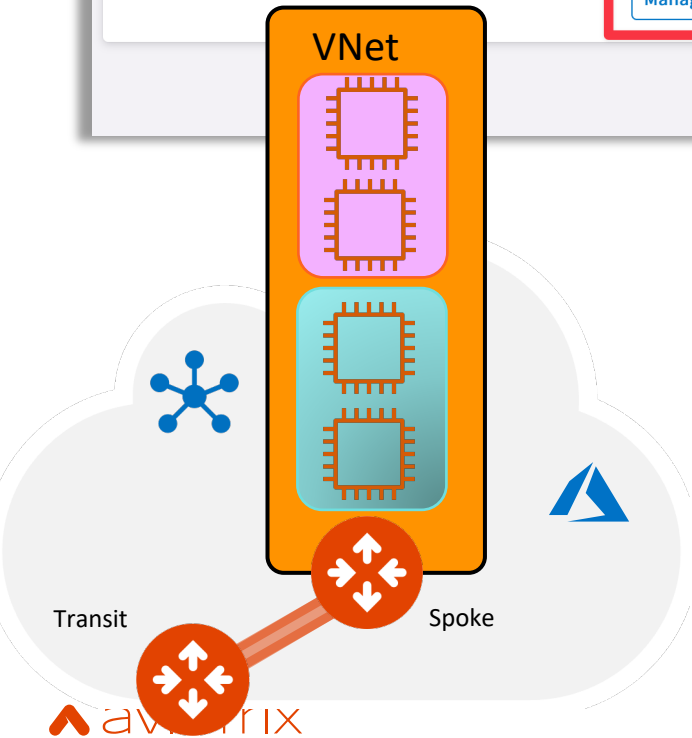
4 New 1 Modified Discard Commit

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



- 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

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	<input checked="" type="checkbox"/> Enabled
AZURE-WESTEUROPE-	Azure ARM	westeurope	AZURE-AVIATRIX	<input checked="" type="checkbox"/> Enabled

Total 2 VPC/VNets

I understand the network impact of the changes.

Cancel Save

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 Logging

Action

Permit

SG Orchestration

On

Ensure TLS

Off

TLS Decryption

Off

Intrusion Detection (IDS)

Off

Rule Priority

Place Rule

Cancel

Save In Drafts

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

Cancel

Save In Drafts

- ❑ 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 (default is five days).

Policy Monitor

Auto Refresh

Search

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

Close



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:
 - ❑ Classification based on the **CSP Tags**
 - ❑ Classification based on the **Resource Properties** (i.e. Name, Region or Account Name)
 - ❑ Classification based on the **IPs/CIDRs**
- 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	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



Name
intra-rule-icmp

Source SmartGroups
BU1 x

Destination SmartGroups
BU1 x

Protocol
ICMP

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

- ❑ Source Smart Group and Destination Smart Group must differ



Name
inter-rule-icmp

Source SmartGroups
BU1 x

Destination SmartGroups
BU2 x

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 automatically 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.



Next:

Lab 8 Distributed Cloud Firewall