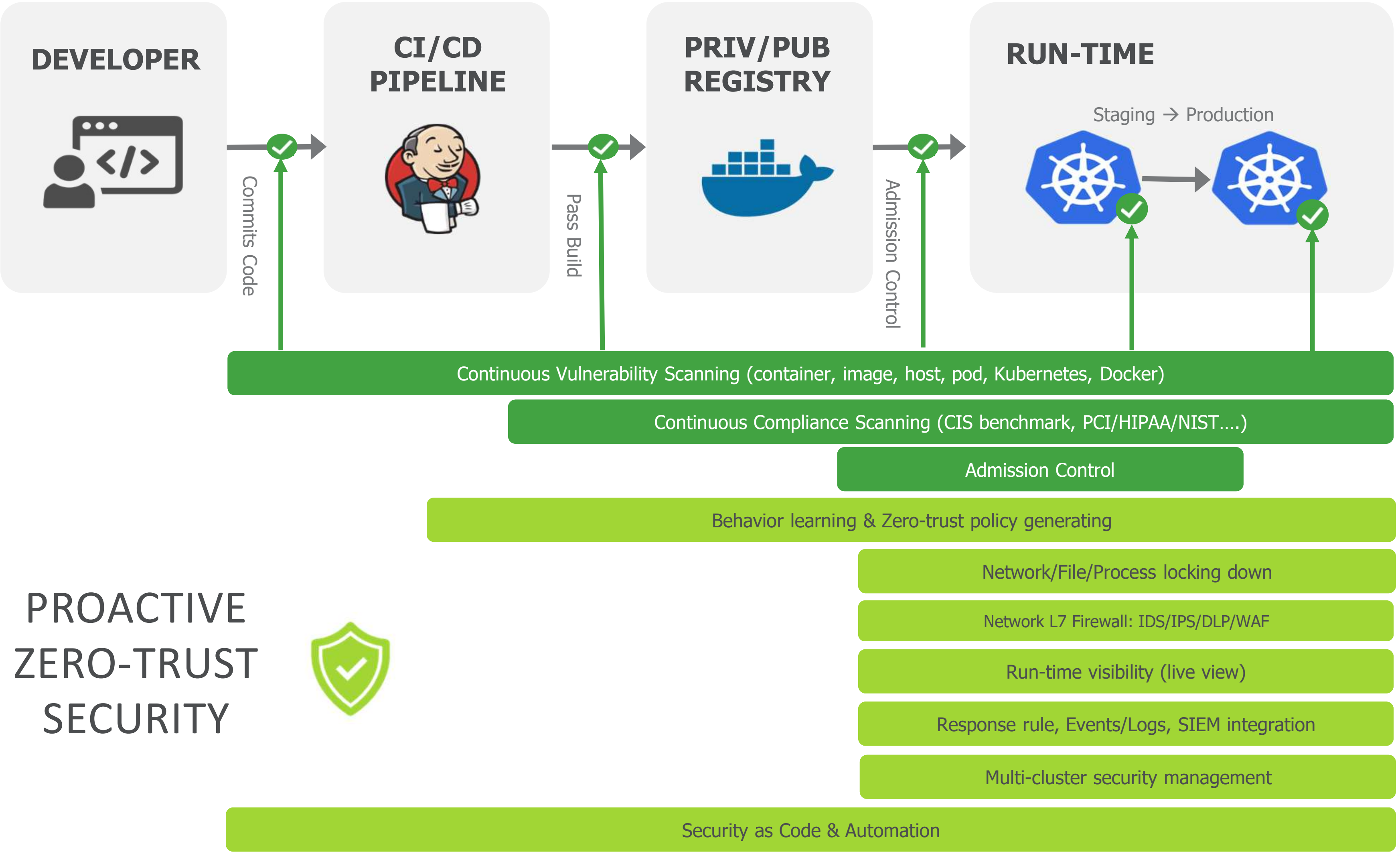
OPEN ZERO TRUST

FULL LIFECYCLE CONTAINER SECURITY

FROM DEV TO PRODUCTION

May 2022

PROACTIVE ZERO-TRUST SECURITY



DEVELOPER

CI/CD PIPELINE

PRIV/PUB REGISTRY

RUN-TIME

Staging → Production

Commits Code

Pass Build

Admission Control

Continuous Vulnerability Scanning (container, image, host, pod, Kubernetes, Docker)

Continuous Compliance Scanning (CIS benchmark, PCI/HIPAA/NIST….)

Admission Control

Behavior learning & Zero-trust policy generating

Network/File/Process locking down

Network L7 Firewall: IDS/IPS/DLP/WAF

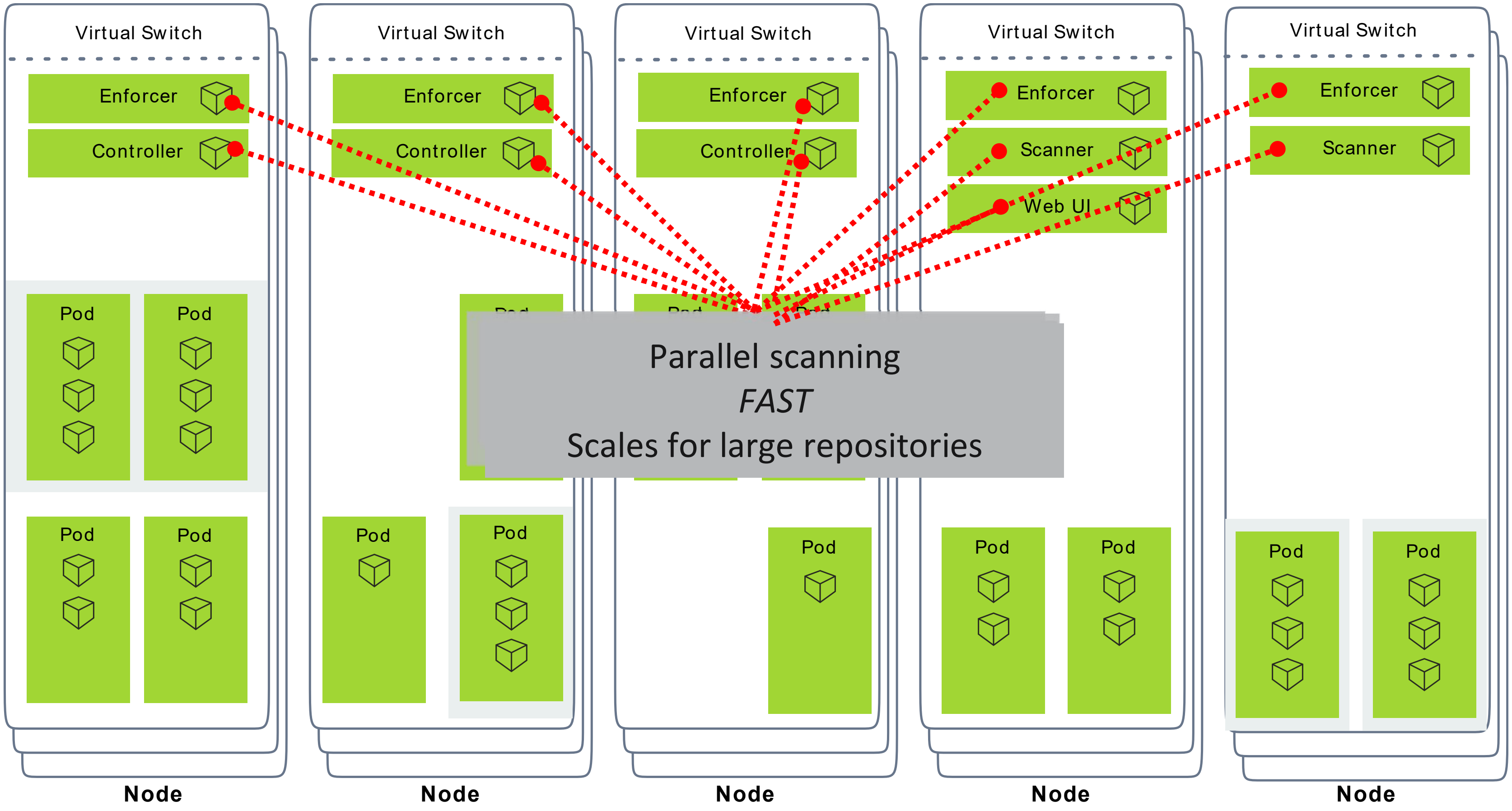
Run-time visibility (live view)

Response rule, Events/Logs, SIEM integration

Multi-cluster security management

Security as Code & Automation

ARCHITECTURE / DEPLOYMENT

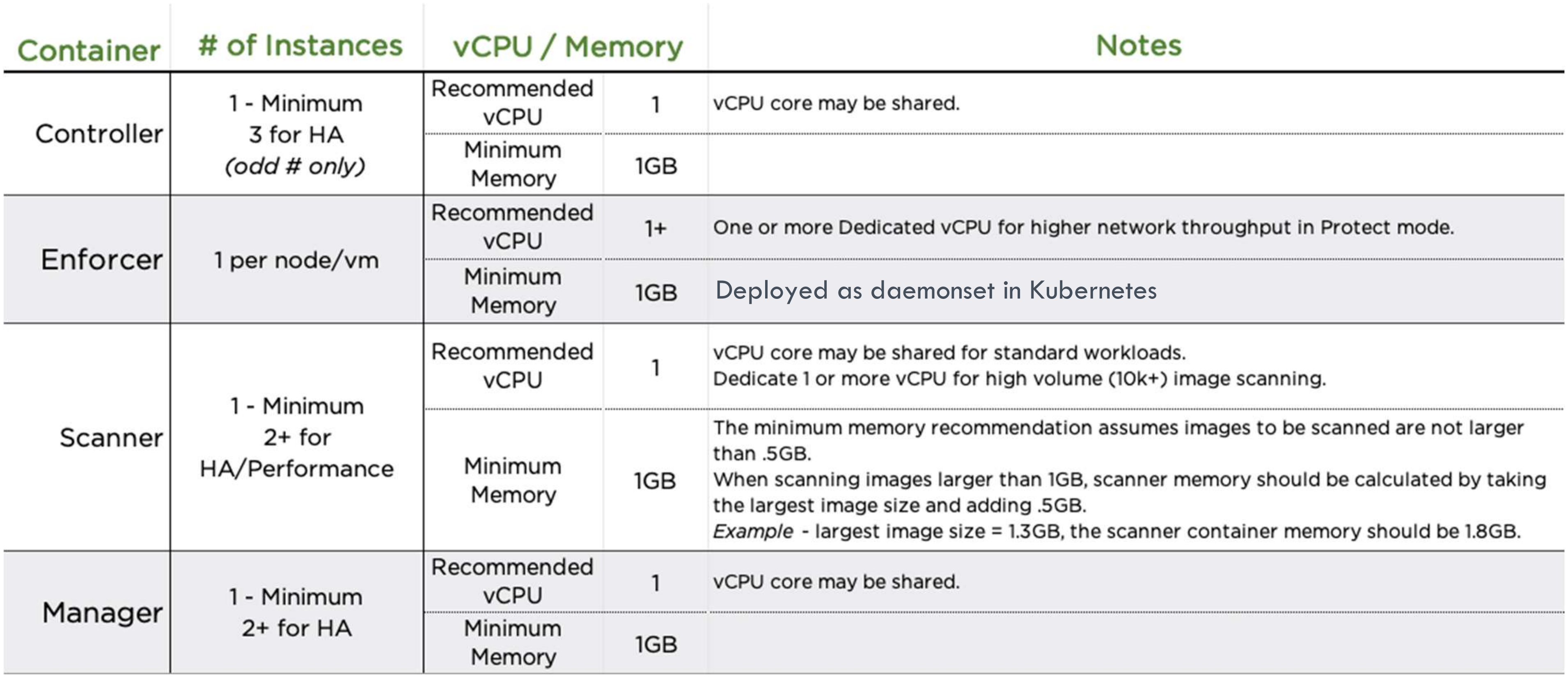


Parallel scanning

FAST

Scales for large repositories

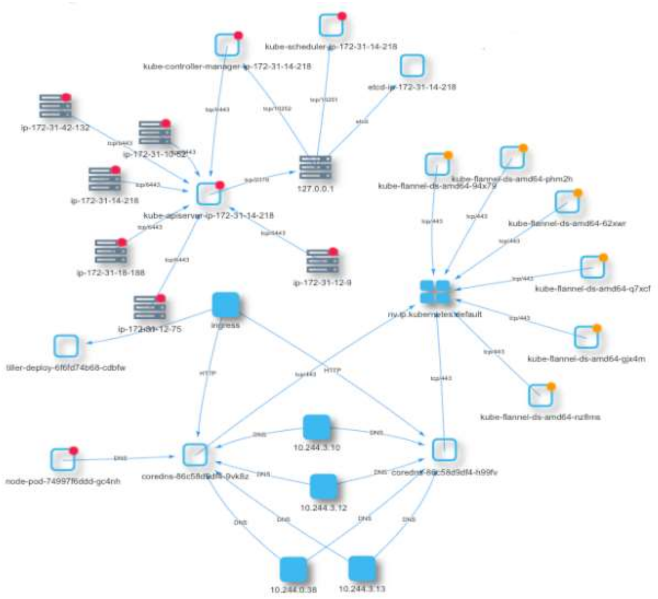
DETAILED INFRASTRUCTURE SPECS



Container	# of Instances	vCPU / Memory		Notes
Controller	1 - Minimum 3 for HA *(odd # only)*	Recommended vCPU	1	vCPU core may be shared.
		Minimum Memory	1GB	
Enforcer	1 per node/vm	Recommended vCPU	1+	One or more Dedicated vCPU for higher network throughput in Protect mode.
		Minimum Memory	1GB	Deployed as daemonset in Kubernetes
Scanner	1 - Minimum 2+ for HA/Performance	Recommended vCPU	1	vCPU core may be shared for standard workloads. Dedicate 1 or more vCPU for high volume (10k+) image scanning.
		Minimum Memory	1GB	The minimum memory recommendation assumes images to be scanned are not larger than .5GB. When scanning images larger than 1GB, scanner memory should be calculated by taking the largest image size and adding .5GB. *Example* - largest image size = 1.3GB, the scanner container memory should be 1.8GB.
Manager	1 - Minimum 2+ for HA	Recommended vCPU	1	vCPU core may be shared.
		Minimum Memory	1GB	

* Being stress tested and validated by large Cloud provider to 1000 node clusters!

OPEN ZERO TRUST: FULL LIFECYCLE CONTAINER SECURITY PLATFORM


kube-scheduler-ip-172-31-14-218
kube-controller-manager-ip-172-31-14-218
etcd-ip-172-31-14-218
ip-172-31-42-132
ip-172-31-10-82
ip-172-31-14-218
127.0.0.1
kube-apiserver-ip-172-31-14-218
ip-172-31-18-188
ip-172-31-12-9
ip-172-31-12-75
ingress
tiller-deploy-6f6fd74b68-cdbfw
kube-flannel-ds-amd64-94x79
kube-flannel-ds-amd64-phm2h
kube-flannel-ds-amd64-62xwr
kube-flannel-ds-amd64-q7xcf
nv.ip.kubernetes.default
kube-flannel-ds-amd64-gjx4m
kube-flannel-ds-amd64-nzfms
node-pod-74997f6ddd-gc4nh
coredns-86c58d9df4-9vk8z
coredns-86c58d9df4-h99fv
10.244.3.10
10.244.3.12
10.244.0.38
10.244.3.13
tcp/6443
tcp/10252
tcp/10251
etcd
tcp/2379
tcp/443
HTTP
DNS

Unique Attack Protection in Production

- Complete Run-Time Attack Detection & Prevention – Network, Process, File, Host, Orchestrator
- Deep Network Packet Inspection for Real-Time Attack Prevention

Complete Security Automation

- Automated CI/CD Security, Security Policy As Code, Automated Alerting & Response

Vulnerability & Compliance Management for DevOps

- 'Shift-Left' CI/CD Scanning with Admission Control
- Kubernetes CIS Benchmark, PCI Controls

True Cloud-Native Solution

- Deploys and Updates as a Container
- Integrated into CI/CD Tools and Container Orchestrators - Kubernetes

MITRE ATTACK COVERAGE

MITRE ATT&CK® is a globally-accessible knowledge base of adversary tactics and techniques based on real-world observations. The ATT&CK knowledge base is used as a foundation for the development of specific threat models and methodologies in the private sector, in government, and in the cybersecurity product and service community.

Initial Access	Execution	Persistence	Privilege Escalation	Defense Evasion	Credential Access	Discovery	Impact
🟩 Exploit Public-Facing Application	🟩 Container Administration Command	🟩 External Remote Services	🟩 Escape to Host	🟩 Build Image on Host	🟨 Brute Force	🟩 Container and Resource Discovery	🟨 Endpoint Denial of Service
🟩 External Remote Services	🟩 Deploy Container	🟩 Implant Internal Image	🟩 Exploitation for Privilege Escalation	🟩 Deploy Container	🟨 Password Guessing	🟩 Network Service Scanning	🟨 Network Denial of Service
🟨 Valid Accounts	🟩 Scheduled Task/Job	🟩 Scheduled Task/Job	🟩 Scheduled Task/Job	🟩 Impair Defenses	🟨 Password Spraying		🟩 Resource Hijacking
⬜ Default Accounts	🟩 Container Orchestration Job	🟩 Container Orchestration Job	🟩 Container Orchestration Job	🟩 Disable or Modify Tools	🟨 Credential Stuffing		
⬜ Local Accounts	🟩 User Execution	🟨 Valid Accounts	🟨 Valid Accounts	🟩 Indicator Removal on Host	🟩 Unsecured Credentials		
	🟩 Malicious Image	⬜ Default Accounts	⬜ Default Accounts	🟩 Masquerading	🟩 Credentials In Files		
		⬜ Local Accounts	⬜ Local Accounts	🟩 Match Legitimate Name or Location	🟩 Container API		
				🟨 Valid Accounts			
				⬜ Default Accounts			
				⬜ Local Accounts			

🟩 Covered by Open Zero Trust

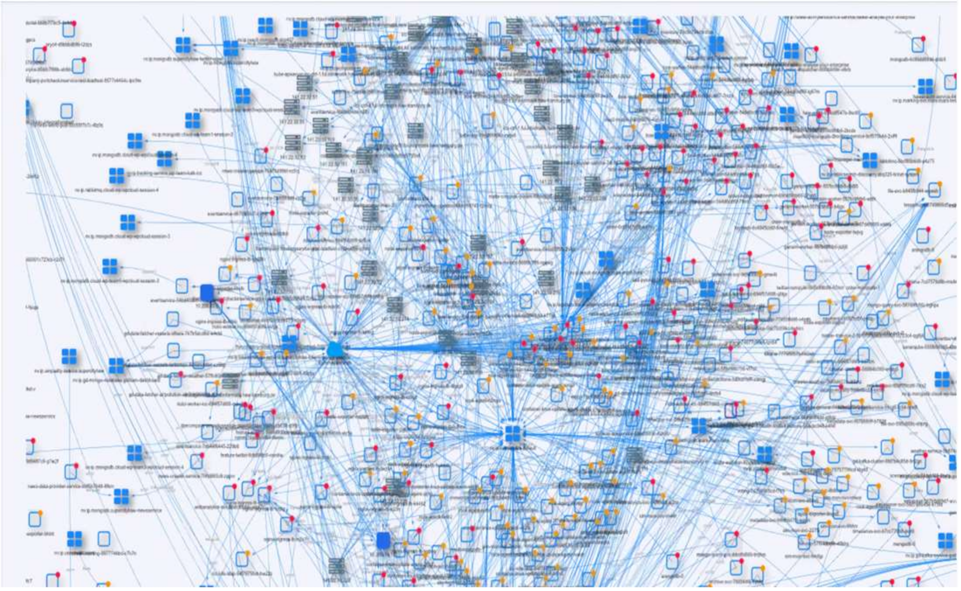
🟨 Partially covered by Open Zero Trust

⬜ Covered by 3rd party solutions

https://blog.neuvector.com/article/how-to-use-neuvector-with-the-mitre-attck-framework

CUSTOMER SPOTLIGHT

"I'd recommend that you take a serious look at what's running inside your container network." – *JOHN DEEMING, VP of PaaS*

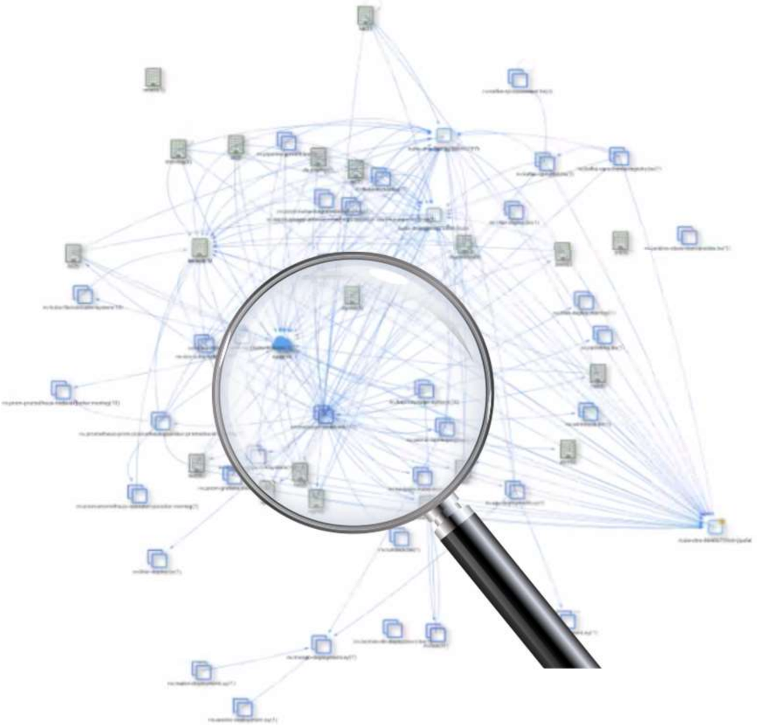


The FICO Score application was migrated to OpenShift, running on both AWS and private clouds accessing highly sensitive data. The fraud and identity theft protection service was in production on 159 worker nodes in 37 countries. In total there are 800 production and developer nodes being protected by NeuVector as of end of 2019.
NeuVector provides:

- *Compliance*
- *Block all traffic leaving Kubernetes Clusters by default*
- *Runtime Security, container threat protection*
- *Fast Vulnerability Scanning*

KUBERNETES NETWORK DPI USE CASES

- Application Layer Segmentation
- Break Out Detection
- Strict, declarative egress controls
- Command & Control Connections
- Sensitive Data Detection
- North/South and East/West Threat Detection
- North/South In- & Exfiltration
- WAF rules including OWASP Top 10 and Log4j
- API Security
- PCI DLP Compliance
- Full Network Packet Capture / Forensics
- Application Connection Debugging



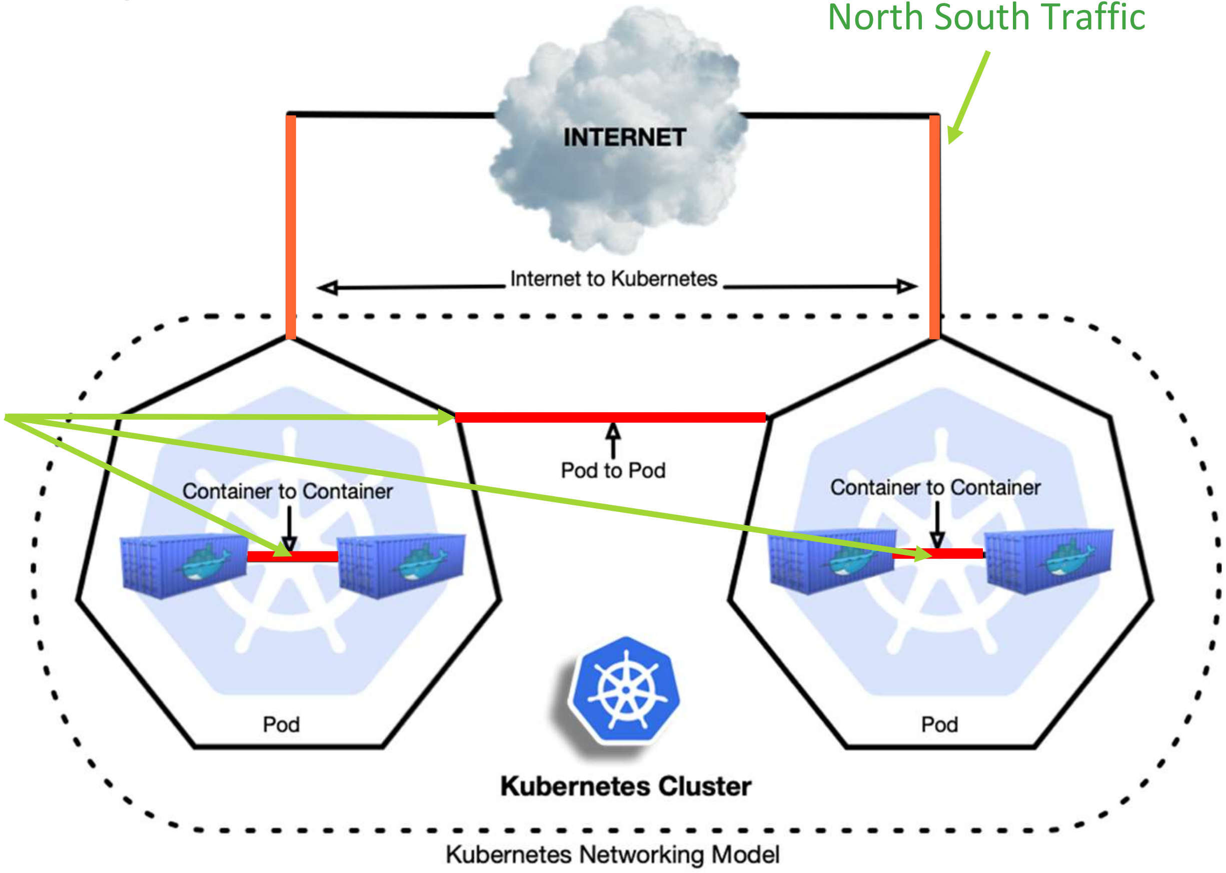
OPENSHIFT kubernetes docker RANCHER

OPEN ZERO TRUST

L7 NETWORK BEHAVIOR INSPECTION

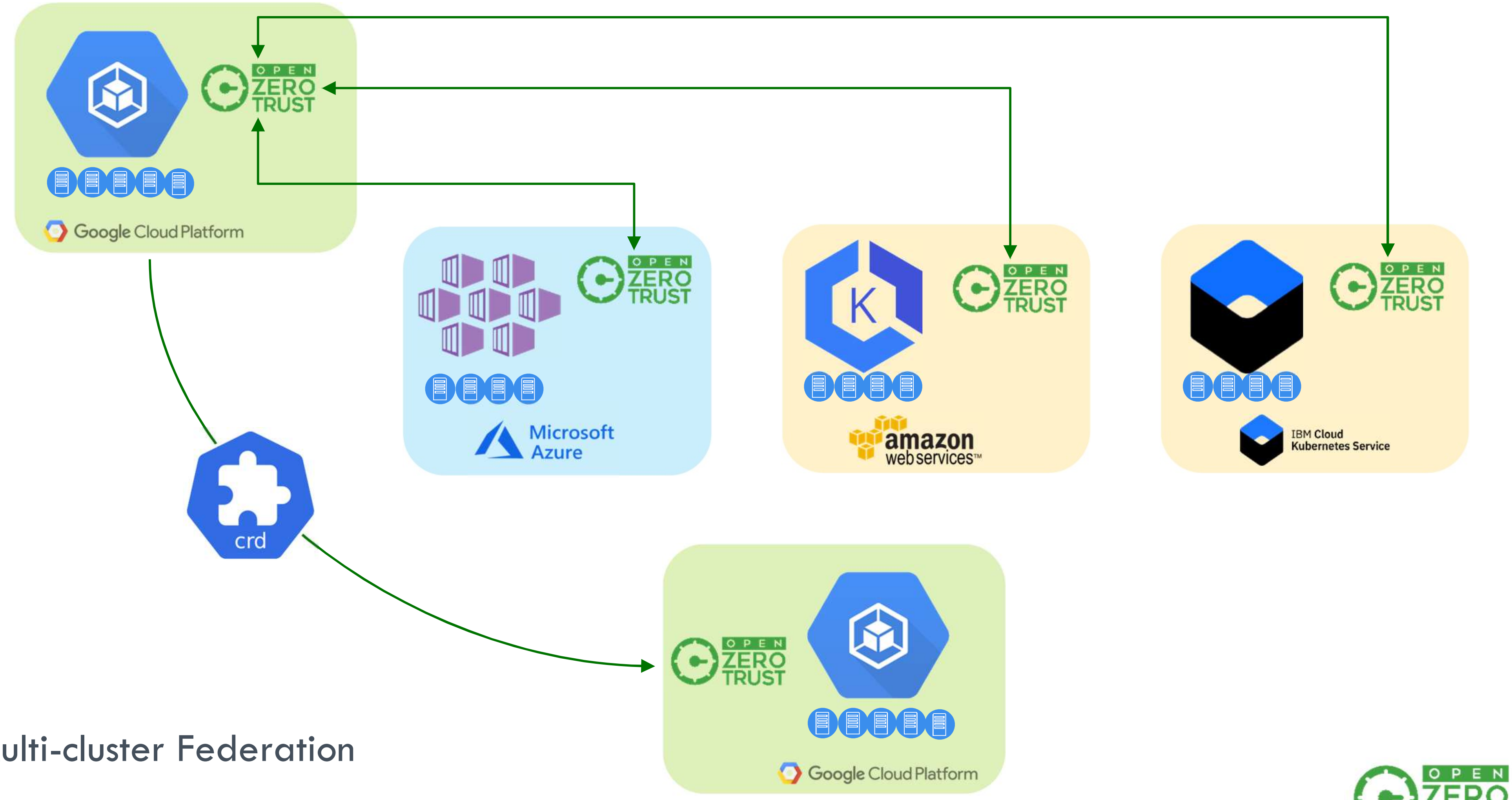
North South Traffic

East-West Traffic



Deep Packet Inspection

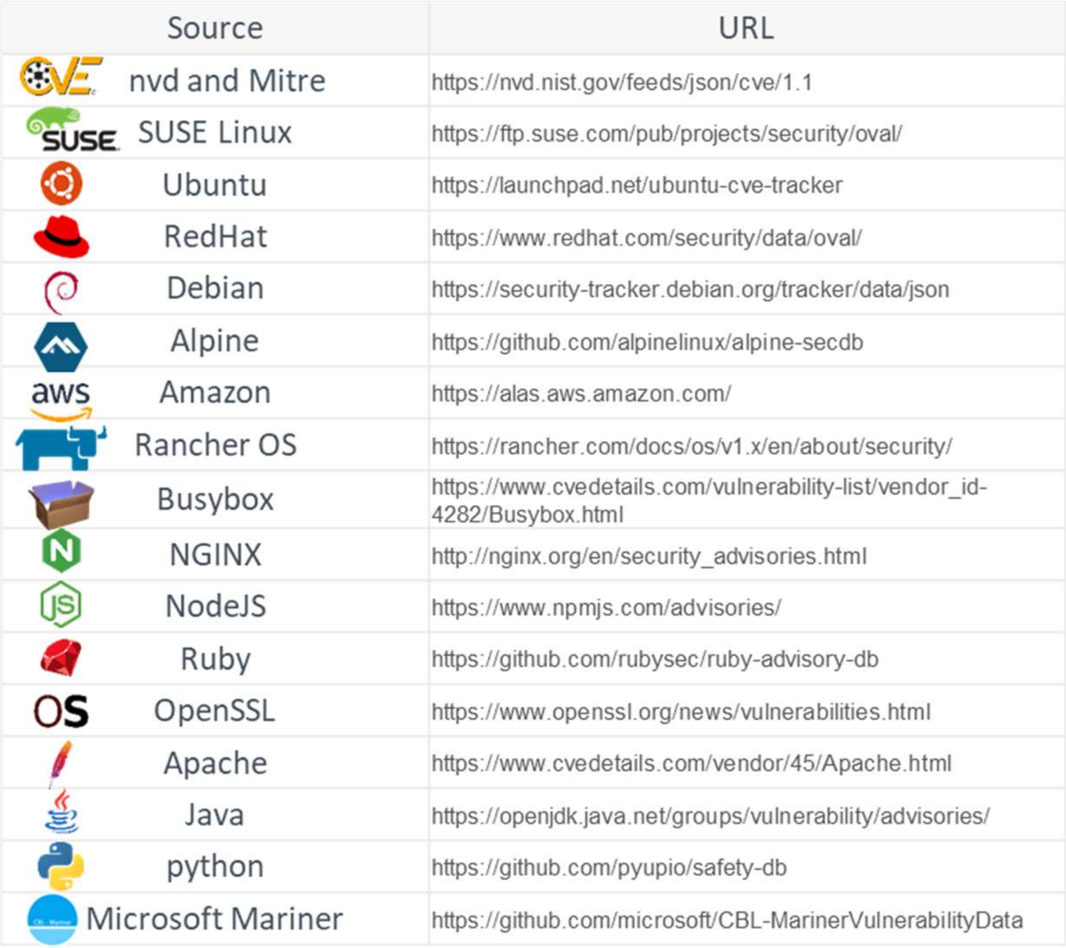
- Layer 3/4 Port
- Layer 7 Protocol
  +
- Processes



Multi-cluster Federation

CVE DATABASE SOURCES

Updated nightly



Source	URL
nvd and Mitre	https://nvd.nist.gov/feeds/json/cve/1.1
SUSE Linux	https://ftp.suse.com/pub/projects/security/oval/
Ubuntu	https://launchpad.net/ubuntu-cve-tracker
RedHat	https://www.redhat.com/security/data/oval/
Debian	https://security-tracker.debian.org/tracker/data/json
Alpine	https://github.com/alpinelinux/alpine-secdb
Amazon	https://alas.aws.amazon.com/
Rancher OS	https://rancher.com/docs/os/v1.x/en/about/security/
Busybox	https://www.cvedetails.com/vulnerability-list/vendor_id-4282/Busybox.html
NGINX	http://nginx.org/en/security_advisories.html
NodeJS	https://www.npmjs.com/advisories/
Ruby	https://github.com/rubysec/ruby-advisory-db
OpenSSL	https://www.openssl.org/news/vulnerabilities.html
Apache	https://www.cvedetails.com/vendor/45/Apache.html
Java	https://openjdk.java.net/groups/vulnerability/advisories/
python	https://github.com/pyupio/safety-db
Microsoft Mariner	https://github.com/microsoft/CBL-MarinerVulnerabilityData

NeuVector CVE Database is Updated via 17 Security Sources Nightly

APPLICATION PROTOCOLS RECOGNIZED

- HTTP/HTTPS
- SSL
- SSH
- DNS
- DNCP
- NTP
- TFTP
- ECHO
- RTSP
- SIP
- ICMP
- Oracle

- MySQL
- Redis
- Zookeeper
- Cassandra
- MongoDB
- PostgresSQL
- Kafka
- Couchbase
- ActiveMQ
- ElasticSearch
- MemCache

- RabbitMQ
- Radius
- VoltDB
- Consul
- Syslog
- Etcd
- Spark
- Apache
- Nginx
- Jetty
- NodeJS

THREATS AUTOMATICALLY DETECTED

SYN Flood

TCP Split Handshake

Detect SSH 1, 2, or 3

HTTP Neg Content

TCP small window

DNS Zone Transfer

SQL Injection

TCP Small MSS

ICMP Flood

Ping Death

Detect SSL TLS v1.0

HTTP Smuggling

DNS Buffer Overflow

ICMP Tunneling

Apache Struts RCE

Cipher Overflow

IP Teardrop

DNS Flood DDoS

SSL Heartbleed

MySQL Access Deny

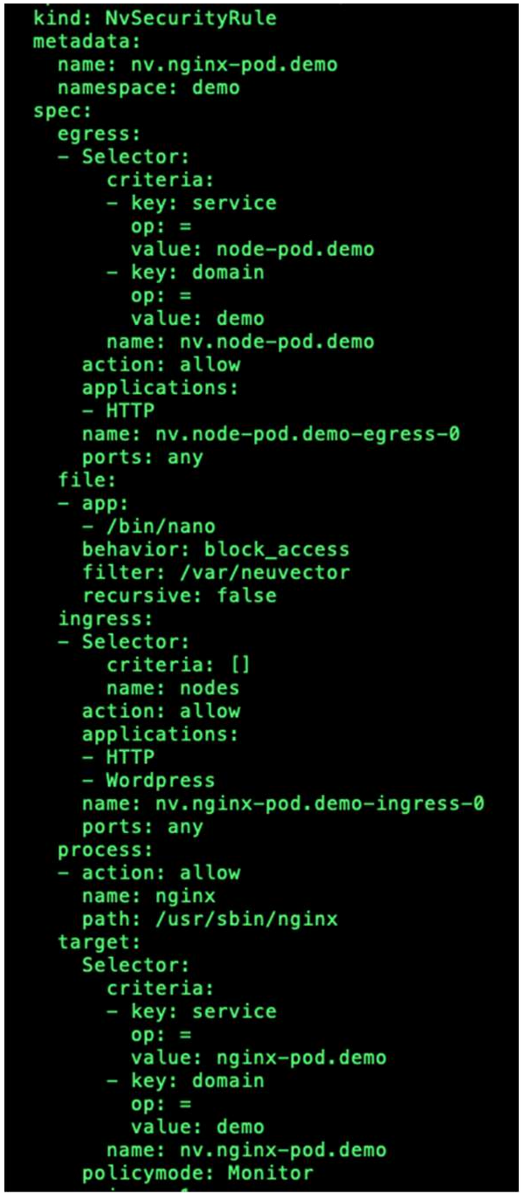
DNS Null Type

DNS Tunneling

K8’s Man-in-the-middle

SECURITY AS CODE

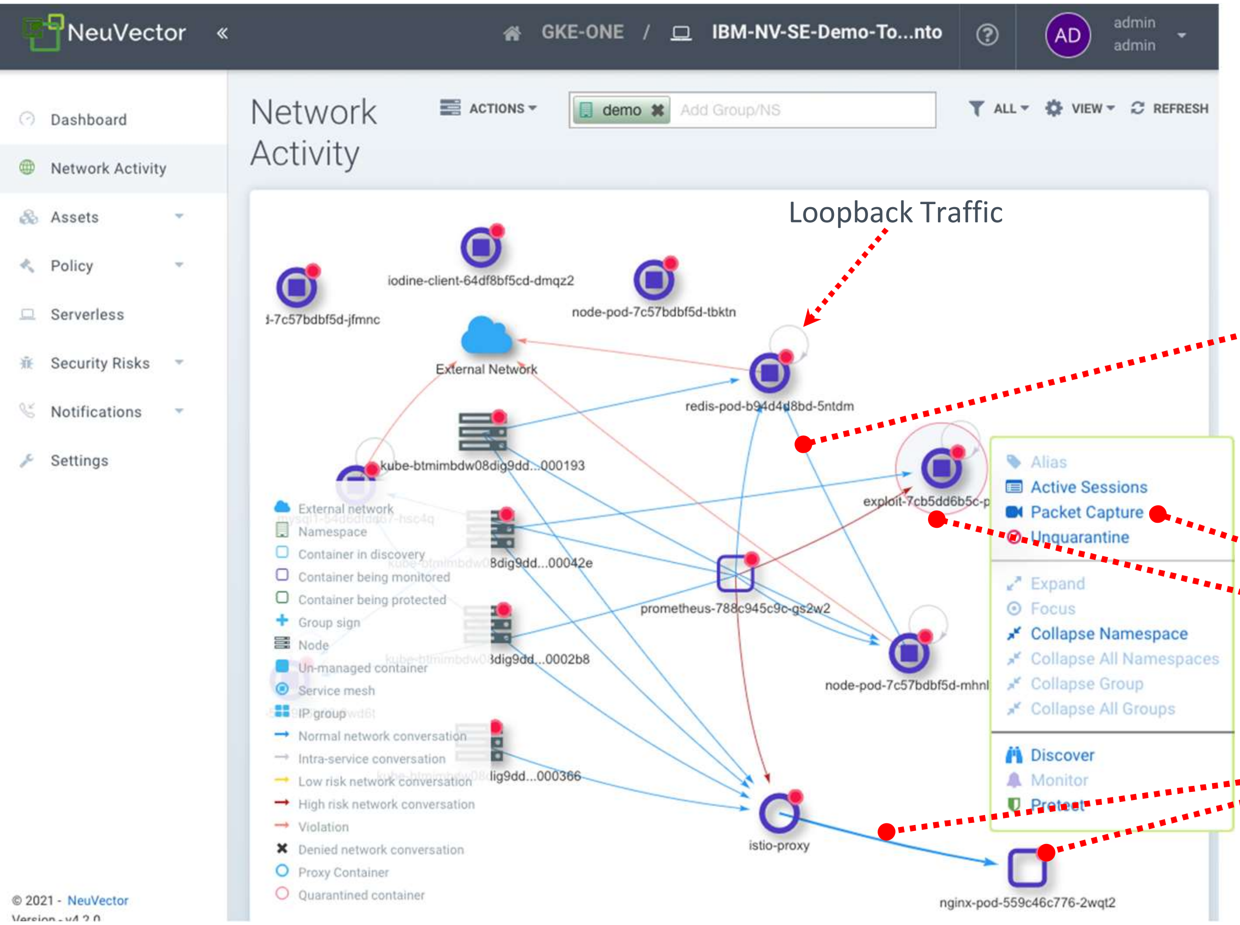
- ✓ Define Application Behaviors in Kubernetes-native yaml
  - ✓ Network Connections and Protocols
  - ✓ Ingress/egress controls
  - ✓ Processes & File System Protection
- ✓ Version Control of Security Policies
- ✓ Deploy & Enforce Global Security Rules
  - ✓ Ingress / Egress, DLP detection, etc.
- ✓ RBAC Integrated
  - ✓ Kubernetes enforcement of CRD creation permissions
- ✓ Eases migration from staging to production
- ✓ Supports Open Policy Agent (OPA), other integrations



```
kind: NvSecurityRule
metadata:
  name: nv.nginx-pod.demo
  namespace: demo
spec:
  egress:
  - Selector:
      criteria:
      - key: service
        op: =
        value: node-pod.demo
      - key: domain
        op: =
        value: demo
      name: nv.node-pod.demo
    action: allow
    applications:
    - HTTP
    name: nv.node-pod.demo-egress-0
    ports: any
  file:
  - app:
    - /bin/nano
    behavior: block_access
    filter: /var/neuvector
    recursive: false
  ingress:
  - Selector:
      criteria: []
      name: nodes
    action: allow
    applications:
    - HTTP
    - Wordpress
    name: nv.nginx-pod.demo-ingress-0
    ports: any
  process:
  - action: allow
    name: nginx
    path: /usr/sbin/nginx
  target:
    Selector:
      criteria:
      - key: service
        op: =
        value: nginx-pod.demo
      - key: domain
        op: =
        value: demo
      name: nv.nginx-pod.demo
    policymode: Monitor
```

VISUALIZE & PROTECT SERVICE MESHES

Istio



✓ Shows Application Workloads ONLY

- View/Hide Istio System Containers

✓ Automates Istio System Monitoring

- Learn & Allow-list Istio Control Plane & Proxy Connections

✓ Automates Segmentation

- App & System Allow-Lists

✓ Detects Attacks Even Via Trusted Connections

✓ Automated Response Capabilities

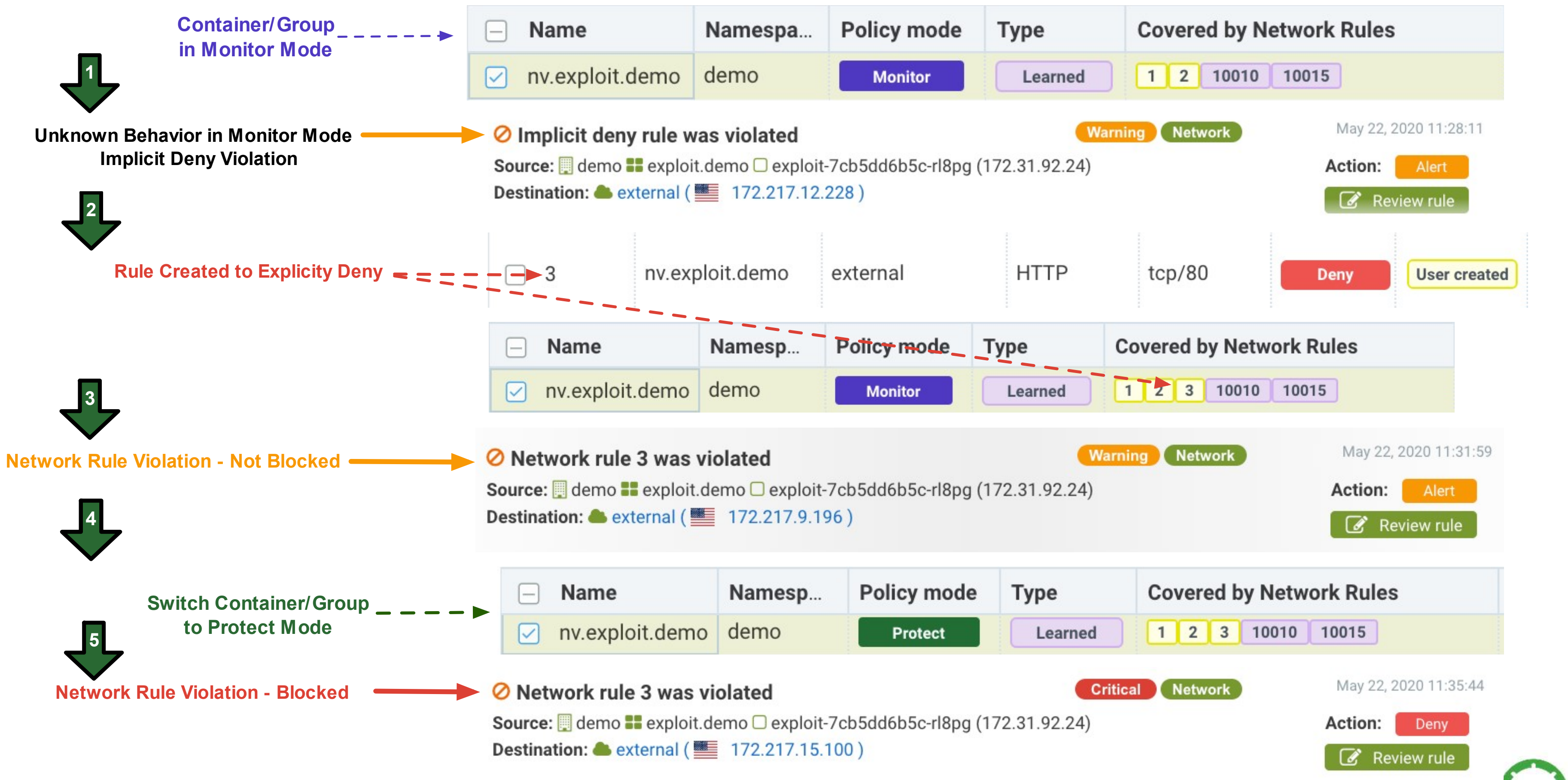
- Packet Capture
- Quarantine Without Killing
- Webhooks

✓ Inspects Traffic with Pod-to-Pod Encryption On

- Between container & side-car proxy
- U.S. Patent 11,075,884 issued July 27, 2021

OPEN ZERO TRUST

OPERATING – SETTING & ENFORCING RULES



Container/Group in Monitor Mode

⊟	Name	Namespa...	Policy mode	Type	Covered by Network Rules
☑	nv.exploit.demo	demo	Monitor	Learned	1 2 10010 10015

1

Unknown Behavior in Monitor Mode Implicit Deny Violation

⊘ Implicit deny rule was violated Warning Network May 22, 2020 11:28:11

Source: demo exploit.demo exploit-7cb5dd6b5c-rl8pg (172.31.92.24)

Destination: external (172.217.12.228)

Action: Alert

Review rule

2

Rule Created to Explicity Deny

⊟ 3	nv.exploit.demo	external	HTTP	tcp/80	Deny	User created

⊟	Name	Namesp...	Policy mode	Type	Covered by Network Rules
☑	nv.exploit.demo	demo	Monitor	Learned	1 2 3 10010 10015

3

Network Rule Violation - Not Blocked

⊘ Network rule 3 was violated Warning Network May 22, 2020 11:31:59

Source: demo exploit.demo exploit-7cb5dd6b5c-rl8pg (172.31.92.24)

Destination: external (172.217.9.196)

Action: Alert

Review rule

4

Switch Container/Group to Protect Mode

⊟	Name	Namesp...	Policy mode	Type	Covered by Network Rules
☑	nv.exploit.demo	demo	Protect	Learned	1 2 3 10010 10015

5

Network Rule Violation - Blocked

⊘ Network rule 3 was violated Critical Network May 22, 2020 11:35:44

Source: demo exploit.demo exploit-7cb5dd6b5c-rl8pg (172.31.92.24)

Destination: external (172.217.15.100)

Action: Deny

Review rule

OPEN ZERO TRUST

THANK YOU!