Generating custom seccomp profiles with Inspektor Gadget

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Hi, I'm Jose

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Agenda

- ❑ Introduction to Seccomp
- ❑ Seccomp in Kubernetes
- ❑ Inspektor Gadget and its seccomp gadget
- ❑ Live Demo! 💻

Seccomp

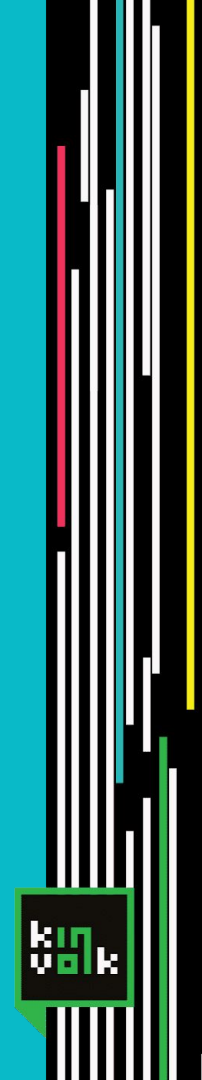
What is it?

- Seccomp stands for *secure computing*
- It is a Linux kernel feature that allows us to restrict the system calls a process can do

How does it work?

- Strict mode:
  - The first developed seccomp mode.
  - Allowed specific syscalls: read(), write(), exit(), and sigreturn().
  - Any other syscall made by the process, seccomp sends a SIGKILL signal.
- Filter mode:
  - We can specify what we want to do for each system calls.
  - Every syscall passes through a filter that is done using BPF (Berkeley Packet Filter).
  - Result of the filter: Allow, kill, errno, log and others.
  - Also known as seccomp mode 2 or seccomp-bpf.

Seccomp in Kubernetes



Hardening container's security

- In the *securityContext* section of the Container or Pod, we can define the Seccomp profile to be used:
  - Kubernetes API Reference Docs
  - Restrict a Container's Syscalls with seccomp | Kubernetes [stable from v1.19]
- Seccomp profile types:
  - *Unconfined:* Seccomp disabled (Default configuration)
  - *RuntimeDefault:* Container runtimes default profile:
    - Default Docker profile is what most runtimes use
    - Enable seccomp for all workloads with a new v1.22 alpha feature | Kubernetes
  - *Localhost:* Custom profile:
    - *localhostProfile: my-profiles/profile.json*
    - Available in the node at <kubelet-root-dir>/seccomp/my-profiles/profile.json

How a Seccomp profile looks like?

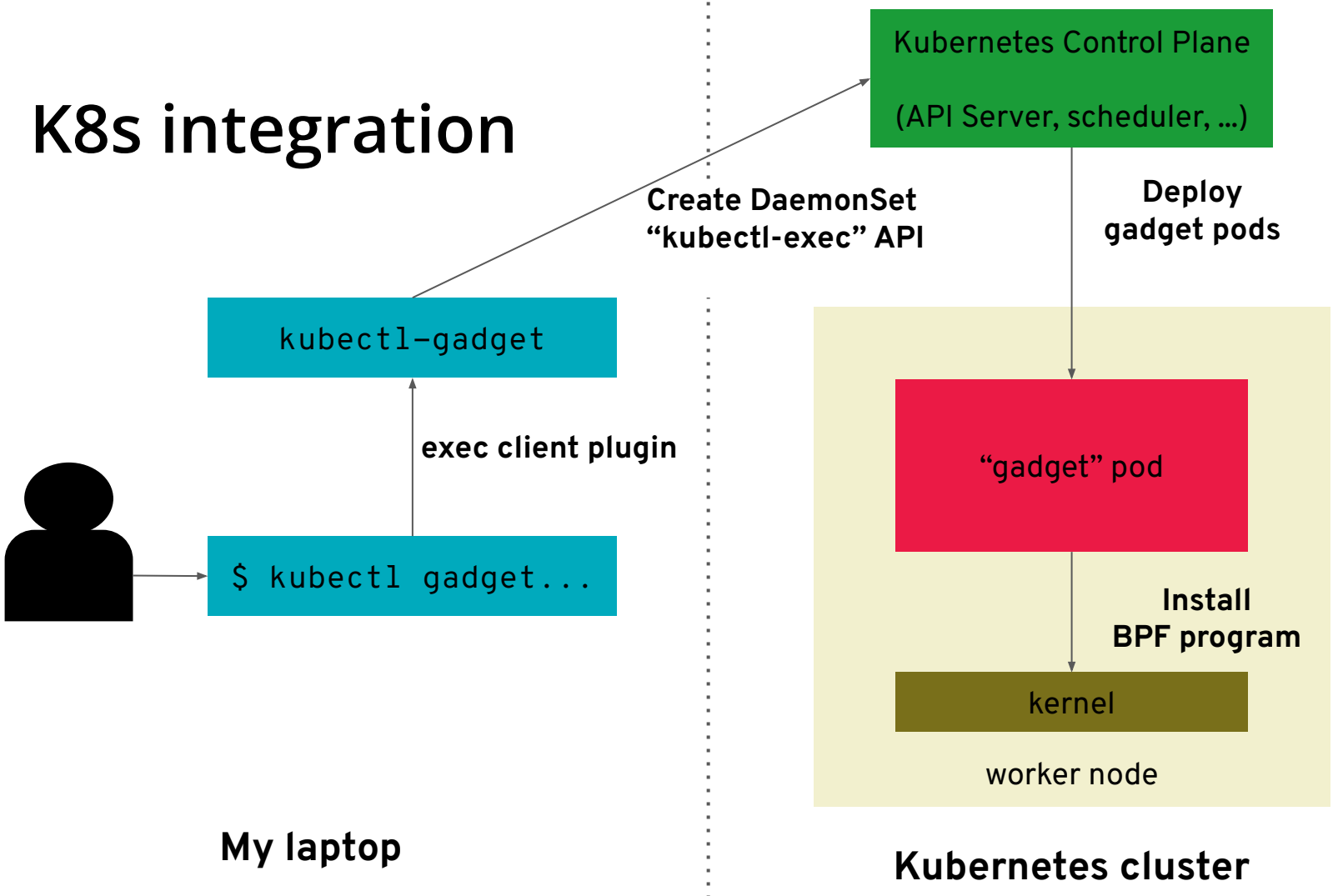
```
{
    "defaultAction": "SCMP_ACT_ERRNO",
    "architectures": [
        ...
    ],
    "syscalls": [
        {
            "names": [
                "read",
                "write“,
                ...
            ],
            "action": "SCMP_ACT_ALLOW"
        },
        ...
    ]
}
```

Inspektor Gadget

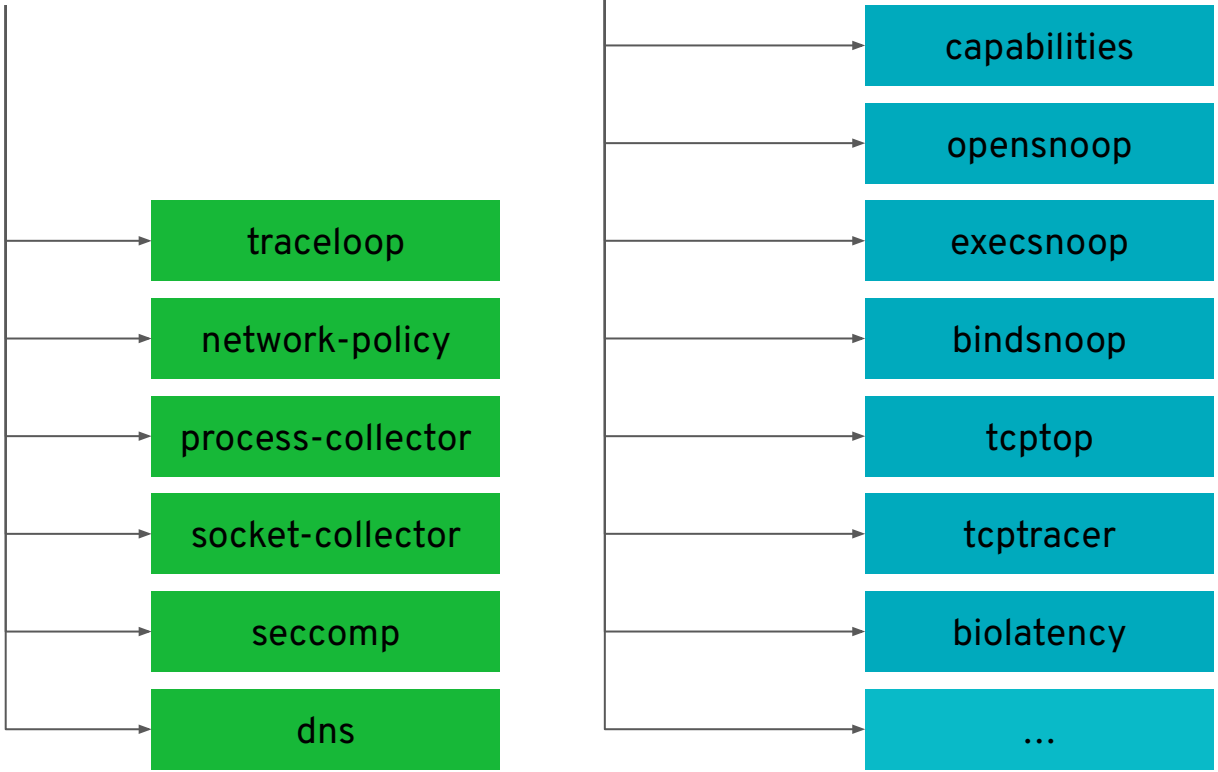
Tracing Cloud Native applications

- Granularity of tracing: pods
  - PIDs are not useful when we don't know which pod it is
  - We don't want to trace all the system processes on a node
- Aggregation
  - Using Kubernetes labels, namespace, etc
- kubectl-like user experience
  - Developers should not need to SSH
  - Developers should not need to deploy a pod + kubectl-exec for each tracing
- Integrated experience with existing tools

K8s integration

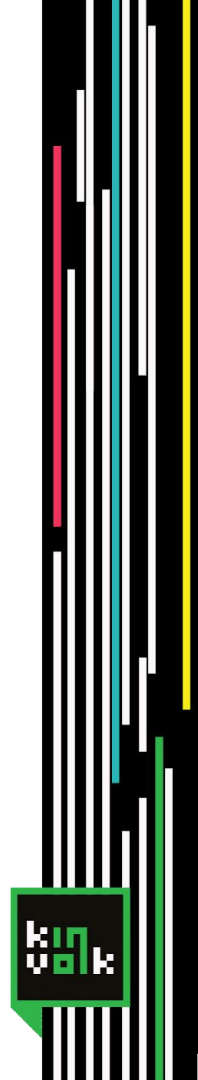


“kubectl gadget”



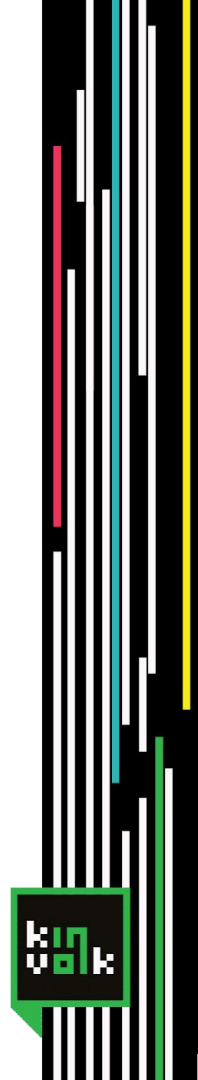
Selectors

```
$ kubectl gadget execsnoop \
    --selector k8s-app=myapp,tier=bar \
    --namespace default \
    --podname myapp1-l9ttj \
    --node ip-10-0-12-31 \
    --containername my-container
```

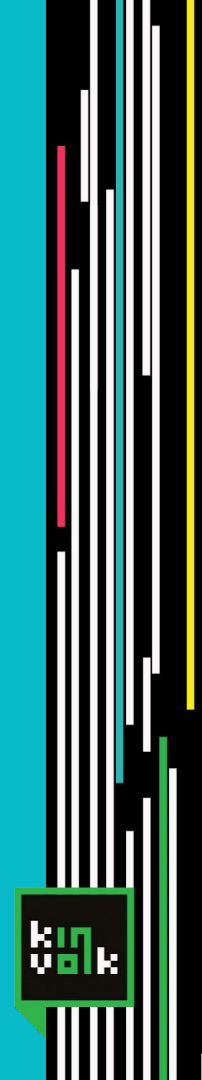


Trace custom resource

```
apiVersion: gadget.kinvolk.io/v1alpha1
kind: Trace
metadata:
  name: process-collector
  namespace: gadget
spec:
  node: aks-agentpool-1234-vmss01
  gadget: process-collector
  filter:
    labels:
      component: etcd
    namespace: kube-system
  outputMode: Status
  runMode: Manual
```



Seccomp advisor gadget



How does it work?

- Uses eBPF to records the syscalls that are issued by each container.
- Then, uses this information to generate a seccomp profile with *SCMP_ACT_ERRNO* as default action and an allowed list with the recorded syscalls.

How to use the gadget?

- We can use the kubectl-gadget CLI or the Trace custom resource (integration with Web UIs).
- Profiles are generated when we stop the gadget or, automatically, when pods terminate.
- Integration with the Kubernetes Security Profiles Operator or manually deploying the generated profiles in the nodes.

Live Demo 💻

Questions?

Get involved!

Contribute

Inspektor Gadget:

- https://github.com/kinvolk/inspektor-gadget/blob/main/docs/CONTRIBUTING.md
- **#inspektor-gadget** channel in the Kubernetes Slack.

Thank you!

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