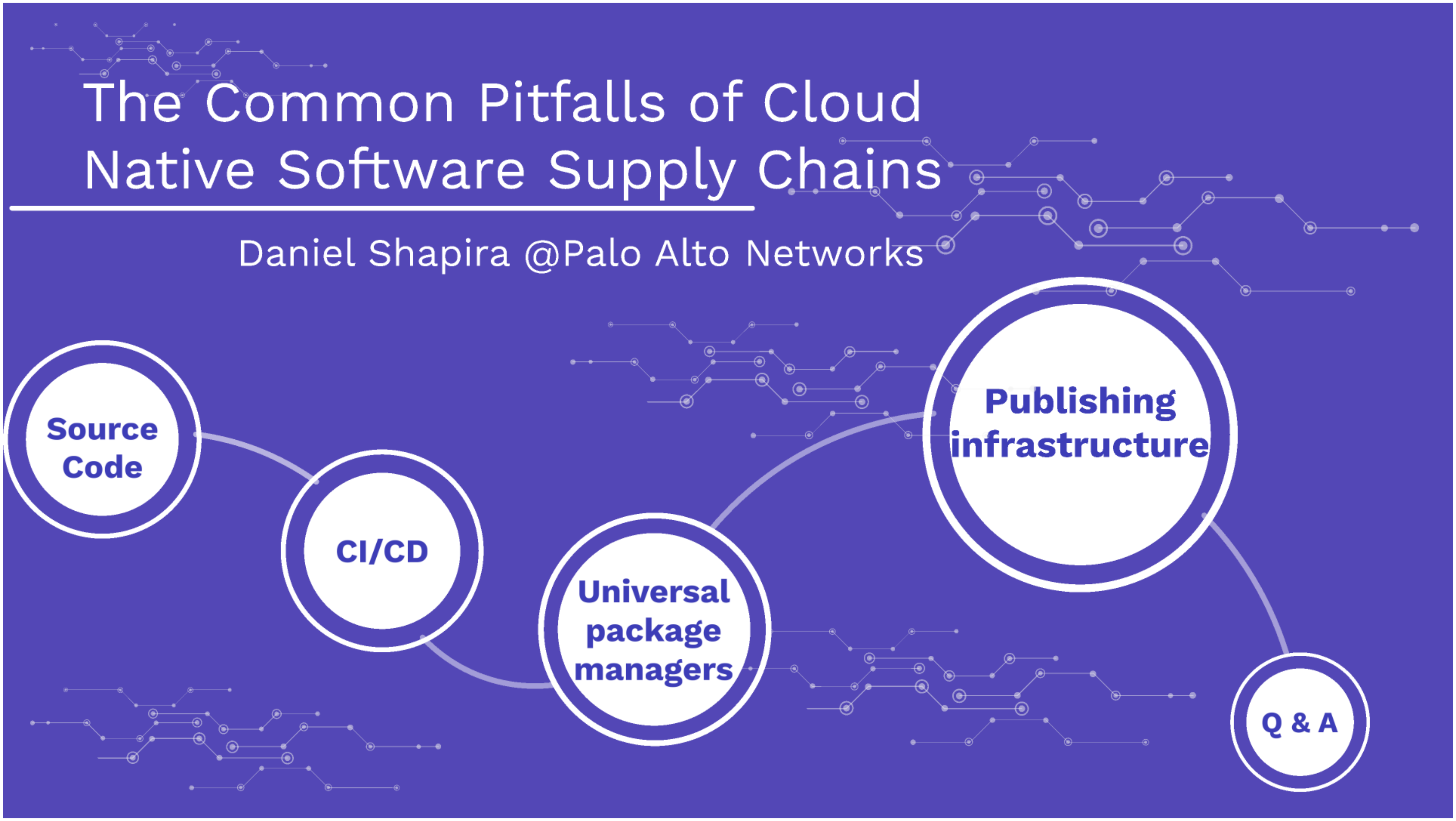


The Common Pitfalls of Cloud Native Software Supply Chains

Daniel Shapira @Palo Alto Networks

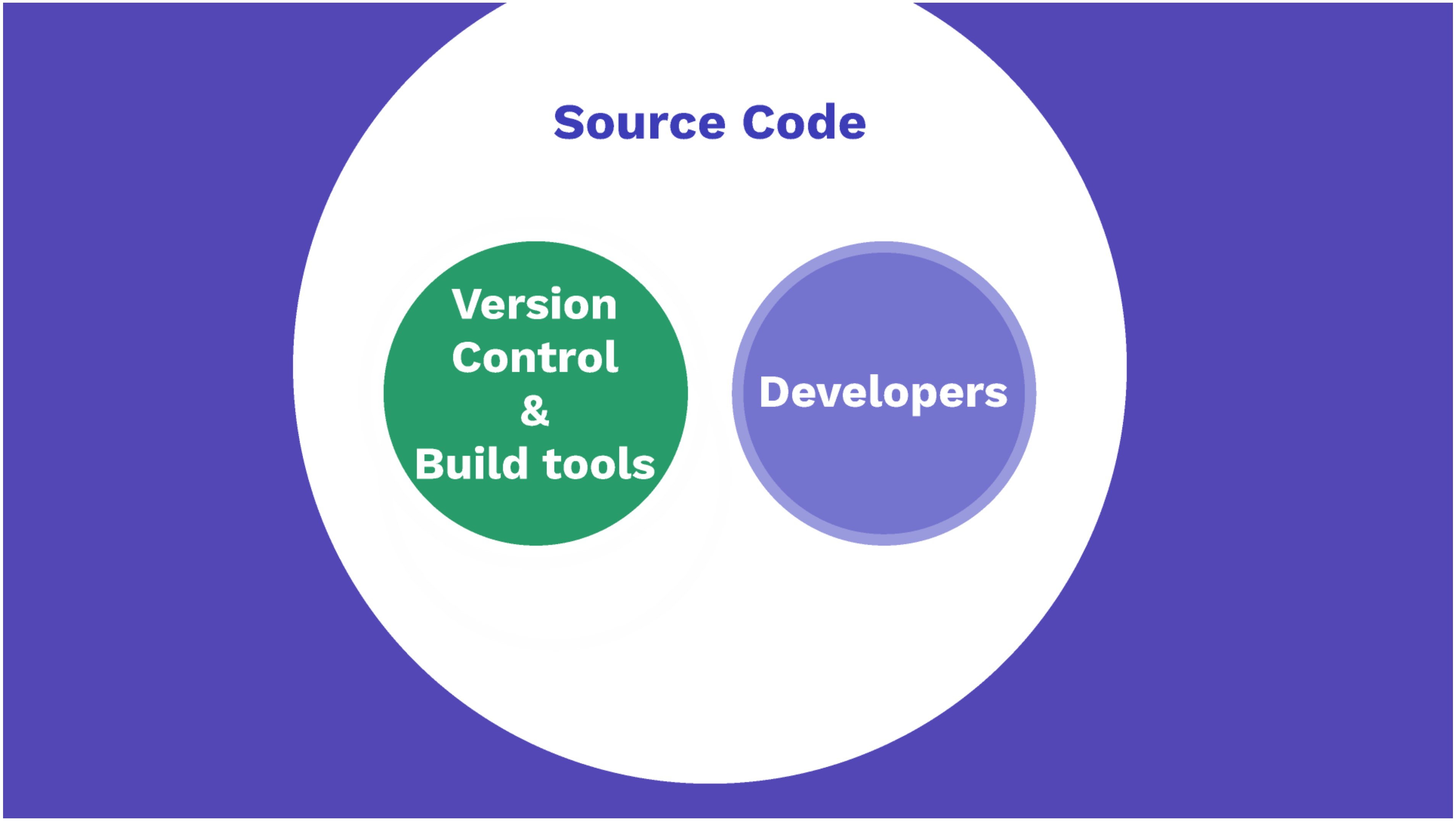
Source Code

CI/CD

Universal package managers

Publishing infrastructure

Q & A



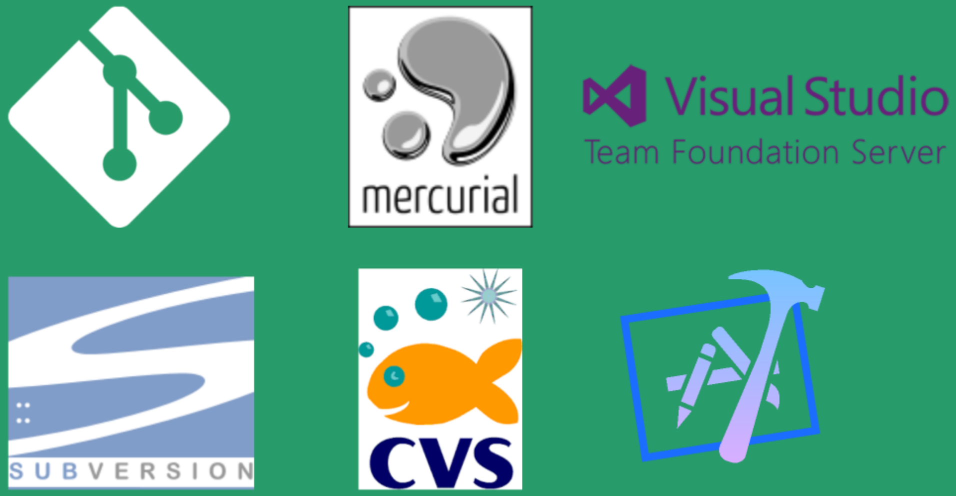
Source Code

Version Control & Build tools

Developers

Version Control & build tools

Version Control & build tools



Version Control & build tools

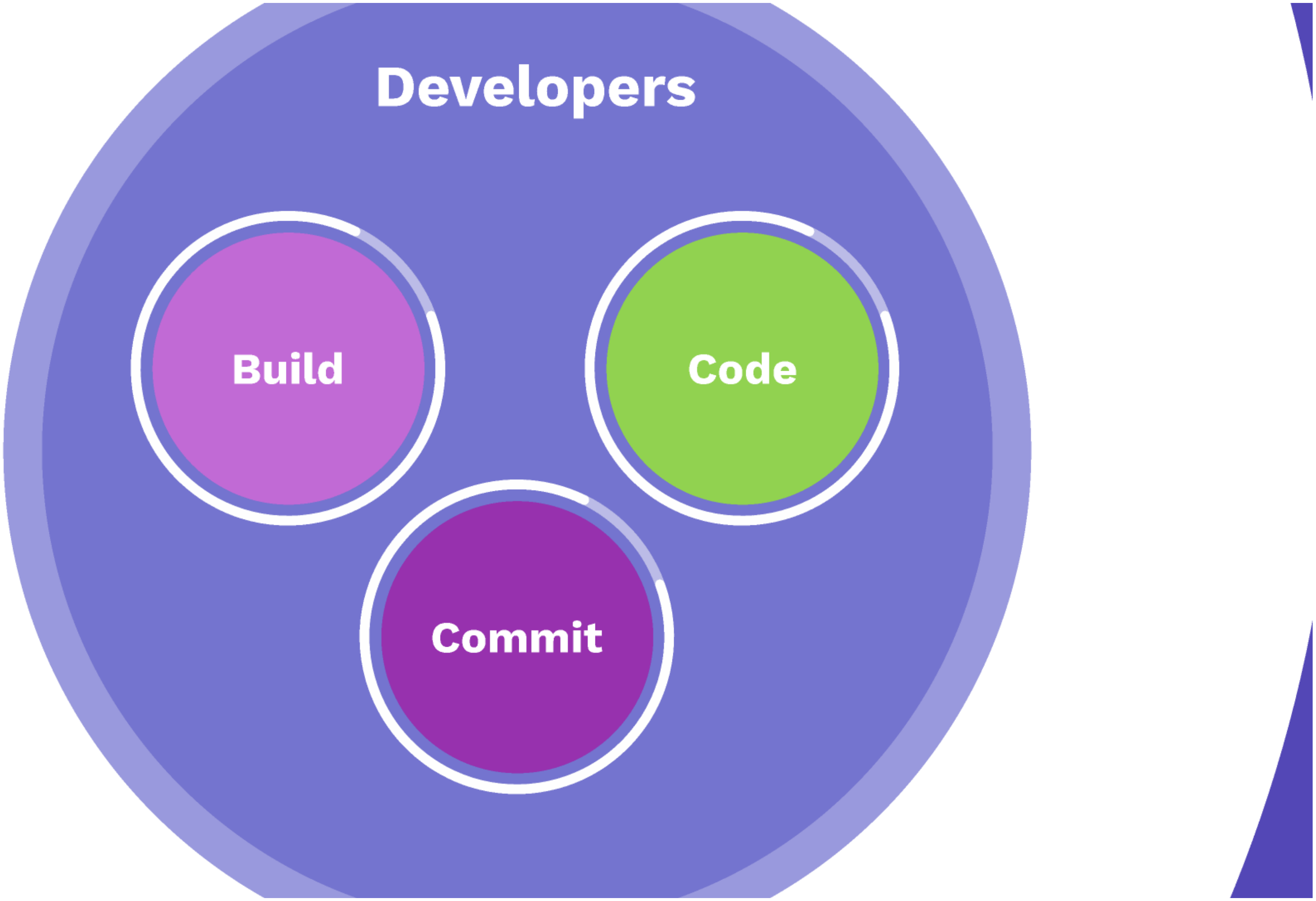
mercurial
Visual Studio
Team Foundation Server
SUBVERSION
CVS

Mature & considered safe

Version Control & build tools

Mature & considered safe

As long as they are authentic


Developers
Build
Code
Commit

Build Tools

Build Tools

Build Tools

Fake tool-chains

Fake tool-chains

XcodeGhost - a malicious Xcode version

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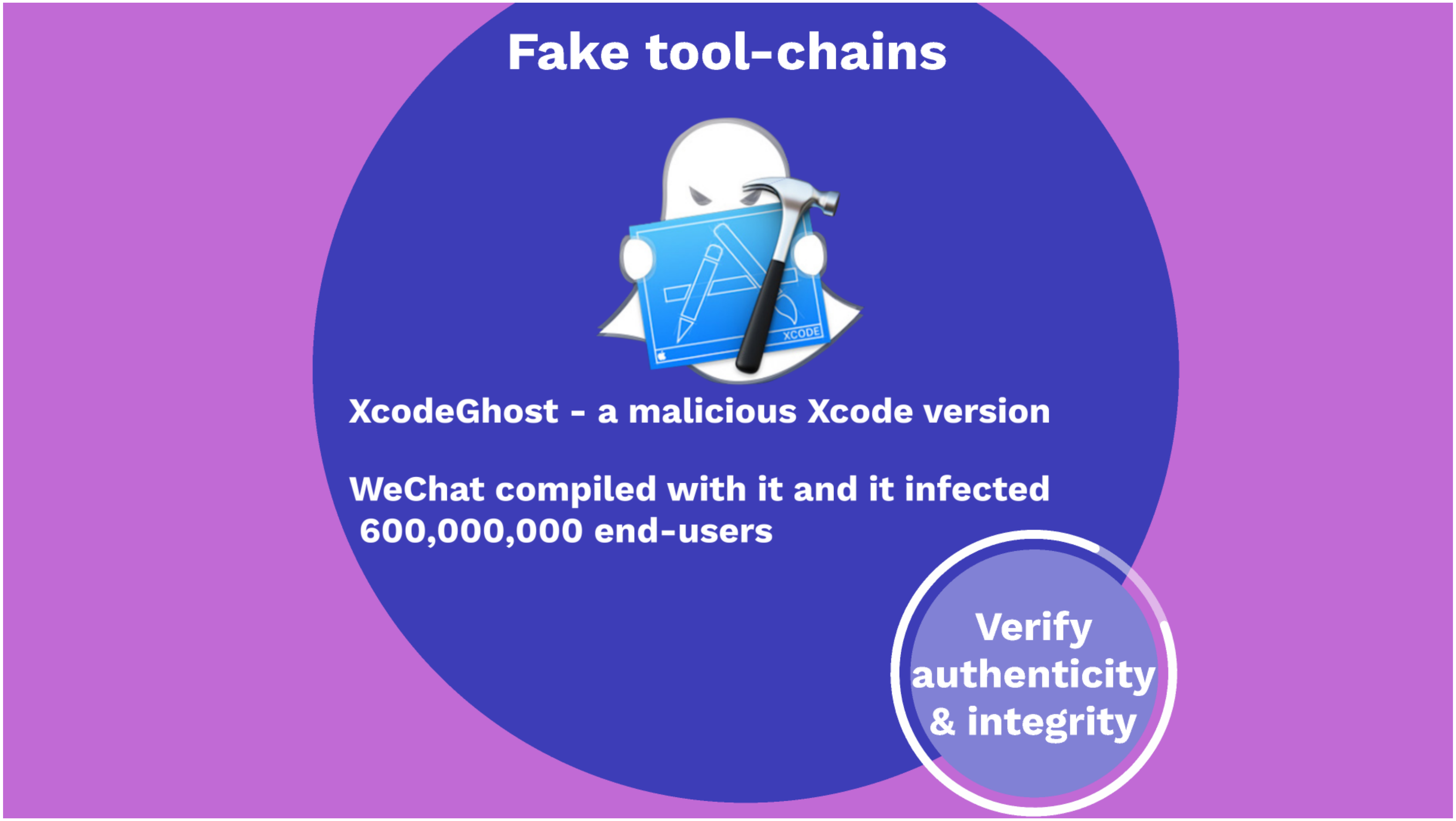
WeChat compiled with it and it infected 600,000,000 end-users



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Verify authenticity & integrity

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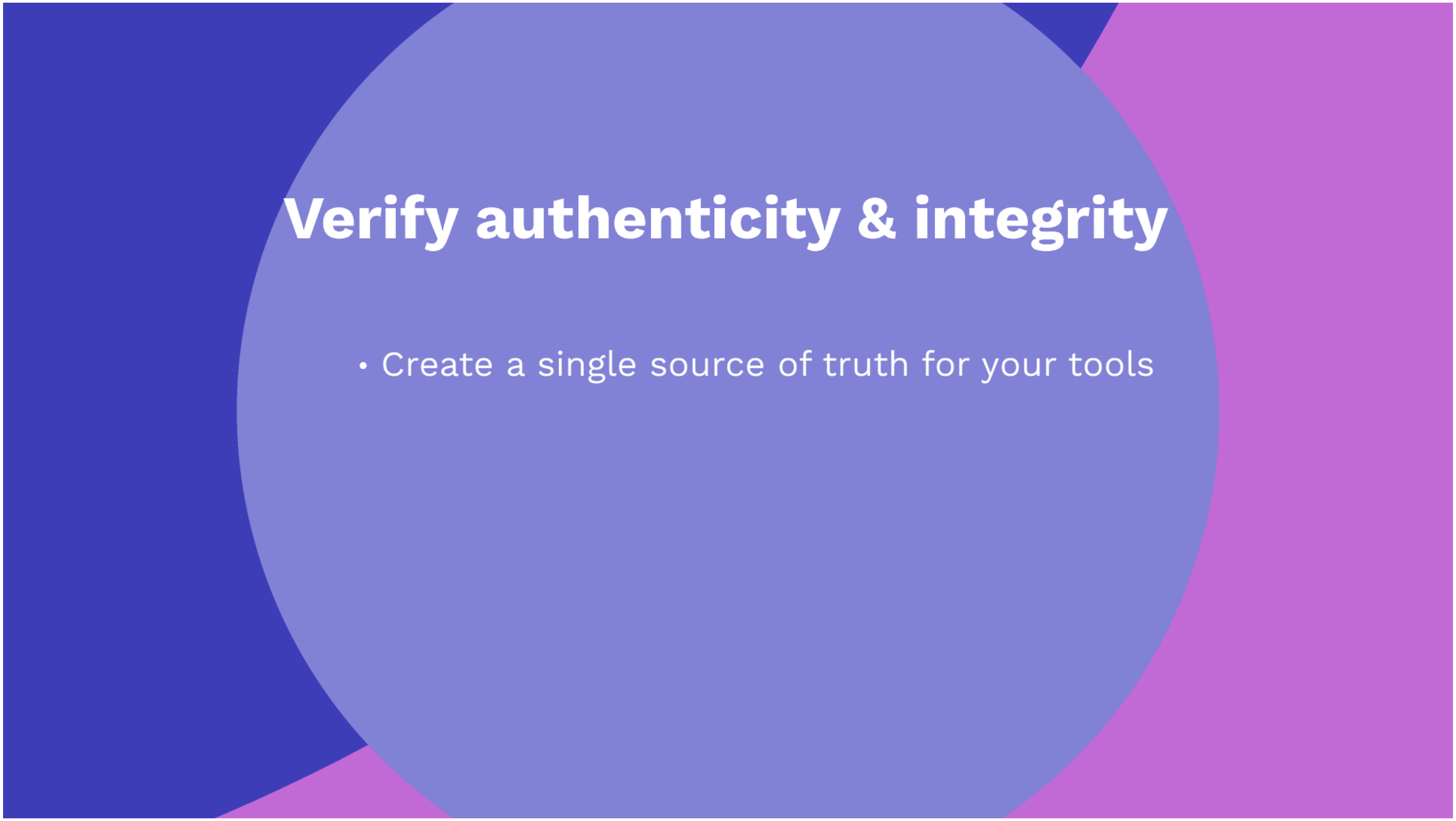
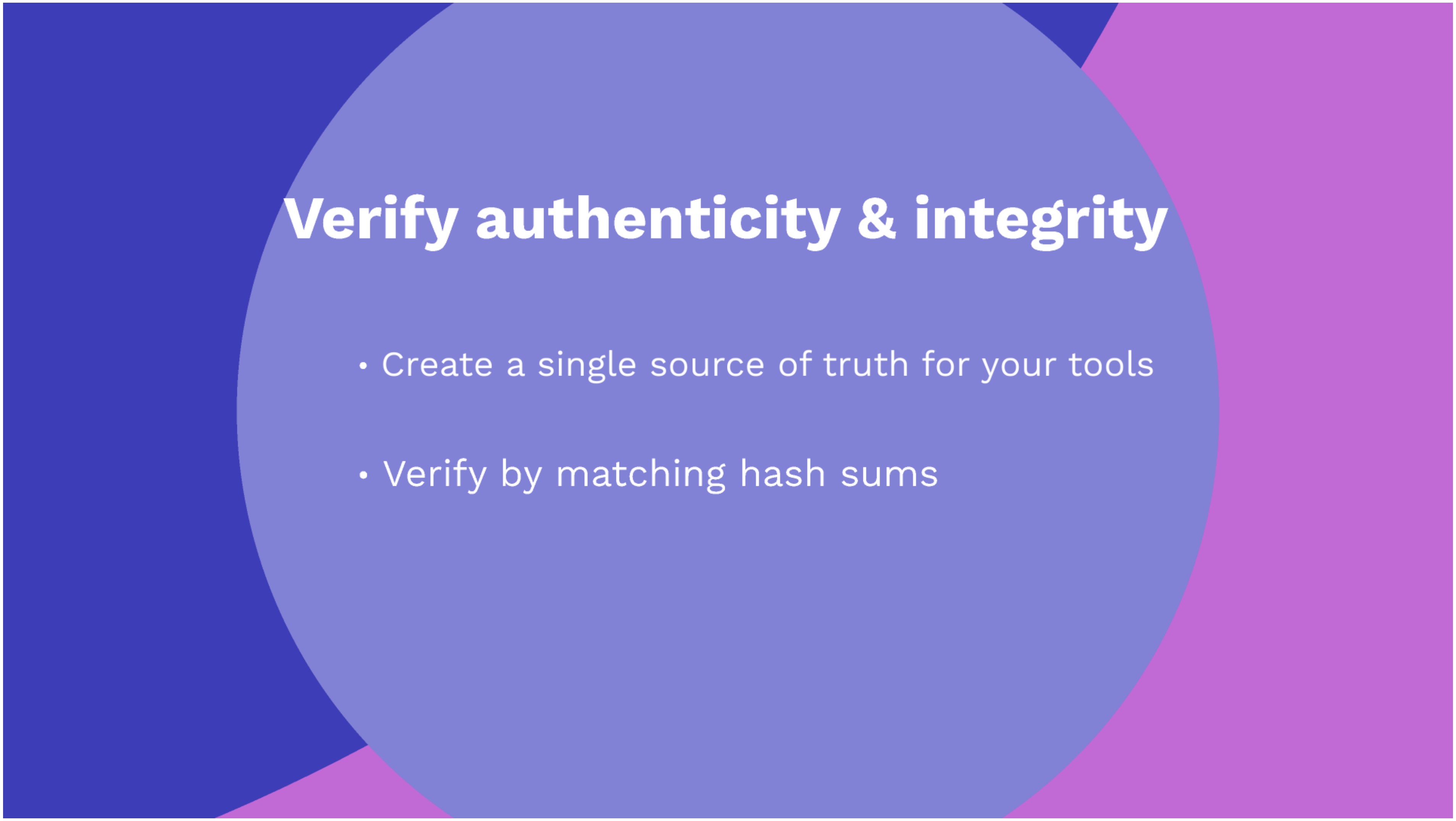


Verify authenticity & integrity

- Create a single source of truth for your tools



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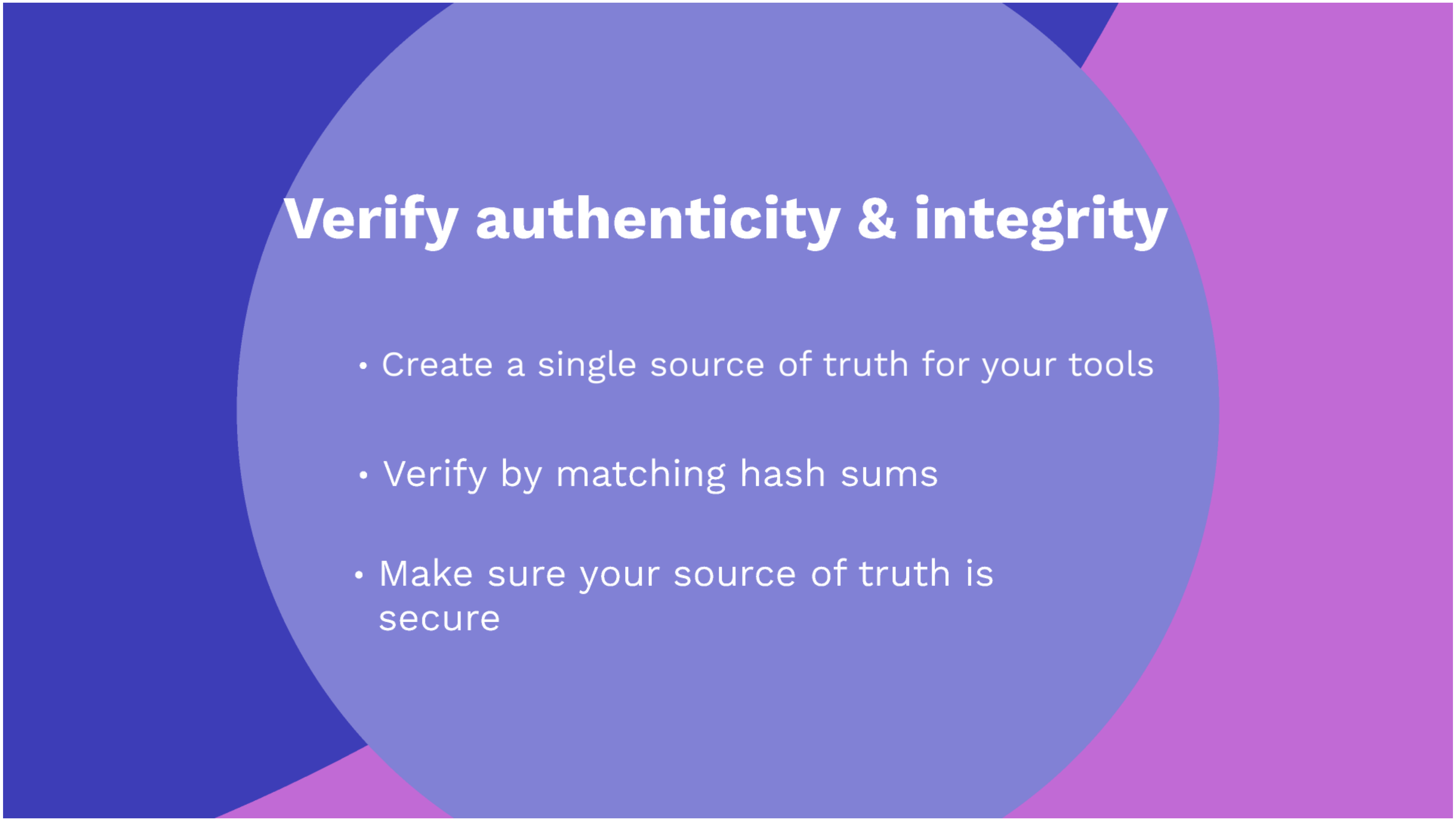
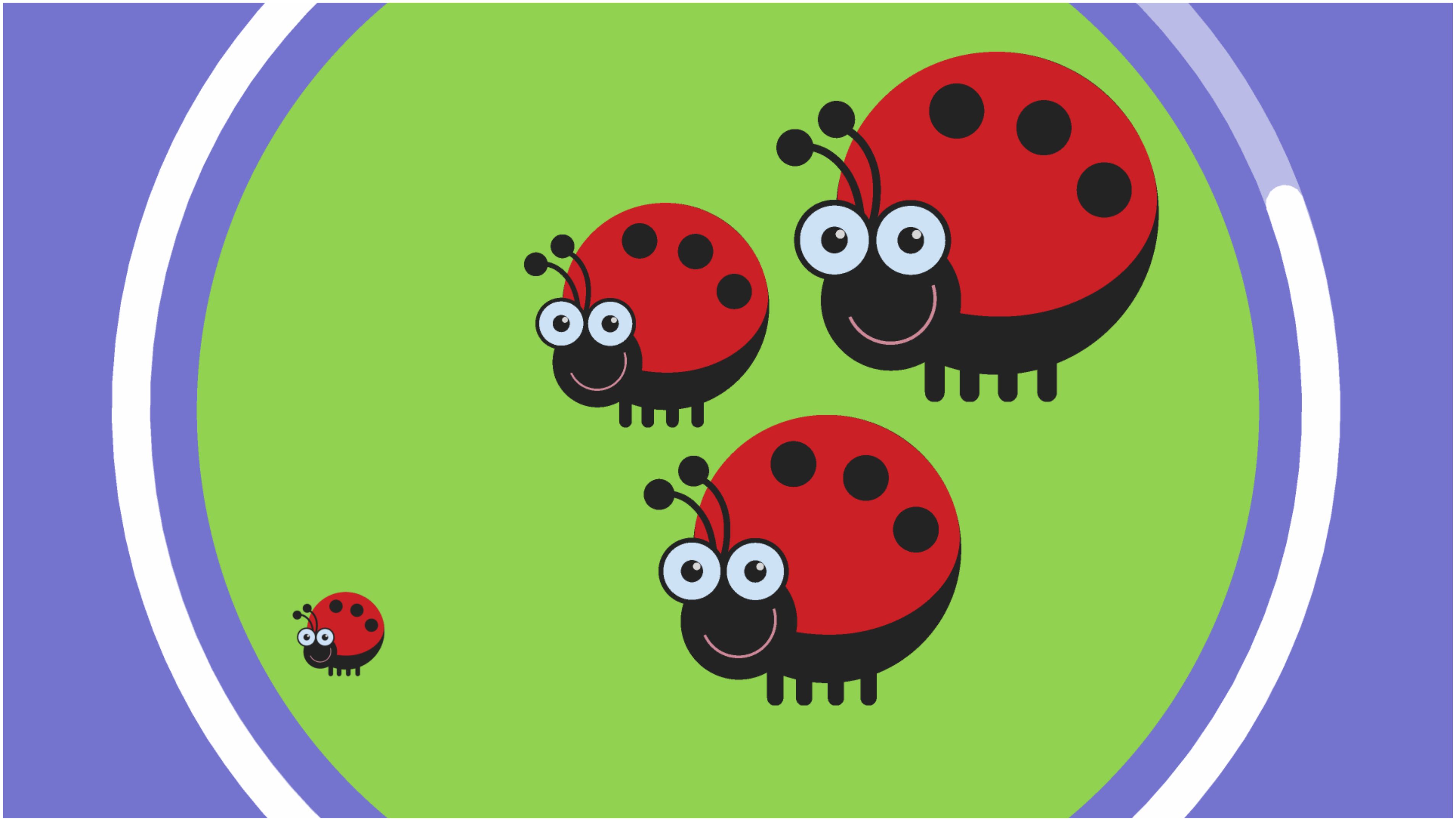


Verify authenticity & integrity

- Create a single source of truth for your tools
- Verify by matching hash sums
- Make sure your source of truth is secure

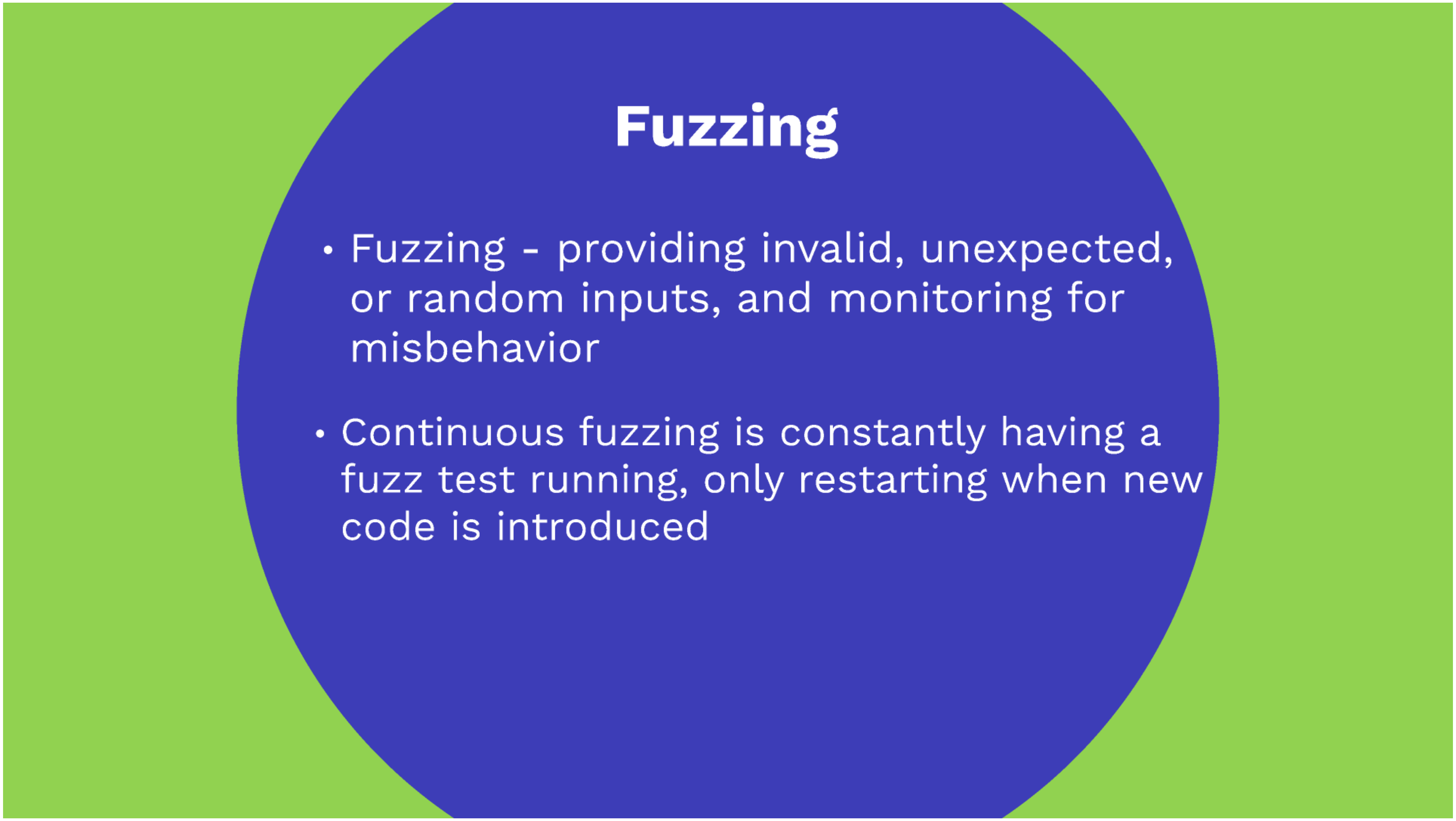


Fuzzing

Fuzzing

Fuzzing

- Fuzzing - providing invalid, unexpected, or random inputs, and monitoring for misbehavior



Fuzzing

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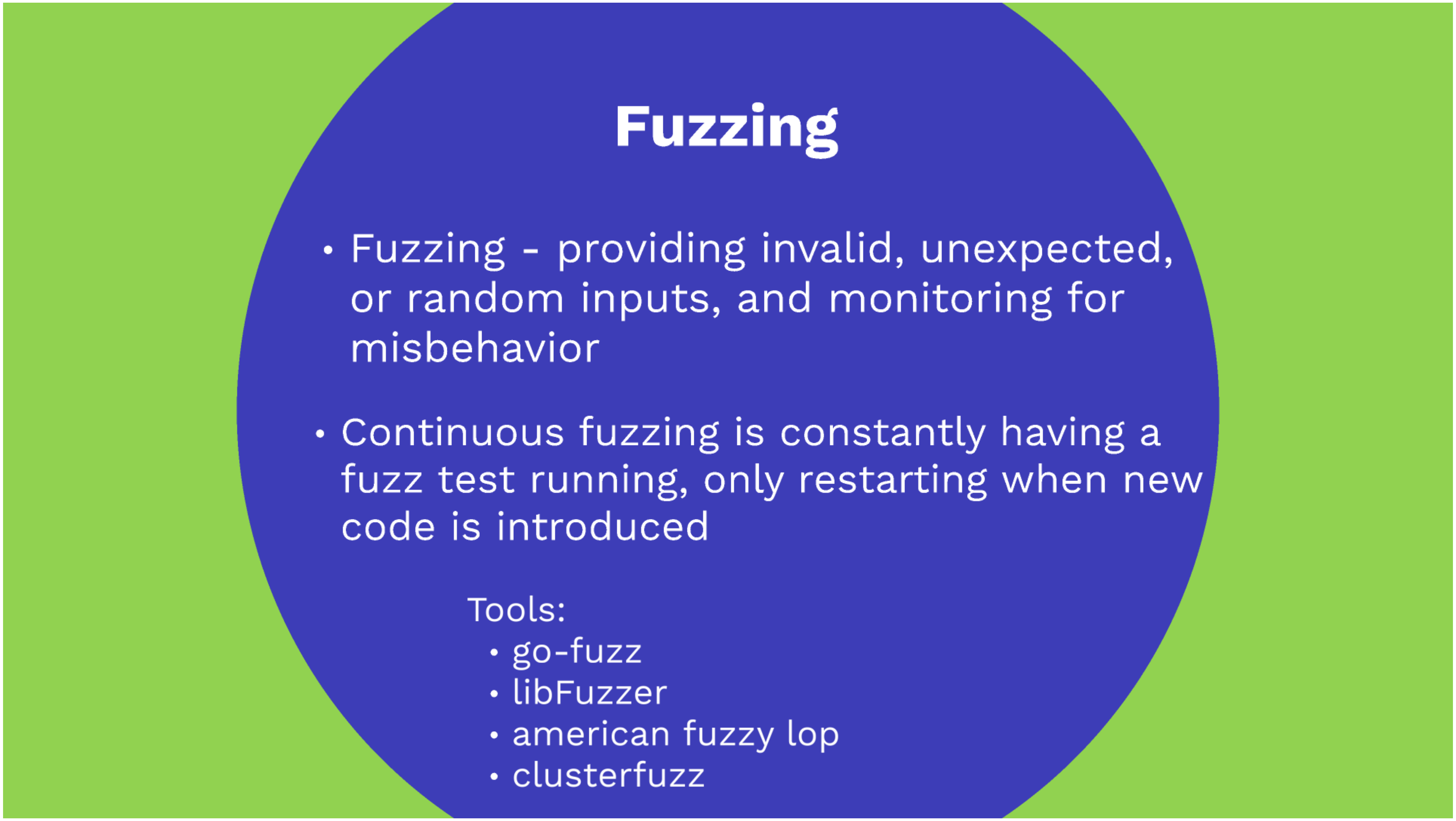
- Continuous fuzzing is constantly having a fuzz test running, only restarting when new code is introduced



Fuzzing

- Fuzzing - providing invalid, unexpected, or random inputs, and monitoring for misbehavior
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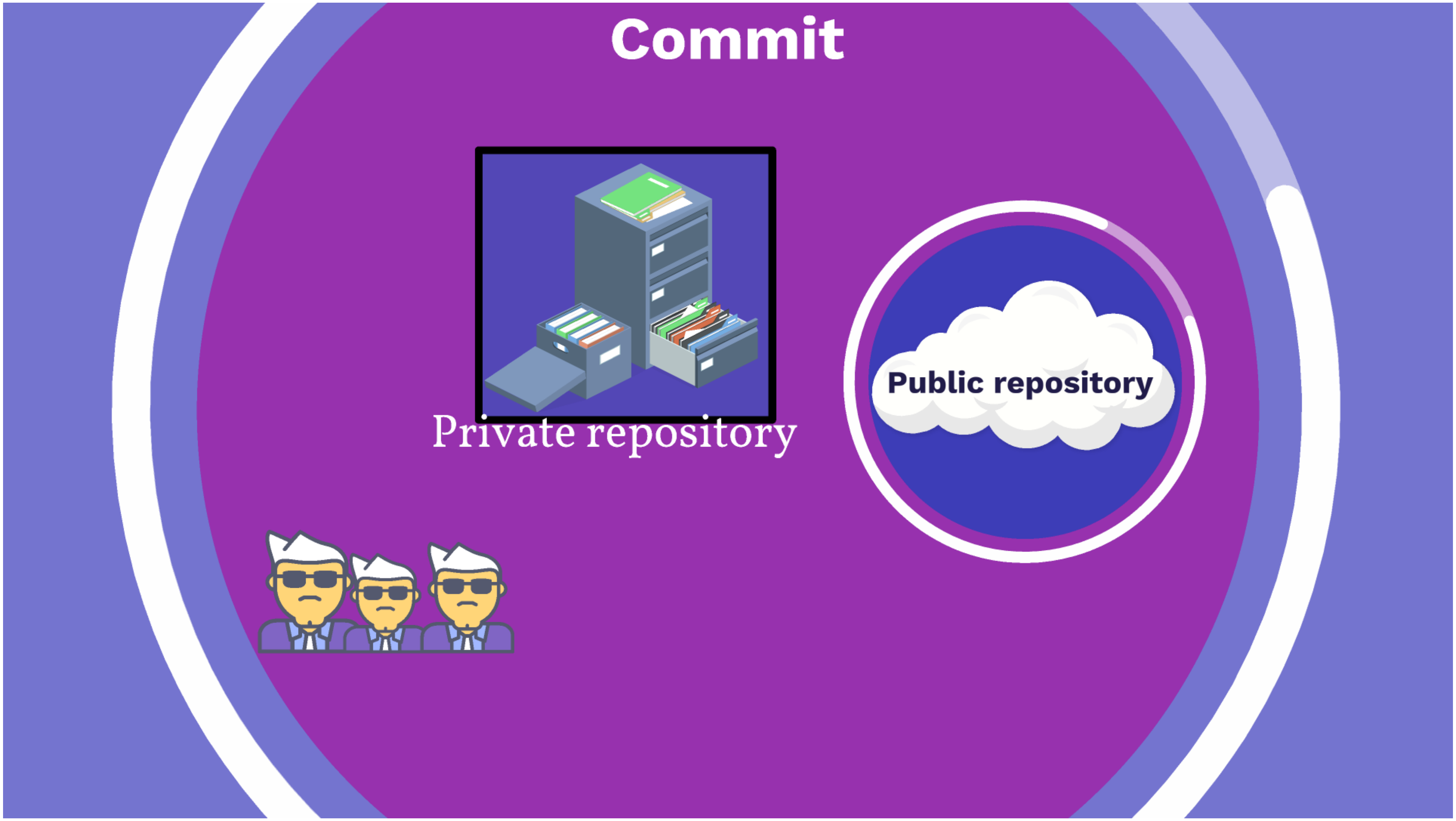
Tools:

- go-fuzz
- libFuzzer
- american fuzzy lop
- clusterfuzz

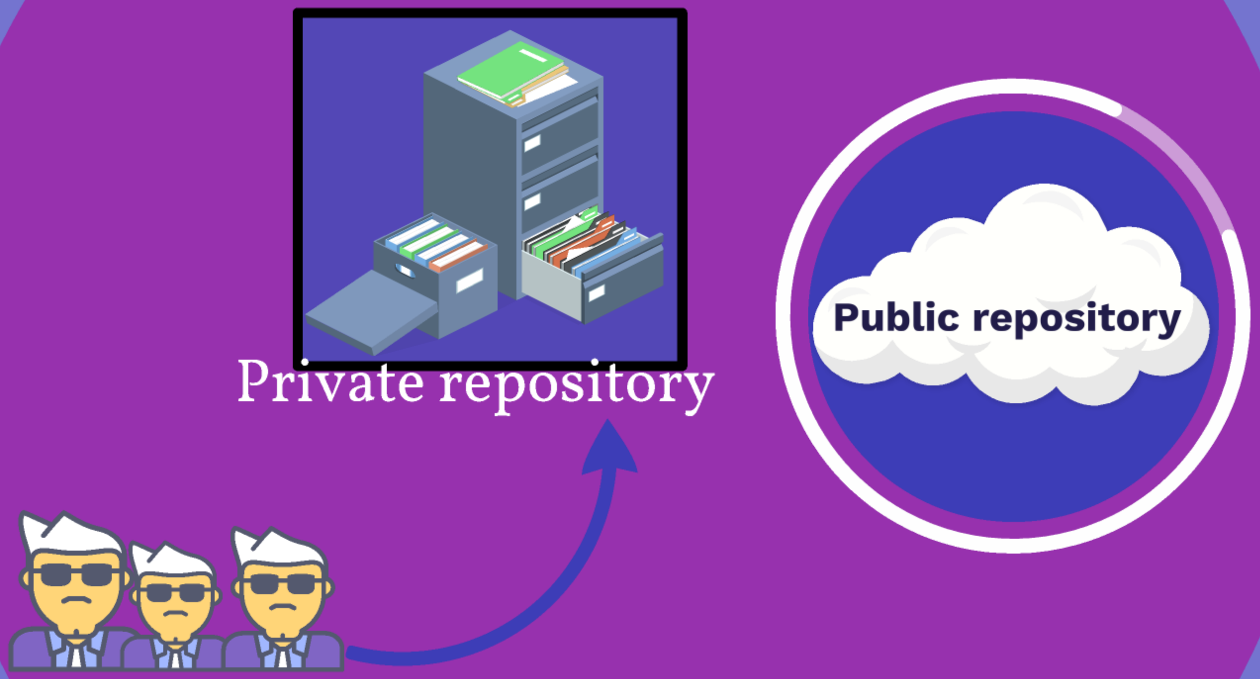


Commit

Private repository

Public repository

Commit



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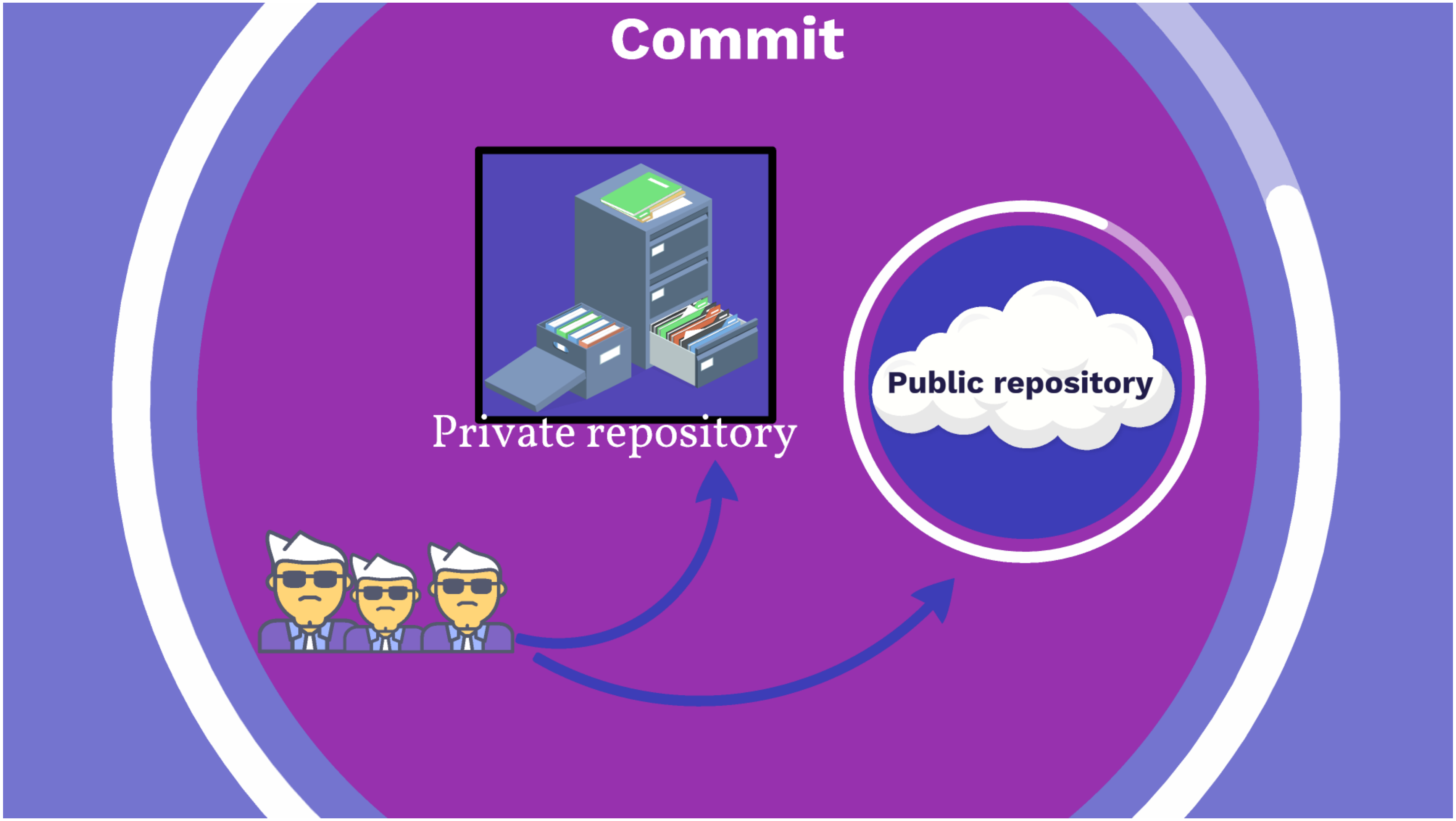

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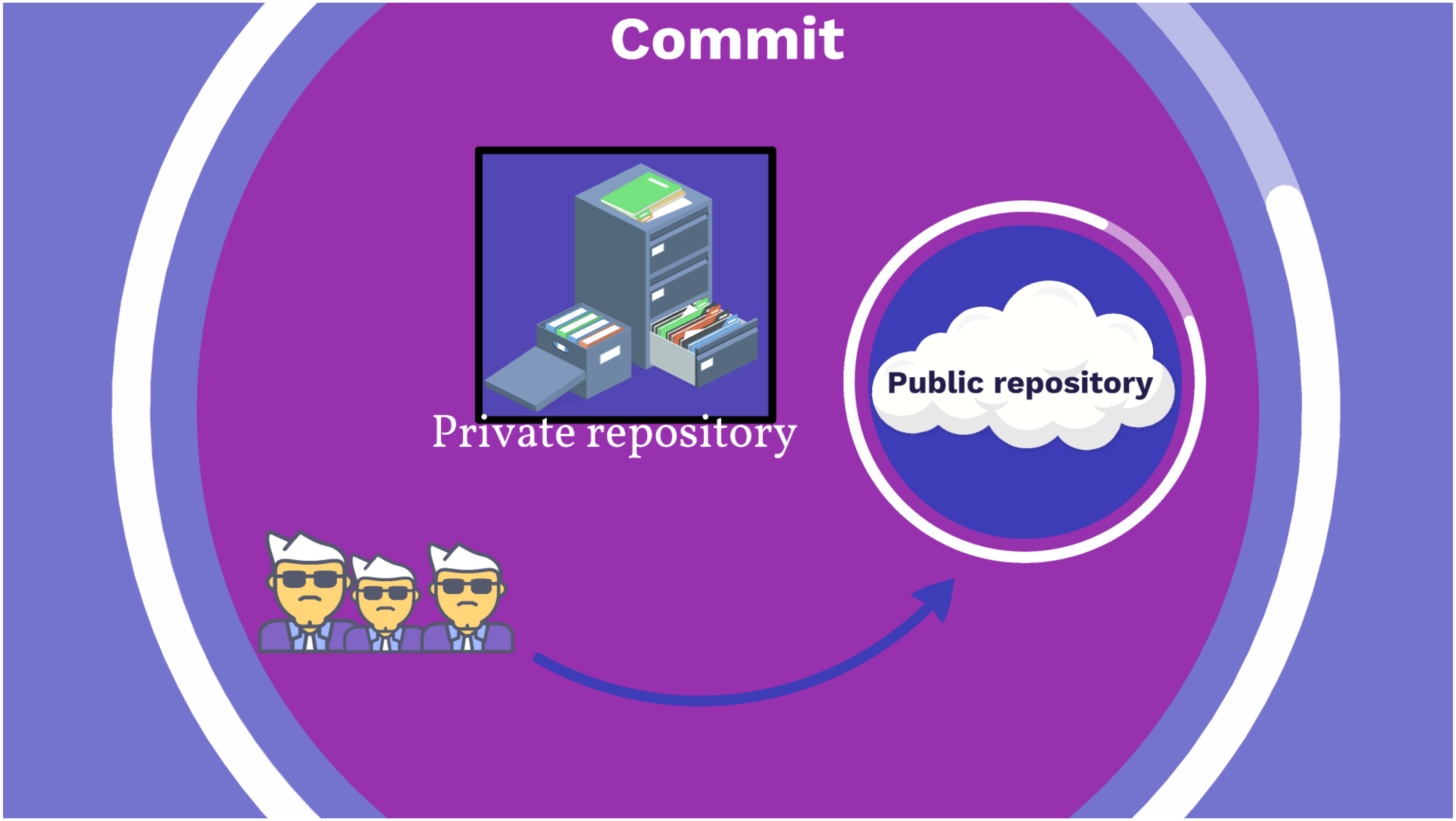

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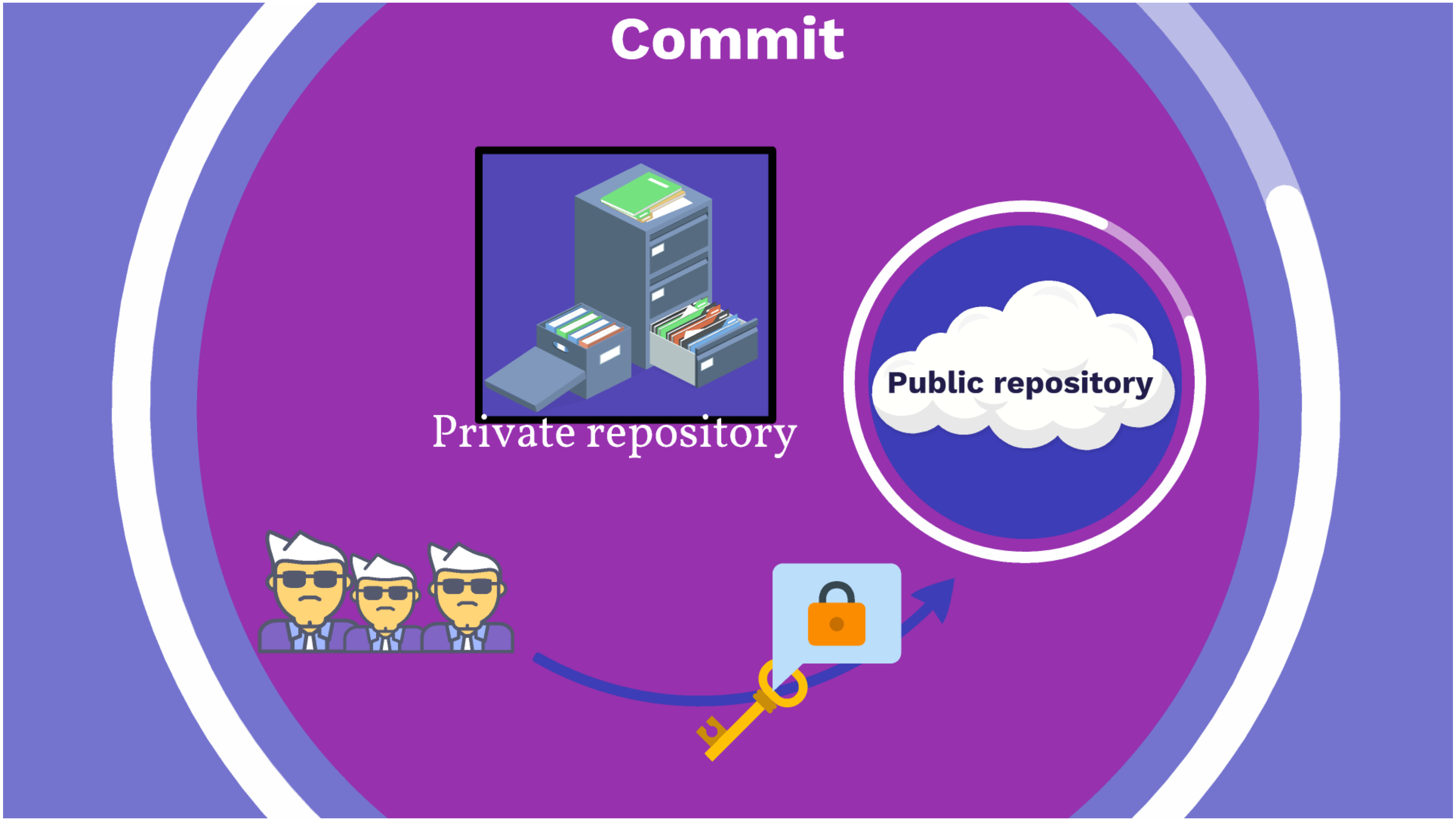

Commit
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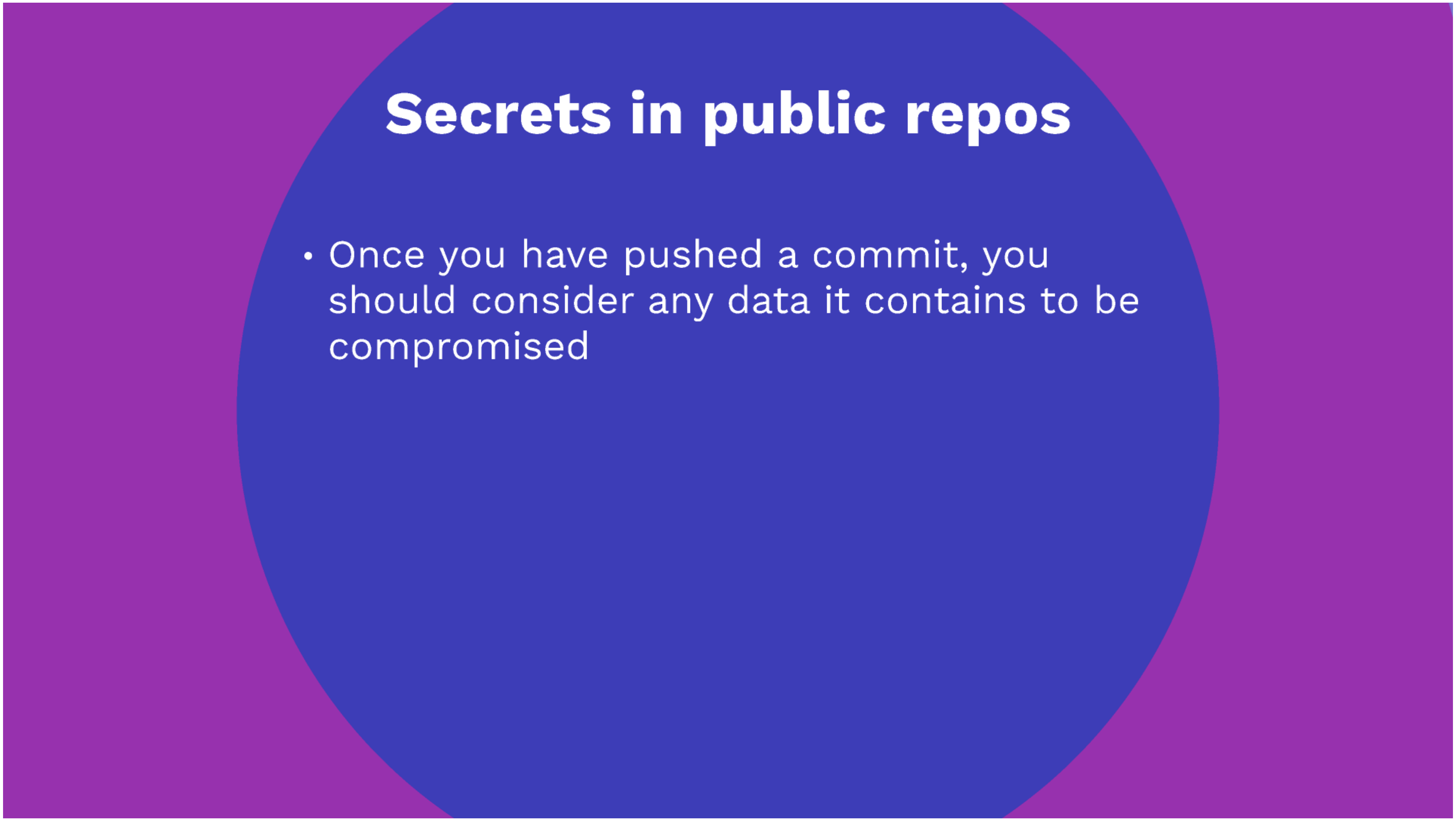
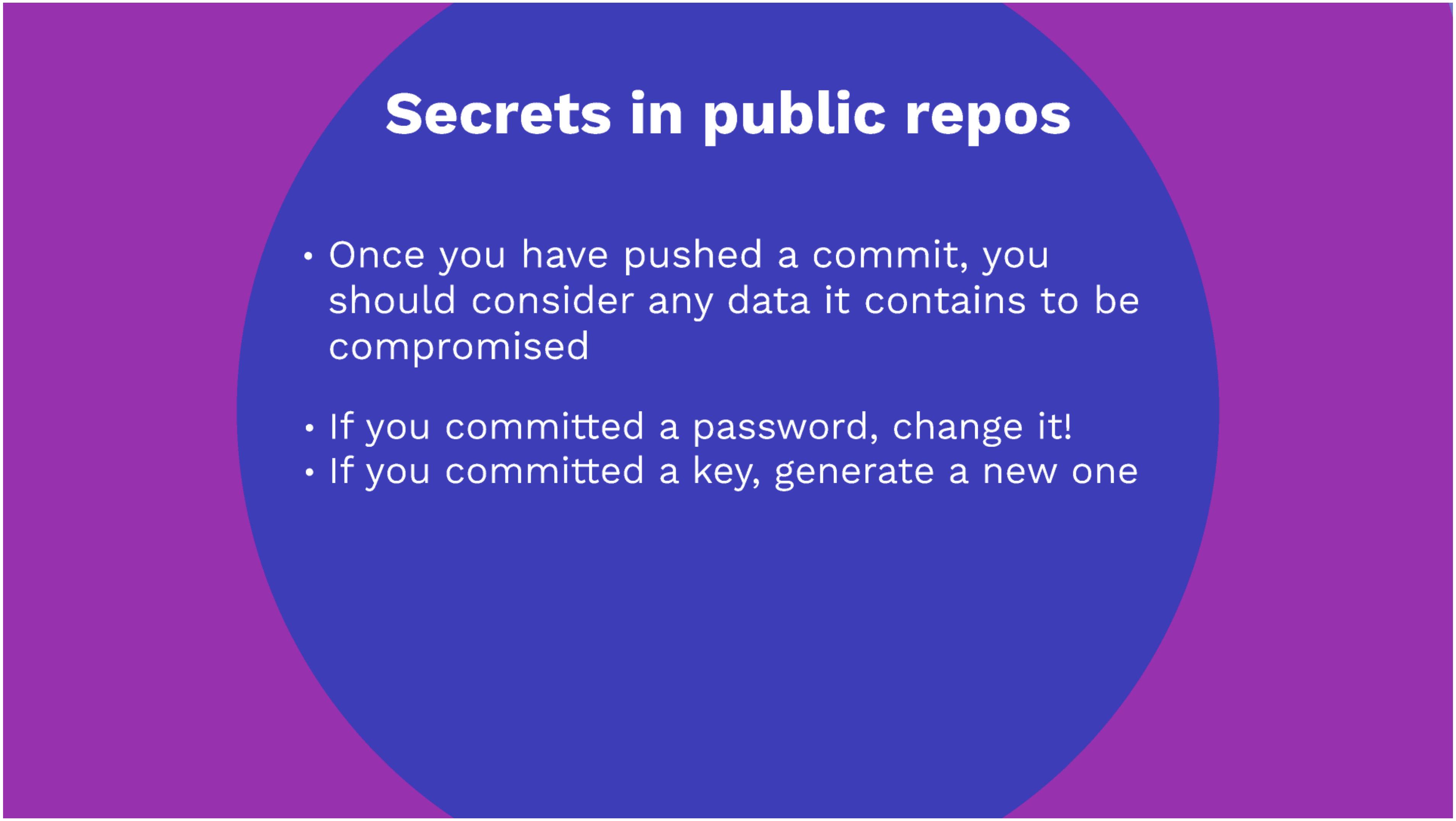
Public repository



Secrets in public repos

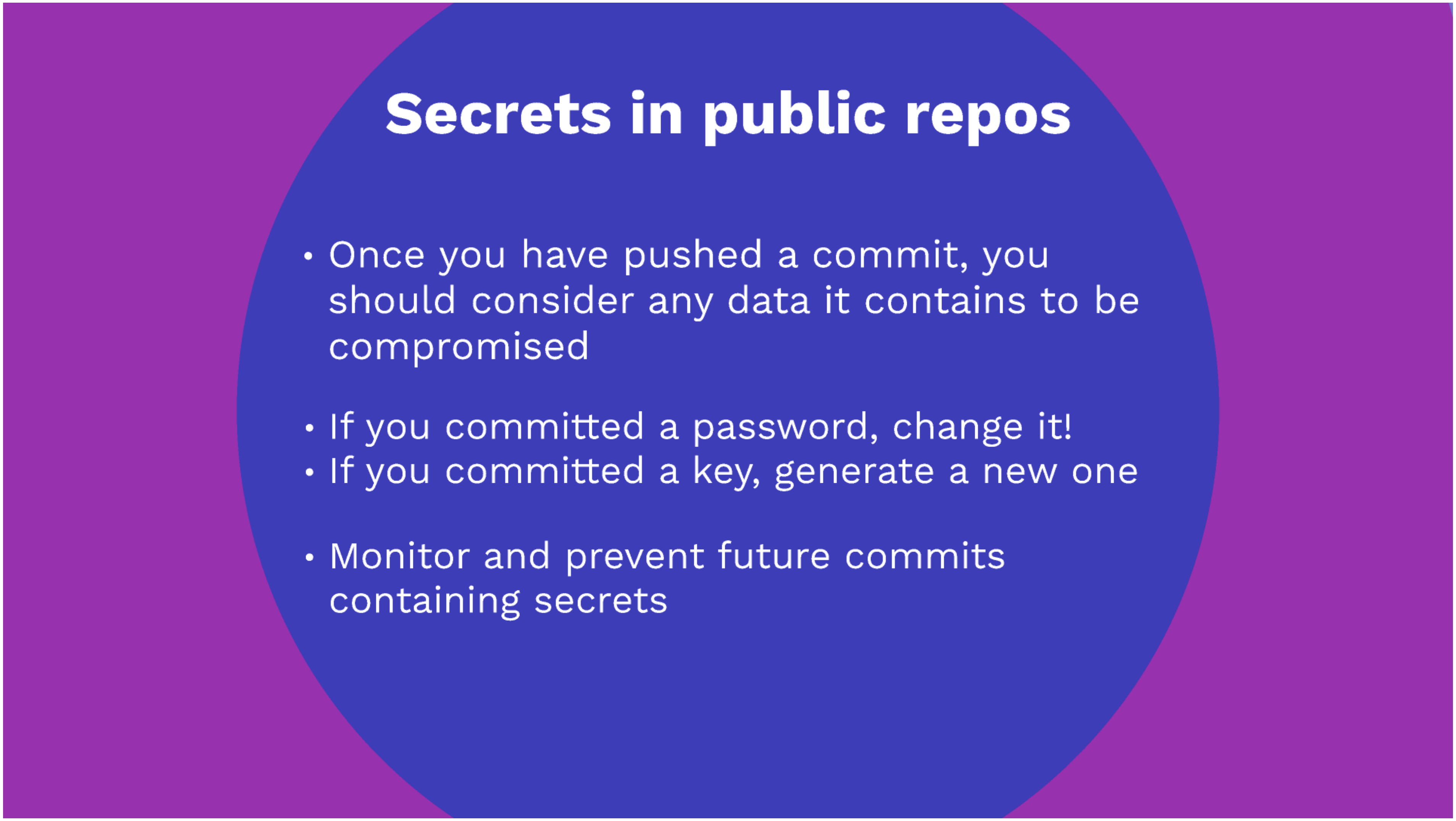
- Once you have pushed a commit, you should consider any data it contains to be compromised



Secrets in public repos

- Once you have pushed a commit, you should consider any data it contains to be compromised

- If you committed a password, change it!
- If you committed a key, generate a new one



Secrets in public repos

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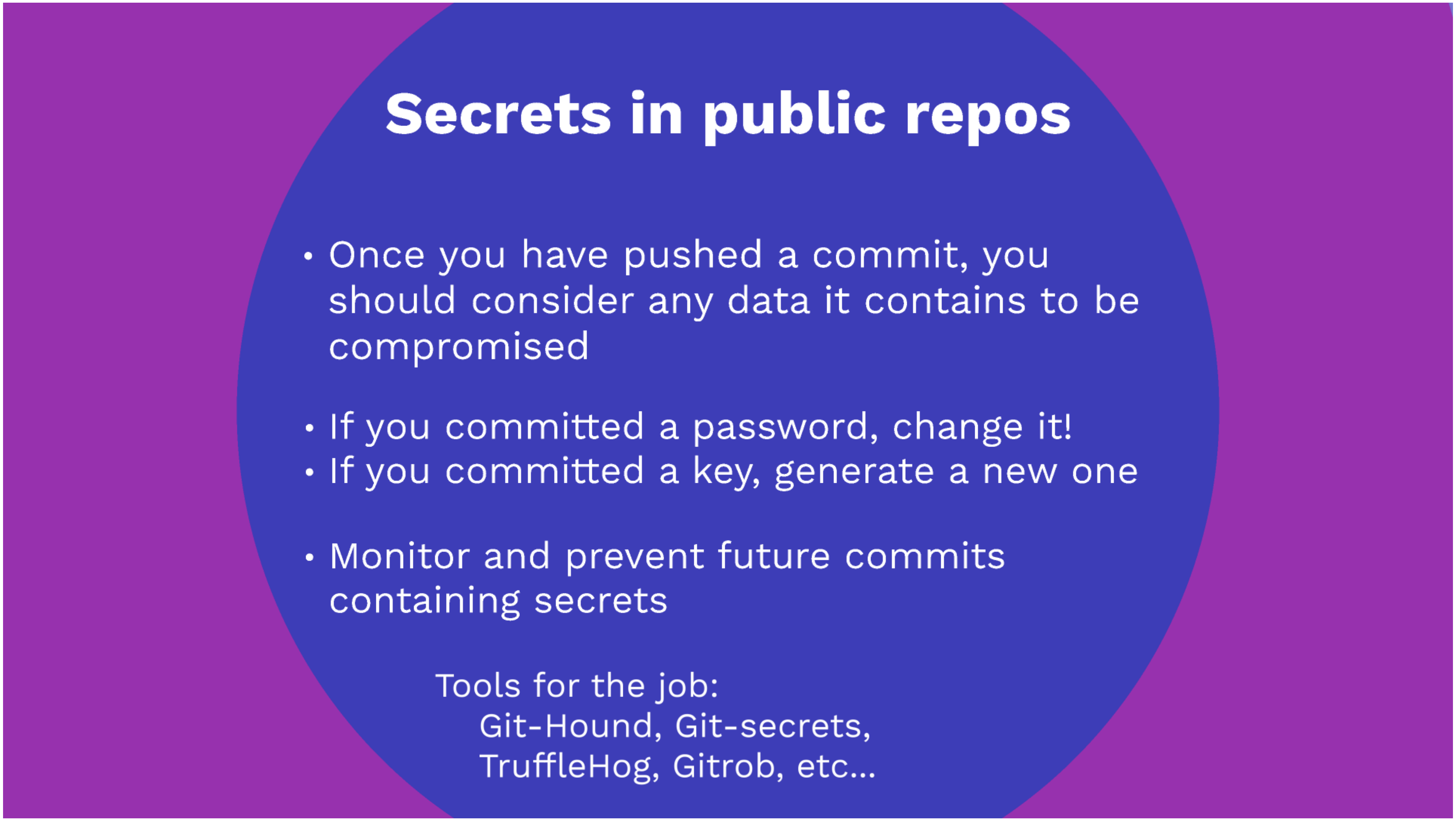
- Monitor and prevent future commits containing secrets



Secrets in public repos

- Once you have pushed a commit, you should consider any data it contains to be compromised

- If you committed a password, change it!
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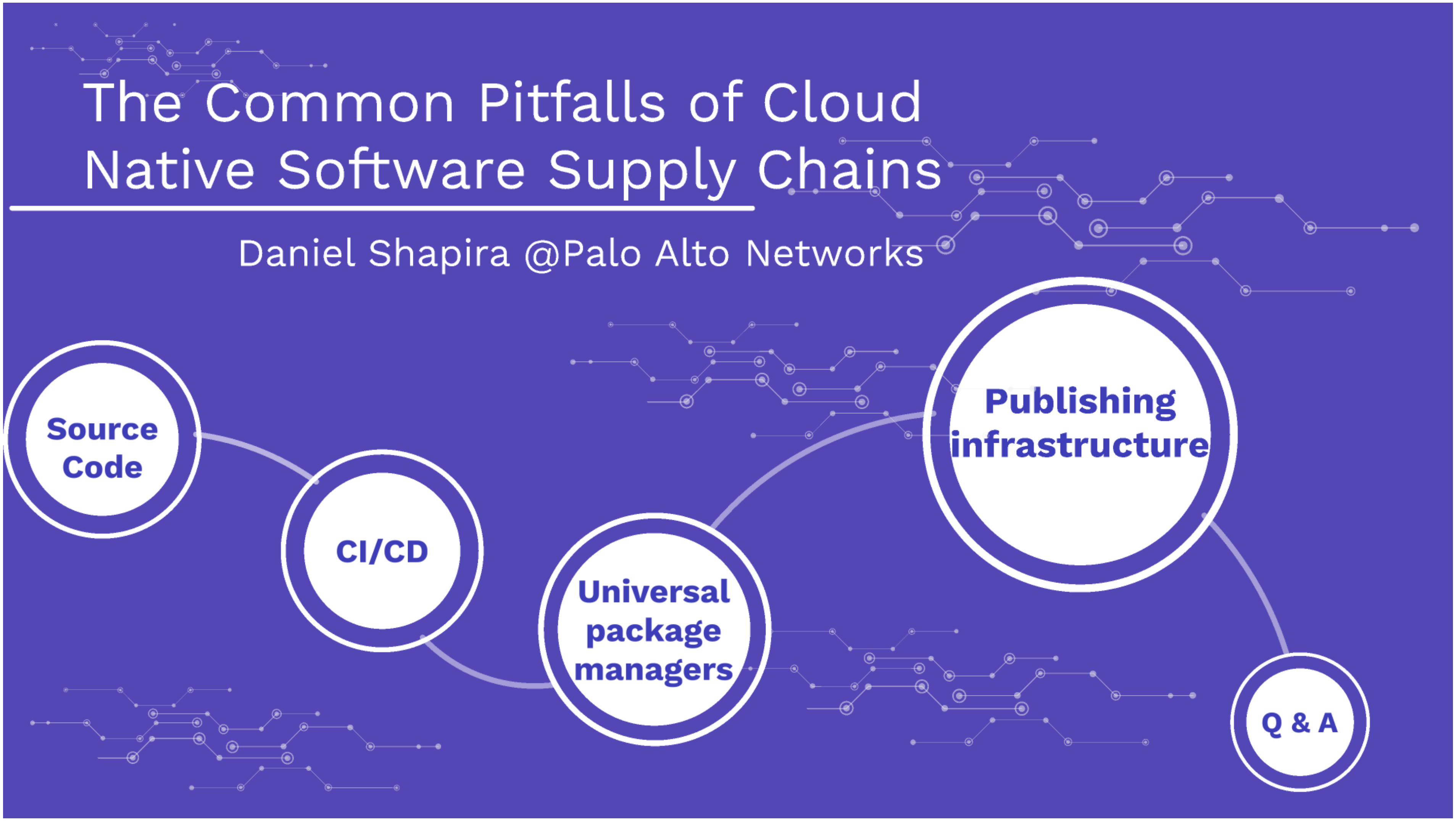
- Monitor and prevent future commits containing secrets

Tools for the job:
Git-Hound, Git-secrets,
TruffleHog, Gitrob, etc...



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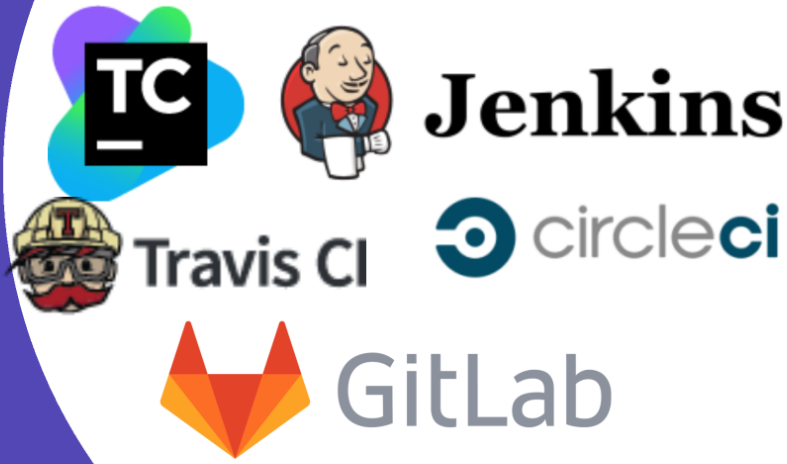
Continuous Integration



CVEs

Secrets

Configs

CVEs

CVEs

- CVE - a list of entries for publicly known vulnerabilities

CVEs

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CVEs

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CVEs

- CVE - a list of entries for publicly known vulnerabilities
- Over 300 CVEs in old versions of CI/CD tools
- 60% of which were reported during 2019 alone
- A CVE is your mark to upgrade!

Secrets

Secrets

- If secrets are not leaking from version control, they might leak from your CI

Secrets

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- Build history may contain sensitive information

Secrets

- If secrets are not leaking from version control, they might leak from your CI
- Build history may contain sensitive information
- Anyone who can create jobs on Jenkins can uncover all Global secrets

Misconfigurations

Misconfigurations

- Anonymous access allowed

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- Instances publicly exposed

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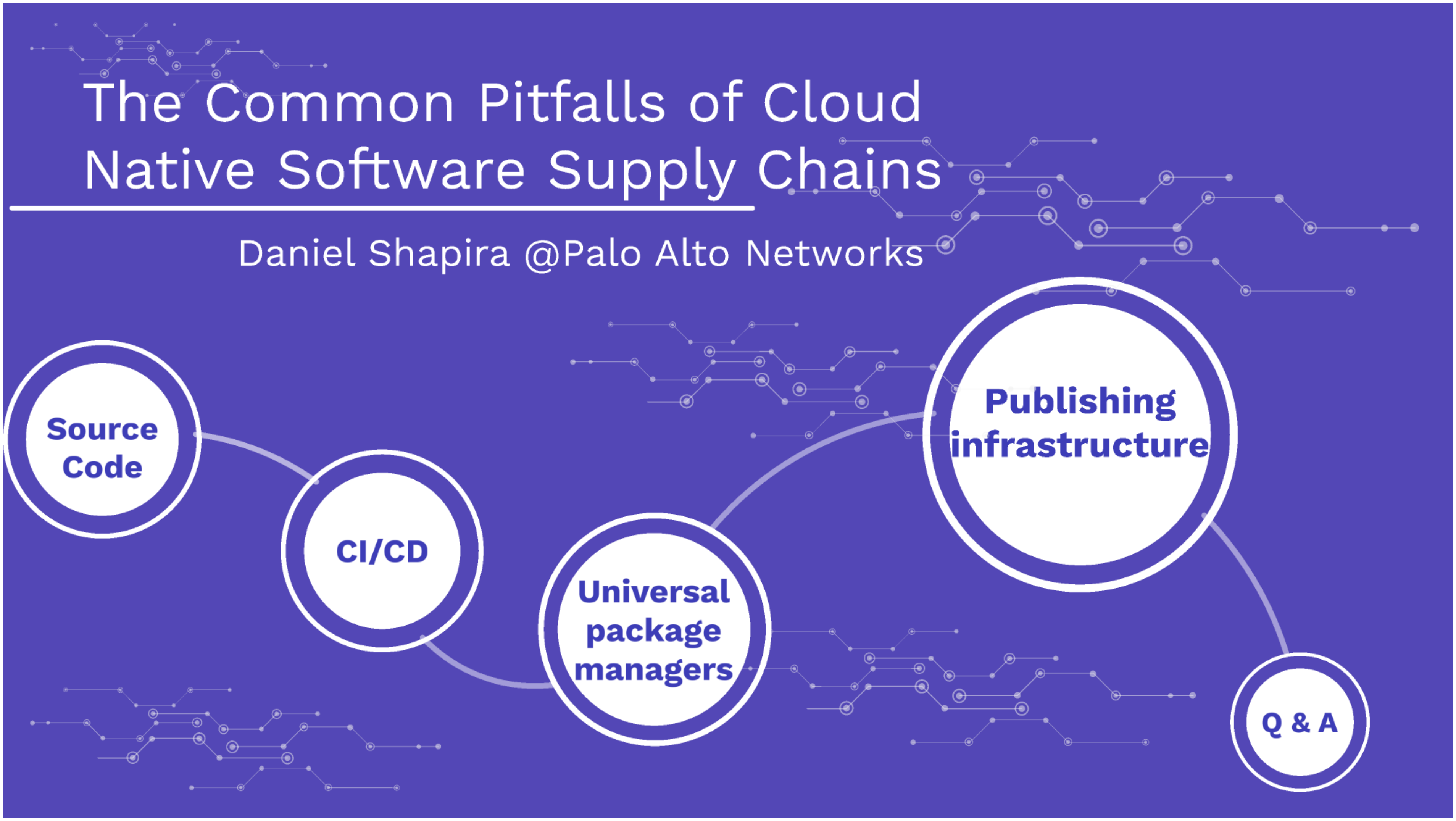
Misconfigurations

- Anonymous access allowed
- Instances publicly exposed
- Over-permissive privileges given
- Authentication is not enforced everywhere



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Q & A

Universal Package Managers

archiva™
CloudRepo
cloudsmith
ProGet
JFrog Artifactory

Auth
&
Authz

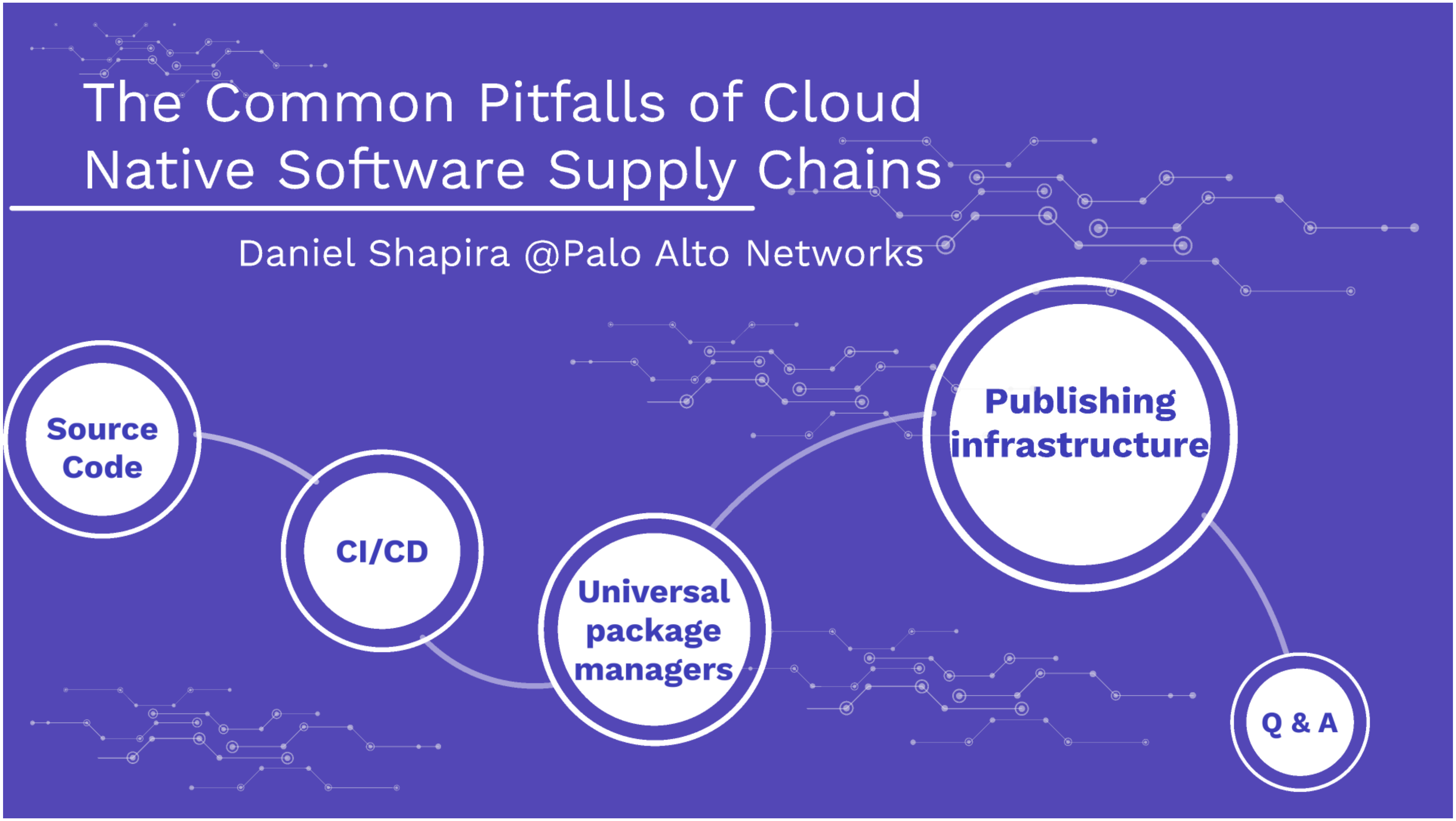
Authentication & Authorization

Authentication & Authorization

- Authentication is the Achilles heel

Authentication & Authorization

- Authentication is the Achilles heel
- Dangerously over-permissive default settings



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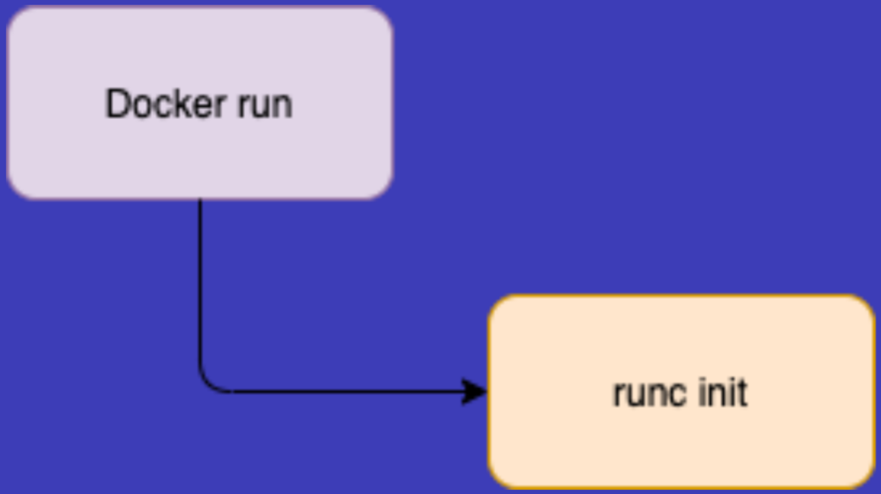
Publishing infrastructures

Azure
aws
Google Cloud Platform
DC/OS
RED HAT® OPENSHIFT
kubernetes
docker
Containers

Containers

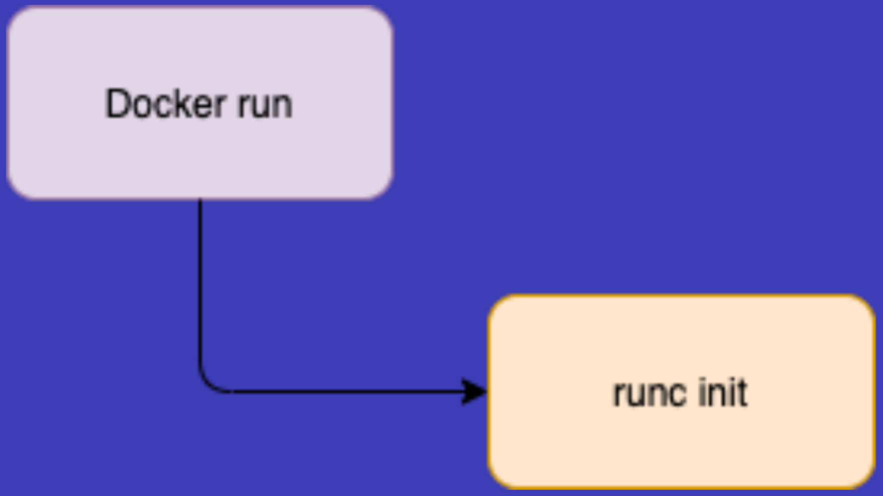


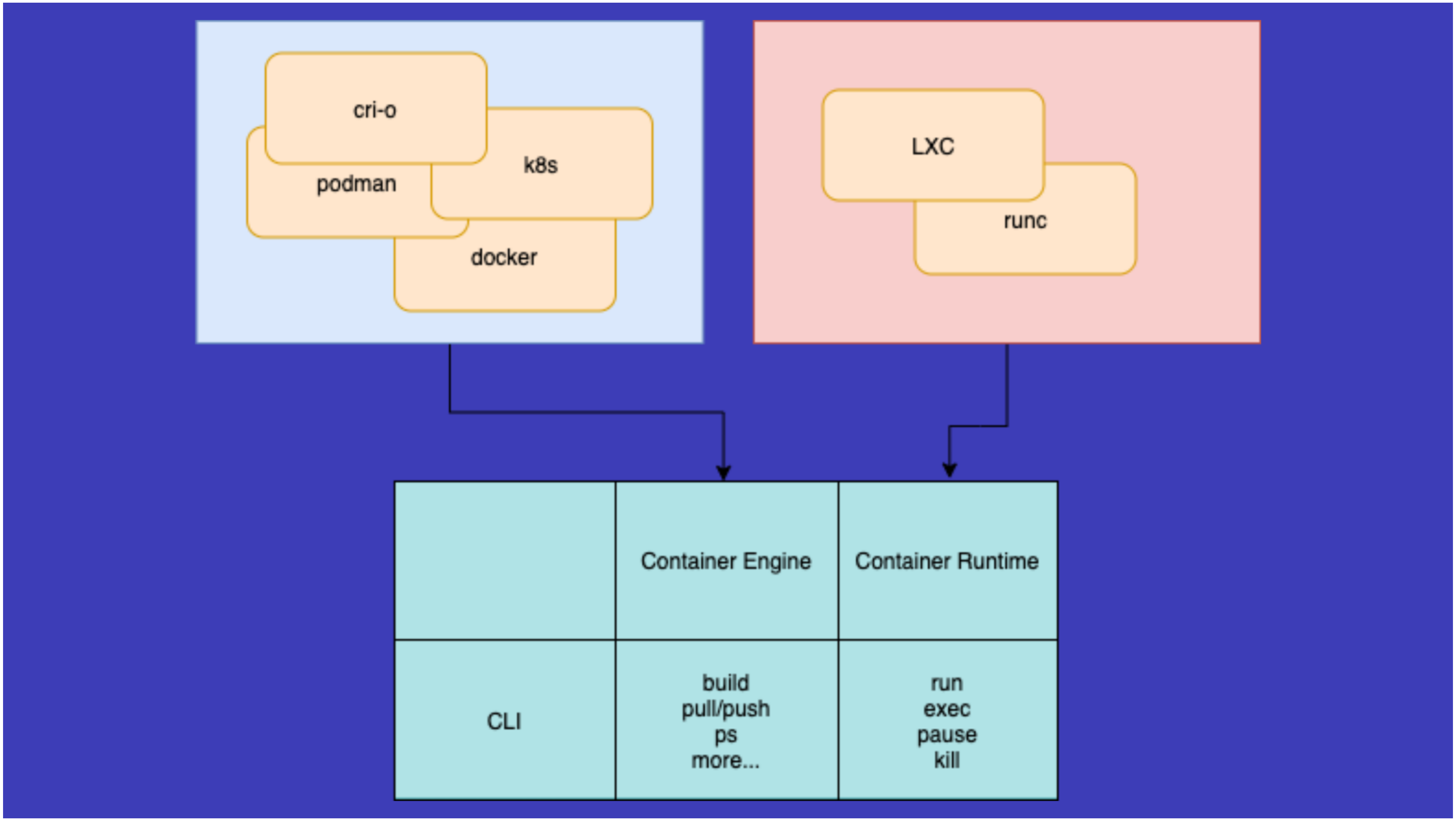
Docker run

runc init

Containers

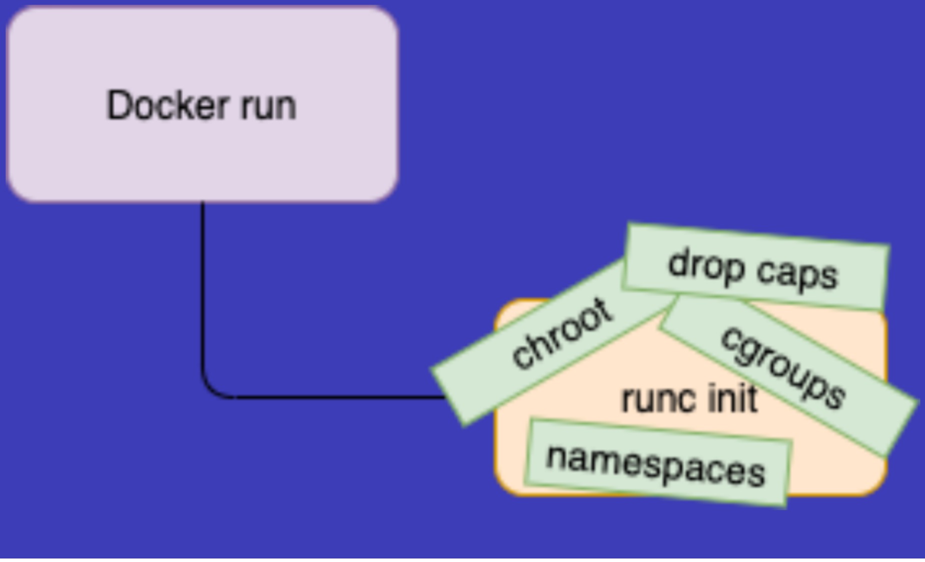
- Restricted processes chrooted to a separate filesystem





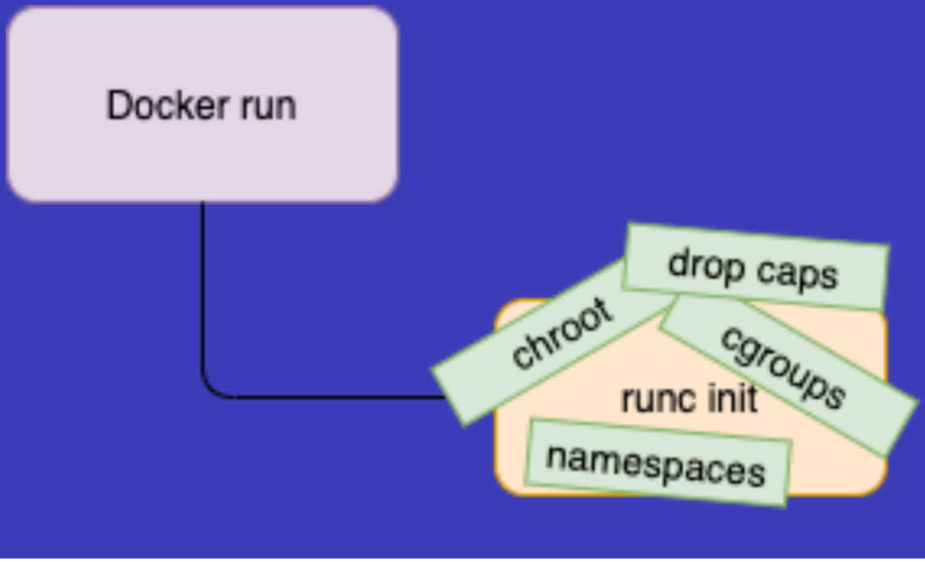
	Container Engine	Container Runtime
CLI	build pull/push ps more...	run exec pause kill

Containers



Containers

- docker run



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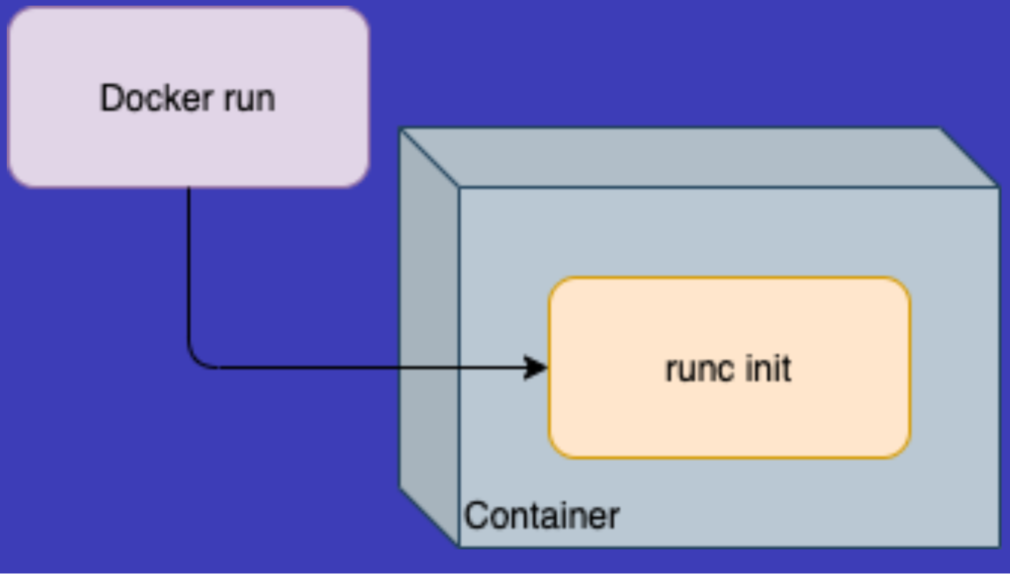
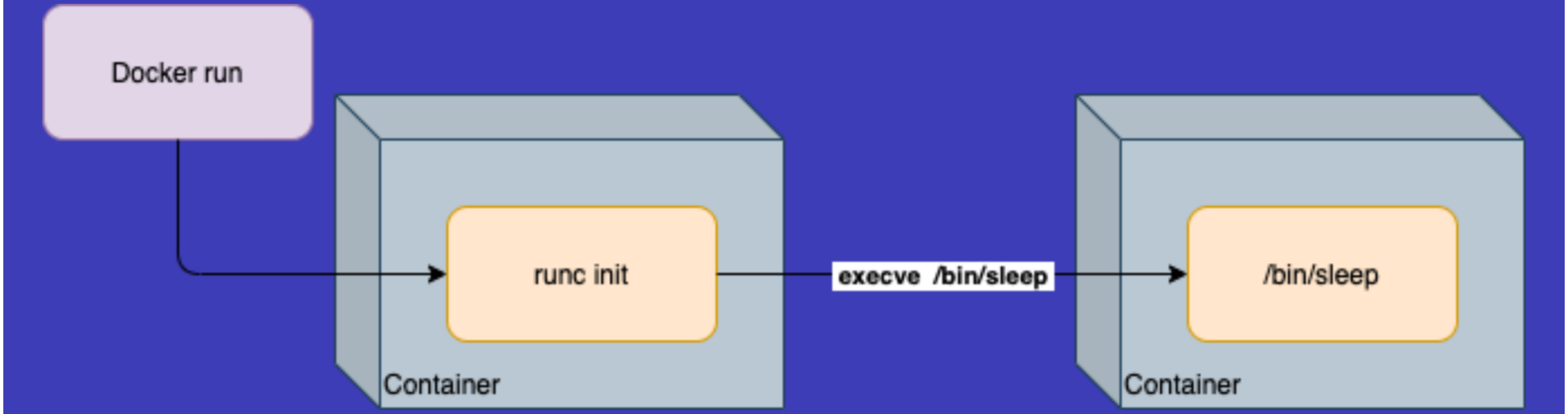
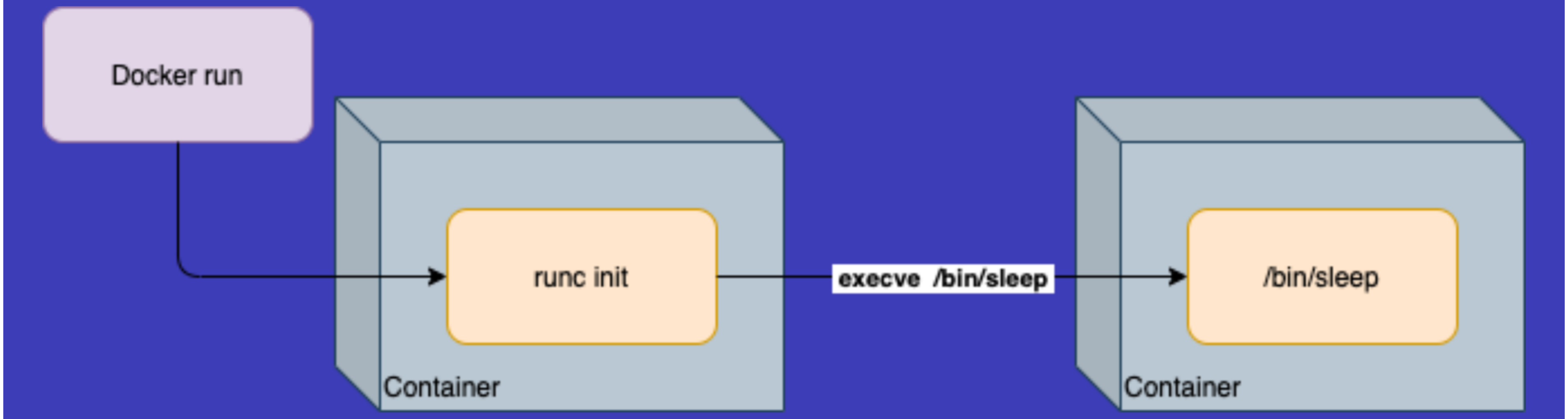


Containers

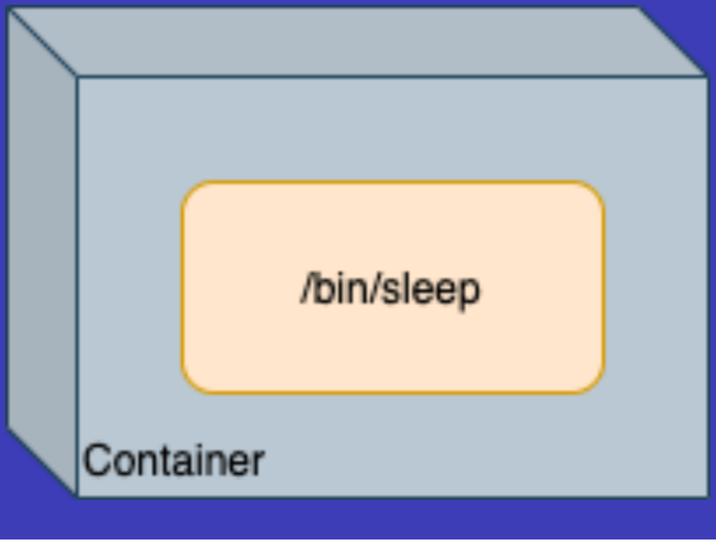

Docker run
runc init
Container
execve /bin/sleep
/bin/sleep
Container

Containers

- docker run ubuntu sleep

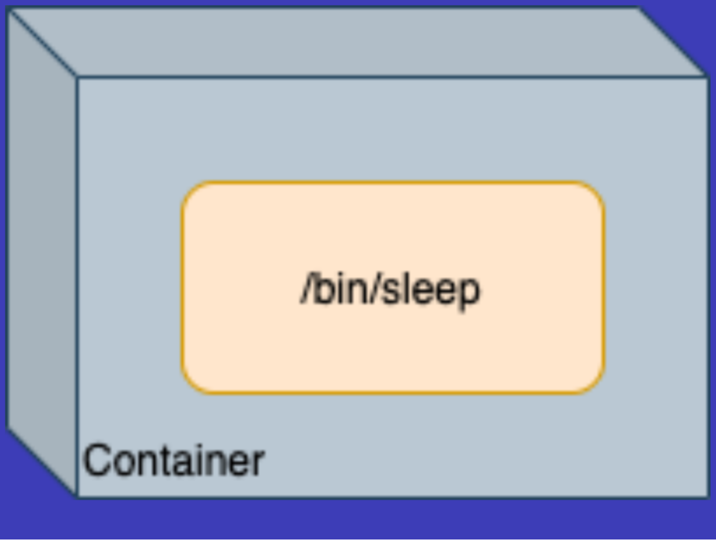


Containers



Containers

- docker run ubuntu sleep



Containers - attack surface

- Container escape

How?

1. malicious container images
2. breached container

Containers - Copy command

Containers - Copy command

- Copy from a container to host
- Copy from host to container
- Copy between containers

```
> docker cp /tmp/file ubuntu_container:/tmp/file

> podman cp host_file ubuntu_container:/dir/abc
```

Copy command - Podman

```
> podman cp host_file ubuntu_container:/dir/abc
```

- Build container path (from host's view)
  - /var/lib/…/$container_id/merged + /dir/abc

- Then preform copy
  - cp host_file /var/lib/…/$container_id/merged/dir/abc

Podman - the problem

- **Symlinks !**

- Symlink - a file that that contains a reference to another file or directory

Podman - CVE-2019-10152

- **Symlinks resolved under host root**

- symlink "fake_directory=>/critical/path"

```
> podman cp host_file container:/fake_directory/file
```

result : /critical/path/file

Copy command - Docker

- 1. Resolve container path in container root
- 2. Add resolved path to container mount point
- 3. Preform copy operation

Copy command - Docker

fake_directory => /critical/path

```
> docker cp host_file container:/fake_directory/file
```

1. /critical/path/file
2. /var/lib/..../$container_id/merged + /critical/path/file
3. cp host_file /var/lib/..../$container_id/merged/critical/path/file

Docker CVE-2018-15664

- Symlink exchange race attack

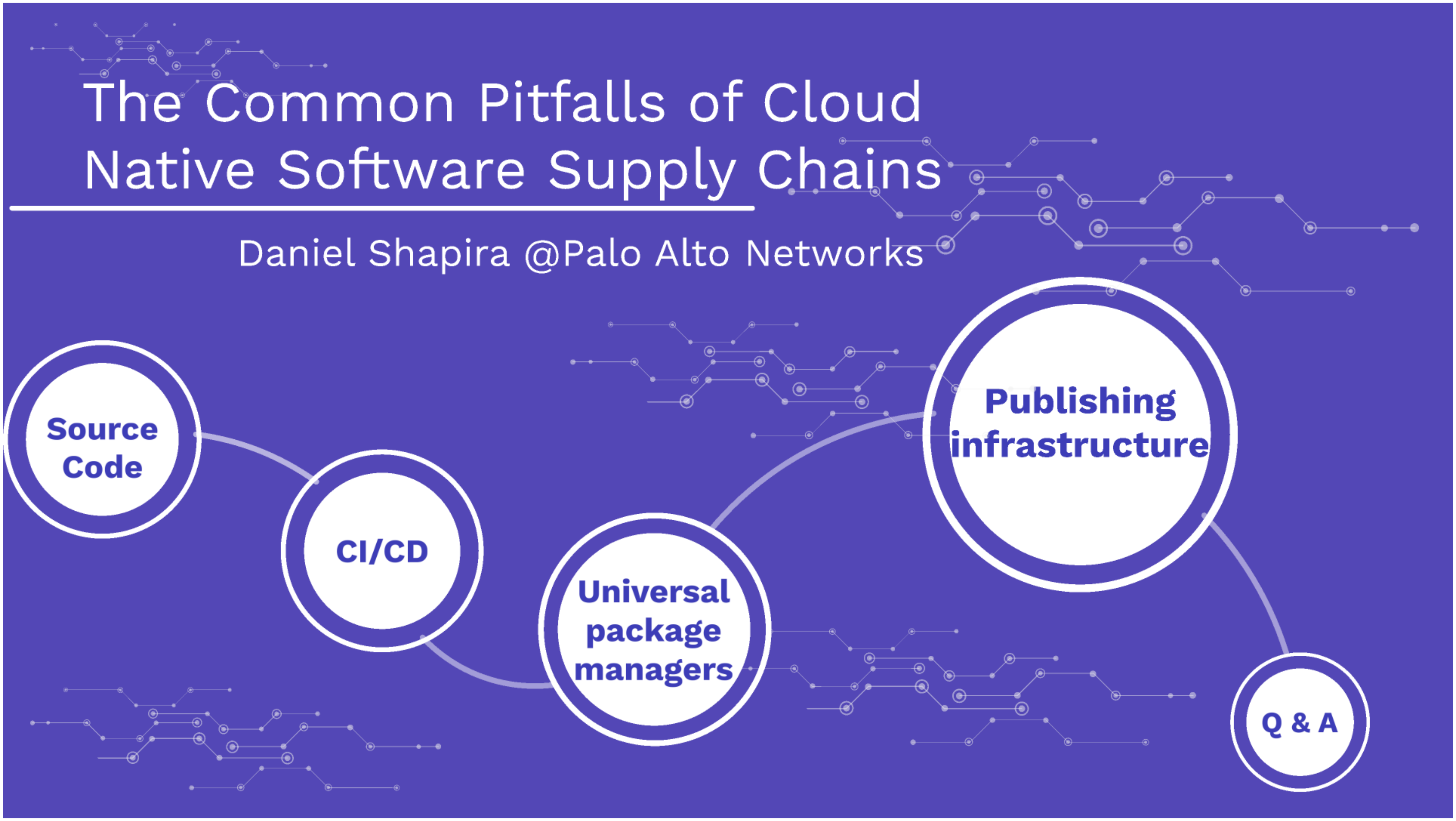
```
> docker cp /host_file container:/somedir/file
```

1. /somedir/file
2. /var/lib/..../$container_id/merged + /somedir/file

   somedir => /critical/path

3. cp /host_file /var/lib/.../merged/somedir/file

   /critical/path/file



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Questions?

Thank you!

Thank you!

Contact Me:

dshapira@paloaltonetworks.com

@Da5h_Solo

references:

https://cutt.ly/Exposed-Artifacts

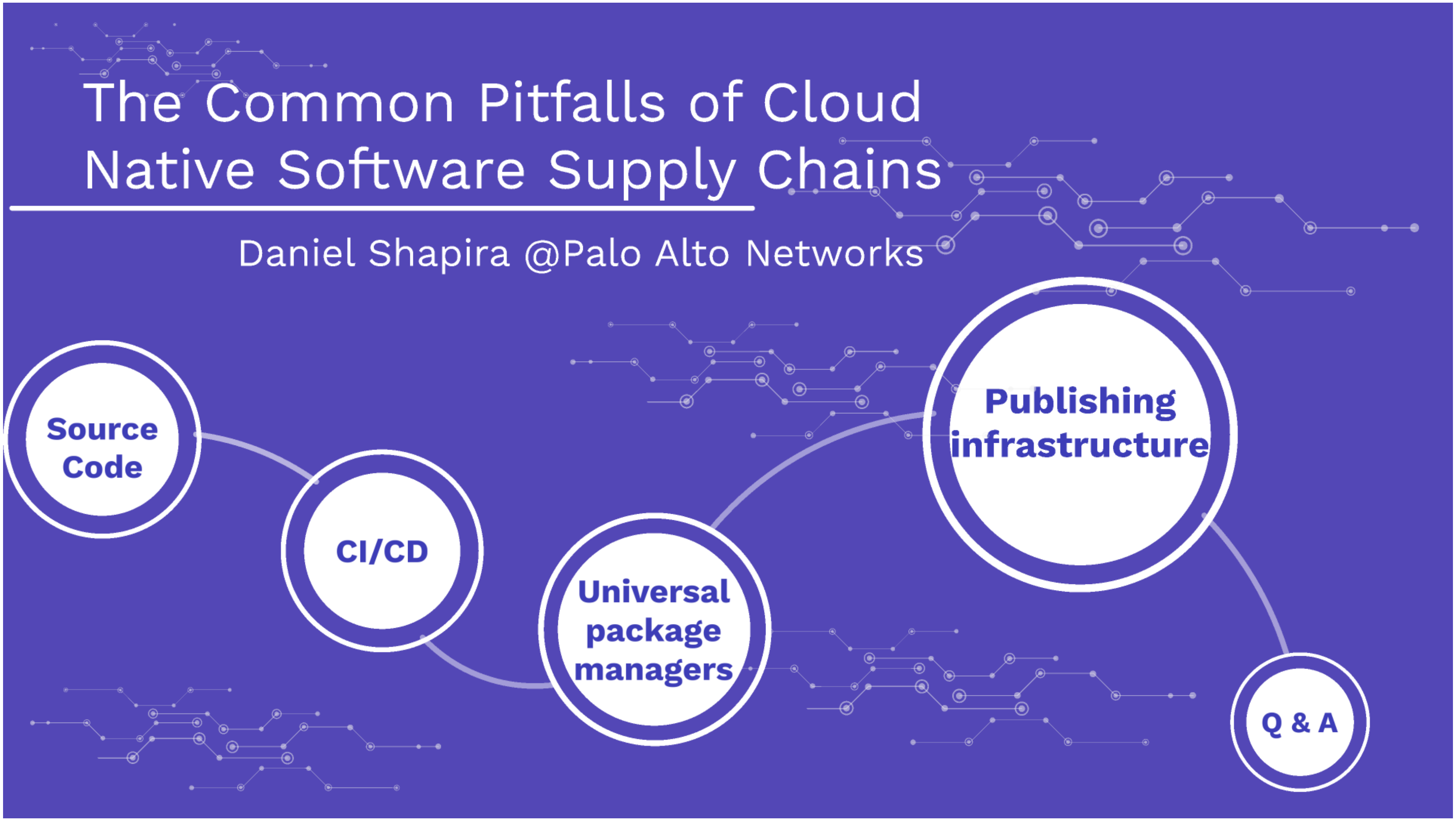
https://cutt.ly/Open-Registries

https://cutt.ly/Escaping-Docker

more to be published soon :)

graphics from:

https://www.freepik.com



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