

# Project Overview

**Background:** Cert-manager is an open-source tool that manages X.509 certificates specifically for cloud native Kubernetes or OpenShift environments (Collins, 2022). Cert-manager obtains certificates from a variety of Certificate Authorities(CAs), both popular public CAs as well as private CAs, and ensures the certificates are valid and up-to-date through a component called issuer. It also attempts to renew certificates at a configured time before expiry.

**Problem Statement:** End-users of cert-manager like software developers, Quality Assurance Engineers and Site Reliability Engineers (SREs) currently face challenges with testing the capabilities and robustness of Kubernetes cluster deployments with cert-manager.

**Project Goal:** The vision for this project is to be the standard open-source testing tool for cert-manager deployments adopted by the Kubernetes community.

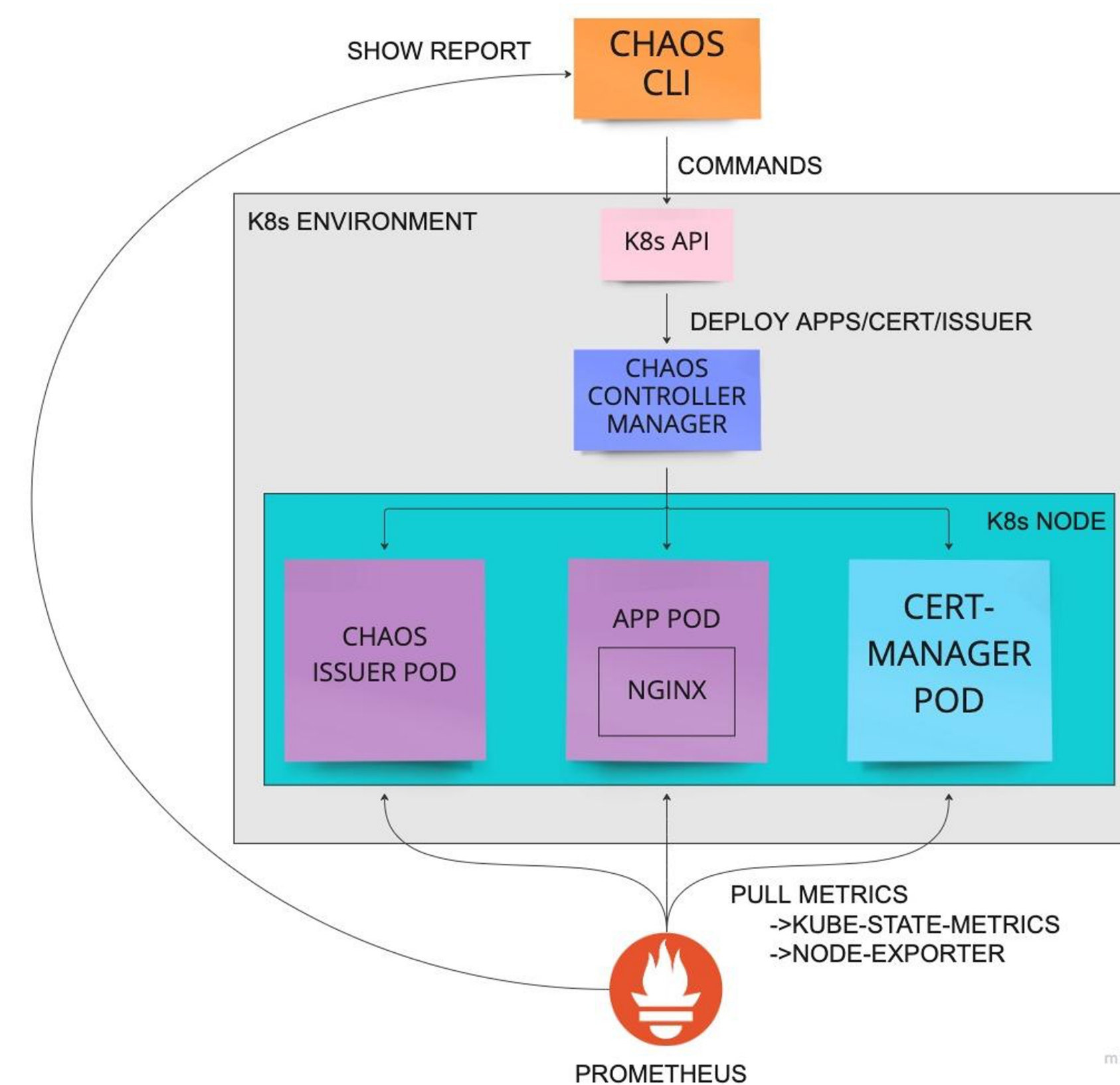
## Tools Used: Cert-Manager, Kube Builder, Kubernetes and Go.



## Solution

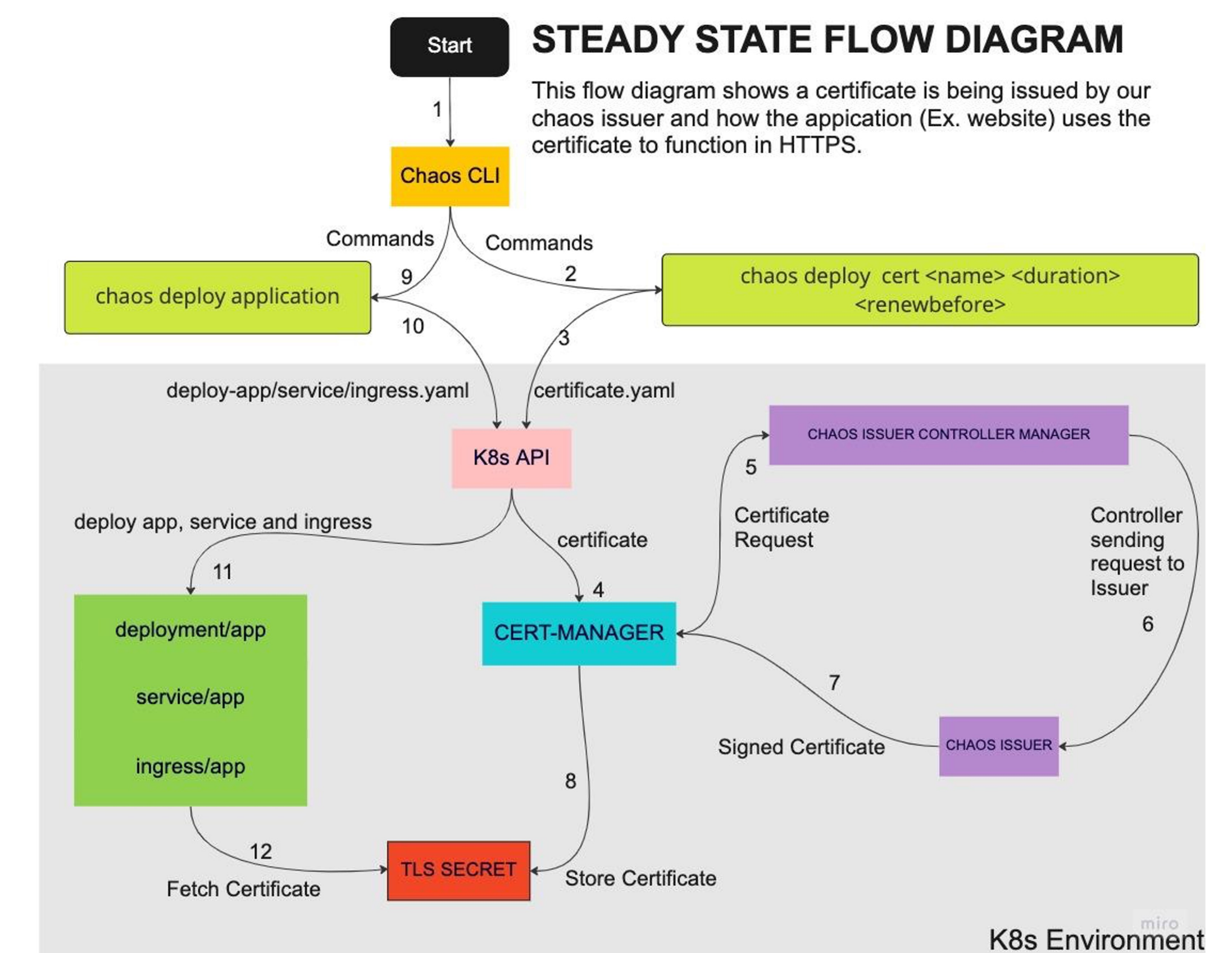
- Build a standard open-source testing tool for cert-manager deployments adopted by the Kubernetes community.
- Enabling users to introduce chaos scenarios to Kubernetes clusters deployed with cert-manager, which would allow them to prepare for unintended failures.
- Laying the foundation for a testing platform that the community can continue to build upon.

# Architecture

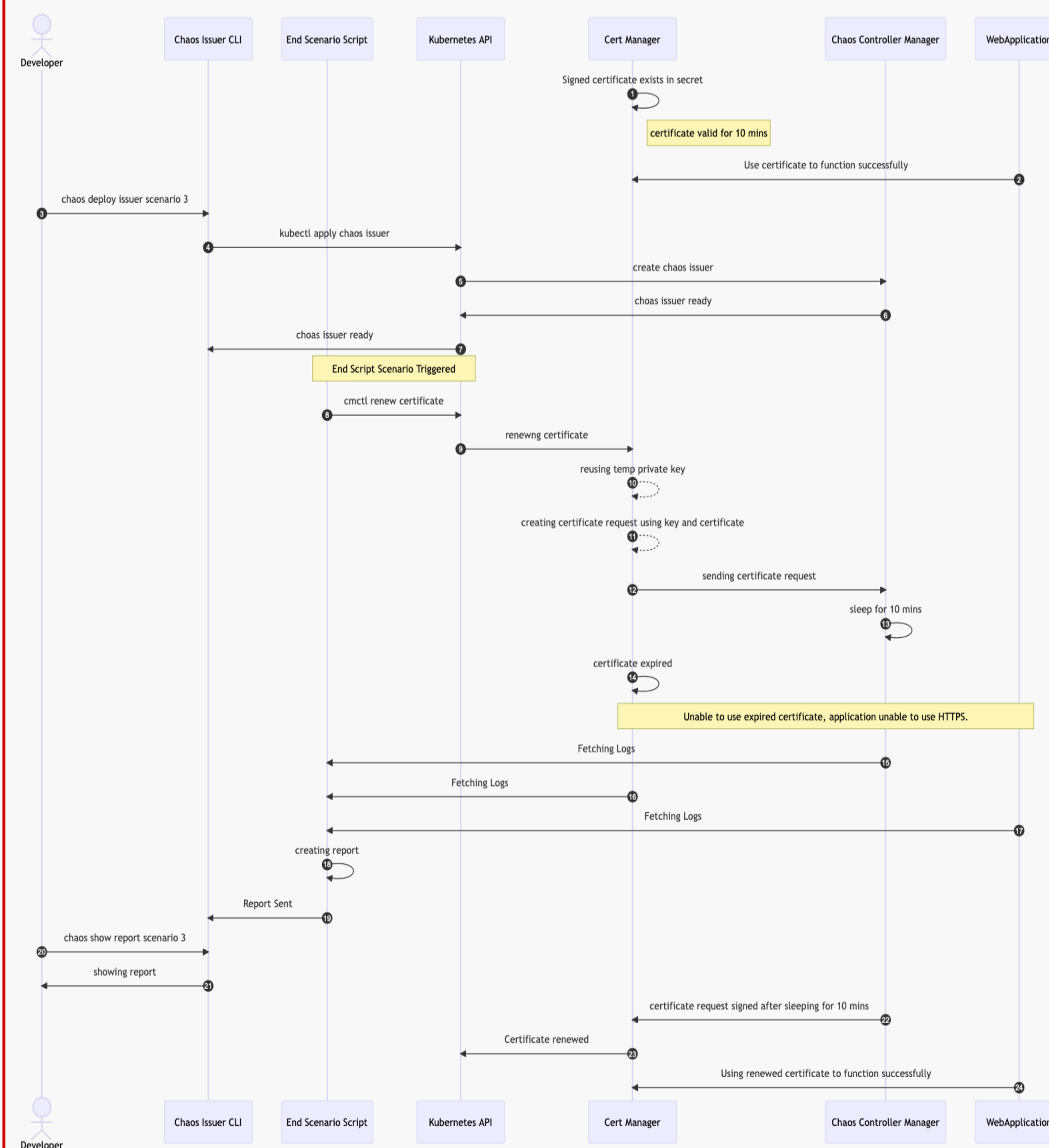


The figure on the left side shows the design architecture of the Chaos Issuer

The figure on the right side shows the steady state flow diagram



## Example End-to-End Scenario



## Results

- Developed a configurable self-signed Cert-manager issuer (called Chaos Issuer) to introduce chaos in the Kubernetes cluster where cert-manager is deployed.
- Identified and documented different chaos scenarios that can be used to create havoc in the system.
- Designed and implemented an end-to-end solution for at least 2 different chaos scenarios that a user of the Chaos Issuer can use to assess the event in more detail (either to build resiliency of the system, or to handle errors, or to test limitations).
- The tool incorporates a basic report generation feature that assesses logs and functions as a starting point for remediation.

## Future Work

- Extending the tool to accommodate for more chaos scenarios.

## References

- <https://cert-manager.io/>
- <https://kubernetes.io/>
- <https://prometheus.io/>
- <https://book.kubebuilder.io/>
- <https://go.dev/>