# GitOps on K3s + ArgoCD — Report

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GitHub Repo URL: <https://github.com/saeedzawarudo-afk/gitops-k3s-argocd>

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## Introduction

This project implements a lightweight, budget-friendly GitOps setup using K3s (a minimal Kubernetes distribution) and ArgoCD on an Azure Free Tier virtual machine. ArgoCD continuously reconciles the desired state defined in Git with the actual state in the K3s cluster, ensuring safe, auditable, and repeatable deployments.

## Abstract

A single-node K3s cluster hosts ArgoCD, which is configured to watch a public Git repository containing Kubernetes manifests for a sample NGINX application. Changes pushed to the repository are automatically detected by ArgoCD and rolled out to the cluster. The outcome is a working GitOps pipeline demonstrating auto‑sync, drift correction, and basic rollout behavior.

## Tools Used

• Azure VM (Standard\_B1s, Ubuntu 22.04)

• K3s (lightweight Kubernetes)

• kubectl (Kubernetes CLI)

• ArgoCD (GitOps controller + UI)

• GitHub (source of truth for manifests)

## Steps Involved

• Provision an Azure VM and open required ports (22 for SSH, 30080 for the sample app).

• Install K3s and configure kubeconfig for the current user.

• Install ArgoCD in the 'argocd' namespace using the official manifest.

• Retrieve the ArgoCD admin password and use kubectl port‑forward to access the UI locally on port 8080.

• Push Kubernetes manifests (Namespace, Deployment, Service) to a GitHub repository under path apps/hello-k8s/.

• Create an ArgoCD Application that points to the repository and path; enable automated sync (and optionally prune/self‑heal).

• Demonstrate GitOps by updating the Deployment image tag and pushing to Git; observe ArgoCD auto‑sync and rolling update.

• Validate the running resources with 'kubectl -n hello get all' and access the app at http://<VM\_PUBLIC\_IP>:30080.

## Conclusion

The project successfully demonstrates GitOps fundamentals on a minimal Azure footprint. Using ArgoCD with K3s delivers a simple yet production‑inspired workflow where Git is the single source of truth. The same approach can be extended to multiple applications, environments (dev/stage/prod), and integrated with CI checks to gate changes before they are applied to the cluster.