

Zero-Downtime Multi-Cluster Kubernetes Platform Upgrades

Jonathan Alaimo & Asaf Erlich

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Introduction

- Kubernetes is a popular tool for container orchestration
- Kubernetes enables users to describe the needs of logical application units and schedules them across virtual resources pools
- Kubernetes automatically
 - Manages service discovery
 - Tracks resource allocation
 - Scales based on compute utilization
 - Checks the health of resources
 - Enables self-healing by restarting or replicating containers

A Platform Is More Than Kubernetes

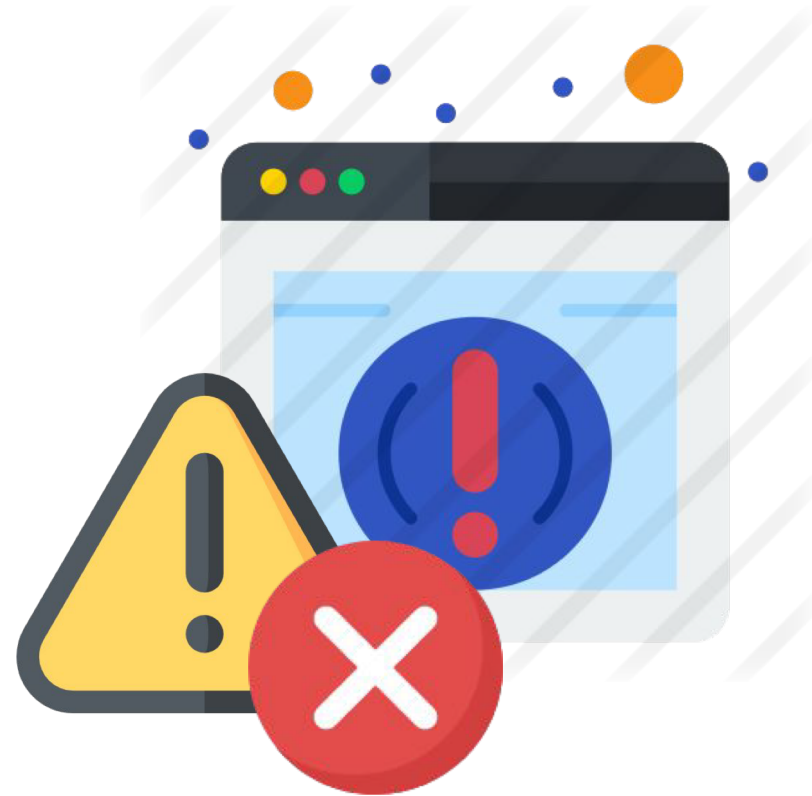
- High availability
- Authentication, authorization, and accounting
 - Enterprise integrations
 - RBAC configuration
 - Network security
 - Audit configuration
 - Admissions control
- Metrics pipelines and integrations
- Logging pipelines and integrations
- Compliance
- Ingress
- Cloud provider integration
- Storage integrations
- CI/CD integrations
- Multi-tenancy
- Discovery

Change Is Constant

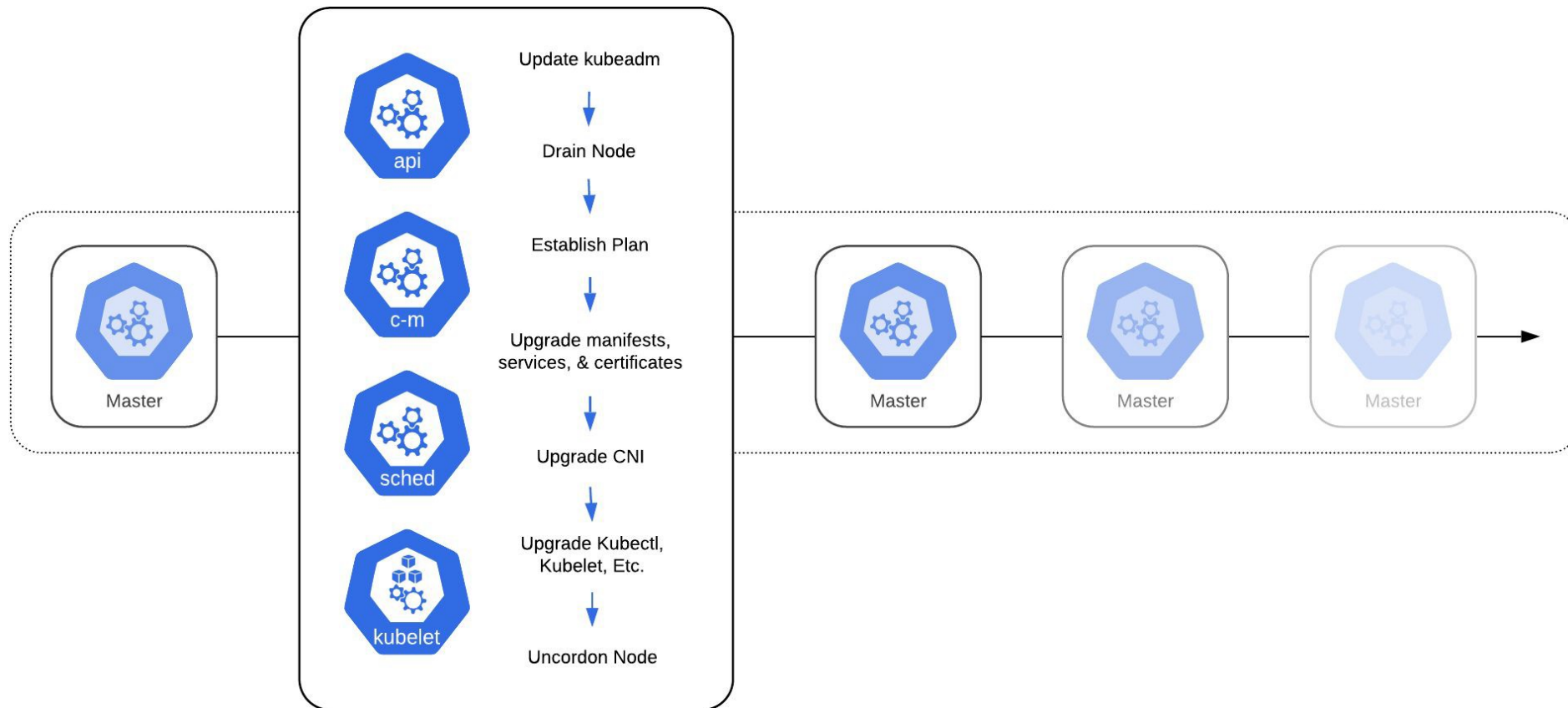
- Infrastructure
 - Nodes, OS, load balancers, networking
- Kubernetes
 - Major versions, patches, core components, CNI, autoscaler, DNS
- Configuration
 - Networking, RBAC, admissions control
- Foundation Software
 - Metrics, logging, building blocks, operators

Change Is Risky

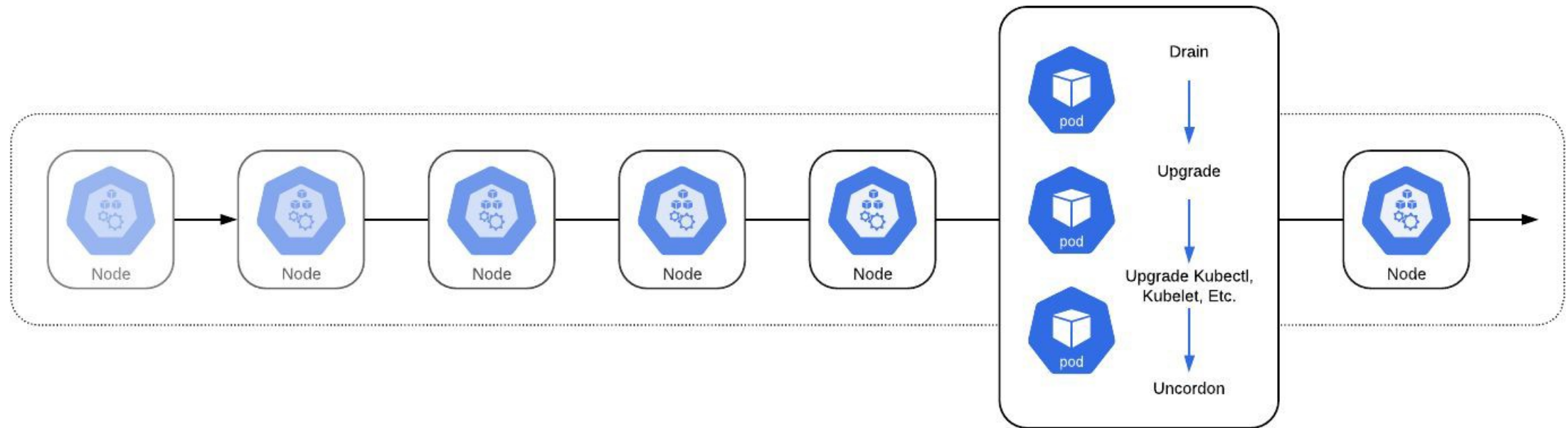
- Not making changes is worse
- Security holes, bugs, and missing feature will eventually force change
- Not having a well defined risk mitigation strategy for releases is negligent
- Delivering smaller changes frequently mitigates risk



Upgrade In-Place: Control Plane



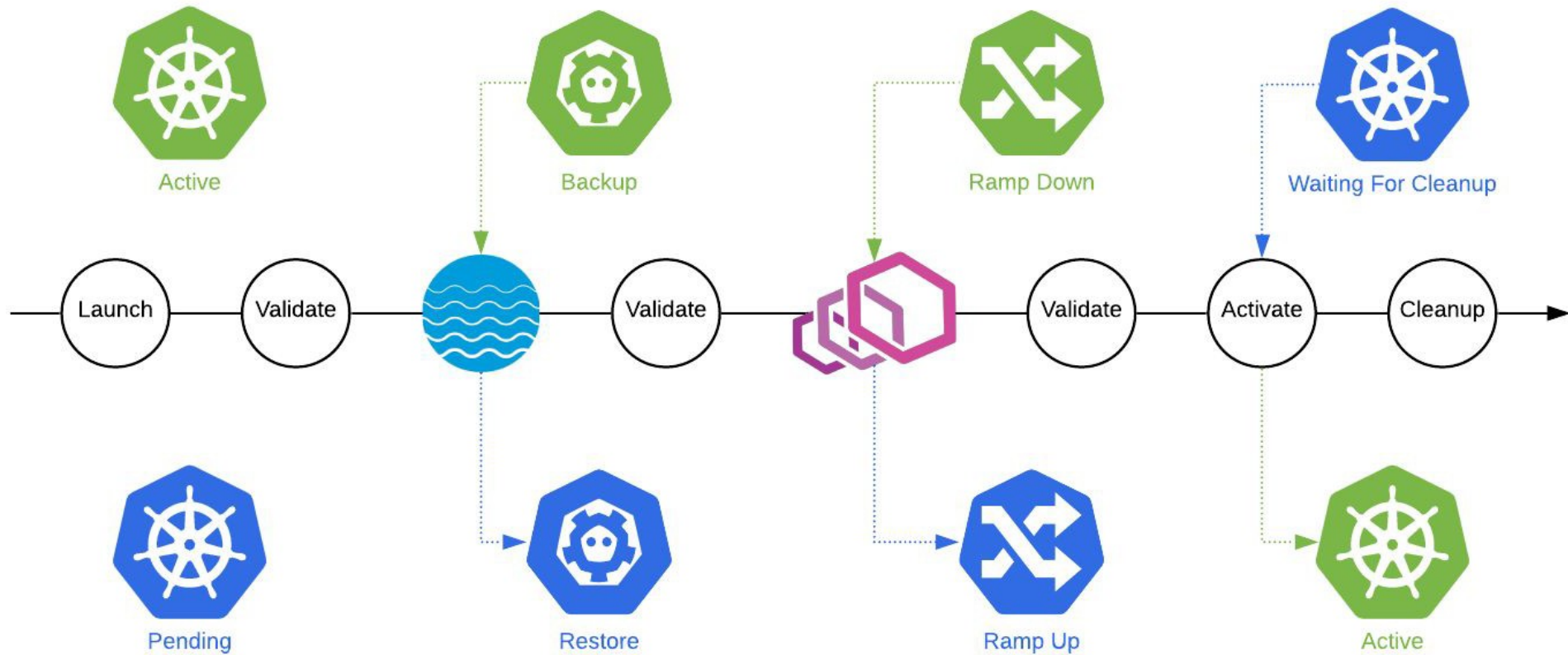
Upgrade In-Place: Data Plane



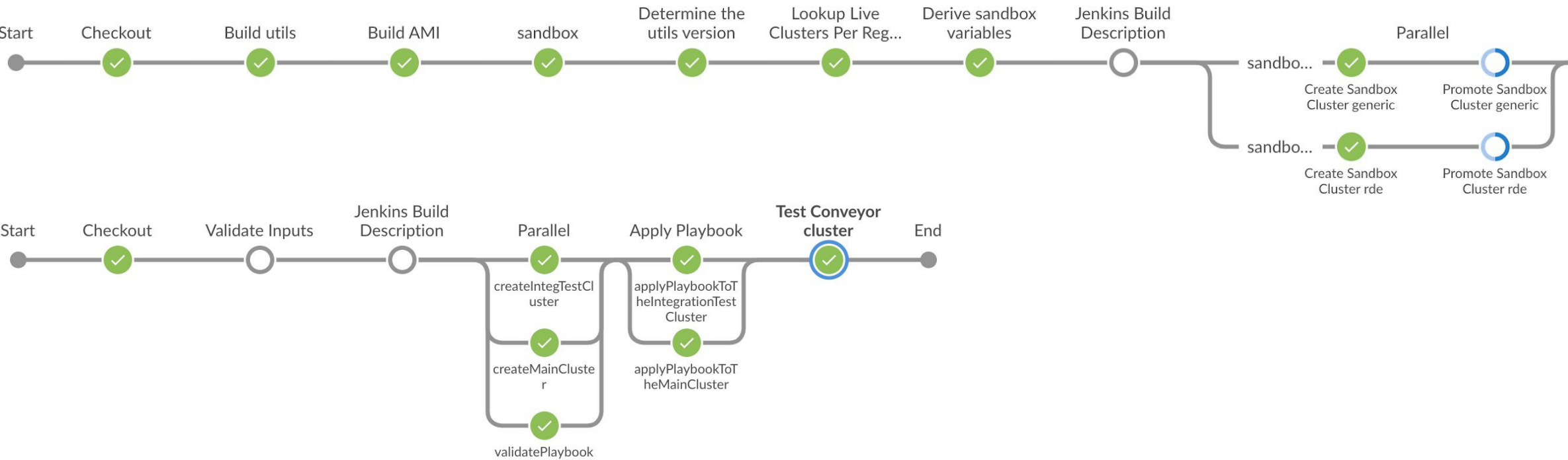
Upgrade In-Place: Risks

- Draining may fail to complete
- Nodes may fail to start properly
- Applications may fail to restart after draining nodes
- Capacity distribution could be disrupted
- Control plane capacity is disrupted
- Control plane can lose quorum
- Data corruption in ETC/D
- Rollback complexity continuously increases throughout the process
- Total loss of control plane

Multi-Cluster: Upgrades



Multi-Cluster: Continuous Integration And Deployment



Multi-Cluster: Challenges

- Additional tooling is required for traffic migration
- Additional tooling is required for automated cluster discovery
- Significant complexity to migrate services with persistent volumes or consensus requirements
- Costs of maintaining a duplicate control plane and related infrastructure during promotions

Multi-Cluster: Benefits

- Idempotent stages allow for in-place debugging
- Traffic rollout provides a full platform canary
- A quick and tunable complete rollback is available at any stage
- Configuration is qualified during data migration
- Foundation software is qualified before clusters are live
- Services are qualified before taking traffic
- Straightforward automation and promotion process
- Release and recovery procedures are the same

Thank You!

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