A Practical Checklist for Building Robust CI/CD Pipelines

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Abstract

A comprehensive checklist for designing maintainable continuous integration and continuous delivery pipelines, with explanations of why each stage matters and how to structure them.

Keywords: CI/CD, continuous integration, continuous delivery, DevOps, pipeline, automated testing, deployment

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A well-designed CI/CD pipeline is the backbone of a fast, safe software delivery organisation. This resource provides a practical checklist of the essential stages and practices for resilient pipelines.

1. Source Control and Branching

- Keep a single source of truth in Git with a clean branching model - Require pull requests with review before merging to main - Enforce protected branches and status checks - Sign commits and pin the CI/CD configuration itself

2. Linting and Static Analysis

- Run linters and formatters automatically on every change - Enforce code style and identify common defects early - Integrate security scanners for dependencies and secrets - Gate merges on a clean static analysis pass

3. Testing Strategy

- Run unit tests fast and in parallel per commit - Execute integration and end-to-end tests against realistic environments - Measure and enforce coverage thresholds - Run property-based and mutation testing where valuable

4. Build and Artifact Management

- Build reproducible artifacts with pinned dependencies - Tag and version every artifact uniquely - Store immutable artifacts in a registry with retention policies - Sign and scan images for vulnerabilities before promotion

5. Deployment and Release Management

- Automate deployment through environments (staging, production) - Use blue-green or canary strategies for low-risk rollouts - Support one-command rollbacks to a known-good release - Manage configuration and feature flags separately from code - Implement audit trails and approvals for production changes

6. Observability and Feedback

- Collect metrics, logs and traces from every stage - Alert on pipeline failures and flaky tests promptly - Track deployment frequency, lead time, change failure rate and MTTR - Continuously improve based on measurable feedback

A trustworthy pipeline fails loudly and fast. Invest in fast builds, deterministic tests and automated rollback so that shipping software becomes a boring, reliable routine.

References

DORA State of DevOps Report; The DevOps Handbook; GitLab CI/CD Documentation; GitHub Actions Documentation.

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