Deployment Strategies CSSE6400

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Branching & Deployment Strategies

- Branching Strategies
- Deployment Strategies
 - Recreate Deployment

 - Rolling Deployment
 - Blue/Green Deployment
- Canary Deployment
- A/B Deployment
- Shadow Deployment

There isn't any one perfect deployment strategy.

Definition 0. Branching

Copying the trunk to allow separate and parallel development.

- Branches deviate from the trunk.
- A few different branching strategies.

Branching Strategies

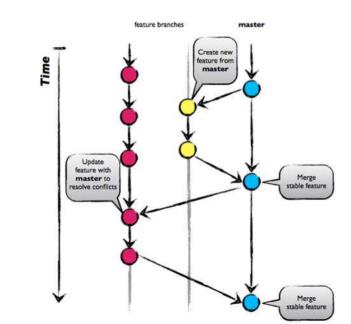
- GitHub Flow
- GitLab Flow

• Release Branches

Branching strategies supporting deployment strategies.

GitHub Flow [Haddad, 2022]

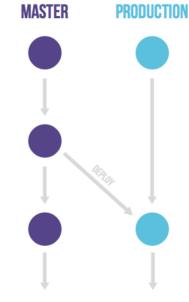
- Main is always deployable
- Create branch
- Make changes
- Create pull request
- Resolve issues
- Merge pull request
- Delete branch



- CSSE3200 Feature Branches are a variant of this.
- Supports CI & CD.
- Expects there is a single deployable version (e.g. cloud / web systems).

GitLab Flow [Saavedra, 2023]

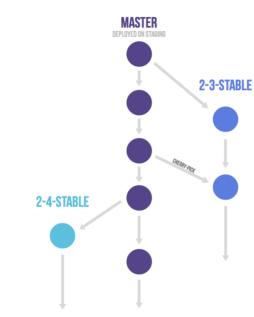
- Supports deployment windows
 - Merge to production
 - Deploy when allowed
- Production branch
 - Plus alpha, beta, ...
- Still have
 - Dulli Have
 - Feature branches
 - Pull requests



- Deployment windows examples
 - App store approval
 - Server availability
 - Support availability

Release Branches [Saavedra, 2023]

- Supports multiple versions of system
- Feature development in main
- Released versions are branches
- Bug fixes in main
 - Cherry-pick into branches

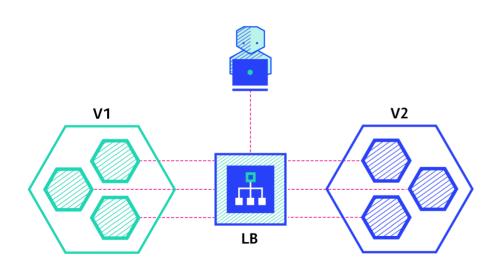


• Cherry-pick: commit is copied from one branch to another, but the branches aren't merged.

How a software system is made available to clients.

Definition 0. Deployment Strategy

Recreate Deployment [Tremel, 2017]



- Shutdown version 1.
- Deploy version 2.
- Requires downtime.

Recreate Deployment

Pros Easy

- Renewed state
- App reinitialised
- Persistent storage consistent with system

version

Cons

Downtime

Renewed state means app is reinitialised and db table structure is consistent with system version.

Rolling Deployment [Tremel, 2017]

- Slowly roll out new version.
- Pool of instances of V1 behind load balancer.
- Deploy an instance of **V2**.
- Add **V2** instance to pool.
- Remove one V1 instance from pool.
- Continue until **V2** is fully deployed, replacing **V1**.

Rolling Deployment	
Pros	Cons
Fairly easy	Time
 Slow release of new 	• Support multiple APIs
version – Observe issues – Rollback	• Support different versions of persistent data structure
 Stateful instances can finish gracefully 	• No control over traffic to different versions
• Instance is killed when inactive	

Blue-Green Deployment [Tremel, 2017]

- V2 deployed alongside V1, including same number of instances.
 - V2 tested in production environment.
 - Load balancer switched to use **V2** instances
 - Shutdown V1 instances.

Blue-Green Deployment

Pros

- Instant release of new version
- Fast rollback if necessaryOnly one version 'live' at
- Only one version 'live' at any time
 No versioning conflicts

Cons

- Expensive
 - Double the infrastructure
- Stateful instance version switch difficult
 - Can't kill instance in middle of a transaction

Canary Deployment [Tremel, 2017]

- Gradually shift traffic from V1 to V2.
- Traffic usually split by percent (e.g. 90/10, 80/20, ...).
- Allows a trial deployment to see what happens.

Canary Deployment

Pros • New version released to

- subset of users • Can monitor perform-

• Easy and fast rollback

- ance and error rates

Cons

- Slow
- Implies poor testing

Canary is commonly used to see if something works or will fail in production.

A/B Deployment [Tremel, 2017]

- Actually it's A/B Testing.
- Both versions are deployed and usage evaluated, usually via analytics.
 - Long Term: Deploy version that has best usage result.

A/B Deployment

Pros

- Multiple versions run in parallel
- Full control over traffic distribution

Cons

- Needs intelligent load balancer
- Debugging a version is
 - difficult
 - Need good logs & tools

A/B testing & deployment requires sophisticated infrastructure and analytics to do well.

hadow	Deployment [Tremel, 2017]		

All traffic is sent to V1 & V2.
Tests V2 ability to handle production load.
Doesn't impact on production traffic or user experience.
V2 rolled out when it demonstrates it is stable.
Need to manage interactions with external services (e.g. payment gateway).
When customer checks out their shopping cart, you don't

want to send two payment requests from V1 & V2.

• Persistent data from V1 (production data) needs to be

copied to **V2** when it's deployed as production, with any

• Complex to setup.

• V2 deployed alongside V1.

• Mock external services.

data migration.

Shadow Deployment

Pros • Performance testing with

- production traffic
- No impact on users

Cons

Expensive

services

- Double the
 - infrastructure
- Complex to setup
 - Need mocks for external

Performance testing may give false confidence. - It's not user testing.

Deployment Strategy Options • Staging or beta testing

- Recreate or Rolling
- Production (Live)
 - Rolling or Blue/Green
- Uncertain of system stability
- Canary
- Evaluation - A/B or Shadow

There isn't any one perfect deployment strategy.

Deployment Considerations [Tremel, 2017]

Strategy	ZERO DOWNTIME	REAL TRAFFIC TESTING	TARGETED USERS	CLOUD COST	ROLLBACK DURATION	NEGATIVE IMPACT ON USER	COMPLEXITY OF SETUP
RECREATE version A is terminated then version B is rolled out	×	×	×	•••	•••		000
RAMPED version B is slowly rolled out and replacing version A	~	×	×	■00	•••	■00	■00
BLUE/GREEN version B is released alongside version A, then the traffic is switched to version B	~	×	×	•••	000	■■□	■■□
CANARY version B is released to a subset of users, then proceed to a full rollout	~	~	×	■ □ □	■□□	■□□	■■□
A/B TESTING version B is released to a subset of users under specific condition	~	~	~	■00	■□□	■00	
SHADOW version B receives real world traffic alongside version A and doesn't impact the response	~	~	×	•••	000	000	•••

References

What are the best git branching strategies.

[Haddad, 2022] Haddad, R. (2022).

https://faun.dev/c/stories/manuelherrera/git-branching-strategies-in-2022/.

[Saavedra, 2023] Saavedra, C. (2023).

Combine gitlab flow and gitlab duo for a workflow powerhouse.

https://about.gitlab.com/blog/2023/07/27/gitlab-flow-duo/.

Tremel, 2017] Tremel, E. (2017).

Six strategies for application deployment.

https://thenewstack.io/deployment-strategies/.