# Deployment Strategies CSSE6400

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## Definition 1. Deployment Strategy

How a software system is made available to clients.

## Deployment Strategies

- Branching Strategies
- Recreate Deployment
- Rolling Deployment
- Blue/Green Deployment
- Canary Deployment
- A/B Deployment
- Shadow Deployment

#### Definition 2. Branching

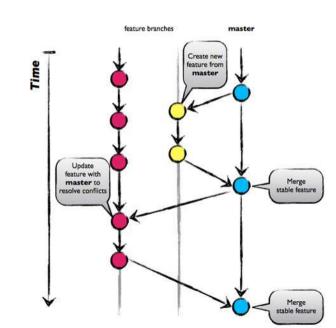
Copying the trunk to allow separate and parallel development.

#### Branching Strategies

- GitHub Flow
- GitLab Flow
- Release Branches

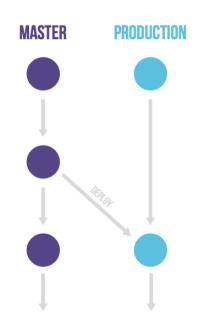
#### GitHub Flow [Haddad, 2022]

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



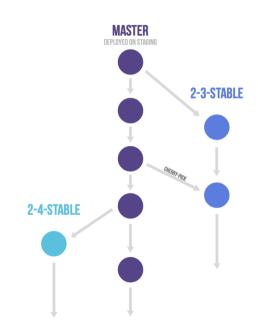
#### GitLab Flow [git, ]

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

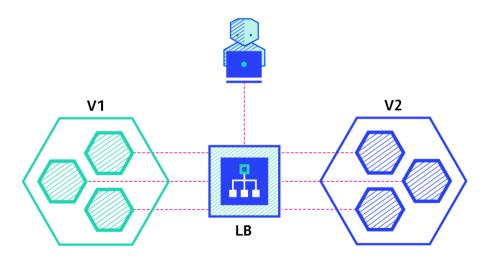


#### Release Branches [git, ]

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



## Recreate Deployment [Tremel, 2017]



#### Recreate Deployment

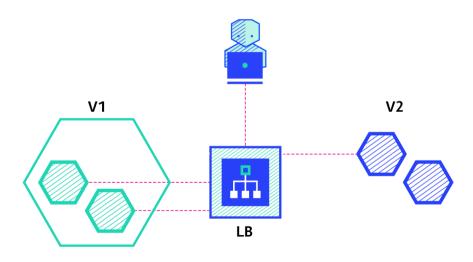
## Pros

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

#### Cons

Downtime

## Rolling Deployment [Tremel, 2017]



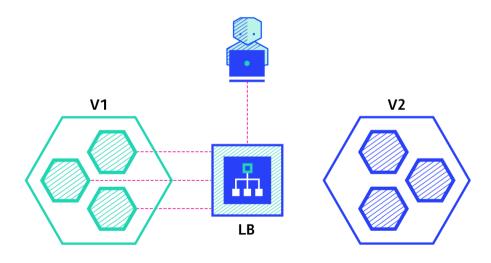
#### Rolling Deployment

### Pros

- Fairly easy
- Slow release of new version
  - Observe issues
  - Rollback
- Stateful instances can finish gracefully
  - Instance is killed when inactive

- Time
- Need to support multiple APIs
- No control over traffic to different versions

## Blue-Green Deployment [Tremel, 2017]



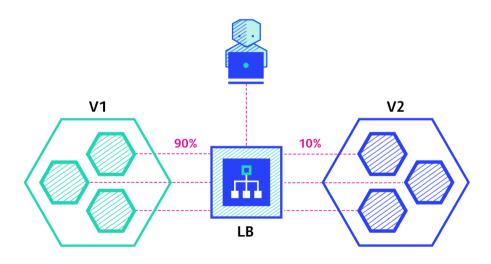
#### Blue-Green Deployment

#### Pros

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

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

## Canary Deployment [Tremel, 2017]



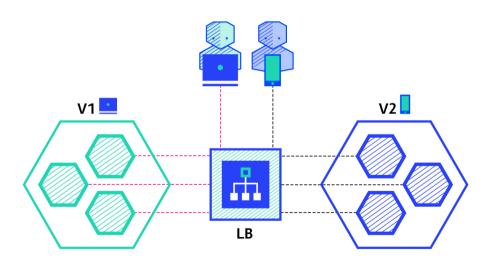
#### Canary Deployment

### Pros

- New version released to subset of users
- Can monitor performance and error rates
- Easy and fast rollback

- Slow
- Often implies poor testing

## A/B Deployment [Tremel, 2017]



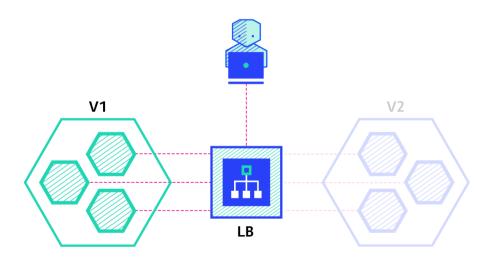
#### A/B Deployment

#### Pros

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

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

## Shadow Deployment [Tremel, 2017]



#### Shadow Deployment

#### Pros

- Performance testing with production traffic
- No impact on users

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

## Deployment Strategy Options

- Staging or beta testing
  - Recreate or Rolling
- Production (Live)
  - Rolling or Blue/Green
- Uncertain of system stabilityCanary
- Evaluation
  - A/B or Shadow

## 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	×	×	×	■00	•••		000
RAMPED  version B is slowly rolled out and replacing version A	~	×	×	■□□	•••	■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	~	~	×	•••	000	000	

#### References

```
[git, ] Introduction to gitlab flow.
https://repository.prace-ri.eu/git/help/topics/gitlab_flow.md.
[Haddad, 2022] Haddad, R. (2022).
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What are the best git branching strategies.
https://www.flagship.io/git-branching-strategies/.
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[Tremel, 2017] Tremel, E. (2017).
Six strategies for application deployment.
https://thenewstack.io/deployment-strategies/.
```