

# CONTINUOUS INTEGRATION

G. Molines  
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# INTRODUCTION



# Goals

- What is hard?
- → integration
- Integrate early!

# BUILD – ONE MACHINE



# Building on one machine

Stages:

- Prepare files
- Compile source
- Compile tests
- Copy resources
- Package
- Invoke tests
- Check test results
- Generate test report

# Example: in java:

## Stages:

- Prepare files
- Compile source
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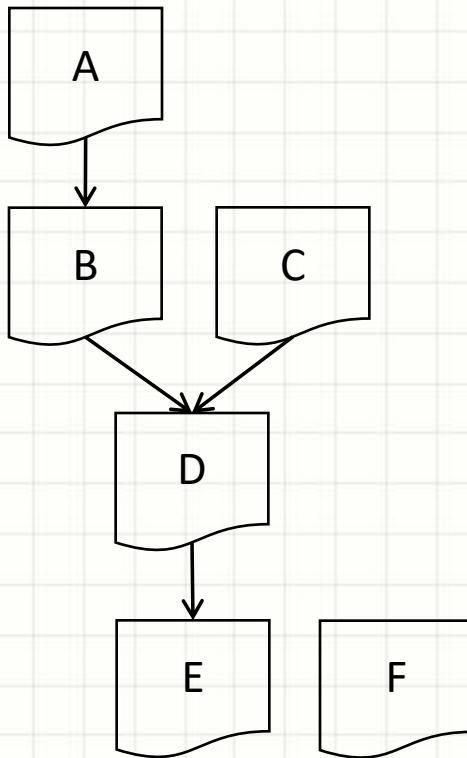
## Tools:

- .
- javac
- javac
- cp
- jar
- Junit
- check errorlevel
- junitreport

# Orchestration

- Shell script
  - Not portable
  - Redo everything, all the time
- Ant script
  - Portable
  - Can skip target
  - Becomes cumbersome on large projects
- Maven
  - Portable
  - Dependency management
  - Stage enforced

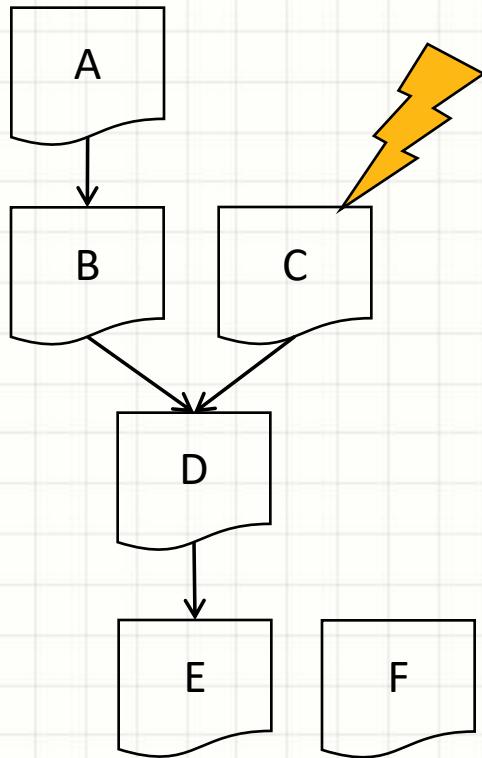
# Module dependency graph



Orchestration:

- Build A
- Build B
- Build C
- Build D
- Build E
- Build F

# Code change



Orchestration:

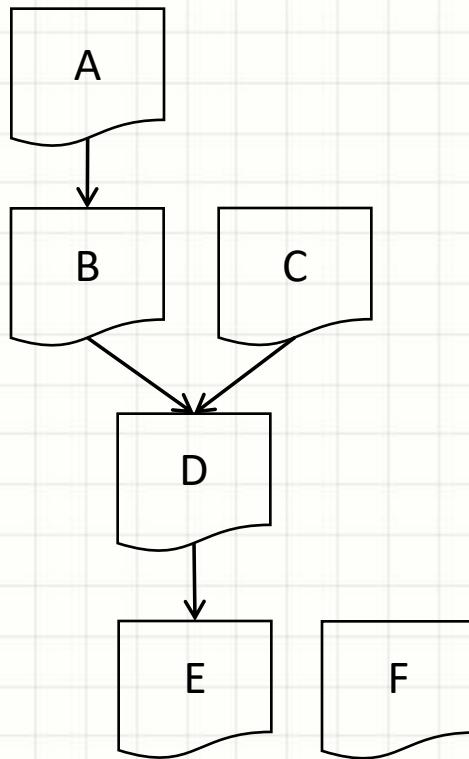
- Build A
- Build B
- Build C
- Build D
- Build E
- Build F

- How to be smarter?
  - Don't rebuild A & B
  - → Make, ant
- Still, that's a lot to build...
- We need more horsepower
- How about a build server?

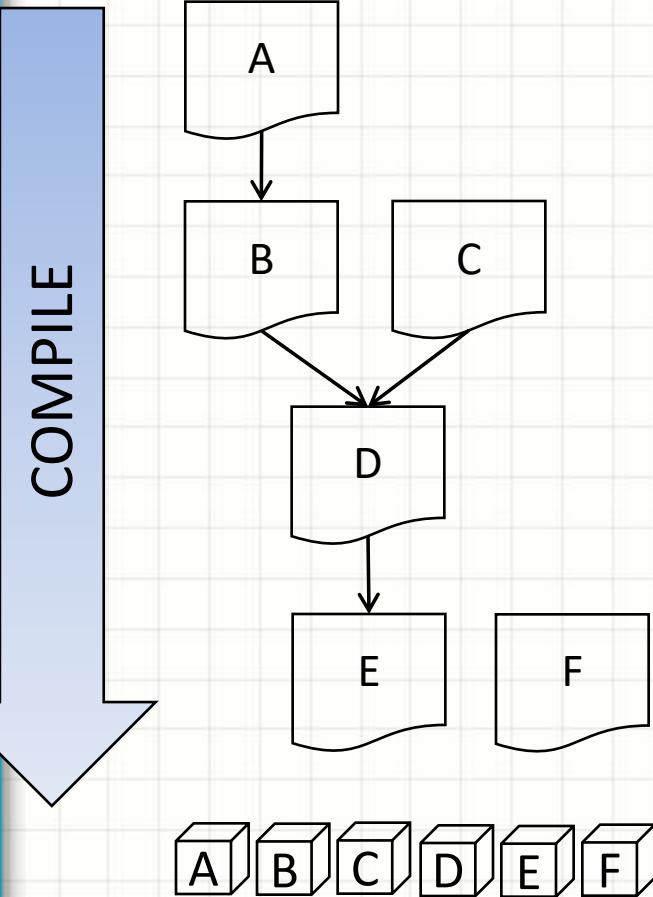
# **DEDICATED BUILD SERVER**



# Classical product build

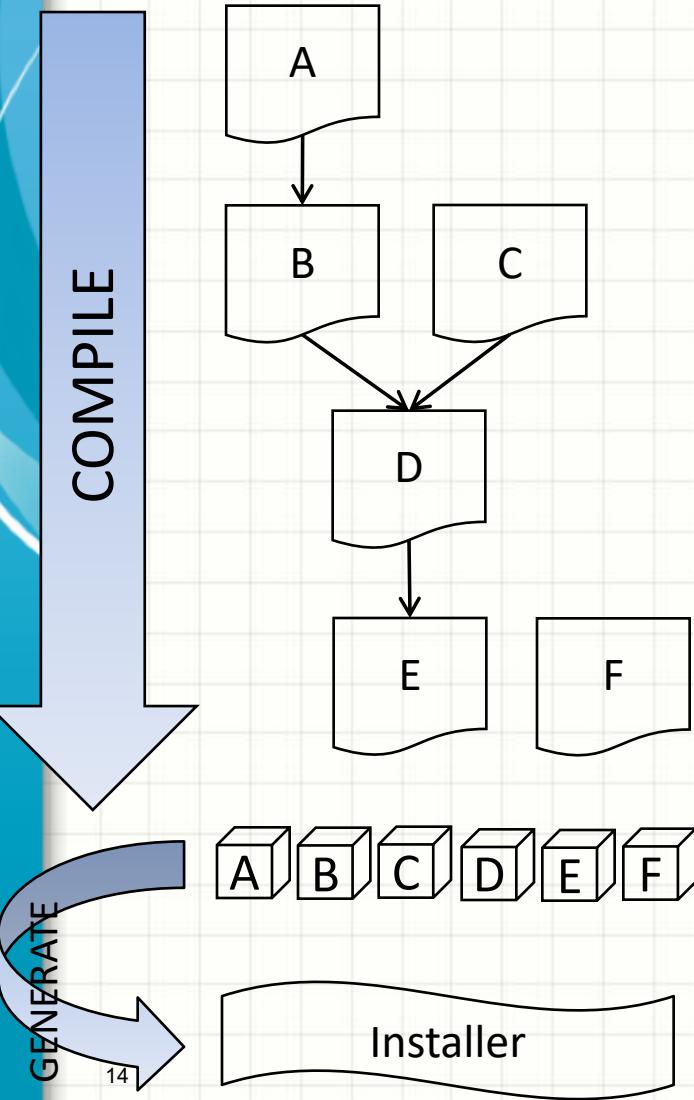


# Classical product build

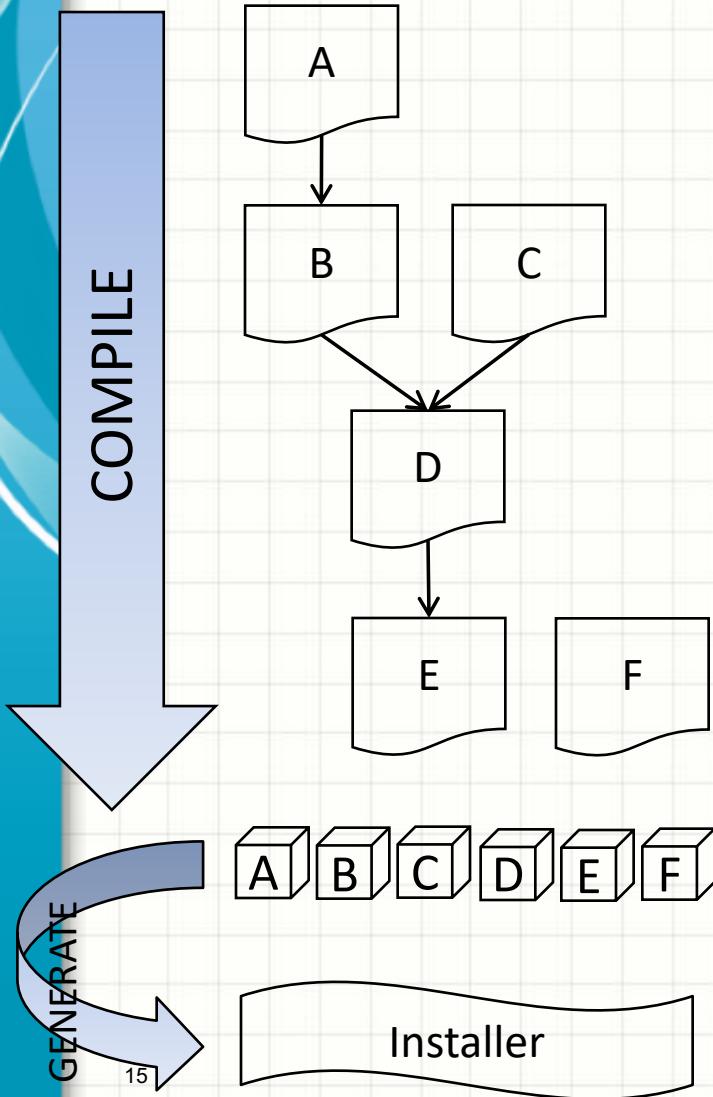


Note: compile really means compile + run unit-tests.  
If a module's unit-tests fail,  
do we consider its  
« compilation » succesfull ?

# Classical product build



# Classical product build

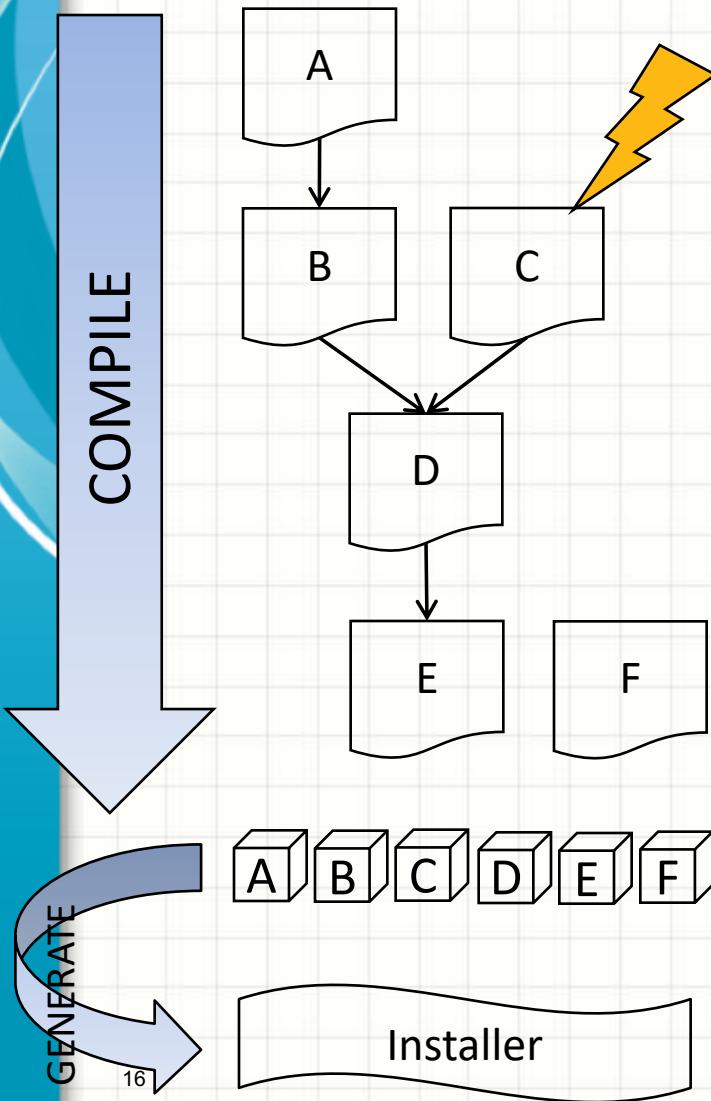


Automate

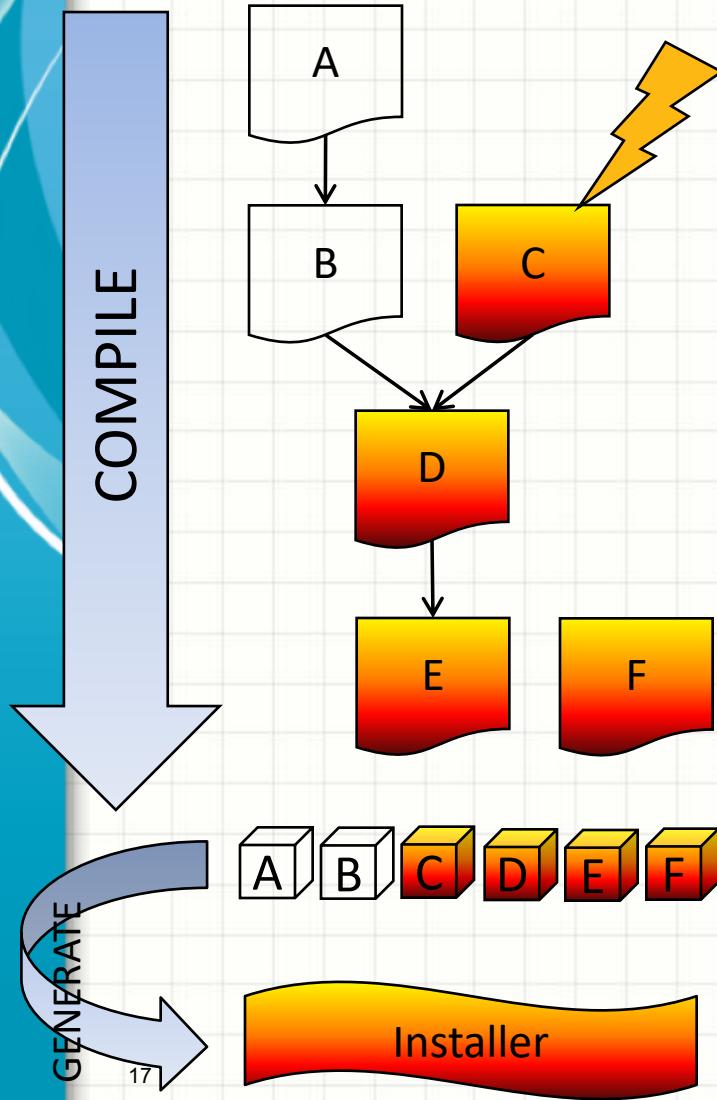
Repeat as fast as possible

The whole process can take hours (or days) !

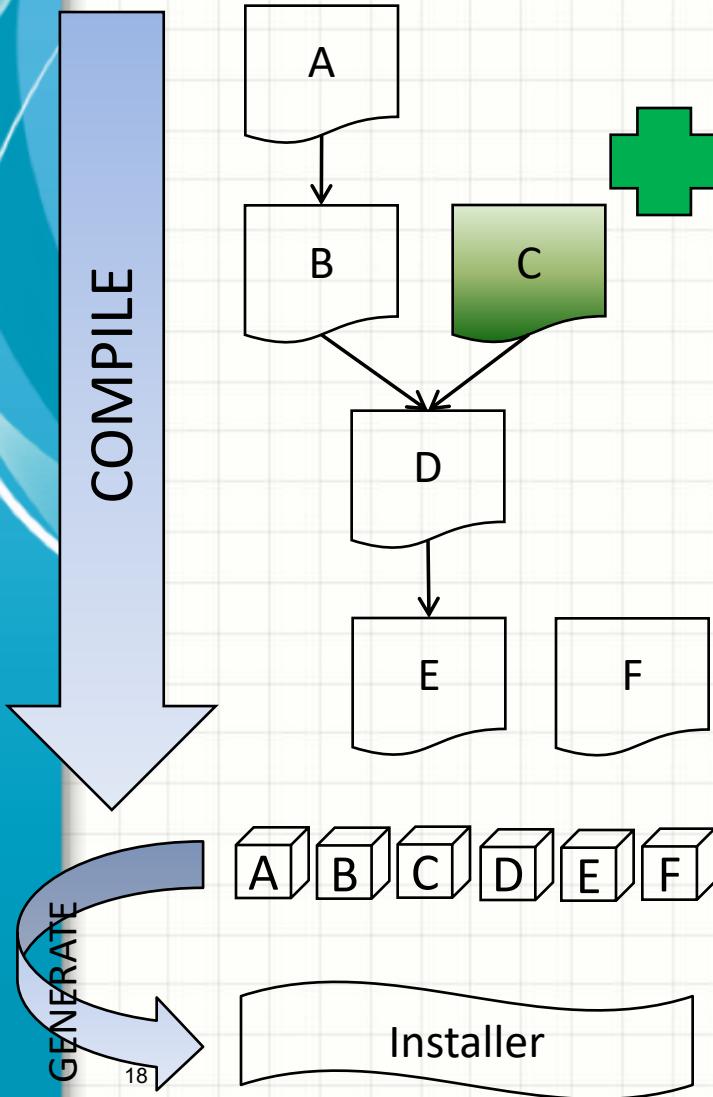
# Classical product build



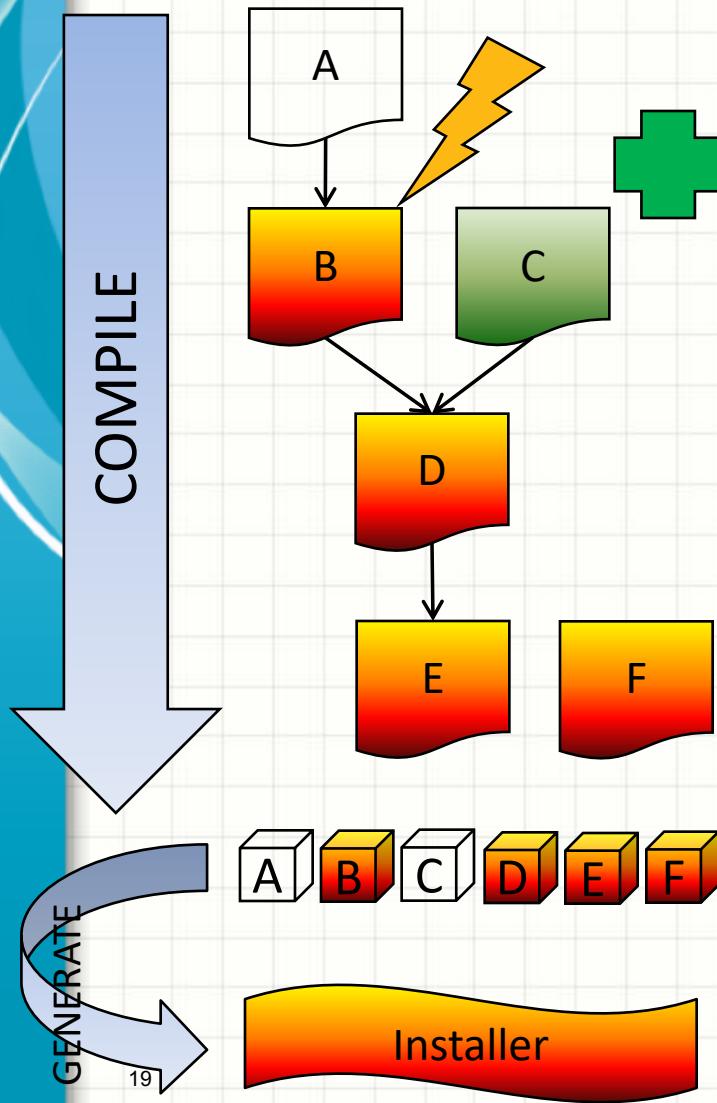
# Classical product build



# Classical product build



# Classical product build



# Issues

- Build is always broken -> **unreliable**
- Feedback takes days to come -> **slow**
- To ensure end of iteration builds succeed, several days of code freeze -> **unavailable**
- Adding a new module add hours to the build -> **not scalable**

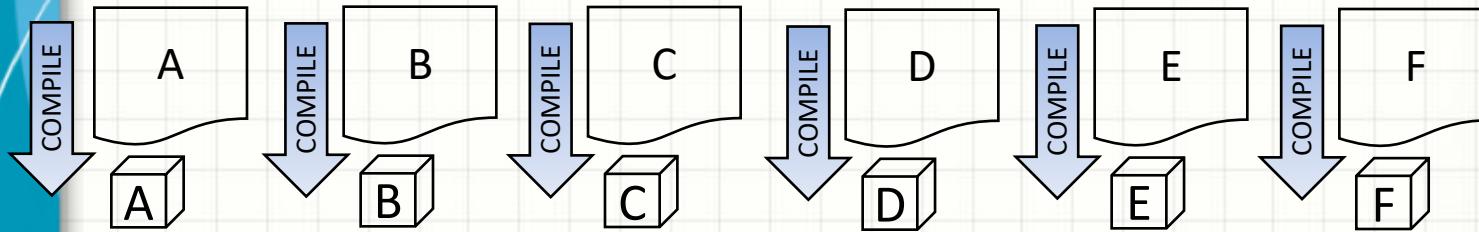
# What can we do?

- Build in parallel
- Do not recompile unchanged component
  - By storing / reusing compiled artifacts

# ARTIFACT REPOSITORY

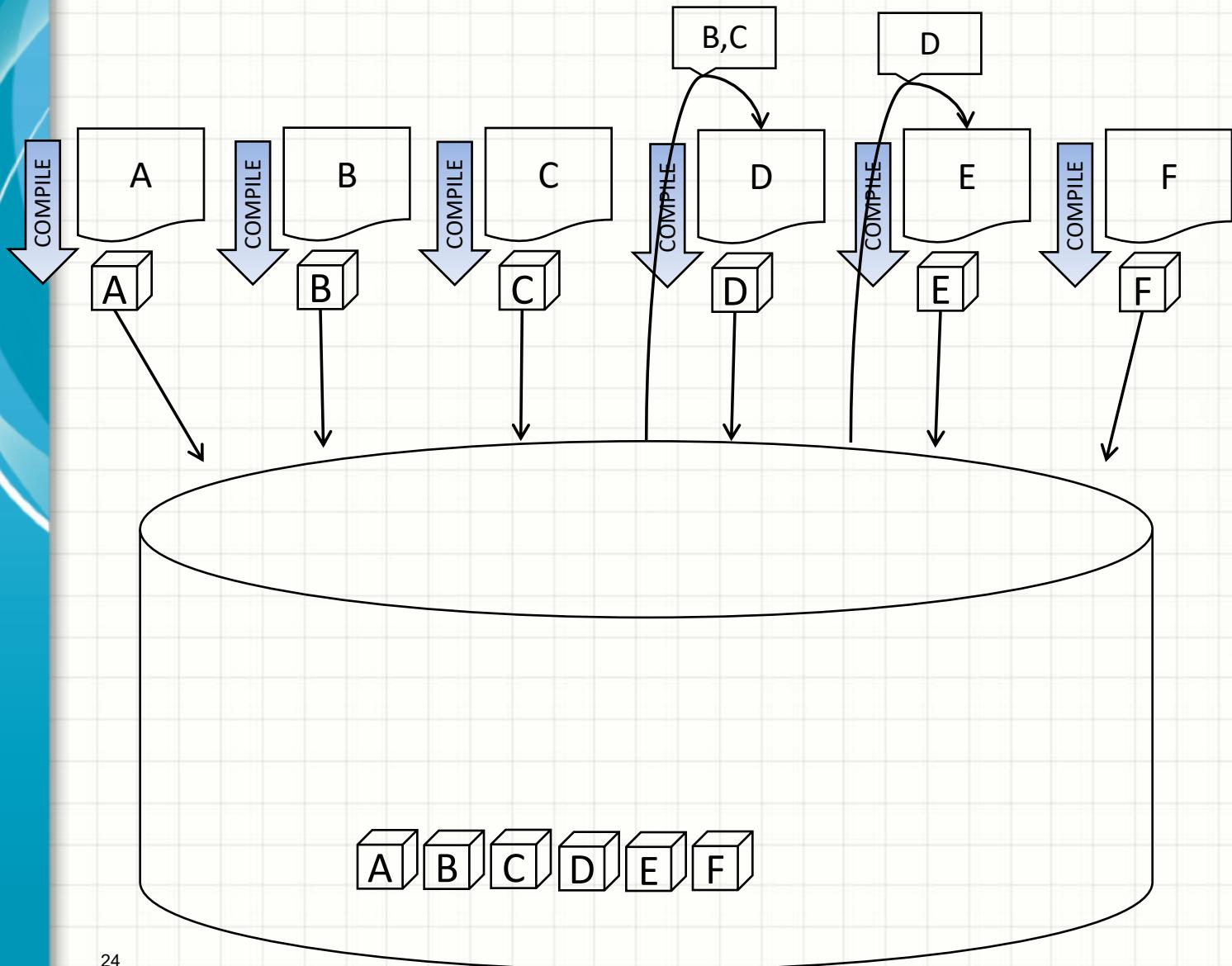


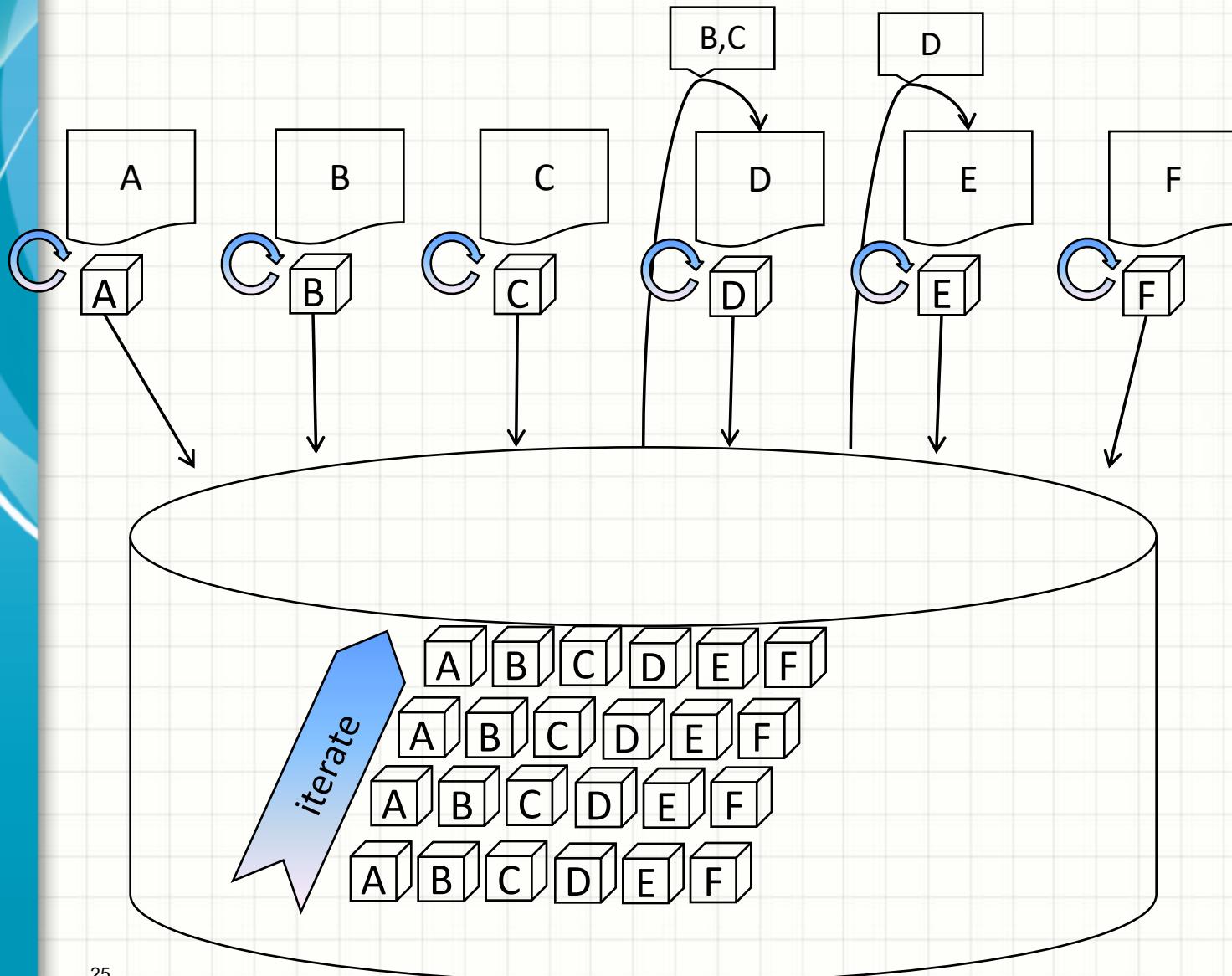
# Continuous Integration

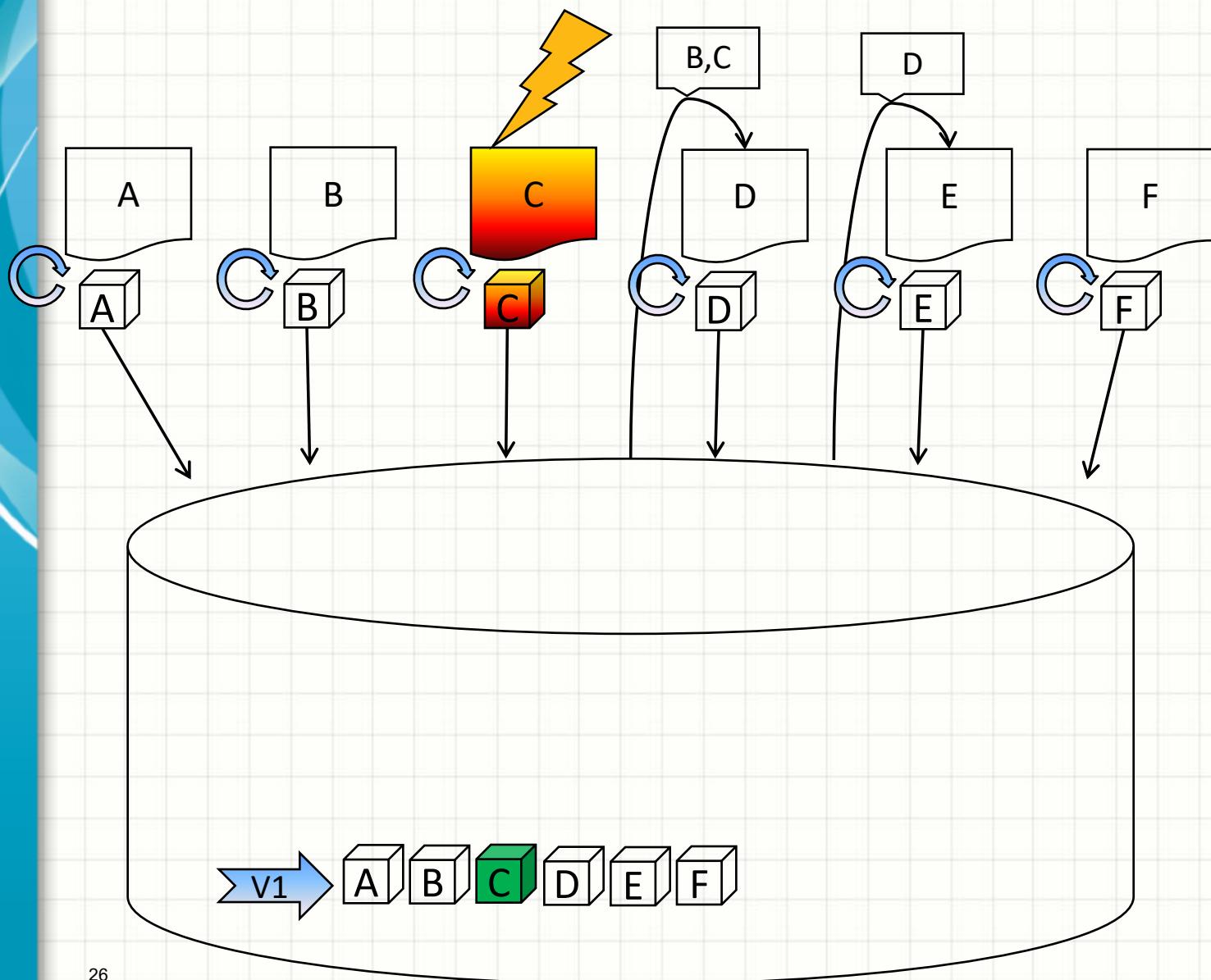


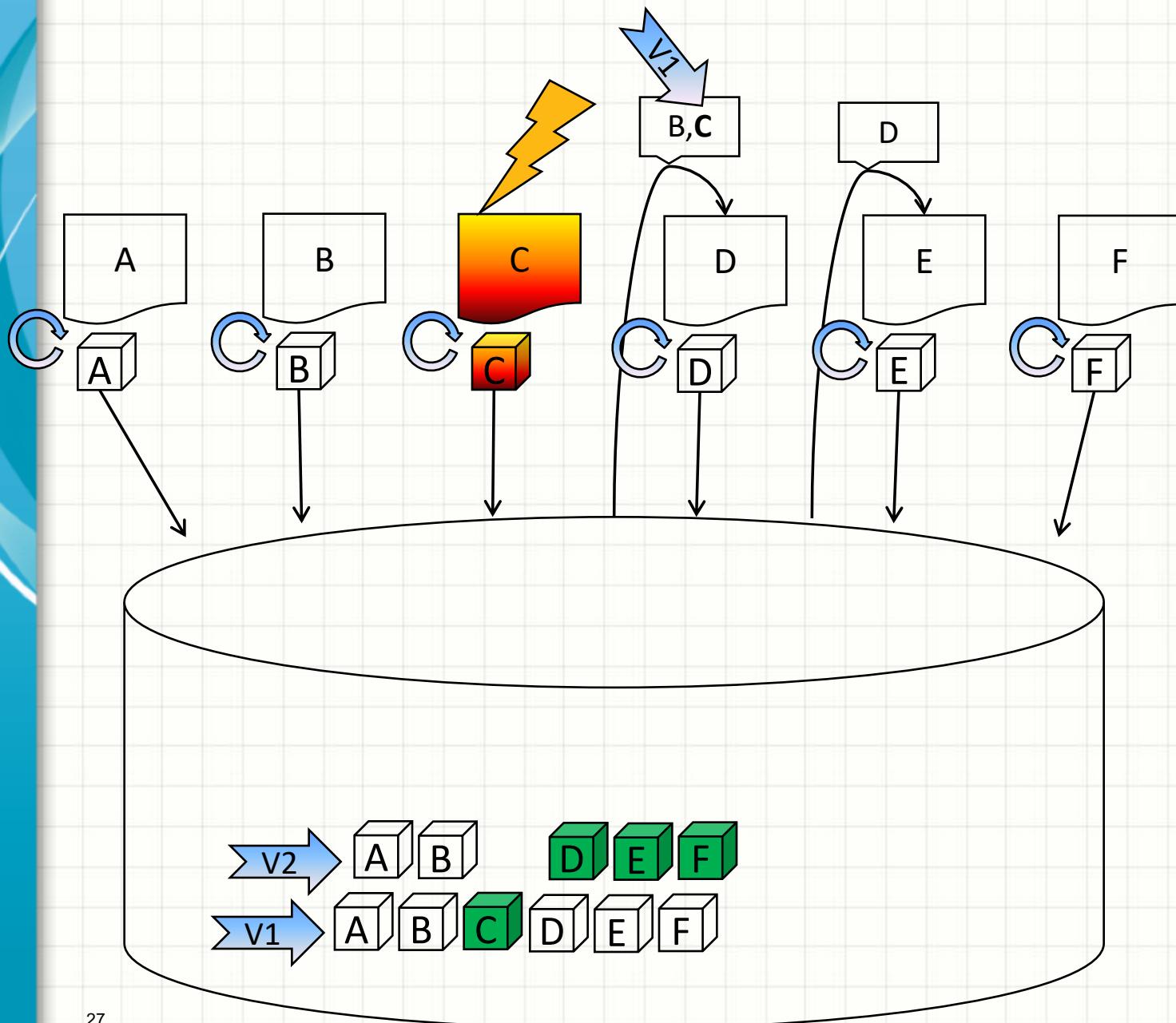
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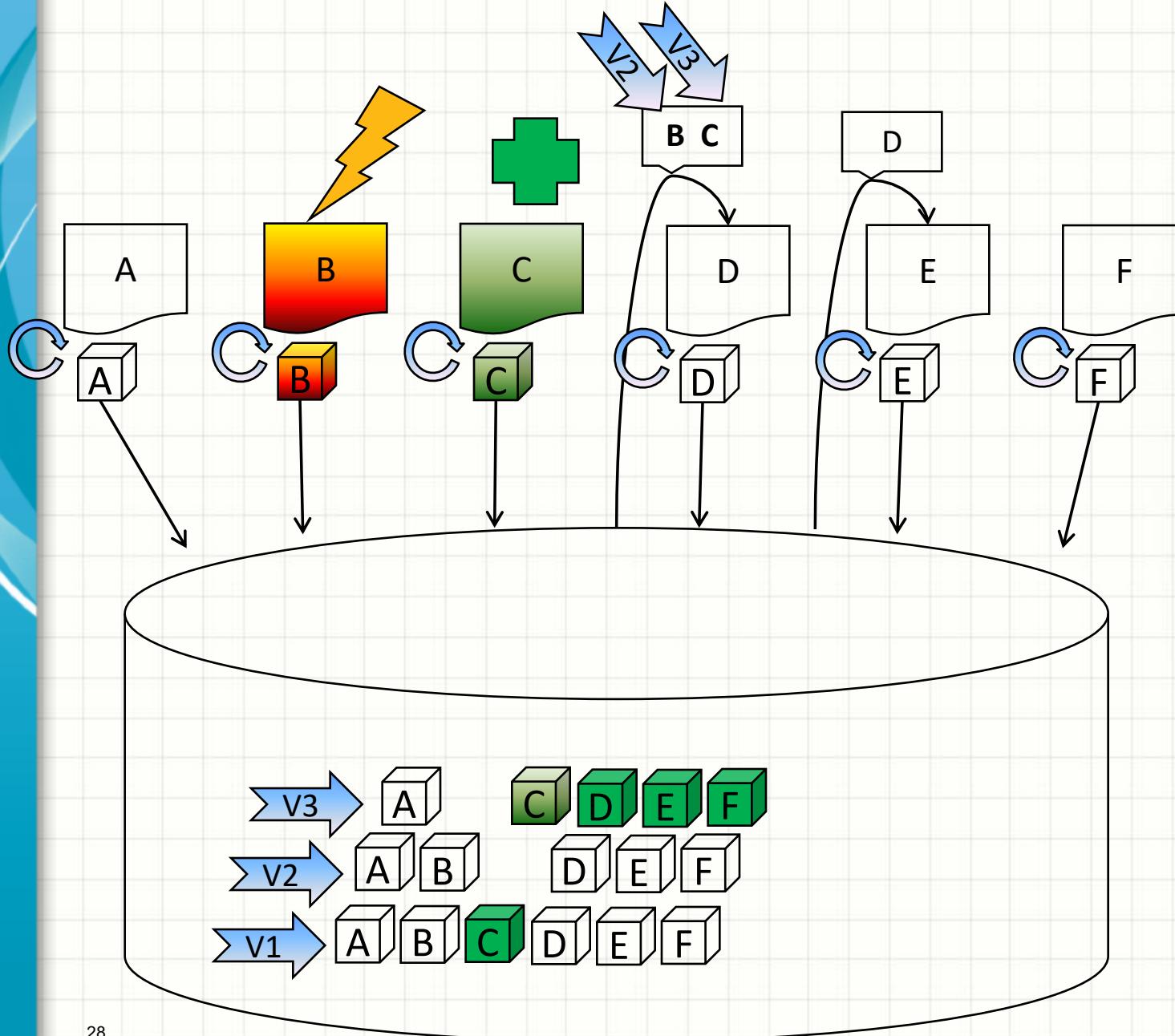
If a module's unit-tests fail, we consider its « compilation » as failed !

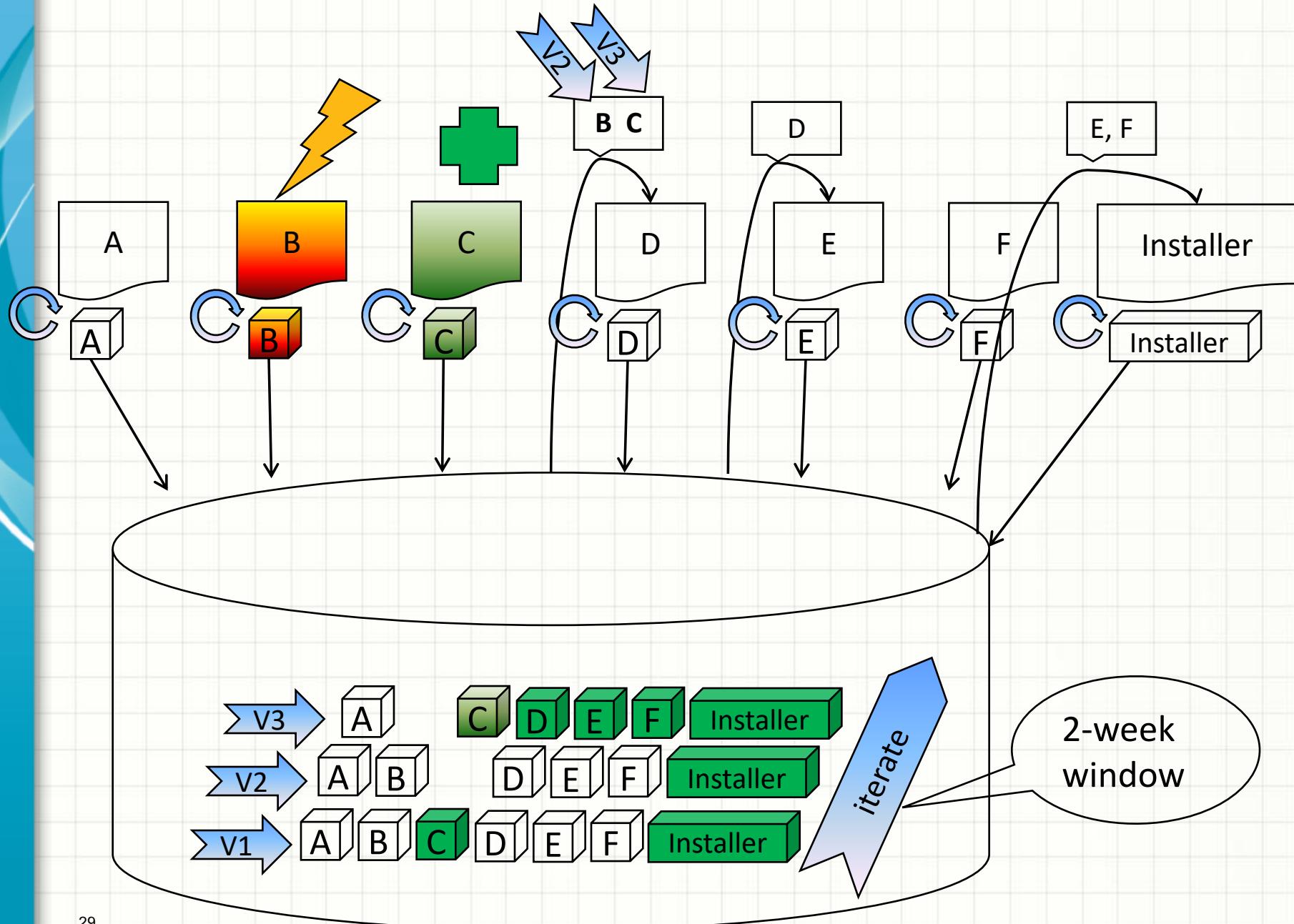












# What did we gain?

- More frequent green builds
  - No team blocked
- Integration all along
  - Detect issues early, when they're still easy to fix
- Testing all along
  - Regressions spotted early
- Scalability

# At what cost?

- Rigorous approach
- Need clear interfaces / contracts
- Need more hardware
- Need actual **tests!!!**

# Maven repositories

- Maven central repository
- Maven internal repository
- Maven local repository (on dev. Hard drive)

# Real life example

# AS PART OF THE BUILD



# Code complexity

- Lines of code
  - With/without comments
- # methods per class, #lines per file
- Cyclomatic complexity

# Static code analysis

- Detection of specific patterns
- On source or bytecode
- Useful for
  - Vulnerabilities
  - Copyright infringement
  - Defect prevention

# Coverage

- Code exercised by tests
- Drives
  - testing strategy
  - dataset selection
- But... easy to trick

# Multitools

- Eg: SonarQube
- Defects, code smells
- Security vulnerability
- General code “health”

# BRANCHING



# Start a project

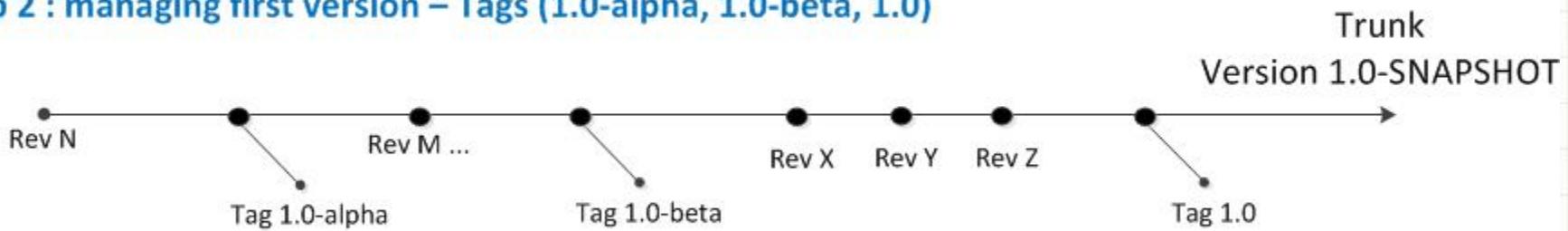
Step 1 : starting development – Trunk (1.0-SNAPSHOT)

Initial commit



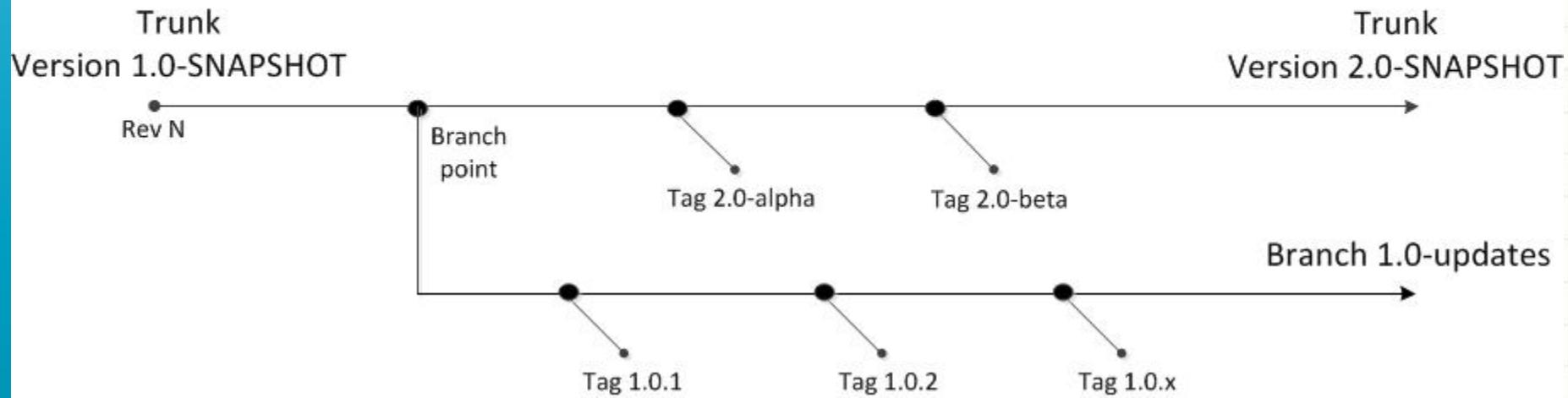
# First release

## Step 2 : managing first version – Tags (1.0-alpha, 1.0-beta, 1.0)



# Several releases

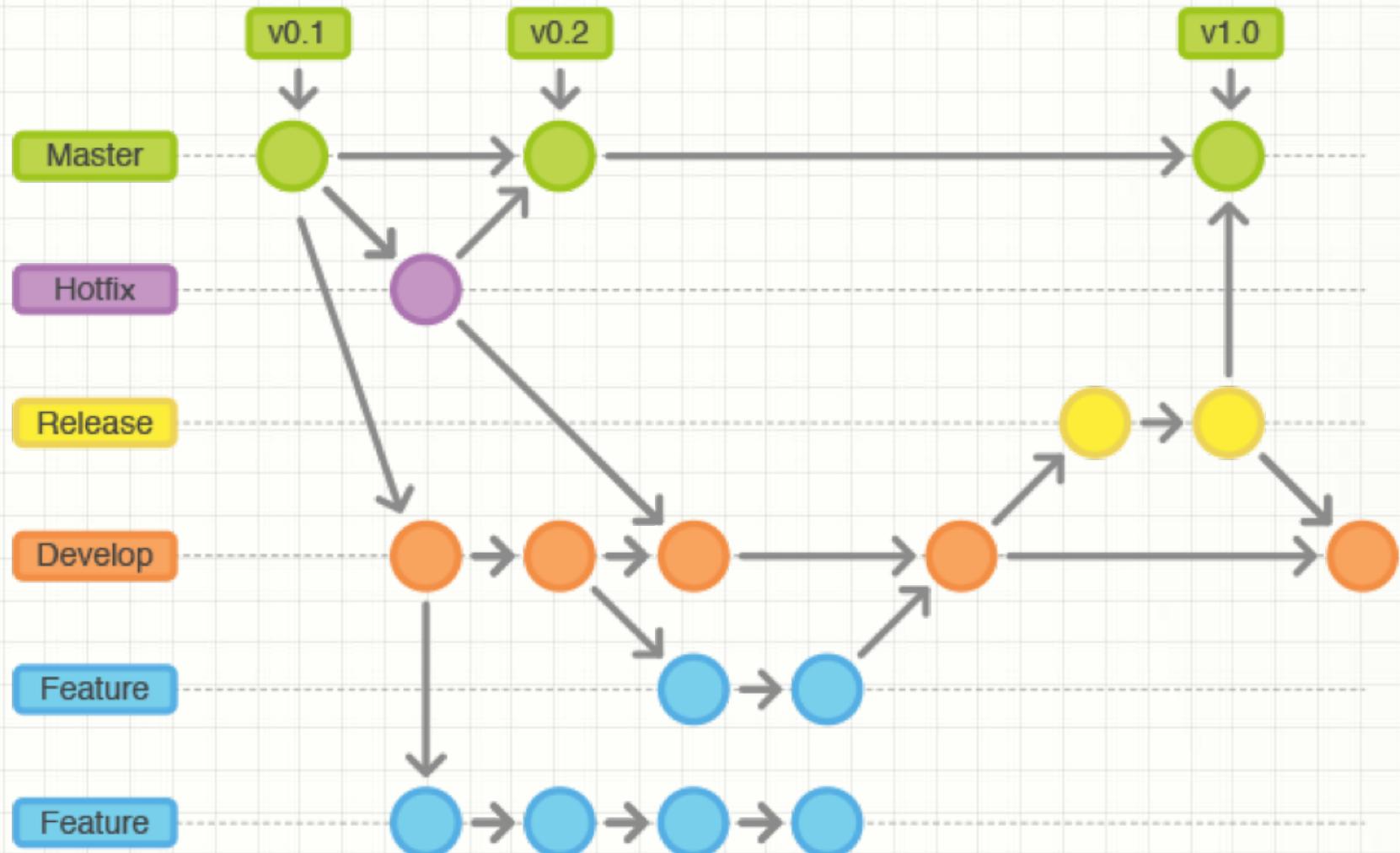
Step 3 : managing several versions – Branches (trunk = 2.0-SNAPSHOT, branch for 1.0-updates)

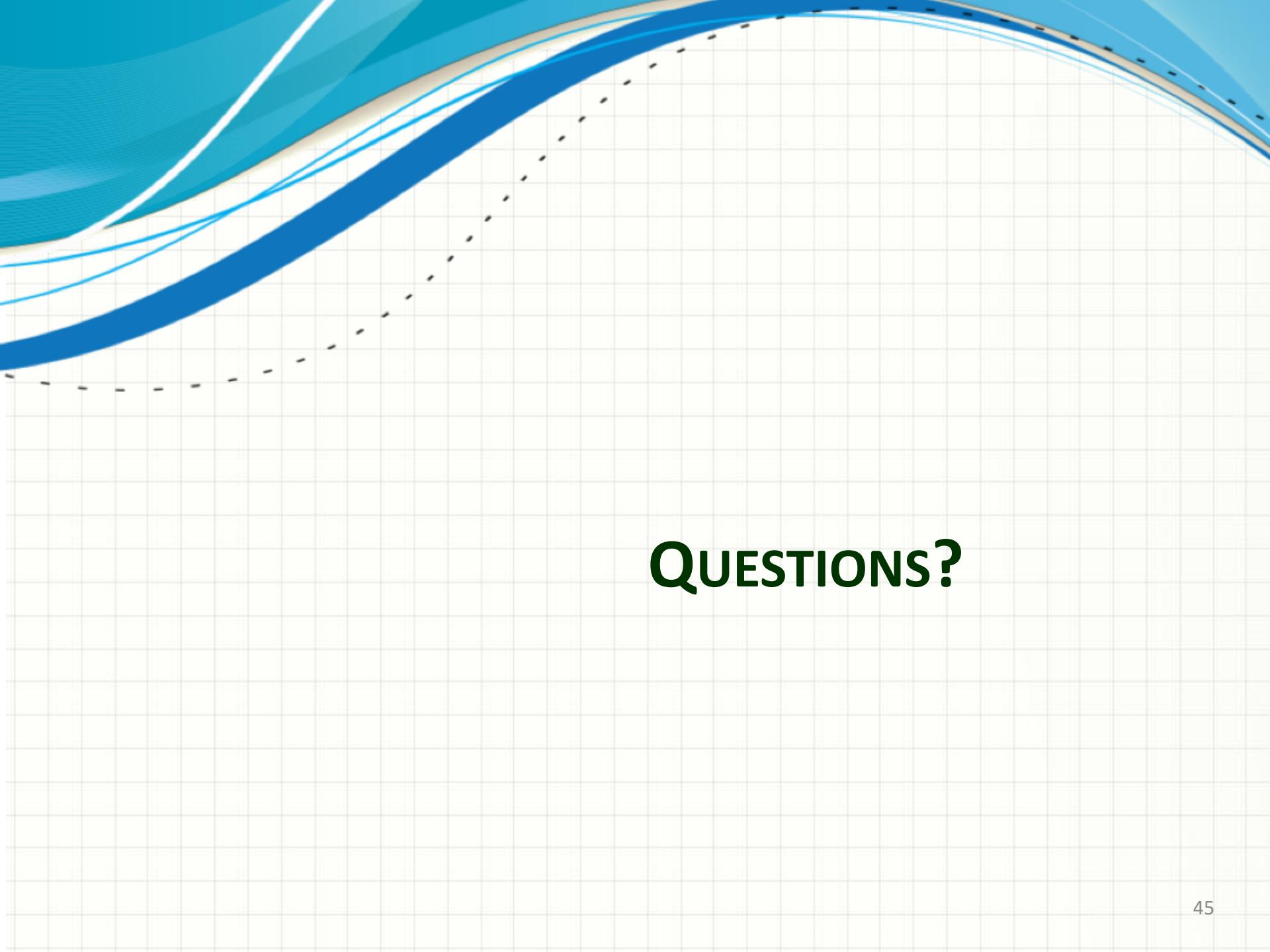


# Strategies

- Release branch
- Feature branch
- Team branch

# Git Flow





# QUESTIONS?

# TD

- For your project Polydiploma
  - Decide how to split it into components
  - Establish dependencies
  - Split the build script
- **Goal:** at the end of today, should be able to build each component independently on **\*one\*** machine (no repository yet)

# APPENDIX