MATLAB EXPO 2021

Continuous Integration with MATLAB and Simulink

Adam Sifounakis

MathWorks®

Let's start with a few quick polls (and a surprise)!

- Do you use CI today?
- Which CI platforms do you use?
- Do you share your MATLAB code publicly on GitHub?

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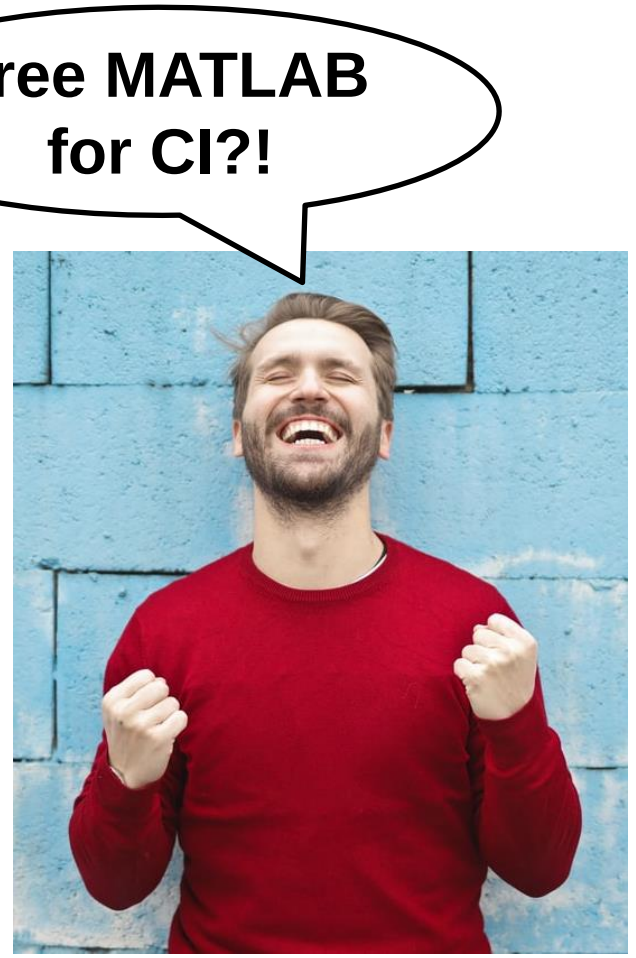
- Which CI platforms do you use?
- Do you share your MATLAB code publicly on GitHub?
  - MathWorks provides free CI support for public GitHub repositories!



Stay tuned!

Today, we will answer the following questions…

What are the benefits of CI?

How do MATLAB and Simulink fit into the CI ecosystem?

How do I get started with CI?

Is there really free CI support for public GitHub repositories?

What is Continuous Integration (CI)?

- Continuous Integration is the practice of automating the building and testing of software
- CI enables teams of developers to frequently and more safely merge code changes into a larger code base

CI helps you develop better code, faster!

Benefits of Continuous Integration

Consistent, repeatable environment

Automate testing of latest changes

Test early, test often

Identify integration issues quickly

Trace issues to the source

Who uses CI?

Traditionally, only software companies used CI…

Today, engineers and scientists are riding the CI wave, too!

What do engineers and scientists do with CI?

Tessella Designs Attitude and Orbit Control Algorithms for Solar Orbiter Spacecraft Using Model-Based Design

Aerospace

Accelerating Development of a Diabetes Management System with Model-Based Design: Q&A with Bigfoot Biomedical

Medical Devices

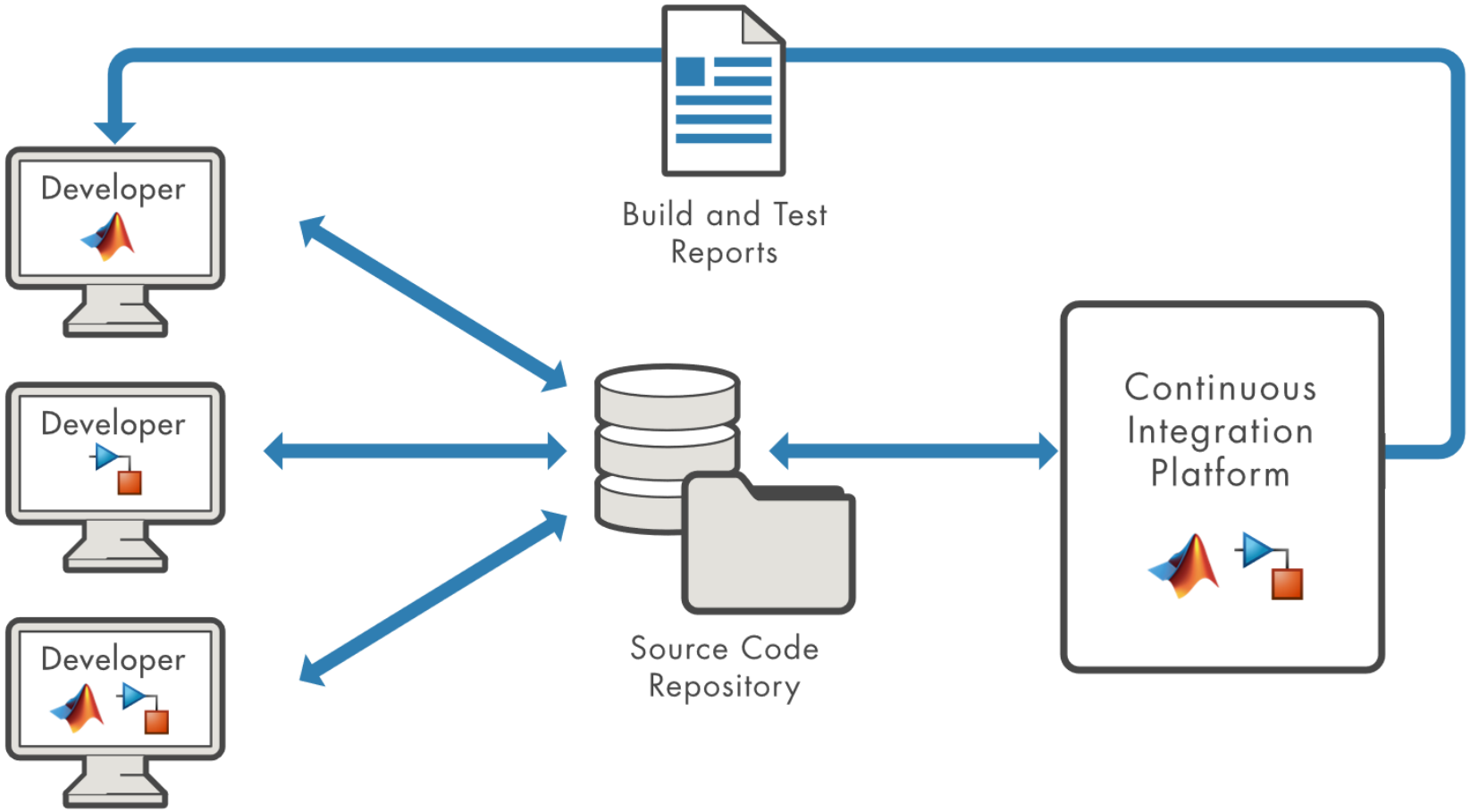
BAE Systems Controls Develops Autopilot for Unmanned Aerial Vehicle

Autonomous Vehicles

Vestas Develops Control Software for Wind Power Plants with Model-Based Design and Continuous Integration

Energy Production

What does the CI-based workflow look like?



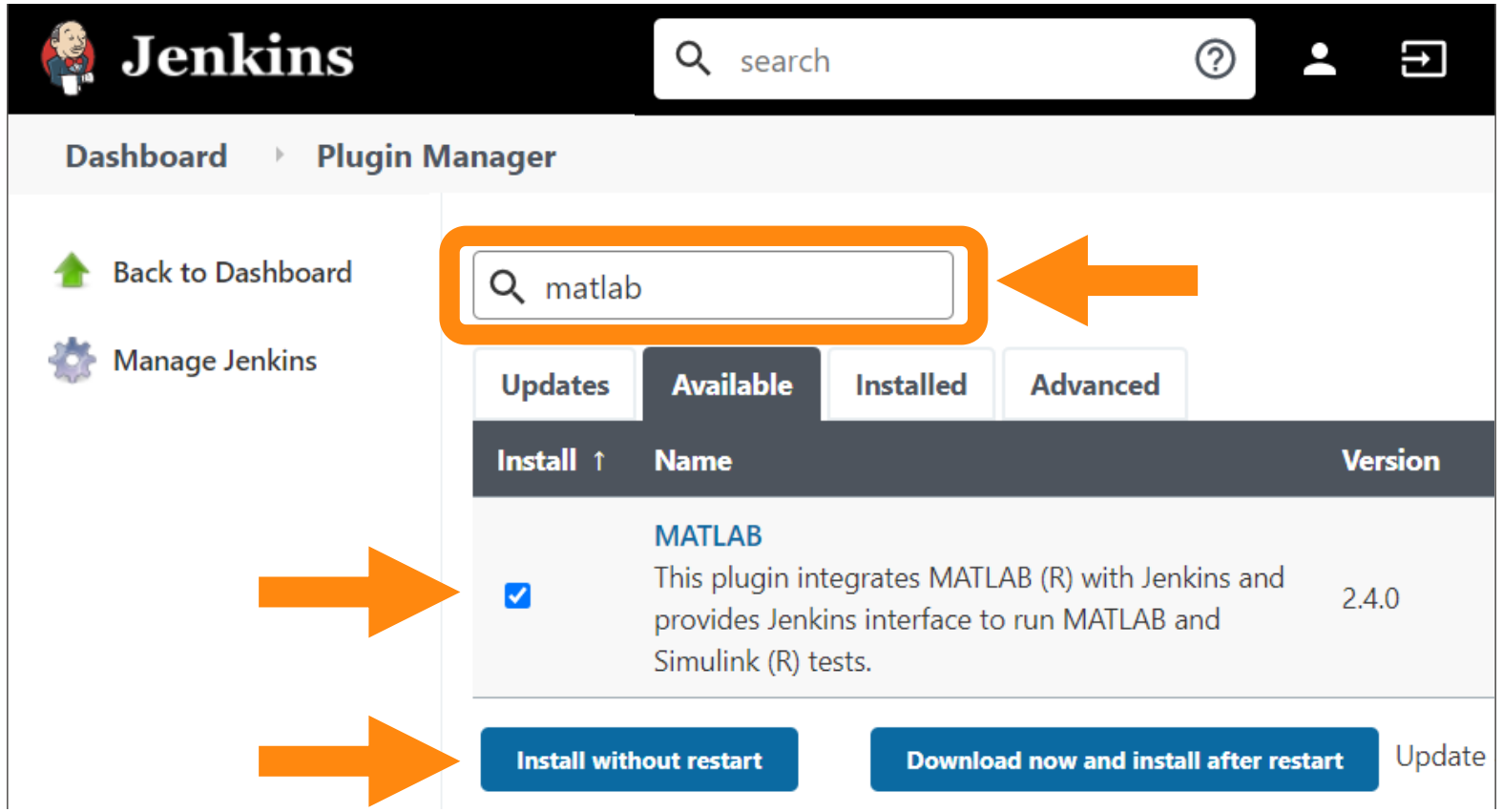
What's the easiest way to get started with CI?

- Use our plugins to streamline CI job setup for MATLAB and Simulink
  - Azure DevOps
  - Jenkins
  - CircleCI
  - Travis CI
  - GitHub Actions
- Don't worry, you can still use MATLAB and Simulink with other CI platforms!
  - The plugins just make it *easier*
- Reference architectures to get you started with cloud-based hosts
  - AWS, Azure, and Google Cloud Platform (GCP)
  - https://github.com/mathworks-ref-arch

Jenkins Configuration Walkthrough

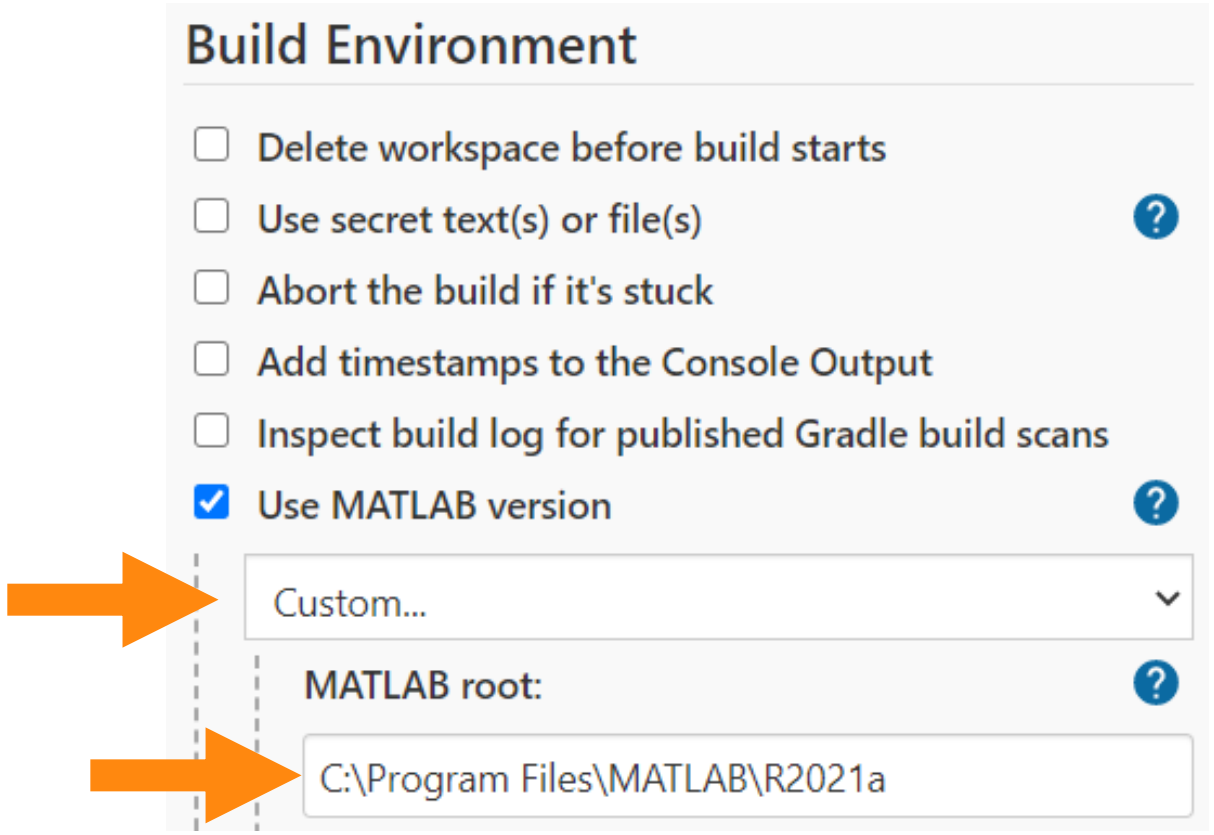
Using the MATLAB plugin for Jenkins

- Install the MATLAB plugin



Using the MATLAB plugin for Jenkins

- Install the MATLAB plugin
- Tell Jenkins where to find MATLAB



Using the MATLAB plugin for Jenkins

- Install the MATLAB plugin
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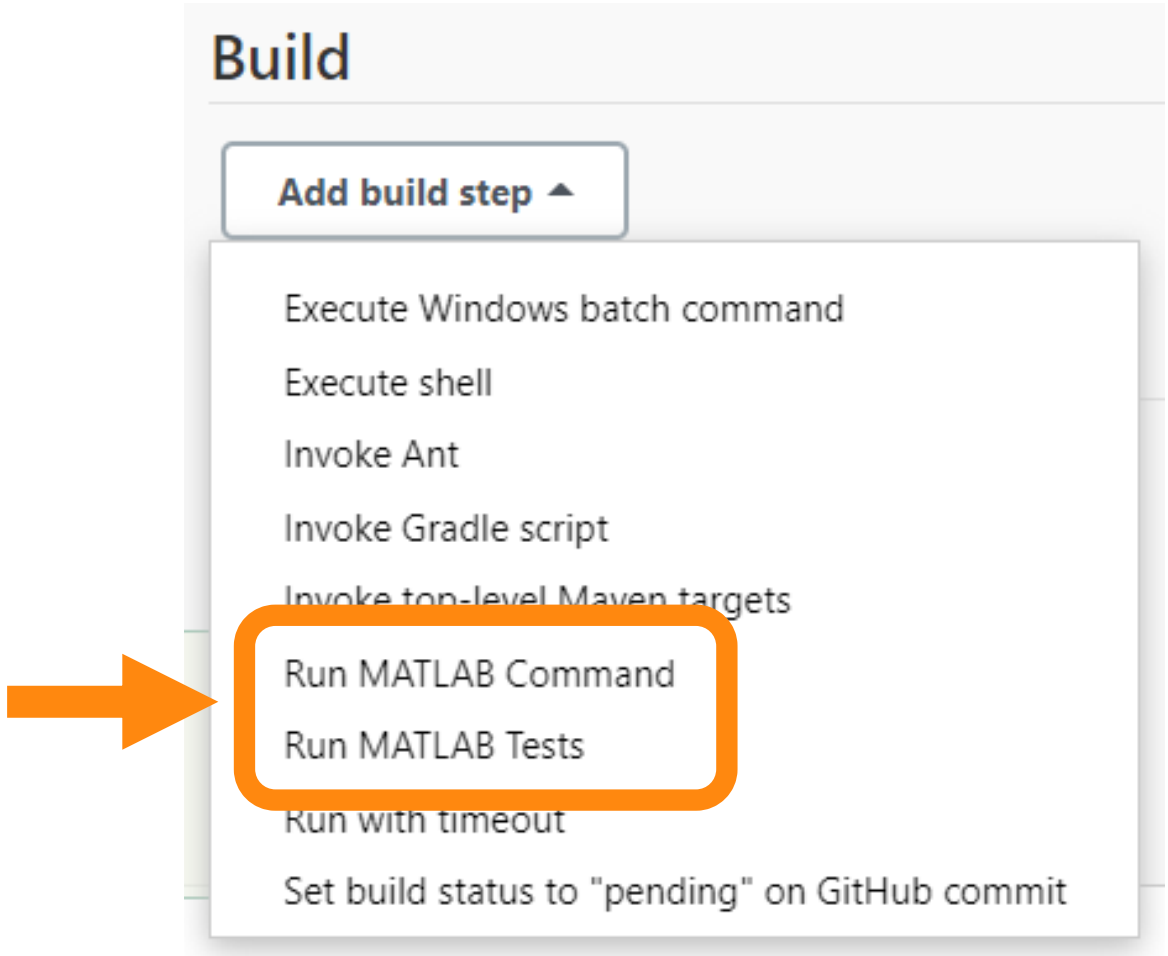
- Tell Jenkins what to do
  - Run all MATLAB tests
  - Run a custom MATLAB command



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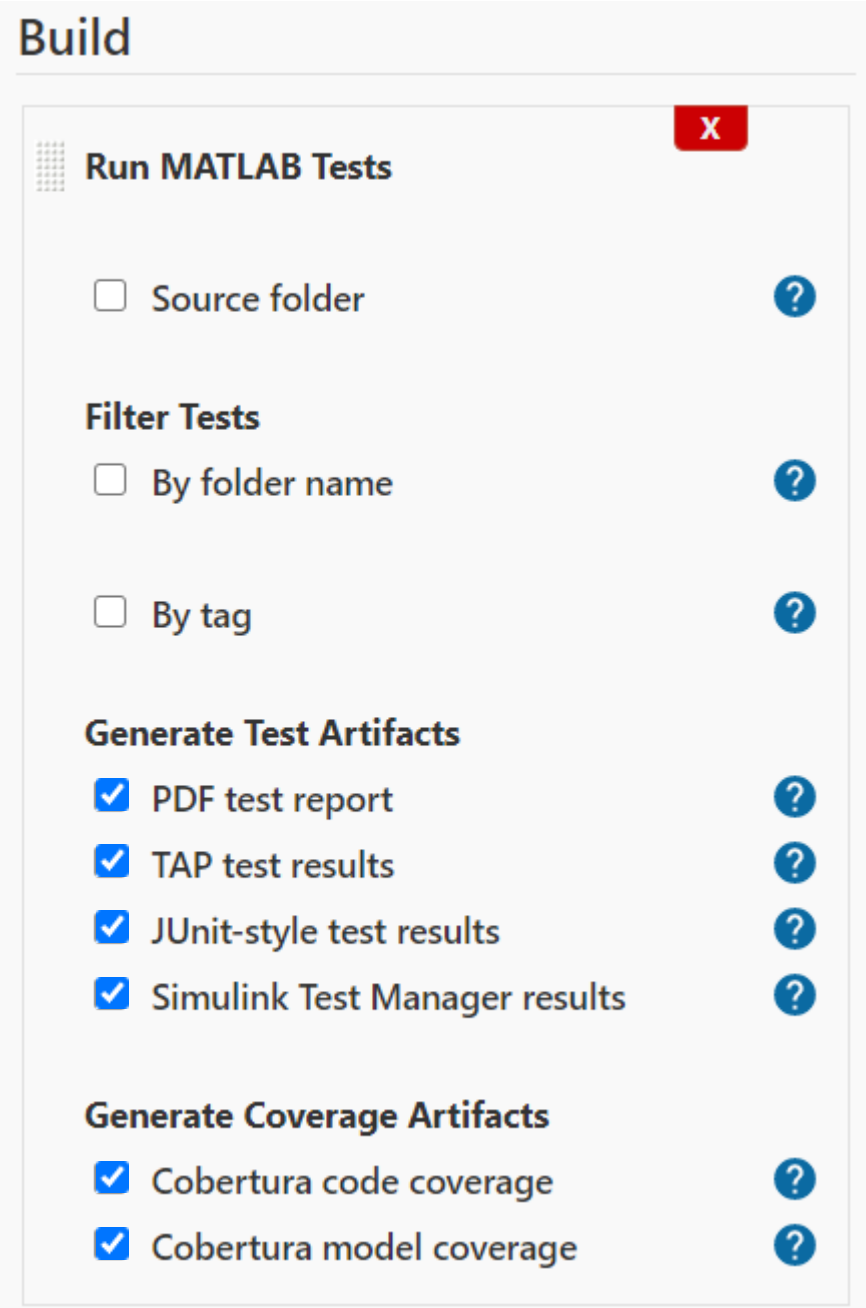
- Choose which test results you want to see



Using the MATLAB plugin for Jenkins

- Install the MATLAB plugin
- Tell Jenkins where to find MATLAB
- Tell Jenkins what to do
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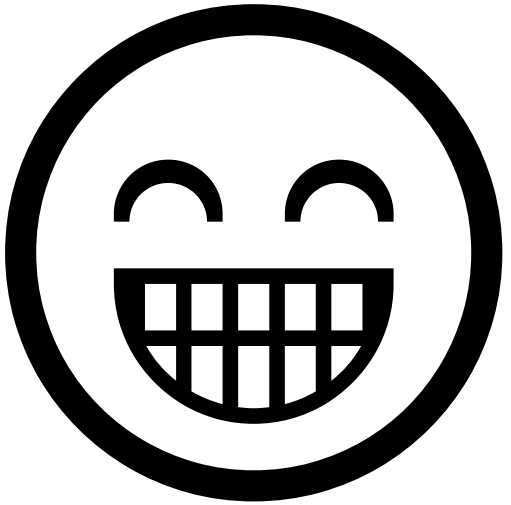
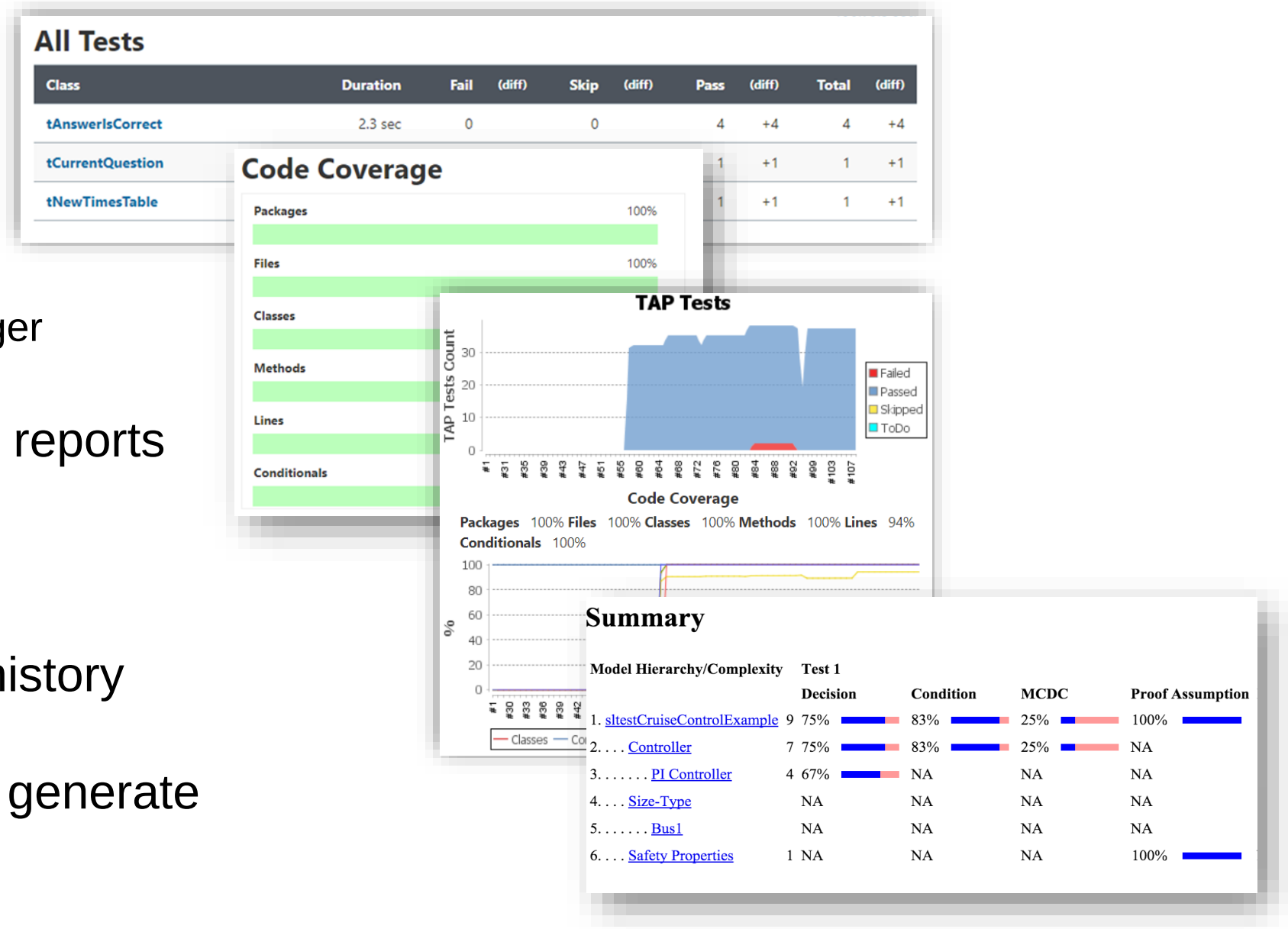
- Choose which test results you want to see
- That's it! You're ready to build!



Viewing build results in Jenkins

- Test results
  - TAP
  - JUnit-style
  - Simulink Test Manager
- Cobertura coverage reports
  - Code coverage
  - Model coverage
- Test and coverage history
- Custom reports you generate



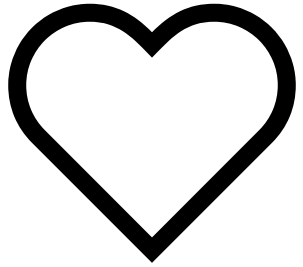
When are we going to talk about the free CI support for MATLAB?

Free MATLAB CI support for public GitHub repositories

- MathWorks now provides free CI support for MATLAB and Simulink if:
  1. your code and models are publicly available on GitHub
  2. your CI build is publicly available on a supported CI platform
  3. you don't use any excluded products (e.g., MATLAB Compiler, MATLAB Coder)

- Currently supported CI platforms:
  - Azure DevOps
  - CircleCI
  - GitHub Actions
  - Travis CI

MATLAB



GitHub
Community

Can commercial customers use the free CI service?

- Yes and no…
- Why no?
  - Free CI service requires you share your code publicly
  - You don't want to give away your intellectual property
- Why yes?
  - Use "toy" examples to explore potential future cloud migration
- Remember, our plugins support on-premise CI servers and private agents

This sounds great, but how do I get started?

- Check out our example GitHub repository!
  - http://github.com/mathworks/ci-configuration-examples
- The example repository provides:
  - A quick start guide
  - Ready-to-use CI configuration files
  - Example MATLAB code and tests
  - CI badge examples, with helpful links

MATLAB CI Configuration Examples

This repository shows how to run MATLAB tests with a variety of continuous integration systems.

CI Platform	Badges	Badge Help
Azure DevOps	Azure Pipelines succeeded coverage 80%	Blog with helpful information for setting up Azure DevOps badges
CircleCI	circleci passing	CircleCI documentation for setting up badges
GitHub Actions	MATLAB passing	GitHub Actions documentation for setting up badges
Travis CI	build passing	Travis CI documentation for setting up badges

GitHub Actions Demo!

Extending our example to your code and models

- This repository was designed to be easily extendable
  - Replace our code and tests with your code and tests
  - Commit
  - Push
- No need to modify any configuration files!
- CI job automatically triggered by changes to your GitHub repository

Summary and Resources

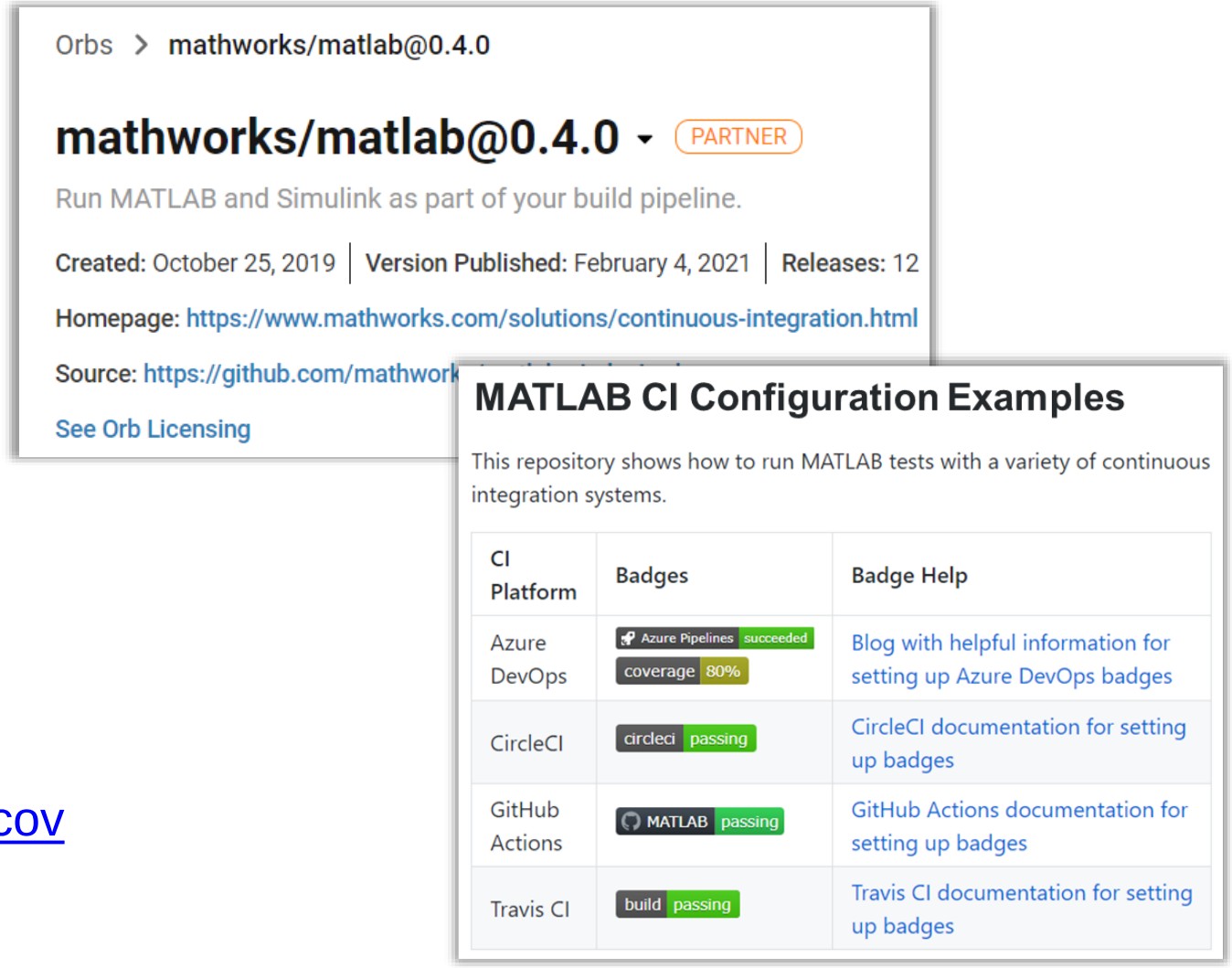
Key Takeaways

- Continuous integration helps you develop high quality software, faster!
- MATLAB and Simulink support you through all stages of CI
- Getting started with CI is easy with our plugins and example codes
- Free CI support for public MATLAB and Simulink GitHub repositories!

Getting Started: CI plugins and code examples

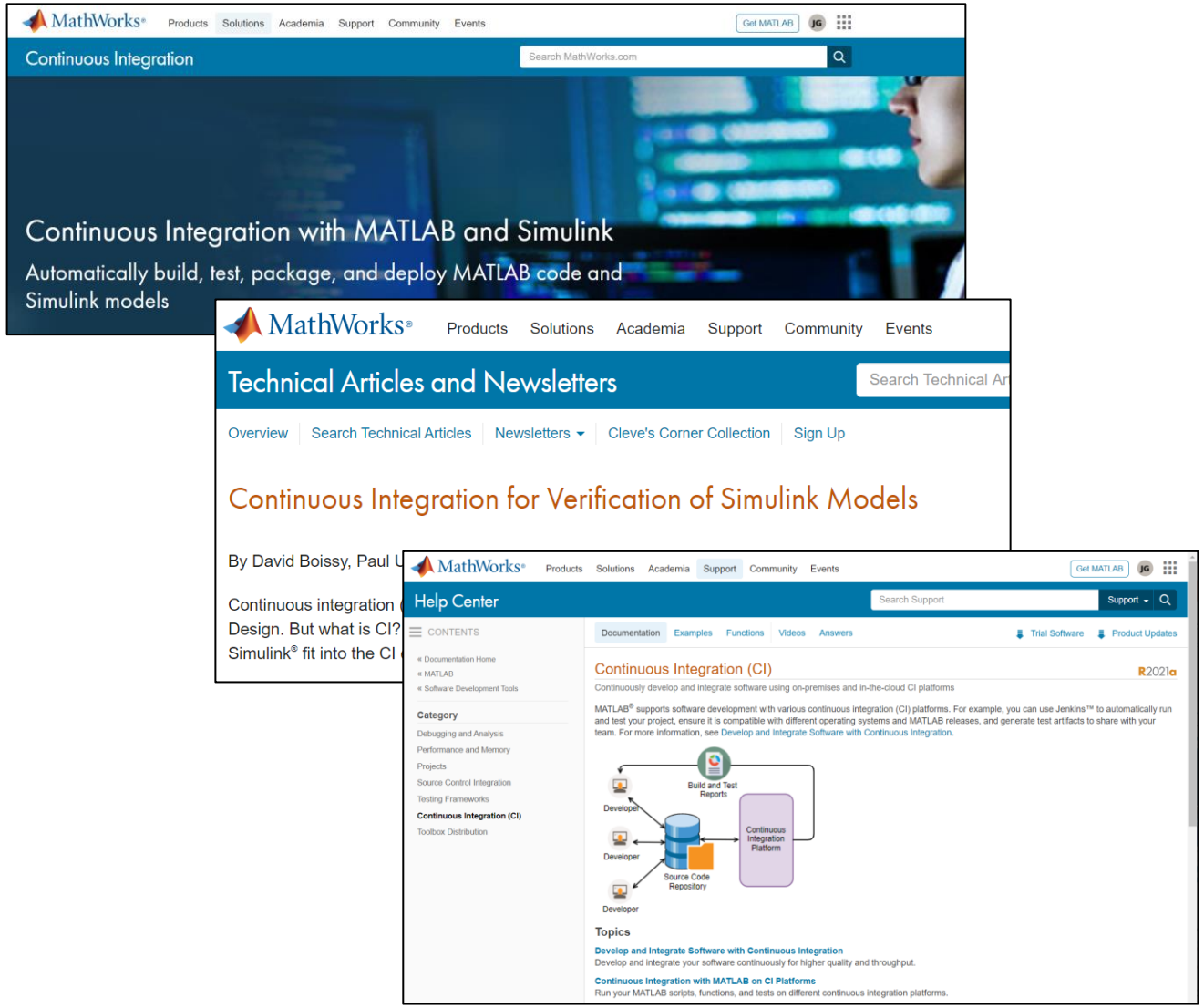
- CI plugins
  - Azure DevOps
  - CircleCI
  - GitHub Actions
  - Jenkins
  - Travis CI

- Code examples
  - CI configuration examples
  - CI with Simulink
  - Code coverage using Codecov



Learning more: about continuous integration with MATLAB and Simulink

- Solutions Page:
  - Continuous Integration Solution Page
- White Papers:
  - Continuous Integration for Verification of Simulink Models
  - Agile Model-Based Design: Accelerating Simulink Simulations in CI Workflows
- Documentation and Blogs:
  - Continuous Integration Documentation Hub
  - Developer Zone: Continuous Integration
  - CI with Projects and Simulink Test



Q&A Time!

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Thank you