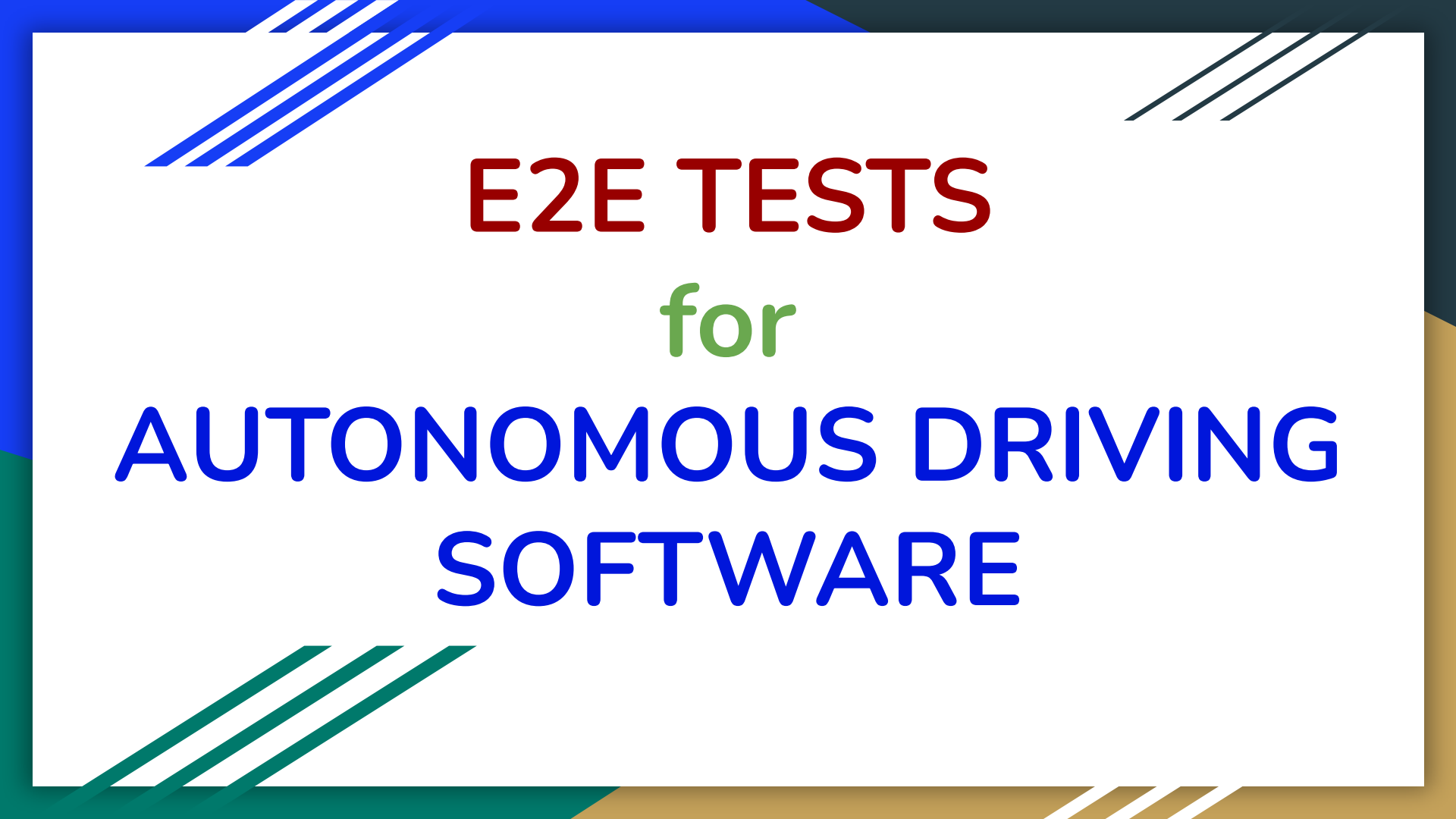




E2E TESTS **for** **AUTONOMOUS DRIVING** **SOFTWARE**

Self Introduction

TIER IV

- Born in China, Lived in NZ for 15 years, moved to Japan 3 years ago, currently living in Hokkaido



Self Introduction

TIER IV

- Born in China, Lived in NZ for 15 years, moved to Japan 3 years ago, currently living in Hokkaido
- Father of a 10 month old boy



Self Introduction



- Born in China, Lived in NZ for 15 years, moved to Japan 3 years ago, currently living in Hokkaido
- Father of a 10 month old boy
- Organising Tokyo Test Fest - a QA conference in Tokyo, Japan.
Catered for Japanese and English speakers

Self Introduction

TIER IV

- Work at TIER IV - Autonomous Driving company based on Open Source Software

Self Introduction

TIER IV

- Work at TIER IV - Autonomous Driving company based on Open Source Software
- We develop autonomous driving software for
 - Buses
 - Robo Taxis
 - Factory carriers

Self Introduction

TIER IV

- Work at TIER IV - Autonomous Driving company based on Open Source Software
- We develop autonomous driving software for
 - Buses
 - Robo Taxis
 - Factory carriers
- We also develop web apps to support the above
 - Fleet management
 - In House CICD services
 - etc.

Contents

TIER IV

- Web Teams at an Autonomous Driving company
- The problem
- Our solution
- Why Cypress

WEB TEAMS

@ an

AUTONOMOUS DRIVING
COMPANY

We provide autonomous driving platform adaptable for multiple applications

CARGO DELIVERY

PASSENGER MOBILITY

PERSONAL CARS

OTHER APPLICATIONS

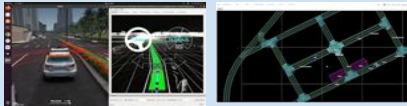


OUR CUSTOMERS

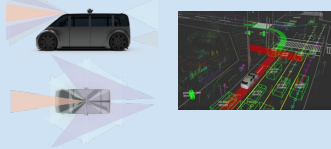
Auto OEMs, System Integrators, Service Operators, Tech Suppliers etc.

TIER IV

Web.Auto
(Cloud based DevOps platform)



Pilot.Auto
(Autonomous Driving Platform)



Edge.Auto
(Autonomous Driving Hardware Platform)



AUTOWARE

Open Source Software

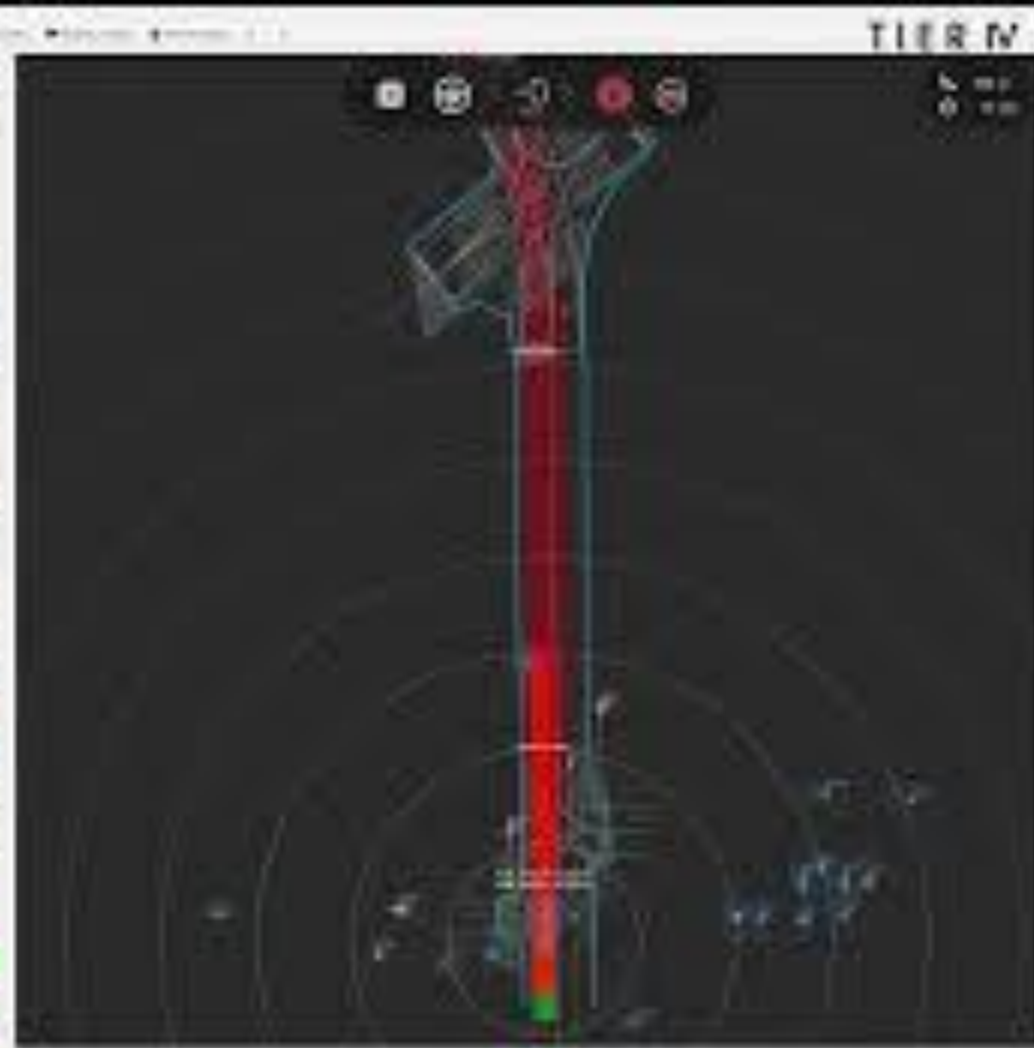


Pilot.Auto

- Autonomous Driving software development

TIER IV



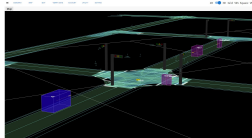
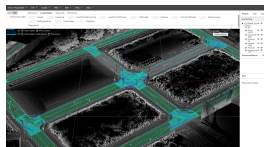


Web.Auto Overview



CI/CD PIPELINE (Evaluator)

Management and execution of AD software build, scenario suites, maps and test results in a scalable cloud environment



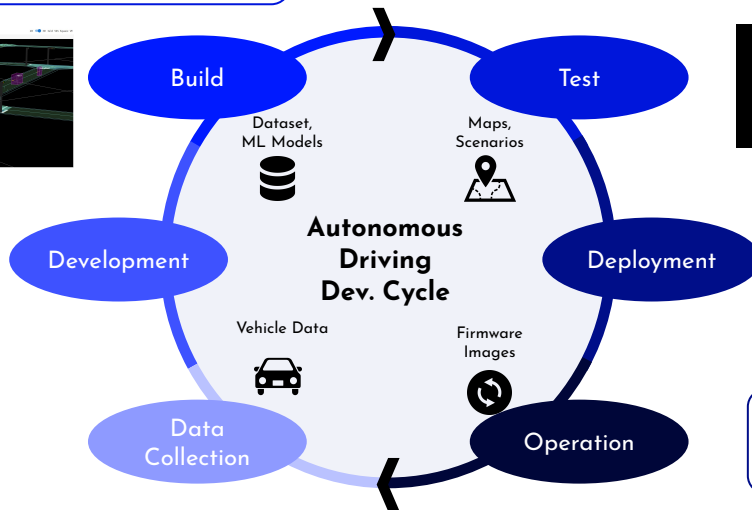
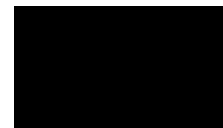
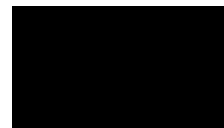
DATA MANAGEMENT

Streamline upload and management of log and sensor data



SIMULATION

Scenario based, log based and digital twin simulations



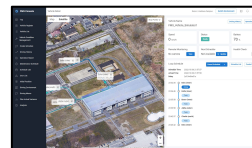
REMOTE OPERATION

Remote monitoring and assistance



FLEET MANAGEMENT

Management and operation of AD vehicles, data analysis and OTA updates



Traditional Web Apps

TIER IV

- Frontend
- Backend

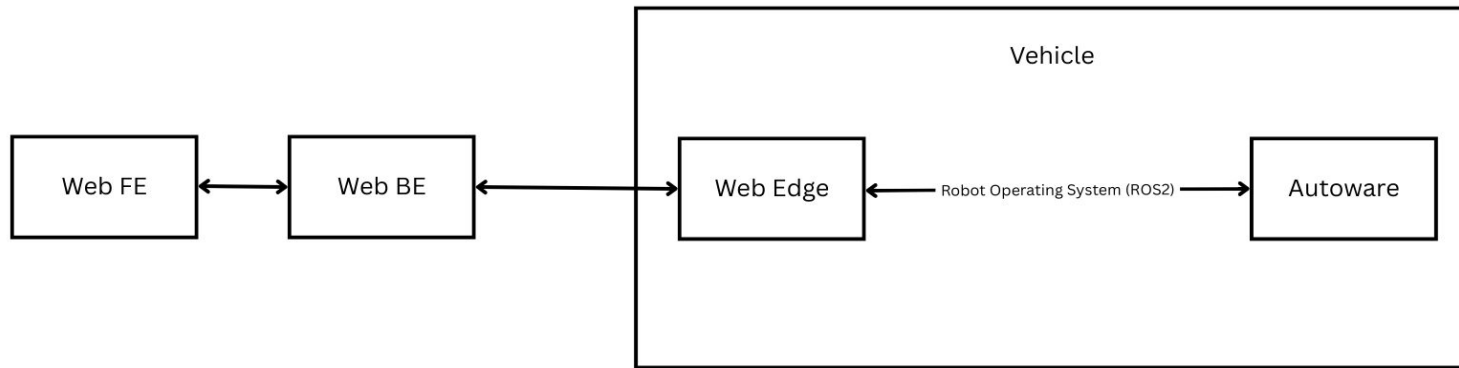
Traditional Web Apps

TIER IV

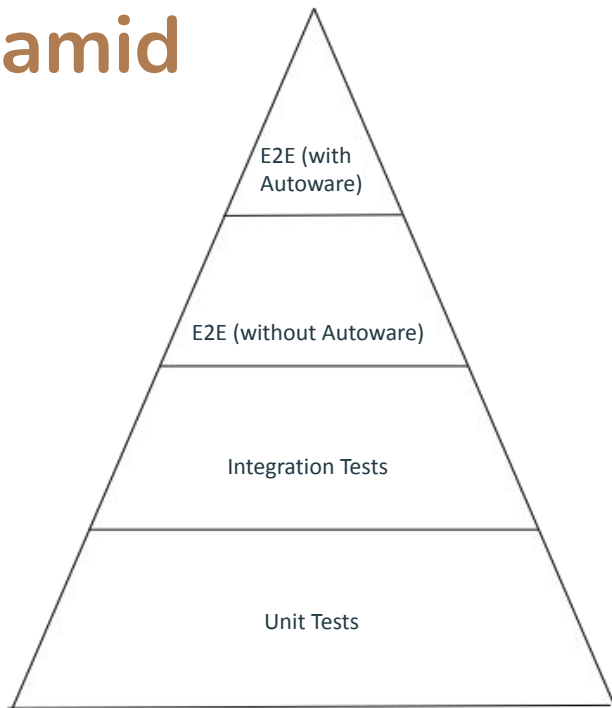
- Frontend
- Backend
- Edge
 - Relays information between backend and Autoware

TIER IV Web Apps

TIER IV



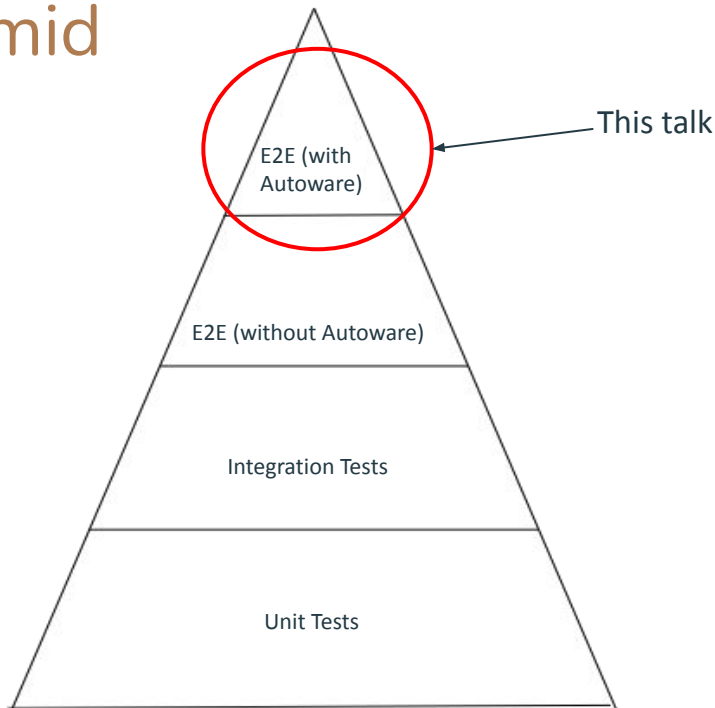
TIER IV's web team's testing pyramid



TIER IV

TIER IV's web team's testing pyramid

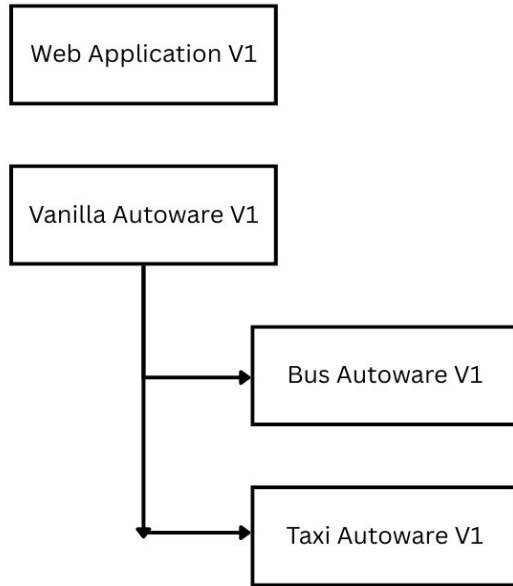
TIER IV



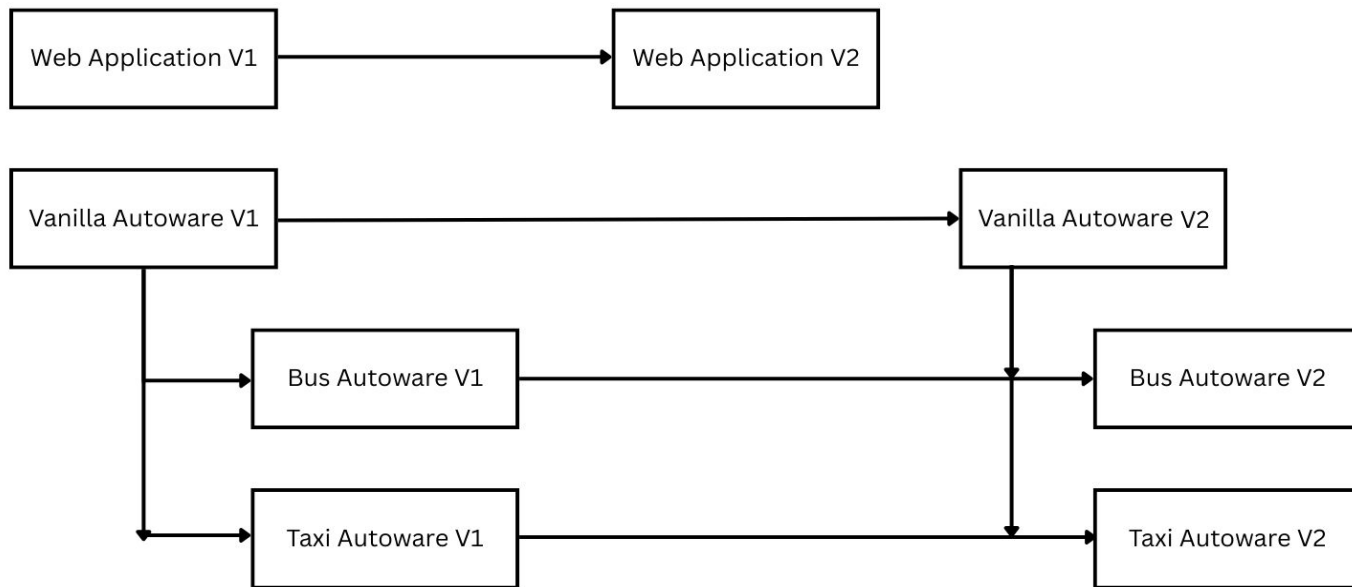
THE PROBLEM:

Asynchronous release
cycles

TIER IV



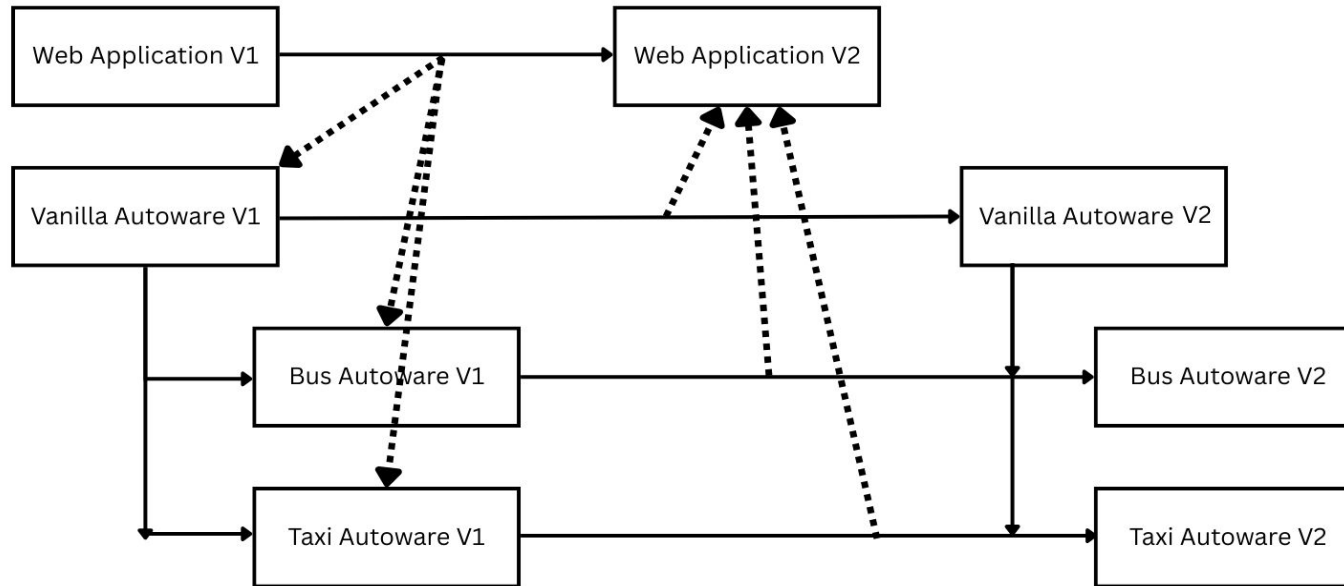
TIER IV



Release ←

Testing ←

TIER IV



The Problem

- Asynchronous releases require too much manual testing to make sure everything works properly

TIER IV



The Problem

TIER IV

- Asynchronous releases require too much manual testing to make sure everything works properly
- So we need to automate



The Problem

TIER IV

- Asynchronous releases require too much manual testing to make sure everything works properly
- So we need to automate
- But the environment is so hard to prepare...
 - Autoware is a big ROS application that takes sometimes hours to build



In comes our CI/CD service - Evaluator

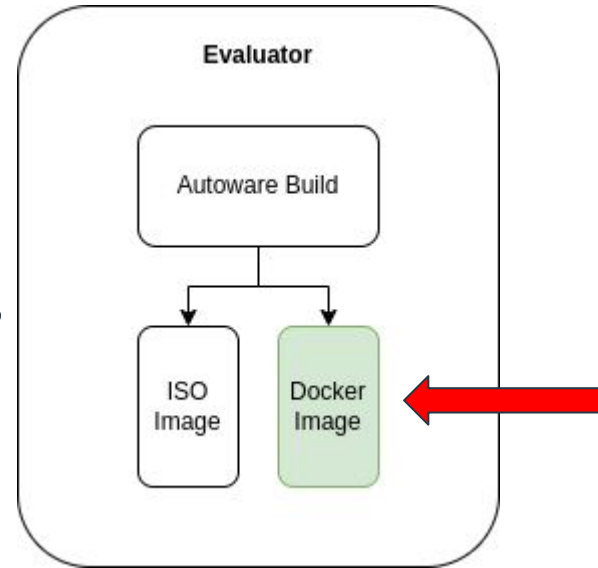
TIER IV

- Pilot.Auto teams use this to build and test their Autoware
- It leaves ISO and Docker images as artifacts!

In comes our CI/CD service - Evaluator

- Pilot.Auto teams use this to build and test their Autoware
- It leaves ISO and Docker images as artifacts!

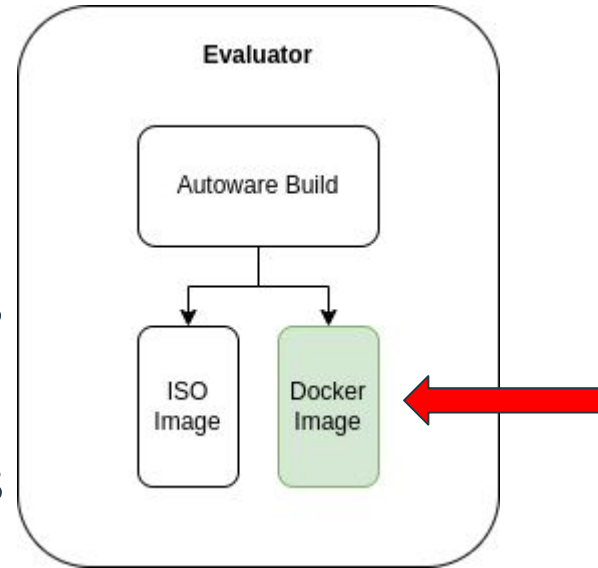
TIER IV



In comes our CI/CD service - Evaluator

- Pilot.Auto teams use this to build and test their Autoware
- It leaves ISO and Docker images as artifacts!
- Run images on AWS = problems solved!

TIER IV



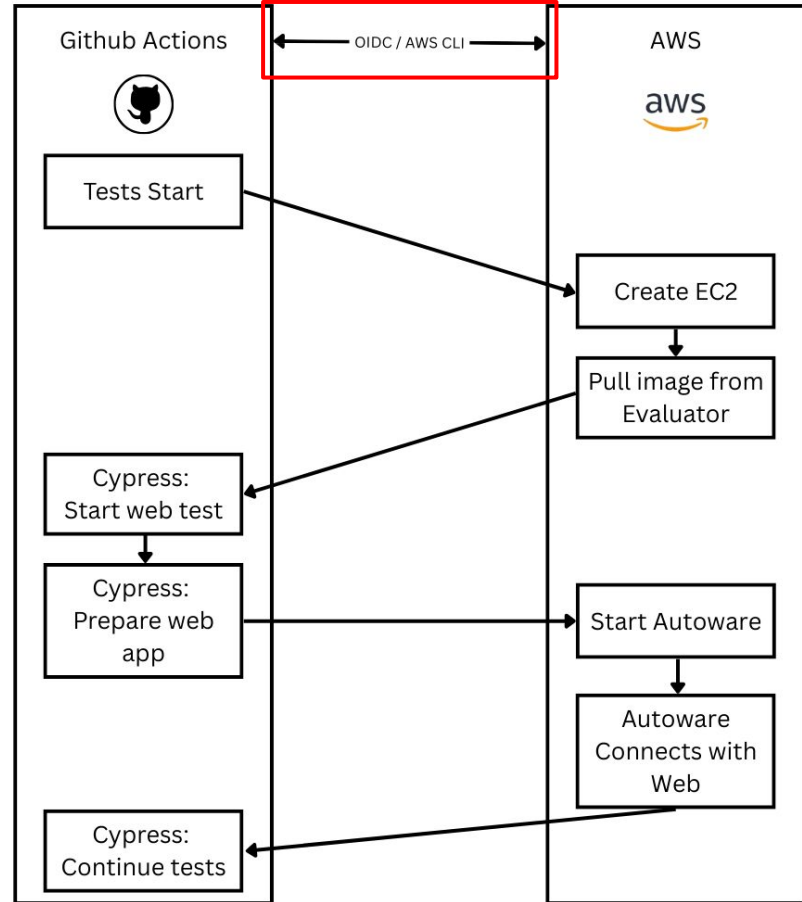


The Solution

Solution

- We use OIDC to allow GitHub Actions to assume an IAM role for secure authentication with AWS
- AWS CLI from actions for all operations to AWS

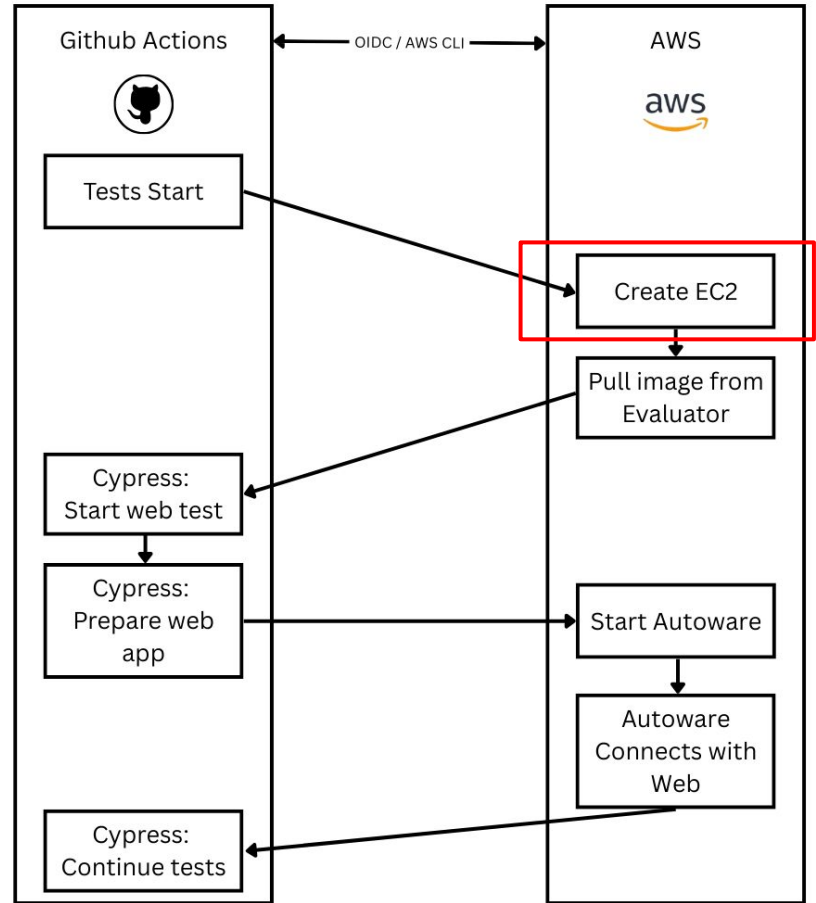
TIER IV



Solution

- We use AMI images so that the same EC2 environment is created every run

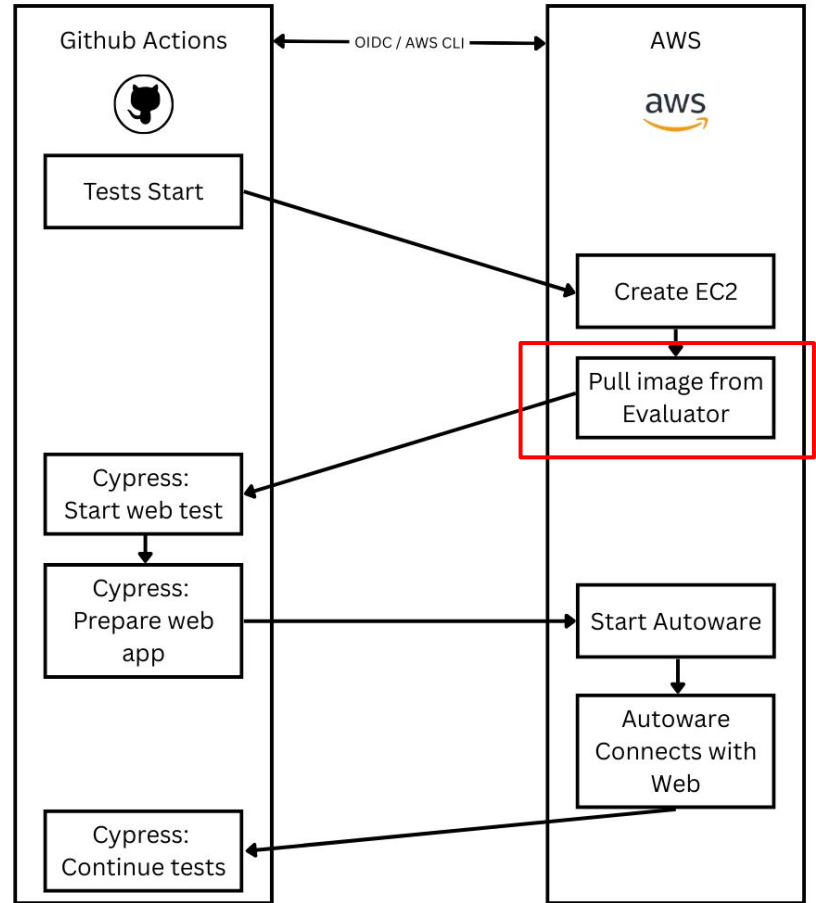
TIER IV



Solution

- Image is pulled with Evaluator's dev team's cli tool
- Image is slightly modified with a docker file to make it have the correct configurations to connect to the web
 - Systemd configurations etc.

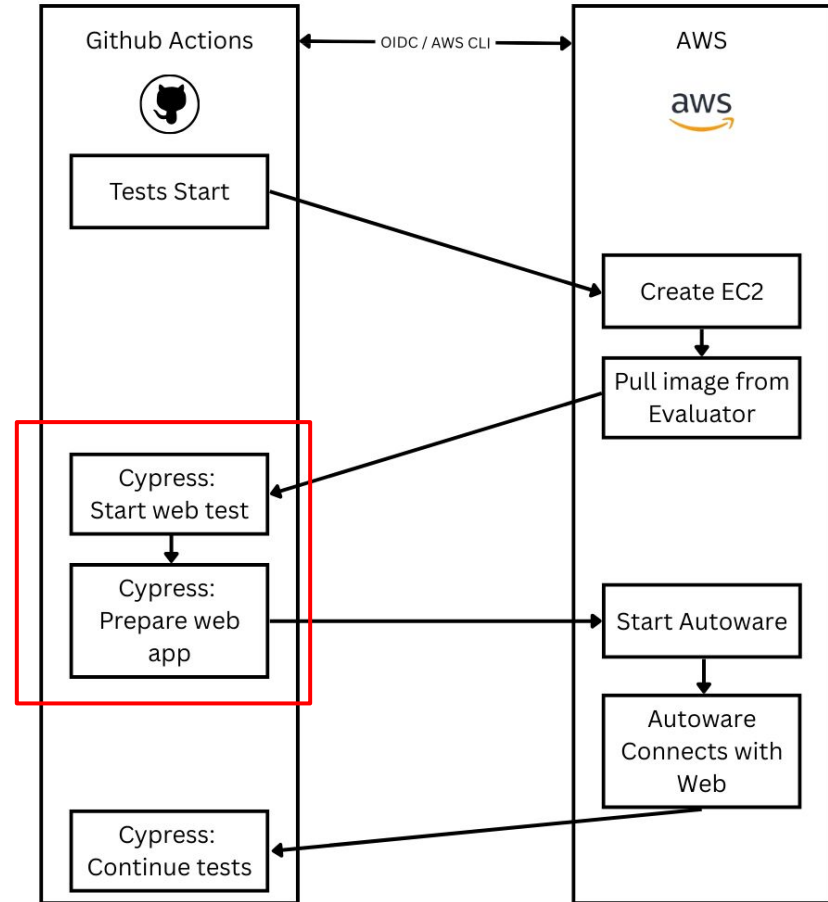
TIER IV



Solution

- Example: register a vehicle on the web side and create a schedule, and make vehicle run on that schedule

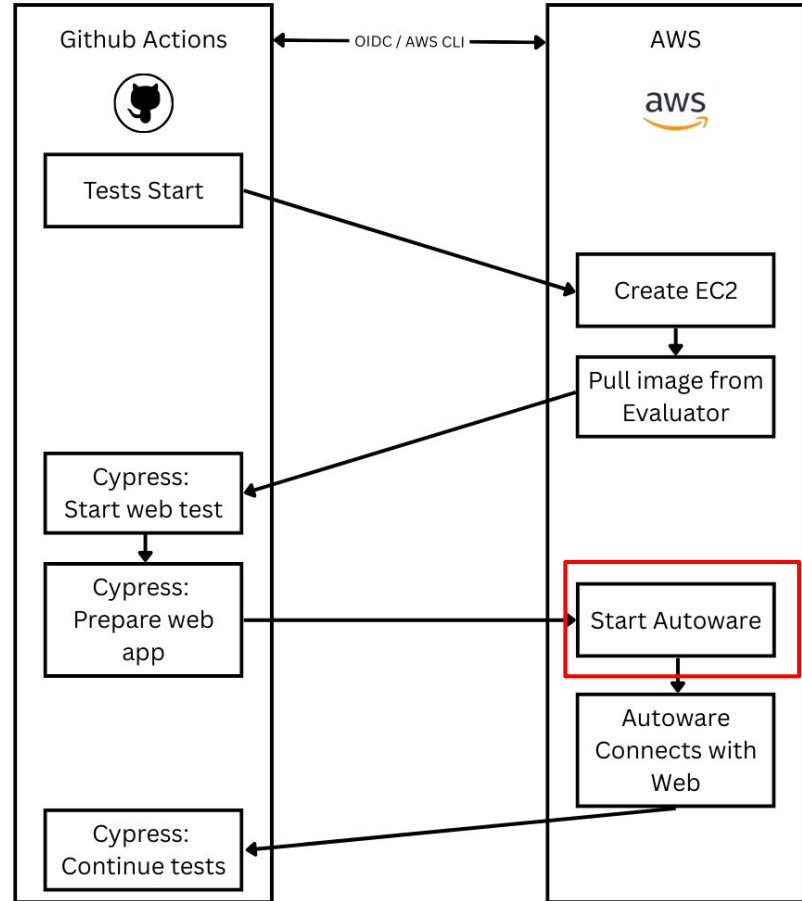
TIER IV



Solution

- `cy.exec -> ssh ->`
execute command
inside docker
container

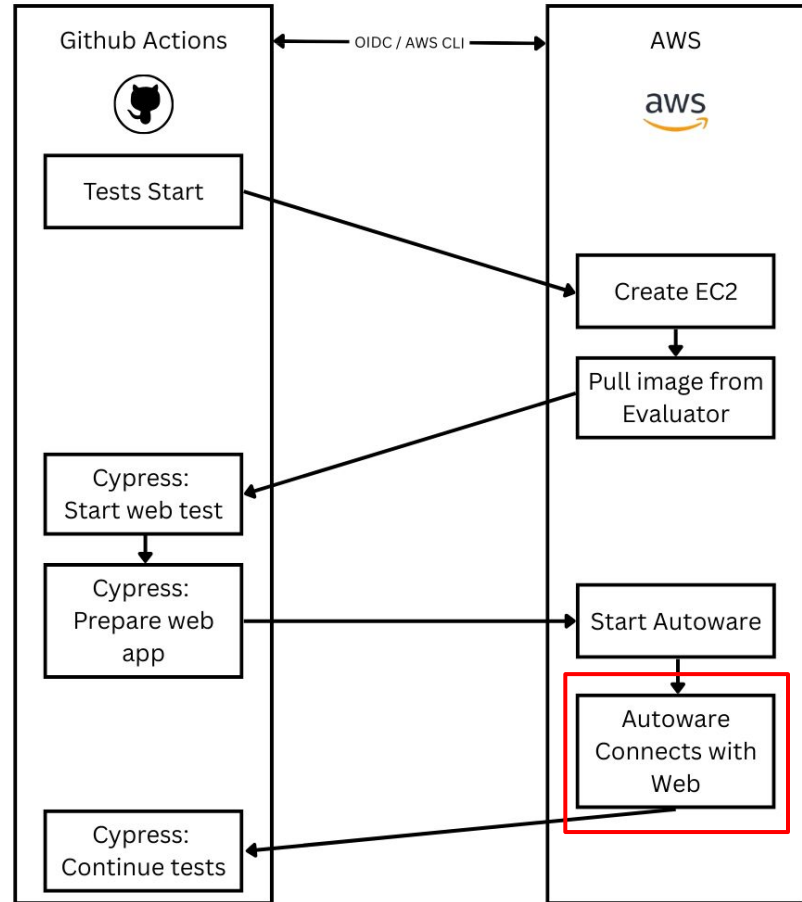
TIER IV



Solution

- Connection with the help of AWS Greengrass (not part of the test but the application)

TIER IV



Why  cypress

Why Cypress



- Test replay on Cypress Cloud

TIER IV

Why Cypress



- Test replay on Cypress Cloud
 - With complicated tests that needs to sync with aws Autoware, it's crucial to be able to debug failures efficiently

TIER IV

Why Cypress



- Test replay on Cypress Cloud
- Access to node environment with `cy.exec()`

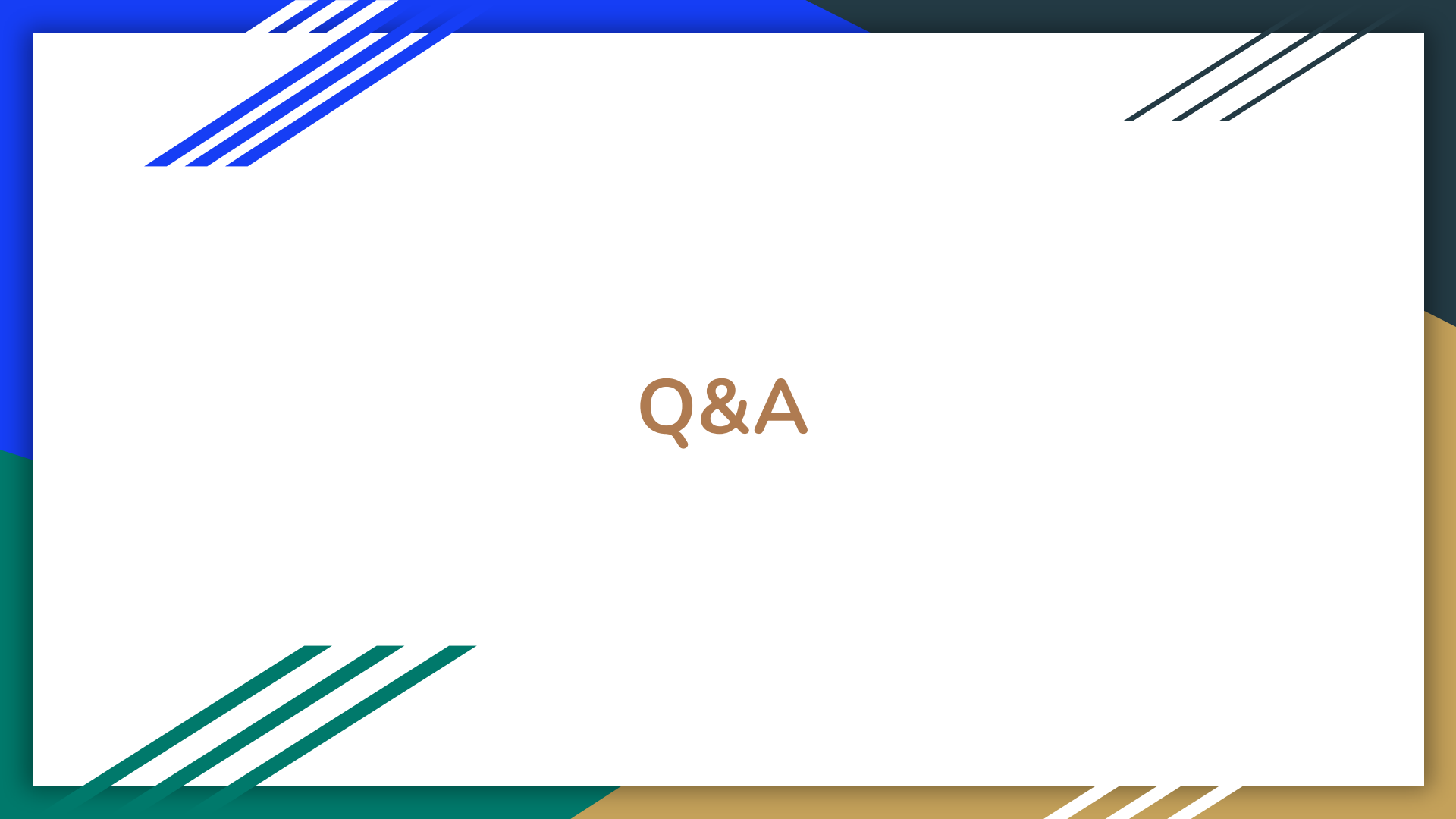
TIER IV

Why Cypress



- Test replay on Cypress Cloud
- Access to node environment with `cy.exec()`
- Developer friendly for cross team collaboration

TIER IV



Q&A