

Ch. 15 - IoT Future Trends

COMPSCI 147
Internet-of-Things; Software and Systems

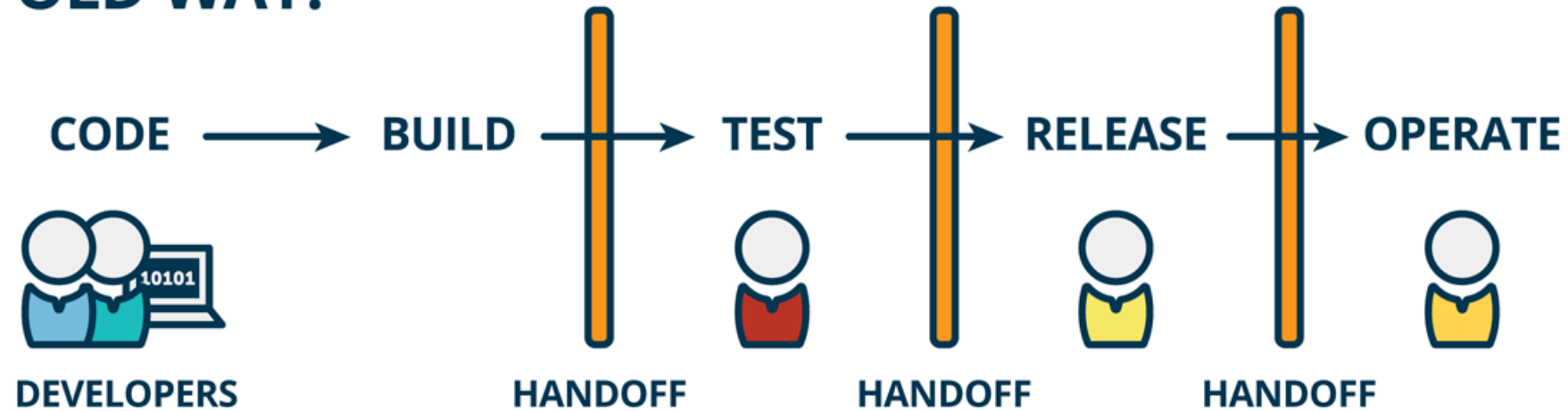


What is happening next

- Scalable deployment strategies
- AIoT: AI + IoT

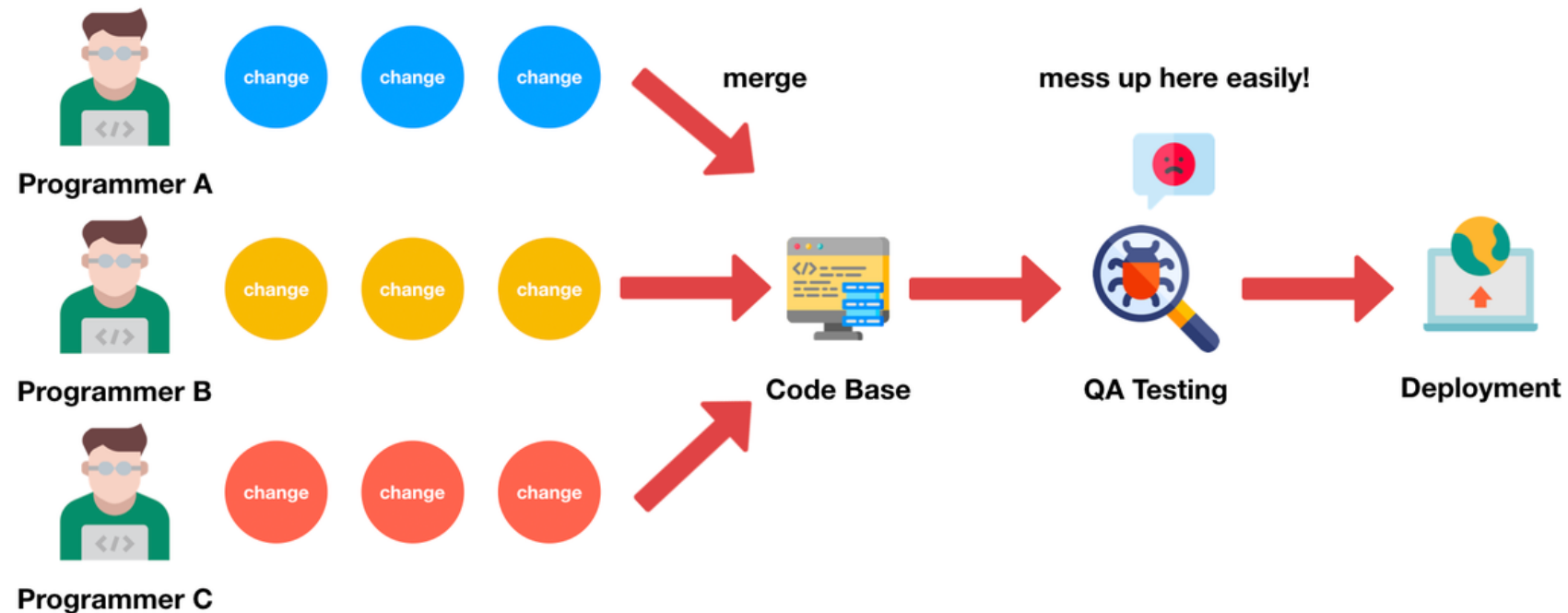
Scalable deployment strategies

OLD WAY:

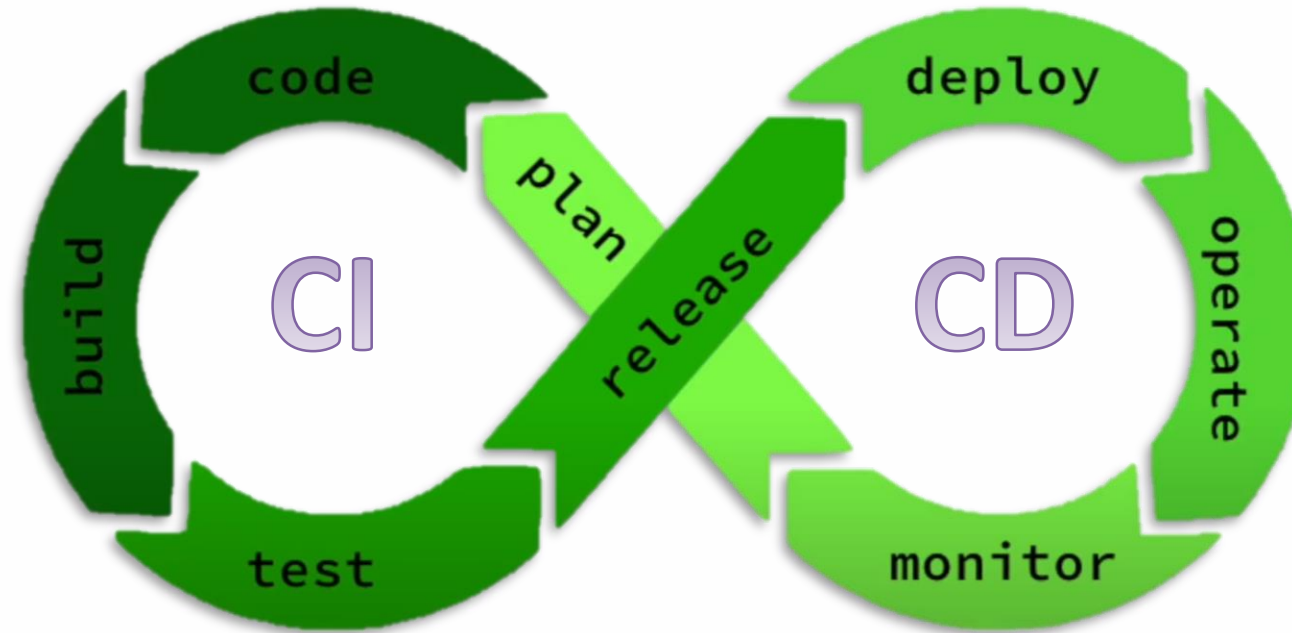


Scalable deployment strategies

Traditional Way



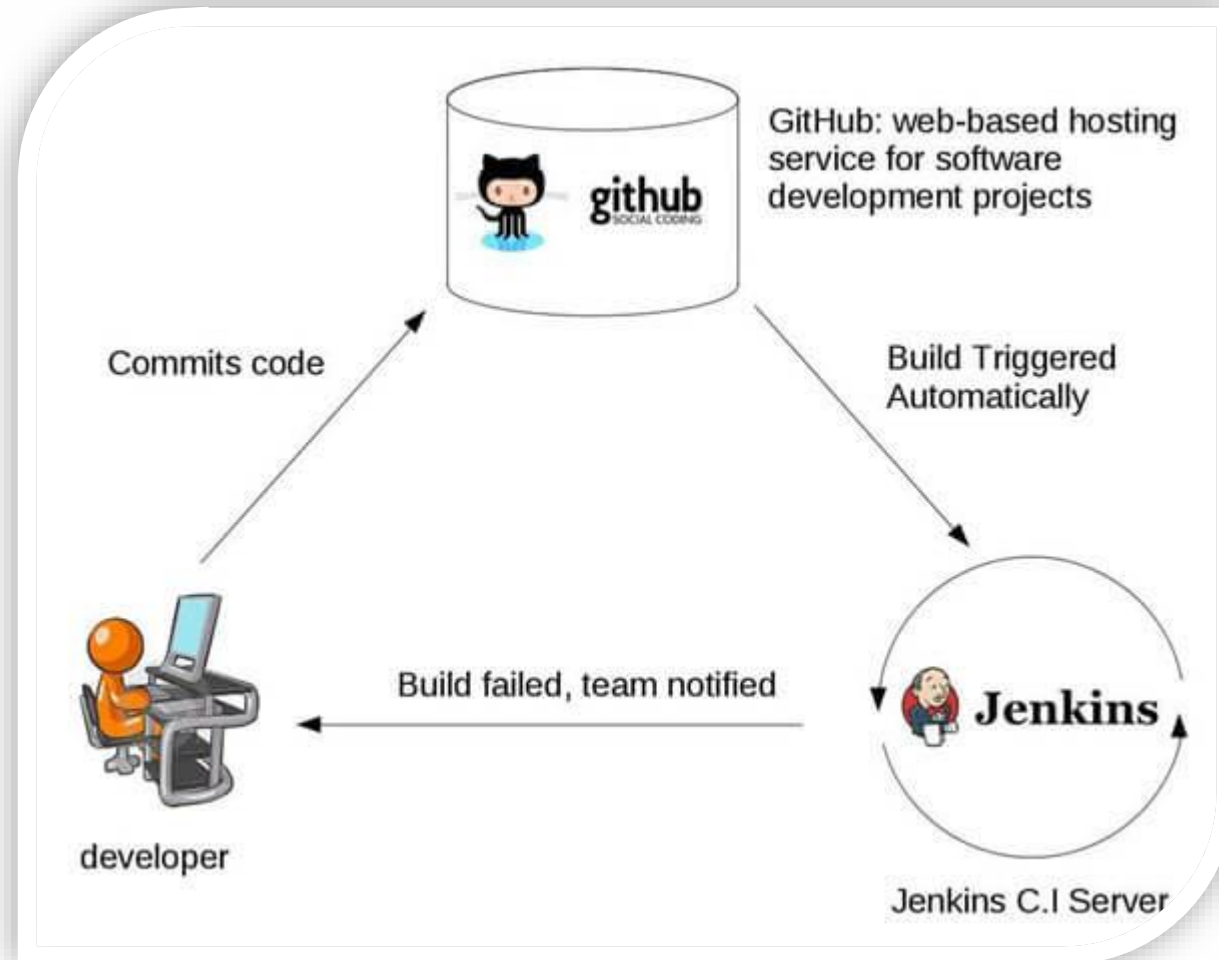
Continuous Integration and Continuous Deployment (CI/CD)



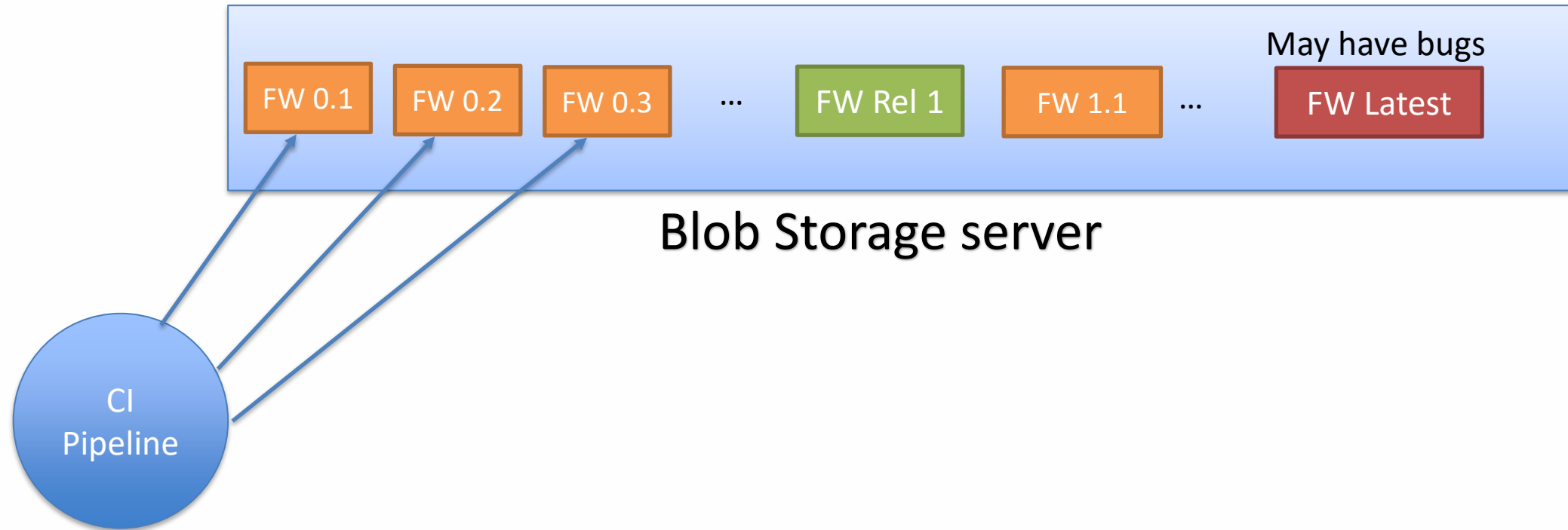
Drastically reduce development times

Continuous Integration

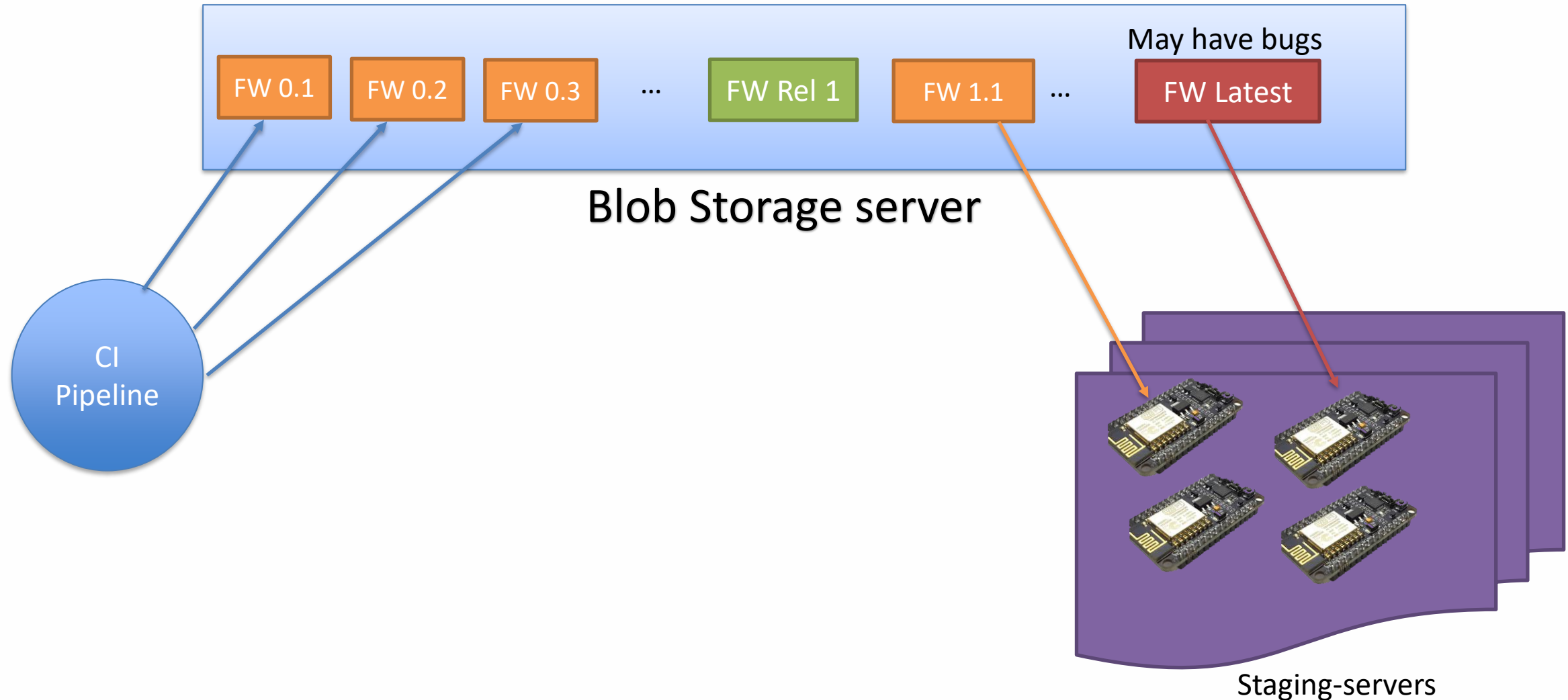
Jenkins
TeamCity
Bamboo
Buddy
GitLab CI
CircleCI
TravisCI



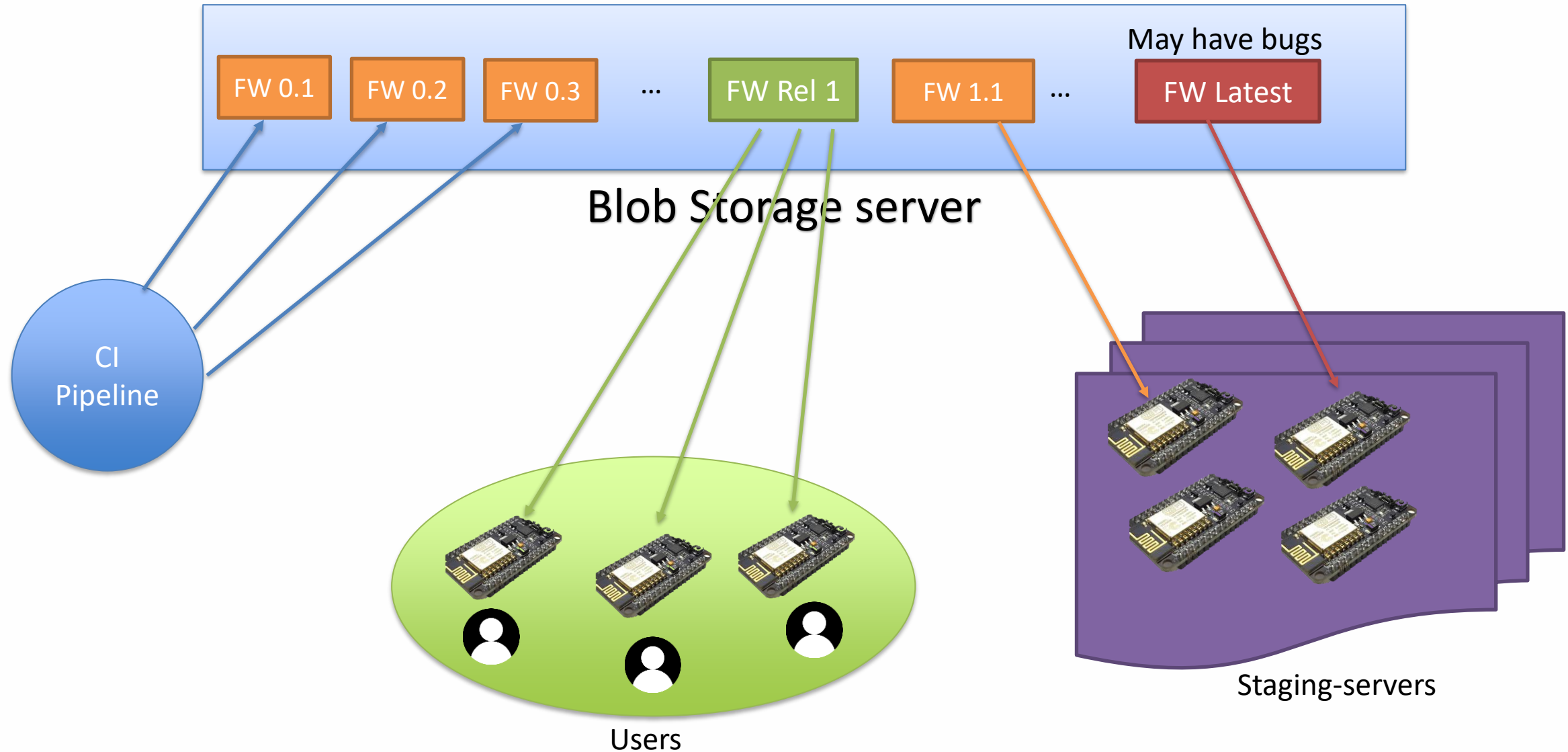
Continuous deployment



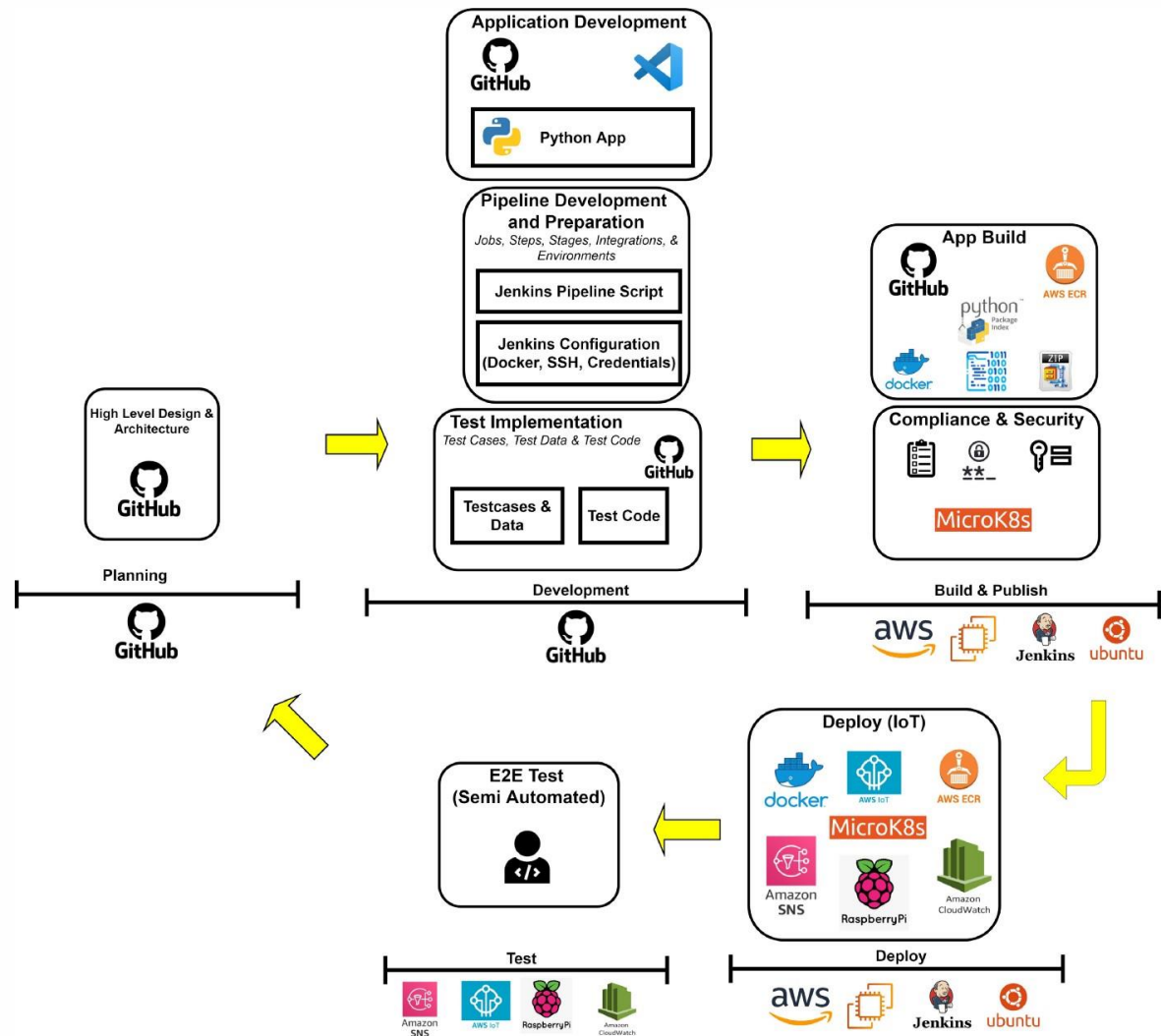
Continuous deployment



Continuous deployment

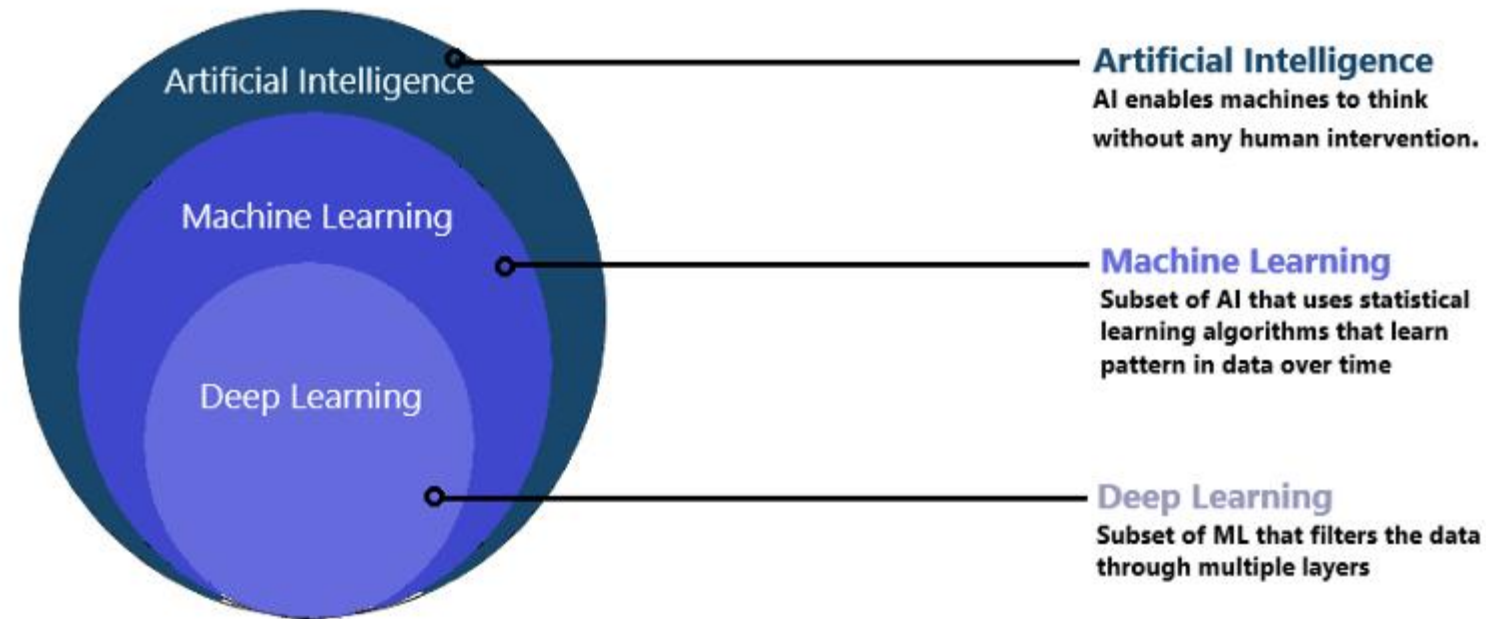


CI/CD benefits



- Faster time to market
- Reduce risk (quick updates)
- Better code quality
- Lot's of automation

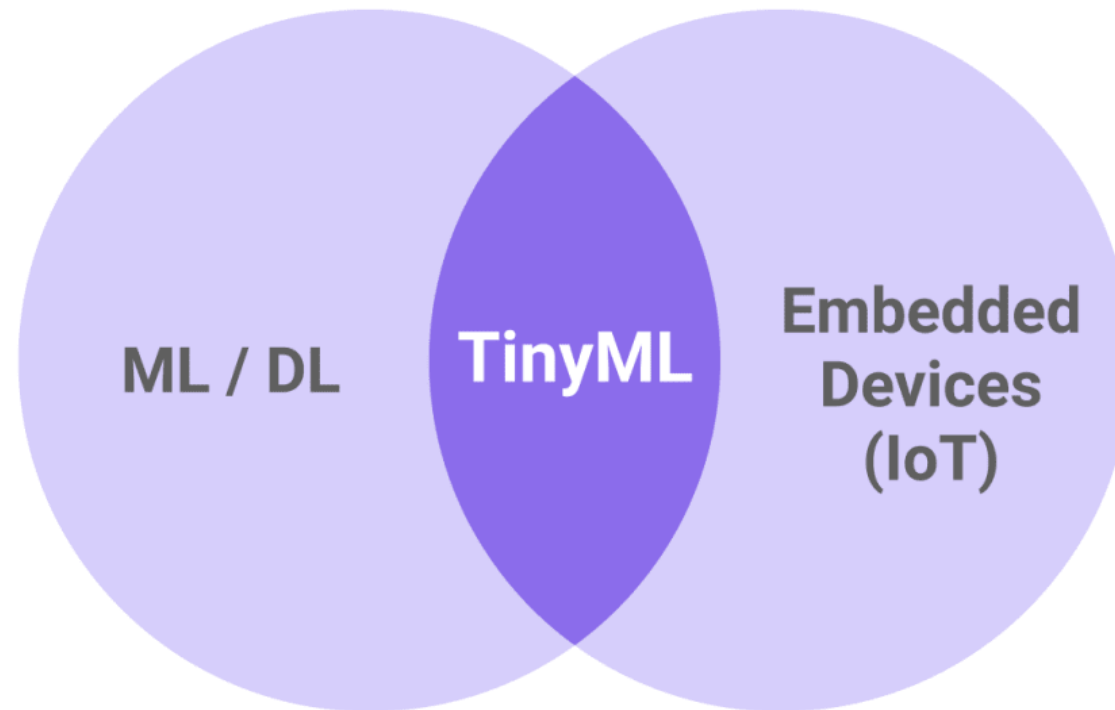
AIoT: Moving beyond traditional applications at the device layer



Extremely resource intensive

TinyML:

- TinyML is the overlap between Machine Learning and embedded (IoT) devices.
- It gives more "intelligence" to power advanced applications using ML.
- The idea is simple - for complex use-cases where rule-based logic is insufficient; apply ML algorithms. And run them on low-power device at the edge. Sounds simple; execution gets tougher.



Typical flow for deploying models on ESP32

- Build models using raw data
- Exporting the model for microcontroller (e.g., C++)
- Use ML Libraries:

https://registry.platformio.org/libraries/tanakamasayuki/TensorFlowLite_ESP32

<https://registry.platformio.org/libraries/adafruit/Adafruit%20TensorFlow%20Lite>

Tutorial: <https://www.youtube.com/watch?v=kZdIO82059E>

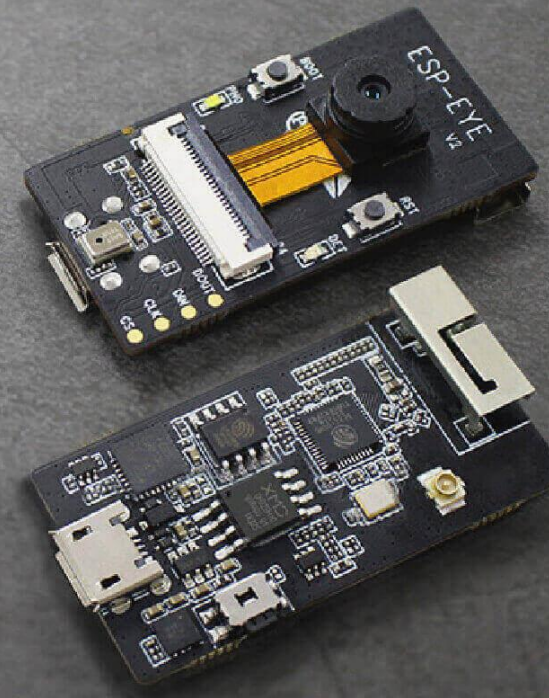
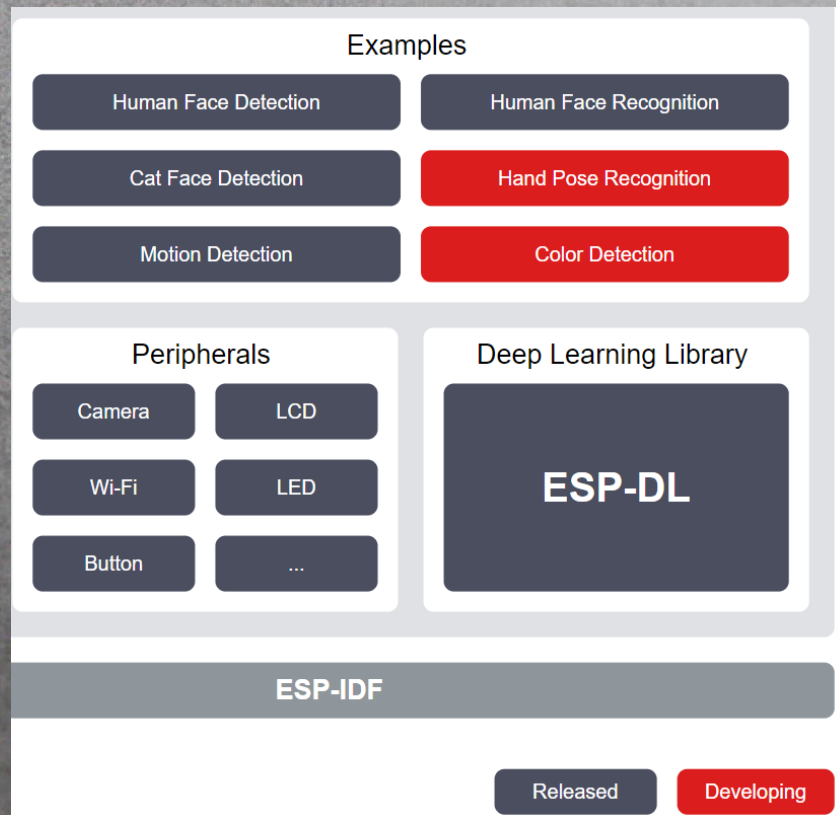
Example

- Can you use ML for Lab 4 ?
- Record the raw readings of the accelerometer and gyroscope whenever you take a step
- Use Jupyter Notebook and train ML models for step recognition
- Deploy the models on ESP32 and test :D

Using camera: ESP Eye

- What about even more demanding sensors ?

<https://github.com/espressif/esp-who>



ESP32
Chip on Board

Hardware accelerators: Google Coral

- Google's answer to on-device AI accelerators

100+ FPS

Coral's hardware product current offering



Dev Board

A single-board computer with a removable system-on-module (SOM) featuring the Edge TPU.

Price

\$149.99



USB Accelerator

A USB accessory featuring the Edge TPU that brings ML inferencing to existing systems.

Price

\$74.99



Camera

An auto focus 25x25 mm 5-megapixel compatible camera module.

Price

\$24.99



Environmental Sensor Board

An accessory board that provides temperature, light, and humidity sensors for IoT applications.

Price

\$24.99



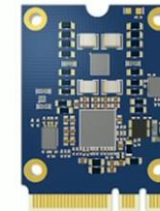
SOM

A fully integrated System on Module in a 40mm x 48mm pluggable module with Edge TPU on board.

Price

\$114.99

Volume discount pricing available



PCI-E Accelerator

A PCI-E board for easy integration of Edge TPU into existing systems.

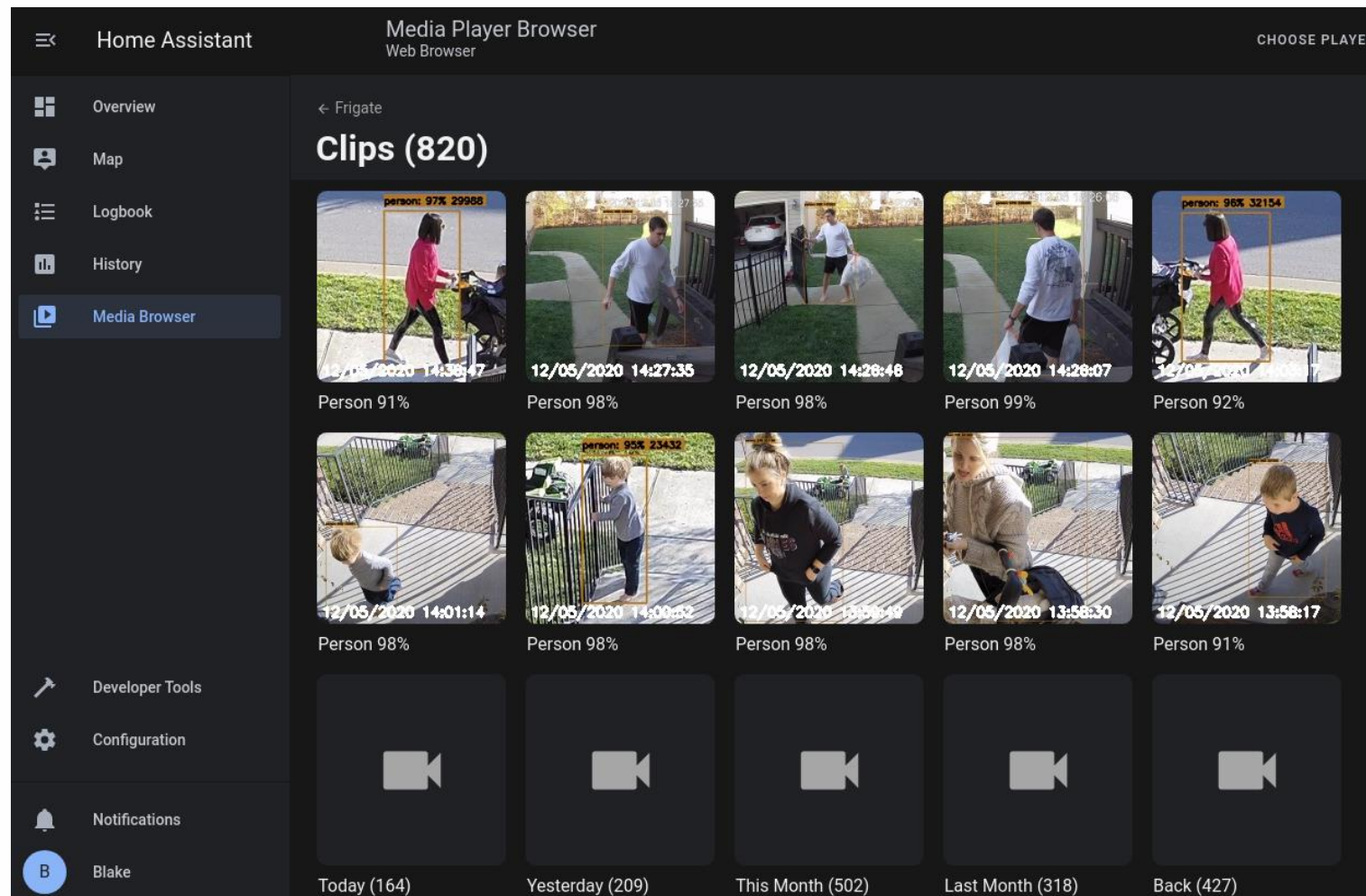
Available: Q3' 2019

Price

\$64.99

Example project with Coral

- Frigate: NVR With Realtime Object Detection with Google Coral



Thank you

