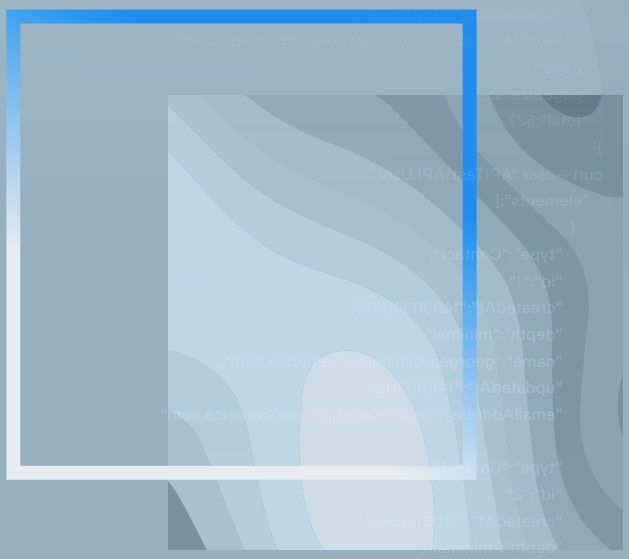
Faraday

Integrating Faraday in the software development process

Part One GitHub



This white paper produced by our technical team, shares important information to attack vulnerabilities from the first stage when developing software.

About Us

Faraday's mission is to **make security simple and accessible to everyone**, using our experience and passion to enable SMB/SME companies reducing their gap between exposure and remediation.

We truly believe that a clear understanding of your security posture is the primary key to reduce your attack surface, allowing you to make smarter decisions to protect your most valuable assets.

Security is a world-class engineering challenge and we want to help. We are a passionate leading team that wants to transform the way security works.

Outstanding research results published

Constant contribution to the global security community

+15 years working with F500

Speakers at the best security conferences

+60 employees worldwide

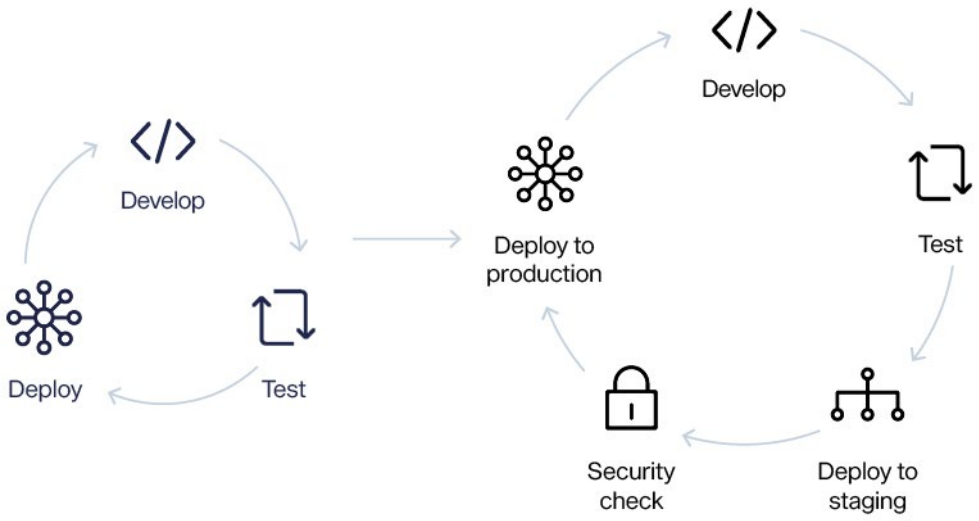
Get to know us at **faradaysec.com**

Integrating Faraday in the software development process

Introduction

Usually, software companies see security as an afterthought, which can be generally added when the product is completely operative. This approach could have been debatable in the past. Nowadays, it's considered a bad decision since it could generate unexpected vulnerabilities in the released source code.

The **DevOps** concept gives us a new paradigm in our teams, a new role with a developer background focused on continuous integration, combining and automating all the development components several times a day. Automatization, deployment and scalability are day-to-day topics in the **DevOps** concept. If we combine this role and security, we can find tasks related to DevSecOps which are centered on **Sofware Development Life Cycle (SDLC)**. This way, we can take the good practices of **DevOps** and apply them to security checks all together as a continuous process, providing us with the same app automatization level for all the security attributes, functional and non-functional attributes. All of these variables promote a more secure and robust software system.



Wrapping up, one of the goals is to change the security team interaction from *"approve each version of CI/CD process"* to an independent system, giving them the ability to monitor and audit the process in every stage. To do this **we need to add security mechanisms in each pipeline step**, identify possibles failures and to be able to deliver a more strong model.

In this document, we are going to explain with simple steps how to integrate our **Faraday** platform to our development and deployment process. This will allow us to detect vulnerabilities earlier in the development life cycle and how to manage them easily, making sure they're not included in the production environment and avoiding external threats.

What tools and technologies are we going to use?

- A **vulnerable app** written in Python: https://github.com/midpipps/PythonFlaskVulnerableApp
- **GitHub Actions** for the CI/CD process.
- **Heroku** will be the PaaS where we will deploy our vulnerable app.
- A **Faraday** instance accessible over the internet.
- **Bandit** to make a static code report (SAST).
- **OWASP Zap** to execute a security scan over our recently deployed application.

We are going to use **an application we know is vulnerable and has been written in Python**, in order to scan the code using **Bandit**. Then, we will deploy this application in a **Heroku** instance and run a simple **OWASP Zap** scan over it. Finally, we will upload both reports to our **Faraday** instance.

1. Create a Heroku App

First of all, we need to create a Heroku application. To do this, we recommend following the official website instructions. You can choose other similar services -like DigitalOcean or AWS- but keep in mind that the next GitHub workflow should be modified.

2. Create a GitHub repository with our vulnerable app

We need to create a GitHub repository and upload our vulnerable app there. Please make sure that the manual deployment process with Heroku (or the service you've chosen) works in your local machine. For this example, we've used this repository.

3. Create a GitHub Actions workflow

This is the point of this document! We need to create our GitHub workflow which will be executed following some rules defined by us.

For this white paper, we've decided to run our workflow when a user executes the **push** event over the **master branch.**

So, go to your repository and create this directory tree in the root of it: **.github/workflow** . Then create a **.yml** file inside, in our case we created a **ci.yml** file.

As we said before, first we need to define our workflow name and the trigger event:

```
name: CI

on:
  push:
    branches:
    -  master
```

Then, we can define the jobs of our workflow:

```
jobs:
  build:
    runs-on: ubuntu-latest

  scan:
    needs: [build]
    runs-on: ubuntu-latest

  upload:
    needs: [scan]
    runs-on: ubuntu-latest
```

We've defined 3 jobs: **build**, **scan** and **upload**, and all of them run over a ubuntu-latest image.

GitHub Actions execute all the jobs at the same time, but for this example we need to execute them sequentially. To do this, we use the property **needs.** So, the **scan** job has the property **needs: [build]** and the **upload** job has the property **need: [scan]**. This way we can assure that they run in a sequential order.

3.1 Defining the *Build* job

```
build:
    runs-on: ubuntu-latest

    steps:
    -  uses: actions/checkout@v1

    -  name: Use Python
       uses: actions/setup-python@v2
       with:
          python-version: '3.x'
          architecture: 'x64'

    -  name: Install dependencies
       run: |
          python -m install --upgrade pip
          pip install -r requirements.txt

    -  name: Run Bandit (Python code analyzer)
       run: bandit -r . -f xml -o flaskapp_faraday_bandit.xml || true


    -  name: Upload Bandit Report
       uses: actions/upload-artifact@v2
       with:
         name: bandit-report
         path: flaskapp_faraday_bandit.xml

    -  name: Add Remote Origin
```

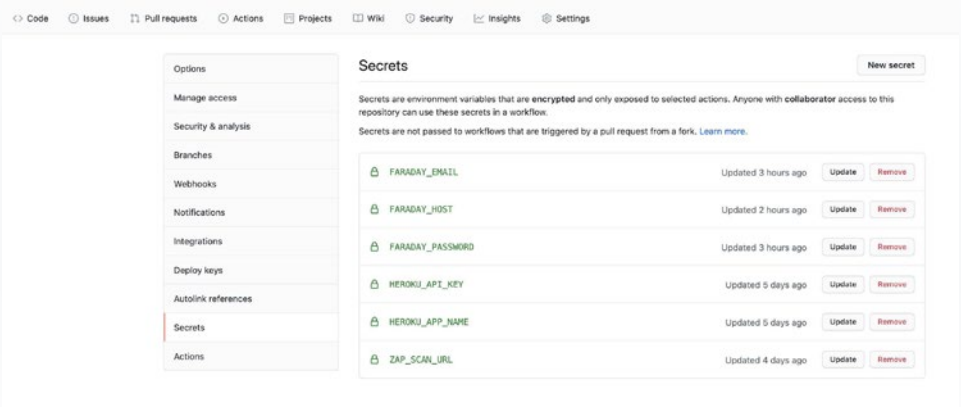
```
        run: |
          git remote add heroku https://heroku:${{ secrets.HERO-
KU_API_KEY }}@git.heroku.com/${{ secrets.HEROKU_APP_NAME }}.git

    -  name: Deploy to Heroku
       run: git push heroku HEAD:master -f
```

The first action to execute is **actions/checkout@v1**. This will download our repository in the assigned workspace by GitHub.

The next step declares a Python 3 environment and installs the repository dependency using the file **requirements.txt**. This file has Bandit as dependency so we can use it now. Then we run **Bandit**. This will create a report in **xml** format with the name **flaskapp_faraday_bandit.xml**. For Faraday it's important to pay attention to the suffix **_faraday_bandit.xml**, because it will be used to recognize the plugin report when we upload it to our **Faraday** instance.

Once Bandit has finished, we need to upload the generated report to GitHub using **actions/upload-artifact@v2**. This action combined with **actions/download-artifact@master** are the mechanisms provided by GitHub Actions to share outputs between jobs.

The last two actions are the **Heroku** deployment. An important note here is that we've used the variables **secrets.HEROKU_API_KEY** and **secrets.HEROKU_APP_NAME.** Those variables can be defined in the **Secrets** section over the **Settings** tab of our GitHub Repository:



By declaring these secret variables, we can avoid pushing sensitive information directly in our workflow file.

3.2 Defining the *Scan* job

This job will run a simple scan over our recently deployed vulnerable app.

As you can see, we've used a dockerized version of **OWASP Zap**. For this reason, we need to choose the docker image and declare some options.

```
scan:
   needs: [build]
   runs-on: ubuntu-latest

   container:
     image: owasp/zap2docker-stable
     options: --user root -v ${{ github.workspace }}:/zap/wrk/:rw

   steps:
     - name: Run Zap Baseline Scan
       run: zap-baseline.py ${{ secrets.ZAP_SCAN_URL }} -x zap-report.xml || echo 0

     - name: Upload Zap Report Artifact
       uses: actions/upload-artifact@v2
       with:
         name: zap-report
         path: zap-report.xml
```

Then, we run the scan and save the report with the name **zap-report.xml.** Finally, we upload the report as we did with the Bandit report in the build job.

3.3 Defining the *Upload* job

```
 upload:
   needs: [scan]
   runs-on: ubuntu-latest

   container:
       image: python:3.9.1
       options: --user root -v ${{ github.workspace }}:/reports:rw

   steps:

     - name: Get current date
       id: date
       run: echo "::set-output name=date::$(date +'%Y-%m-%d')"

     - name: Download Zap Report Artifact
       uses: actions/download-artifact@master
       with:
         name: zap-report
         path: zap-report

     - name: Download Bandit Report Artifact
       uses: actions/download-artifact@master
       with:
         name: bandit-report
         path: bandit-report

     - name: Upload Reports to Faraday
```

```
        run: |
          pip install faraday-cli
          faraday-cli auth -f ${{ secrets.FARADAY_HOST }} -u ${{
secrets.FARADAY_USERNAME }} -p ${{ secrets.FARADAY_PASSWORD }}
          faraday-cli create_ws ${{ github.event.repository.name }}-
${{ steps.date.outputs.date }}-${{ github.run_number }}
          faraday-cli process_report -w ${{ github.event.repository.
name }}-${{ steps.date.outputs.date }}-${{ github.run_number }} /
reports/bandit-report/flaskapp_faraday_bandit.xml
          faraday-cli process_report -w ${{ github.event.repository.name }}-${{ steps.
date.outputs.date }}-${{ github.run_number }} /reports/zap-report/zap_report.xml
```

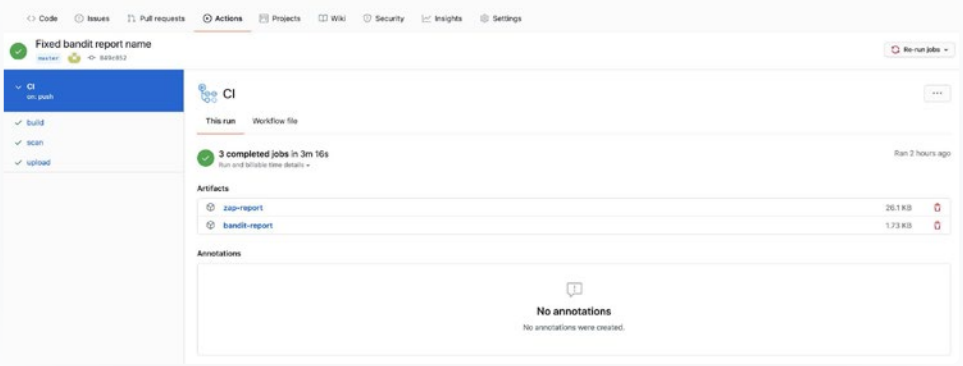
In this job, we are going to upload both generated reports to our **Faraday** instance.
To do this, we need to use the library **faraday-cli** that can be installed easily using **pip** command.
So, we defined the Upload job to work inside a docker image with Python 3 in order to allow us to install **faraday-cli** easily later.
Then we generated a variable saving the current date with the format **YYYY-mm-dd**.
This variable will be used for the workspace name in our **Faraday** instance.
Now, we need to download both reports generated in the previously executed jobs using the **actions/download-artifact@master** action.
Lastly, we need to install **faraday-cli** and then perform an authentication, create a workspace and process our reports. This last step uses the other declared variables in the **Secrets** section (previously mentioned) and uses some GitHub context variables too.
The workspace name format will be **<repository-name>-<date>-<github-running-number>**, so for example it can be: **faraday-pipelines-2020-11-03-68**.

Important Note: Faraday has GitHub Custom Action available which allows you to process the reports too. However, this is not mandatory. In case you want to use this custom action, the Upload Job should be defined as follows:

```
  upload:
    needs: [scan]
    runs-on: ubuntu-latest

    steps:

      - name: Get current date
        id: date
        run: echo "::set-output name=date::$(date +'%Y-%m-%d')"

      - name: Download Zap Report Artifact
        uses: actions/download-artifact@master
        with:
          name: zap-report
          path: zap-report
```

```
      - name: Download Bandit Report Artifact
        uses: actions/download-artifact@master
        with:
          name: bandit-report
          path: bandit-report

      - name: Upload Reports to Faraday
        uses: infobyte/gha-faraday-report-uploader@main
        with:
          host: ${{ secrets.FARADAY_HOST }}
          username: ${{ secrets.FARADAY_USERNAME }}
          password: ${{ secrets.FARADAY_PASSWORD }}
          workspace: ${{ github.event.repository.name }}-
${{ steps.date.output.date }}-${{ github.run_number }}
          files: bandit-report/flaskapp_faraday_bandit.xml zap-report/zap-report.xml
```

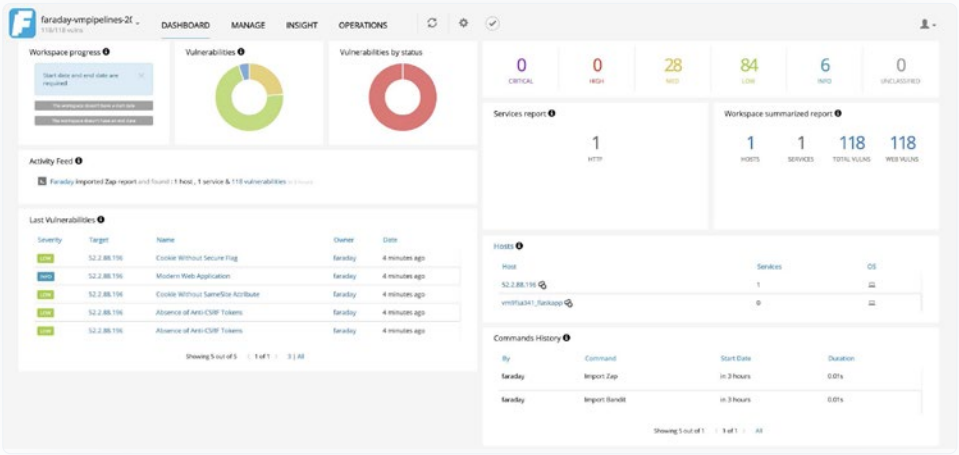
After commiting and pushing the changes with our brand new **ci.yml** file, we can see the running result clicking on the tab **Actions** of our GitHub Repository.



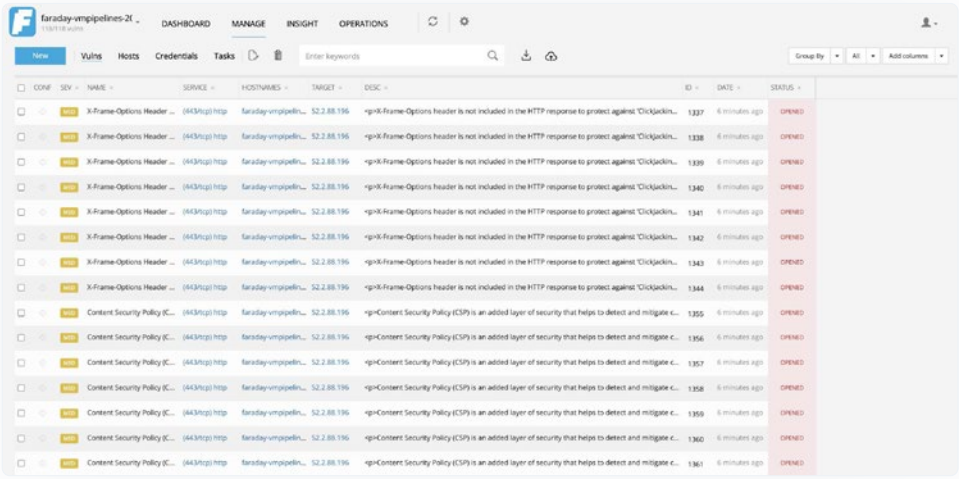
If you want, you can download the raw reports generated by **Bandit** and **OWASP Zap** (they're attached to the action result when you use the **actions/upload-artifact@v2**).

Now, if you look into your **Faraday** instance, you should see your new workspace created in the previous GitHub Action running this way:

Finally, you can see the dashboard workspace:



As you can see, several vulns were found. These vulnerabilities can be easily managed as usual with Faraday, as shown in the following status report image:



Conclusions

Now you know how to easily integrate Faraday with our CD/CI feature using a few tools.

As mentioned in the introduction, keeping our apps integrated with Faraday will allow us to ease the security team's work in the company, allowing us to detect earlier security bugs that could be released in the production version. All of this by just adding simple middle steps in the CI/CD process.

This example has been created focusing on GitHub Actions, but can be extended for other CI/CD tools like Travis CI, Jenkins, Bitbucket Pipelines, among others.

Last but not least, for this example we used only two reports, but you can use all the scanners you'd like because Faraday is compatible with a **large list of reports.** The only limit is your imagination!

Useful links

App Vuln Management: Integrating Faraday in the software development process

What is DevSecOps?
Vulnerability Management
Example used repo + Script import_scan.py
GitHub Actions Documentation
Faraday plugin's list
OWASP Zap official website
Bandit official website
How to deploy a Python's application in Heroku
How to deploy a flask application in heroku using GitHub Actions
Vulnerable application used in this example
GitHub Action: Faraday Uploader