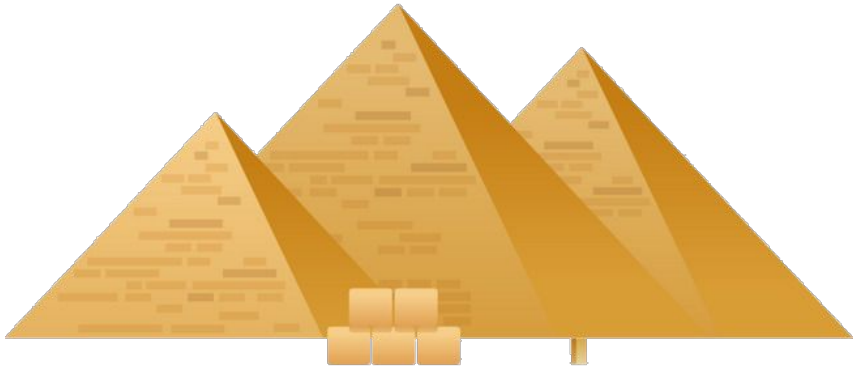

Discover project Thoth

Thoth team - https://thoth-station.ninja

Presented by:

Maya Costantini <mcostant@redhat.com>
Fridolin Pokorny <fridolin@redthat.com>

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$ whoarewe

- Thoth - AIDevSecOps
  - Started (2018) as a research project in AICoE team, Office of the CTO
  - https://thoth-station.ninja
- Current members:
  - Christoph Goern, Dominik Tuchyna, Francesco Murdaca, Frido Pokorny, Gage Krumbach, Gregory Pereira, Harshad Reddy Nalla, Kevin Postlethwait, Maya Costantini, Pep Turro Mauri, Viliam Podhajecky
- See our linked YouTube channel for more information
- Follow us on Twitter - @ThothStation

Our mission

- Help Python developers and data scientists create healthy applications

- Project has multiple parts:
  - AICoE-CI - a CI that builds container images
  - Thoth resolver - a recommendation engine for Python applications
    - AIDevSecOps
  - Dependency Monkey - a service that can validate software in a cluster
  - jupyterlab-requirements extension for managing dependencies
  - Bots maintaining GitHub repositories
  - A self hosted Python package index using Pulp available to all Red Hatters
  - Container image analysis and containerized Python applications

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Agenda

1. Introducing Python cloud based resolver
2. Benefits of resolving application dependencies in the cloud
   a. Know your runtime environment
   b. Know your Python dependencies
3. A CLI for the Python cloud based resolver
4. Demo

Thoth: The cloud Python resolver

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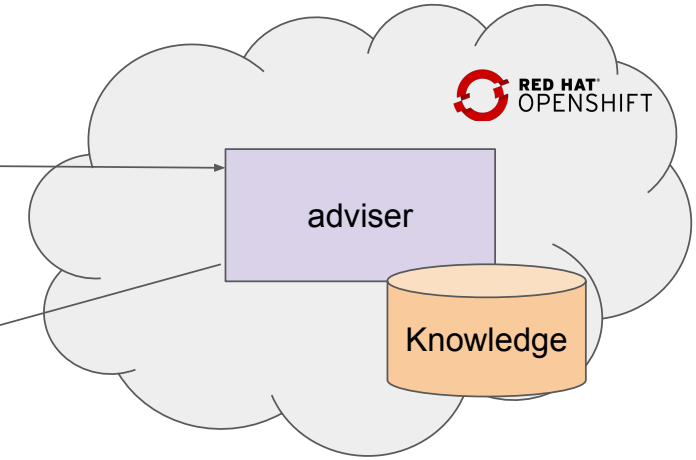
The Python resolver run in cloud

- Recommendation engine for Python applications
- Publicly available to the community
- Stochastic resolver implementing gradient-free reinforcement learning methods
  - Temporal difference learning is used in production
- See documentation for more information:
  - https://thoth-station.ninja/docs/developers/adviser

Python cloud resolver

Requirements
Constraints
Information about software in runtime environment
 - OS, Python version, base image, CUDA, ...
Information about hardware in runtime environment
 - CPU, GPU, ...
Static source-code analysis
Recommendation type



Lockfile + justification

```
$ pip install thamos
$ thamos config
$ thamos advise
```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Declarative interface for the resolver to resolve Python packages following prescribed rules

Prescriptions - declarative interface to the cloud based resolver

- Provide a way to declaratively state how the resolution process should look like
- Community driven open database used by the resolver to resolve high quality software - you can contribute!
  - https://github.com/thoth-station/prescriptions/
- A set of YAML files that are automatically consumed by the resolver in a deployment
- See documentation for more information:
  - https://thoth-station.ninja/docs/developers/adviser/prescription.html

Prescriptions - Example

- Pillow in version 8.3.0 does not work with NumPy

  https://github.com/python-pillow/Pillow/issues/5571

```
with PIL.Image.open(filepath) as img:
      numpy.array(img, dtype=numpy.float32)
```

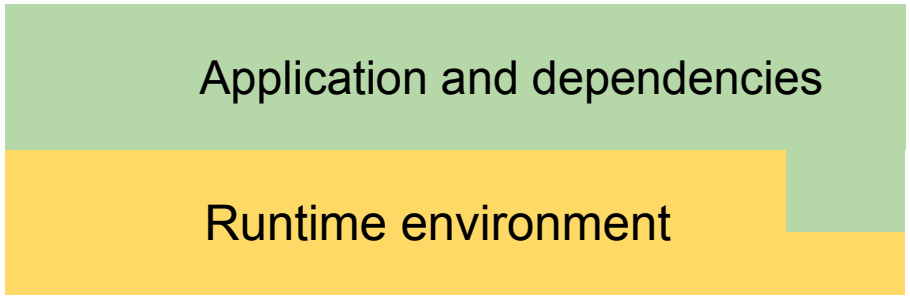
```
>           frame_paletted = np.array(im, np.uint8)
E           TypeError: __array__() takes 1 positional argument but 2 were given

/lib/python3.9/site-packages/imageio/plugins/pillow.py:745: TypeError
```

```
units:
 steps:
 - name: Pillow830TypeErrorStep
   type: step
   should_include:
     adviser_pipeline: true
   match:
     package_version:
       name: pillow
       version: ==8.3.0
       index_url: https://pypi.org/simple
     state:
       resolved_dependencies:
       - name: numpy
   run:
     not_acceptable: Pillow in version 8.3.0 does not work with NumPy
     stack_info:
     - type: WARNING
       message: Pillow in version 8.3.0 does not work with NumPy
       link: https://github.com/python-pillow/Pillow/issues/5571
```

Fitting the runtime environment

- Checking RPM, Python packages, ABI, CUDA, cuDNN, OpenMKL, ...
- One central place to declare requirements
  - Prescriptions (packages)
  - User's runtime environment (Pipfile, .thoth.yaml file)
- Still optional, the resolution might be "generic", like pip, Pipenv, ...



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Security - AIDevSecOps

- Docs: Thoth security advises
- Recommendations based on static source code analysis
  - See recommendations from the Python standard library (example)
- PyPA - advisory-db
  - A database of known vulnerabilities in Python ecosystem
  - https://github.com/pypa/advisory-db
- Security Scorecards by Open Source Security Foundation
  - https://openssf.org/blog/2020/11/06/security-scorecards-for-open-source-projects/
  - Example: see scorecards_prefixed prescriptions for TensorFlow
- + additional information about Python packages not strictly related to security

🖥 Demo

```
pip install thamos
thamos config
thamos add “flask~=0.12”
thamos advise
```

Look at the tutorial documentation to reproduce the demo

https://redhat-scholars.github.io/managing-vulnerabilities-with-thoth

Thank you

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