

Introduction to Containers with Docker

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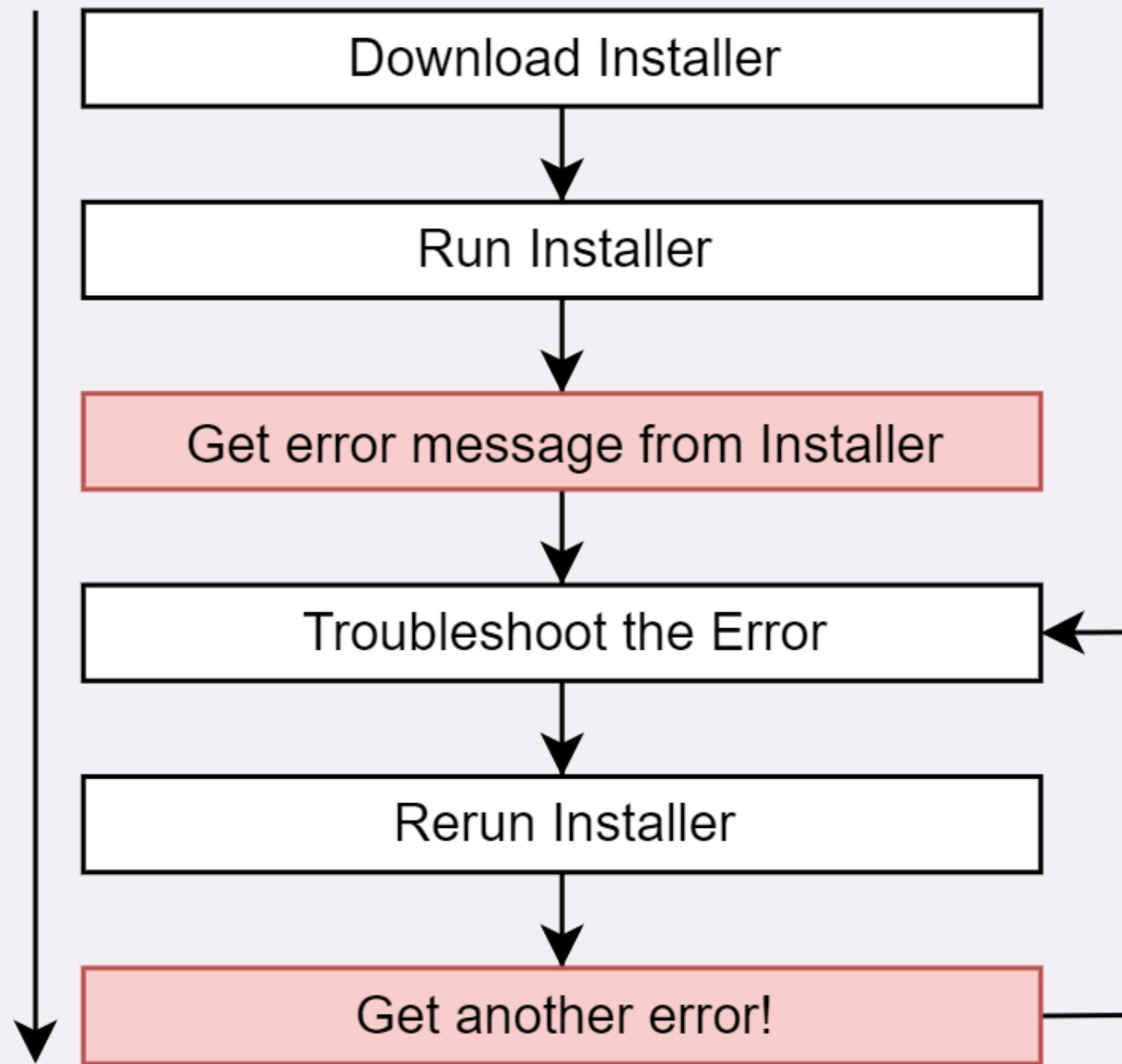
18th January, 2020

AGENDA

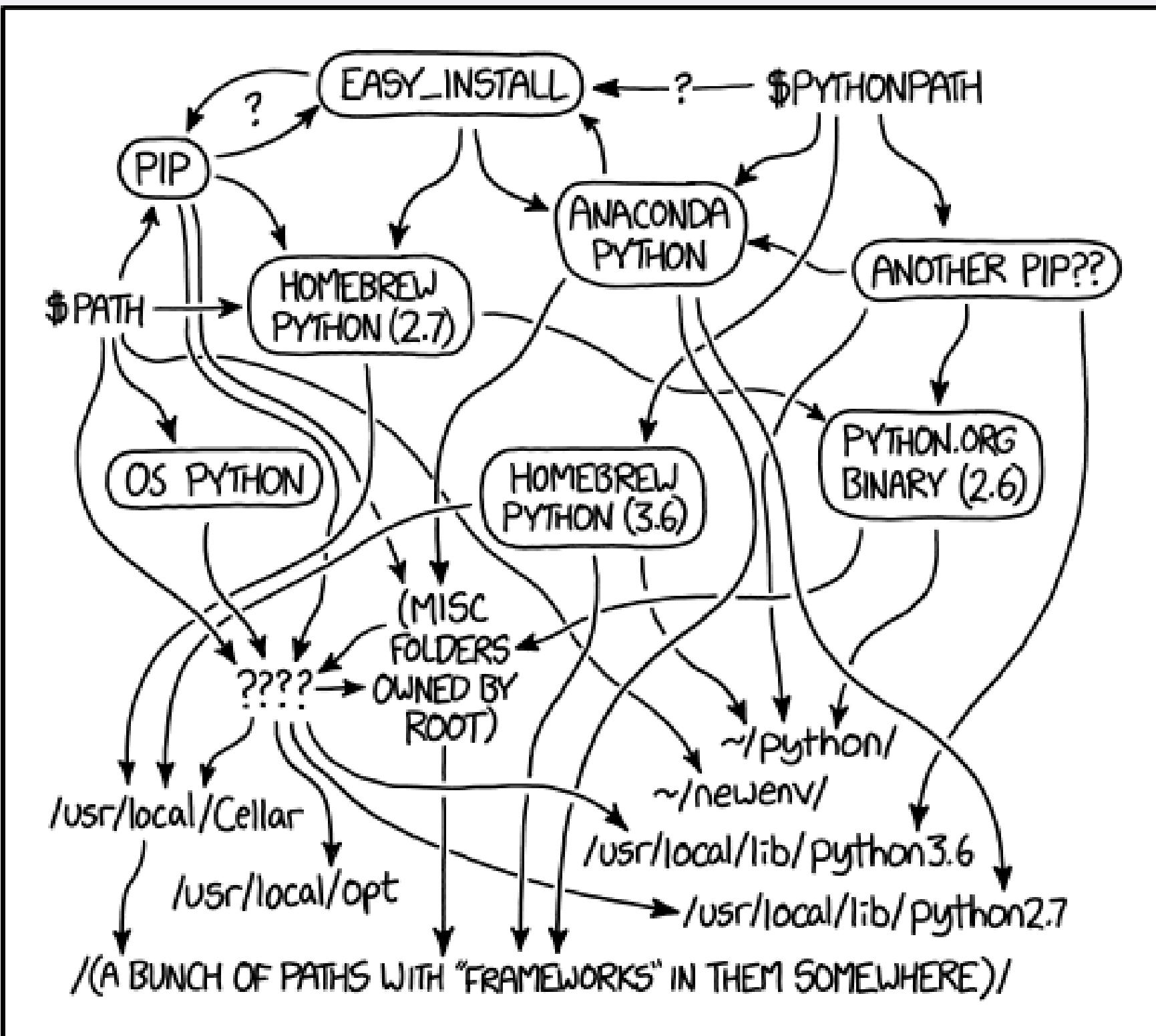
1. How to install an Application?
2. Docker- What & Why?
3. How Docker works?
4. Containers
5. Docker Installation
6. Docker CLI Commands
7. Dockerfile
8. Building a Docker Image
9. Wrapping Up

How to install a software?

Flow



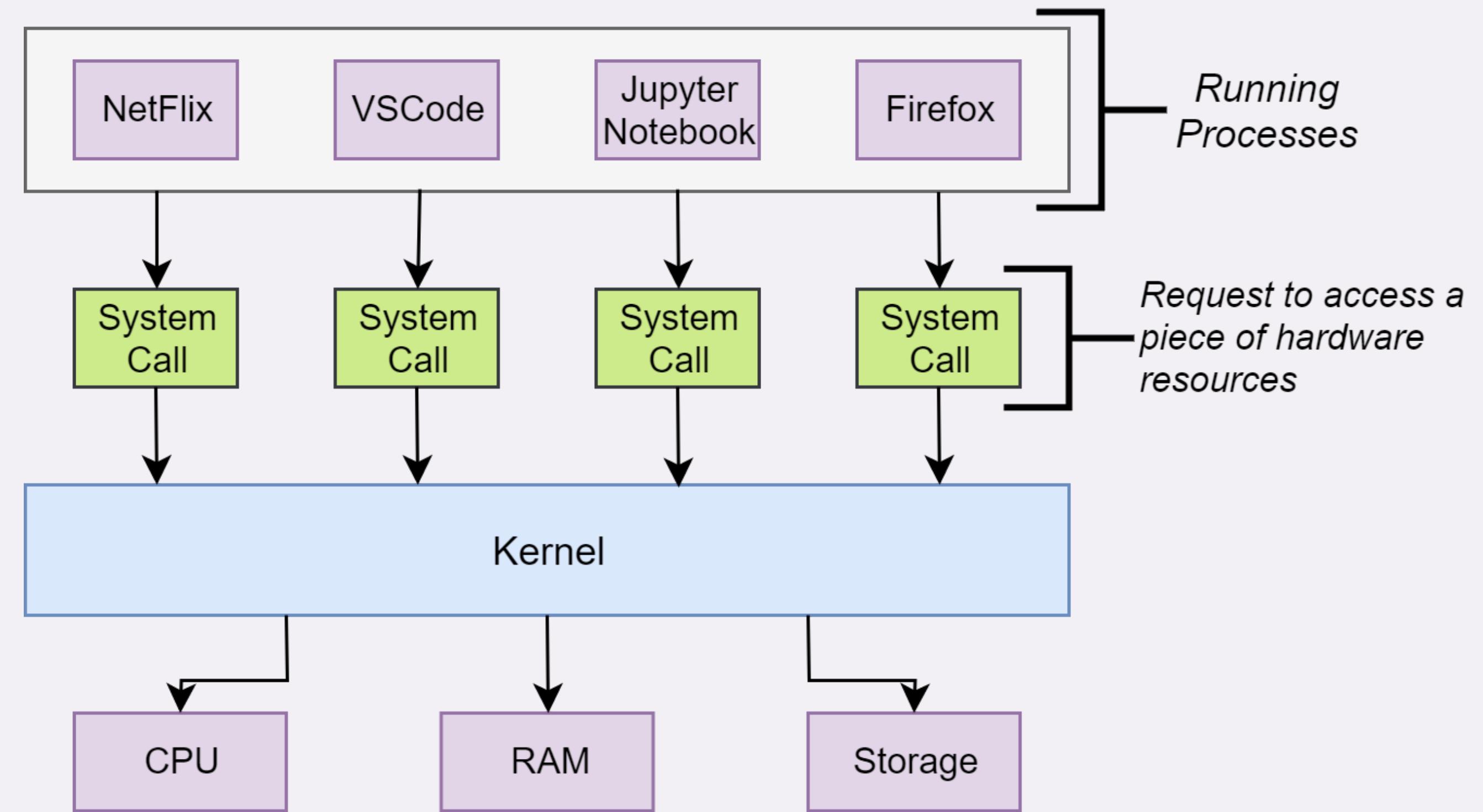
THE PROBLEM WITH SOFTWARE INSTALLATION



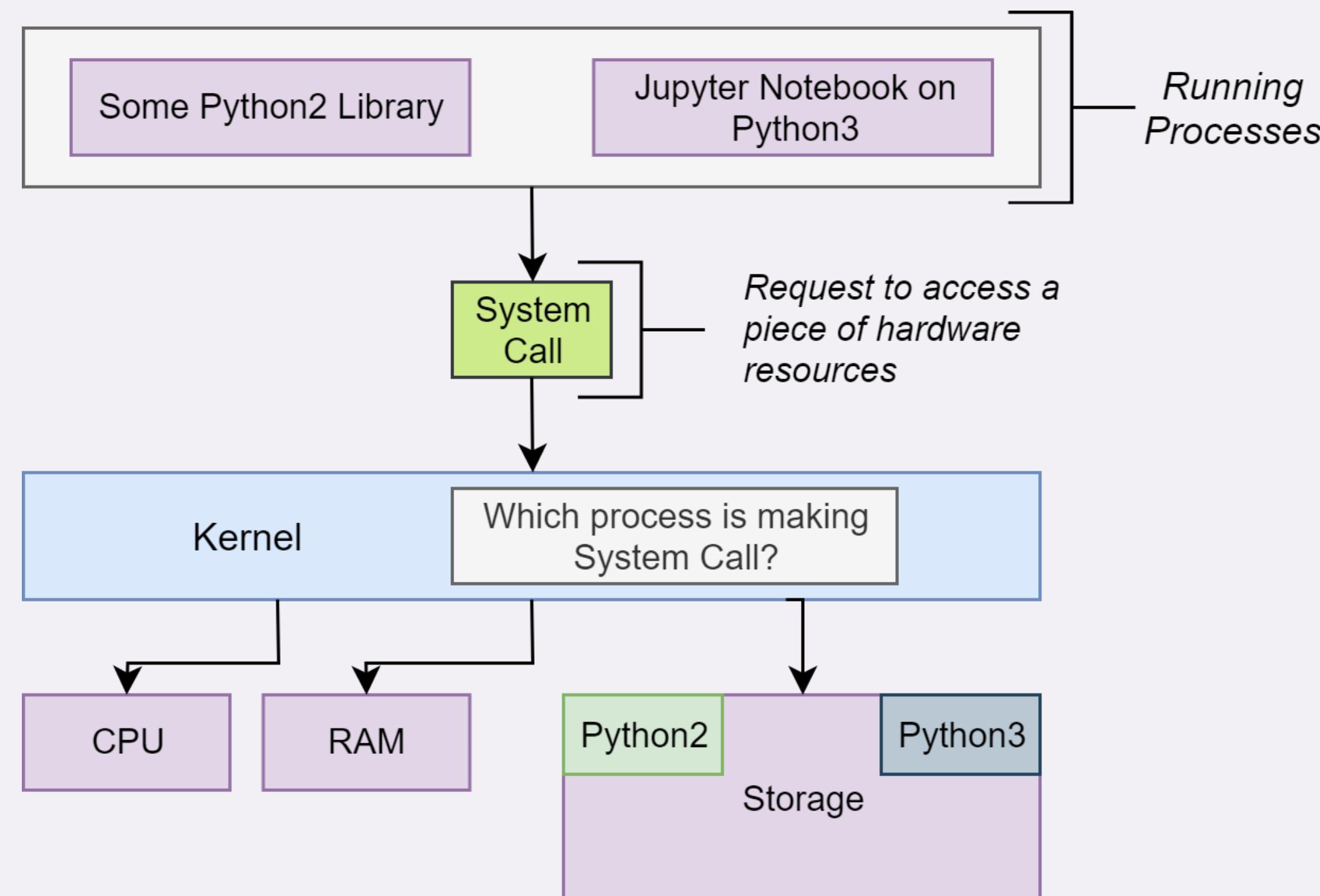
THE PROBLEM WITH SOFTWARE DEPENDENCY

xkcd.com/1987/

How programs run in a Hardware



Conflicting Dependencies



Namespace & Cgroups

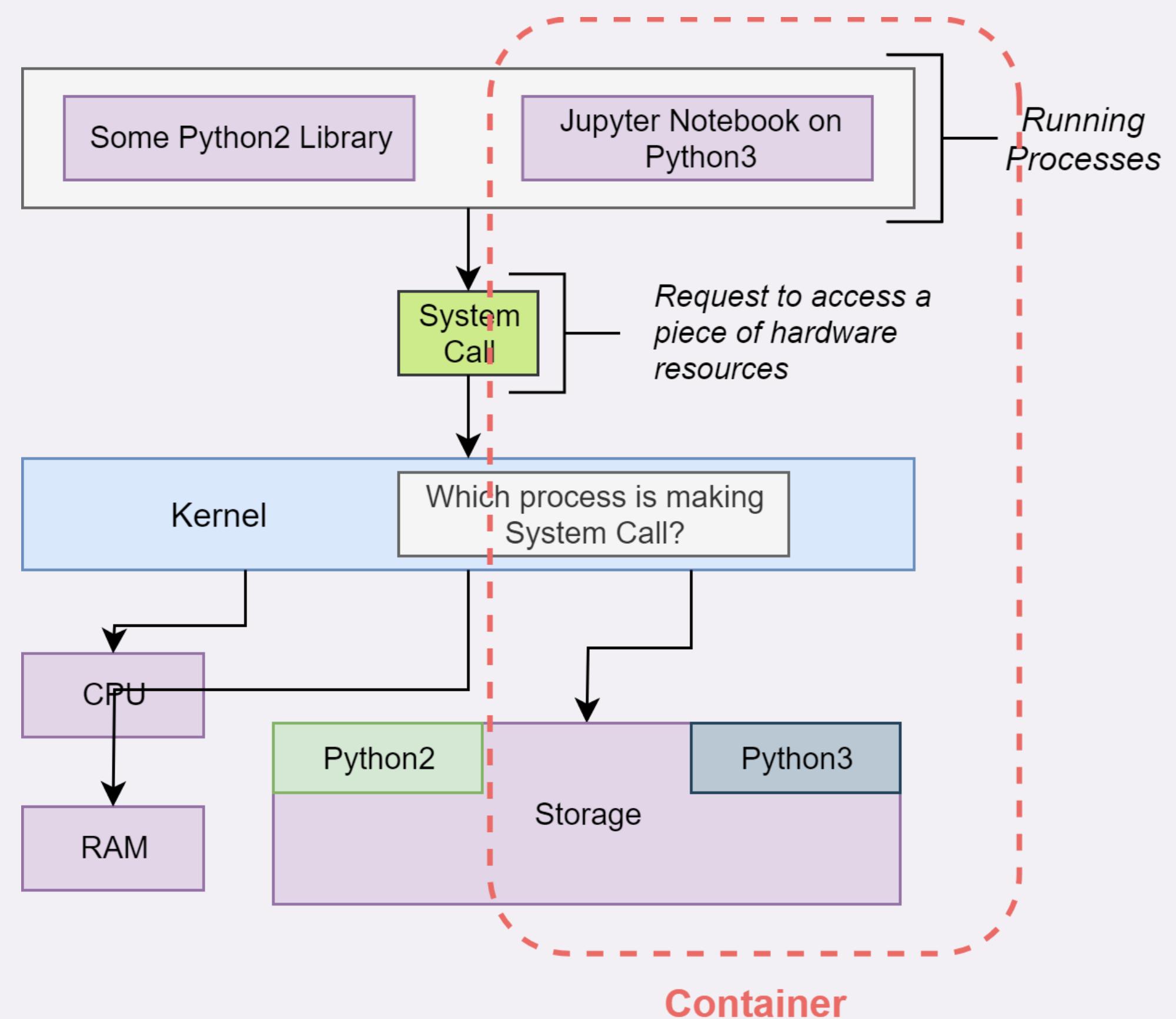
● NAMESPACES

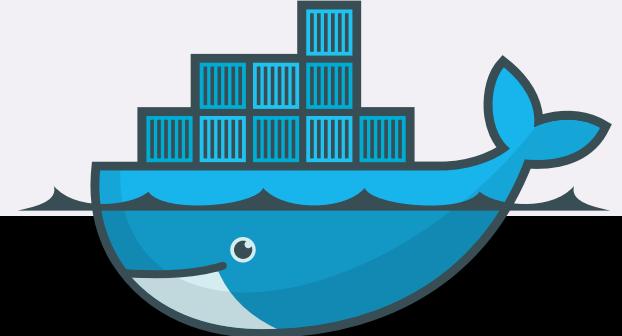
- Isolates resources per process or a group of processes
- Resources:
 - Processes (Other)
 - Storage
 - Network
 - Users
 - Hostnames

● CONTROL GROUPS

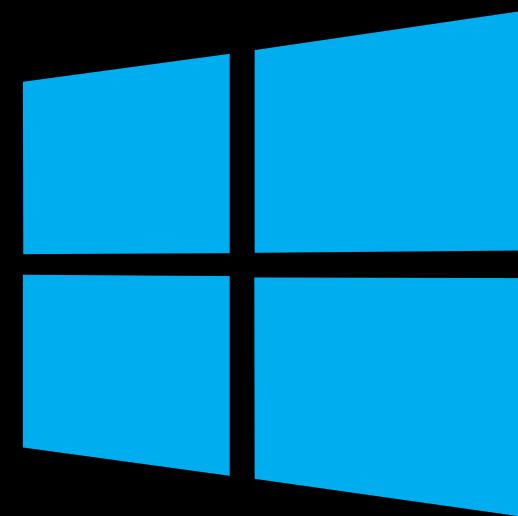
- Limits amount of resource per process
- Resources:
 - CPU
 - Memory
 - Storage I/O
 - Network Bandwidth

WHAT IS A CONTAINER?





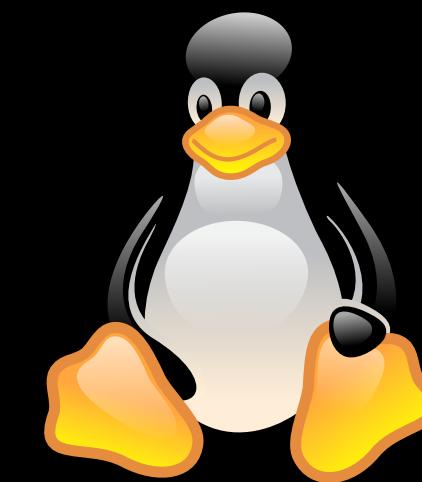
DOCKER INSTALLATION



1. Native Installation
2. Docker Toolbox
(Runs on VirtualBox)



1. Native Installation
2. Docker Toolbox
(Runs on VirtualBox)



1. Default Package Repo
2. Official Docker Repo

\$ docker run <image name>

```
● ● ●
Terminal

user@docker:~$ docker run hello-world
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
1b930d010525: Pull complete
Digest: sha256:9572f7cdcee8591948c2963463447a53466950b3fc15a247fcad1917ca215a2f
Status: Downloaded newer image for hello-world:latest

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
1. The Docker client contacted the Docker daemon.
2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
   (amd64)
3. The Docker daemon created a new container from that image which runs the
   executable that produces the output you are currently reading.
4. The Docker daemon streamed that output to the Docker client, which sent it
   to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
$ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
https://hub.docker.com/

For more examples and ideas, visit:
https://docs.docker.com/get-started/
```

```
$ docker run <image name> <custom command with arguments>
```



```
user@docker:~$ docker run busybox echo hello! world
Unable to find image 'busybox:latest' locally
latest: Pulling from library/busybox
bdbbaa22dec6: Pull complete
         Digest: sha256:6915be4043561d64e0ab0f8f098dc2ac48e077fe23f488ac24b665166898115a
Status: Downloaded newer image for busybox:latest
hello! world
```

\$ docker ps



CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS
PORTS	NAMES			
45e3238b7e06	drake666/redis_serv	"redis-server" funny_northcutt	9 seconds ago	Up 9 seconds
8d8b5ed95967	busybox	"ping google.com" vigilant_chatterjee	49 seconds ago	Up 49 seconds
92cfa5123c57	drake666/soif	"gunicorn '-b :80' w..." 0.0.0.0:80->80/tcp kind_joliot	About a minute ago	Up About a minute

docker system prune

```
user@docker:~$ docker system prune
WARNING! This will remove:
- all stopped containers
- all networks not used by at least one container
- all dangling images
- all dangling build cache

Are you sure you want to continue? [y/N] y
Deleted Containers:
d1c36ffe80608cf5046742a15b570f22c774895efdca4825756dfb01b32d6b6e

Deleted Images:
deleted: sha256:bbfcc48c17e5ab979fb2e8f16d455d1430daed800e18acce75d23fa2fcfa7f7ab
deleted: sha256:ec80076d0b32450471d3d1eab8d2266c477c8f40597be383a64ccda4b4c9cdf6
deleted: sha256:cd733ac0762d0915343884203be192cc63452bb84bd2fd52d59e99c17a67535c
deleted: sha256:cf1c276924286cea9b248978dbb90022b1539f72995b8b0fde584d6753390dc3
deleted: sha256:af3656a58e0ea345e76b1fec914235495dbda1b78ae00b77c56e894c8478da3c
deleted: sha256:06b7fb1c822e0de3cc2552ef3a0ae31d54ffbaac6e4dd8af5673800271bd0371
deleted: sha256:bd7820b15b8d6ea50c71b8366339d43fef225d4c0d058f9787022a103e029053
deleted: sha256:d84c0c19666b1d10a1957117120f16c78fcc7368d3d9c750ab44d478db5cd494
deleted: sha256:ad61abad8b9813cc7b635ccdef19bcbf3b3f0b78b5e515439f547ddcea56a301
deleted: sha256:c9d38ddb9edbf82c0ed38dab4c89ad36d39d1c01d31b2a5ada1d8e6894577875
deleted: sha256:22390a8e0f853278442209c57f8b33f3377c154a978f5518c48c88091df0e137
Total reclaimed space: 943.2kB
```

```
$ docker stop <container id>
$ docker kill <container id>
```

```
● ● ●

user@docker:~$ docker ps
CONTAINER ID        IMAGE               COMMAND
8d8b5ed95967      busybox             "ping google.com"
user@docker:~$ docker stop 8d8b5ed95967 # SIGTERM kill
8d8b5ed95967
user@docker:~$ docker start 8d8b5ed95967
8d8b5ed95967
user@docker:~$ docker kill 8d8b5ed95967 # instant kill
```

```
$ docker run -it <image> <command>
$ docker exec -it <container id> <command>
```

```
● ● ●

user@docker:~$ docker run -it busybox sh
/ #
/ # ls
bin dev etc home proc root sys tmp usr var
/ # cd root
~ # ls
~ # exit
user@docker:~$ docker exec -it 92cfa5123c57 bash
root@92cfa5123c57:/usr/src/app# ls
Dockerfile LICENSE Procfile README.md __pycache__ app.py deprecated.py mongoconfig.py
requirements.txt runtime.txt static templates test_class.py wsgi.py
root@92cfa5123c57:/usr/src/app# exit
exit
```

Dockerfile

```
● ● ●  
FROM alpine  
  
RUN apk add --update redis  
  
CMD [ "redis-server"]  
  
EXPOSE 6379
```

```
● ● ●  
FROM python:3  
  
WORKDIR /usr/src/app  
  
COPY requirements.txt ./  
RUN pip install -r requirements.txt  
  
COPY . .  
  
CMD [ "gunicorn", "-b :80" , "wsgi:app"]  
  
EXPOSE 80
```

\$ docker build -t <username>/<repository> .

```
user@docker:~$ docker build -t user/redis-alpine .
Sending build context to Docker daemon 5.482MB
Step 1/4 : FROM alpine
latest: Pulling from library/alpine
e6b0cf9c0882: Pull complete
Digest: sha256:2171658620155679240babee0a7714f6509fae66898db422ad803b951257db78
Status: Downloaded newer image for alpine:latest
--> cc0abc535e36
Step 2/4 : RUN apk add --update redis
--> Running in 43dfe48abf9e
fetch http://dl-cdn.alpinelinux.org/alpine/v3.11/main/x86_64/APKINDEX.tar.gz
fetch http://dl-cdn.alpinelinux.org/alpine/v3.11/community/x86_64/APKINDEX.tar.gz
(1/1) Installing redis (5.0.7-r0)
Executing redis-5.0.7-r0.pre-install
Executing redis-5.0.7-r0.post-install
Executing busybox-1.31.1-r8.trigger
OK: 7 MiB in 15 packages
Removing intermediate container 43dfe48abf9e
--> 429d91d9d7d1
Step 3/4 : CMD ["redis-server"]
--> Running in 5841b24c4490
Removing intermediate container 5841b24c4490
--> 103b928abd8e
Step 4/4 : EXPOSE 6379
--> Running in f0c6ef644e0c
Removing intermediate container f0c6ef644e0c
--> b988ebc0cd8a
Successfully built b988ebc0cd8a
Successfully tagged user/redis-alpine:latest
```

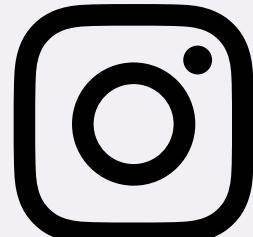
ABOUT ME



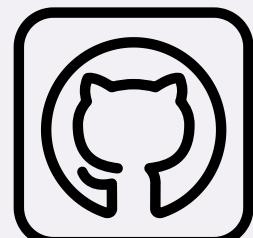
- Enthusiast in Cloud, IoT, DevOps and Electronics
- Finalist in TCS Inframind 2019 in DevOps
- Photographer ☔



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@snehangshu_b



@forkbomb-666

THANK YOU!