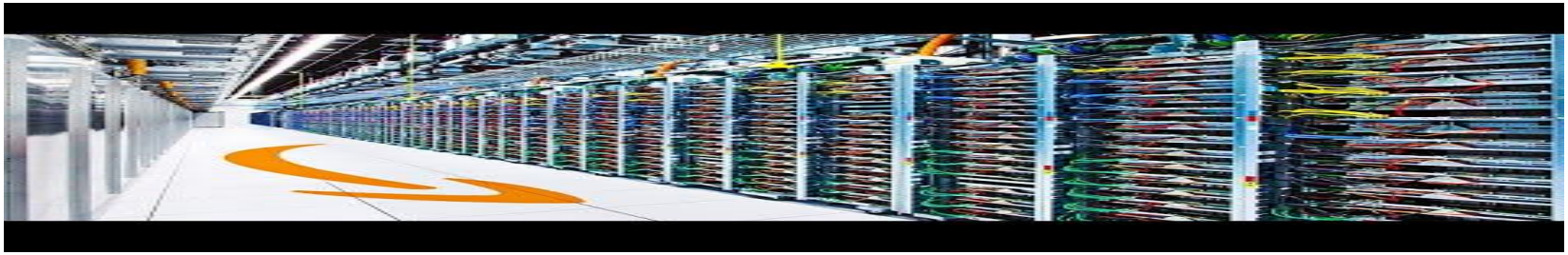
Software execution and packaging

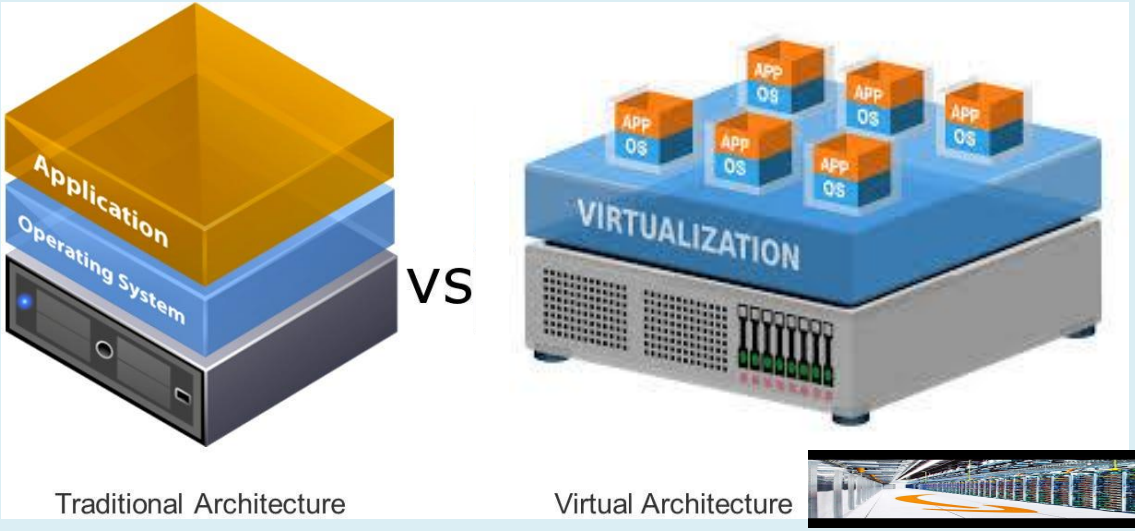
- Virtual machines
- Software packaging
- Examples
- Trade-offs

Software execution



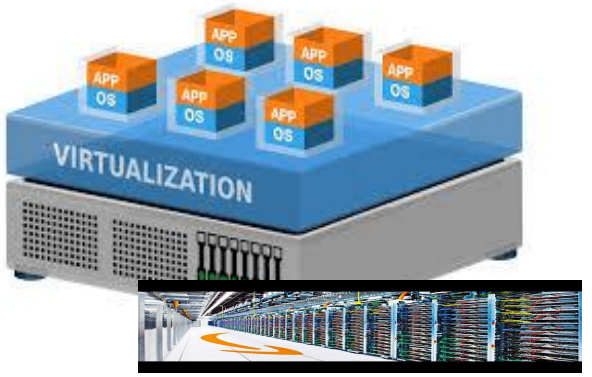
Virtual machines

- Software runs on a "virtual machine"
- A virtual machine is software that acts like a physical machine



Why not run directly on the hardware?

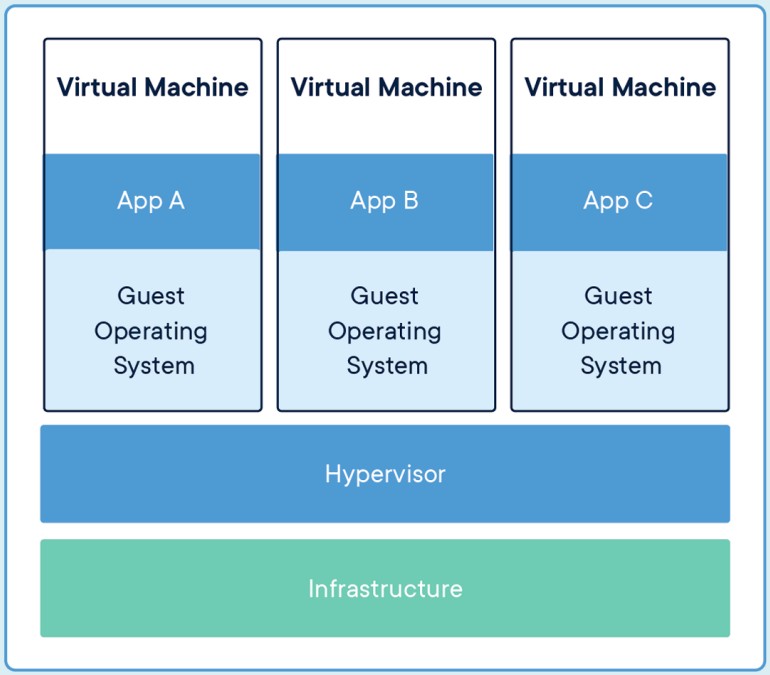
The extra layer(s) introduce complexity and some inefficiency, but…

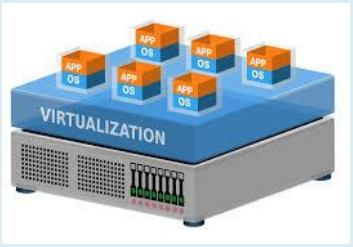


- Servers are big, share between customers
- Allow software to run anywhere in AWS
- Problems in one app do not impact others
  - *Hardware-enforced isolation between apps…*
- Allows live migration to another machine
    - *e.g. if you need more cores or RAM*

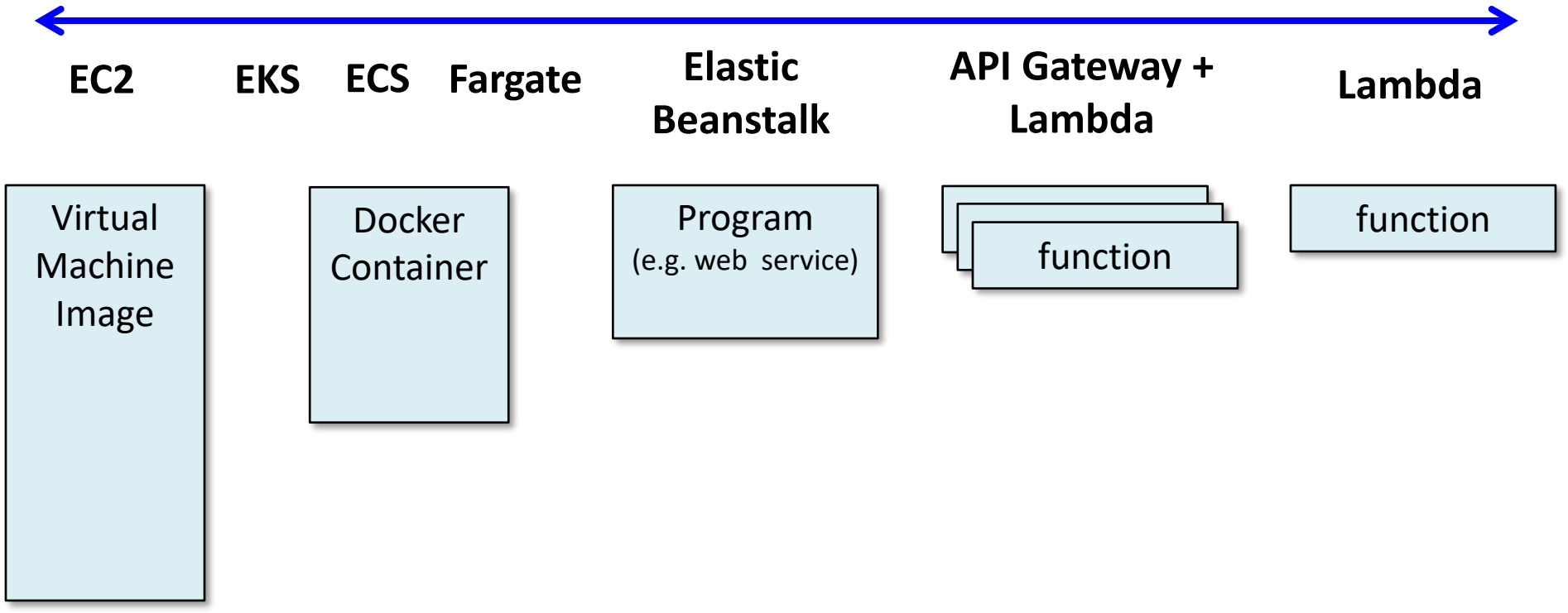
Example

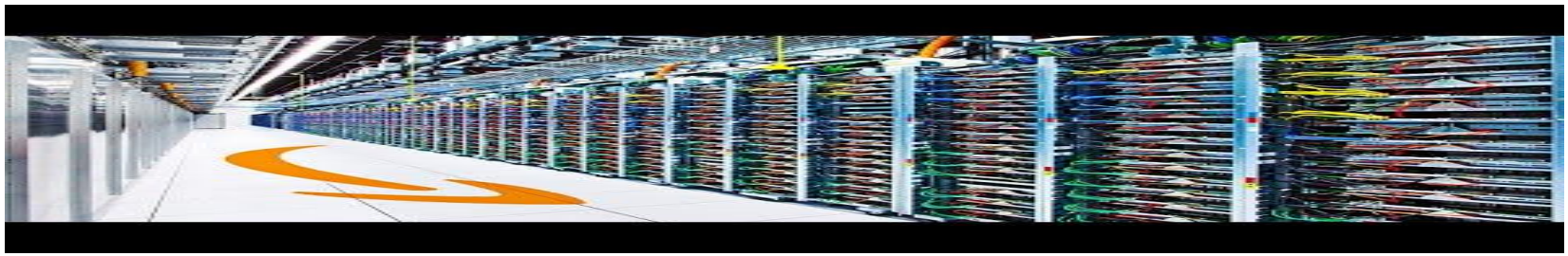
- My laptop is running Microsoft's Hyper-V
- On top of Hyper-V is Windows and Ubuntu





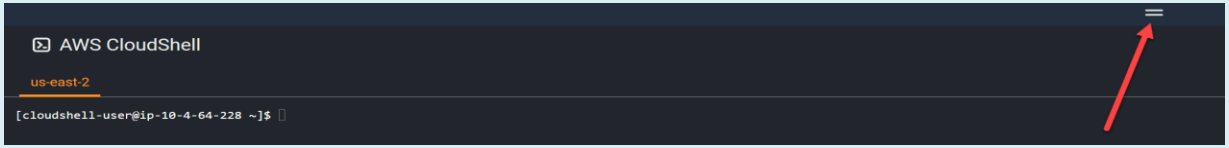
Software packaging options



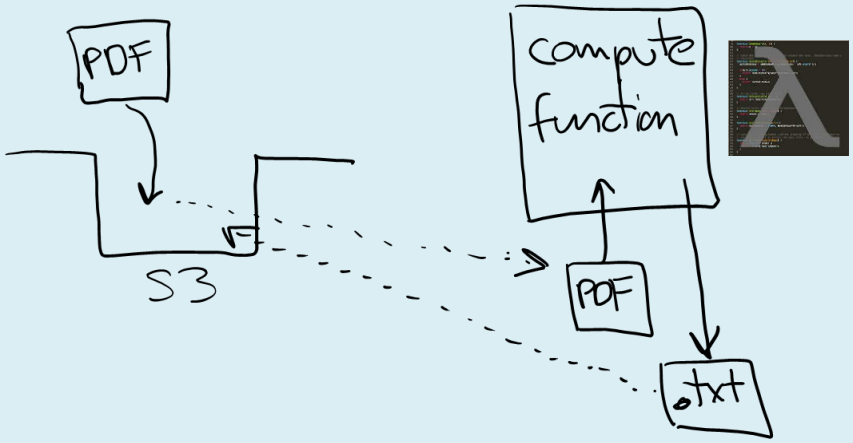


Example: Project 03

- **Used lambda to deploy compute function**
  - *We configured AWS, uploaded code, and AWS did the rest…*

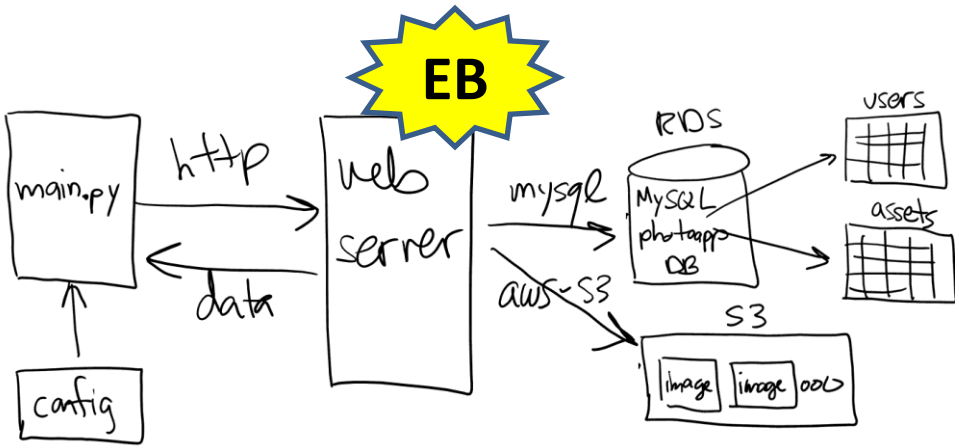



```
mkdir python
cd python
pip3 install pymysql pypdf typing_extensions==4.6.1 -t .
cd ..
zip -r pymysql-pypdf.zip python
aws s3 cp pymysql-pypdf.zip s3://my-lambda-layers
```



Example: Project 02

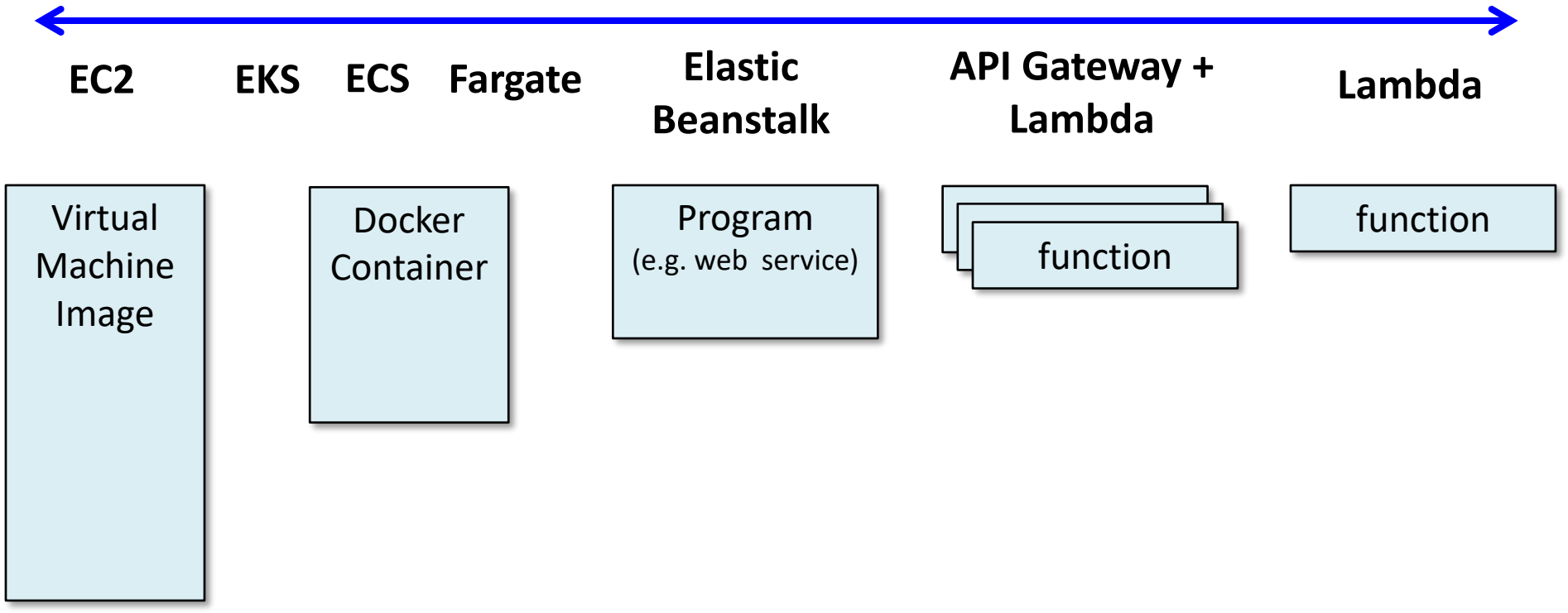
- **Used Elastic Beanstalk to host our web service**
  - *We configured AWS, uploaded .zip, AWS did the rest*

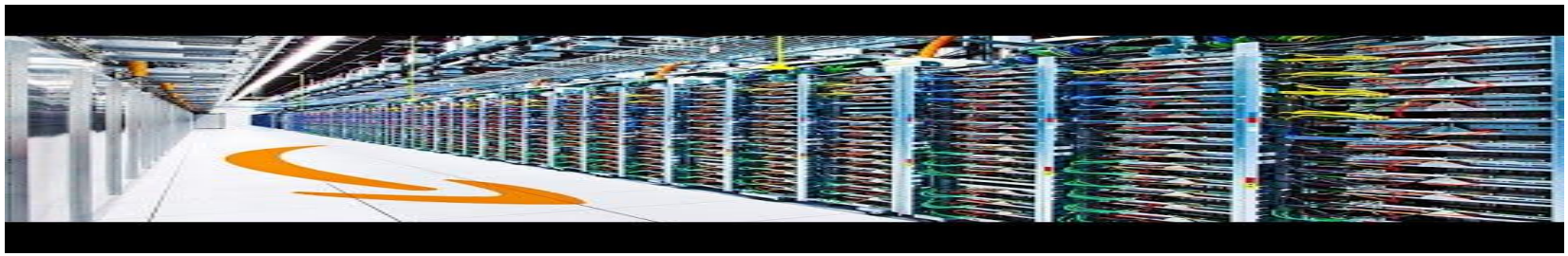



```
package.json
1  {
2    "name": "nodejs",
3    "version": "1.0.0",
4    "description": "",
5    "main": "app.js",
6    "scripts": {
7      "test": "echo \"Error: no test specified\" &&
8    },
9    "keywords": [],
10   "author": "",
11   "license": "ISC",
12   "dependencies": {
13     "@aws-sdk/client-s3": "^3.669.0",
14     "@aws-sdk/credential-providers": "^3.669.0",
15     "@types/node": "^22.7.4",
16     "aws-sdk": "^2.1691.0",
17     "express": "^4.21.0",
18     "ini": "^5.0.0",
19     "mysql": "^2.18.1",
20     "node-fetch": "^3.3.2",
21     "uuid": "^10.0.0"
22   },
23   "engines": {
24     "node": "18.20.4",
25     "npm": "10.7.0"
26   }
27 }
```

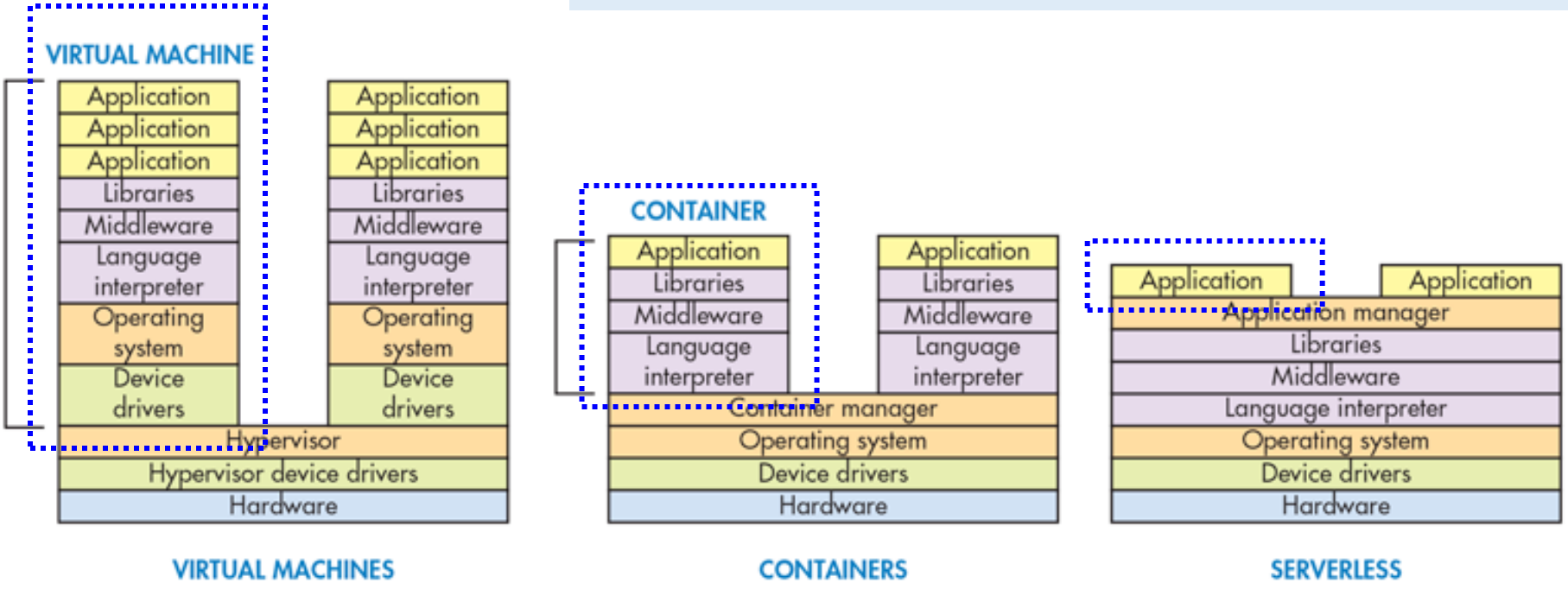
package.json

Software packaging options





Software packaging trade-offs



VIRTUAL MACHINES | CONTAINERS | SERVERLESS

Software development operations (DevOps)

Running in AWS frees you from *hardware* concerns, but many software operational concerns remain. These are all called **DevOps**:

- Install and configure 3rd party software:
  - *databases, web servers, libraries, distributed caches, message queues, coordination tools, etc.*
- Deploy new versions of your application when released
- Monitor application and OS health:
  - *OS security updates, log files, CPU utilization, cleanup disk space, vacuum database, etc.*
- Manage security:
  - *Configure users, set/rotate passwords/keys, monitor network traffic / logins / access*

That's it, thank you!