

Containers and Cloud Data Stores

The background of the slide features a photograph of the Alma Mater statue at the University of Illinois, which is a central figure in a long, flowing gown with her arms outstretched. The statue is set against a backdrop of trees with bare branches. The entire image is overlaid with a semi-transparent orange color, which serves as the background for the white text.

CS 240 - The University of Illinois

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October 14, 2021

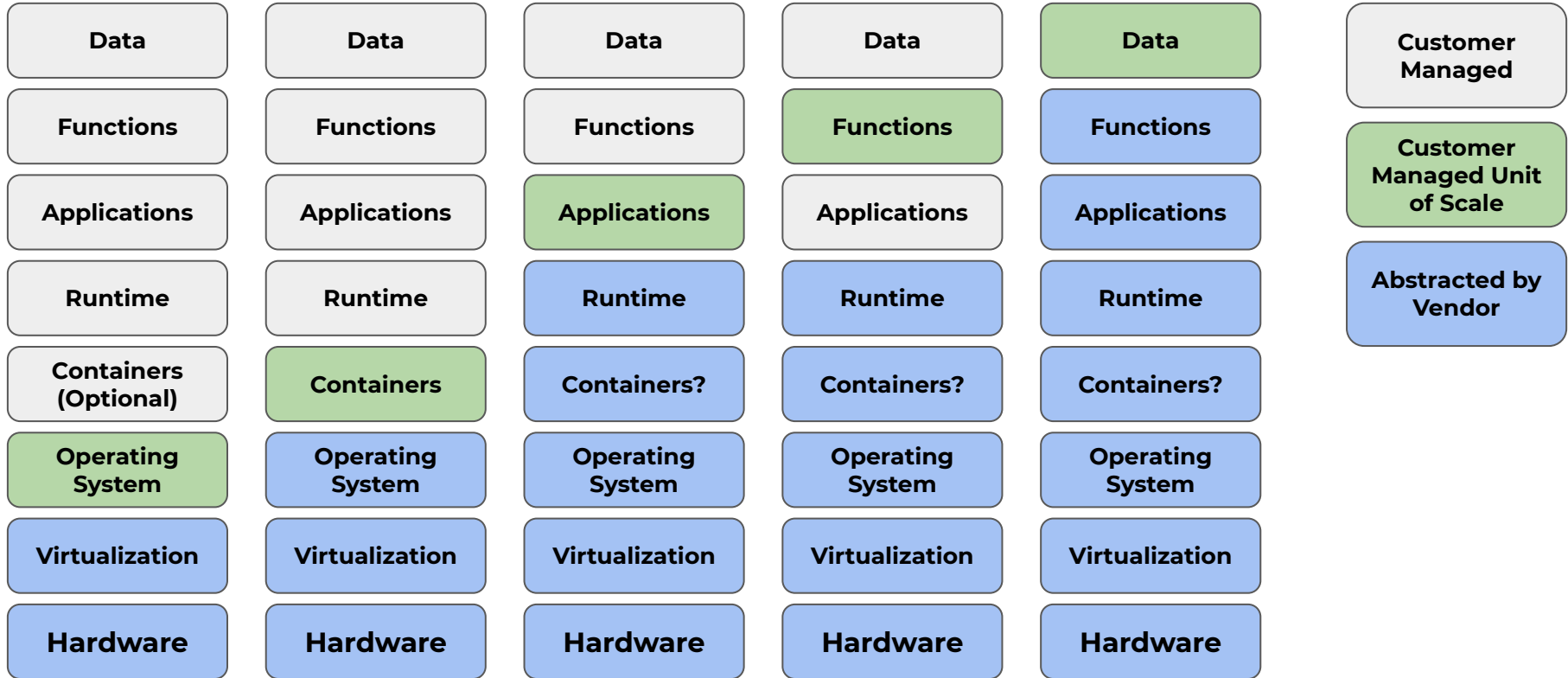
IaaS

CaaS

PaaS

FaaS

SaaS



Containers as a Service (CaaS)

Containers provide an **isolated snapshot** of a system that can be deployed in an isolated environment on heterogeneous systems.

Key Technology: **Docker**

Docker Containers

A photograph of a crowd gathered around a statue of Alma Mater, overlaid with a semi-transparent orange filter. The text "Docker Containers" is centered in white. The background shows a large group of people, mostly seen from the back, looking towards a central statue. The statue is a classical-style figure, likely representing a personification of knowledge or a university's founding figure. The scene is outdoors, with trees visible in the background. The overall color scheme is dominated by the orange overlay.

Docker Containers

Container Developer:

Container User:

```
1 FROM gcc:latest
2 COPY ./docker/entrypoint.sh /
3 RUN chmod +x entrypoint.sh
4 ENTRYPOINT ["/entrypoint.sh"]
```

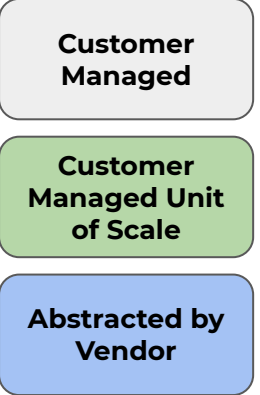
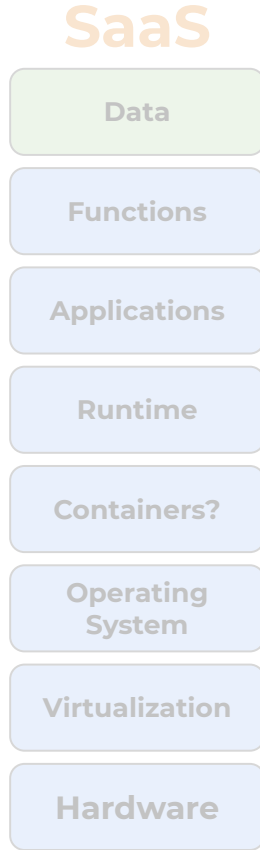
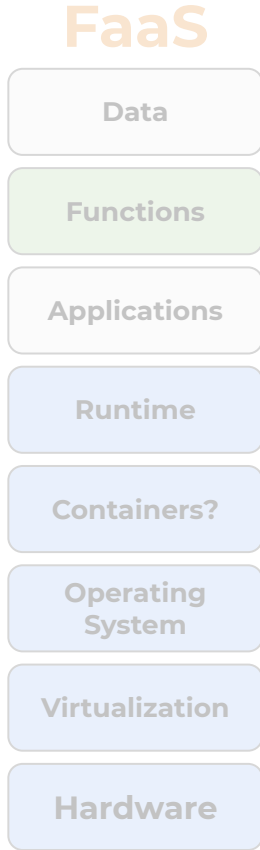
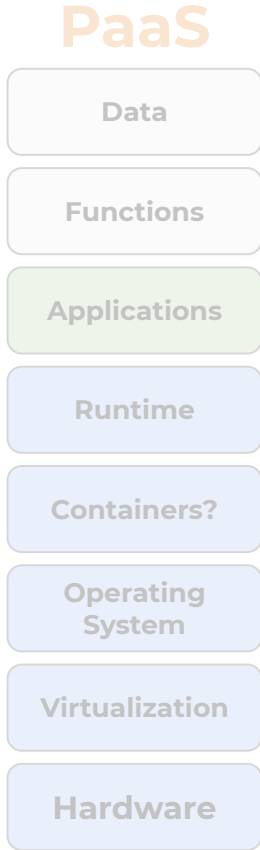
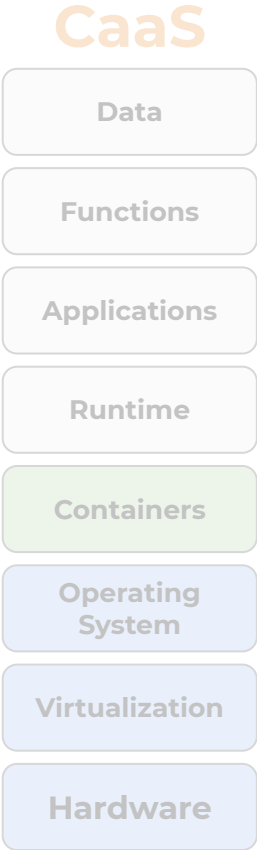
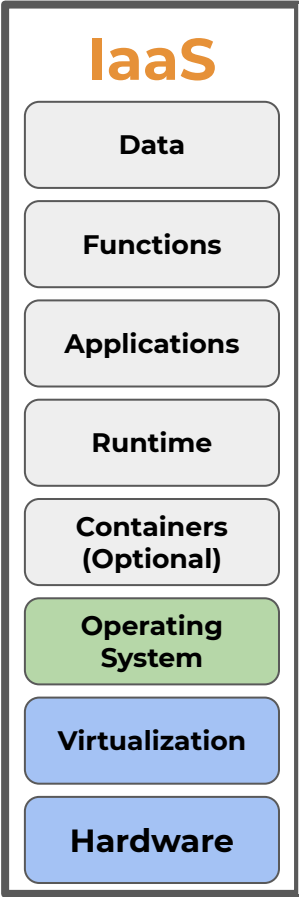
```
docker build --tag mp3-docker .
```

```
1 docker run -it --rm -v "pwd" :/mp3  
mp3-docker "make"
```

```
1 docker run --rm -it -p 27017:27017 mongo
```




AWS / Azure / GCP



AWS

t4g: Uses AWS Graviton2 CPUs (ARM, ex: M1-like)

t3a: Uses AMD CPUs (x86-64)

t3: Uses Intel CPUs

	vCPU	RAM	t4g	t3	t3a
nano	2	0.5 GiB	\$0.0042	\$0.0052	\$0.0047
micro	2	1 GiB	\$0.0084	\$0.0104	\$0.0094
small	2	2 GiB	\$0.0168	\$0.0208	\$0.0188
medium	2	4 GiB	\$0.0336	\$0.0416	\$0.0376

Azure

B1: Uses Intel CPUs (equivalent to **t3**)

	vCPU	RAM	B1
B1ls	1	0.5 GiB	\$0.0052
B1s	2	1 GiB	\$0.0104
B1ms	2	2 GiB	\$0.0207
B1s	2	4 GiB	\$0.0416

Google Compute Engine

Custom-built instances:

- \$0.022890 / vCPU hour
- \$0.003067 / GB hour

	vCPU	RAM	Price
(Custom)	0.25	0.5 GiB	~\$0.00725
(Custom)	1	4 GiB	~\$0.035158
e2-standard-2	2	8 GiB	\$0.067006
(Custom)	2	8 GiB	~\$0.070316

Data Stores

A photograph of a crowd of people gathered around a statue of Alma Mater, overlaid with a semi-transparent orange filter. The text "Data Stores" is centered in white. The background shows a large group of people, some looking towards the camera and others looking towards the statue. The statue is a large, classical-style figure standing on a pedestal. The overall scene is outdoors, with trees and foliage visible in the background.

Data Storage

Central to almost all cloud applications is data and there are many solutions to data storage available.

Option 1: In-Memory

Option 2: File-Backed Storage

Option 3: Key-Value Storage

Option 4: Document Store

Option 5: Relational Database

Option 6: Specialized Data Stores

MongoDB

A photograph of a crowd of people gathered around a statue of Alma Mater, overlaid with a semi-transparent orange filter. The text 'MongoDB' is centered in white. The statue is a large, classical-style figure standing on a pedestal. The crowd consists of many people, mostly seen from the back or side, looking towards the statue. The background shows bare tree branches, suggesting a winter or late autumn setting. The overall tone is warm due to the orange overlay.

```
1 docker run --rm -it -p 27017:27017 mongo
```



```
collection = db["cs240"]
```

```
collection.insert_one(  
    {"Hello": "World", "Name": "Wade"}  
)
```

```
collection.find_one(  
    {"Name": "Wade"}  
)
```