Introduction to the Cloud

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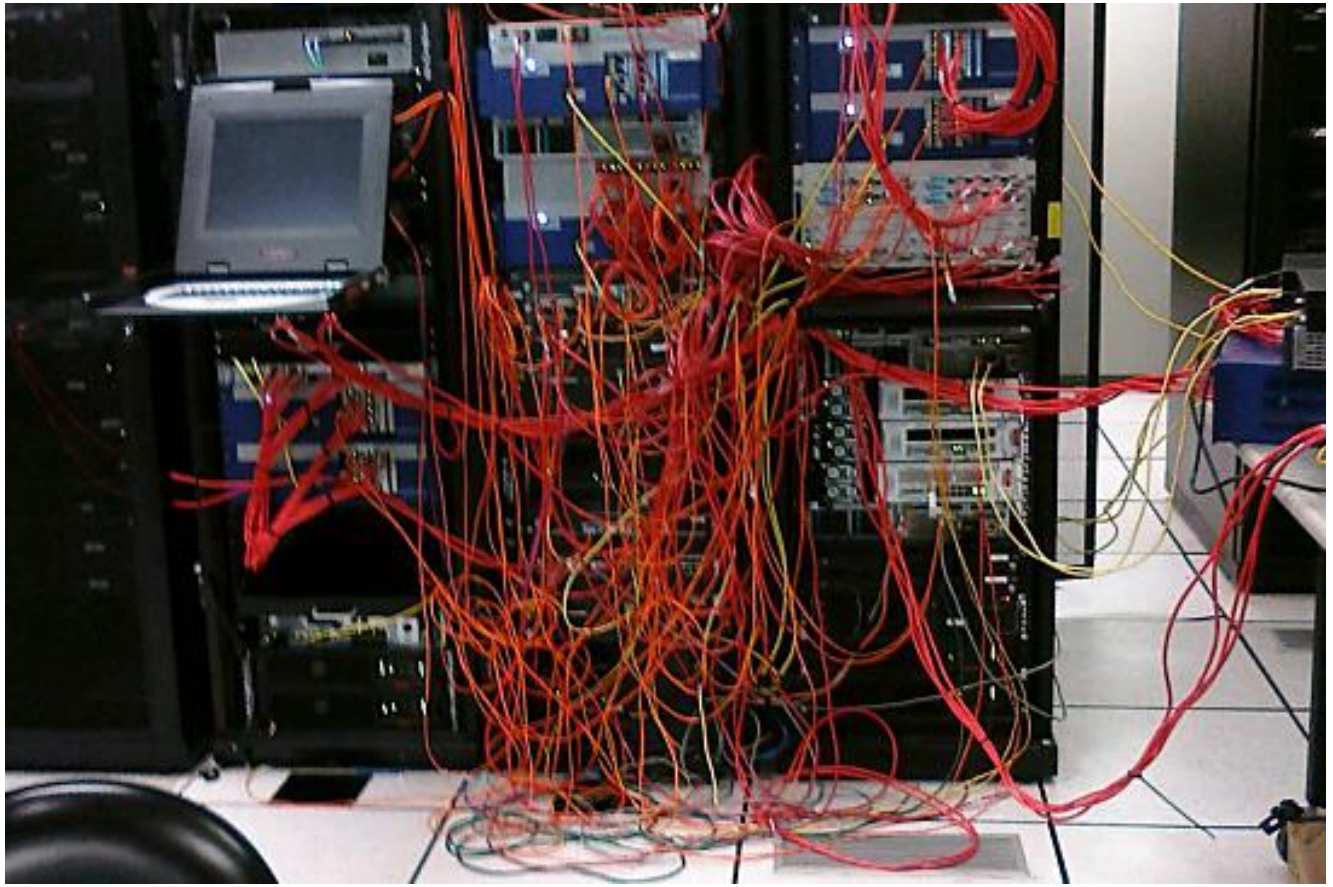
Before the cloud…

- If you needed a server, you had to:
  - Buy it
  - Install it
  - Maintain it
  - Replace it
  - Have an IT team

Before the cloud…

- You often ended up with this:



Before the cloud…

- The same goes with:
  - Networking
  - Databases
  - User Management
  - And more…

Before the cloud…

- But there's more…

BLACK FRIDAY

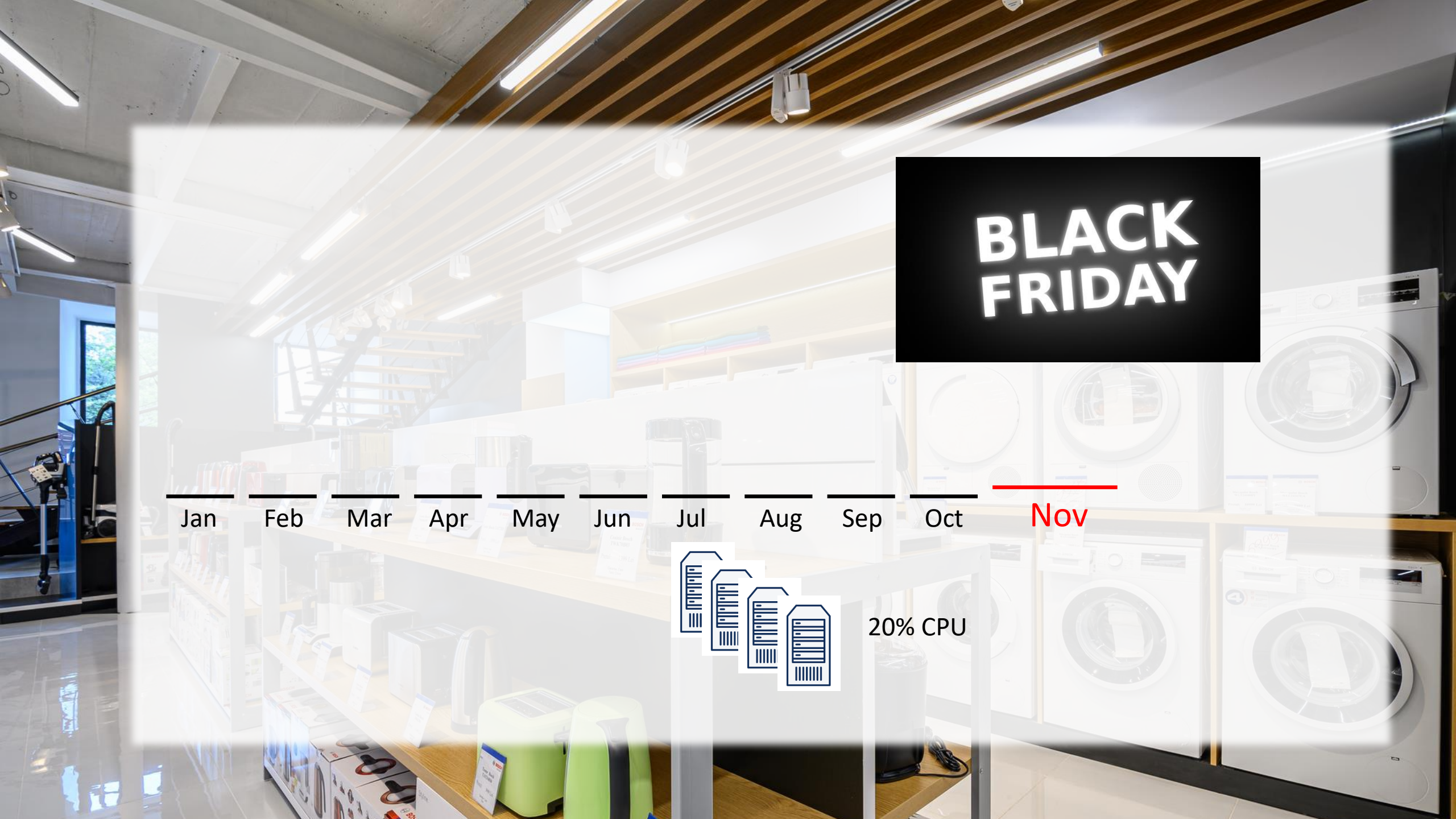
Jan Feb Mar Apr May Jun Jul Aug Sep Oct **Nov**

60% CPU

BLACK FRIDAY

Jan Feb Mar Apr May Jun Jul Aug Sep Oct **Nov**

120% CPU


BLACK
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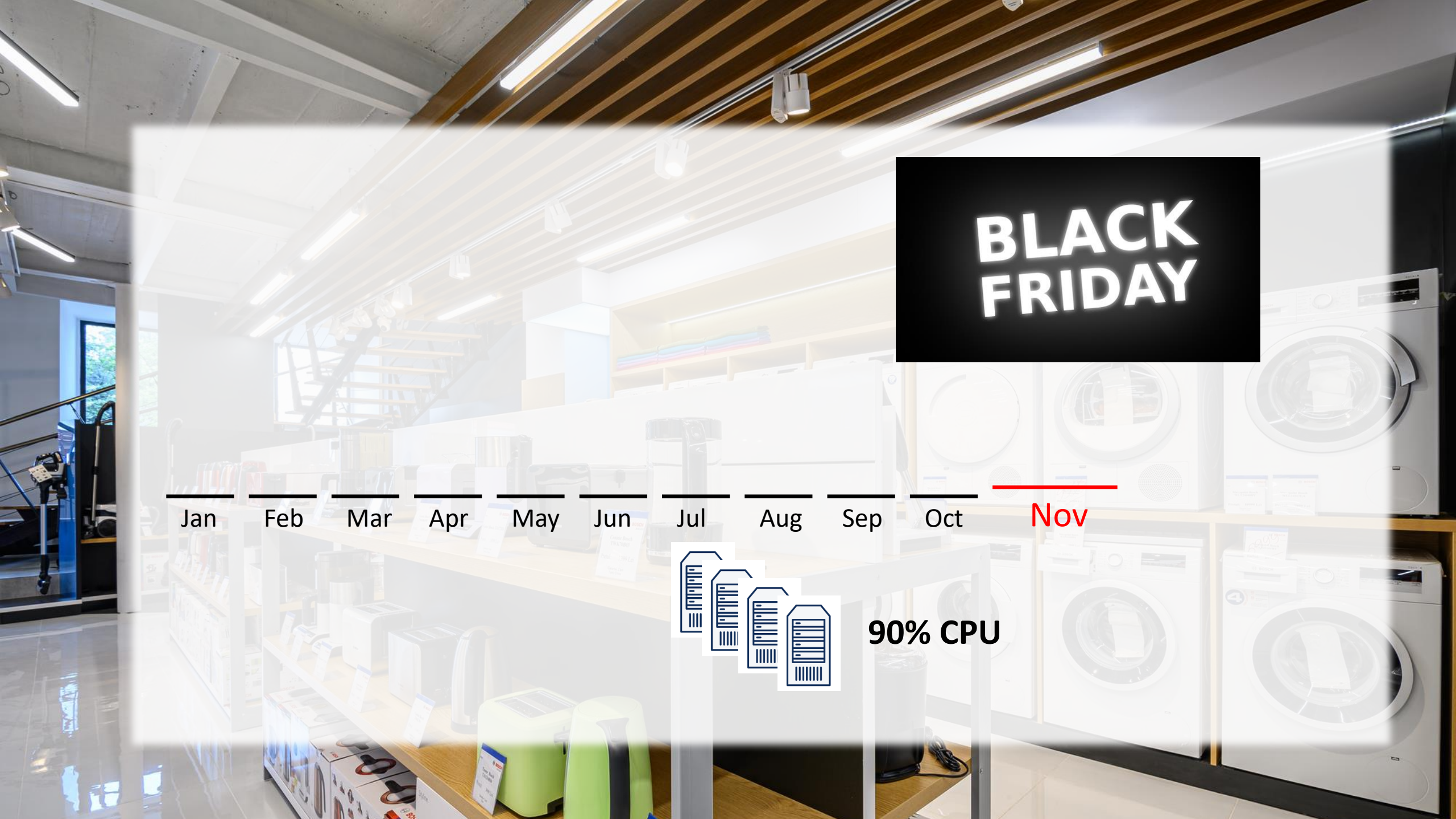
20% CPU


BLACK
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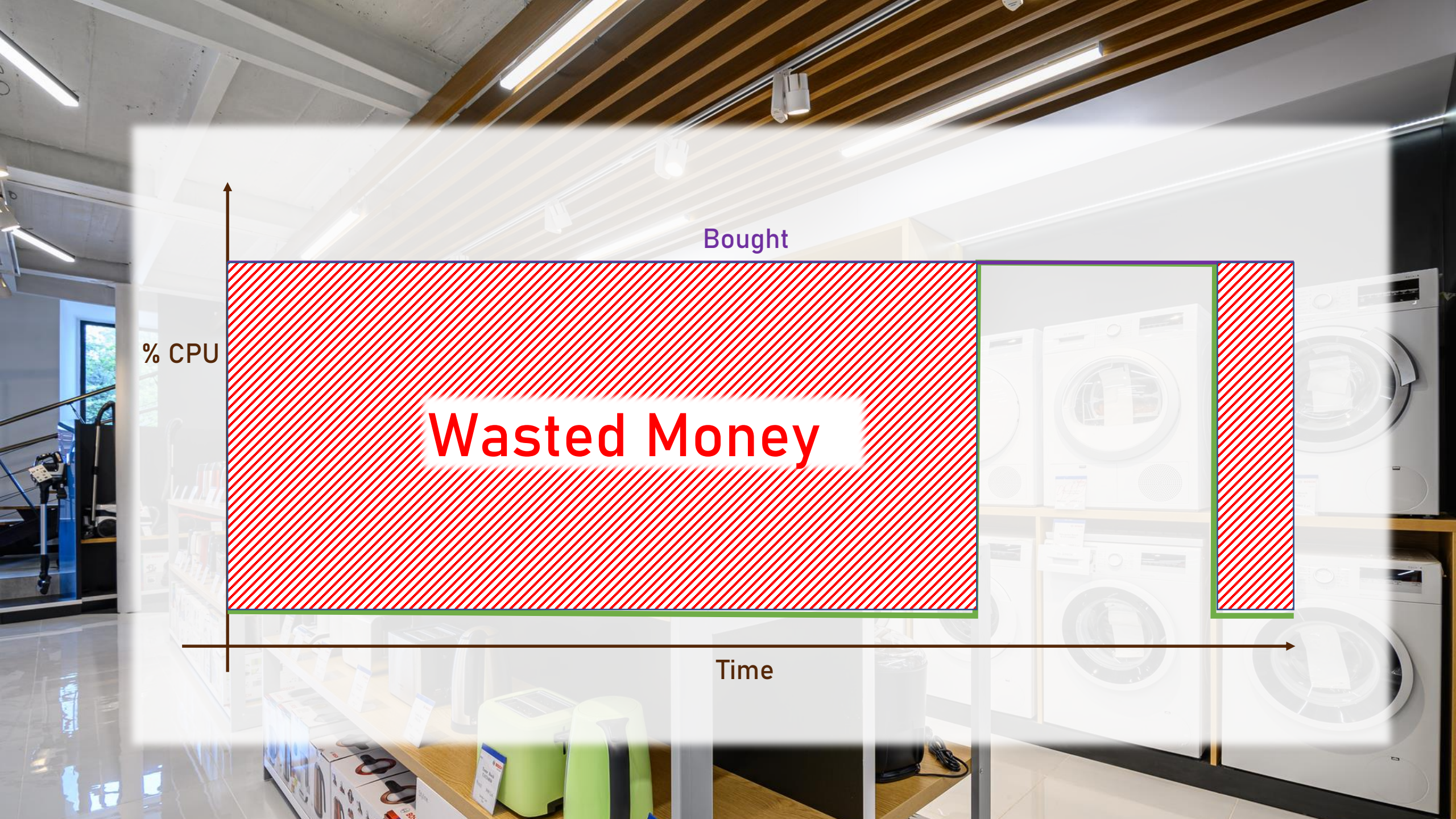
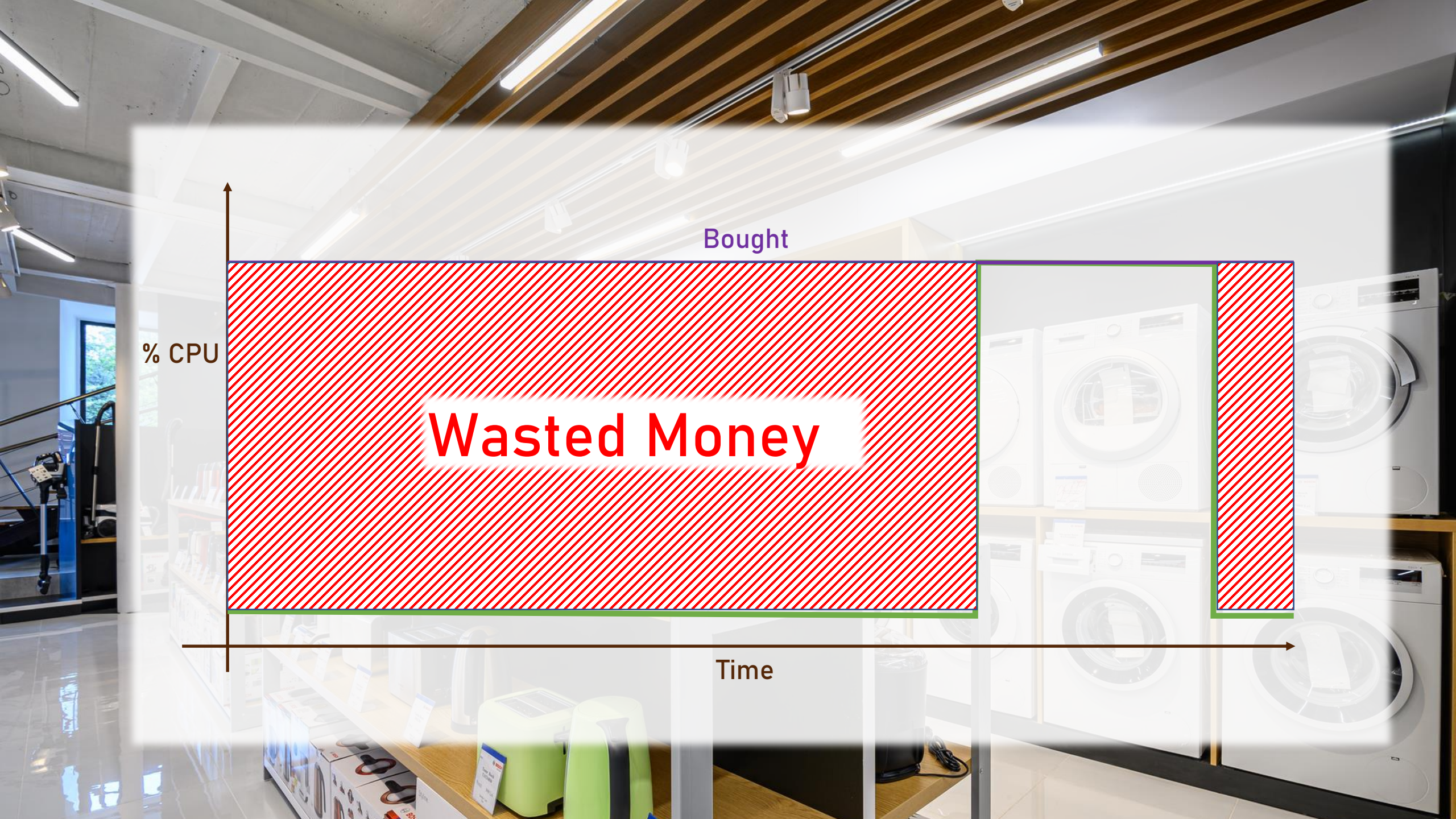
90% CPU


Bought
% CPU
Wasted Money
Time

Before the cloud…

- If you needed a server, you had to:
  - Buy it
  - Install it
  - Maintain it
  - Replace it
  - Have an IT team


Bought
% CPU
Wasted Money
Time


The Cloud:
Compute, Networking, Storage and other services
Managed by SOMEONE ELSE

Cloud Providers

- Companies who build huge data centers
- Fill it with servers, networking, cooling, electricity etc.
- Design and install various services
- Make it publicly accessible

Data Center

Microsoft Azure Datacenter in Washington

Data Center

Microsoft Azure Datacenter in The Netherlands

Cloud Services

- Clouds are huge and the competition is fierce
- Offer a lot of additional services:
  - AI
  - IOT
  - Kubernetes
  - And lots more…

In the cloud era…

- If you need a server, you can:
  - Create it in the cloud within minutes
  - Use it as you wish
  - Pay for what you use
  - Shut it down when not needed
  - Automatically maintained, patched, secured, monitored


The Cloud:
Compute, Networking, Storage and other services
Managed by SOMEONE ELSE

5 Characteristics of Cloud Computing

- On-Demand Self Service
- Broad Network Access
- Resource Pooling
- Rapid Elasticity
- Measured Service

On-Demand Self Service

- No human interaction is needed for resource provisioning
- Resource can be provisioned (created) with a click of a button
- Provisioning is available 24/7

Broad Network Access

- Resources can be accessed from anywhere using the network
- Ideally high broadband
- No physical access is required at any time

Resource Pooling

- Physical resources are shared between customers
- The cloud's backbone decides which physical resource to allocate for a customer's virtual services
- Some advanced cloud services allow for physical resource separation

Rapid Elasticity

- Resources can be scaled up and down as needed, automatically
- No need to purchase resources for a one-time peak scenario

Measured Service

- Payment is done only for resources actually used
- Server time / DB storage / Function calls etc.
- Measurement usually done in high-resolution
  - Server time by the second
- No need to invest money in non-used resources

Types of Cloud Services

IaaS

PaaS

SaaS

IaaS

- Infrastructure as a Service
- The cloud provides the underlying platform
  - Compute
  - Networking
  - Storage
- The client handles, and is responsible for all the rest

IaaS

- Most common example:
  - Virtual Machines
- The cloud provides the host machine, networking and disks
- The client creates the virtual (guest) machine, installs software on it, patches it, maintains it etc.

PaaS

- Platform as a Service
- The cloud provides platform for running apps
- Including: Compute, networking, storage, runtime environment, scaling, redundancy, security, updates, patching, maintenance etc.
- The client just needs to bring the code to run

PaaS

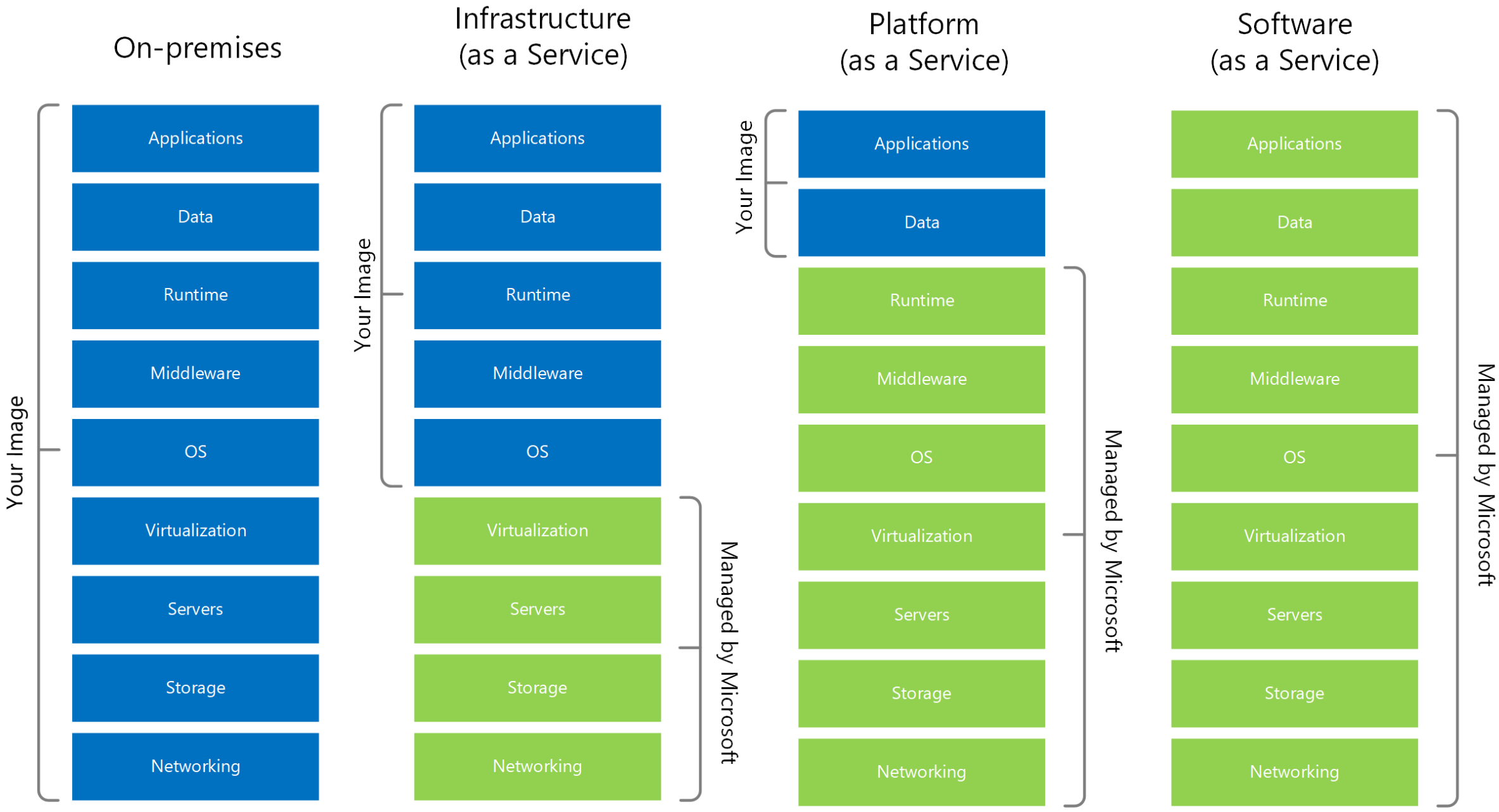
- Most common example:
  - Web Apps
- The cloud provides the runtime for running web apps
- The client uploads the code, and it just runs
- The client has no access to the underlying virtual machines

SaaS

- Software as a Service
- A software running completely in the cloud
- The user doesn't need to install anything on-premises or on his machine
- The provider of the software takes care of updates, patches, redundancy, scalability etc.

SaaS

- Common examples:



Source: https://docs.microsoft.com/en-us/azure/cloud-adoption-framework/strategy/monitoring-strategy

Additional Service Types

- FaaS – Functions as a Service
- DBaaS – Database as a Service
- DaaS – Desktop as a Service
- IOTaaS – IOT as a Service
- AIaaS – AI as a Service

Types of Clouds

Public

Private

Hybrid

Public Cloud

- The cloud is set up in the public network
- Managed by large companies
- Accessible through the internet
- Available to all clients and users
- Clients have no access to underlying infrastructure

Public Cloud

IBM **Cloud**

Private Cloud

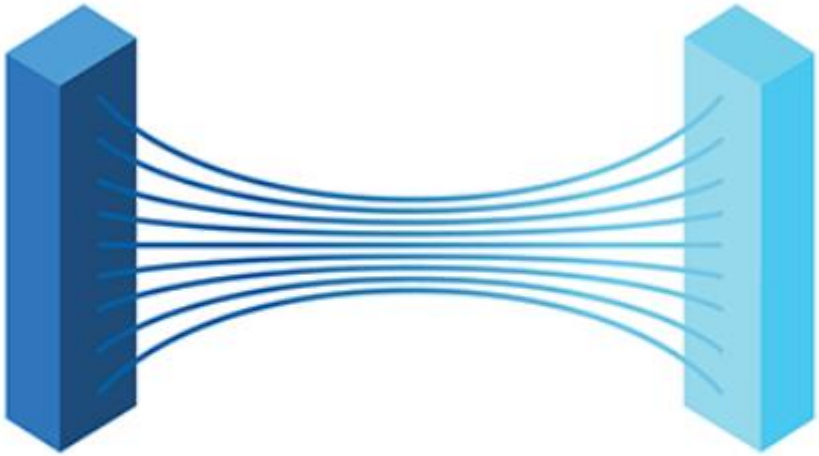
- A cloud set up in an organization's premises
- Managed by the organization's IT team
- Accessible only in the organization's network
- Available to users from the organizations
- Uses private cloud infrastructure and engines
- Contains a subset of the public cloud's capabilities

Private Cloud

Hybrid Cloud

- A cloud set up in an organization's premises…
- …but also connected to the public cloud
- Workload can be separated between the two clouds
- ie. Sensitive data in the organization's premises, public data in the public cloud
- Usually managed by the public cloud, but not always

Hybrid Cloud



We're going to talk about…

Public

Private

Hybrid

Cloud Providers

- Companies which build datacenters and provide public cloud services
  - IaaS, PaaS, SaaS
  - Other services

Main Cloud Providers

Figure 1. Magic Quadrant for Cloud Infrastructure and Platform Services

Cloud Providers Growth

Q2 2020:

Cloud	% Growth
AWS	29%
Azure	47%
Google	43%

Azure is the fastest growing public cloud, for years

Introduction to Microsoft Azure

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- Microsoft's public cloud
- Announced in October 2008
- Released in February 2010
- The 2nd largest public cloud
- Closing the gap…

- First focused on PaaS services
  - To counter AWS's IaaS focus
- Later added IaaS
- Currently offers the largest variety of cloud services

- Major clients:

Regions

- Microsoft built a lot of datacenters for Azure
- Each datacenters' location is called Region
- There are ~60 Azure Regions (more than any other cloud)
- Almost every new resource in the cloud should be allocated to a region

Source: https://azure.microsoft.com/en-us/global-infrastructure/geographies/

Zones

- Some of the regions have more than one physical datacenter
- Great for availability in case one datacenter fails
- Each datacenter is called Zone
- When there are more than one datacenter in a region, the region is said to have Availability Zones
- Some cloud services benefit from Availability Zones

Source: https://azure.microsoft.com/en-us/global-infrastructure/geographies/

Paired Regions

- Some regions have designated pair region
- For increased availability
- When a full region fails – the other one can fill its place
- Relevant for some of the cloud services
- Pairs are set by Azure and cannot be changed

Source: https://azure.microsoft.com/en-us/global-infrastructure/geographies/

Azure Services

- Everything that can be done in the cloud is called

Cloud Service

- ie. Creating VMs, building databases, set up networks, use AI algorithms, using central user management etc.

Azure Services

- Go to:

  https://azure.microsoft.com/en-us/services/