



Innovation Lab

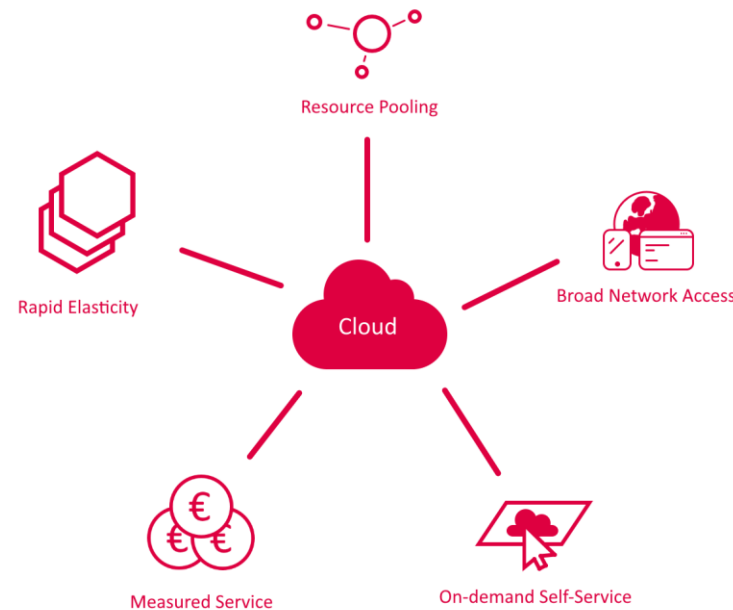
Artus Vranken  
Jorn Jossa

## Cloud Computing

# CLOUD COMPUTING

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Cloudcomputing is het via een netwerk op aanvraag beschikbaar stellen van hardware, software en gegevens.



# CLOUD COMPUTING

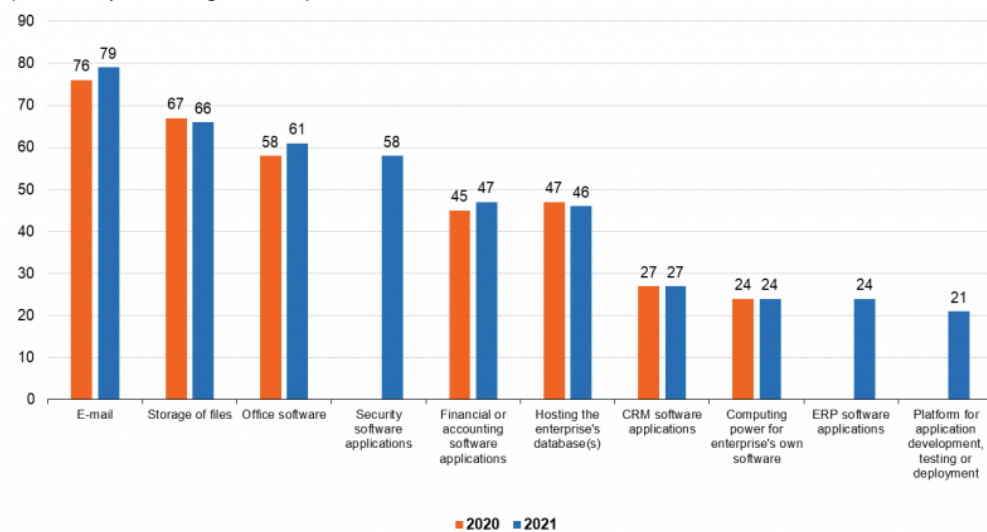
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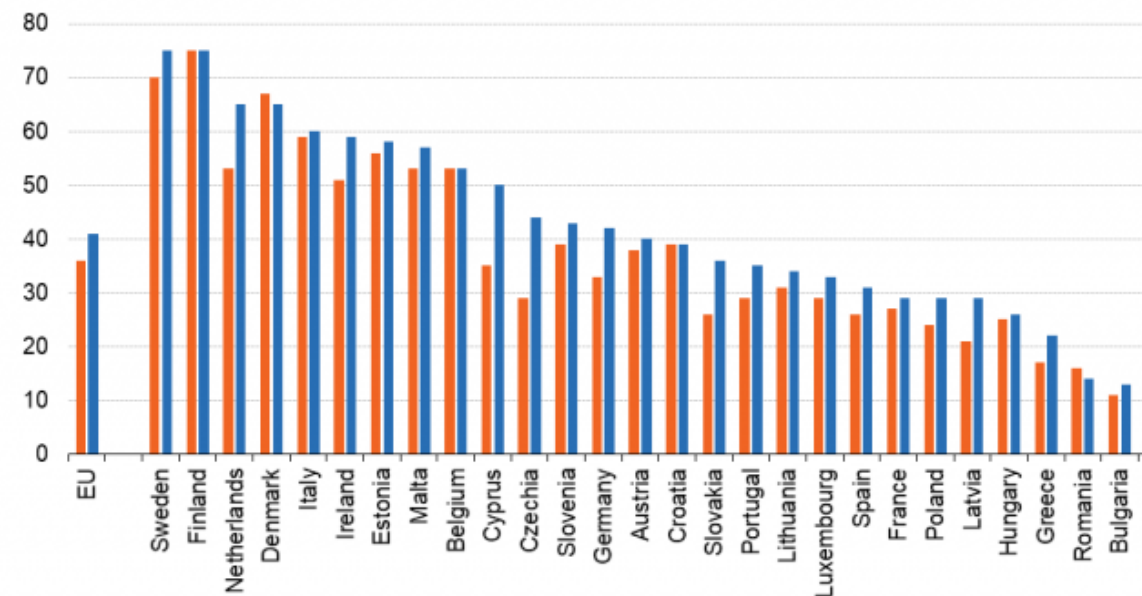
# WIE GEBRUIKT CLOUD COMPUTING?

Use of cloud computing services in enterprises, by type of cloud service, EU, 2020 and 2021

(% of enterprises using the cloud)



Use of cloud computing services, 2020 and 2021  
(% of enterprises)



Karakteristieken volgens NIST:

- On-demand self-service
- Broad network access
- Resource pooling
- Rapid elasticity
- Measured service

# ON-DEMAND SELF-SERVICE

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- Automatisch toevoegen
- Automatisch verwijderen
- Geen menselijke interactie

# ON-DEMAND SELF-SERVICE

EC2 > Instances > Launch an instance

Launch an instance

Info

Amazon EC2 allows you to create virtual machines, or instances, that run on the AWS Cloud. Quickly get started by following the simple steps below.

Name and tags

Info

Name

innovation-lab-vps

Add additional tags

▼ Application and OS Images (Amazon Machine Image)

Info

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below

Q Search our full catalog including 1000s of application and OS images

Quick Start

Amazon Linux

aws

macOS

Mac

Ubuntu

ubuntu

Windows

Microsoft

Red Hat

Red Hat

S

Browse more AMIs

Including AMIs from AWS, Marketplace and the Community

▼ Summary

Number of instances

Info

1

Software Image (AMI)

Amazon Linux 2 Kernel 5.10 AMI...read more

ami-05fa00d4c63e32376

Virtual server type (instance type)

t2.micro

Firewall (security group)

New security group

Storage (volumes)

1 volume(s) - 8 GiB

Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) instance usage on free tier AMIs per month, 30 GiB of EBS storage, 2 million IOs, 1 GB of snapshots, and 100 GB of bandwidth to the internet.

Cancel

Launch instance

Slide 7

# ON-DEMAND SELF-SERVICE

Instances (1/1) [Info](#)

Refresh

Connect

Instance state

Actions

Launch instances

< 1 >

<input checked="" type="checkbox"/>	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS	Public IPv4 ...	Elastic IP
<input checked="" type="checkbox"/>	innovation-lab...	i-02fcdaa4b443ff45d	<span>Running</span>	t2.micro	-	No alarms	eu-west-1a	ec2-34-244-185-246.eu...	34.244.185.246	-

Instance: i-02fcdaa4b443ff45d (innovation-lab-vps)

Details

Security

Networking

Storage

Status checks

Monitoring

Tags

▼ Instance summary [Info](#)

Instance ID

i-02fcdaa4b443ff45d (innovation-lab-vps)

IPv6 address

-

Hostname type

IP name: ip-172-31-44-98.eu-west-1.compute.internal

Answer private resource DNS name

IPv4 (A)

Auto-assigned IP address

34.244.185.246 [Public IP]

IAM Role

-

▼ Instance details [Info](#)

Platform

Public IPv4 address

34.244.185.246 | [open address](#)

Instance state

Running

Private IP DNS name (IPv4 only)

ip-172-31-44-98.eu-west-1.compute.internal

Instance type

t2.micro

VPC ID

vpc-0d92ec13b34f75aee

Subnet ID

subnet-0ff77016dd8715610

Private IPv4 addresses

172.31.44.98

Public IPv4 DNS

ec2-34-244-185-246.eu-west-1.compute.amazonaws.com | [open address](#)

Elastic IP addresses

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AWS Compute Optimizer finding

Opt-in to AWS Compute Optimizer for recommendations. | [Learn more](#)

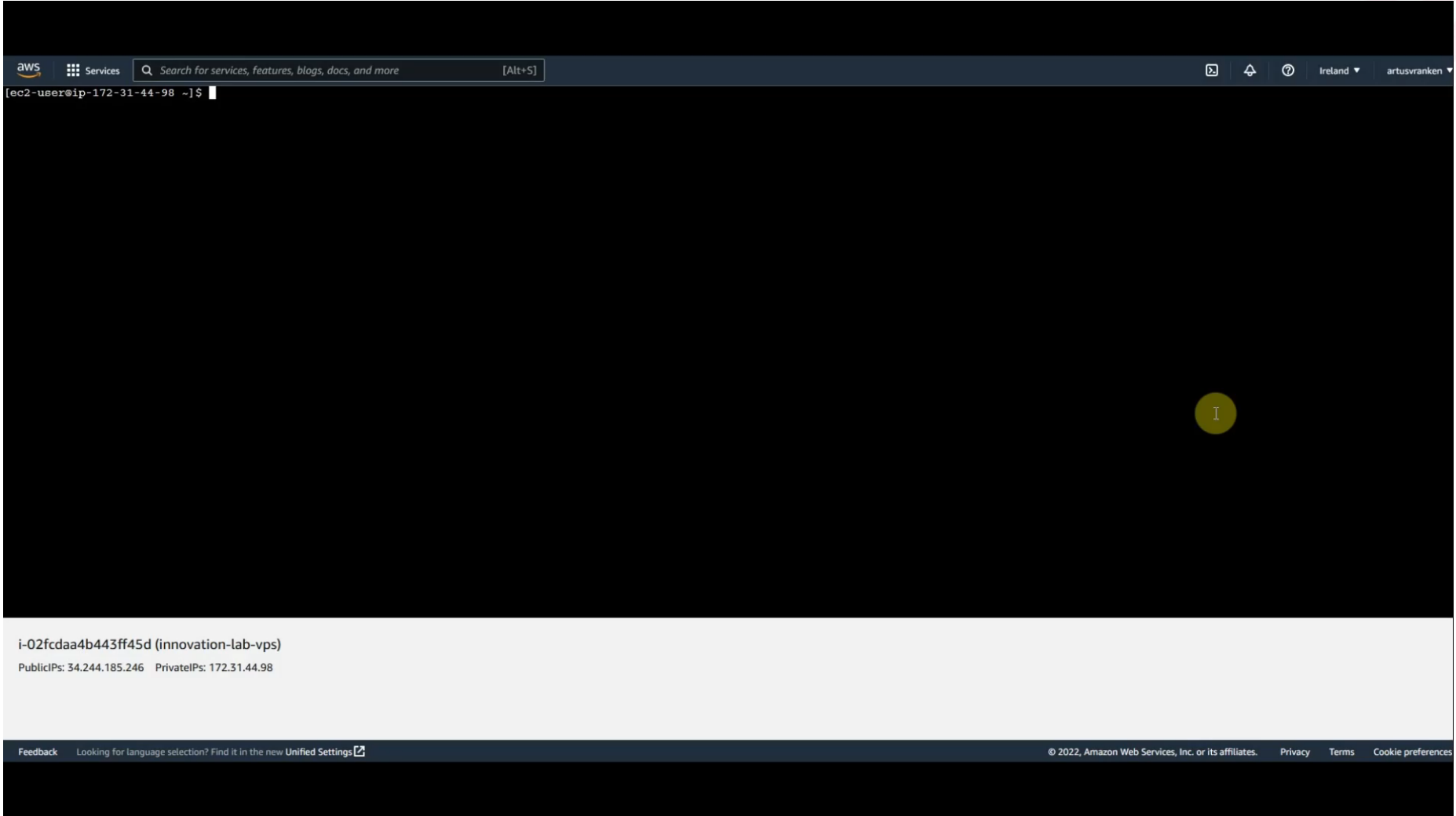
Auto Scaling Group name

-

Slide 8



# ON-DEMAND SELF-SERVICE



# ON-DEMAND SELF-SERVICE

Instances (1/1) Info

Find instance by attribute or tag (case-sensitive)

Refresh

Connect

Instance state ▲

Actions

<input checked="" type="checkbox"/>	Name ▼	Instance ID	Instance state ▼	Instance type ▼	Status check	Alarm status	Availability Zone ▼
<input checked="" type="checkbox"/>	innovation-lab...	i-02fcdaa4b443ff45d	Terminated ⓘ	t2.micro	–	No alarms +	eu-west-1a

Stop instance

Start instance

Reboot instance

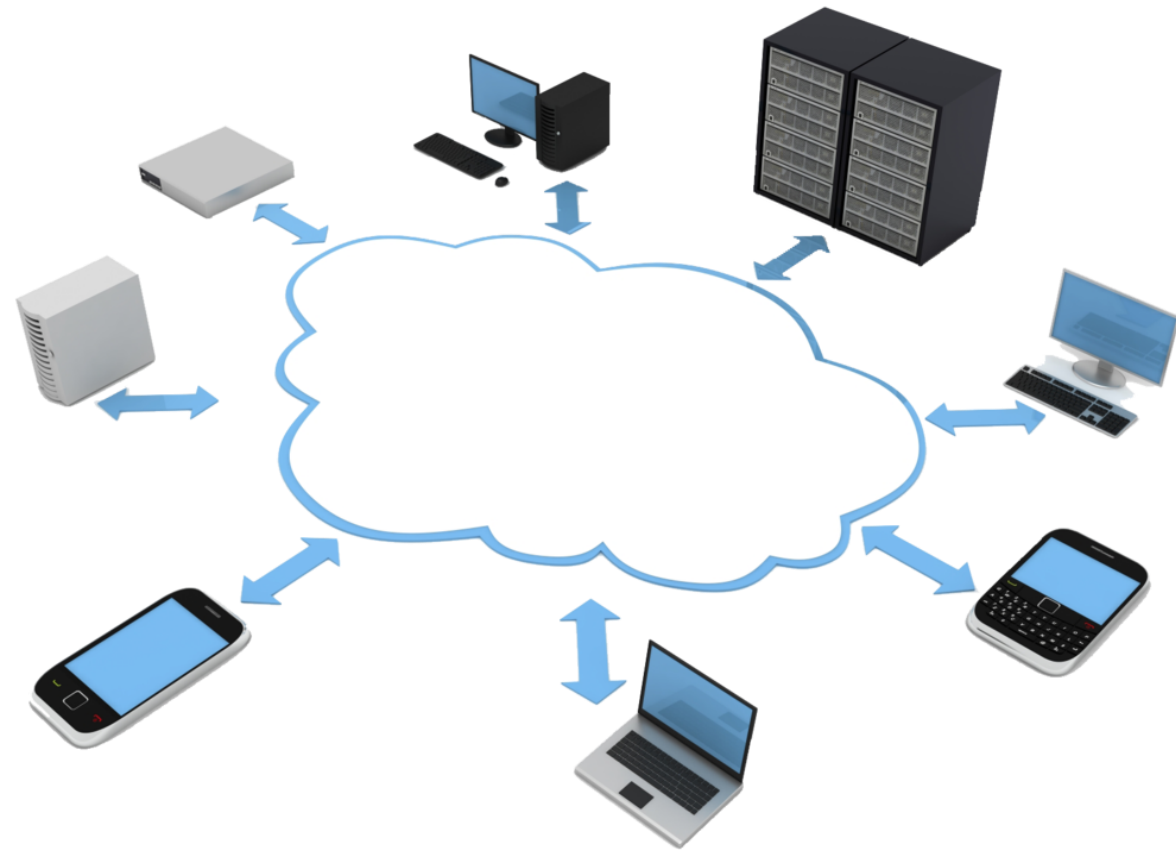
Hibernate instance

Terminate instance

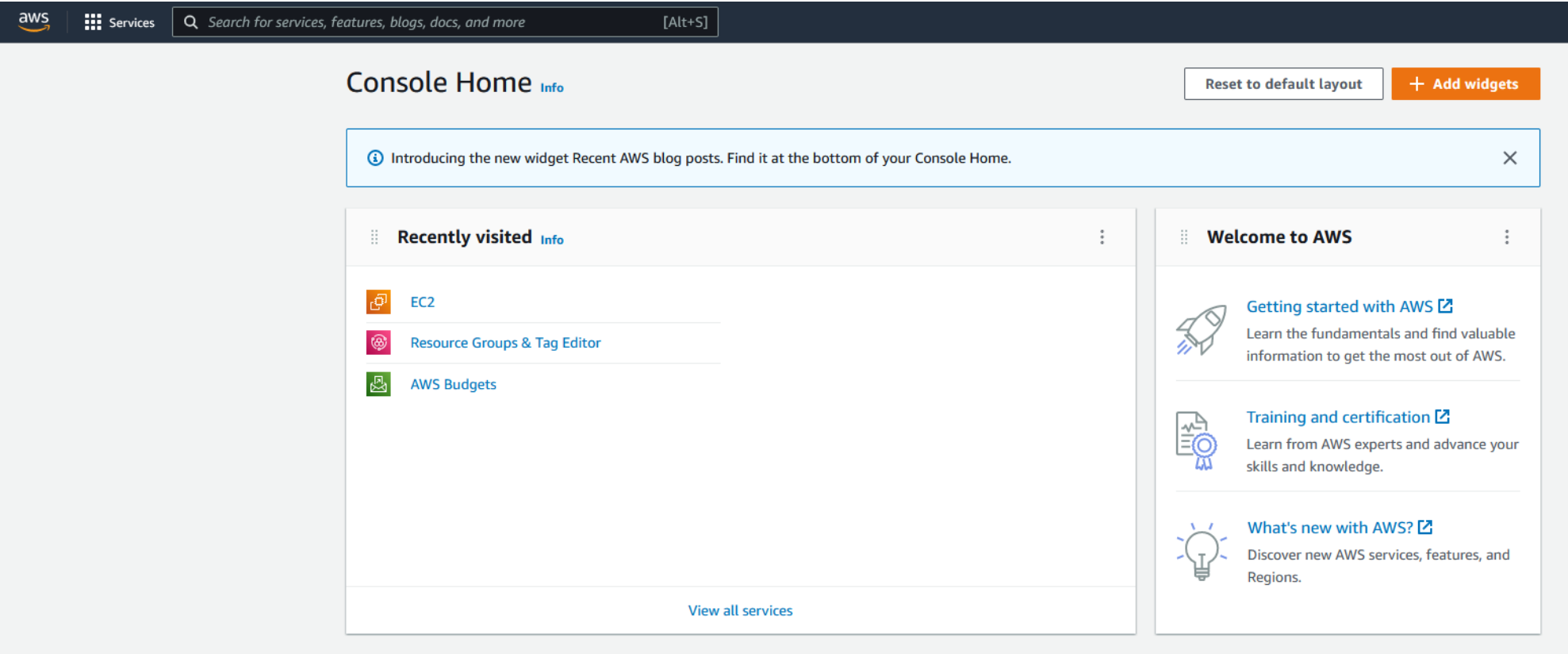
# BROAD NETWORK ACCESS

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- Bereikbaar over netwerk
- Standaardmechanismes
  - desktop
  - tablet
  - ...



# BROAD NETWORK ACCESS



# BROAD NETWORK ACCESS

20:37

artusvraken  
195409194629

N. Virginia

CloudWatch alarms

0

In alarm

0

Insufficient data

View all

AWS Health

0

Open issues  
past 7 days

0

Scheduled  
changes

0

Other  
notifications  
past 7 days

View all

Cost Management

No cost and usage information is available at this time.  
Please enable Cost Explorer. [Learn more](#)

Recently visited

Showing services supported in the app

EC2

Dashboard

Services

20:38

artusvraken  
195409194629

Ireland

EC2

Resources

Autoscaling groups

Groups

0

Instances

0

Elastic IPs

Addresses

0

Instances

Instances

1

Running

0

Key pairs

Pairs

0

Load balancers

Load balancers

0

Network interfaces

Interfaces

0

Dashboard

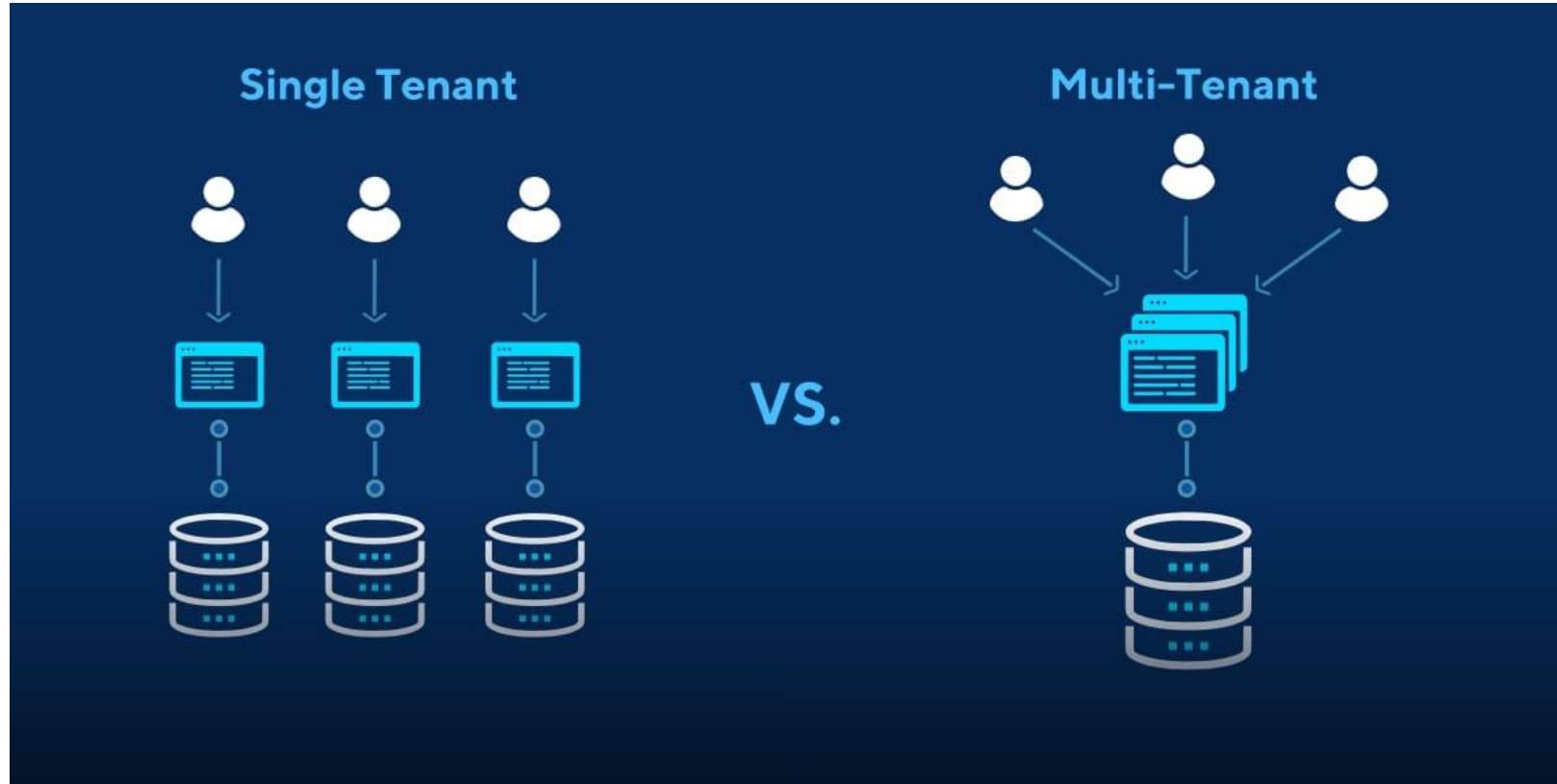
Services

# RESOURCE POOLING

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- Meerdere consumenten
- Dynamische toewijzing
- Onafhankelijk van locatie
- “multi-tenant”

# RESOURCE POOLING



# RAPID ELASTICITY

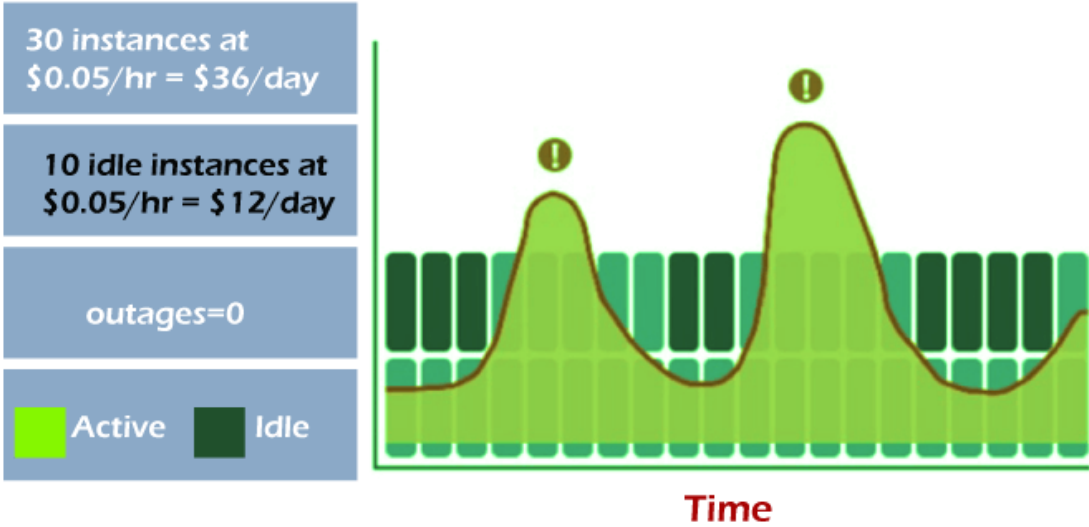
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- Diensten toevoegen
- Diensten verwijderen
- Geen limiet
  - van resources
  - van tijd

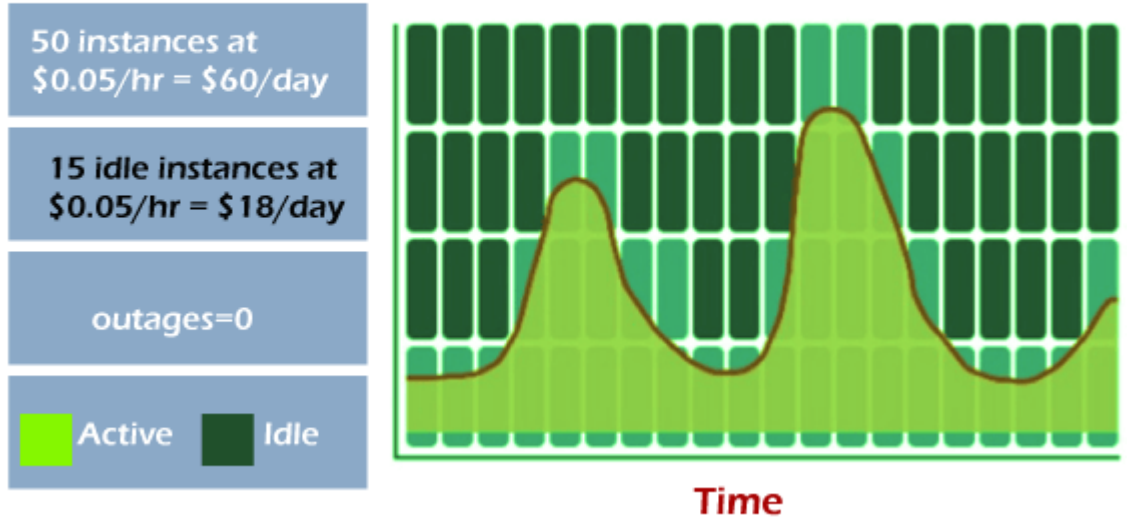


# RAPID ELASTICITY

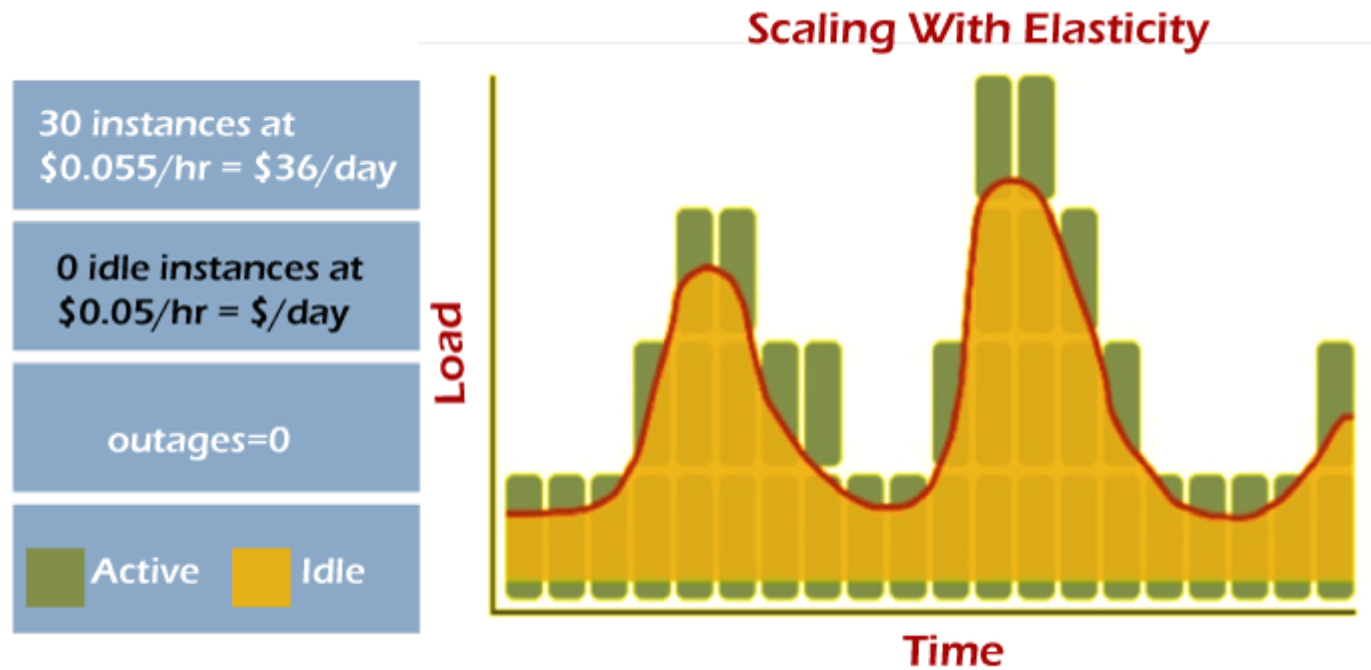
Underprovisioning



Overprovisioning



# RAPID ELASTICITY



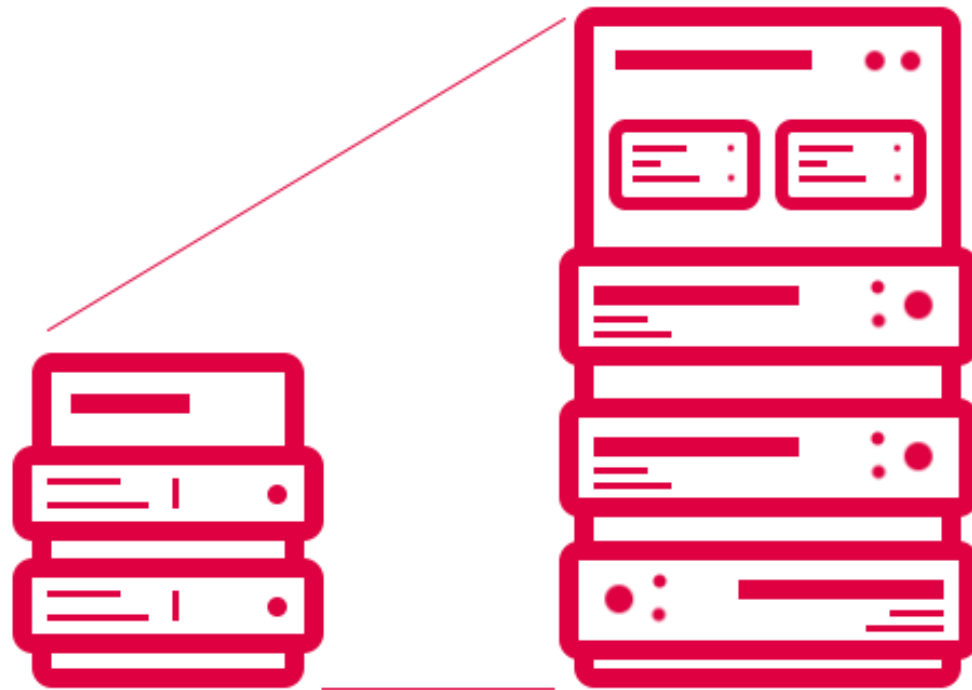
# RAPID ELASTICITY - SCALING

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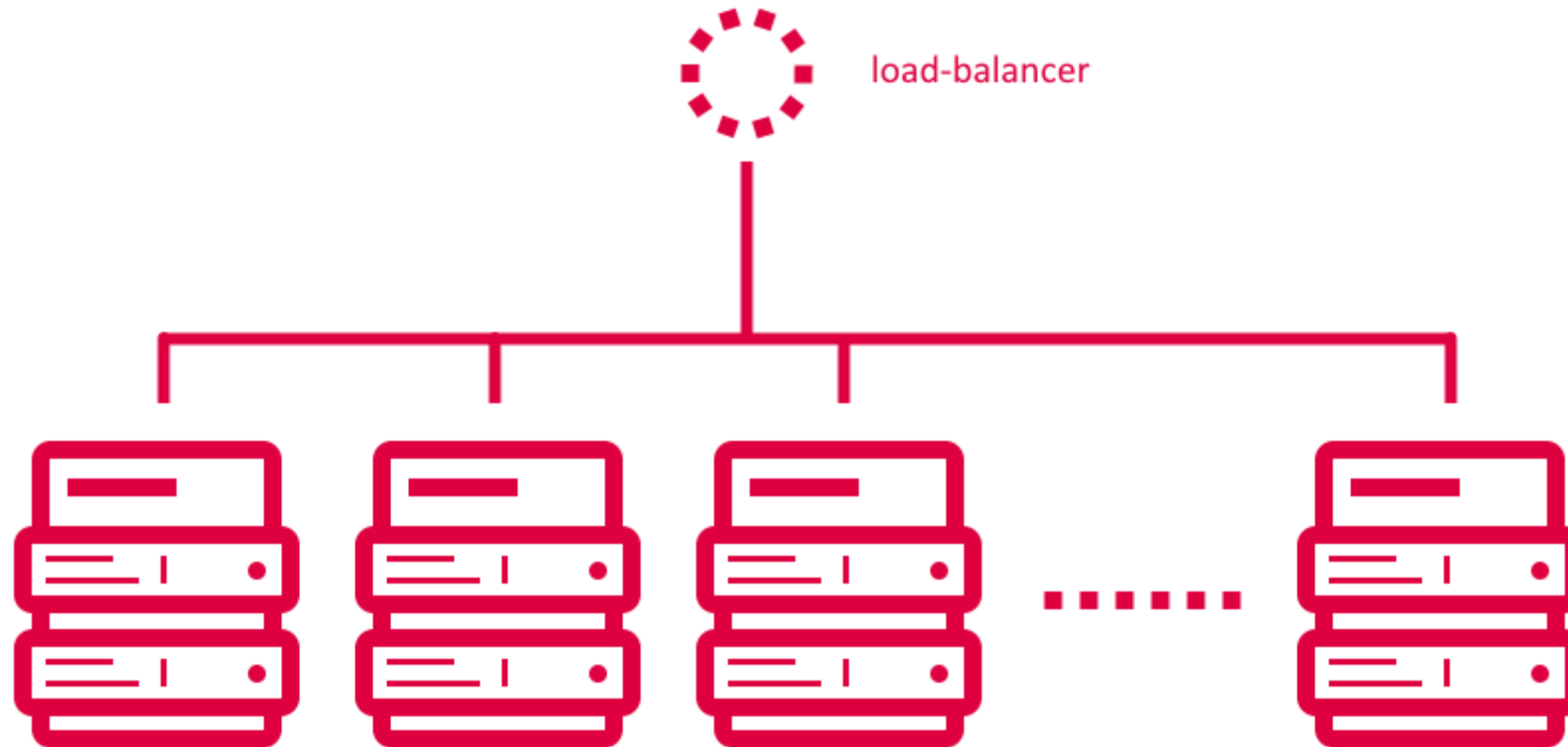
# RAPID ELASTICITY – VERTICAL SCALING

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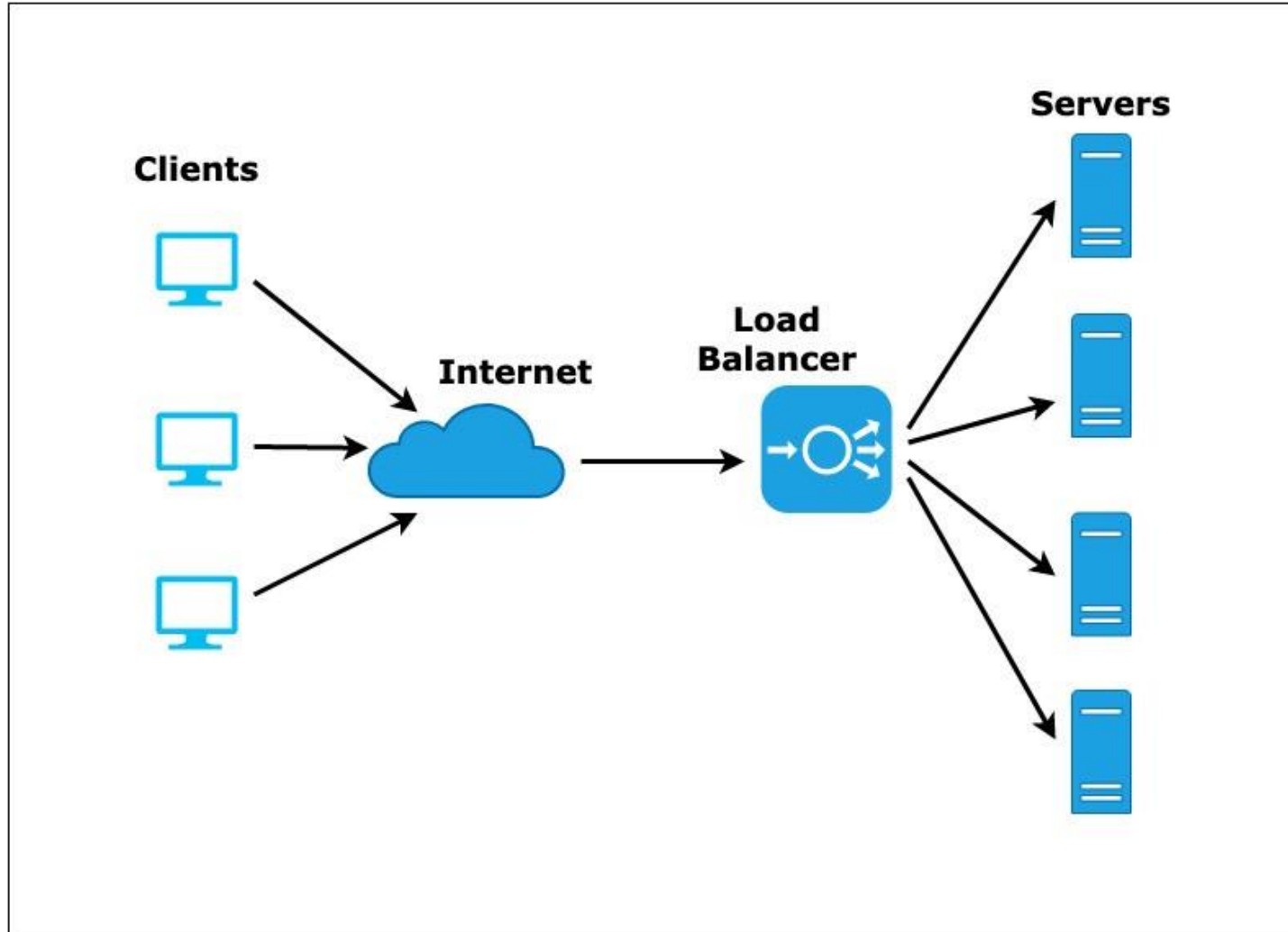


# RAPID ELASTICITY – HORIZONTAL SCALING

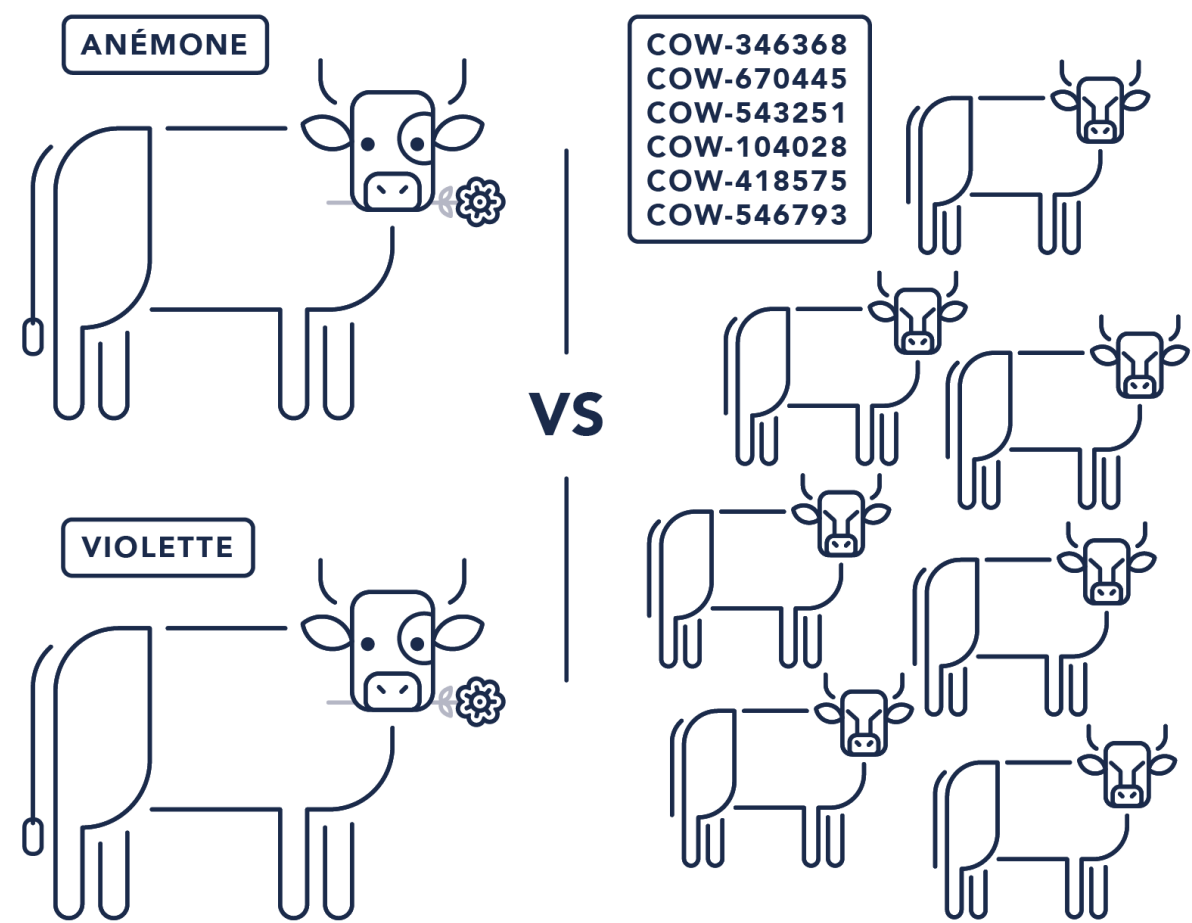
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# RAPID ELASTICITY – HORIZONTAL SCALING



# RAPID ELASTICITY – CATTLE, NOT PETS



# QUIZ

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- <https://forms.gle/piMK6FvdBH37f841A>





# WAAROM CLOUD COMPUTING?

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- Eigen infrastructuur is duur
  - aankoop
  - beheer



# WAAROM CLOUD COMPUTING?

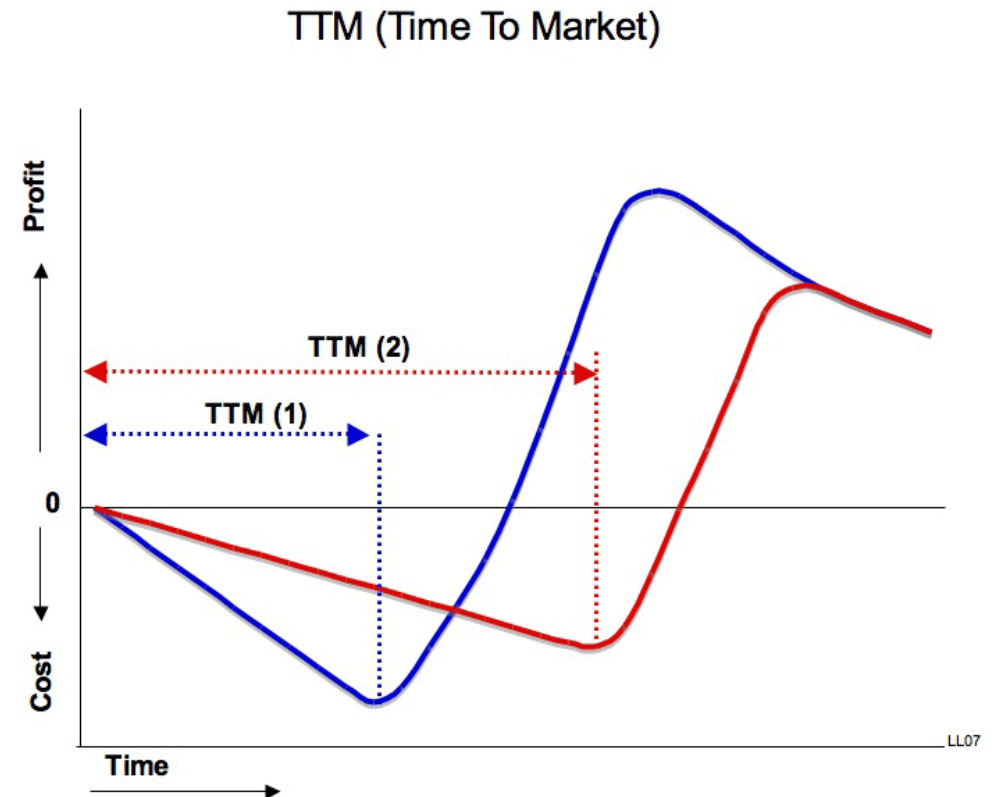
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- Infrastructuur gaat stuk
- Gebruik/verkeer onder- of overschat
- Infrastructuur verouderd
- Personeel



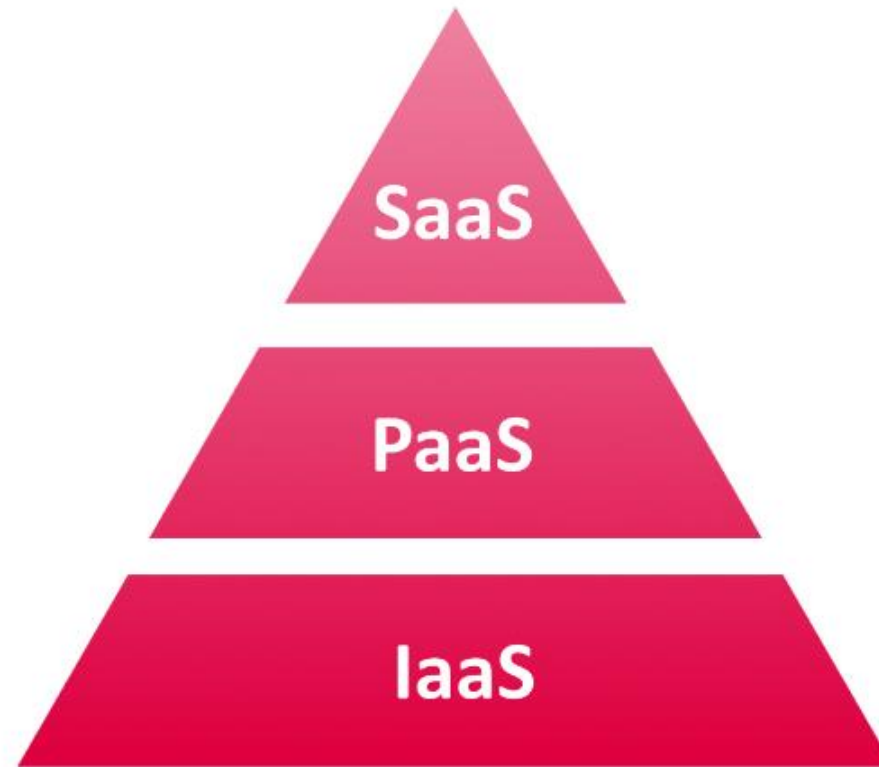
# WAAROM CLOUD COMPUTING?

- Verlies
  - tijd
  - geld
- Time-to-market



# IAAS – PAAS - SAAS

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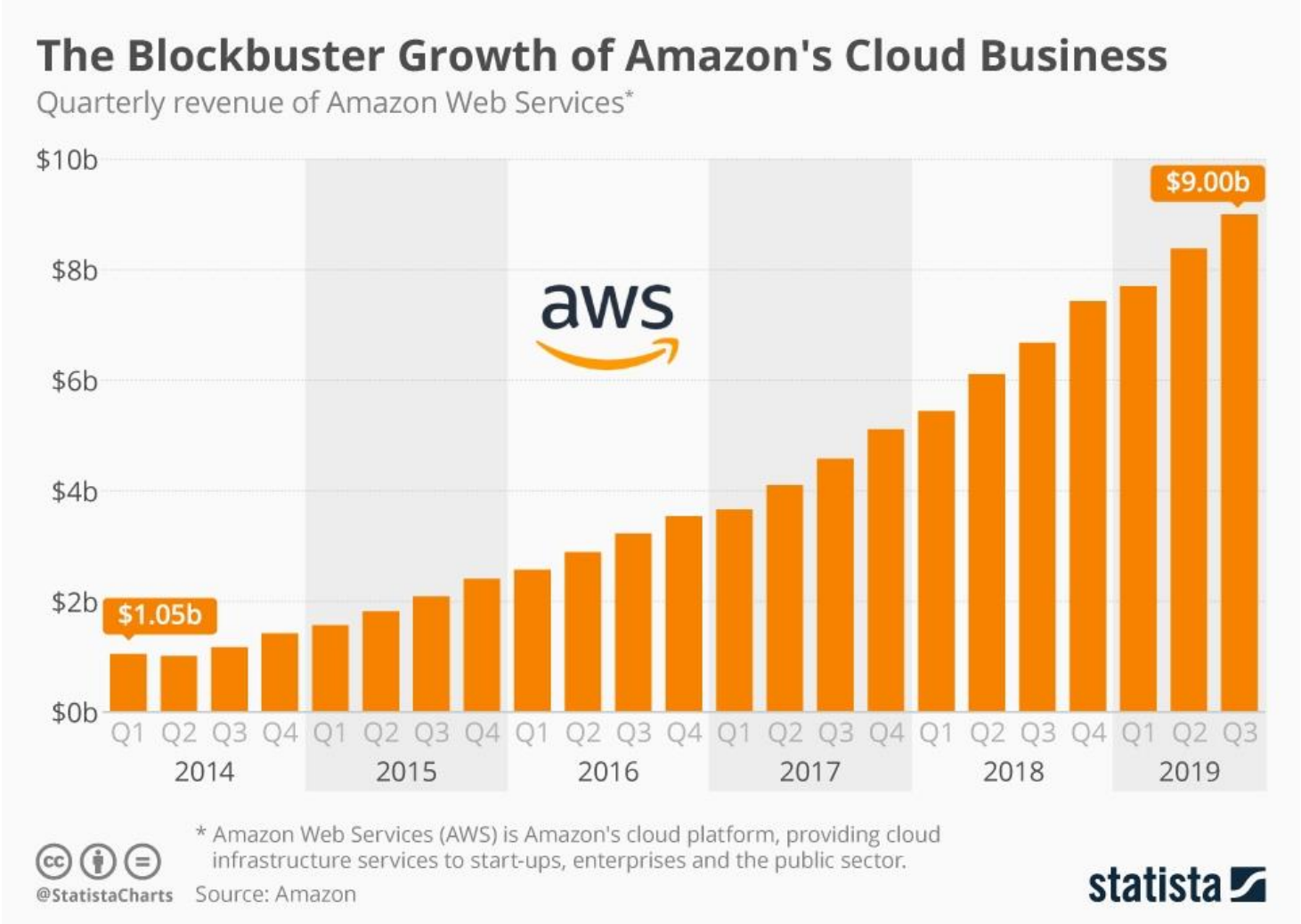


# INFRASTRUCTURE AS A SERVICE - IAAS

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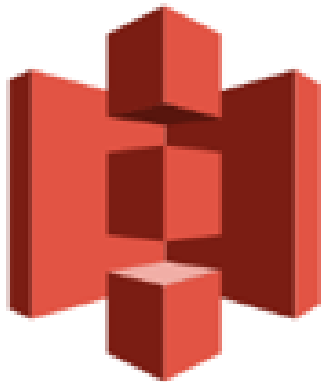


# INFRASTRUCTURE AS A SERVICE - IAAS

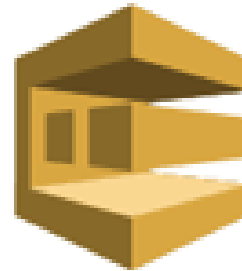


# INFRASTRUCTURE AS A SERVICE - IAAS

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Amazon S3



Amazon  
**SQS**



Amazon  
**EC2**

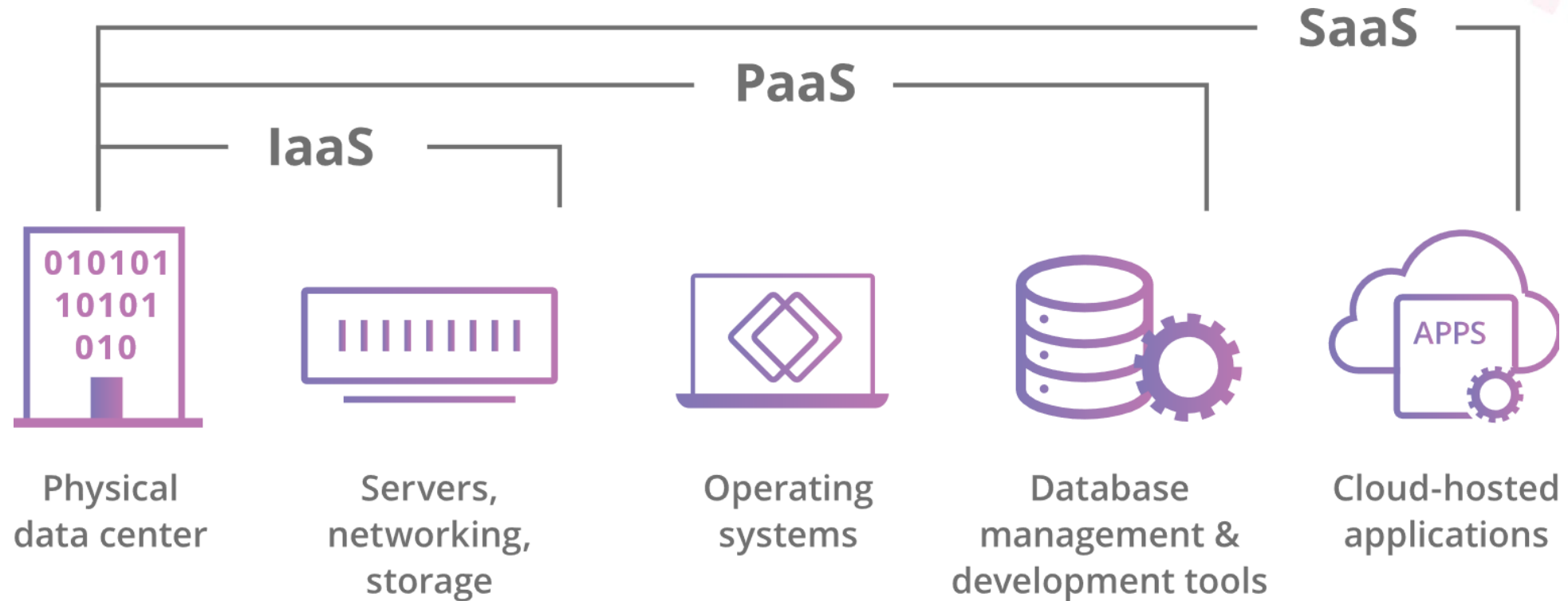
# INFRASTRUCTURE AS A SERVICE - IAAS

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- Variabele kosten
- Automatisch
- Makkelijk experimenteren
- Minder personeel
- Groter bereik



# PLATFORM AS A SERVICE - PAAS



# PLATFORM AS A SERVICE - PAAS

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- Geen low-level infrastructuur
- Besturingssystemen
- Databanken
- Container services

# PLATFORM AS A SERVICE - PAAS

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Elastic BeanStalk



App Engine

# SOFTWARE AS A SERVICE - SAAS



## **SaaS Software**

VS



## **Traditional Software**

### **Subscription**

Users subscribe to the software without paying any money up front



### **One-time fee**

Users purchase the software up front and install it on their own computers

### **Multiple devices**

Applications can be used across multiple devices with a single login, the application can be updated online instantaneously



### **Single device**


Licensed individually and usually limited to a single device and when updates come out, they must be downloaded or purchased and installed

# SOFTWARE AS A SERVICE - SAAS

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- Dropbox
- Gmail
- Slack

# IAAS - PAAS - SAAS



On-site	IaaS	PaaS	SaaS
Data	Data	Data	Data
Applications	Applications	Applications	Applications
Runtime	Runtime	Runtime	Runtime
Middleware	Middleware	Middleware	Middleware
O/S	O/S	O/S	O/S
Virtualization	Virtualization	Virtualization	Virtualization
Servers	Servers	Servers	Servers
Storage	Storage	Storage	Storage
Networking	Networking	Networking	Networking

■ Zelf te beheren   ■ Beheerd door provider

# QUIZ

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- <https://forms.gle/C4AiAdyEHgNDCqFDA>

