

GENERATING WITTY COMMENTS...

LET'S GO!



GETTING TO KNOW THE **AMAZING** AMAZON WEB SERVICES

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University of Naples, Federico II

A LITTLE BIT OF CONTEXT



Cloud computing is the on-demand delivery of computing resources through a cloud services platform via the internet with pay-as-you-go pricing.

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■ **Infrastructure as a Service (IaaS)**

The service vendor provides users access to computing resources such as servers, storage and networking.

SERVICE MODELS: A VISUAL COMPARISON

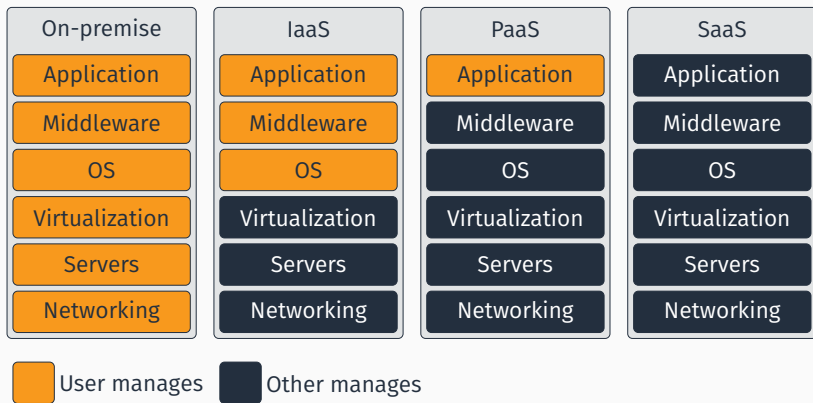
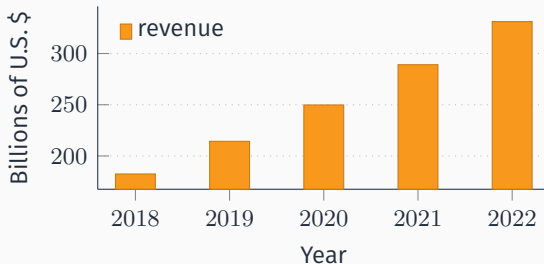


Figure 1: A service models comparison

SOME STATS

Worldwide Public Cloud Services Revenue Forecast (Billions of U.S. Dollars) [Gar19]

2018	2019	2020	2021	2022
182,4	214,3	249,8	289,1	331,2



- Google



Google Cloud

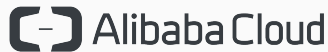
- Google
- IBM



- Google
- IBM
- Microsoft



- Google
- IBM
- Microsoft
- Alibaba



- Google
- IBM
- Microsoft
- Alibaba
- Oracle



- Google
- IBM
- Microsoft
- Alibaba
- Oracle
- Amazon



PUBLIC CLOUD ADOPTION

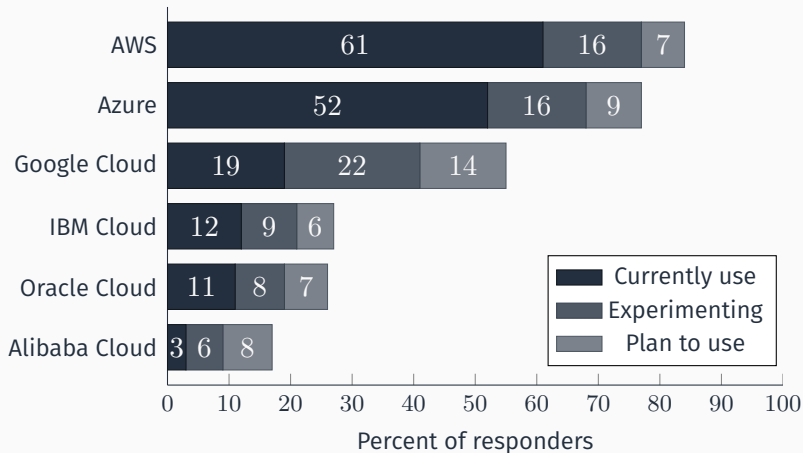


Figure 2: Public Cloud Adoption in January 2019 [Fle19]

THE MULTI-CLOUD TREND

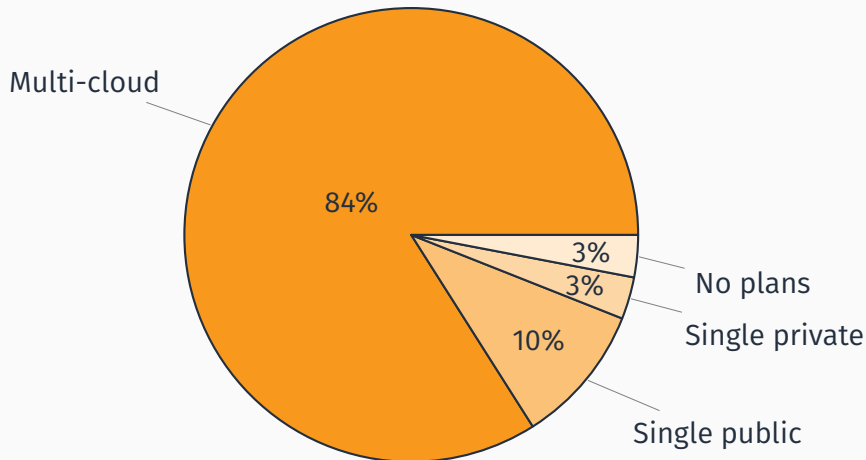


Figure 3: Enterprise cloud strategy in Jan 2019 (1000+ Employees)

[Fle19]

AN AWS BESTIARIUM





Amazon Web Services is a collection of cloud-based services.



Amazon Web Services is a collection of cloud-based services.
A very big one.



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AN AWS BESTIARIUM



DATABASE SERVICES

- Set up, operate a relational database in the cloud.



RELATIONAL DATABASE SERVICE (RDS)

- Set up, operate a relational database in the cloud.
- Takes care of backups, patching.



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- Supports:
 - MySQL, PostgreSQL, MariaDB
 - Oracle, MS SQL Server



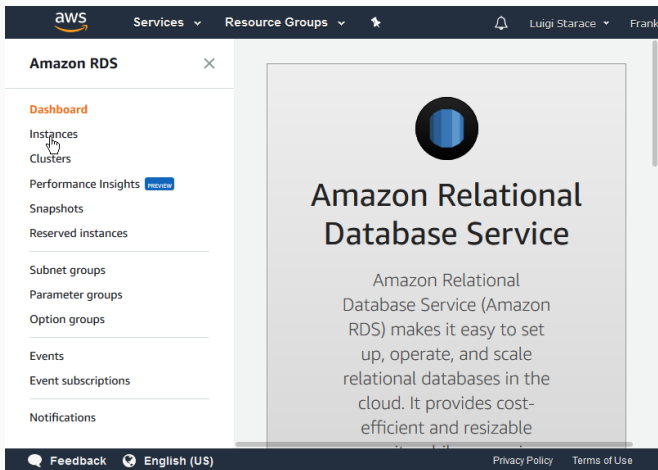
RELATIONAL DATABASE SERVICE (RDS)

- Set up, operate a relational database in the cloud.
- Takes care of backups, patching.
- Supports:
 - MySQL, PostgreSQL, MariaDB
 - Oracle, MS SQL Server
 - Amazon Aurora



RDS: CREATE A DATABASE INSTANCE

Go to the RDS Console and select “instances” .



RDS: CREATE A DATABASE INSTANCE

Select “Launch DB instance”.

The screenshot displays the AWS Management Console interface for Amazon RDS. The top navigation bar includes the AWS logo, 'Services', 'Resource Groups', and user information. The left sidebar lists various RDS services, with 'Instances' selected. The main content area shows the 'Instances (0)' page, featuring a 'Launch DB instance' button highlighted by a mouse cursor. Other visible elements include a search bar, pagination controls, and a table header for 'DB instance'.

Amazon RDS

Dashboard

Instances

Clusters

Performance Insights

Snapshots

Reserved instances

Subnet groups

Parameter groups

Option groups

Events

Event subscriptions

Notifications

RDS > Instances

Instances (0)

Instance actions

Restore from S3

Launch DB instance

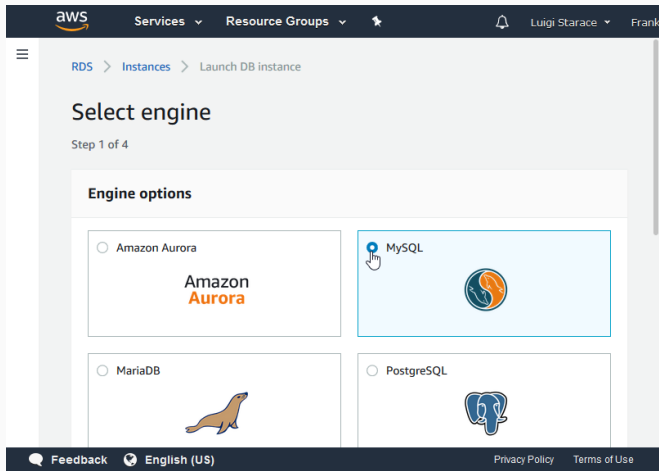
Filter instances

DB instance

Feedback English (US) Privacy Policy Terms of Use

RDS: CREATE A DATABASE INSTANCE

Select MySQL DBMS.



RDS: CREATE A DATABASE INSTANCE

Enable only free-tier options and continue.

The screenshot shows the AWS Management Console interface for creating a new RDS database instance. The top navigation bar includes the AWS logo, 'Services', 'Resource Groups', and user information 'Luigi Starace' and 'Frank'. The main content area displays three database engine options: Oracle, Microsoft SQL Server, and MySQL. The MySQL option is selected, and its details are shown below. The details include a description of MySQL on RDS and a list of features. At the bottom of the wizard, there is a checkbox labeled 'Only enable options eligible for RDS Free Usage Tier' which is checked. To the right of this checkbox are links for 'Info', 'Cancel', and a prominent orange 'Next' button. A mouse cursor is pointing at the 'Next' button. The bottom of the console shows a 'Feedback' link, the language 'English (US)', and links for 'Privacy Policy' and 'Terms of Use'.

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☐ Oracle

ORACLE

☐ Microsoft SQL Server

Microsoft SQL Server

MySQL

MySQL is the most popular open source database in the world. MySQL on RDS offers the rich features of the MySQL community edition with the flexibility to easily scale compute resources or storage capacity for your database.

- Supports database size up to 16 TB.
- Instances offer up to 32 vCPUs and 244 GiB Memory.
- Supports automated backup and point-in-time recovery.
- Supports cross-region read replicas.

☒ Only enable options eligible for RDS Free Usage Tier [Info](#) [Cancel](#) [Next](#)

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RDS: CREATE A DATABASE INSTANCE

Select MySQL version 5.7.21

The screenshot shows the AWS RDS console interface for creating a new database instance. The top navigation bar includes the AWS logo, 'Services', 'Resource Groups', a star icon, a notification bell, and the user's name 'Luigi Starace' with a dropdown arrow. The breadcrumb trail indicates the path: 'RDS > Instances > Launch DB instance'. The main heading is 'Specify DB details', with a sub-header 'Step 2 of 3'. The 'Instance specifications' section contains a link to the 'AWS Simple Monthly Calculator' for cost estimation. The 'DB engine' is set to 'MySQL Community Edition'. The 'License model' dropdown is set to 'general-public-license'. The 'DB engine version' dropdown is set to 'mysql 5.7.21'. A 'Known issues/limitations' section is partially visible at the bottom. The footer contains a 'Feedback' link, a language selector set to 'English (US)', and links to 'Privacy Policy' and 'Terms of Use'.

aws Services Resource Groups

RDS > Instances > Launch DB instance

Specify DB details

Step 2 of 3

Instance specifications

Estimate your monthly costs for the DB Instance using the [AWS Simple Monthly Calculator](#).

DB engine
MySQL Community Edition

License model [Info](#)
general-public-license ▼

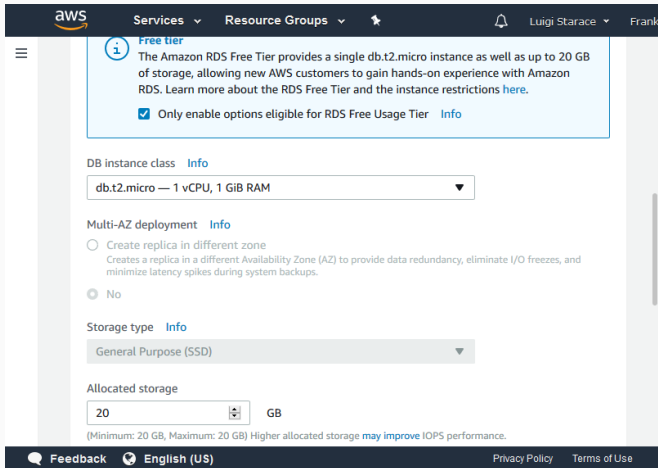
DB engine version [Info](#)
mysql 5.7.21 ▼

[Known issues/limitations](#)

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RDS: CREATE A DATABASE INSTANCE

Select `db.t2.micro` instance.



Free tier
The Amazon RDS Free Tier provides a single db.t2.micro instance as well as up to 20 GB of storage, allowing new AWS customers to gain hands-on experience with Amazon RDS. Learn more about the RDS Free Tier and the instance restrictions [here](#).

☒ Only enable options eligible for RDS Free Usage Tier [Info](#)

DB instance class [Info](#)
db.t2.micro — 1 vCPU, 1 GiB RAM ▼

Multi-AZ deployment [Info](#)
☐ Create replica in different zone
Creates a replica in a different Availability Zone (AZ) to provide data redundancy, eliminate I/O freezes, and minimize latency spikes during system backups.
☒ No

Storage type [Info](#)
General Purpose (SSD) ▼

Allocated storage
20 GB
(Minimum: 20 GB, Maximum: 20 GB) Higher allocated storage [may improve](#) IOPS performance.

[Feedback](#) [English \(US\)](#) [Privacy Policy](#) [Terms of Use](#)

RDS: CREATE A DATABASE INSTANCE

Enter your desired settings (**remember the password!** ⚠).

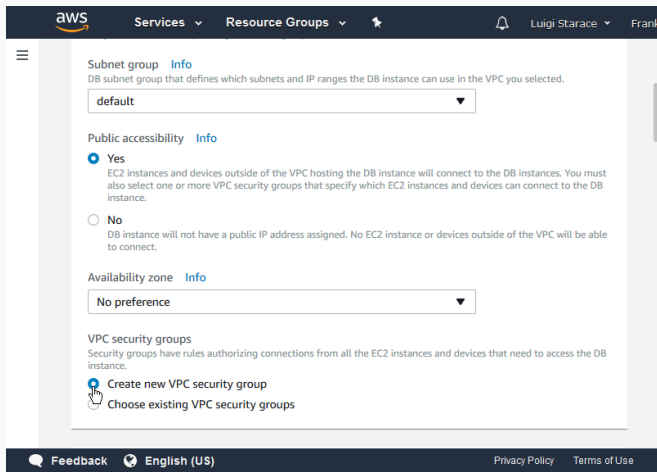
The screenshot shows the AWS Management Console interface for creating a new RDS database instance. The top navigation bar includes the AWS logo, 'Services', 'Resource Groups', a star icon, a notification bell, and the user's name 'Luigi Starace'. The main content area is titled 'Settings' and contains three sections for configuration:

- DB instance identifier** (Info): A text input field containing 'serverful-webapp-db'. Below the field, a note states: 'Specify a name that is unique for all DB instances owned by your AWS account in the current region. DB instance identifier is case insensitive, but stored as all lower-case, as in "mydbinstance". Must contain from 1 to 63 alphanumeric characters or hyphens (1 to 15 for SQL Server). First character must be a letter. Cannot end with a hyphen or contain two consecutive hyphens.'
- Master username** (Info): A text input field containing 'serverfulwebapp'. Below the field, a note states: 'Specify an alphanumeric string that defines the login ID for the master user. Master Username must start with a letter. Must contain 1 to 16 alphanumeric characters.'
- Master password** (Info) and **Confirm password** (Info): Two password input fields, both masked with dots. Below the Master password field, a note states: 'Master Password must be at least eight characters long, as in "mypassword". Can be any printable ASCII character except "/", "", or "@'.'

At the bottom right of the settings area are three buttons: 'Cancel', 'Previous', and 'Next'. A mouse cursor is pointing at the 'Next' button. The footer of the console includes a 'Feedback' link, the language 'English (US)', and links for 'Privacy Policy' and 'Terms of Use'.

RDS: CREATE A DATABASE INSTANCE

Be sure to select “create a new security group” .



The screenshot shows the AWS RDS console interface for creating a database instance. The top navigation bar includes the AWS logo, 'Services', 'Resource Groups', a star icon, a notification bell, and the user's name 'Luigi Starace' with a dropdown arrow. A sidebar menu is visible on the left. The main content area is titled 'Subnet group' with an 'Info' link. Below this is a description: 'DB subnet group that defines which subnets and IP ranges the DB instance can use in the VPC you selected.' A dropdown menu shows 'default'. The next section is 'Public accessibility' with an 'Info' link. It has two radio button options: 'Yes' (selected) and 'No'. The 'Yes' option has a description: 'EC2 instances and devices outside of the VPC hosting the DB instance will connect to the DB instances. You must also select one or more VPC security groups that specify which EC2 instances and devices can connect to the DB instance.' The 'No' option has a description: 'DB instance will not have a public IP address assigned. No EC2 instance or devices outside of the VPC will be able to connect.' The next section is 'Availability zone' with an 'Info' link. A dropdown menu shows 'No preference'. The final section is 'VPC security groups' with a description: 'Security groups have rules authorizing connections from all the EC2 instances and devices that need to access the DB instance.' There are two radio button options: 'Create new VPC security group' (selected, with a hand cursor icon) and 'Choose existing VPC security groups'. The bottom of the console shows a 'Feedback' button, a language selector set to 'English (US)', and links for 'Privacy Policy' and 'Terms of Use'.

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Subnet group [Info](#)
DB subnet group that defines which subnets and IP ranges the DB instance can use in the VPC you selected.

default

Public accessibility [Info](#)

☒ Yes
EC2 instances and devices outside of the VPC hosting the DB instance will connect to the DB instances. You must also select one or more VPC security groups that specify which EC2 instances and devices can connect to the DB instance.

☐ No
DB instance will not have a public IP address assigned. No EC2 instance or devices outside of the VPC will be able to connect.

Availability zone [Info](#)


No preference

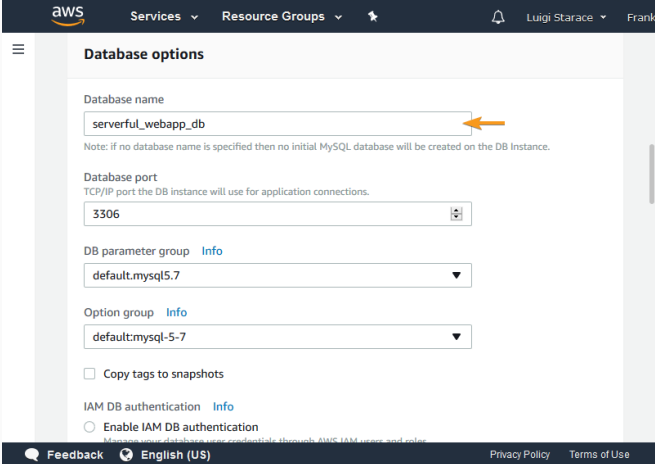
VPC security groups
Security groups have rules authorizing connections from all the EC2 instances and devices that need to access the DB instance.

☒ Create new VPC security group
☐ Choose existing VPC security groups

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RDS: CREATE A DATABASE INSTANCE

Enter a database name for the instance (**important!** ) and leave the rest as is.



The screenshot shows the 'Database options' configuration page in the AWS Management Console. The 'Database name' field is highlighted with an orange arrow and contains the text 'serverful_webapp_db'. Below it is a note: 'Note: if no database name is specified then no initial MySQL database will be created on the DB Instance.' The 'Database port' is set to '3306'. The 'DB parameter group' is set to 'default:mysql5.7'. The 'Option group' is set to 'default:mysql-5-7'. There are checkboxes for 'Copy tags to snapshots' and 'IAM DB authentication', both of which are currently unchecked. The bottom of the console shows a 'Feedback' button, the language 'English (US)', and links for 'Privacy Policy' and 'Terms of Use'.

Database options

Database name

serverful_webapp_db

Note: if no database name is specified then no initial MySQL database will be created on the DB Instance.

Database port

TCP/IP port the DB instance will use for application connections.

3306

DB parameter group [Info](#)

default:mysql5.7

Option group [Info](#)

default:mysql-5-7

☐ Copy tags to snapshots

IAM DB authentication [Info](#)

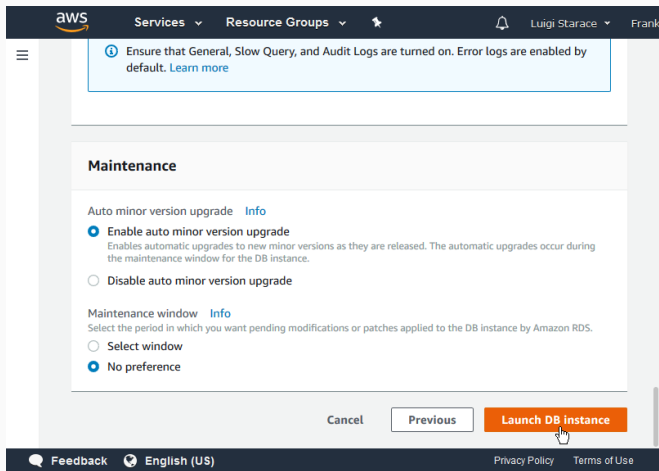
☐ Enable IAM DB authentication

Manage your database users credentials through AWS IAM users and roles.

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RDS: CREATE A DATABASE INSTANCE

Click on “Launch DB Instance” .



The screenshot shows the AWS Management Console interface for the 'Launch DB Instance' wizard. At the top, the AWS logo is on the left, and navigation links for 'Services', 'Resource Groups', and user information ('Luigi Starace', 'Frank') are on the right. A blue notification box at the top states: 'Ensure that General, Slow Query, and Audit Logs are turned on. Error logs are enabled by default. [Learn more](#)'. The main content area is titled 'Maintenance' and contains two sections. The first section, 'Auto minor version upgrade', has an 'Info' link and two radio button options: 'Enable auto minor version upgrade' (which is selected) and 'Disable auto minor version upgrade'. The 'Enable' option has a description: 'Enables automatic upgrades to new minor versions as they are released. The automatic upgrades occur during the maintenance window for the DB instance.' The second section, 'Maintenance window', also has an 'Info' link and a description: 'Select the period in which you want pending modifications or patches applied to the DB instance by Amazon RDS.' It contains two radio button options: 'Select window' and 'No preference' (which is selected). At the bottom of the form are three buttons: 'Cancel', 'Previous', and 'Launch DB instance' (which is orange and has a mouse cursor clicking on it). The footer of the console includes a 'Feedback' link, the language 'English (US)', and links for 'Privacy Policy' and 'Terms of Use'.

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Ensure that General, Slow Query, and Audit Logs are turned on. Error logs are enabled by default. [Learn more](#)

Maintenance

Auto minor version upgrade [Info](#)

☒ Enable auto minor version upgrade
Enables automatic upgrades to new minor versions as they are released. The automatic upgrades occur during the maintenance window for the DB instance.

☐ Disable auto minor version upgrade

Maintenance window [Info](#)
Select the period in which you want pending modifications or patches applied to the DB instance by Amazon RDS.

☐ Select window

☒ No preference

Cancel Previous **Launch DB instance**

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RDS: CREATE A DATABASE INSTANCE

The creation process takes around 15 minutes. Click on “View DB Instance Details” to visit the detail page for the instance you just created.

The screenshot shows the AWS Management Console interface for the 'Launch DB instance' page. At the top, the navigation bar includes the AWS logo, 'Services', 'Resource Groups', and user information. The breadcrumb trail shows 'RDS > Instances > Launch DB instance'. A green notification box with a checkmark icon states: 'Your DB instance is being created. Note: Your instance may take a few minutes to launch.' Below this, a section titled 'Connecting to your DB instance' provides instructions: 'Once Amazon RDS finishes provisioning your DB instance, you can use a SQL client application or utility to connect to the instance. Learn about connecting to your DB instance'. At the bottom right, there are two buttons: 'All DB instances' and 'View DB instance details'. A mouse cursor is pointing at the 'View DB instance details' button, which is highlighted in orange.

RDS: CREATE A DATABASE INSTANCE

When done, the status in your instance detail page will change to “available”.

The screenshot displays the AWS Management Console interface for an Amazon RDS instance. The breadcrumb navigation shows 'RDS > Instances > serverful-webapp-db'. The instance name 'serverful-webapp-db' is prominently displayed at the top, with an 'Instance actions' dropdown menu to its right. Below this, the 'Summary' section contains a table with the following details:

Engine	DB instance class	DB instance status	Pending maintenance
MySQL 5.7.21	db.t2.micro	available	none

An orange arrow points to the 'available' status in the 'DB instance status' column. Below the summary, the 'CloudWatch (54)' section is visible, featuring a search bar, a legend for 'serverful-webapp-db', and a series of numbered tabs (1-9) for navigating through log events. The footer of the console shows the copyright notice '© 2008 - 2018, Amazon Web Services, Inc. or its affiliates. All rights reserved.' along with links to 'Privacy Policy' and 'Terms of Use'.

RDS: CREATE A DATABASE INSTANCE

Notice a few important elements in the details section. We're going to need these later.

DetailsModify

Configurations ARN arn:aws:rds:eu-central-1:788880174327:db:serverful-webapp-db Engine MySQL 5.7.21 License Model General Public License Created Time Sun Apr 15 08:40:55 GMT+200 2018 DB Name serverful_webapp_db Username serverfulwebapp Option Group default:mysql-5-7 Parameter group default:mysql5.7 (in-sync)	Security and network Availability zone eu-central-1c VPC vpc-12e77979 Subnet group default Subnets subnet-e4184a8f subnet-97274ada subnet-f53fb788 Security groups rds-launch-wizard-1 (sg-03a2d775170d52c34) (active) Publicly accessible Yes Endpoint serverful-webapp-db.cviyaf0ewont.eu-central-1.rds.amazonaws.com	Instance and IOPS Instance Class db.t2.micro Storage Type General Purpose (SSD) Storage 20 GB Availability and durability DB instance status available Multi AZ No Automated backups Enabled (7 Days) Latest restore time April 15, 2018 at 8:45:00 AM UTC+2	Maintenance details Auto minor version upgrade Yes Maintenance window mon:01:28-mon:01:58 UTC (GMT) Backup window 20:55-21:25 UTC (GMT) Pending Modifications None Pending maintenance none Encryption details Encryption enabled No
--	--	---	---

By default, our newly-created instance will not be publicly accessible. If we want to be able to connect to it from any IP ¹ (e.g. from a Java program running on our laptop or from MySQL Workbench), we'll need to add a new rule to the security group to allow all inbound traffic.

¹notice that this is not a good practice in a production environment! [Sta]

RDS: CREATE A DATABASE INSTANCE

Click on the security group in the section *Security Group Rules*.

Security group rules (2)

Filter security group rules

< 1 > ⚙

Security group	Type	Rule
rds-launch-wizard-1 (sg-03a2d775170d52c34)	CIDR/IP - Inbound	79.51.216.139/32
rds-launch-wizard-1 (sg-03a2d775170d52c34)	CIDR/IP - Outbound	0.0.0.0/0

RDS: CREATE A DATABASE INSTANCE

Select the *Inbound* tab then click on the Edit button.

The screenshot shows the AWS Management Console interface. On the left is a navigation sidebar with categories like EC2 Dashboard, INSTANCES, IMAGES, and ELASTIC BLOCK STORE. The main content area displays the 'Create Security Group' page for a security group named 'rds-launch-wizard-1' with ID 'sg-03a2d775170d52c34'. The 'Inbound' tab is selected, showing a table of inbound rules. An 'Edit' button is visible above the table. A hand cursor is shown clicking the 'Inbound' tab and the 'Edit' button.

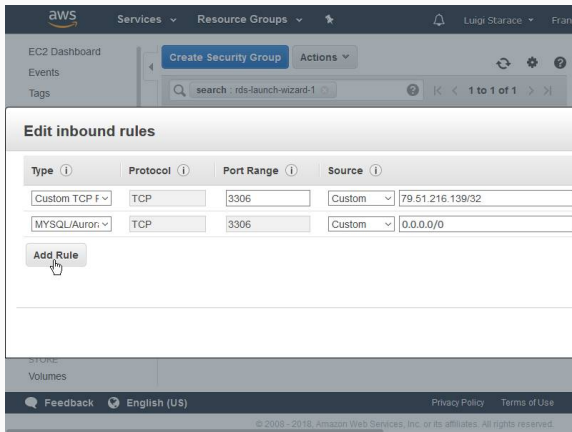
Security Group: sg-03a2d775170d52c34

Tab: **Inbound**

Type	Protocol	Port Range	Source	Description
Custom TCP	TCP	3306	79.51.216.139/	

RDS: CREATE A DATABASE INSTANCE

Add a new rule as shown in the picture below. Then save and return to the RDS instance detail page.



STEP 7: CREATE A DATABASE INSTANCE

The rule you just added should be displayed among the other two.

Security group rules (3)

Filter security group rules

< 1 > ⚙

Security group	Type	Rule
rds-launch-wizard-1 (sg-03a2d775170d52c34)	CIDR/IP - Inbound	79.51.216.139/32
rds-launch-wizard-1 (sg-03a2d775170d52c34)	Security Group - Inbound	0.0.0.0/0
rds-launch-wizard-1 (sg-03a2d775170d52c34)	CIDR/IP - Outbound	0.0.0.0/0

RDS: CONNECT TO THE DATABASE INSTANCE

```
Connection conn = null;
...
try {
    String dbName = "your_db_name";
    String userName = "your_username";
    String password = "your_pwd";
    //Endpoint is the hostname
    String host = "inst_name.1234567.us-east-1.rds.
        amazonaws.com";
    String port = "3306";
    String jdbcUrl = "jdbc:mysql://" + host + ":" + port +
        "/" + dbName + "?user=" + userName + "&password="
        + password;
    conn = DriverManager.getConnection(jdbcUrl);
    // Do something with the Connection
} catch (SQLException ex) {...}
```

- DynamoDB
 - *Fast and flexible NoSQL database service for any scale.*



- **DynamoDB**
 - *Fast and flexible NoSQL database service for any scale.*
- **ElastiCache**
 - In memory data store.
 - Supports memcached, Redis



NON RELATIONAL DATABASE SERVICES

- **DynamoDB**
 - *Fast and flexible NoSQL database service for any scale.*
- **ElastiCache**
 - In memory data store.
 - Supports memcached, Redis
- **Neptune**
 - Graph database service
 - Supports RDF, SPARQL, ...

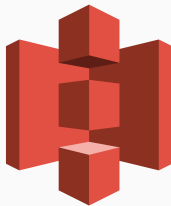


AN AWS BESTIARIUM

CLOUD STORAGE

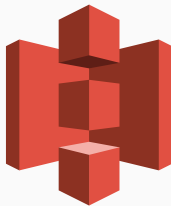
AMAZON SIMPLE STORAGE SERVICE (S3)

- *store and retrieve any amount of data from anywhere*



AMAZON SIMPLE STORAGE SERVICE (S3)

- *store and retrieve any amount of data from anywhere*
- 99.999999999% durability (nine nines!)



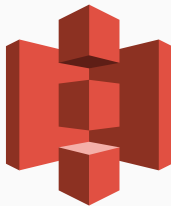
AMAZON SIMPLE STORAGE SERVICE (S3)

- *store and retrieve any amount of data from anywhere*
- 99.999999999% durability (nine nines!)
- Data is distributed across a *minimum* of three availability zones



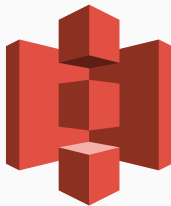
AMAZON SIMPLE STORAGE SERVICE (S3)

- *store and retrieve any amount of data from anywhere*
- 99.999999999% durability (nine nines!)
- Data is distributed across a *minimum* of three availability zones
- A logical unit of storage is a *bucket*



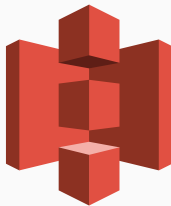
AMAZON SIMPLE STORAGE SERVICE (S3)

- *store and retrieve any amount of data from anywhere*
- 99.999999999% durability (nine nines!)
- Data is distributed across a *minimum* of three availability zones
- A logical unit of storage is a *bucket*
- Multiple storage classes



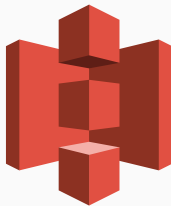
AMAZON SIMPLE STORAGE SERVICE (S3)

- *store and retrieve any amount of data from anywhere*
- 99.999999999% durability (nine nines!)
- Data is distributed across a *minimum* of three availability zones
- A logical unit of storage is a *bucket*
- Multiple storage classes
 - Standard



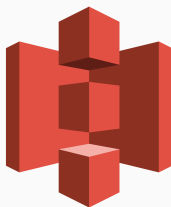
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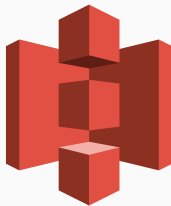
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 - Amazon Glacier



Multiple storage classes

Storage class	Storage	Retrieval (per 1K req.)
Standard	\$0.022 per GB	\$0.0004
Infrequent access	\$0.0125 per GB	\$0.001
IA single zone	\$0.01 per GB	\$0.001

Table 1: S3 pricing (Ireland)

AMAZON SIMPLE STORAGE SERVICE (S3) - MORE

Multiple storage classes

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Table 1: S3 pricing (Ireland)

Example 1: Host 1GB of files for a month with 10M retrievals

With standard class: $\$0.022 + \$4 = \$4.022$

With IA class: $\$0.0125 + \$10 = \$10.0125$

AMAZON SIMPLE STORAGE SERVICE (S3) - MORE

Multiple storage classes

Storage class	Storage	Retrieval (per 1K req.)
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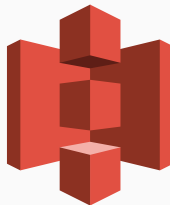
Table 1: S3 pricing (Ireland)

Example 2: Host 1GB of files for a month with 500 retrievals

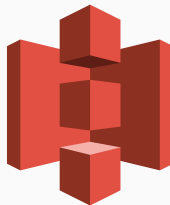
With standard class: $\$0.022 + \$0.0002 = \$0.0222$

With IA class: $\$0.0125 + \$0.0005 = \$0.013$

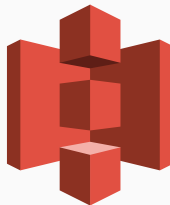
- Well-integrated with other services



- Well-integrated with other services
 - Machine Learning



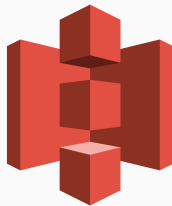
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- Well-integrated with other services
 - Machine Learning
 - Big Data Analysis
- REST API



- Well-integrated with other services
 - Machine Learning
 - Big Data Analysis
- REST API
- Can be used to host static websites



AN AWS BESTIARIUM



MISCELLANEA



- Comprehend (for NLP) [Dashboard](#)





- Comprehend (for NLP) [Dashboard](#)
- Rekognition (Visual Analysis) [Dashboard](#)



- Comprehend (for NLP)  Dashboard
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- Polly (text-to-speech)
- Transcribe (speech-to-text)

USING COMPREHEND FROM A NODE.JS APP

```
const AWS = require('aws-sdk');
const comprehend = new AWS.Comprehend();
...
var params = {
  LanguageCode: "it",
  Text: "Questo è un testo di esempio."
};
comprehend.detectSentiment(params, (err, data) => {
  if (err) {
    console.log(err, err.stack);
    return;
  }
  else{
    const sentiment = data.Sentiment;
    console.log(sentiment);
  }
});
```

■ Cognito



- Cognito
 - Sign-up and authentication



- Cognito
 - Sign-up and authentication
 - Federated identities



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 - Content Delivery Network



■ Cognito

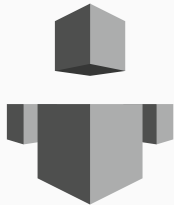
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■ CloudFront

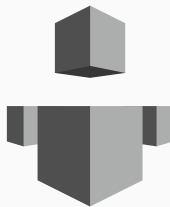
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- Cognito
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- Mechanical Turk



■ ???

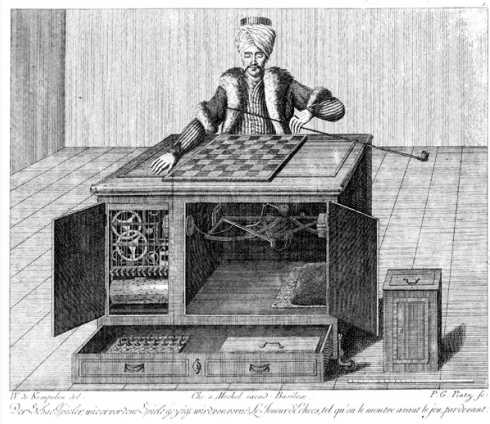


THE TURK

The Turk was a chess-playing automaton built in 1770.

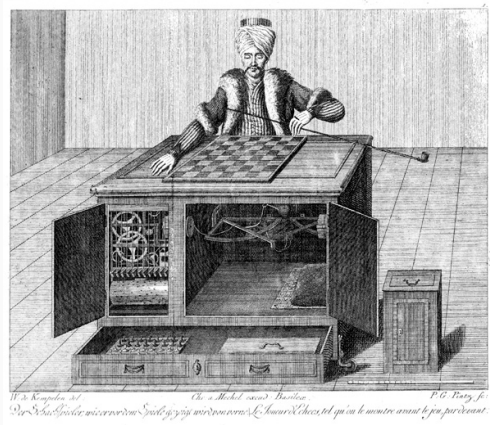
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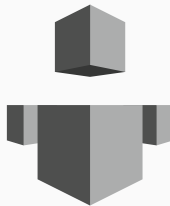


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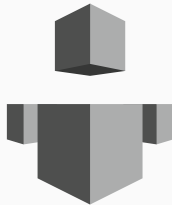
The Turk was a chess-playing automaton built in 1770. Obviously it was a fraud.



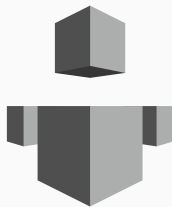
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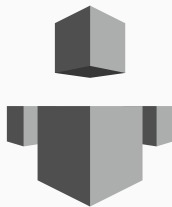
- Human Intelligence through an API



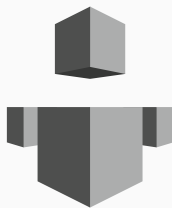
- Human Intelligence through an API
- Create HIT (Human Intelligence Task)



- Human Intelligence through an API
- Create HIT (Human Intelligence Task)
- Elastic, on-demand workforce



- Human Intelligence through an API
- Create HIT (Human Intelligence Task)
- Elastic, on-demand workforce
- Available 24/7



AN AWS BESTIARIUM

COMPUTING

- (Virtual) Servers on demand



Azure: Virtual Machines 

Google Cloud: Compute Engine 

AMAZON ELASTIC COMPUTE CLOUD (EC2)

- (Virtual) Servers on demand
- Different types of instances to suit computing needs



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Azure: Virtual Machines  web

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- Scaling **not** included!



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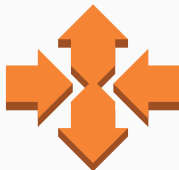
- *Scaling is the ability to increase or decrease the compute capacity of your application*



Azure: Virtual Machine Scale Sets [web](#)

Google Cloud: Load Balancing [web](#)

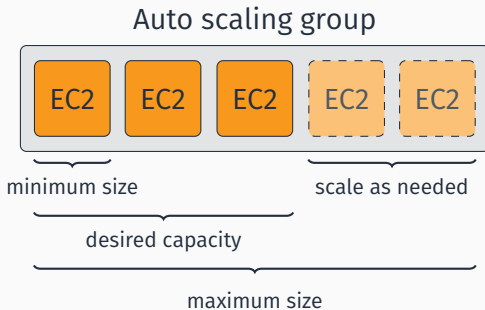
- *Scaling is the ability to increase or decrease the compute capacity of your application*
- Scale your application manually, on a scheduled basis or on demand



Azure: Virtual Machine Scale Sets  web

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AMAZON EC2 AUTO SCALING: DETAILS



- Distributes incoming traffic across multiple EC2 instances



AMAZON ELASTIC LOAD BALANCING (ELB)

- Distributes incoming traffic across multiple EC2 instances
- Pay-per-use billing



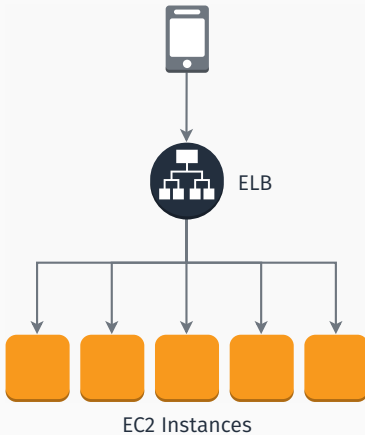
- Distributes incoming traffic across multiple EC2 instances
- Pay-per-use billing
 - Execution time



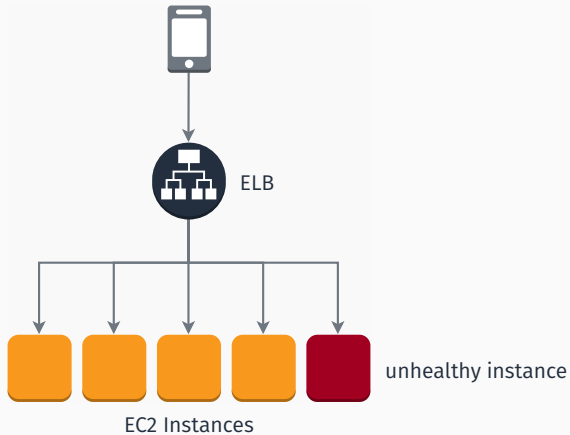
- Distributes incoming traffic across multiple EC2 instances
- Pay-per-use billing
 - Execution time
 - Number of requests / traffic



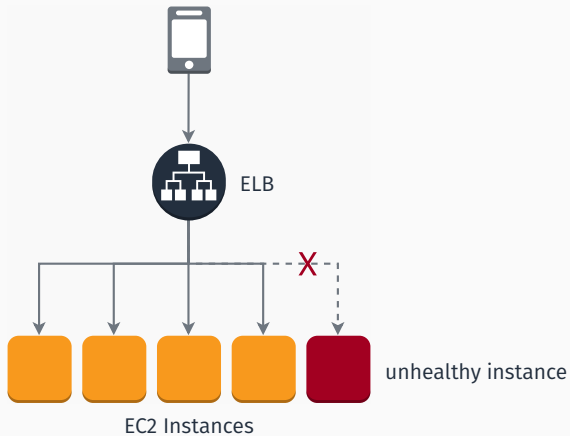
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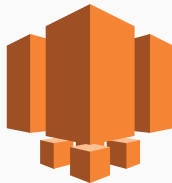
AMAZON ELASTIC LOAD BALANCING (ELB)



AMAZON ELASTIC LOAD BALANCING (ELB)



- A lightweight, simplified offer



Websites:

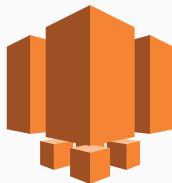


EC2



Lightsail

- A lightweight, simplified offer
- Bundles computing, storage, and networking capacity



Websites:

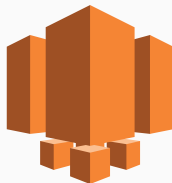


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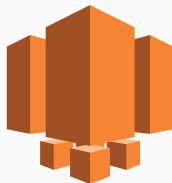


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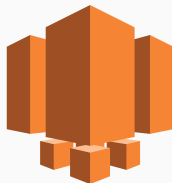


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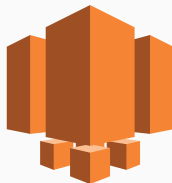


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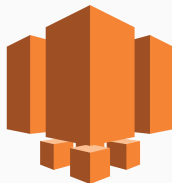


EC2



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- Bundles computing, storage, and networking capacity
- Preconfigured instances for
 - Debian, Windows Server, ...
 - Wordpress, Magento, Redmine, ...
 - LAMP stack, Nginx, ...
- Low and **predictable** monthly costs



Websites:



EC2



Lightsail

- *“Easy to begin, impossible to outgrow”*



- *“Easy to begin, impossible to outgrow”*
- Easy-to-use service to deploy web apps



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- Free of charge. Pay only for the AWS resources you use.



IS EC2 ELASTIC ENOUGH?

TRICKY USE CASES: SPORADIC REQUESTS

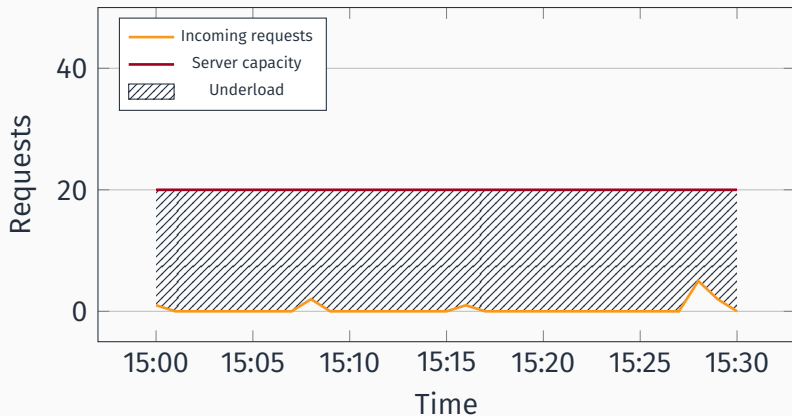


Figure 4: Sporadic requests example

TRICKY USE CASES: INCONSISTENT REQUESTS

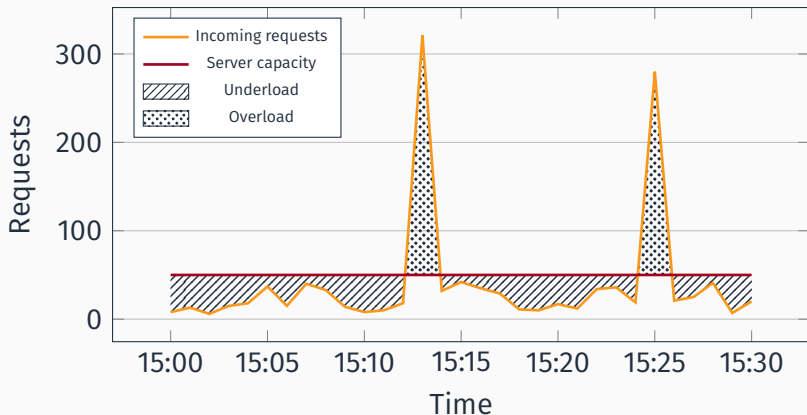


Figure 5: Inconsistent requests example

- You provide the code and say when to run it.



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- Execution is triggered by events



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- Pay only for **actual** execution time.
- Run your code without thinking about infrastructure
 - No need to worry about provisioning, load balancing, scaling...



AWS Lambda imposes some limits

- Max 300 seconds execution time.



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- Max 3008 MB memory allocation.



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- For a complete list: [📄 Lambda docs](#)



FaaS (Functions as a Service)

- Functions are the unit of deployment

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 - Based on Apache OpenWhisk [▶ web](#)

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Pros

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