

Linux 2

DEVOPS 2021

Lektion 8

Idag

- Virtuella servrar (del 1/2)
- Virtualisering och hypervisors
- Skapa/administrera Linux-VM i molnet (EC2/AWS)

Virtuella

system & maskiner

Allmänt om virtuella system

- Tar bort kopplingen mellan "maskin" och hårdvara (eller åtminstone gör den svagare)
- Lätta att skapa och att flytta mellan datorer
- Kan köra på olika sorters hårdvara
- Kan (ofta) köras på olika sorters operativsystem
 - (linux på linux, linux på mac, windows på linux, ...)

Allmänt om virtuella system

“ A virtual machine (VM) is a software program or operating system that not only exhibits the behavior of a separate computer, but is also capable of performing tasks such as running applications and programs like a separate computer. A virtual machine, usually known as a guest is created within another computing environment referred as a "host." Multiple virtual machines can exist within a single host at one time. ”

-- <https://www.techopedia.com/definition/4805/virtual-machine-vm>

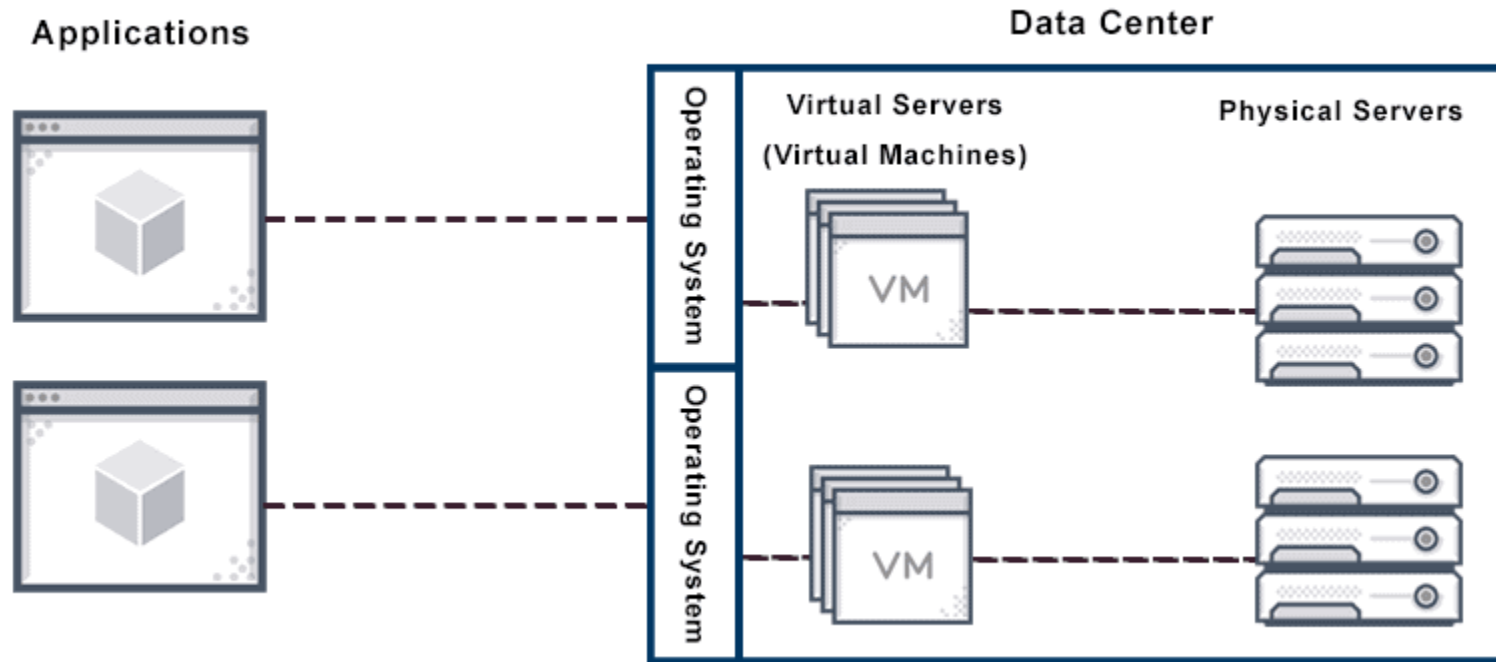
Övning 1

- Vilka virtuella system (i vid bemärkelse) vet ni om att ni brukar använda?

Övning 1: Några exempel

- VMWare eller annan "kör annat operativsystem på din dator"
- Emulatorer
- En molntjänst man besöker
- Javascript i din webbläsare
- JVM (Java Virtual Machine)

Virtuell server



Virtuell server

- Virtuell server kan flyttas mellan fysiska servrar
- En fysisk server kan ha flera virtuella maskiner/servrar
- Virtuell server kan finnas på en fysisk server du tar hand om, eller i en molntjänst

Virtuell server

- Flexibilitet
- Skalbarhet
- Tar bort den direkta fysiska kopplingen
 - konfigurera "hårdvara" med config-filer istället för sladdar och prylar
 - Starta om och hantera med kommandon
 - Skala upp och ner

Hypervisor

Hypervisor

“ A hypervisor (or virtual machine monitor, VMM, virtualizer) is computer software, firmware or hardware that creates and runs virtual machines. ”

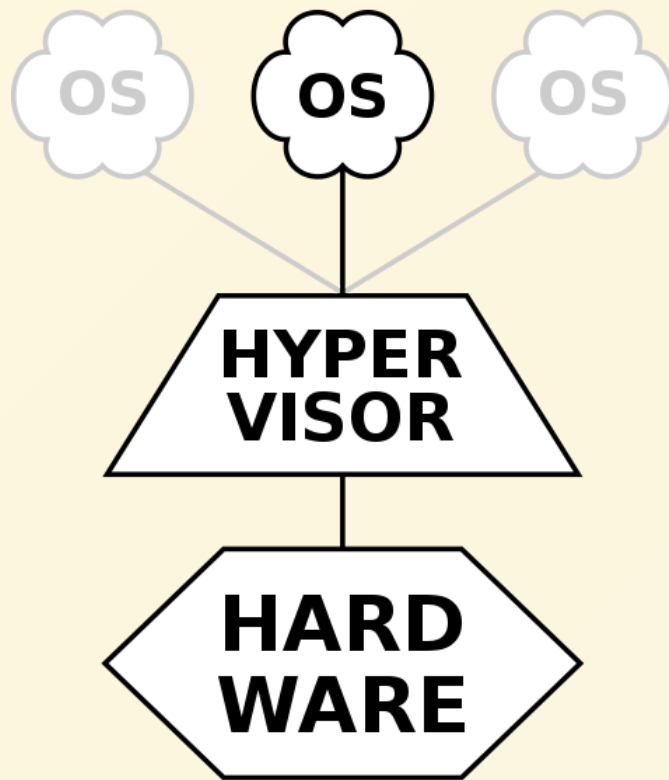
Hypervisor

Typ 1

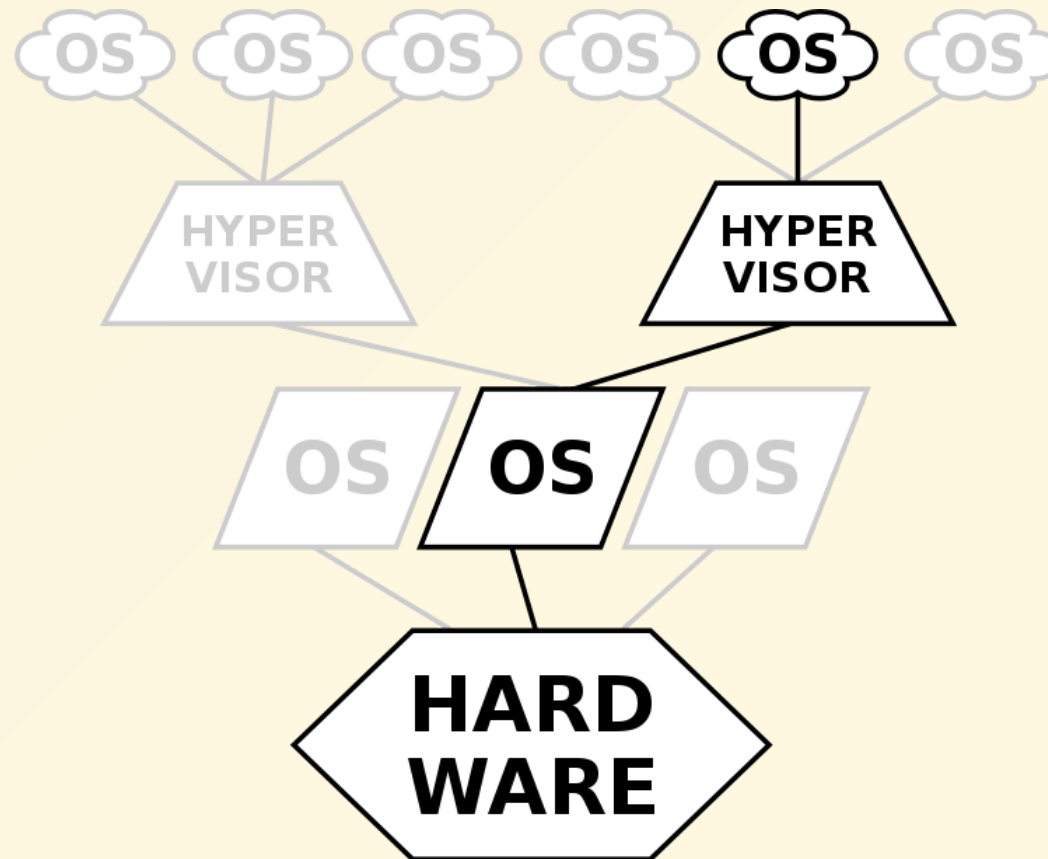
Direkt på hårdvaran, dvs hypervisor ÄR operativsystemet. Exempel: **VMWare ESXi, Microsoft Hyper-V, Xen**

Typ 2

Ett program som körs inuti ett annat operativsystem, t ex Linux.
Exempel: **VirtualBox, VMWare Workstation, ..**



TYPE 1
native
(bare metal)



TYPE 2
hosted

Virtuella maskiner

- Enkelt att sätta upp en maskin för att testa miljö
- Skapa miljöer med flera maskiner som interagerar
- Användbart för utveckling, test och drift

Använda virtuella servrar "in house"

- Fortfarande serverpark i egen datahall
- Minska effekten av enstaka hårdvarufel med virtualisering i flera skikt
- Utgår från typiska behov av relationsdatabaser, fillagring och applikationer

Scenario

- Vi tänker oss att vi skall bygga upp ett sådant
- "in house" system med hög grad av virtualisering
- Databaskluster
- Lagring
- Virtuella servrar för applikationer

Databaskluster

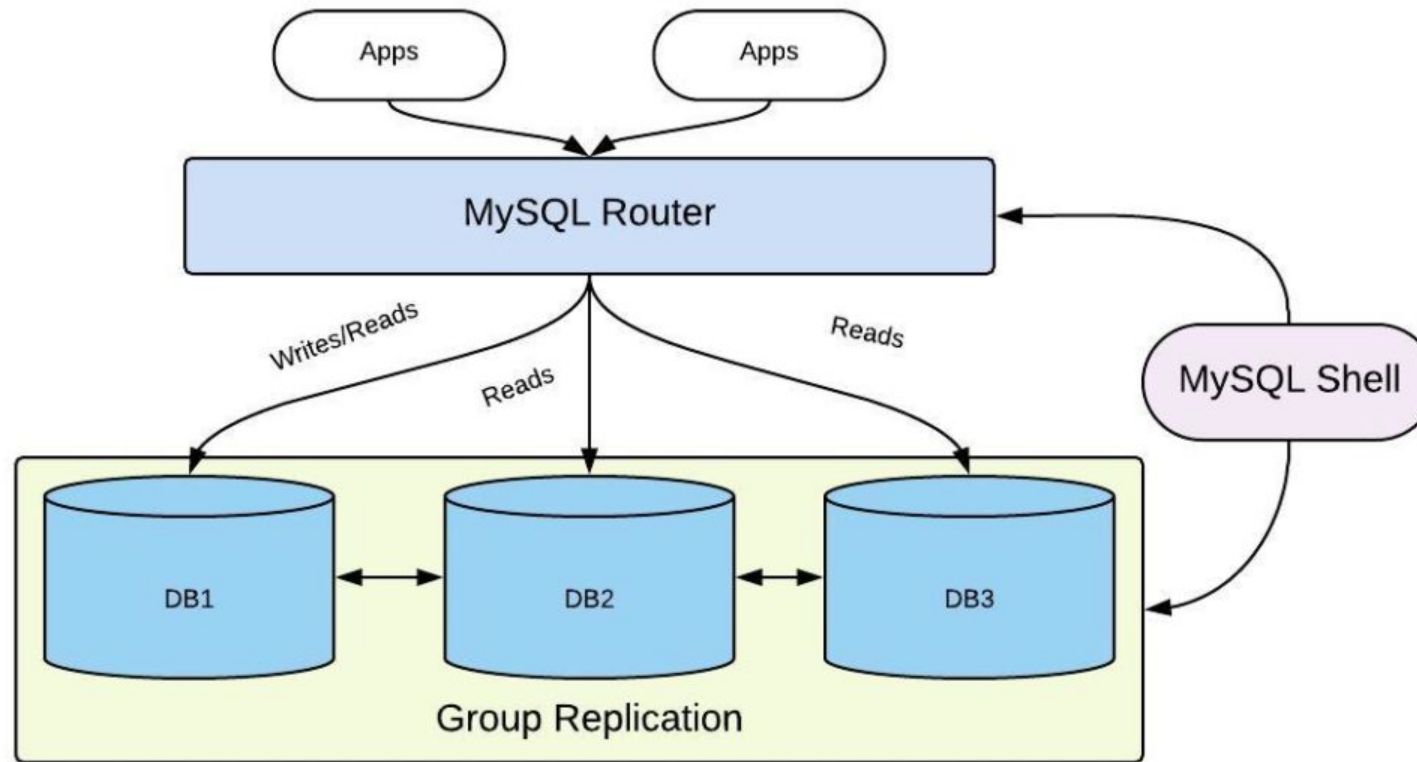
“ Clustering, in the context of databases, refers to the ability of several servers or instances to connect to a single database. An instance is the collection of memory and processes that interacts with a database, which is the set of physical files that actually store data. ”

-- [_https://www.techopedia.com/definition/17/clustering-databases](https://www.techopedia.com/definition/17/clustering-databases)

Databaskluster

- Databashanterare på flera servrar, som kommunicerar med varandra
- Enskilda databaser ”spridda” över klustret, inte hårt kopplade till en viss server
- Feltolerans (inte beroende av en viss server) – ”shared nothing”
- Lastbalansering

Databaskluster



VPS: Virtual Private Server

- I detta scenario en virtuell serverinstans på en lokal hypervisor
- Kan enkelt flyttas till annan hårdvara vid behov
- Får sina resurser tilldelade / konfigurerade
- Tillgång till del av den fysiska serverns resurser
- Eget operativsystem på den virtuella servern

Övning 2

- Tänk dig att ett företag överväger att gå från fysiska servrar till virtuella servrar ("in house") för drift av en stor e-handelssite med tillhörande logik och relationsdatabaser med data om både varor och kunder.
- Formulera för- och nackdelar med en sådan övergång.

Övning 2, exempel

- Fördelar
 - Minskade hårdvarukostnader på sikt
 - Möjlighet till förbättrad driftsäkerhet
 - Lättare att skala upp vid behov
- Nackdelar
 - En investering i mer hårdvara vid övergången ger högre kostnader momentant
 - Ytterligare en del att administrera i drift

Övning 3

Antag nu att företaget i förra övningen bestämt att ni skall gå vidare och bygga upp ett system av virtuella servrar. Gör en riskanalys för själva övergången från fysiska till virtuella servrar, och föreslå åtgärder för de risker som får ett högt riskvärde

Övning 3

Risk	Sannolikhet	Konsekvens	Riskvärde	Åtgärder
Problem med att kopiera över data	3	5	15	Testa ut en bra rutin
Förseningar i att bygga upp det virtuella systemet	2	3	6	-
Program som inte fungerar i den nya miljön	2	5	10	Testa igenom, skriv om vid behov
Personal inte säker på hur de ska hantera virtuella servrar	3	4	12	Utbildning

VM i molnet

Virtuell server i molnet

- Leverantör som tillhandahåller en stor och spridd serverpark bakom de virtuella servrarna.
- Stora aktörer: AWS (Amazon), Azure (Microsoft), Google cloud (Google)

Cloud (molntjänster)

- Många servrar i nätver
- Virtuella servrar kan i princip ligga var som helst i detta nät
- Tjänster av olika slag, från en "egen" server till specifika funktioner

Cloud (molntjänster)

“ Cloud computing is the on-demand availability of computer system resources, especially data storage (cloud storage) and computing power, without direct active management by the user. The term is generally used to describe data centers available to many users over the Internet.[1] Large clouds, predominant today, often have functions distributed over multiple locations from central servers. ”

Cloud (molntjänster)

Private cloud

Egen serverpark utspridd till att utgöra moln för ett företag att lägga servrar och tjänster på.

Public cloud

Moln tillgängligt för vem som helst som vill köpa tjänster, såsom hos de stora leverantörerna.

AWS & EC2

AWS

- Behövs ett konto hos AWS
- Finns en uppsättning färdiga serveruppsättningar som man kan välja att köra
- Notera behovet av att generera ett nyckelpar för inloggning
- <https://aws.amazon.com/>

AWS Accounts Include 12 Months of Free Tier Access

Including use of Amazon EC2, Amazon S3, and Amazon DynamoDB
Visit aws.amazon.com/free for full offer terms

Create an AWS account

Email address

Password

Confirm password

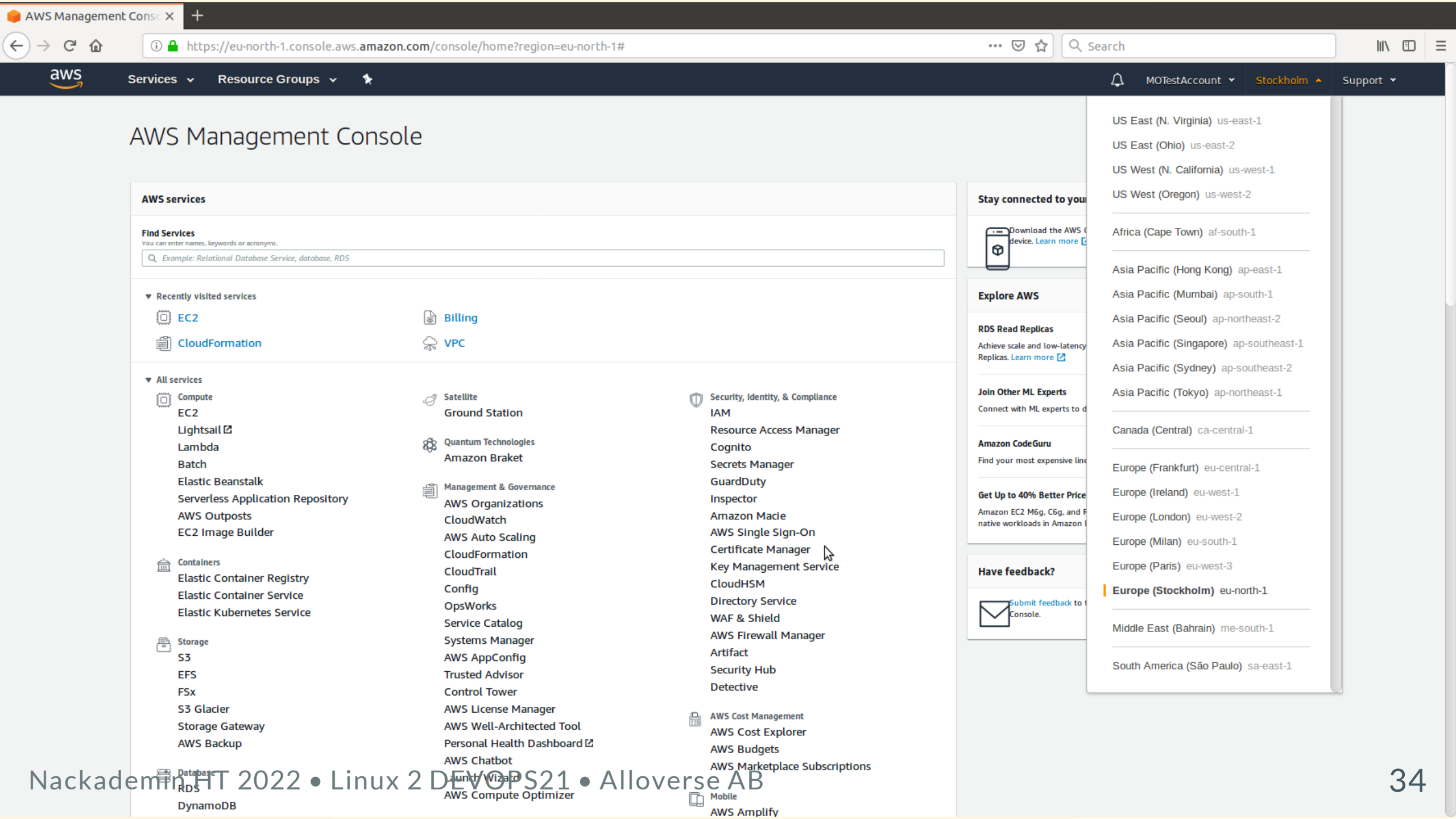
AWS account name ⓘ

Continue

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AWS Management Console

AWS services

Find Services

You can enter names, keywords or acronyms.

Q Example: Relational Database Service, database, RDS

Recently visited services



EC2



Billing



CloudFormation



VPC

All services



Compute

EC2

Lightsail

Lambda

Batch

Elastic Beanstalk

Serverless Application Repository

AWS Outposts

EC2 Image Builder



Containers

Elastic Container Registry

Elastic Container Service

Elastic Kubernetes Service



Storage

S3

EFS

FSx

S3 Glacier

Storage Gateway

AWS Backup



Database

RDS

DynamoDB



Satellite

Ground Station



Quantum Technologies

Amazon Braket



Management & Governance

AWS Organizations

CloudWatch

AWS Auto Scaling

CloudFormation

CloudTrail

Config

OpsWorks

Service Catalog

Systems Manager

AWS AppConfig

Trusted Advisor

Control Tower

AWS License Manager

AWS Well-Architected Tool

Personal Health Dashboard

AWS Chatbot

Launch Wizard

AWS Compute Optimizer



Security, Identity, & Compliance

IAM

Resource Access Manager

Cognito

Secrets Manager

GuardDuty

Inspector

Amazon Macie

AWS Single Sign-On

Certificate Manager

Key Management Service

CloudHSM

Directory Service

WAF & Shield

AWS Firewall Manager

Artifact

Security Hub

Detective



AWS Cost Management

AWS Cost Explorer

AWS Budgets

AWS Marketplace Subscriptions



Mobile

AWS Amplify

Stay connected to you



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Explore AWS

RDS Read Replicas

Achieve scale and low-latency with Read Replicas. [Learn more](#)

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Amazon CodeGuru

Find your most expensive lines of code.

Get Up to 40% Better Prices

Amazon EC2 M5g, C5g, and F5g instances offer up to 40% better prices for native workloads in Amazon EC2.

Have feedback?



[Submit feedback](#) to the AWS Management Console.

US East (N. Virginia) us-east-1

US East (Ohio) us-east-2

US West (N. California) us-west-1

US West (Oregon) us-west-2

Africa (Cape Town) af-south-1

Asia Pacific (Hong Kong) ap-east-1

Asia Pacific (Mumbai) ap-south-1

Asia Pacific (Seoul) ap-northeast-2

Asia Pacific (Singapore) ap-southeast-1

Asia Pacific (Sydney) ap-southeast-2

Asia Pacific (Tokyo) ap-northeast-1

Canada (Central) ca-central-1

Europe (Frankfurt) eu-central-1

Europe (Ireland) eu-west-1

Europe (London) eu-west-2

Europe (Milan) eu-south-1

Europe (Paris) eu-west-3

Europe (Stockholm) eu-north-1

Middle East (Bahrain) me-south-1

South America (São Paulo) sa-east-1

Launch instance wizard | X

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https://eu-north-1.console.aws.amazon.com/ec2/v2/home?region=eu-north-1#LaunchInstanceWizard:

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Resource Groups ▾

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MOTestAccount ▾

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Support ▾

1. Choose AMI

2. Choose Instance Type

3. Configure Instance

4. Add Storage

5. Add Tags

6. Configure Security Group

7. Review

Step 1: Choose an Amazon Machine Image (AMI)

Cancel and Exit

Community AMIs

☐ Free tier only ⓘ


Free tier eligible

through extras.

Root device type: ebs

Virtualization type: hvm

ENA Enabled: Yes



Amazon Linux AMI 2018.03.0 (HVM), SSD Volume Type - ami-08e6c82a680d66080

Amazon Linux

Free tier eligible

The Amazon Linux AMI is an EBS-backed, AWS-supported image. The default image includes AWS command line tools, Python, Ruby, Perl, and Java. The repositories include Docker, PHP, MySQL, PostgreSQL, and other packages.


Root device type: ebs

Virtualization type: hvm

ENA Enabled: Yes

Select

64-bit (x86)



SUSE Linux Enterprise Server 15 SP2 (HVM), SSD Volume Type - ami-037f792e10db0c48c

SUSE Linux

Free tier eligible

SUSE Linux Enterprise Server 15 Service Pack 2 (HVM), EBS General Purpose (SSD) Volume Type. Public Cloud, Advanced Systems Management, Web and Scripting, and Legacy modules enabled.


Root device type: ebs

Virtualization type: hvm

ENA Enabled: Yes

Select

64-bit (x86)



Ubuntu Server 18.04 LTS (HVM), SSD Volume Type - ami-0363142d8c97b94c8

Free tier eligible

Ubuntu Server 18.04 LTS (HVM),EBS General Purpose (SSD) Volume Type. Support available from Canonical (<http://www.ubuntu.com/cloud/services>).


Root device type: ebs

Virtualization type: hvm

ENA Enabled: Yes

Select

64-bit (x86)



Ubuntu Server 16.04 LTS (HVM), SSD Volume Type - ami-076695b3315782bbb

Free tier eligible

Ubuntu Server 16.04 LTS (HVM),EBS General Purpose (SSD) Volume Type. Support available from Canonical (<http://www.ubuntu.com/cloud/services>).


Root device type: ebs

Virtualization type: hvm

ENA Enabled: Yes

Select

64-bit (x86)




Are you launching a database instance? Try Amazon RDS.

Amazon Relational Database Service (RDS) makes it easy to set up, operate, and scale your database on AWS by automating time-consuming database management tasks. With RDS, you can easily deploy **Amazon Aurora, MariaDB, MySQL, Oracle, PostgreSQL, and SQL Server** databases on AWS. [Aurora](#) is a MySQL- and PostgreSQL-compatible, enterprise-class database at 1/10th the cost of commercial databases. [Learn more about RDS](#)

Launch a database using RDS

Hide



Red Hat Enterprise Linux 8 (HVM), SSD Volume Type - ami-0b149b24810ebb323

Red Hat

Red Hat Enterprise Linux version 8 (HVM). EBS General Purpose (SSD) Volume Type

Select


1. Choose AMI
2. Choose Instance Type
3. Configure Instance
4. Add Storage
5. Add Tags
6. Configure Security Group
7. Review

Step 7: Review Instance Launch

Please review your instance launch details. You can go back to edit changes for each section. Click **Launch** to assign a key pair to your instance and complete the launch process.

▼ AMI Details

Edit AMI

 **Ubuntu Server 18.04 LTS (HVM), SSD Volume Type - ami-0363142d8c97b94c8**

Free tier eligible

Ubuntu Server 18.04 LTS (HVM),EBS General Purpose (SSD) Volume Type. Support available from Canonical (<http://www.ubuntu.com/cloud/services>).
Root Device Type: ebs Virtualization type: hvm

▼ Instance Type

Edit instance type

Instance Type	ECUs	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance
t3.micro	Variable	2	1	EBS only	Yes	Up to 5 Gigabit

▼ Security Groups

Edit security groups

Security group name

launch-wizard-1

Description

launch-wizard-1 created 2020-08-30T14:24:51.018+02:00

Type ⓘ	Protocol ⓘ	Port Range ⓘ	Source ⓘ	Description ⓘ
This security group has no rules				

► Instance Details

Edit instance details

► Storage

Edit storage

► Tags

Edit tags

Launch instance wizard

← → ↺ 🏠

https://eu-north-1.console.aws.amazon.com/ec2/v2/home?region=eu-north-1#LaunchInstanceWizard:

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1. Choose AMI

2. Choose Instance Type

3. Configure Instance

4. Add Storage

5. Add Tags

6. Configure Security Group

7. Review

Step 7: Review Instance Launch

Please review your instance launch details. You can go back to edit changes for each section. Click **Launch** to assign a key pair to your instance and complete the launch process.

▼ AMI Details

Ubuntu Server 18.04 LTS (HVM), SSD Volume Type - ami-0363142d8c97b94c8

Free tier eligible

Ubuntu Server 18.04 LTS (HVM),EBS General Purpose (SSD) Volume Type. Support available from Canonical (http://www.ubuntu.com/cloud/services).

Root Device Type: ebs Virtualization type: hvm

▼ Instance Type

Instance Type	ECUs	vCPUs	Memory (GiB)
t3.micro	Variable	2	1

▼ Security Groups

Security group name

launch-wizard-1

Description

launch-wizard-1 created 2020-08-30T14:24:51

Type ⓘ	Protocol ⓘ
--------	------------

▶ Instance Details

▶ Storage

▶ Tags

Edit AMI

Edit instance type

Edit security groups

Edit instance details

Edit storage

Edit tags

Select an existing key pair or create a new key pair

A key pair consists of a **public key** that AWS stores, and a **private key file** that you store. Together, they allow you to connect to your instance securely. For Windows AMIs, the private key file is required to obtain the password used to log into your instance. For Linux AMIs, the private key file allows you to securely SSH into your instance.

Note: The selected key pair will be added to the set of keys authorized for this instance. Learn more about [removing existing key pairs from a public AMI](#).

Create a new key pair ▾

Key pair name

MyEC2

Download Key Pair

⋮

You have to download the **private key file** (*.pem file) before you can continue. **Store it in a secure and accessible location.** You will not be able to download the file again after it's created.

Cancel Launch Instances

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Feedback 🌐 English (US)

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Server i AWS

Koppla upp med ssh:

```
ssh -i <pem path> <user>@<dns name>
```

Exempel:

```
ssh -i MyEC2.pem ubuntu@ec2-13-49-175-190.eu-north-1.compute.amazonaws.com
```

Övning 4

- Gör dig en Linux-server i AWS.
 - Konto kräver diverse uppgifter, men en standard Linux-server kan köras gratis så länge den inte har mycket trafik.
- Logga in med ssh
- Ta en titt på vilka daemoner som är igång på din nygjorda server
- Vad är installerat per default på din server?

Övning 5

- Gör nu din AWS-maskin till en LAMP-server.
- Se till så att den kan nås från Internet.

EC2 Management Console

←

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https://eu-north-1.console.aws.amazon.com/ec2/v2/home?region=eu-north-1#SecurityGroup:groupId=sg-01e01712859c3b45f

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Resource Groups

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Instances

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Lifecycle Manager

▼ Network & Security

Security Groups

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Elastic IPs

New

Placement Groups

New

Key Pairs

New

Network Interfaces

▼ Load Balancing

Load Balancers

Target Groups

New

▼ Auto Scaling

Launch Configurations

Auto Scaling Groups

EC2 > Security Groups > sg-01e01712859c3b45f - launch-wizard-1

sg-01e01712859c3b45f - launch-wizard-1

Delete security group

Copy to new security group

Details

Security group name

📄 launch-wizard-1

Security group ID

📄 sg-01e01712859c3b45f

Description

📄 launch-wizard-1 created 2020-08-30T14:24:51.018+02:00

VPC ID

📄 vpc-60d67f09

Owner

📄 853638659506

Inbound rules count

1 Permission entry

Outbound rules count

1 Permission entry

Inbound rules

Outbound rules

Tags

Inbound rules

Edit inbound rules

Type	Protocol	Port range	Source	Description - optional
SSH	TCP	22	0.0.0.0/0	-

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🌐 English (US)

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EC2 Management Console

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https://eu-north-1.console.aws.amazon.com/ec2/v2/home?region=eu-north-1#ModifyInboundSecurityGroupRules:securityGroupId=sg-01e...

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aws

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EC2 > Security Groups > sg-01e01712859c3b45f - launch-wizard-1 > Edit inbound rules

Edit inbound rules

Info

Inbound rules control the incoming traffic that's allowed to reach the instance.

Inbound rules

Info

Type	Protocol	Port range	Source	Description - optional	
SSH	TCP	22	Custom		Delete
				0.0.0.0/0	
HTTP	TCP	80	Custom		Delete
				0.0.0.0/0	

Add rule

⚠️

NOTE: Any edits made on existing rules will result in the edited rule being deleted and a new rule created with the new details. This will cause traffic that depends on that rule to be dropped for a very brief period of time until the new rule can be created.

Cancel

Preview changes

Save rules

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Feedback

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Att tänka på vid val av moln

- Region – var har de sina serverhaller, samt legala aspekter.
- Startkostnader, inkl utbildning / experimenttid som kommer behövas.
- Löpande kostnader.
- Avtal avseende upptider, uttryckning vid behov etc.
- Support.
- Säkerhetsaspekter.

Tillbakablick, reflektion, kommentarer ...