Have you been deploying your Azure databases and all connected resources through the portal?
Are you fed-up with clicking, weird resource naming and mostly, with having to deal with changes manually?

If you are working in Azure and you have anything to do with data and the infrastructure, this session is for you!

Azure Infrastructure as Code offers a plethora of possibilities, but the first time I checked it out, all I saw were Azure Resource Manager (ARM) templates. Hard to read, harder to write. They gave me headaches. It seems I wasn't the only one with that problem, because there are excellent tools to help you out! My favourite, and the one I'm using in this session is Terraform.

Now why is this presenter talking about this? I've deployed a number of customer environments with this language. Whenever there's a security update, like a new policy for example, I can deploy this to all customers in minutes. I'll only have to code this once and can easily deliver it many times, saving them time and money. Resources we can spend in other areas like ETL, ELT etc.

During the session, I'll demonstrate the basics of a data deployment, following the spirit of the Microsoft Well Architected Framework. I'll show you my way of working, the structure and and the end result. There is no need to try and photograph what's happening on screen, all the scripts will be available after the session.

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Deploying your data infrastructure

August 2023, Gothenburg

VINCI ENERGIES

Thank you, partners

KOHERA

element 61
experience & expertise

lytix

bmatix
Act informed

inetum.
realdolmen
Positive digital flow

datasense

MICROPOLE
BELUX

LACO/

AKABI

Cloubis

datashift

EpicData.

Sparkle

Tabular Editor

solarwinds

u2u

ae Adapt and Enable

MONIN
Database Managed Services

proximus NXT
tech. bizz. people.

tillit data shapers

ORDINA
Ahead of change

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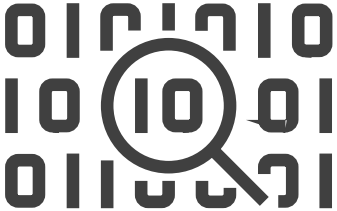
Code and slides are available through Github

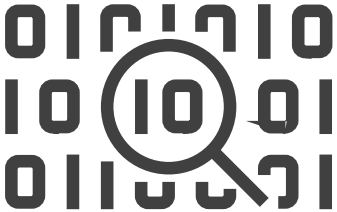
- The code is provided as is, without any warranty for your personal or company Azure Tenant
- Think, read, evaluate and then run
- Review the deployment before adding ANY data to it
- The code is intended as a demo and can function as a starting point for your own deployment. It is **not** production grade.

“IT Governance discovered 1,063 security incidents in 2022, which accounted for 480,014,323 breached records. That represents an 14.8% decrease in security incidents compared to 2021 (1,243).”



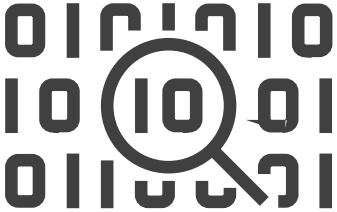
https://www.itgovernance.co.uk/blog/data-breaches-and-cyber-attacks-in-2022-408-million-breached-records

“The Dutch authority for personal data reported 21.151 data leaks and 1826 cyberattacks in 2022. In the last 5 years, 114,258 data leaks were reported.”



https://www.autoriteitpersoonsgegevens.nl/uploads/2023-06/AP_Rapportage_datalekken_2022.pdf

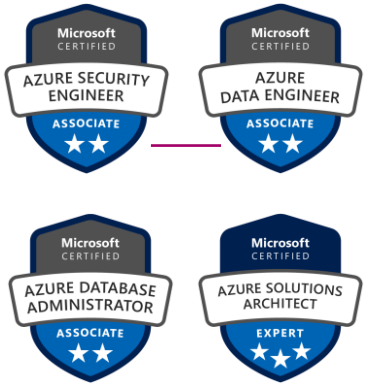
“Stay out of these statistics!”



Any security officer, any company, anywhere in the world

Reitse Eskens

Technical Consultant Axians Business Analytics



SQL: DBA, Performance tuning

Azure: architect, developer, admin

SQL Classes

Speaker

Photography, cycling, chronical volunteer

Twitter: @2meterDBA

LinkedIn: /in/reitseeskens/

Reitse.eskens@axians.com

https://sqlreitse.com

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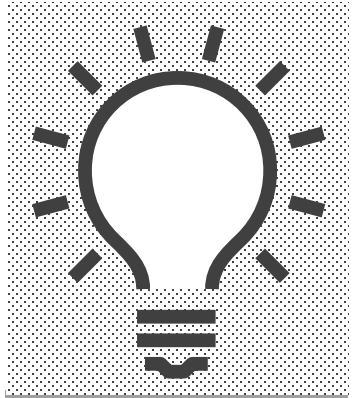
Let’s start a story



Big idea, let’s move this data solution to the cloud!

Architect for security

Learn and use infrastructure as code

Start building your solution

Architect for security

- More than just resource security
- More than user security
- Assume Breach, Zero Trust, Well Architected Framework

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More then resource security

- Create policies to prevent unwanted changes or deployments
- Add locks to prevent accidental changes or deletes

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More than user security

- 2FA or MFA should be the default
- Enable Just in Time access
- Enable Priviliged Identity Management
- Educate your key users
- Enforce security tools like Key Vault

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Assume breach, Zero Trust, WAF/CAF

- What can you do to prevent this breach?
- Hackers are constantly scanning for open ports
- Always deny traffic, unless
- Use the guidelines, don’t take them literally

Infrastructure as Code

- What is it?
- Which flavors are available
- Azure DevOps and GitHub
- Review before release

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What is it?

- Easiest way to deploy resources in the cloud
- Repeatable without differences
- Configurable with parameters

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Flavors

- ARM templates
- AZ Powershell commandlets
- Bicep
- Terraform / Terragrunt
- Pulumi
- Bring your own hybrid

```
 "$schema": "https://schema.management.azure.com/schemas/2019
loymentTemplate.json#",
 "contentVersion": "1.0.0.0",
 "parameters": {
     "virtualMachines_vmdatasat23_name": {
         "defaultValue": "vmdatasat23",
         "type": "String"
     },

sks_vmdatasat23_disk1_c53bab912da04d34a6e80269891edcac_extern
         "defaultValue": "/subscriptions/
facf9-bf12-4ee9-abee-3cd632b1dcbe/resourceGroups/rg_data/prov
rosoft.Compute/disks/
atasat23_disk1_c53bab912da04d34a6e80269891edcac",
         "type": "String"
     },
     "networkInterfaces_nicvmdatasat2301_externalid": {
         "defaultValue": "/subscriptions/
facf9-bf12-4ee9-abee-3cd632b1dcbe/resourceGroups/rg_connectiv
viders/Microsoft.Network/networkInterfaces/nicvmdatasat2301",
```

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Flavors

- ARM templates
- AZ Powershell commandlets
- Bicep
- Terraform / Terragrunt
- Pulumi
- Bring your own hybrid

```
ew-AzVM
  [[-ResourceGroupName] <String>]
  [[-Location] <String>]
  [-EdgeZone <String>]
  [[-Zone] <String[]>]
  [-PublicIpSku <String>]
  -Name <String>
  -Credential <PSCredential>
  [-NetworkInterfaceDeleteOption <String>]
  [-VirtualNetworkName <String>]
  [-AddressPrefix <String>]
  [-SubnetName <String>]
  [-SubnetAddressPrefix <String>]
  [-PublicIpAddressName <String>]
```

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Flavors

- ARM templates
- AZ Powershell commandlets
- Bicep
- Terraform / Terragrunt
- Pulumi
- Bring your own hybrid

```
resource virtualMachine 'Microsoft.Compute/virtualMachines@2020-06-01'
    name: vmName
    location: resourceGroup().location
    properties: {
        hardwareProfile: {
            vmSize: 'Standard_DS1_v2'
        }
        osProfile: {
            computerName: vmName
            adminUsername: adminUsername
            adminPassword: adminPassword
        }
        storageProfile: {
            imageReference: {
                publisher: 'MicrosoftWindowsServer'
                offer: 'WindowsServer'
                sku: '2016-Datacenter'
                version: 'latest'
            }
            osDisk: {
```

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Flavors

- ARM templates
- AZ Powershell commandlets
- Bicep
- Terraform / Terragrunt
- Pulumi
- Bring your own hybrid

```
resource "azurerm_windows_virtual_machine" "vm" {
  count               = var.do_agent_count
  name                = "vm${var.do_workload}0${count.index + 1}"
  resource_group_name = azurerm_resource_group.rg_do.name
  location            = azurerm_resource_group.rg_do.location
  size                = var.do_vm_size
  admin_username      = "vmadmin"
  admin_password      = random_password.vmpw[count.index].result
  network_interface_ids = [
    azurerm_network_interface.vmnic[count.index].id,
  ]

  source_image_reference {
    publisher = "MicrosoftWindowsServer"
    offer     = "WindowsServer"
    sku       = "2022-Datacenter"
    version   = "latest"
  }
```

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Azure DevOps and GitHub

- Code repositories
- Kanban boards to support Agile and Scrum ways of working
- Pipelines to do the heavy lifting
- Pull requests to enforce review of the code before it gets released

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The demos

- Created in Terraform, with PowerShell acting as a support act
- Not better or worse than Bicep, just different
- No DevOps included to prevent information overload

Building your solution

- From the ground up
- Management group with policy
- From subscription to resourcegroup
- Networking first
- Private endpoints only
- No public access
- VPN and Bastion
- Encryption everywhere

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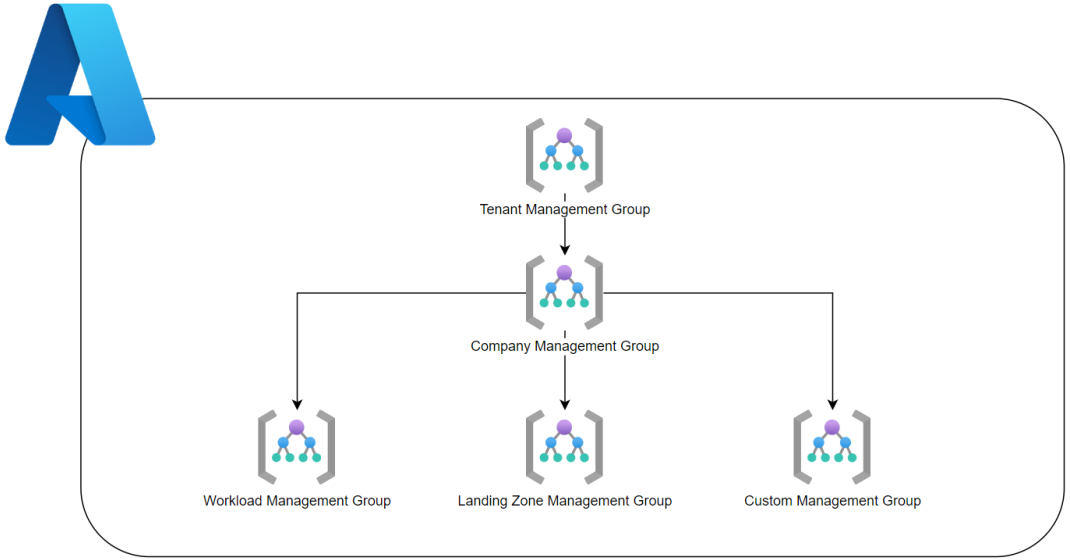
Management group with Policies

- Example policy: restrict VM sizes



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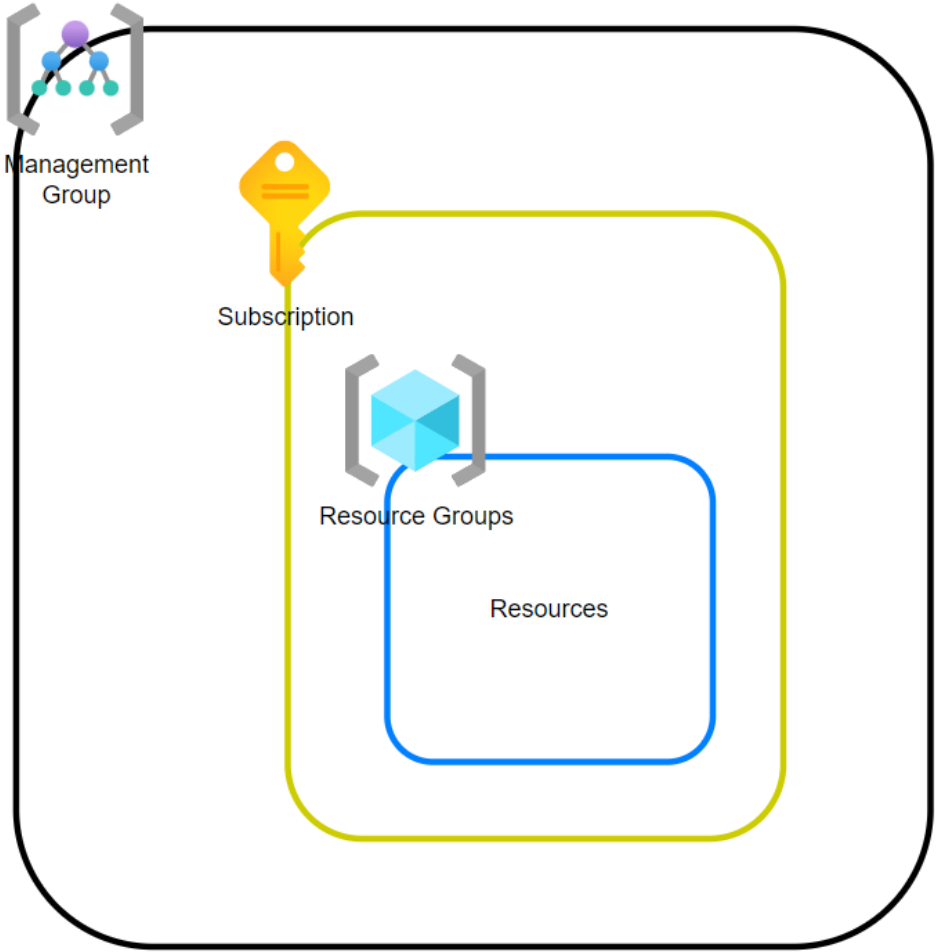
Management Group to Resource Group



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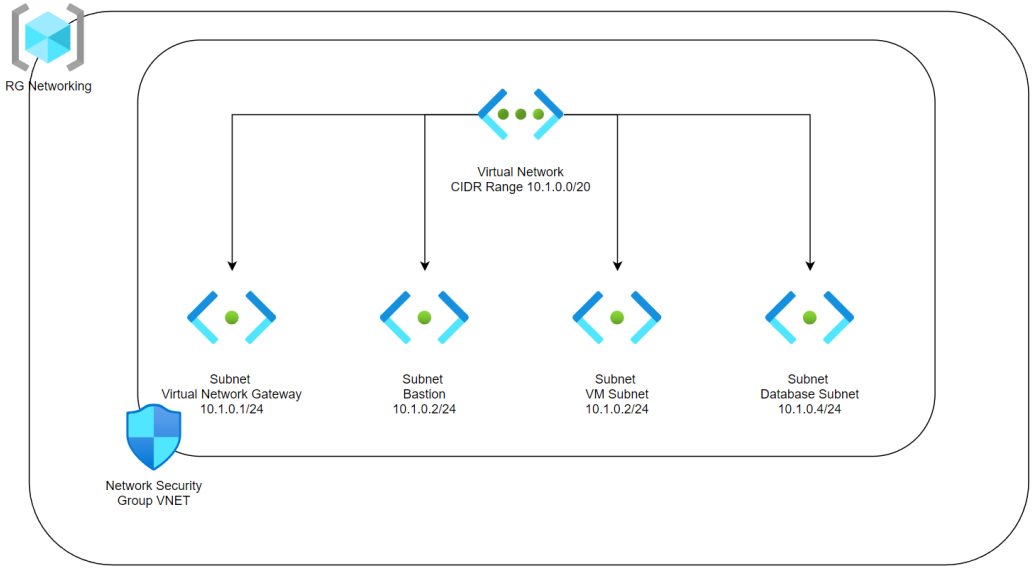
Networking first

- Local Virtual Network, think about your CIDR range
- Subnets matter!
- Secure the subnet with a Network Security Group
- Secure each Network Interface Card and Private Endpoint with it's own NSG
- Add a useful description to each NSG rule



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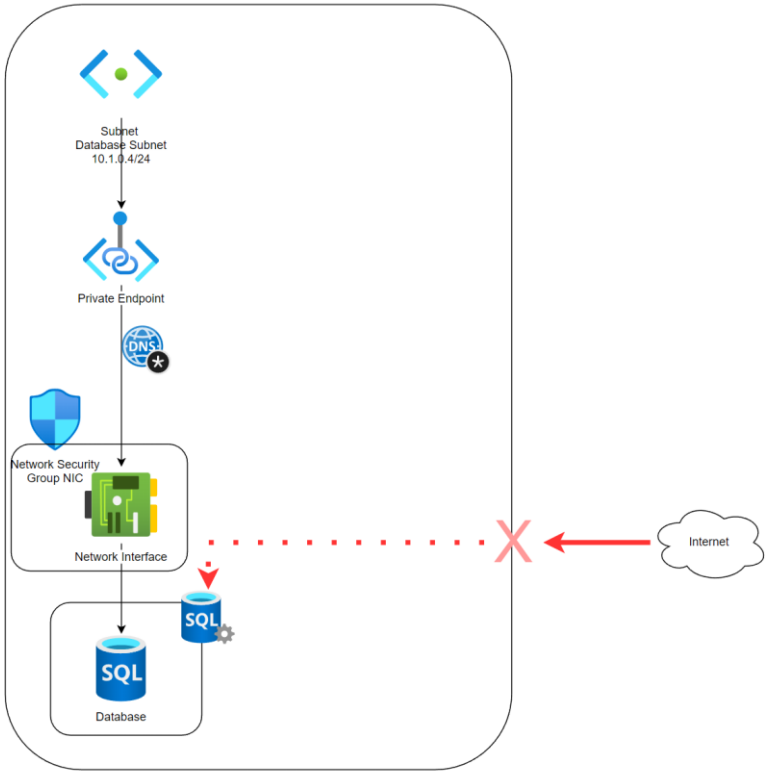
Private endpoints only

- Azure DNS entries
- Secure each Network Interface Card and Private Endpoint with it's own NSG
- Add a useful description to each NSG rule



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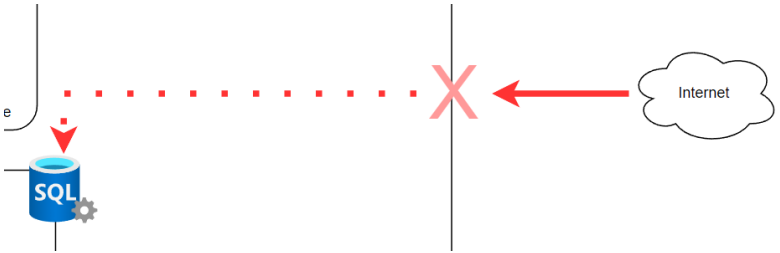
No public access

- Create a policy if you can
- Check each resource if this can be turned off
- Try and connect to each resource to check!



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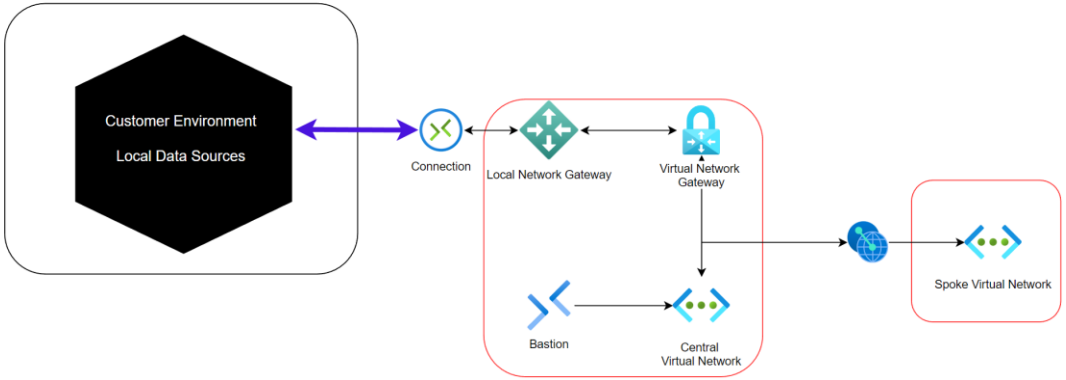
VPN and Bastion

- VPN is hard, but worth the effort
- Make sure you allow the correct CIDR Ranges
- You CAN lose the Azure Firewall if ALL traffic goes through the on-premises firewall.
- Use Bastion if you need RDP access from the Azure Portal
- Always secure these resources with a Network Security Group



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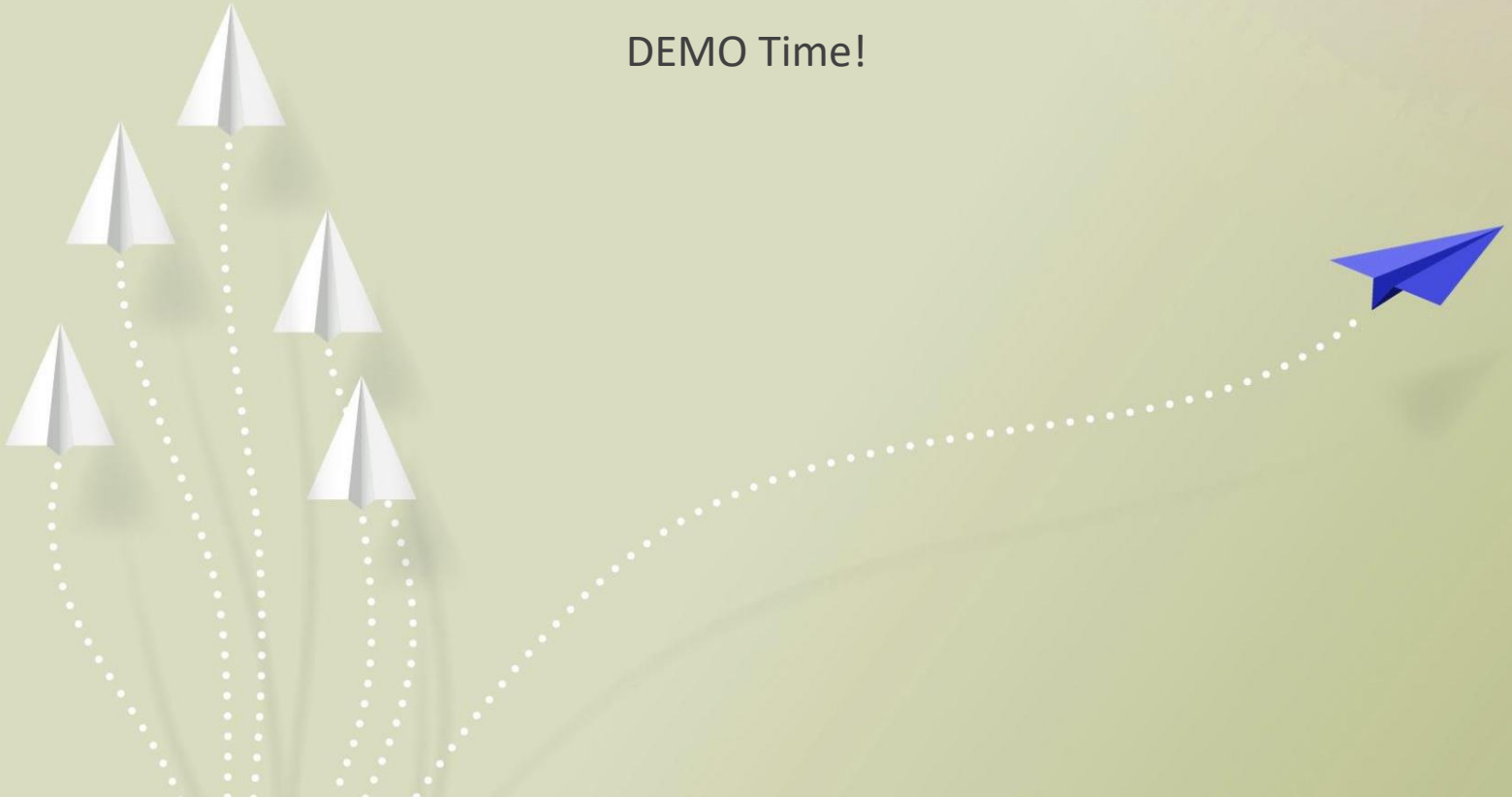
Encryption everywhere

- Databases have Transparent Database Encryption enabled by default
- Add your own certificate to add to the connection security
- Disk encryption is enabled by default, but make sure your Key Vault can store the keys

DEMO Time!



PowerShell

```
PS D:\GIT\SpeakingPrivate\2023-08 Data Saturday Gothenburg> .\Deploy.ps1 -tenant [redacted] -sub [redacted]
cbe -Plan $false -Apply $true
```

Home >

Resource groups

Default Directory

Create | Manage view | Refresh | Export to CSV | Open query | Assign tags

Filter for any field... | Subscription equals **all** | Location equals **all** | Deployment equals **Terraform** | Add filter

Showing 1 to 4 of 4 records.

Name	Subscription
rg_connectivity	Visual Studio Enterprise-abonnement
rg_data	Visual Studio Enterprise-abonnement
rg_identity	Visual Studio Enterprise-abonnement
rg_security	Visual Studio Enterprise-abonnement

Tags (edit)

Cost_Center : TBD

Deployment : Terraform

Environment : Data Saturday Demo

Landing_Zone : Analytics

Owner : Reitse Eskens

Less

rg_connectivity

Resource group

Search

- Overview
- Activity log
- Access control (IAM)
- Tags
- Resource visualizer
- Events

Settings

- Deployments
- Security
- Deployment stacks
- Policies
- Properties
- Locks

Cost Management

- Cost analysis

Create | Manage view | Delete resource group | Refresh | Export to CSV | Open query | Assign tags

Essentials

Resources | Recommendations

Filter for any field... | Type equals **all** | Location equals **all** | Add filter

Showing 1 to 8 of 8 records. Show hidden types

No grouping | List view

Name	Type	Location
nicvmdatasat2301	Network Interface	West Europe
nsgdefaultdb	Network security group	West Europe
nsgdefaultvm	Network security group	West Europe
nsgdefaultvnet	Network security group	West Europe
pepkvdatasat23	Private endpoint	West Europe
pepkvdatasat23.nic.8e8624e9-9195-4c4f-8f8f-f97b50b1abd8	Network Interface	West Europe
pepsqldatasat23.nic.d9694d8f-41d6-48ec-8e80-b198e6ab340d	Network Interface	West Europe
vnetcentral	Virtual network	West Europe

nicvmdatasat2301

Network interface

Search

- Overview
- Activity log
- Access control (IAM)
- Tags

Settings

- IP configurations
- DNS servers

Move | Delete | Refresh | Edit accelerated networking

Essentials

Resource group (move)	rg_connectivity
Location (move)	West Europe
Subscription (move)	Visual Studio Enterprise-abonnement
Subscription ID	814facf9-bf12-4ee9-abee-3cd632b1dcbe
Accelerated networking	Disabled
Virtual network/subnet	vnetcentral/snetVirtualMachines
Private IPv4 address	10.1.3.9
Public IPv4 address	-
Private IPv6 address	-
Public IPv6 address	-
Attached to	vmdatasat23 (Virtual machine) nsgdefaultvm (Network security group)
Type	Regular

nsgdefaultvnet | Subnets

Network security group

Search

- Overview
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems

Associate

Search subnets

Name	Address range
AzureBastionSubnet	10.1.1.0/24
snetDatabases	10.1.2.0/24
snetVirtualMachines	10.1.3.0/24

rg_data

Resource group

Search

- Overview
- Activity log
- Access control (IAM)
- Tags
- Resource visualizer
- Events

Settings

- Deployments
- Security
- Deployment stacks
- Policies
- Properties

Create | Manage view | Delete resource group | Refresh | Export to CSV | Open query | Assign tag

Essentials

Resources | Recommendations

Filter for any field... | Type equals **all** | Location equals **all** | Add filter

Showing 1 to 5 of 5 records. Show hidden types

No grouping | List v

Name	Type	Location
pepsqldatasat23	Private endpoint	West Europe
sqldatasat23	SQL server	West Europe
sqldbdatasat23 (sqldatasat23/sqldbdatasat23)	SQL database	West Europe
vmdatasat23	Virtual machine	West Europe
vmdatasat23_disk1_c53bab912da04d34a6e80269891edcac	Disk	West Europe

Home > Resource groups > rg_data > sqldatasat23

sqldatasat23 | Networking

SQL server

Search

Properties

Locks

Data management

Backups

Deleted databases

Failover groups

Import/Export history

Security

Networking

Microsoft Defender for Cloud

Transparent Data Encryption

Public network access

Public Endpoints allow access to this resource through the internet using a public IP address. An application or resource th access this resource. Learn more

Public network access

- ○ Disable
- ◉ Selected networks

Connections from the IP addresses configured in the Firewall rules section bel more

Virtual networks

Allow virtual networks to connect to your resource using service endpoints. Learn more

+ Add a virtual network rule

Rule	Virtual network	Subnet	Address range	Endpoint status
sqldatasat23-vnet-rule	vnetcentral	snetVirtualMachines	10.1.3.0/24	Succeeded

rg_identity

Resource group

Search

- Overview
- Activity log
- Access control (IAM)
- Tags
- Resource visualizer
- Events

Settings

- Deployments

Create | Manage view | Delete resource group | Refresh | Export to CSV | Open

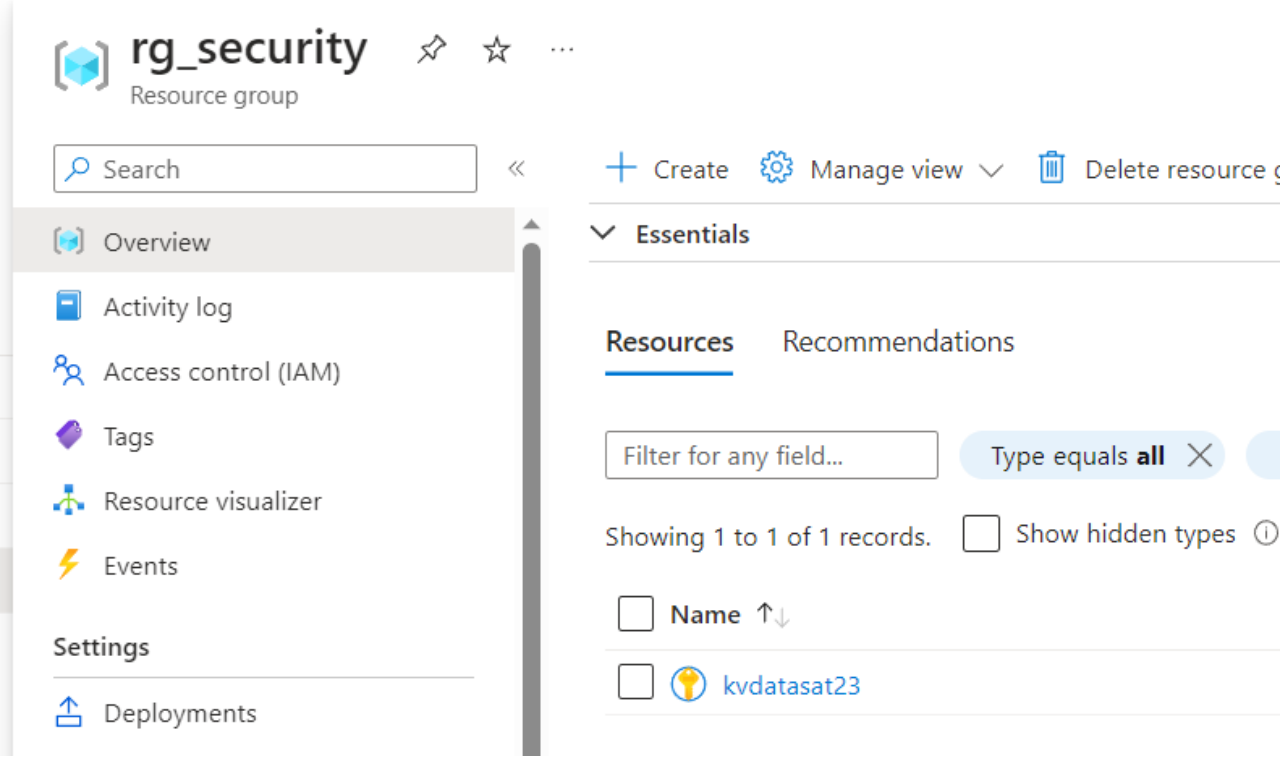
Essentials

Resources | Recommendations

Filter for any field... | Type equals **all** | Location equals **all** | Add filter

Showing 1 to 1 of 1 records. | Show hidden types | No grouping

Name	Type
iddatasaturdayrocks	Managed Identity


rg_security
Resource group
Search
Overview
Activity log
Access control (IAM)
Tags
Resource visualizer
Events
Settings
Deployments
Create
Manage view
Delete resource
Essentials
Resources
Recommendations
Filter for any field...
Type equals all
Showing 1 to 1 of 1 records.
Show hidden types
Name
kvdatasat23

Home > Resource groups > rg_security > kvdatasat23

kvdatasat23 | Secrets

Key vault

Search

- Overview
- Activity log
- Access control (IAM)
- Tags

Generate/Import | Refresh | Restore Backup | View sample code | Manage deleted secrets

Name	Type	Status
Sql-Administrator-Password		Enabled
vmAdminPassword		Enabled

Feedback

- Please ☺

Session Feedback

https://bit.ly/dMC2023_SessionFeedback

THANK YOU!