12
DEZ

Dienstag, 12. Dezember 2017

4. PowerShell Usergroup meetup #region Nürnberg

Veranstaltet von Christian Lehrer

Von PowerShell Usergroup Nürnberg

Was wir unternehmen werden

Am 12.12. ist es soweit. Die PowerShell Usergroup Nürnberg trifft sich zum viert
en Mal.

Bei diesem Termin wird Sylvio Hellmann einen Vortrag zum Thema "Administra
tion of Windows Container with PowerShell" halten. Anschließend geht es wie
gewohnt um allerlei Fragen und Ideen rund um die PowerShell.

Wir freuen uns auf Euch!

Administration of Windows

Container with PowerShell

by Sylvio Hellmann

Sylvio **Hellmann**

Love it, Change it or Leave it.

Principal Consultant

Project Manager

Developer

I am working as a Principal Consultant and Team Leader of the data group at **URANO Informationssysteme GmbH**. My main focus are **SQL Server, Microsoft Business Intelligence/PowerBI** as well as **Machine Learning** technologies on premise and in the cloud. I am supporting customers around the world to solve complex challenges in projects and in operational environments.

Xing.com

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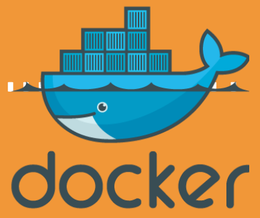
INTRODUCTION

What is..



History

A view back

Server systems
with multiple Applications

Standalone Server

2000

Starting 2001

Virtualization

Host system(s)
with one/multiple guest system(s)

Application based Container
on host systems

Container

2013

2017

SQL Server on Docker

Predefined SQL Server images
for Docker
Production ready

What is **Docker**

Let's Begin Now

Docker

- is a software platform that allows you to build, test, and deploy applications.
- provides an layer of abstraction and automation of operating-system-level virtualization.
- packages software into standardized units called containers.
- Container have everything the software needs to run including libraries, system tools, code, and runtime.
- developed by the company Docker, Inc. and the community

Containers wrap a piece of software in a complete filesystem that contains everything needed to run: code, runtime, system tools, system libraries – anything that can be installed on a server. This guarantees that the software will always run the same, regardless of its environment. https://www.docker.com/what-docker

Advantages of Container

Best of...

Environment Consistency

Containers enable portability and help reduce the organizational and technical frictions of moving an application through the development, testing, and production lifecycle. Containers encapsulate all the necessary application files and software dependencies and serve as a building block that can be deployed on any compute resource regardless of software, operating system, or hardware configurations.

Operational Efficiency

With containers, you can specify the exact amount of memory, disk space, and CPU to be used by a container on an instance. Containers have fast boot times because each container is only a process on the operating system running an application and its dependencies.

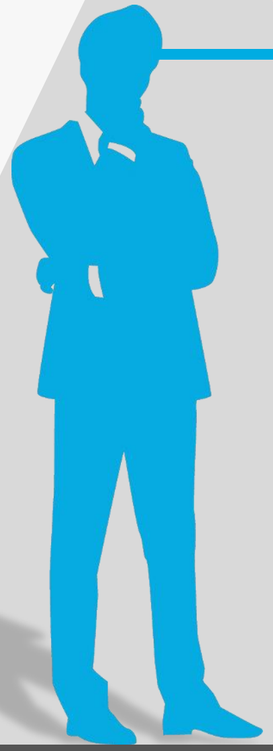
Developer Productivity

Containers increase developer productivity by removing cross-service dependencies and conflicts. Each application component can be broken into different containers running a different microservice. Containers are isolated from one another, so you don't have to worry about libraries or dependencies being in sync for each service. Developers can independently upgrade each service because there are no library conflicts.

Pros

- Simple and fast setup
- New containers can be spun up in seconds
- Relatively low footprint compared to VMs
- Ability to customise images
- Access to Docker repository (hundreds of images available)
- Portability, images can be saved to the Docker Hub

Cons



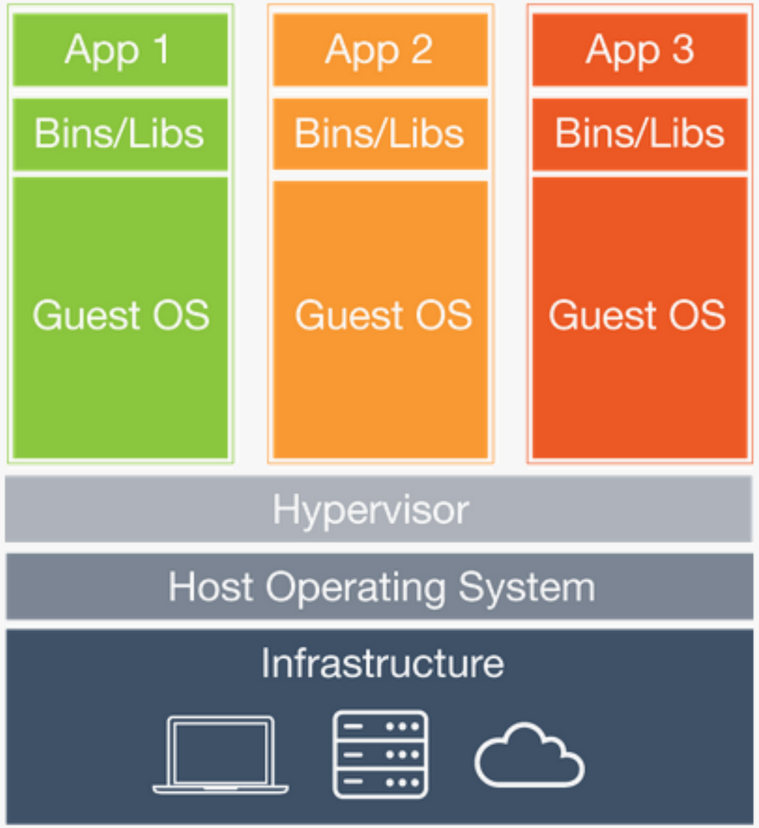
- Only supported on Windows Server 2016 / Windows 10 Anniversary Edition
- Official SQL Server images for 2016 & 2017 only
- Only the database engine is supported
- SQL images aren't the smallest (~13GB)
- Suitability for production?

Pros and Cons

„**Docker** is a platform for developers and sysadmins to develop, ship, and run applications. Docker lets you quickly assemble applications from components and eliminates the friction that can come when shipping code. Docker lets you get your code tested and deployed into production as fast as possible.” Source https://docs.docker.com/engine/

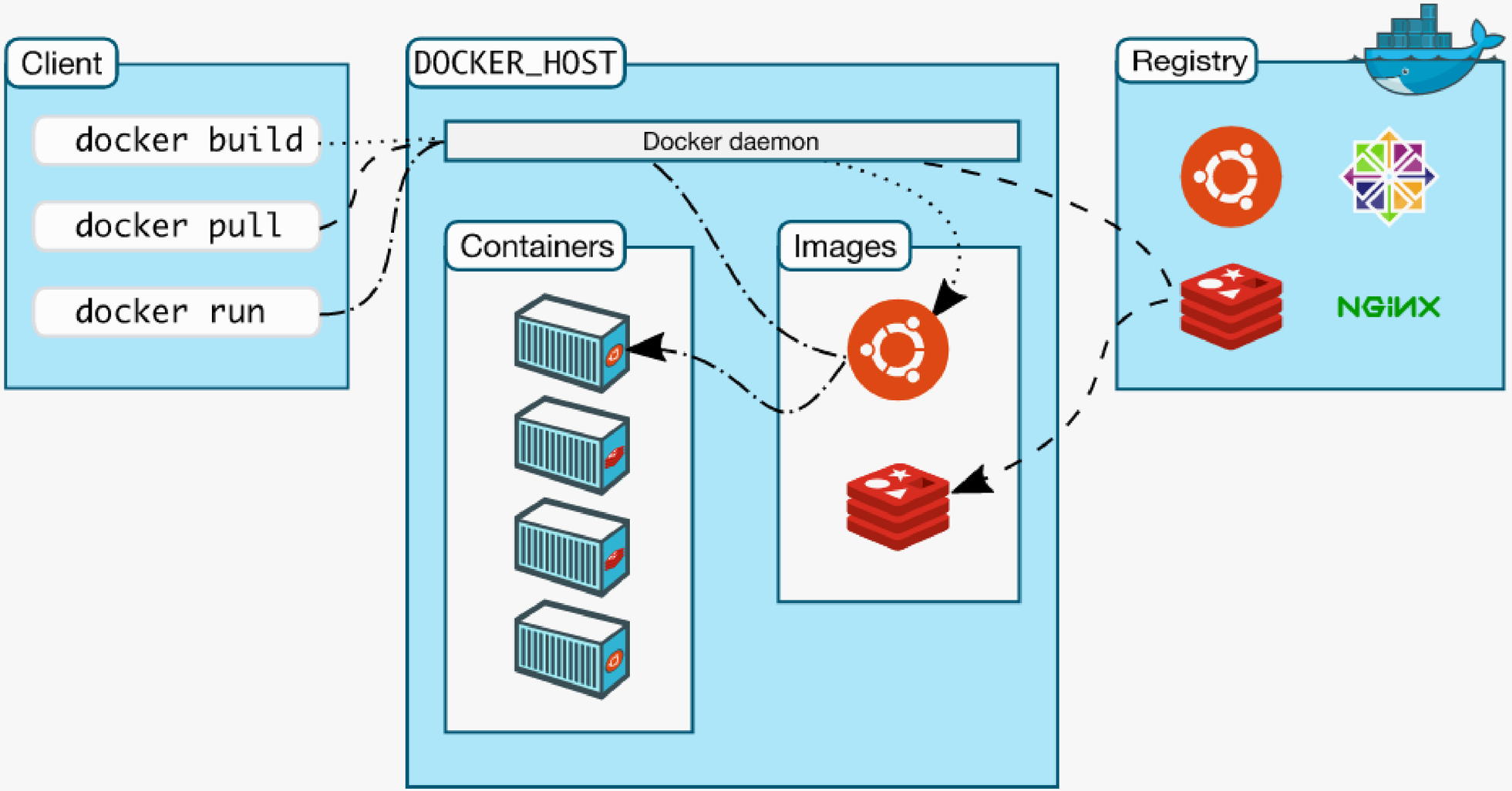
Virtual Machine vs. **Container**

Two worlds, one result = running applications in a closed environment



Docker

Two worlds, one result = running applications in a closed environment



Definitions

summary of Windows Containers jargon with their meaning:

Container Host	Physical or Virtual computer system configured with the Windows Container feature.
Container Image	A container image contains the base operating system, application, and all the application dependencies that are needed to quickly deploy a container.
Container Registry	Container images are stored in a container registry, and can be downloaded on demand. It is a place where container images are published. A registry can be remote or on-premises.
Docker Engine	It is the core of the Docker platform. It is a lightweight container runtime that builds and runs your container.
Docker file	Docker files are used by developers to build and automate the creation of container images. With a Docker file, the Docker daemon can automatically build a container image.

Editions of Docker

Best of...

Community Edition (CE)

Docker CE is available for free and is ideal for developers and small teams looking to get started with Docker to build container apps. Docker CE offers a monthly or quarterly release cadence for both the adventurous and practical developer.

Enterprise Edition (EE)

Docker EE is a subscription of software, support and certification for enterprise dev and IT teams building and managing critical apps in production at scale. Docker EE is a Containers-as-a-Service platform for IT that manages and secures diverse applications across disparate infrastructure, both on-premises and in the cloud.

Moby project (https://mobyproject.org/)

Moby is an open framework created by Docker to assemble specialized container systems without reinventing the wheel. It provides a “lego set” of dozens of standard components and a framework for assembling them into custom platforms. At the core of Moby is a framework to assemble specialized container systems which provides:

Editions of Docker

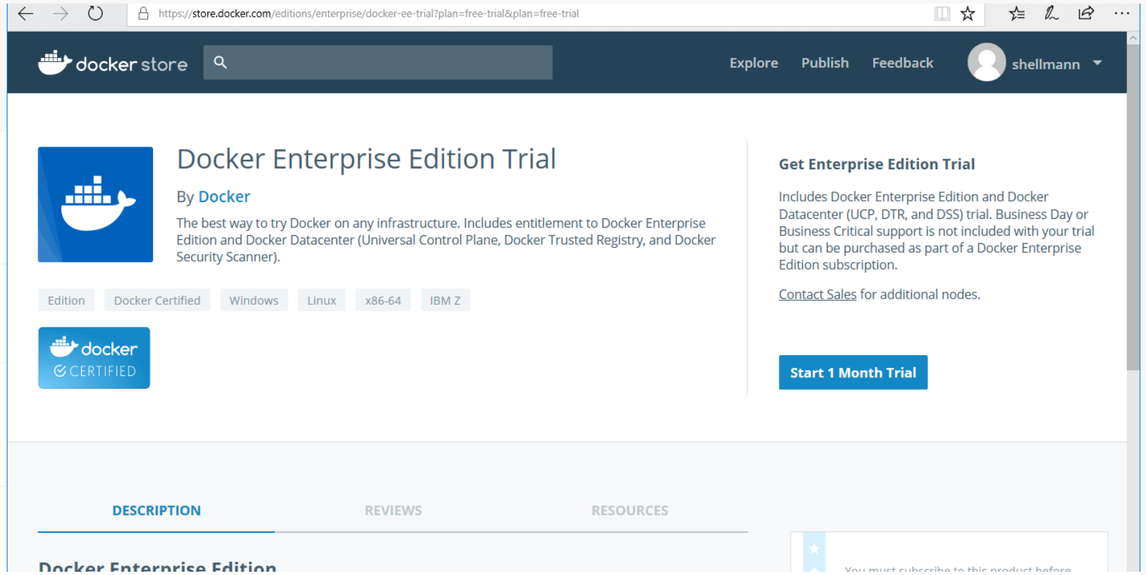
differences

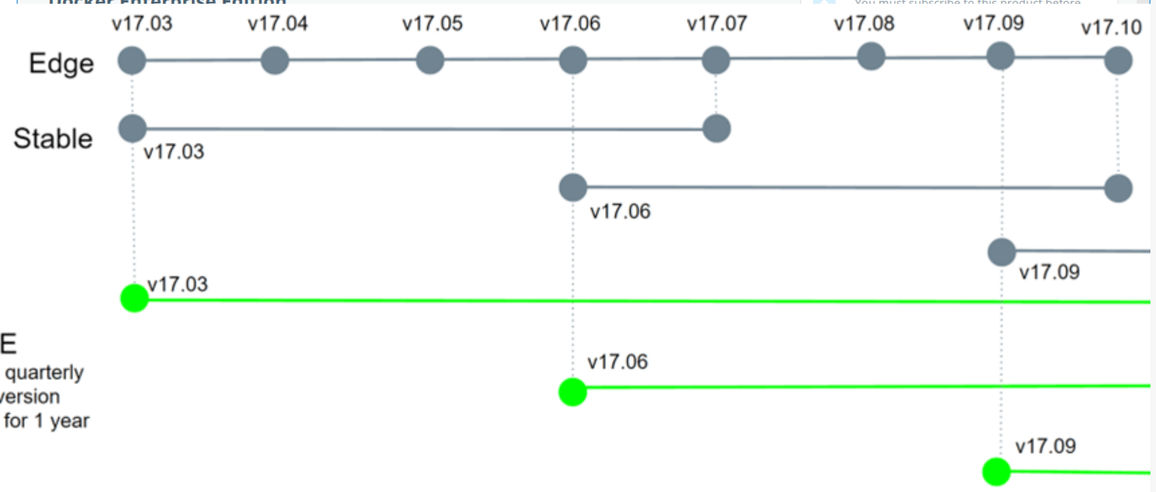
	COMMUNITY EDITION	ENTERPRISE EDITION BASIC SUPPORTED CONTAINER RUNTIME AND ORCHESTRATION	ENTERPRISE EDITION STANDARD INTEGRATED SECURITY AND MANGEMENT
Container engine and built in orchestration, networking, security	✓	✓	✓
Docker Certified Infrastructure, Plugins and ISV Containers		✓	✓
Image Management private registry, caching (Windows and Linux)	Cloud hosted repos		✓
Docker Datacenter Integrated container app management		ENTERPRISE EDITION BASIC PER NODE / PER YEAR	ENTI
Docker Datacenter Enhanced RBAC, LDAP/AD support		Doc	
Integrated secrets mgmt, image signing policy (Windows and Linux)	BUSINESS CRITICAL	$1,500	
Secure multi-tenancy with node-based isolation	BUSINESS DAY	$750	
		Docker E	
Automated Image Promotion	BUSINESS CRITICAL	N/A	$1,500	$2,000
Image security scanning and continuous vulnerability scanning (Windows and Linux)	BUSINESS DAY	N/A	$750	$1,250

Docker CE

Docker EE

EE
Released quarterly
Each version supported for 1 year





Supported OS for Docker

multiple opportunities → one result (deploy and operate containers)

Server

Platform	Docker CE x86_64	Docker CE ARM	Docker CE IBM Z (s390x)	Docker EE x86_64	Docker EE IBM Z (s390x)
CentOS	✓			✓	
Debian	✓	✓			
Fedora	✓				
Microsoft Windows Server 2016				✓	
Oracle Linux				✓	
Red Hat Enterprise Linux				✓	✓
SUSE Linux Enterprise Server				✓	✓
Ubuntu	✓	✓	✓	✓	✓

Client (only CE x86/x64)

Docker for macOS

Docker for Windows 10

Linux

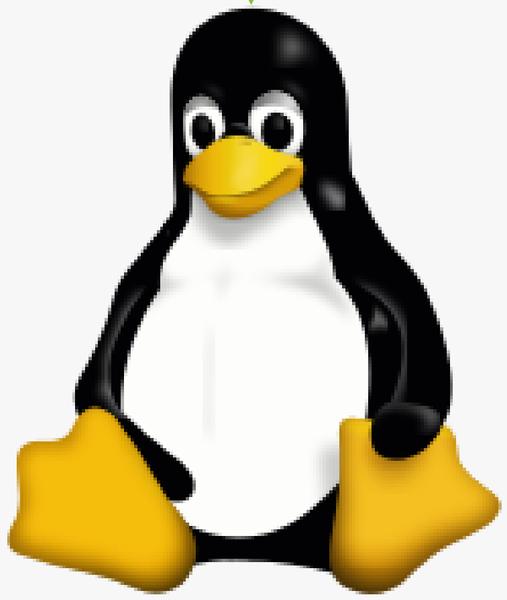
- Rkt (CoreOS)
- LXC, LXD, runC
- OpenVZ
- Linux-Vserver
- Virtuozzo

Cloud

- Amazon EC2 Container Service
- Container Instance
- Google Container Engine
- IBM Bluemix Container Service
- ...

FreeBSD

Jails: independent mini-systems under FreeBSD



Windows

- Virtuozzo
- DrawBridge
- WinDocks
- Sandboxie
- Turbo
- VMWare ThinApp

Container OS

- Googles Container Optimized OS
- Container-Linux oder Tectonic von CoreOS
- Project Atomic
- Ubuntu Core
- VMWare Photon

Other **Container** technologies

Docker Container in **Windows**

History of collaboration between Docker and Microsoft

Docker and Microsoft partner to bring container applications across platforms

Microsoft + Docker

2014

2015

First products

Windows Server Containers, Hyper-V Containers, Docker VM Extensions for Linux on Azure, Docker CLI support on Windows, Compose and Swarm support on Azure, Visual Studio Tooling for Docker, and more

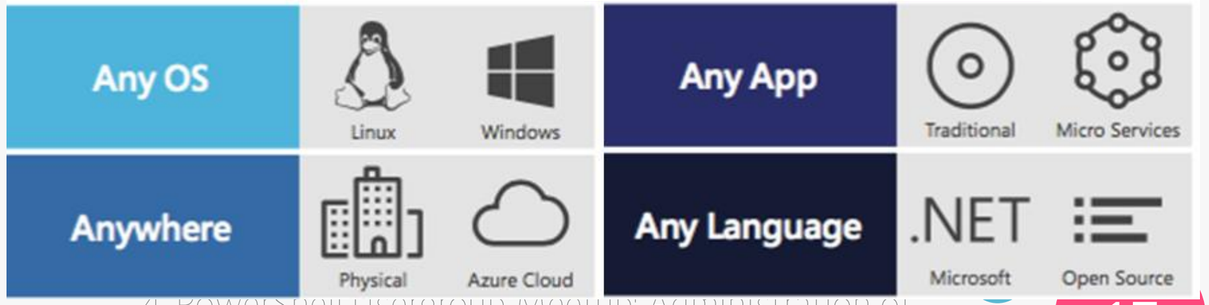
Docker announced a commercial partnership with Microsoft to enable enterprises to modernize their application environments and create hybrid Windows applications using Commercially Supported Docker Engine (CS Docker Engine) and Docker Datacenter with Windows Server 2016

Extend collaboration

2016

2017

Microsoft + Docker = 98% of Workload

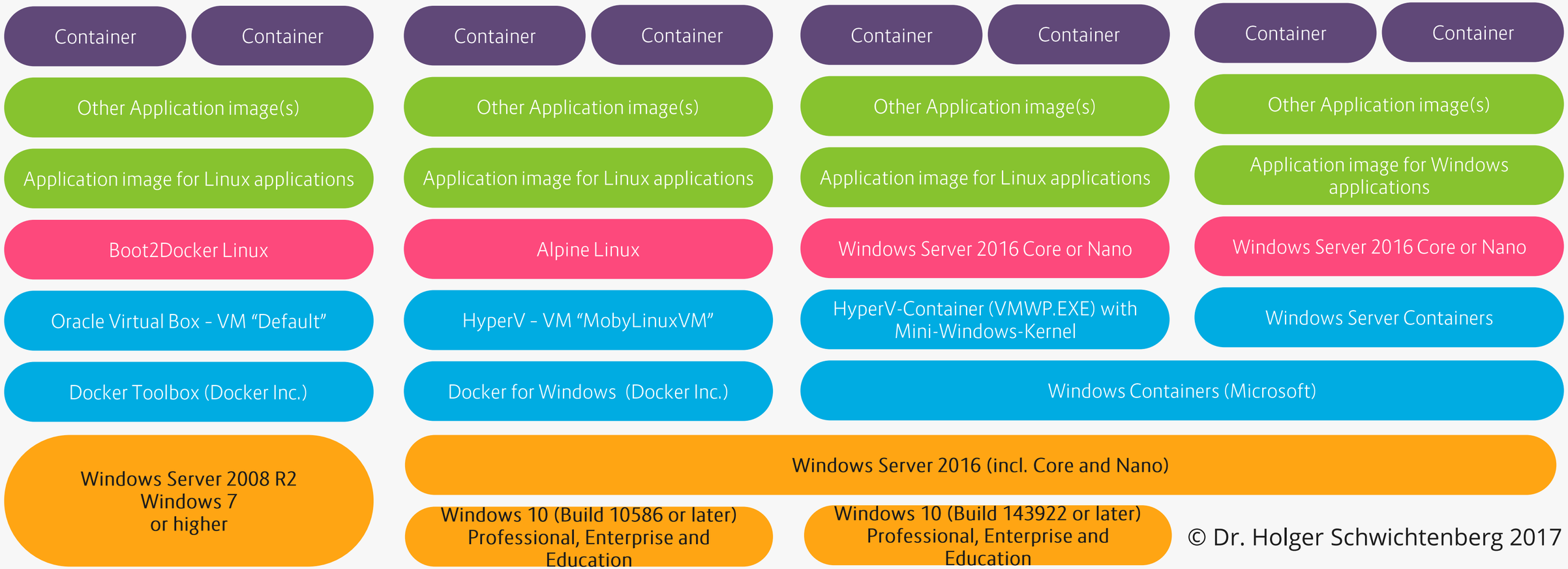


Changes in Windows for Containers

Whats different

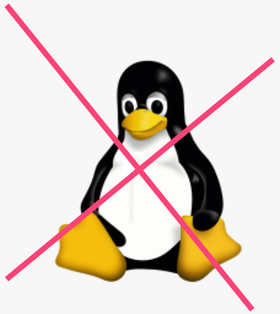
Docker Container in **Windows**

multiple opportunities → one result (deploy and operate containers)



Supported containerized **Applications**

Base Image



Nanoserver

IIS and .NET Core

WindowsServerCore

Runs most Windows Server apps:

IIS, full .NET Framework, SQL Server, ...

HyperV Containers **vs.** Windows Server Containers

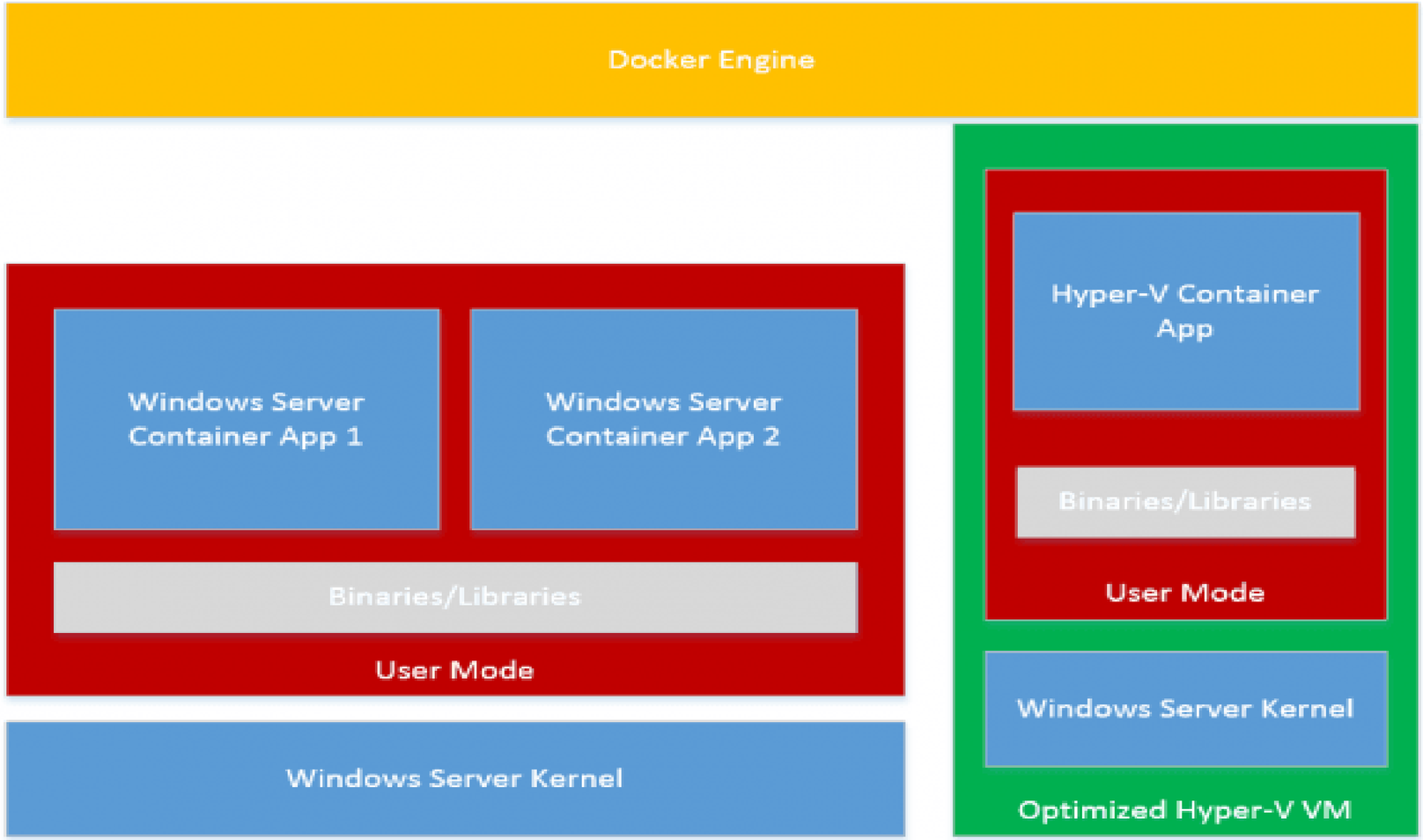
HyperV-Container

- Based on Windows Nano Server image
- They are running in a separate VM → Better isolation
- kernel of the container host is not shared with other Hyper-V Containers
- Only managed by Docker (not with HyperV Manager)
- Booting of Hyper-V container takes longer than Windows Server Container

Windows Server Container

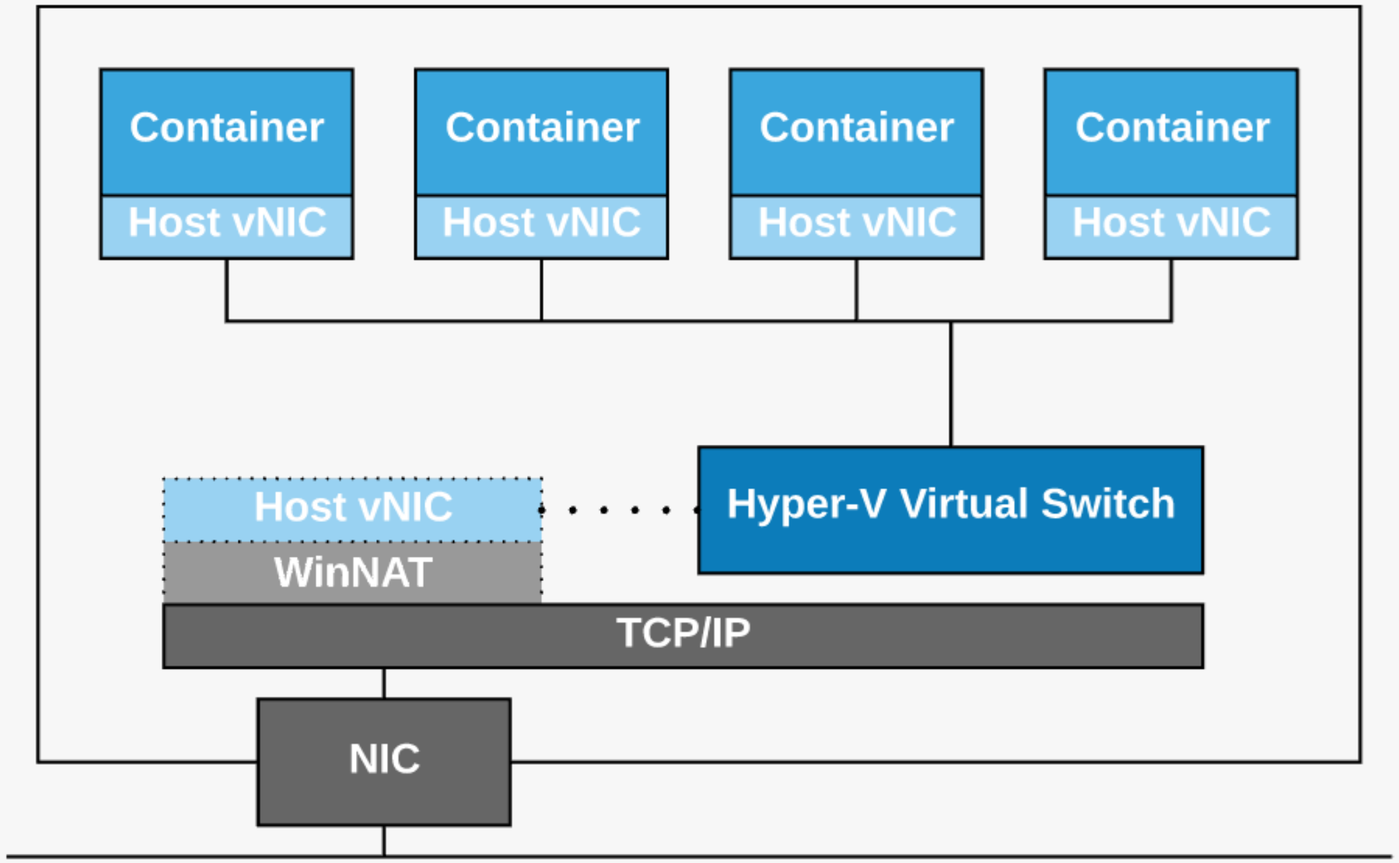
- Isolation provided through namespace, resource & process isolation
- Share kernel with host and other containers

HyperV Containers **vs.** Windows Server Containers



Container Networks

Networking...



Docker base **commands**

How we can do?

```
docker --help
docker version
docker info
docker images
docker pull
docker container run
docker ps
docker logs
```

```
PS C:\Users\Administrator> docker --help

PS C:\Users\Administrator> docker version
client:
PS C:\Users\Administrator> docker info
Containers: 1
 Running: 0
PS C:\Users\Administrator> docker images
REPOSITORY                                  TAG                 IMAGE ID
   CREATED             SIZE
sqldocker                                   latest              0afacd22
   2 hours ago         13.4GB
<none>                                      <none>              c4d5d4e4
   3 hours ago         10.3GB
<none>                                      <none>              e3015a49
PS C:\Users\Administrator> docker ps
CONTAINER ID        IMAGE                                COMMAND             C
          STATUS              PORTS                      NAMES
22f49eaab7c3        microsoft/nanoserver:latest          "powershell"        A
nute ago    Up About a minute                            happy_varahamihira
14e8f03937bb        microsoft/nanoserver:latest          "powershell"        2
ago         Up 2 minutes                                 practical_varahamihi

PS C:\Users\Administrator> Get-Container

ID                  Image          Command             Created
--                  -----          -------             -------
22f49eaab7c3dd091... microsoft/na... powershell        10.10.2017 13
14e8f03937bb69256... microsoft/na... powershell        10.10.2017 13

Debug Mode (client): false
Debug Mode (server): false
Registry: https://index.docker.io/v1/
Experimental: false
```

Docker administration with **PowerShell**

How we can do?

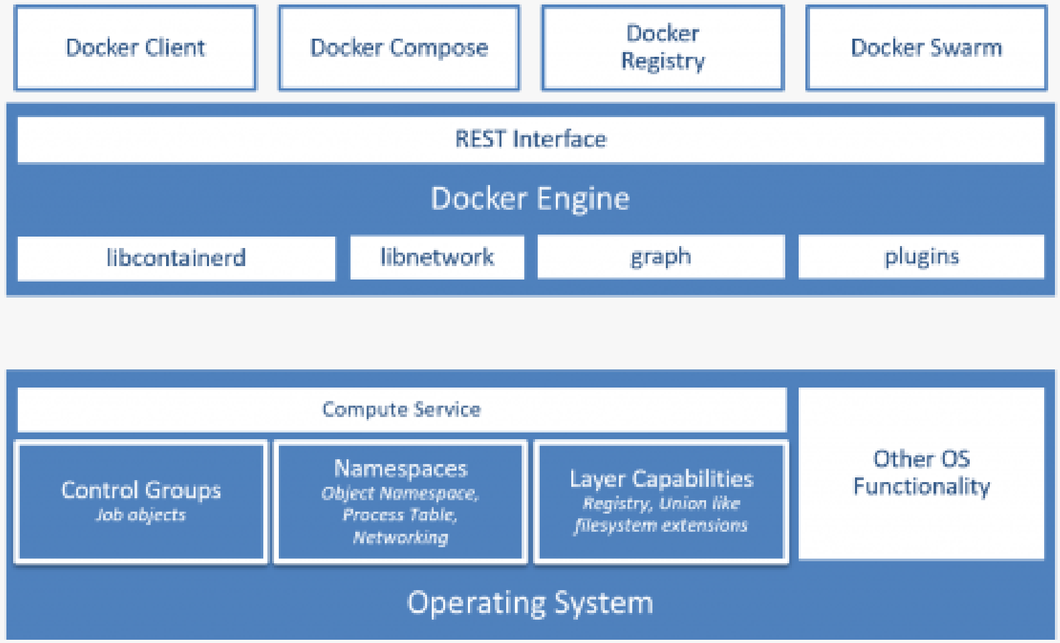
```
PS C:\Users\Administrator> get-command -Module docker | Select-Object -Property Name

Name
----
Attach-Container
Build-ContainerImage
Commit-Container
Exec-Container
Load-ContainerImage
Pull-ContainerImage
Push-ContainerImage
Run-ContainerImage
Save-ContainerImage
Tag-ContainerImage
Add-ContainerImageTag
ConvertTo-ContainerImage
Copy-ContainerFile
Enter-ContainerSession
Export-ContainerImage
Get-Container
Get-ContainerDetail
Get-ContainerImage
Get-ContainerNet
Get-ContainerNetDetail
Import-ContainerImage
Invoke-ContainerImage
New-Container
New-ContainerImage
New-ContainerNet
Remove-Container
Remove-ContainerImage
Remove-ContainerNet
Request-ContainerImage
Start-Container
Start-ContainerProcess
Stop-Container
Submit-ContainerImage
Wait-Container
```

```
'S C:\Users\Administrator> $Container = New-Container -Name Test -ImageIdOrName "microsoft/windowsservercore
'S C:\Users\Administrator> Start-Container $Container
'S C:\Users\Administrator> Get-Container

D                   Image          Command             Created               Status              Names
-                   -----          -------             -------               ------              -----
8e4333dd27235425... microsoft/wi... c:\windows\system... 10.10.2017 13:45:07   Exited (0) 17 sec... Test
70fe0885e9d475ae... microsoft/wi... -SwitchName 'Virt... 10.10.2017 13:33:23   Created             Test3
8efec7803438377a... microsoft/wi... -SwitchName 'Virt... 10.10.2017 13:25:48   Created             Test2
a91d1875a02054ff... microsoft/wi... -SwitchName 'Virt... 10.10.2017 13:24:50   Created             Test1
7e60edda757d261e... microsoft/na... powershell          10.10.2017 13:20:47   Exited (0) 24 min... optim
54fa0ed99327732b... microsoft/na... c:\windows\system... 10.10.2017 13:19:37   Up 25 minutes       peacef
2f49eaab7c3dd091... microsoft/na... powershell          10.10.2017 13:14:50   Up 30 minutes       happy_
4e8f03937bb69256... microsoft/na... powershell          10.10.2017 13:14:14   Up 31 minutes       pract

'S C:\Users\Administrator> docker ps
ONTAINER ID        IMAGE                          COMMAND                  CREATED             STATUS
54fa0ed9932        microsoft/nanoserver           "c:\\windows\\system..."   26 minutes ago      Up 26 minu
2f49eaab7c3        microsoft/nanoserver:latest    "powershell"             31 minutes ago      Up 31 minu
4e8f03937bb        microsoft/nanoserver:latest    "powershell"             31 minutes ago      Up 31 minu
'S C:\Users\Administrator> $Container | Select-Object -Property *


D               : 58e4333dd27235425757e0508c42ac2752c3984b61b6053701f608a1ea8c5865
lames           : {/Test}
mage            : microsoft/windowsservercore
mageID          : sha256:2cddde20d95d018892590b599d9c468eb83265b8a3803440b1f41dfb5b14fbfa
ommand          : c:\windows\system32\cmd.exe
reated          : 10.10.2017 13:45:07
orts            : {}
izeRw           : 0
izeRootFs       : 0
abels           : {}
tate            : created
tatus           : Created
letworkSettings : Docker.DotNet.Models.SummaryNetworkSettings
ounts           : {}
```

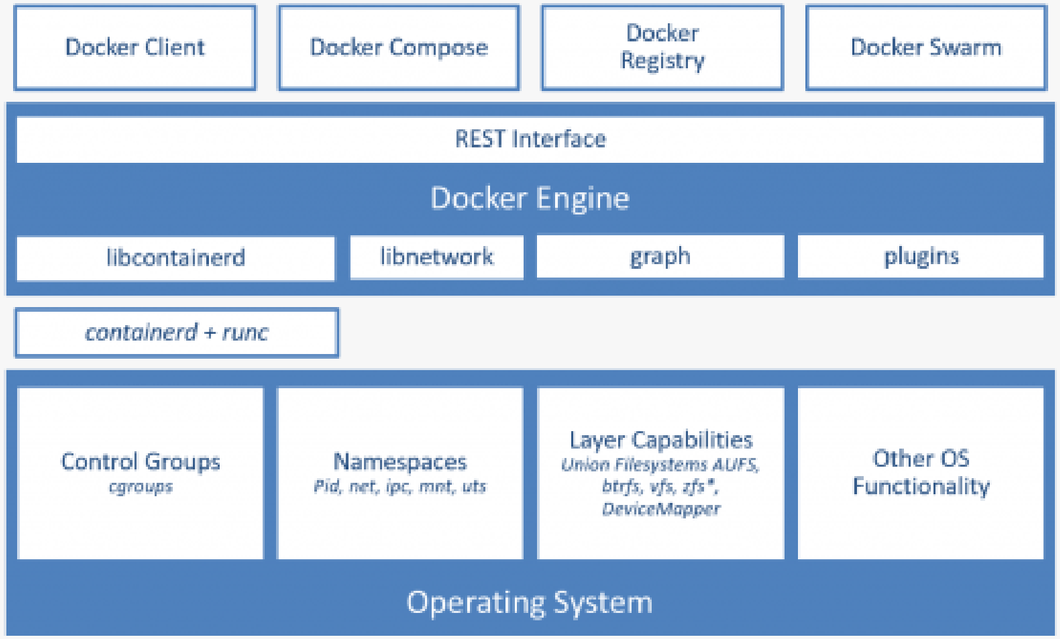
Compare Architecture of Docker Windows vs. Linux

feel the difference

Architecture In Windows

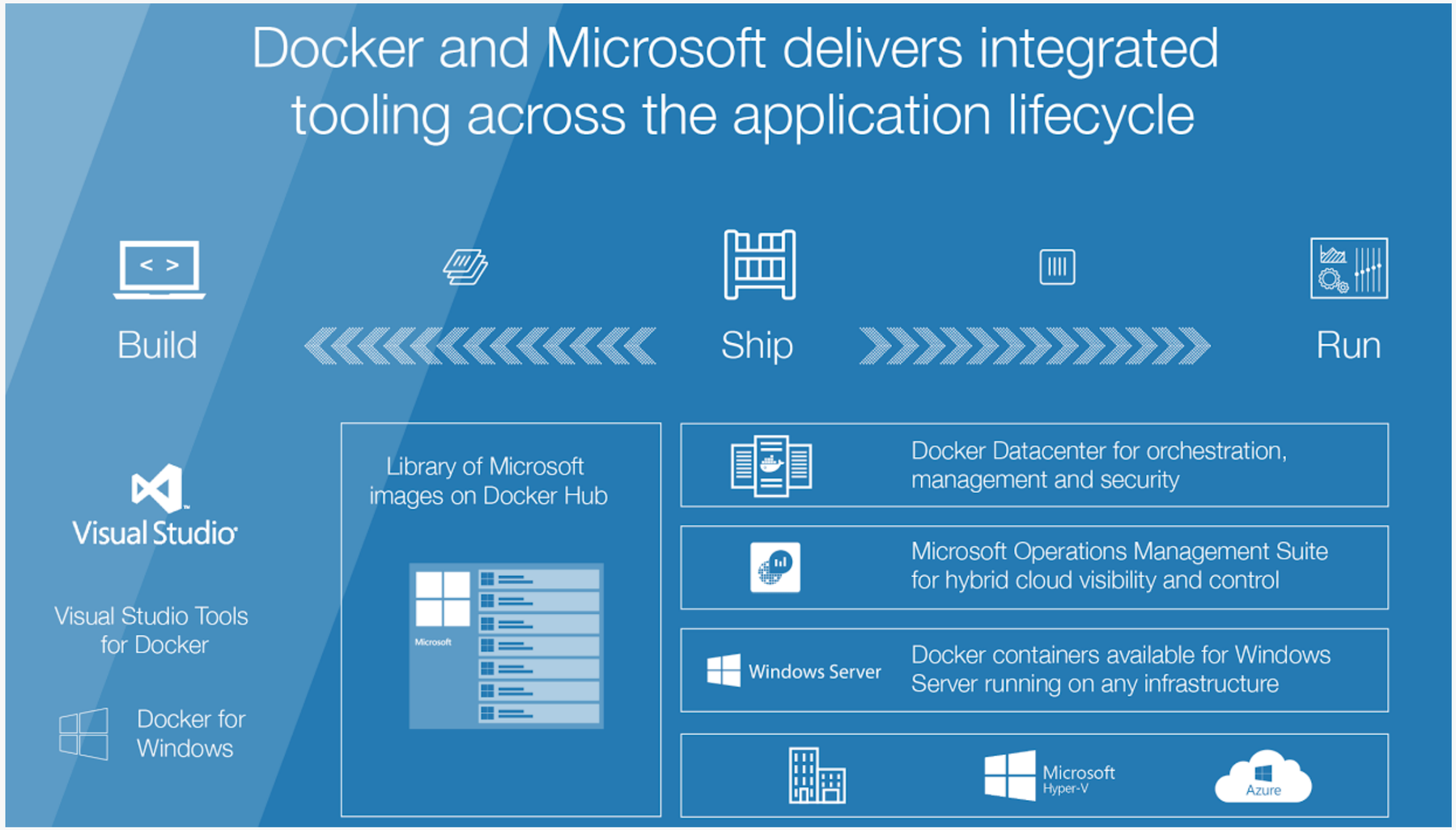


Architecture In Linux



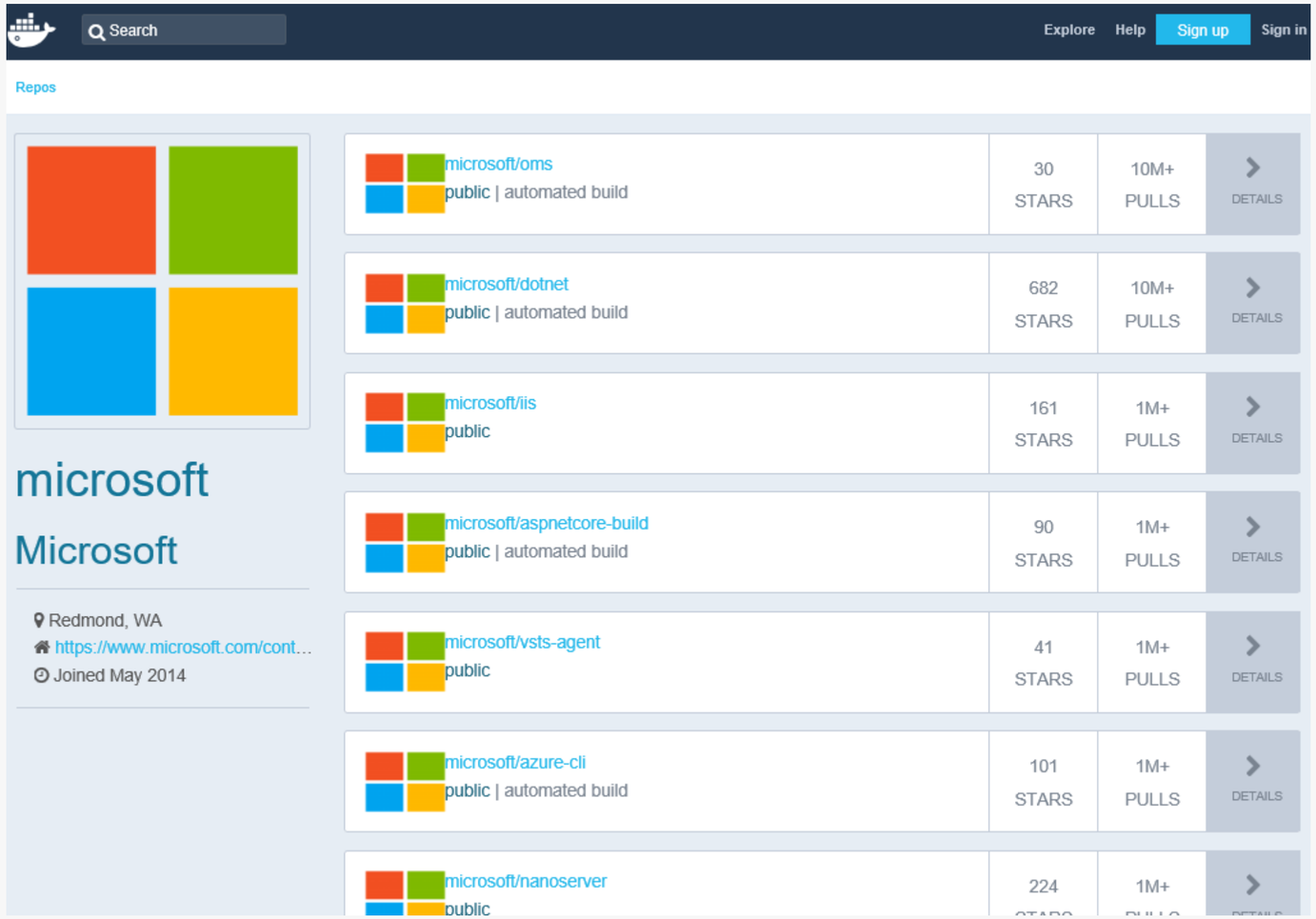
Container lifecycle

Whats going on,....



Library of **Microsoft Images** on Docker Hub

https://hub.docker.com/u/microsoft/



Licensing for **Windows Server/HyperV Containers**

Money, money, money,....

Windows Server Containers

Licensed on host level (not container) → if you have 100 Containers on one host you need only a host license

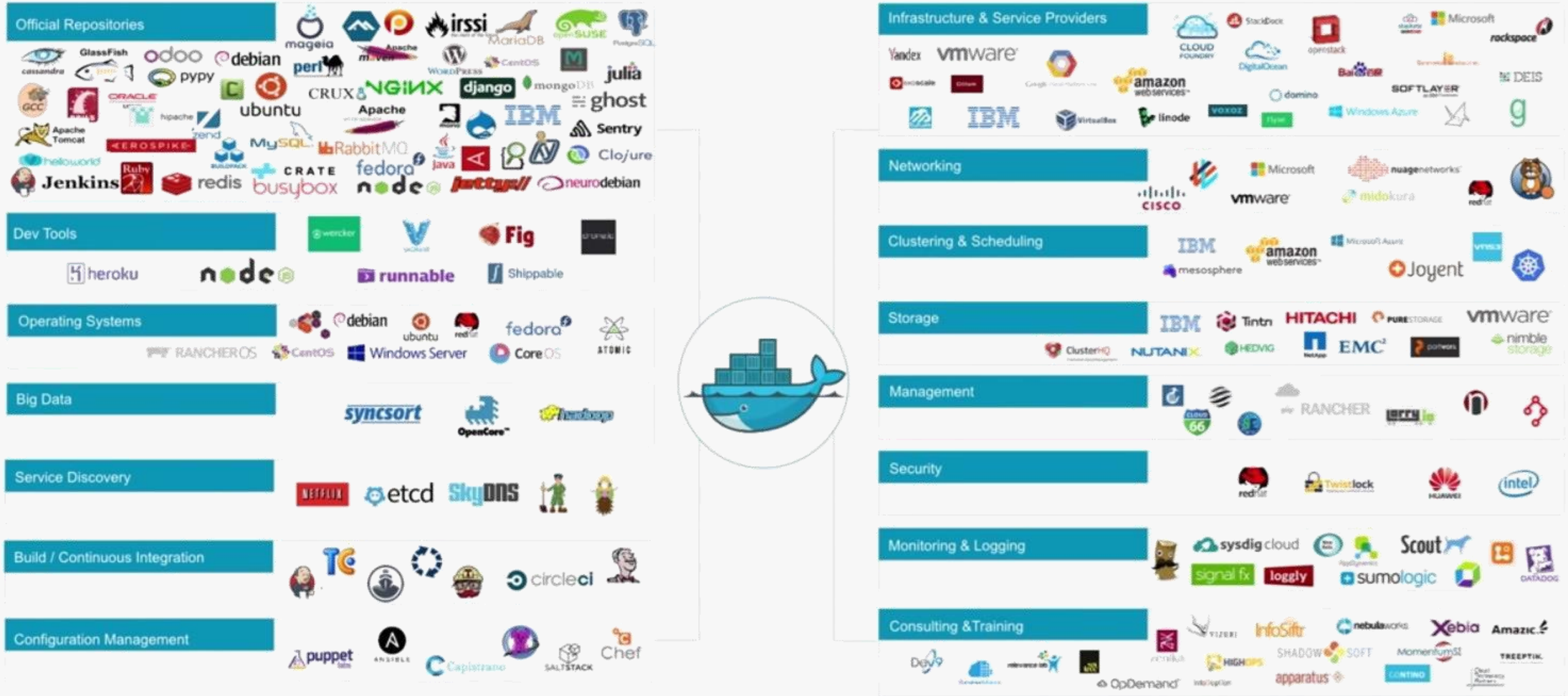
HyperV container

Separately licensed in Standard Editon; overall license in Datacenter Edition

Only the Container is licensed! If you have special software inside the container (e.g. SQL Server), you must have software license from vendor.

Docker **Ecosystem**

Tools, tools, tools, …

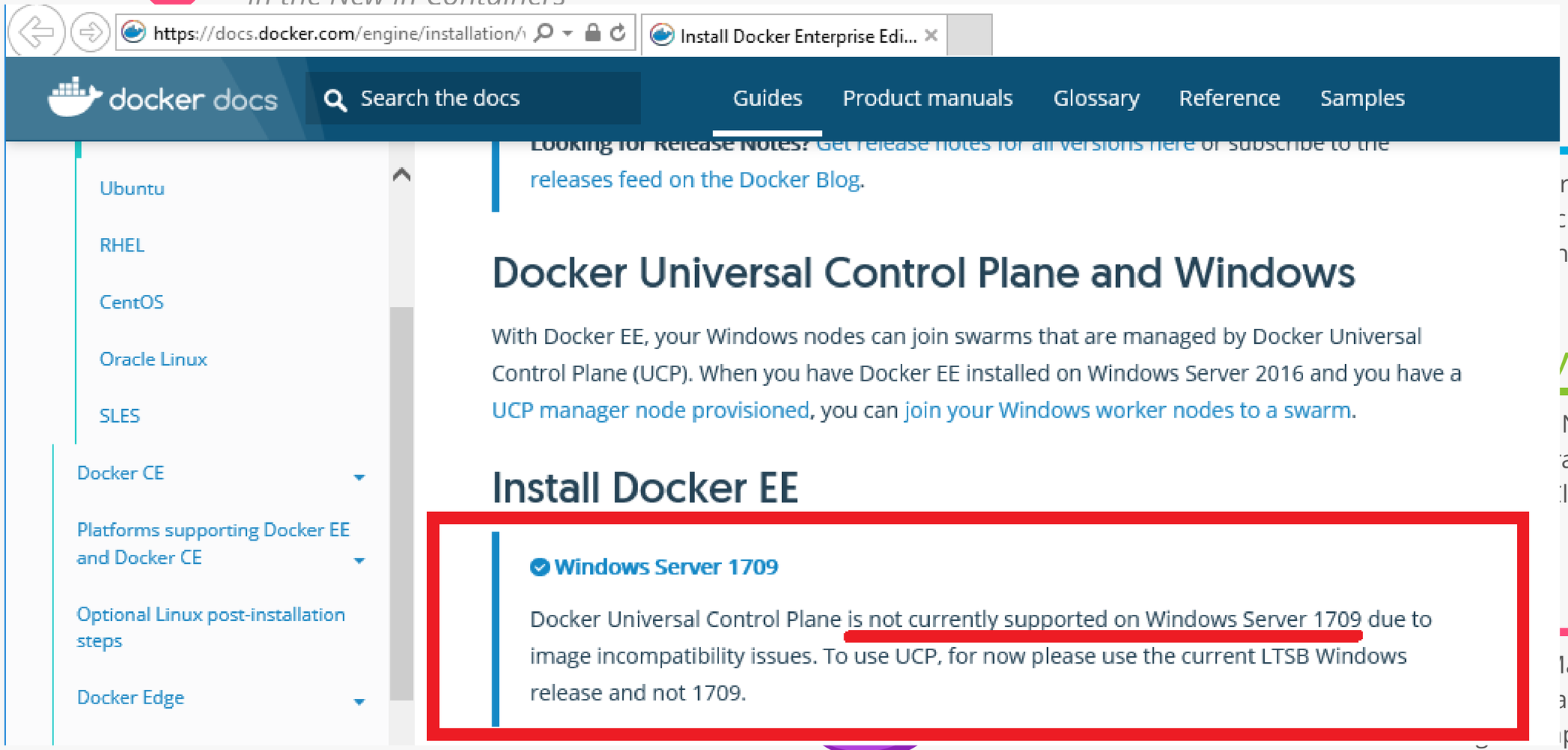


http://collabnix.com/wp-content/uploads/2015/07/Untitled.jpg

- https://github.com/MicrosoftDocs/Virtualization-Documentation/tree/live/windows-server-container-tools

Windows Server 2016 (**v1709**)

in the New in Containers



rovider
chine: enable
n the Container

Networking –
ation solution for
luster Is now

lap SMB File Share
ainer
p CSV volumes
with Storage Space Direct and map them to Containers

Only Operating System with 80MB (currently 390 MB)

Tips & Other

Join to Domain

„Windows Containers cannot be domain-joined“ but
you can use Globally Manages Service Accounts (gMSA) to authenticate Services

2

Installation

Docker on Windows Server

Plan

What is your goal

Questions during planning

- Which edition of Docker is required for your solution? → keep it simple (CE, EE Standard, …)
- Which kind of Docker container (Apps) do you want to use?
- Do you plan containers on Windows or Linux only or a mix of both?
- Which one is the best host OS (Windows, Linux […]) and which edition?
- In the Cloud (which one) or on Premise (which hardware)
- Do you need Hyper-V isolation in Windows Server?
- Is my organization ready for Containers (Developers, Administrators)?
  - What must/should my operational team known? Do I have the right people
  - Processes
- Which Environment (Dev, test, Prod)? Which application?
- What does it cost (this year and going on)

Install of Docker on Windows Server 2016

Multiple ways → one result

Step by step

Lot of steps → but you get the system you want

With PowerShell DCS

Load and run the Script Install-DockerOnWS2016UsingDSC (from 2016 → it was not successful on my system)

Install NuGet-Provider

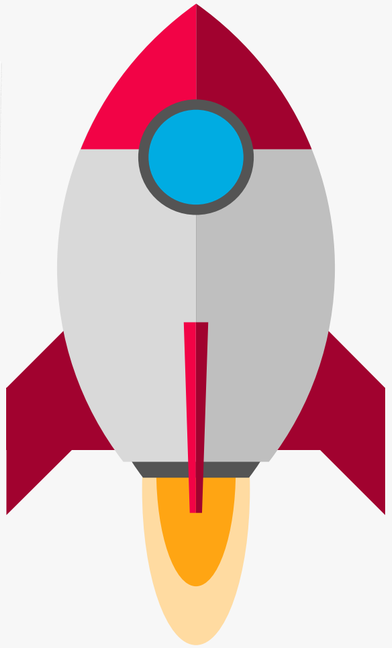
Install modul „DockerMsftProvider“

Install Package DockerMsftProvider and restart the OS

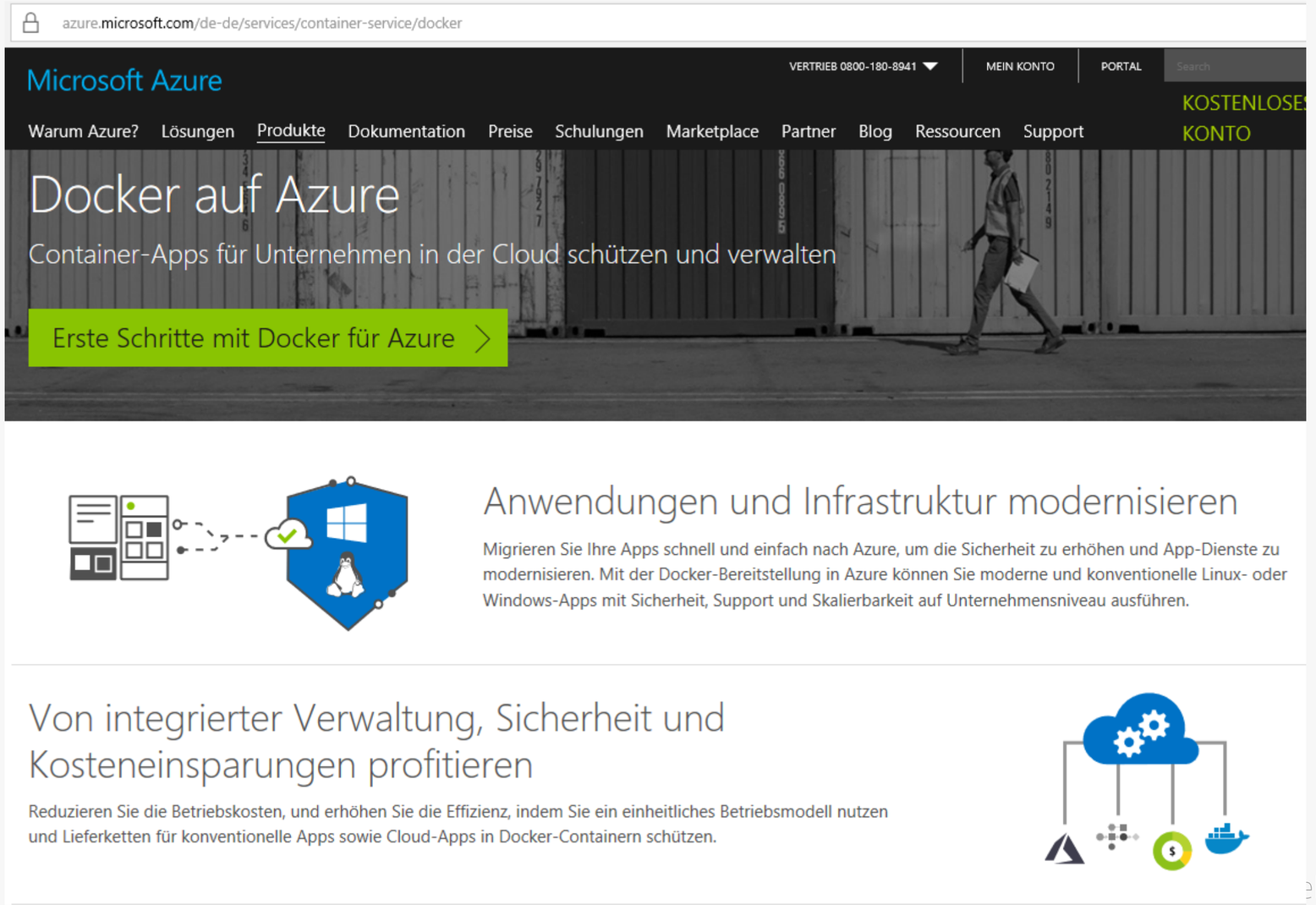
Demo

Install and Configuration of Docker on Windows Server 2016

```powershell
#region Install
$DockerMinimumVersion = '17.06.1-ee-1'
$NuGetPackageProviderVersion = '2.8.5.201'

if (!(Get-PackageProvider -Name "NuGet")) {
    Install-PackageProvider -Name "NuGet" -MinimumVersion $NuGetPackageProviderVersion -Force
}

if (!(Get-Module -Name "DockerMsftProvider" -ListAvailable)) {
    Install-Module -Name "DockerMsftProvider" -Repository PSGallery -Force
}

# notepad "C:\Program Files\WindowsPowerShell\Modules\DockerMsftProvider\1.0.0.1\DockerMsftProvid

Get-Package Docker* | select *
Install-Package -Name docker -ProviderName DockerMsftProvider -MinimumVersion $DockerMinimumVersi

Restart-Computer -Force

#Alternative install with DSC
Install-Script -Name Install-DockerOnWS2016UsingDSC
Install-DockerOnWS2016UsingDSC.ps1

#Install manually https://mobyproject.org/
$version = (Invoke-WebRequest -UseBasicParsing https://raw.githubusercontent.com/docker/docker/ma
Invoke-WebRequest "https://master.dockerproject.org/windows/x86_64/docker-$($version).zip" -OutFi
Expand-Archive -Path "$env:TEMP\docker.zip" -DestinationPath $env:ProgramFiles
$env:path += ";$env:ProgramFiles\Docker"
$existingMachinePath = [Environment]::GetEnvironmentVariable("Path",[System.EnvironmentVariableTa
[Environment]::SetEnvironmentVariable("Path", $existingMachinePath + ";$env:ProgramFiles\Docker",
dockerd --register-service
Start-Service Docker

# Docker CE für Win10: https://docs.docker.com/docker-for-windows/install/#install-docker-for-win
# https://download.docker.com/win/stable/Docker%20for%20Windows%20Installer.exe
```



Docker on Azure



5

Summary

Key **Takeaways**

I was here to bring you the message!

Ready to use

Complex

New operation

Processes are different to typical server operation

In Flow

New releases and features over time

Documentation

Very new! Therefor not enough information about these szenarios

Leadership

Innovation

Try it! Taste it! Do it!

Container in Windows Server!

Docker is easy! But the devil is everywhere...

URANO
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Thank You for your Attention!

Any Questions?

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