

# Windows Server 2016: Nano Server und Container

- Designed für die Cloud



Bernhard Frank  
Hosting Team  
Microsoft

<http://aka.ms/wolkenmacher>

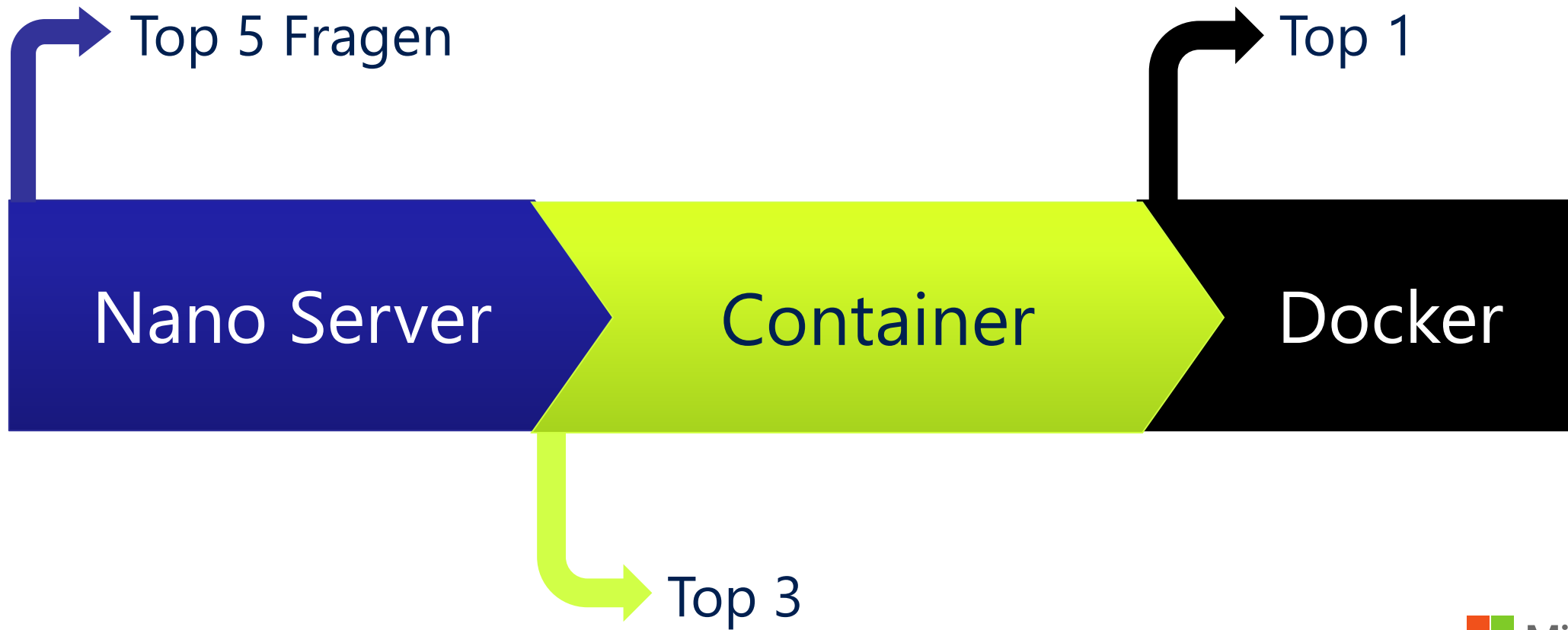


Technical Summit 2015  
The Next Level

#msts15 

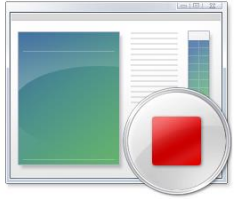


# Agenda



*Frage 1:*  
Warum Nano Server?

# Voice of the Customer



## Reboots impact my business

Why do I have to reboot because of a patch to a component I never use?  
When a reboot is required, the systems need to be back in service ASAP



## Server images are too big

Large images take a long time to install and configure  
Transferring images consumes too much network bandwidth  
Storing images requires too much disk space



## Infrastructure requires too many resources

If the OS consumes fewer resources, I can increase my VM density  
Higher VM density lowers my costs and increases my efficiency & margins

# Security Impact

**Experts: Sony Hackers Were Inside Company Network for a Long Time**

**Home Depot Confirms Cyber Attack from Foreign Entity**

**Staples breach may have affected over a million credit cards**

**Target cyber breach hits 40 million payment cards at holiday peak**

**Now at the Sands Casino: An Iranian Hacker in Every Server**

**A Cyberattack Has Caused Confirmed Physical Damage for the Second Time Ever**

**Five out of every six large companies targeted by cyber attacks in 2014**

*Frage 2:*  
Was ist Nano Server?

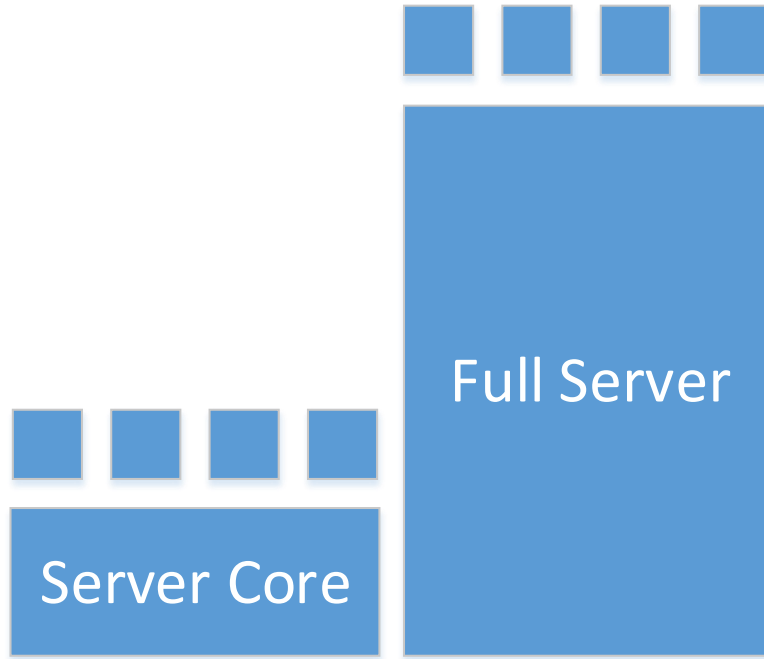
**As'ke•se**, die; -, keine Mehrzahl  
streng enthaltsame und abstinente  
Lebensweise

[Quelle: <http://de.langenscheidt.com/fremdwoerterbuch/askese> , Nov 2015]

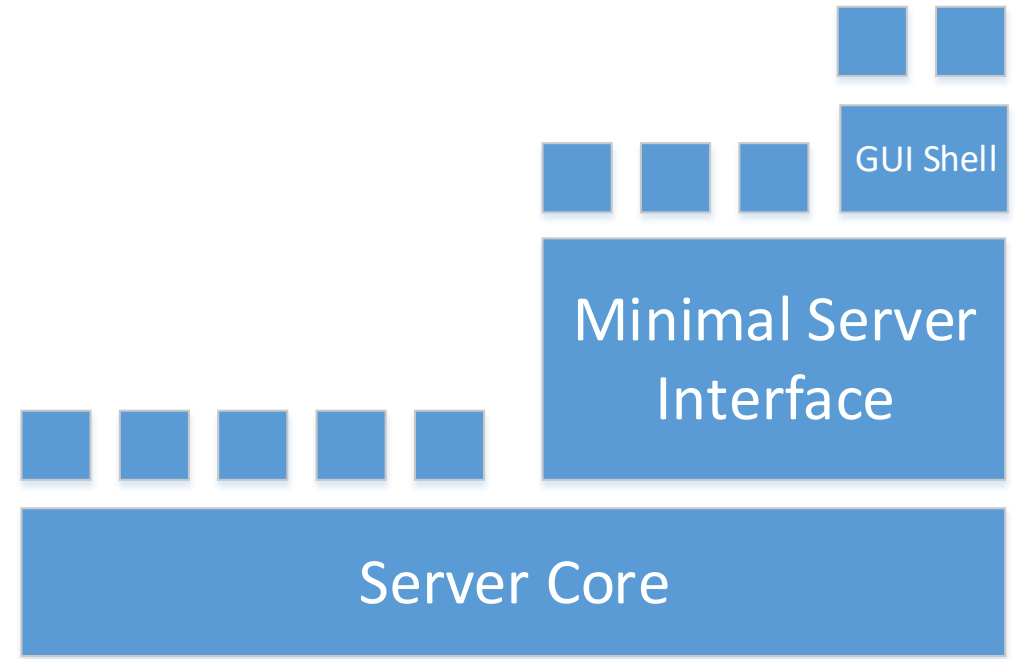
# Our Server Journey



Windows NT to  
Windows Server  
2003



Windows Server 2008  
and  
Windows Server 2008 R2



Windows Server 2012  
and  
Windows Server 2012 R2



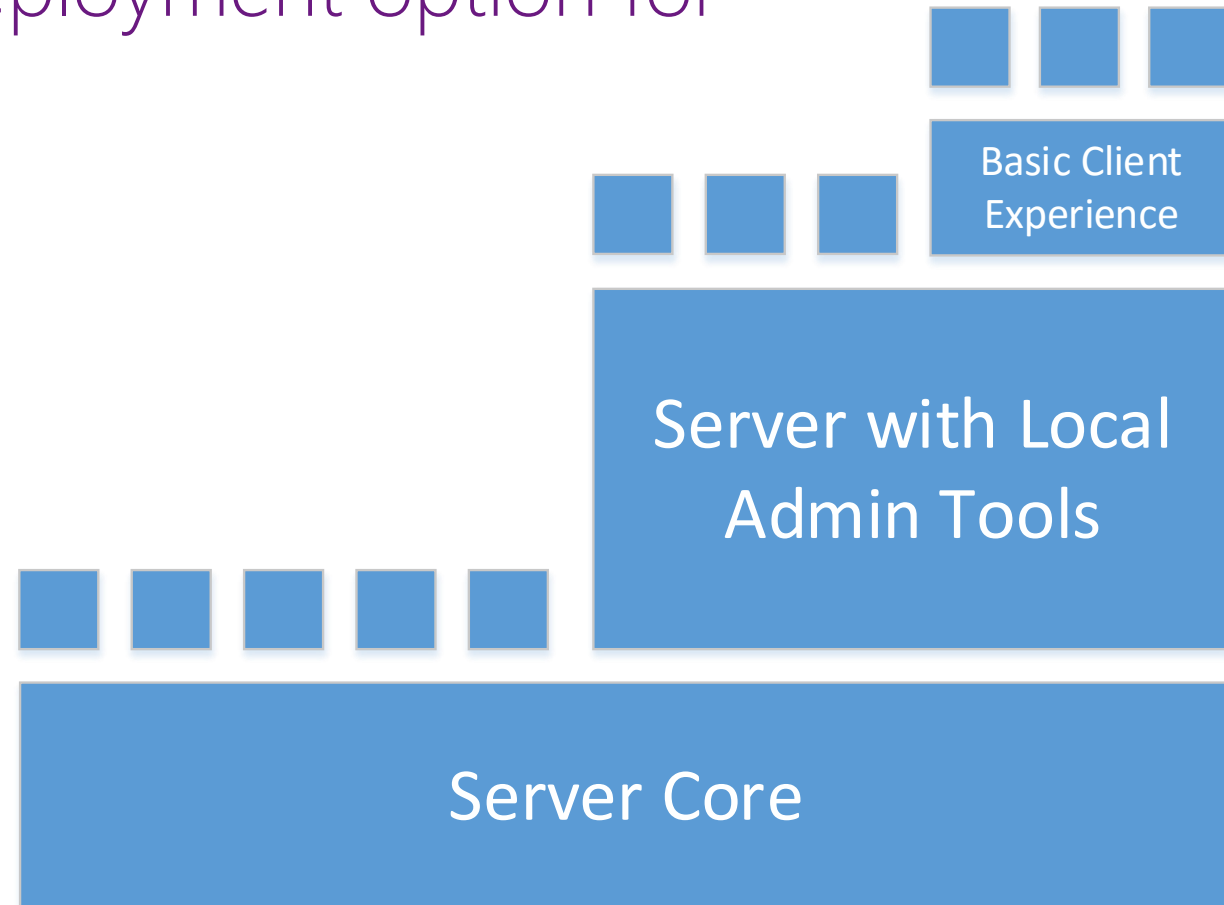
# Nano Server - Next Step in Our Cloud Journey

A new headless, 64-bit only, deployment option for Windows Server

Deep refactoring focused on CloudOS infrastructure

Born-in-the-cloud applications

Follow the Server Core pattern



# Nano Server - Roles & Features

## Zero-footprint model

Server Roles and Optional Features live outside of Nano Server  
Standalone packages that install like applications

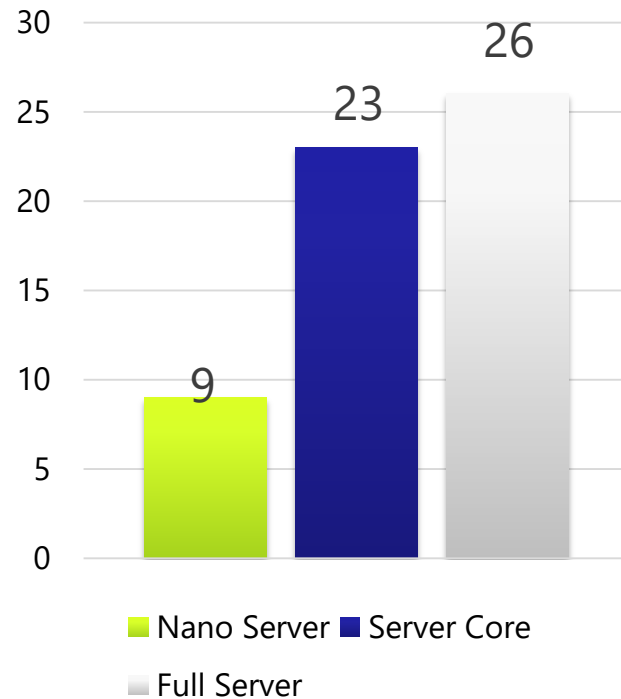
Full Windows Server driver support

Antimalware Built-in

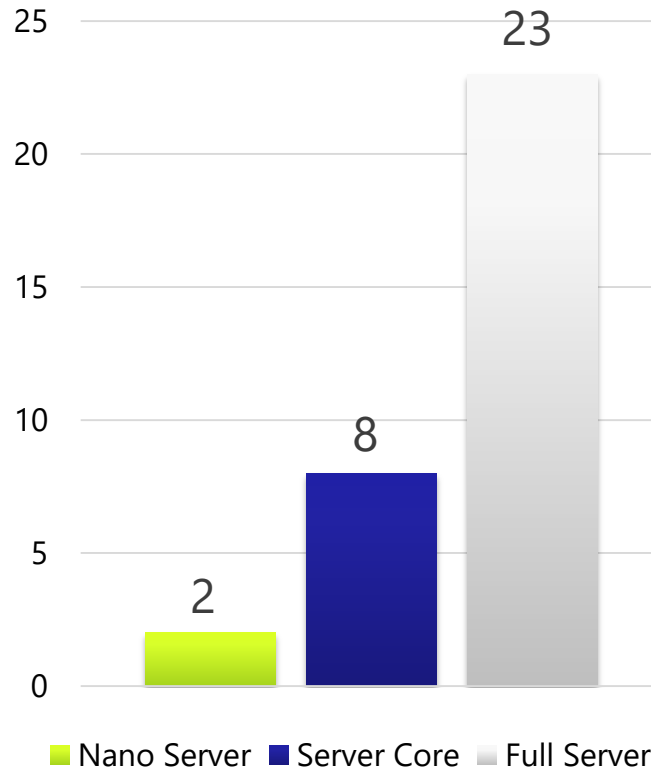
System Center and Apps Insight agents to follow

# Vorläufige Ergebnisse \*)

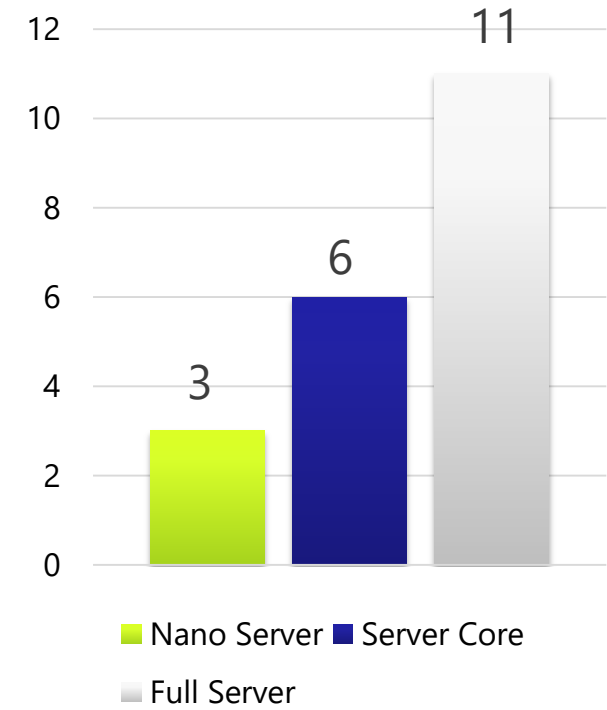
## Important Bulletins



## Critical Bulletins



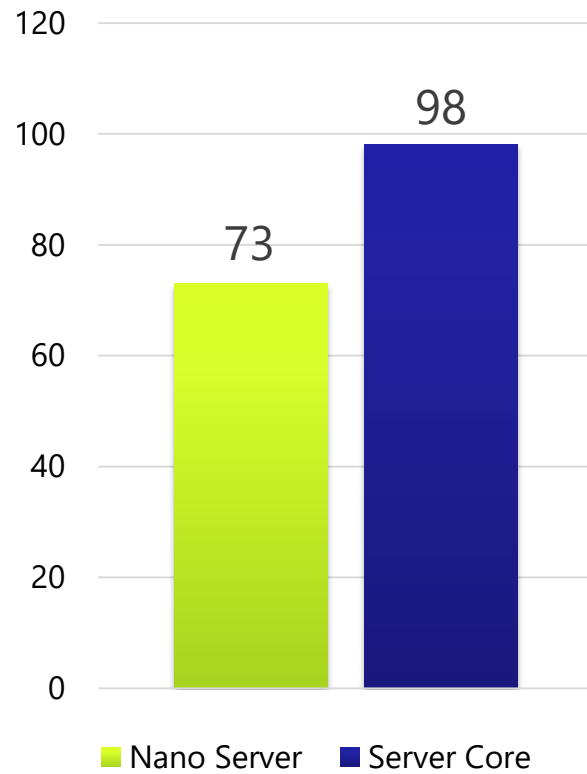
## Number of Reboots



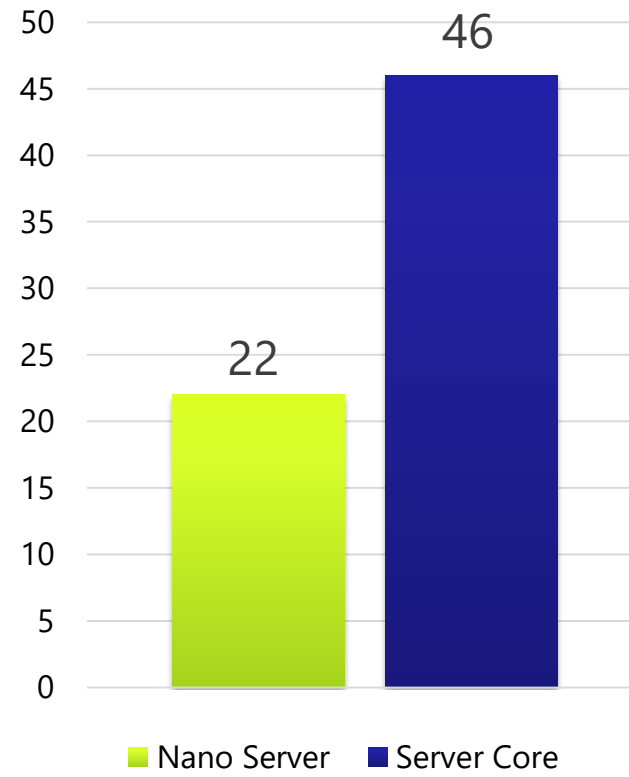
\*) Analysis based on all patches released in 2014

# Vorläufige Ergebnisse

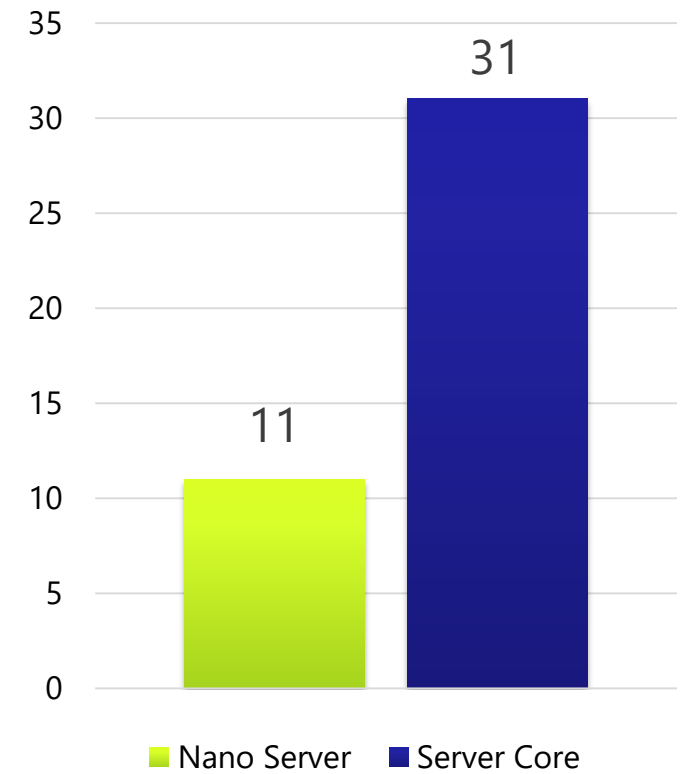
## Drivers loaded



## Services running

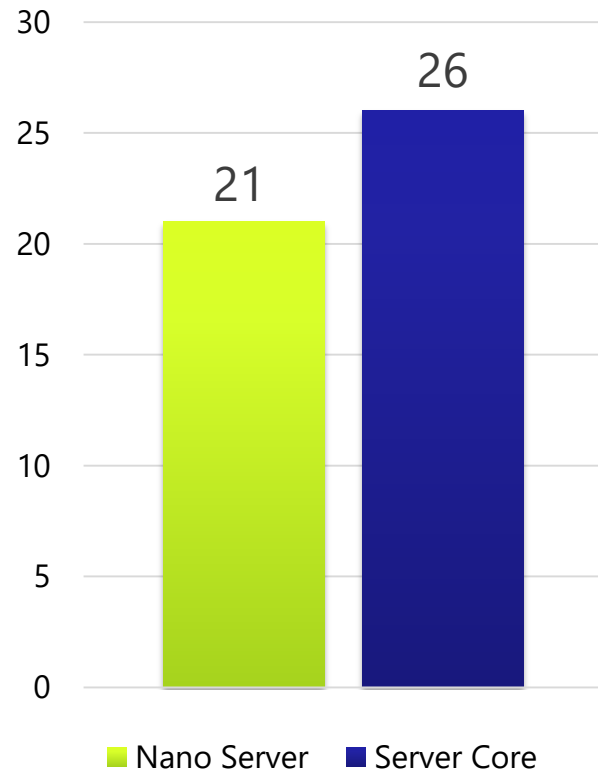


## Ports open

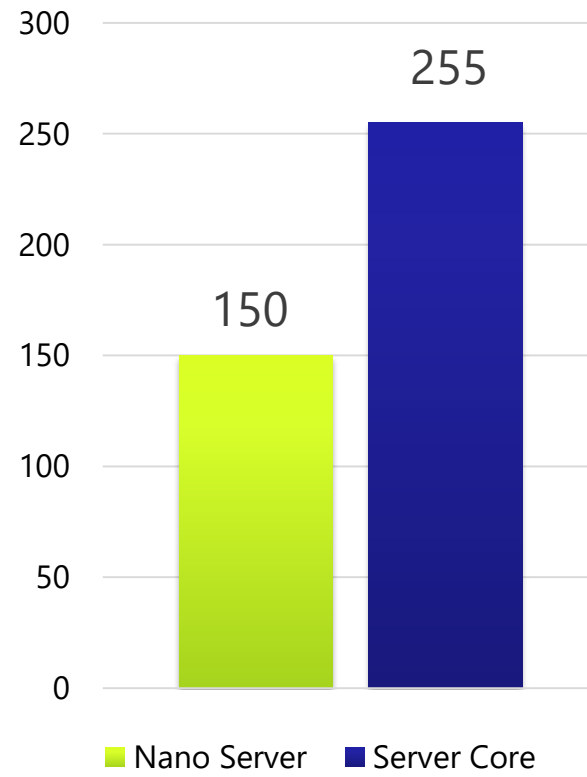


# Vorläufige Ergebnisse

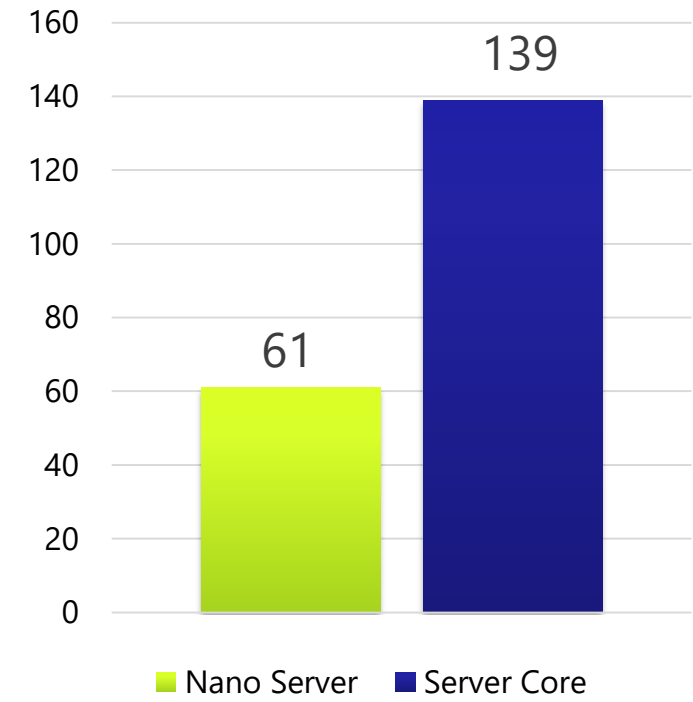
## Process Count



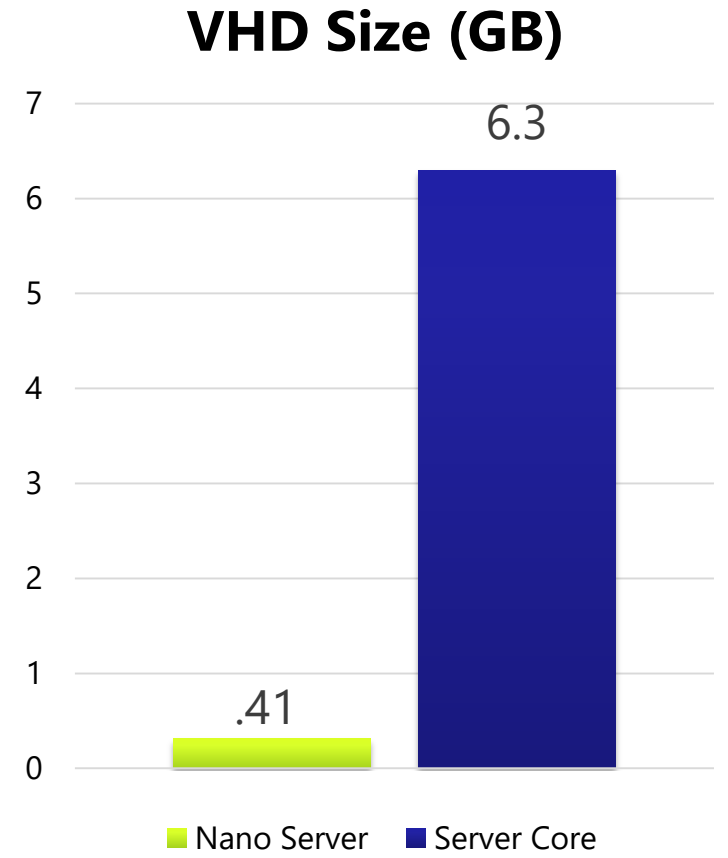
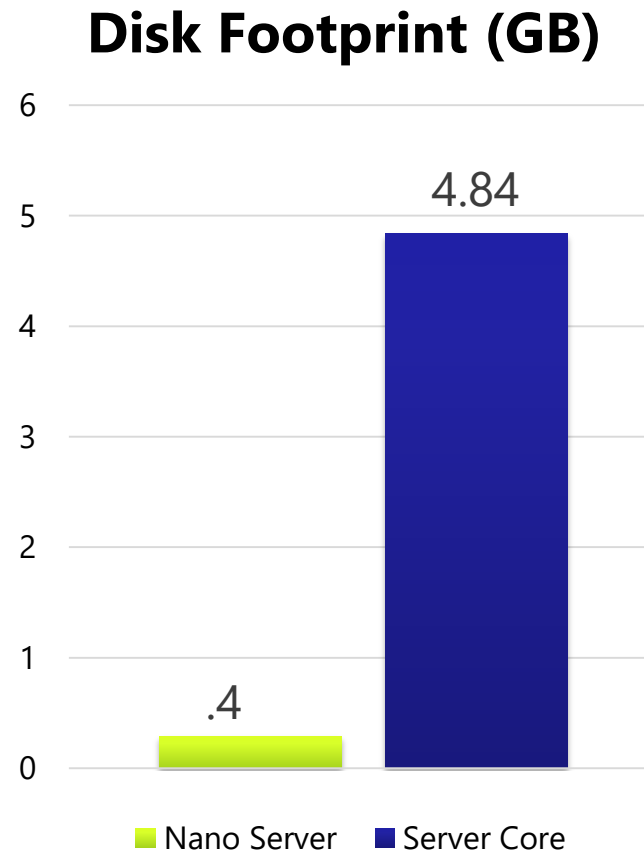
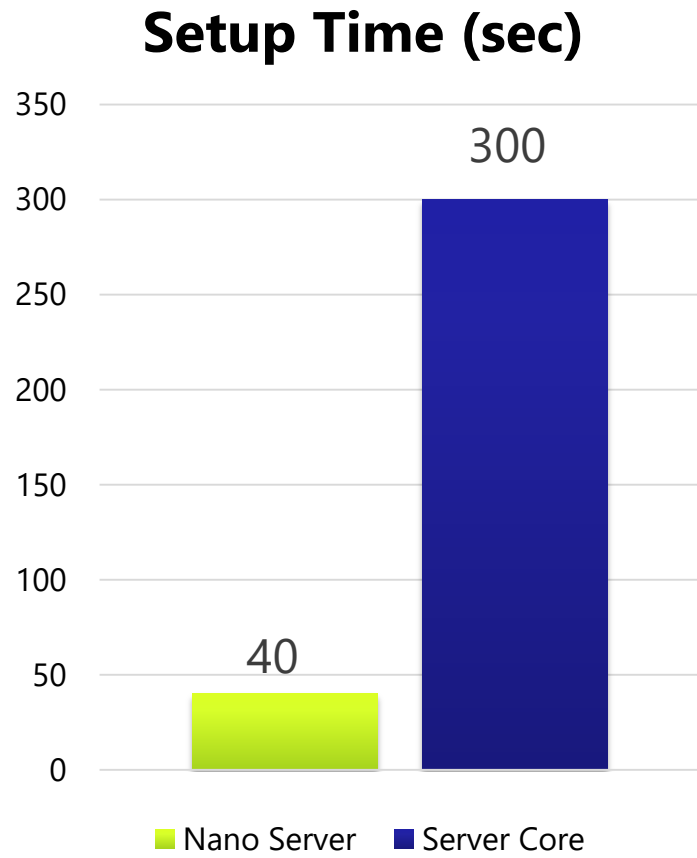
## Boot IO (MB)



## Kernel memory in use (MB)



# Vorläufige Ergebnisse



*Frage 3:*  
Wie installiere ich  
Nano Server?

Demo > \_



*Frage 4:*  
Wie verwalte ich Nano  
Server?

# Nano Server - Management

Eliminating the need to ever sit in front of a server

Remote management/automation via Core  
PowerShell and WMI

Configuration via PowerShell Desired State  
Configuration (DSC)

Integrate into DevOps toolchains

# Nano Server - Core PowerShell

Refactored to run on CoreCLR

Full PowerShell language compatibility & remoting

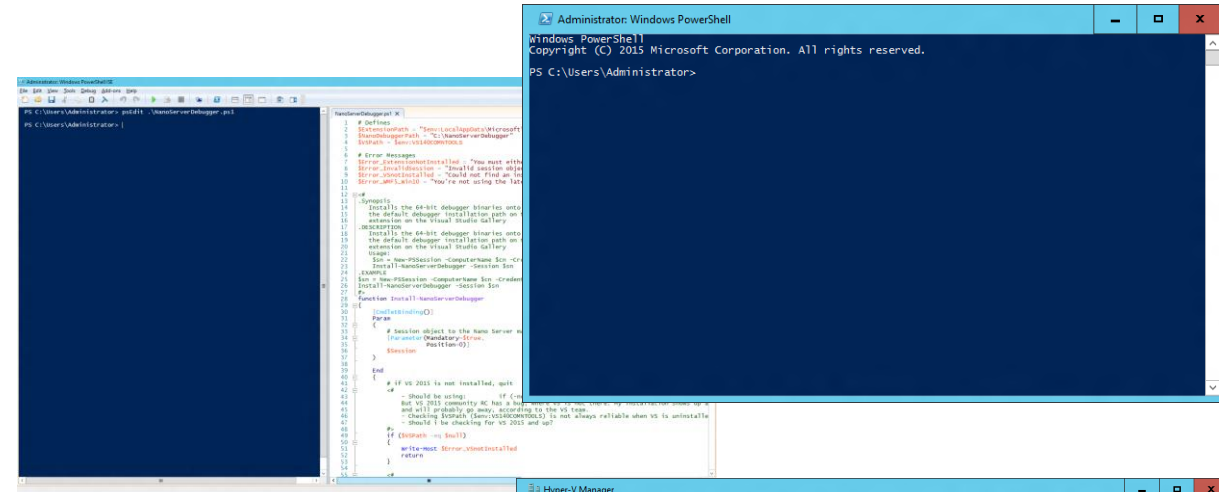
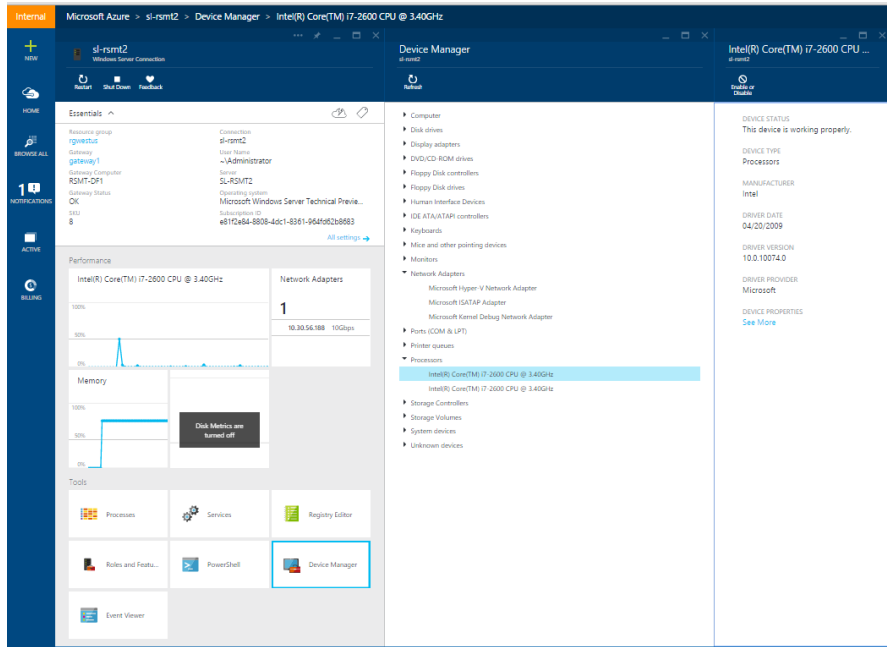
- Invoke-Command, New-PSSession, Enter-PSSession, etc.

Most core engine components

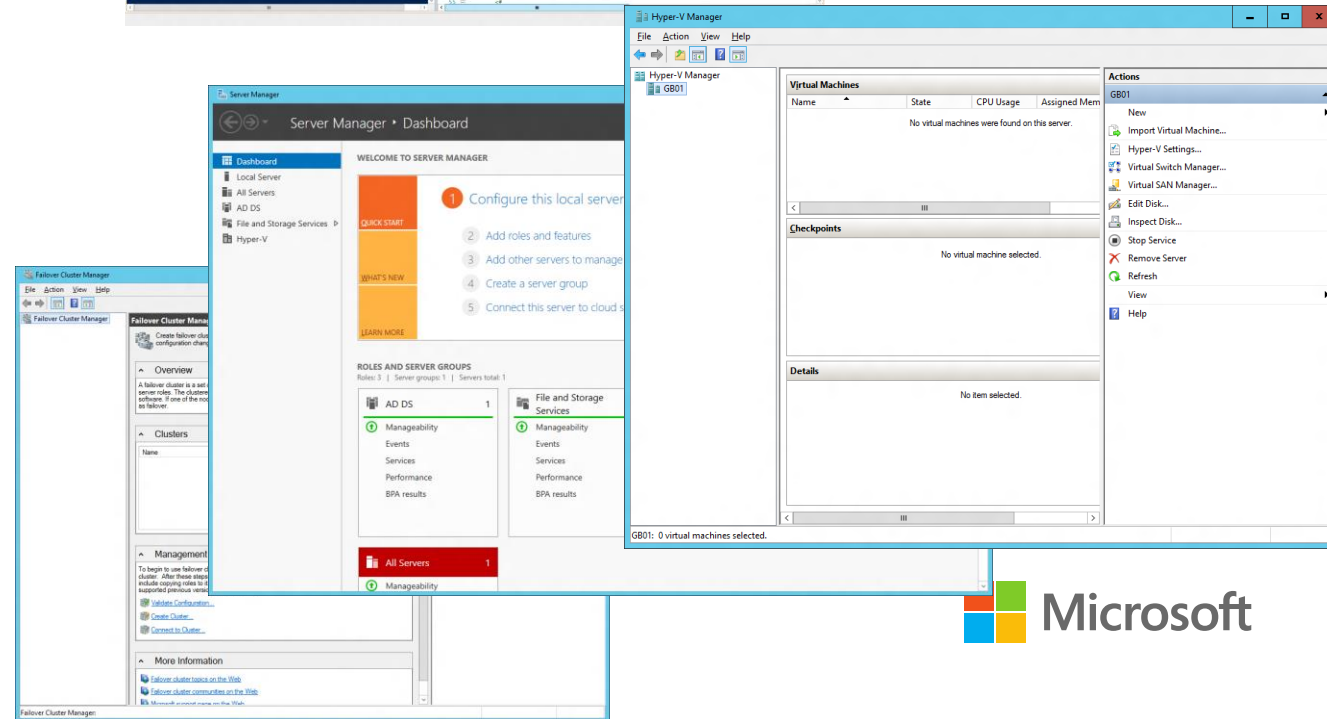
Support for all cmdlet types: C#, Script, and CIM

Limited set of cmdlets initially

# Remotely Managing Nano Server



RSMT  
CorePowerShell  
Hyper-V Manager  
Failover Cluster Mgr  
Server Manager  
PerfMon, Event Viewer ... etc.



# Remotely Managing Nano Server

## Remote Graphical & Web Tools

- Server Manager
- Azure Portal tools
- Task manager
- Registry editor
- File explorer
- Server configuration
- Event viewer
- Disk manager
- Device & driver management
- Performance
- Users & groups

## PowerShell Remoting

- Core PowerShell engine, language, and cmdlets
- Windows Server cmdlets (network, storage, etc.)
- PowerShell DSC
- Remote file transfer
- Remote script authoring & debugging
- PowerShell Web Access

## VM and Container Management

- Hyper-V Manager
- Hyper-V cmdlets
- PowerShell Direct over PSRP
- CimSession support
- Docker
- SCVMM agent & console
- 3rd party agents & consoles

## Deployment & Monitoring

- DISM online & VHD support
- Unattended setup
- Visual Studio integration
- DSC Local Config Manager
- Setup & boot eventing
- SCOM agent
- VSO App Insights
- Azure Op Insights

## Partners & Frameworks

- Chef integration
- .NET Core and CoreCLR
- ASP.NET 5
- Python, PHP, Ruby, Node.js
- PowerShell Classes
- PS Script Analyzer
- PowerShell Gallery
- PowerShellGet

Demo > \_

*Frage 5:*  
Was mache ich mit  
Nano Server?

# Nano Server – Verwendungszweck

Runs cloud components and Born-in-the-Cloud apps

## Availability:

- Host OS for physical hardware
- Guest OS in a VM
- Windows Server containers
- Hyper-V containers

## Key Roles & Features

- Hyper-V, Storage (SoFS), and Clustering
- Core CLR, ASP.NET 5 & PaaS

Nano Server is the future nucleus of Windows Server

Provides a Just Enough OS model for all applications



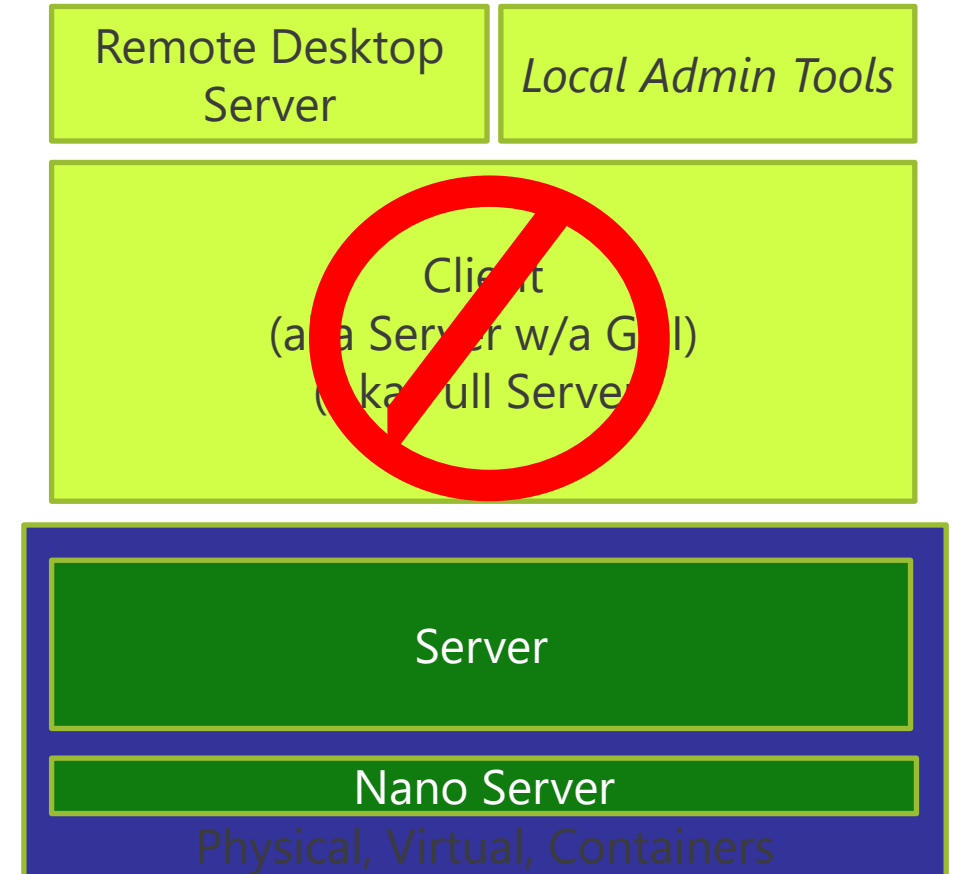
# Server Application Development

Deep refactoring

Client stack for RDS

Developers target Server or Nano Server

Deploy to Physical, Virtual or Containers



# Nano Server - Developer Experience

Windows SDK & Visual Studio 2015 target Nano Server

Download tooling from the VS gallery

Rich design-time experience

Project template, full IntelliSense, error squiggles, etc.

Full remote debugging experience

# Reverse Forwarders

A missing DLL will result in an app failing to run

Provide a way to run existing apps without recompiling for Nano Server

- With Reverse Forwarders your apps will load and API calls in those DLLs will either result in
  - API call will succeed if the API is in the Nano Server boundary
  - Return of Not Implemented if it is not within the Nano Server boundary

Does not eliminate the need to refactor code to what is available in Nano Server

# Reverse Forwarders (cont.)

Optional package that can be included in a Nano Server image when needed

Available reverse forwarders include:

- advapi32.dll
- comctl32.dll
- comdlg32.dll
- gdi32.dll
- kernel32.dll
- ole32.dll
- psapi.dll
- shell32.dll
- shlwapi.dll
- user32.dll
- version.dll
- winmm.dll

# What runs today with the Reverse Forwarders?

Chef

PHP

Nginx

Python 3.5

Node.js

GO

Redis

MySQL

OpenSSL

Java (OpenJDK)

Ruby (2.1.5)

SQLite

# Nano Server – Schnellübersicht I

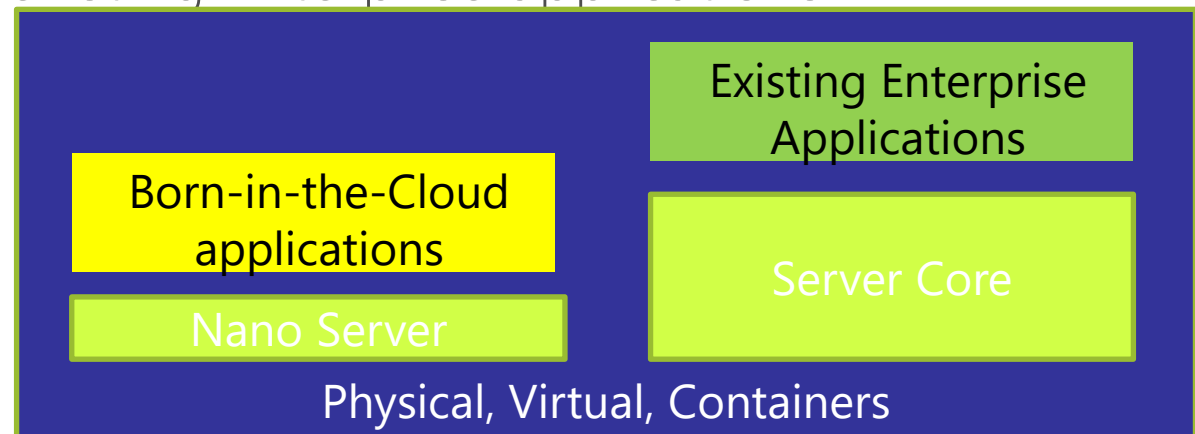
Nano Server is the future nucleus of Windows Server

- Target for cloud components and Born-in-the-Cloud applications
- New foundation for all components

Provides a Just Enough OS model for all applications

Not everything will run on Nano Server

- Server Core provides compatibility for existing Enterprise applications



# Nano Server – Schnellübersicht II

[aka.ms/nanoserver](https://aka.ms/nanoserver)

Administration wird anspruchsvoller

„Askese“ Edition - keine Rolle

Hyper-V, Clustering, File Server Rolle + Defender

Zero Footprint – kein Herumlungern von Bits

Mag keine .msi 's

**Keine**, wirklich keine GUI (nur Notfall TUI)

Win32 on NANO ist refactored -> ReverseForwarders

.Net on NANO ist refactored -> Powershell

Unterstützt Container

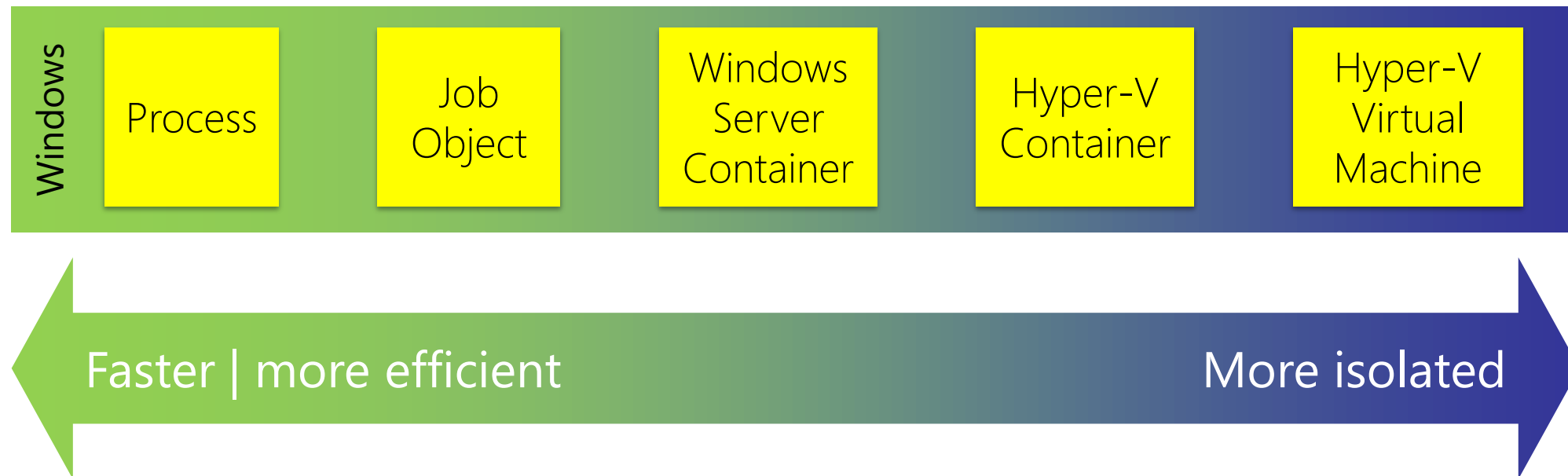
VS Profil

# Was sind Container?

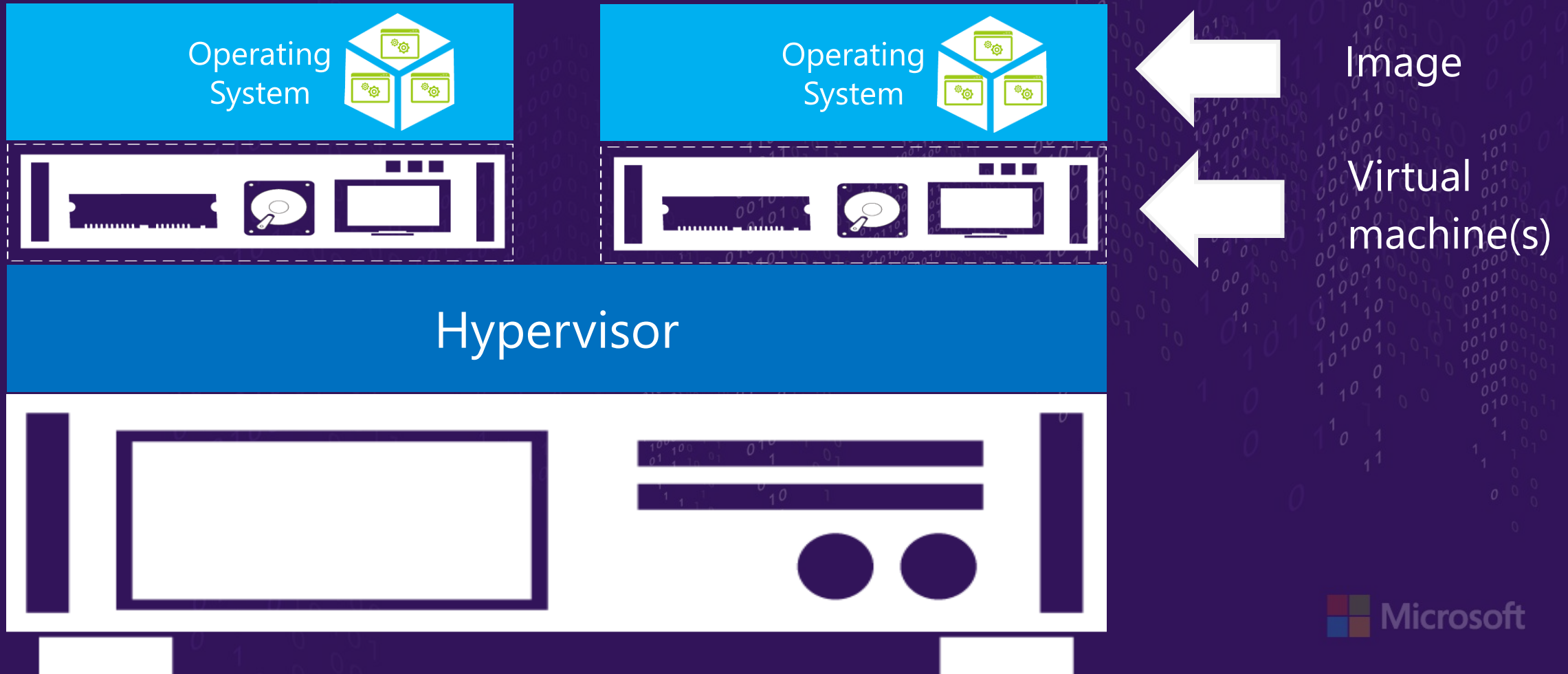




# Isolation Technology In Windows



# Hyper-V

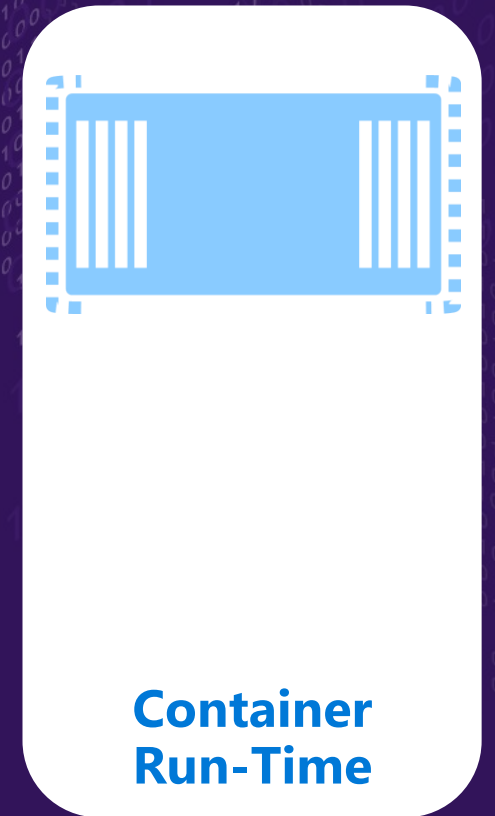
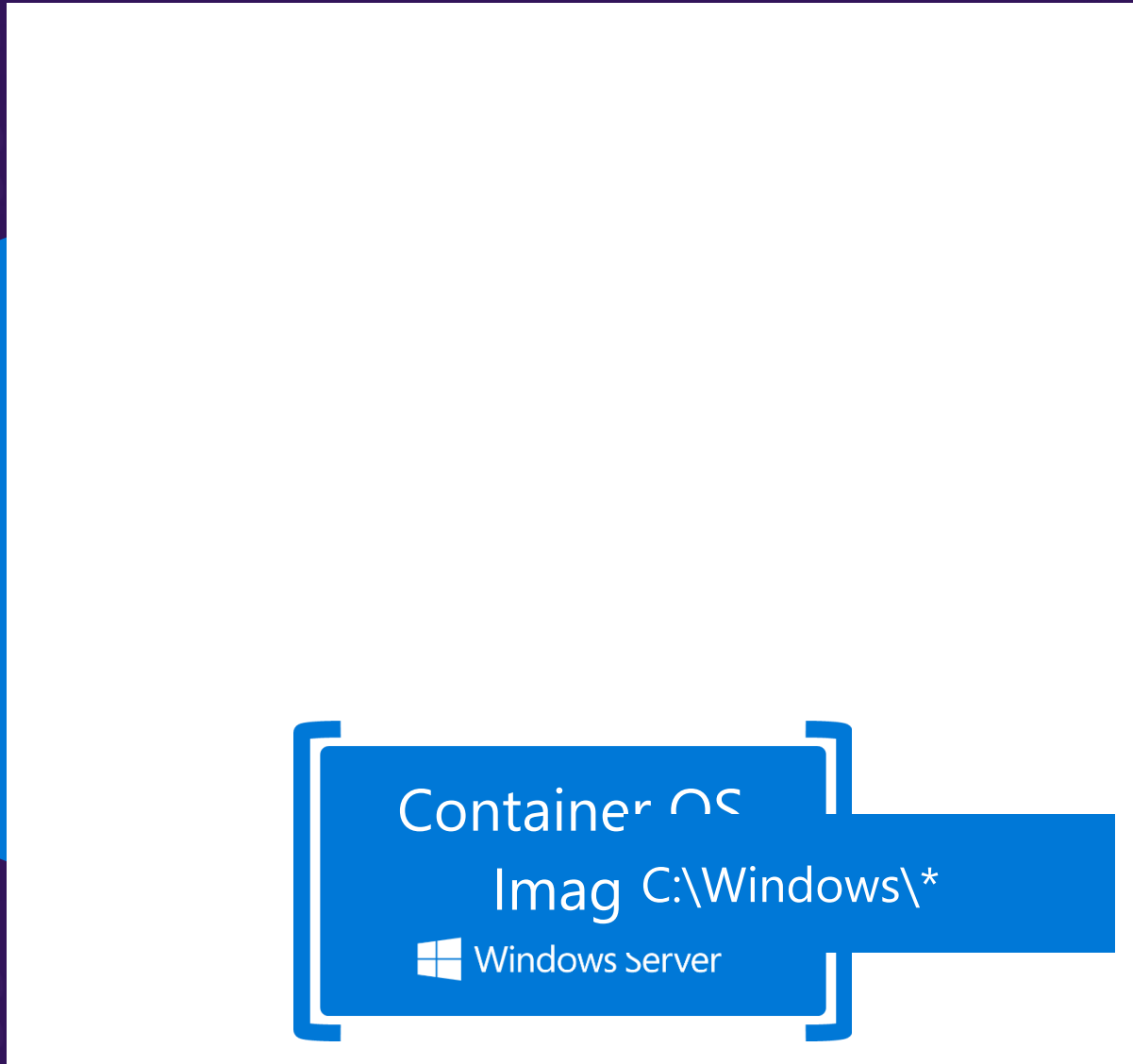
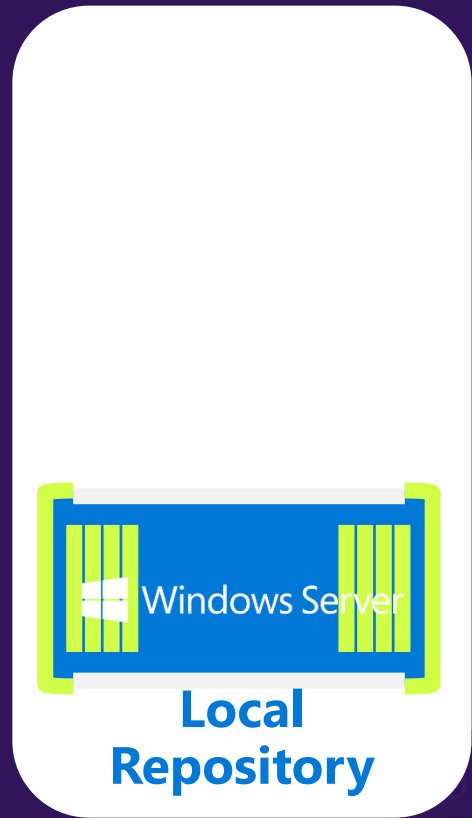


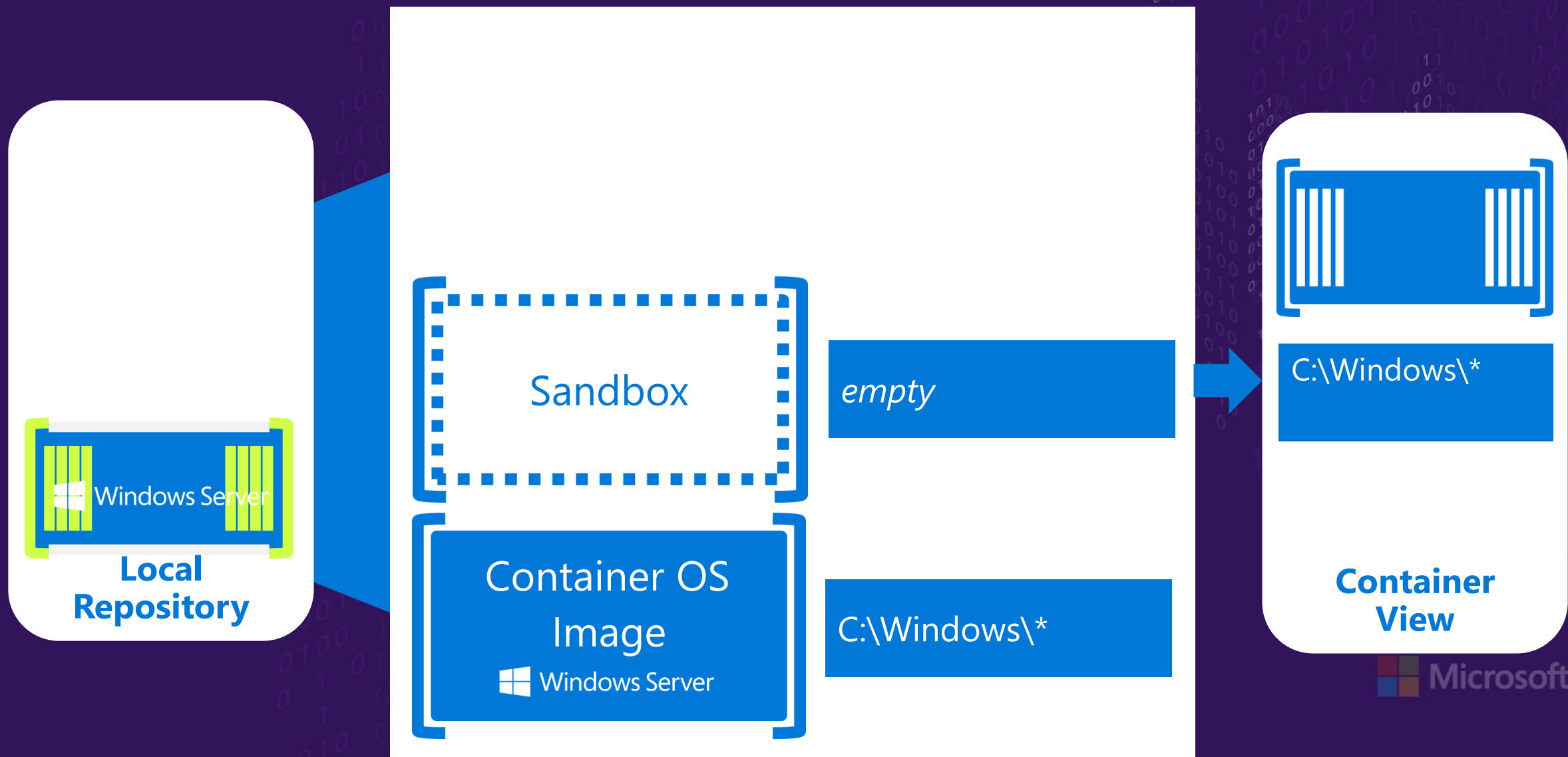
# Container Run-time

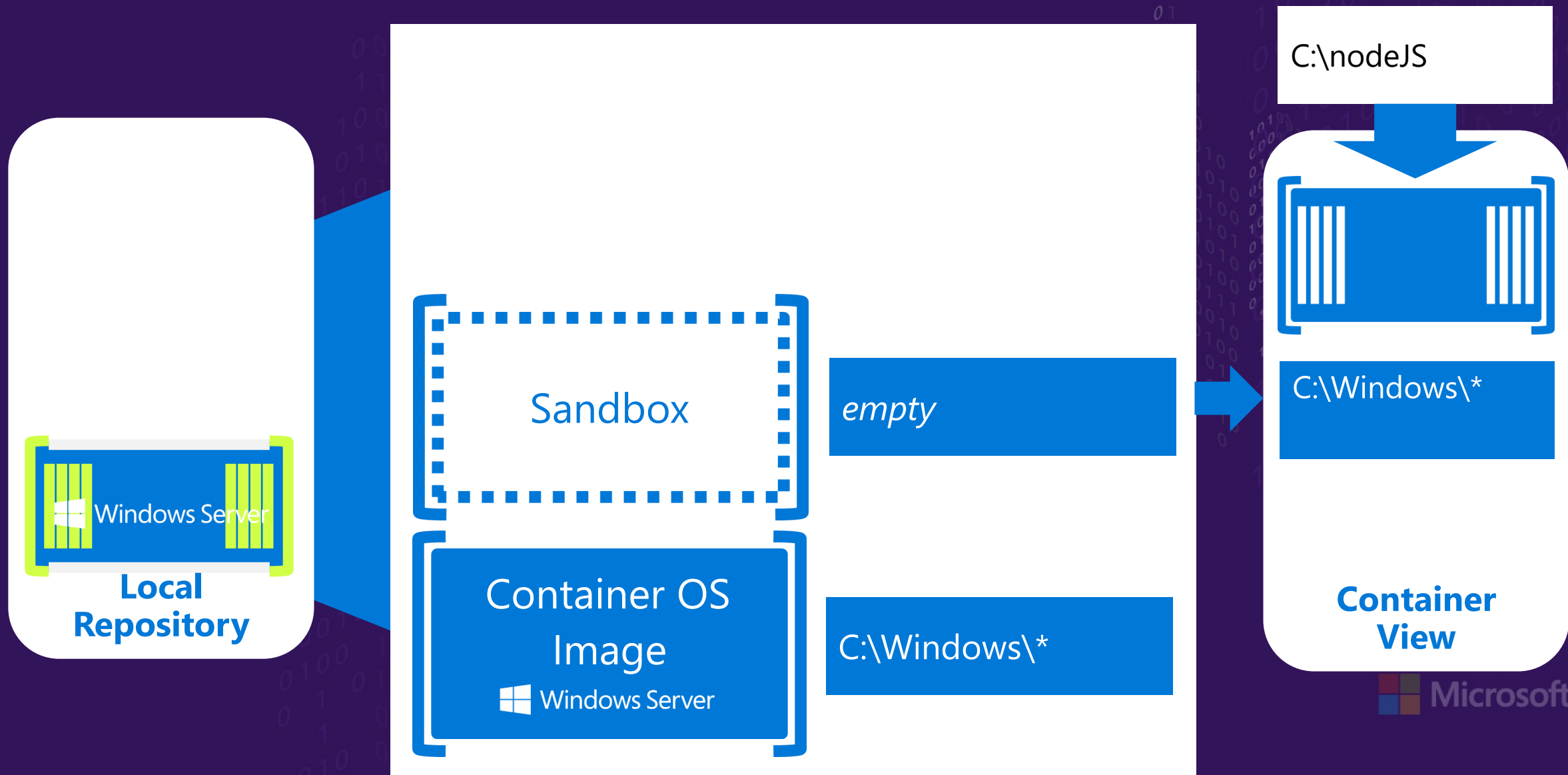


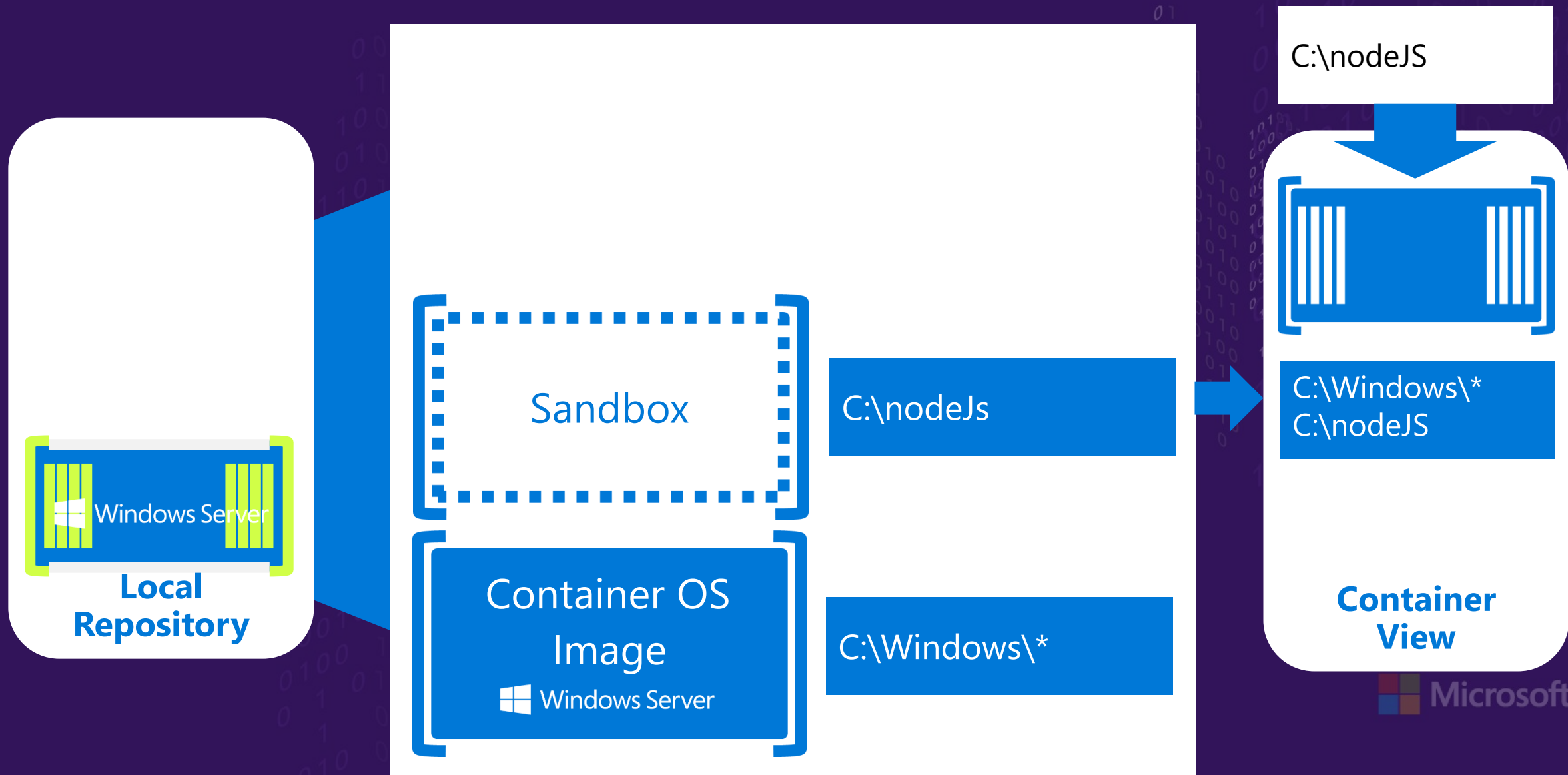
# Wie benützt man Container?

# Image Creation

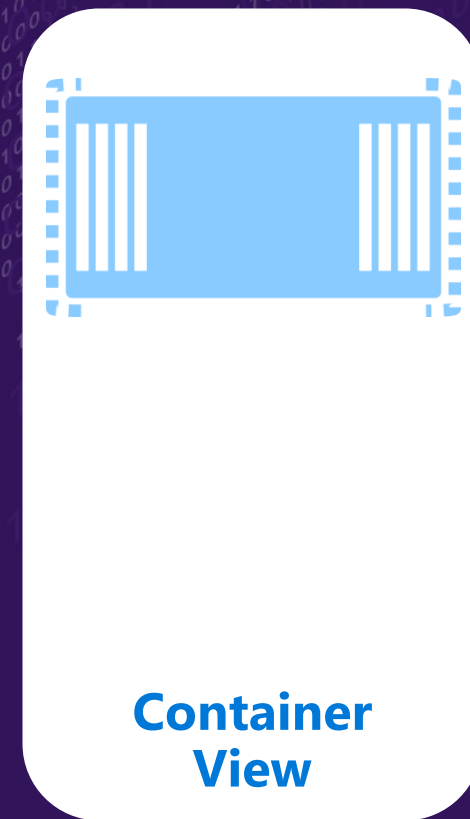
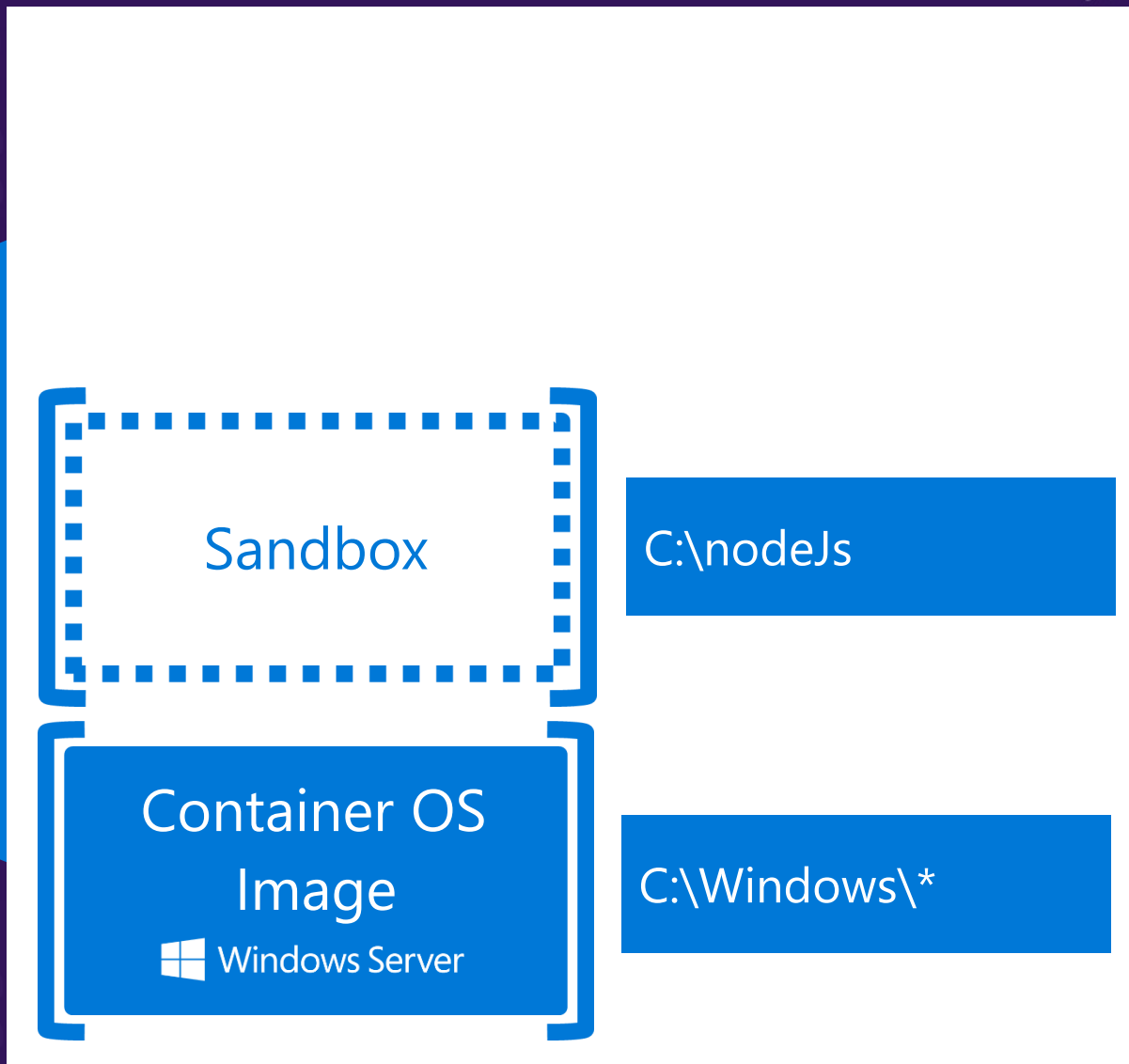
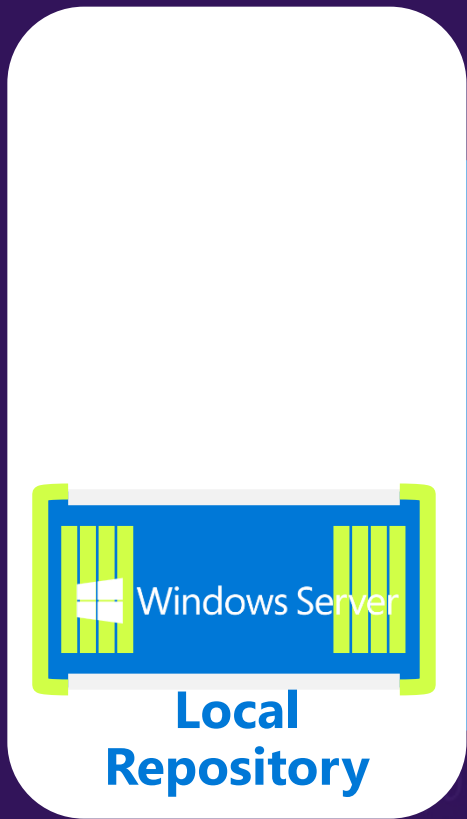


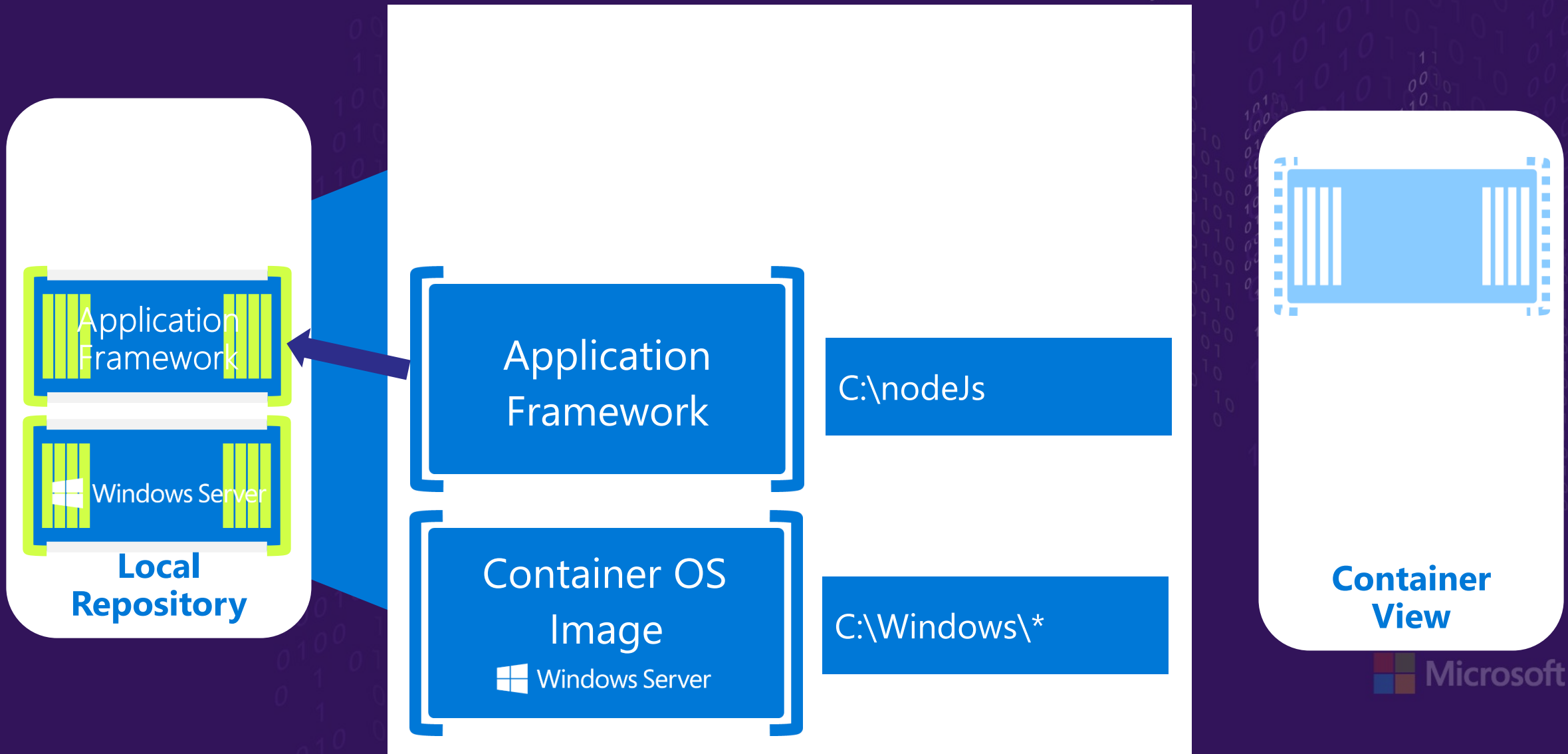












Video > \_

```
PowerShell Demo.txt - Notepad
File Edit Format View Help
Get-ContainerImage
Get-VMSwitch
$container = New-Container -Name "MyContainer" -ContainerImageName WindowsServer
Get-Container
Start-Container -Name "MyContainer"
Enter-PSSession -ContainerId $container.ContainerId -RunAsAdministrator
wget -uri 'http://192.168.99.1/nginx-1.9.3.zip' -OutFile "c:\nginx-1.9.3.zip"
Expand-Archive -Path C:\nginx-1.9.3.zip -DestinationPath c:\ -Force
exit
Stop-Container $container
$webserverimage = New-ContainerImage -Container $container -Publisher Demo -Name
Get-ContainerImage
$webservercontainer = New-Container -Name webserver1 -ContainerImageName nginxwi
Get-Container
Start-Container $webservercontainer
Enter-PSSession -ContainerId $webservercontainer.ContainerId -RunAsAdministrator
cd c:\nginx-1.9.3\
start nginx
get-process
exit
Add-NetNatStaticMapping -NatName "ContainerNat" -Protocol TCP -ExternalIPAddress
if (!(Get-NetFirewallRule | where {$_.Name -eq "TCP80"})) {
    New-NetFirewallRule -Name "TCP80" -DisplayName "HTTP on TCP/80" -Protocol tc
}
```

```
PowerShell Windows Containers on BENARM-DEMO - Virtual Machine Connection
File Action Media View Help
Administrator: Windows PowerShell
PS C:\> ipconfig

Windows IP Configuration

Ethernet adapter vEthernet (Virtual Switch):

    Connection-specific DNS Suffix . . . . . :
    Link-local IPv6 Address . . . . . : fe80::c10e:229f:c0fb:2c7b%8
    IPv4 Address. . . . . : 172.16.0.1
    Subnet Mask . . . . . : 255.240.0.0
    Default Gateway . . . . . :

Ethernet adapter Ethernet 4:

    Connection-specific DNS Suffix . . . . . :
    Link-local IPv6 Address . . . . . : fe80::cd7a:f07b:47b4:8040%10
    IPv4 Address. . . . . : 192.168.99.2
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :

Tunnel adapter isatap.{8D8F561E-6EE5-4DD5-87E7-E60966DE8A97}:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . . . . . :

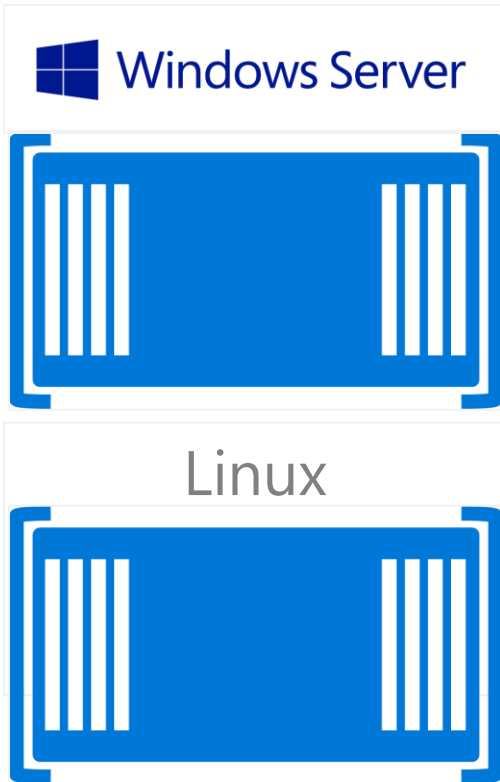
Tunnel adapter isatap.{C357942E-09F6-4CB9-9048-7FBFF992A7AE}:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . . . . . :
PS C:\> _

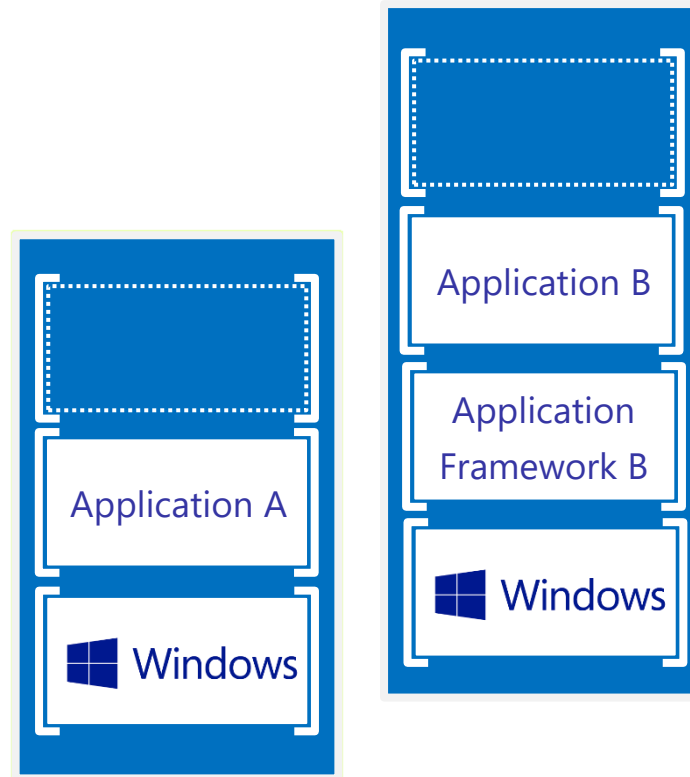
Status: Running
```

# Container Ecosystem

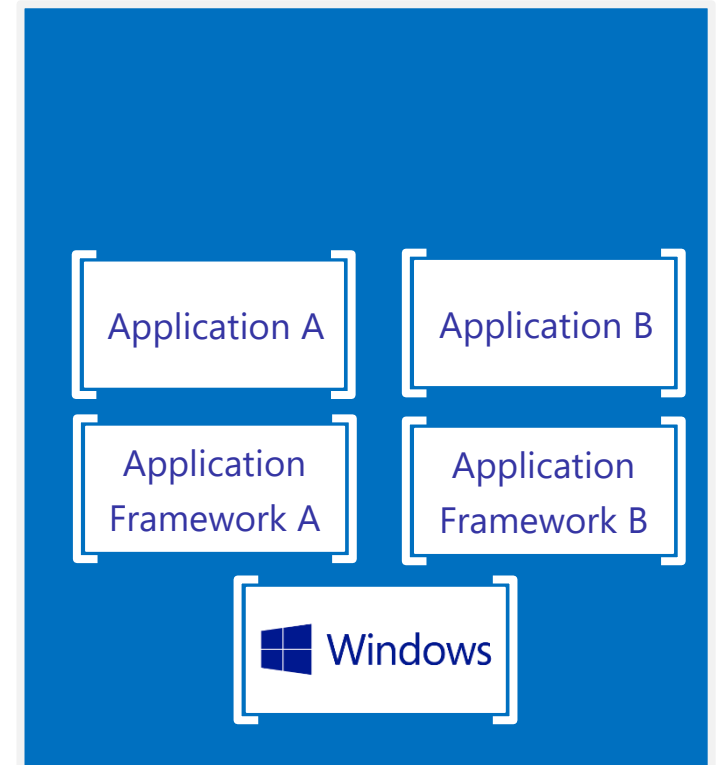
## Container Run-Time



## Container Images

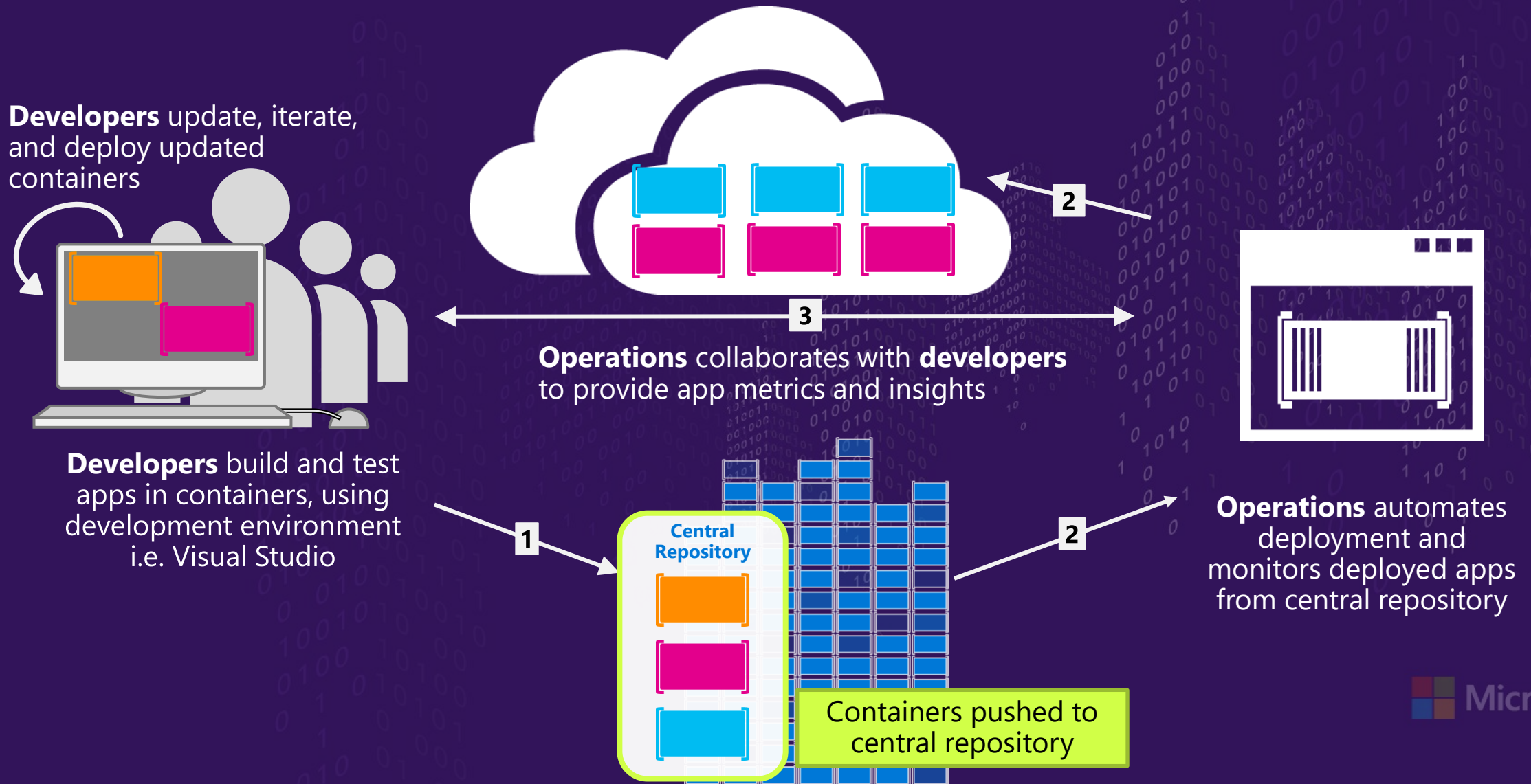


## Image Repository



# Was macht man mit Container?

# Dev/Ops Process with Containers



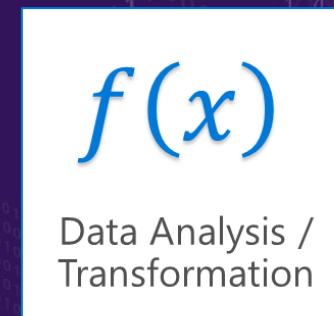
# Container Use Cases

- Workload Characteristics

- Scale out
- Distributed
- State separated
- Rapid (re)start

- Deployment Characteristics

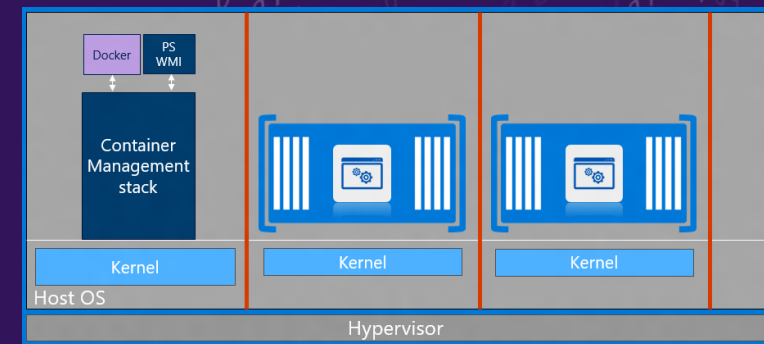
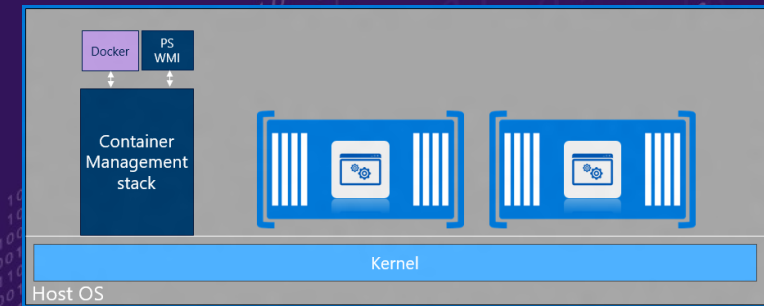
- Efficient hosting
- Multitenancy
- Rapid deployment
- Highly automatable
- Rapid scaling





# Container Use Cases

- Windows Server Container
  - Trusted multi-tenancy
  - Highly automatable
  - Scalable / Elastic
  - Small footprint / Efficient
  - Resource Management
- Hyper-V Containers
  - Windows Server Container
  - Untrusted / hostile multi-tenancy
  - Regulated workloads



# Windows Container OS

- WindowsServerCore
  - Highly compatible
  - Existing Windows Server (Core) applications
- NanoServer
  - Optimized for high density
  - “Born in the cloud” applications
  - Distributed applications

Wer oder was ist...?



docker

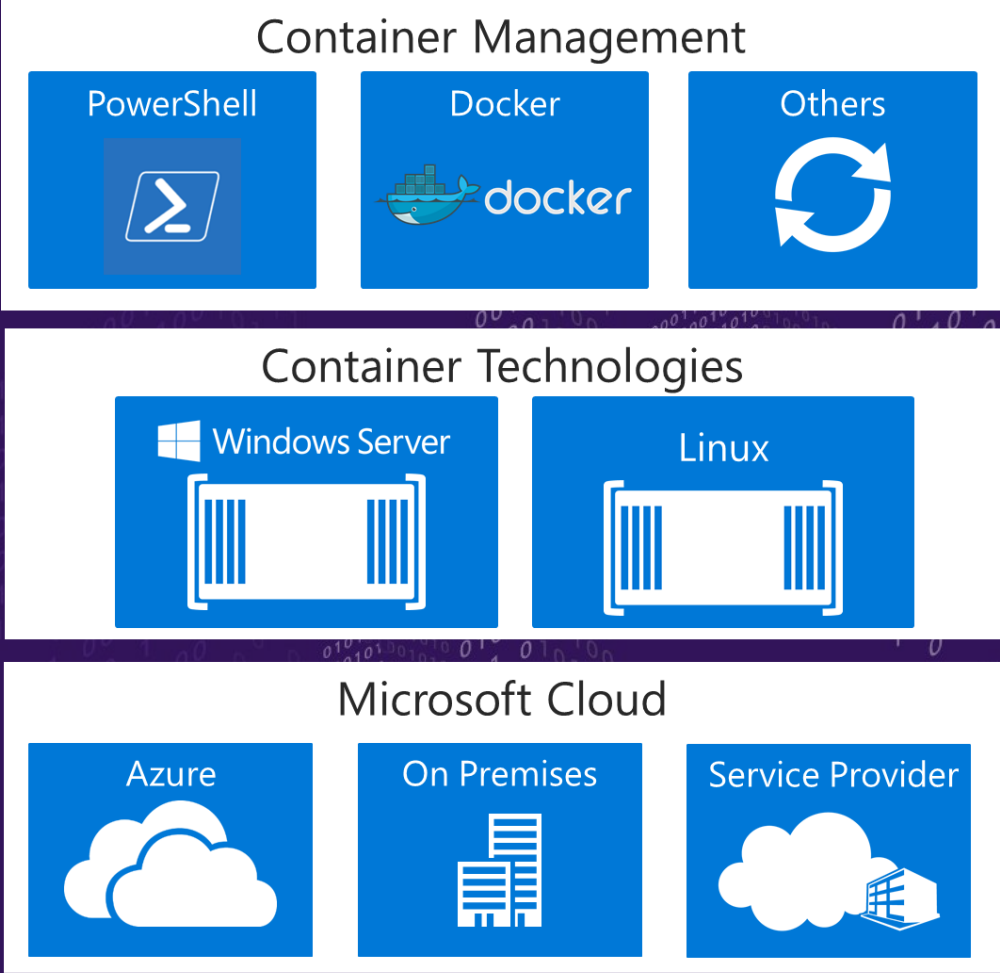
“Docker allows you to package an application with all of its dependencies into a standardized unit for software development.”

[Quelle: <https://www.docker.com/what-docker>, 9.11.2015]

# Containers In The Bigger Picture...

Development Environments

- Visual Studio
- eclipse
- Others...



# Ressourcen

[aka.ms/windowscontainers](https://aka.ms/windowscontainers)

**Videos:** <https://channel9.msdn.com/Blogs/containers>

**Docker:** [docker.com/tryit](https://docker.com/tryit)

# Key Takeaway(s):

Windows Server 2016 provides container technology

Windows Containers enable choice of management stacks

Microsoft enables choice of development tools and integration for containers

# Vielen Dank



# Vielen Dank



© 2014 Microsoft Corporation. All rights reserved. Because Microsoft must respond to changing market conditions, it should not be interpreted to be a commitment on the part of Microsoft, and Microsoft cannot guarantee the accuracy of any information provided after the date of this presentation. MICROSOFT MAKES NO WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, AS TO THE INFORMATION IN THIS PRESENTATION.

# Weiterführende Informationen

## Entwickler:

[www.techwiese.de](http://www.techwiese.de) - News, Ressourcen, Events und Support für Entwickler

[www.msdn.de/newsletter](http://www.msdn.de/newsletter) - MSDN Flash – kostenloser Newsletter für Entwickler

## IT Pros:

[www.itprohub.de](http://www.itprohub.de) - News, Ressourcen, Events und Support für IT Profis

[www.technet.de/flash](http://www.technet.de/flash) - TechNet Flash - kostenloser Newsletter für IT Profis

## Für Devs und IT Pros:

[www.mva.ms](http://www.mva.ms) - Kostenlose Online-Schulungen für Entwickler und IT Profis

[www.ch9.ms](http://www.ch9.ms) - Videoplattform für Entwickler und IT Profis