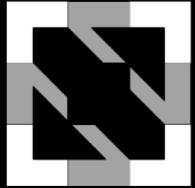




KubeCon



CloudNativeCon

China 2018

深入了解 Kubernetes 上的 Windows 容器

Pengfei Ni

Microsoft Azure

Kubernetes Maintainer



KubeCon



CloudNativeCon

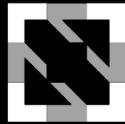
China 2018

1. Windows 容器简介

什么是容器



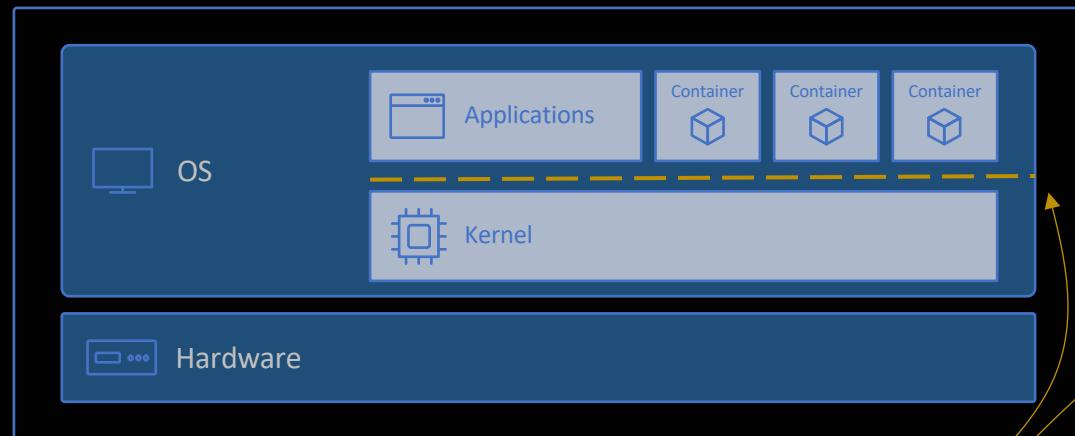
KubeCon



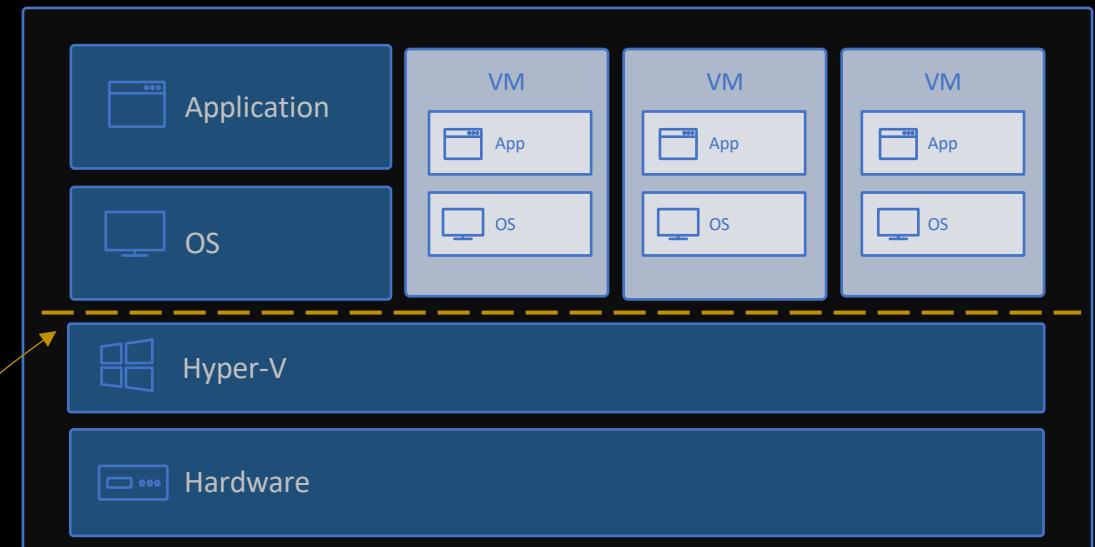
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容器 = 操作系统虚拟化



传统虚拟机 = 硬件虚拟化

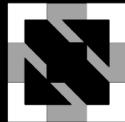


虚拟化边界

为什么要用容器

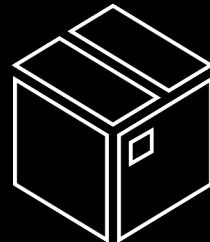


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快速迭代



敏捷部署



不可变性



节省成本



高效部署



弹性突发

开发者

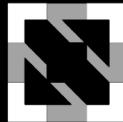
IT

容器的构成

```
PS> docker build -t myimage .
PS> docker run -itd myimage
PS> docker ps
```

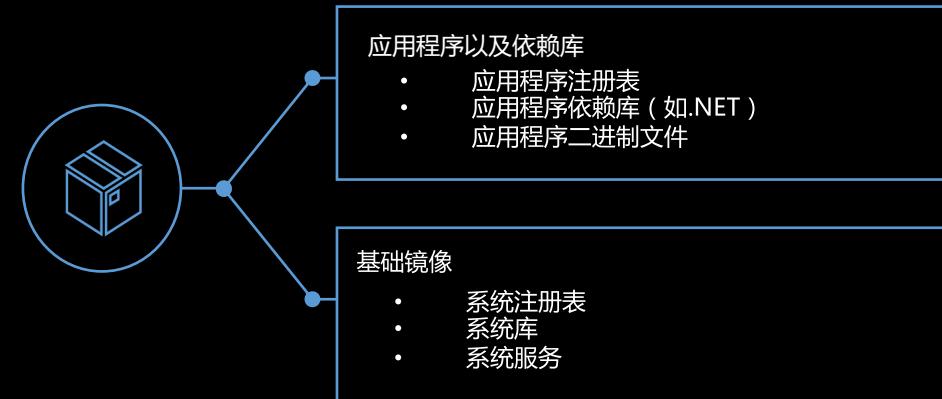


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#基础镜像

```
FROM microsoft/windowsservercore:1803
```

#安装 IIS

```
RUN powershell -Command Add-WindowsFeature Web-Server
```

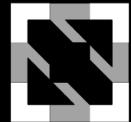
#定义容器启动时的默认命令

```
CMD [ "ping", "localhost", "-t" ]
```

Windows 基础镜像



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nanoserver

为云应用而生

支持 .NET core

93MB

windowsservercore

兼容已有应用

支持 Full .NET
framework

1.4GB

Windows

自动化负载

包含 Windows OS 的大部
分组件

3.4GB

windowsservercore-insider
nanoserver-insider
windows-insider

仅用于开发和测试

[microsoft/windowsservercore:1803](https://mcr.microsoft.com/windows/nanoserver:1803) \Rightarrow mcr.microsoft.com/windows/nanoserver:1803

```
PS C:\> ls "C:\ProgramData\docker\windowsfilter\646c94c76da839f088e2e4a5209100496d7f4ae5b01802fa6a9209f530661293\"
```

```
Directory: C:\ProgramData\docker\windowsfilter\646c94c76da839f088e2e4a5209100496d7f4ae5b01802fa6a9209f530661293
```

| Mode | LastWriteTime | Length | Name |
|-------|---------------------|--------|-----------------|
| ---- | ----- | ----- | ----- |
| d---- | 10/9/2018 8:41 PM | | Files |
| d---- | 10/9/2018 8:41 PM | | Hives |
| -a--- | 10/16/2018 12:18 PM | 429 | layerchain.json |

```
PS C:\> ls "C:\ProgramData\docker\windowsfilter\04f084cfcd981103e0efc7da2b8c341913d63f36ebcaa537e9cae2899912bdad\"
```

```
Directory: C:\ProgramData\docker\windowsfilter\04f084cfcd981103e0efc7da2b8c341913d63f36ebcaa537e9cae2899912bdad
```

| Mode | LastWriteTime | Length | Name |
|-------|--------------------|----------|-----------------|
| ---- | ----- | ----- | ----- |
| d---- | 4/12/2018 10:29 AM | | Files |
| d---- | 9/13/2018 4:58 PM | | Hives |
| d---- | 9/13/2018 4:58 PM | | UtilityVM |
| -a--- | 9/13/2018 4:58 PM | 16384 | bcd.bak |
| -a--- | 9/13/2018 4:58 PM | 16384 | bcd.log.bak |
| -a--- | 9/13/2018 4:58 PM | 0 | bcd.log1.bak |
| -a--- | 9/13/2018 4:58 PM | 0 | bcd.log2.bak |
| -a--- | 9/13/2018 4:58 PM | 41943040 | blank-base.vhdx |
| -a--- | 9/13/2018 4:58 PM | 4194304 | blank.vhdx |
| -a--- | 9/13/2018 4:58 PM | 4 | layerchain.json |
| -a--- | 9/13/2018 4:58 PM | 15 | layout |

容器的运行



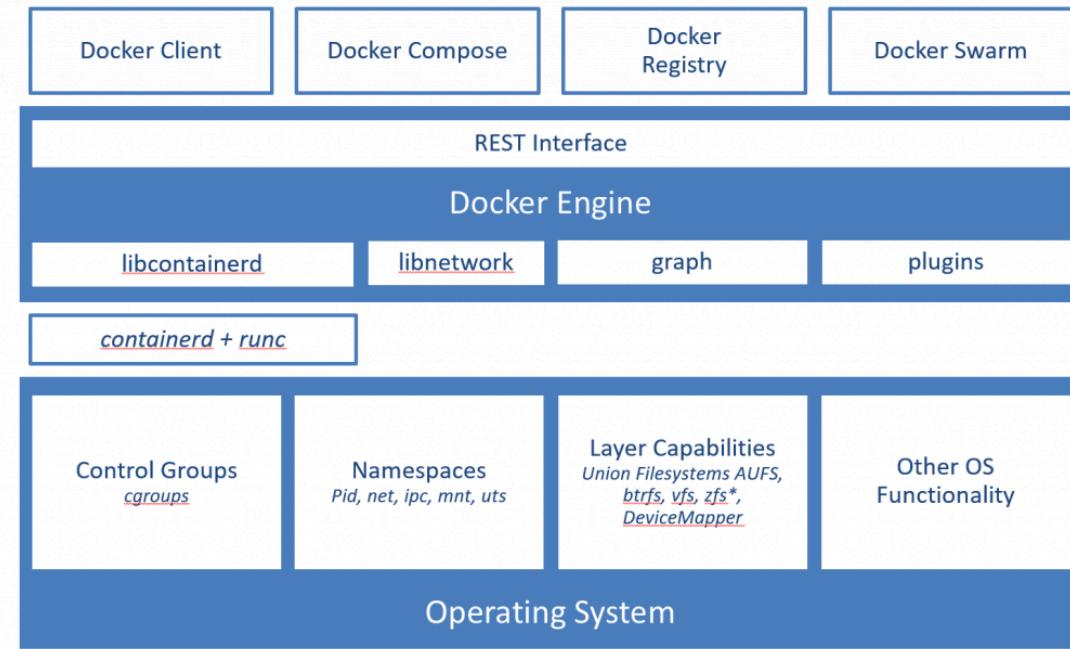
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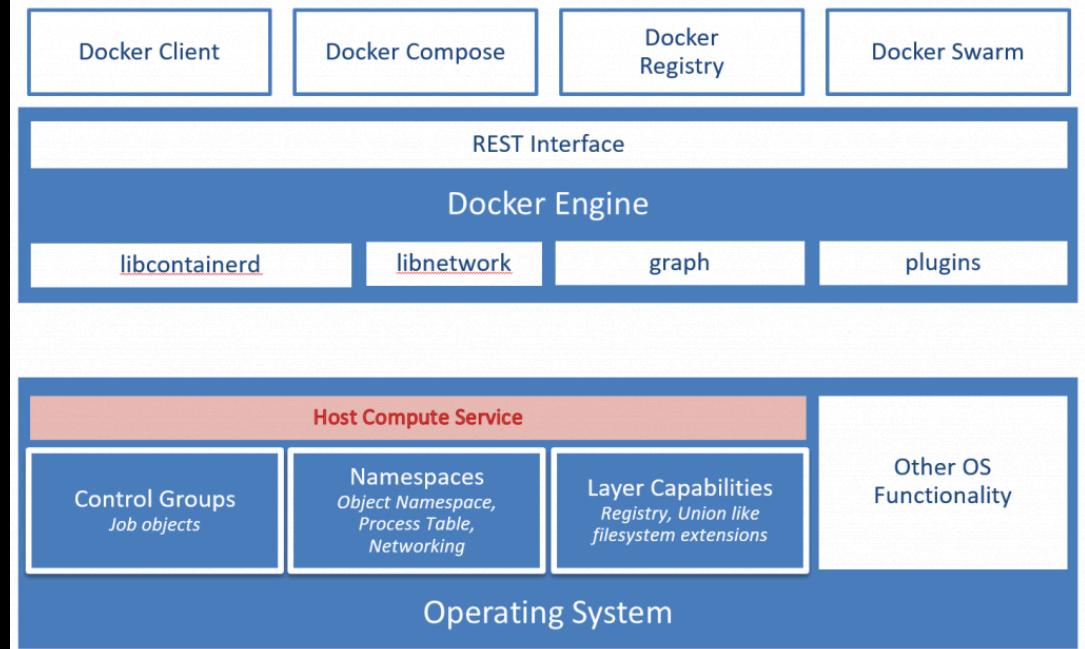
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Architecture In Linux



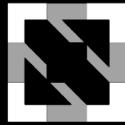
Architecture In Windows



隔离模型



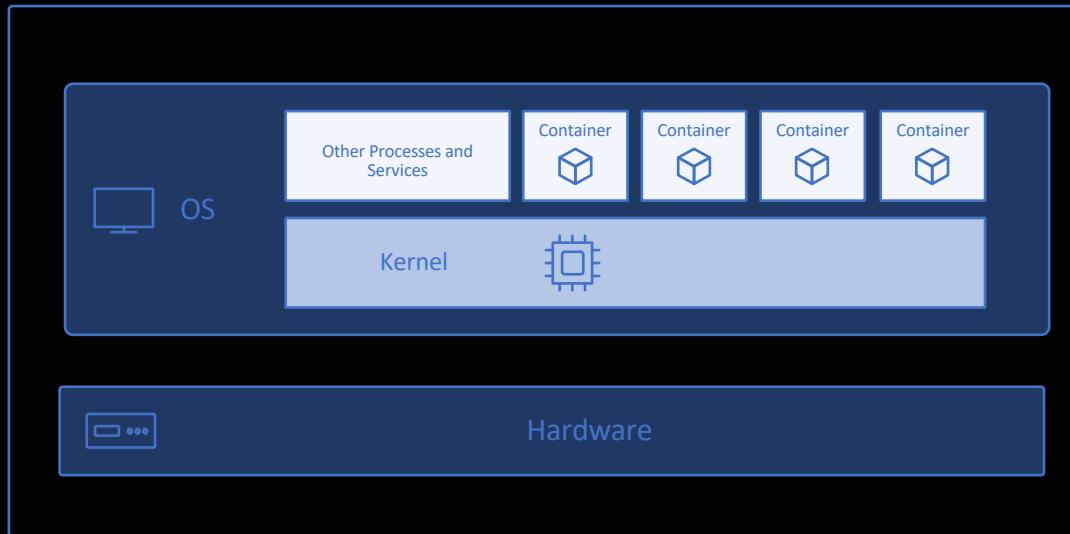
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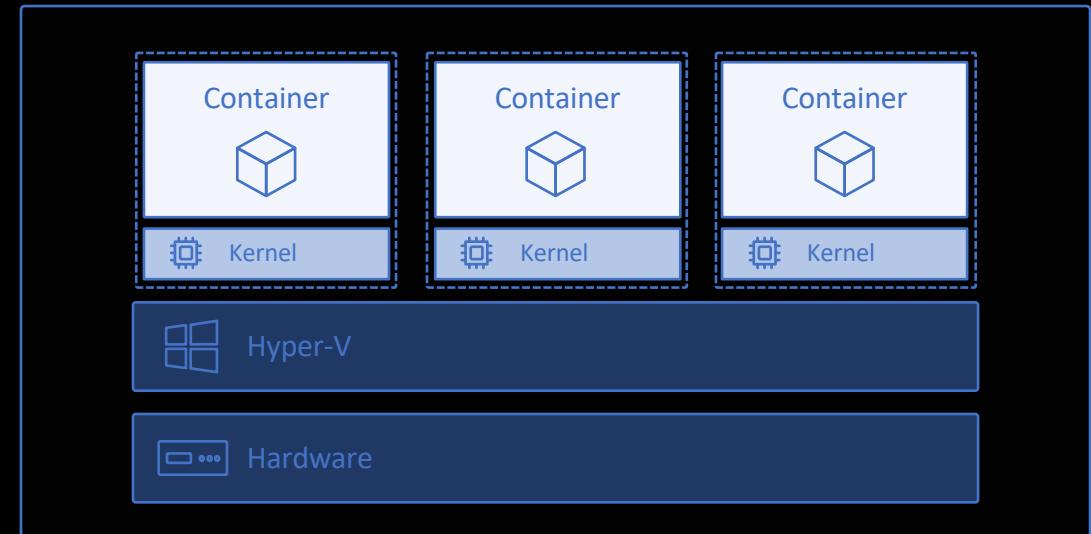
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进程隔离: 共享内核



Hyper-V 隔离: 独立内核



Window Server 版本



KubeCon



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Windows Server 2016

Initial launch of containers

Process and Hyper-V isolation

Docker EE Basic Included at no additional cost

Windows Server 1709

Optimized container images for Nano Server and Server Core

Platform level support for Linux containers

Windows Subsystem for Linux

Networking enhancements for overlays and SDN

Windows Server 1803

Optimized Server Core image

App compat improvements

Native command line tools – curl.exe, tar.exe and SSH

Enhancements to the Windows Subsystem for Linux

Networking enhancements for greater density and quicker endpoint creation

Improved network security with Calico Open source storage plugins for Kubernetes

Platform functionality required for Kubernetes conformance

Windows Server 2019

Optimized Server Core image

App compat improvements

Enhanced Group Managed Service Account support

Platform functionality for Kubernetes and Microsoft Service Fabric

Performance and density improvements

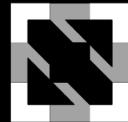
Platform and open source work on CNI networking plugins such as Calico and Flannel

Enhancements to the Windows Subsystem for Linux

版本兼容性



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| Container Version | Host OS Version | | | |
|---------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| | Windows Server 2016 Builds: 14393 | Windows Server 1709 Builds 16299 | Windows Server 1803 Builds 17134 | Windows Server 2019 Builds 17763 |
| Windows Server 2016 | Both Hyper-V and Process Isolation | Hyper-V Isolation only | Hyper-V Isolation only | Hyper-V Isolation only |
| Windows Server 1709 | Not supported | Both Hyper-V and Process Isolation | Hyper-V Isolation only | Hyper-V Isolation only |
| Windows Server 1803 | Not supported | Not supported | Both Hyper-V and Process Isolation | Hyper-V Isolation only |
| Windows Server 1809 | Not supported | Not supported | Not supported | Both Hyper-V and Process Isolation |



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CloudNativeCon

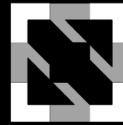
China 2018

2. Windows Server 上的 Kubernetes

容器的挑战



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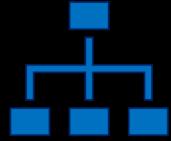


CloudNativeCon

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调度编排



服务发现



负载均衡



监控告警

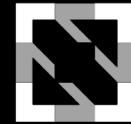


故障恢复

为什么要用Kubernetes



KubeCon



CloudNativeCon

China 2018

The Production-Grade
Container Orchestration



Portable

Public, private, hybrid, multi-
cloud

Extensible

Modular, pluggable,
hookable, composable

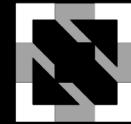
Self-healing

Auto-placement, auto-restart, auto-
replication, auto-scaling

Kubernetes 101

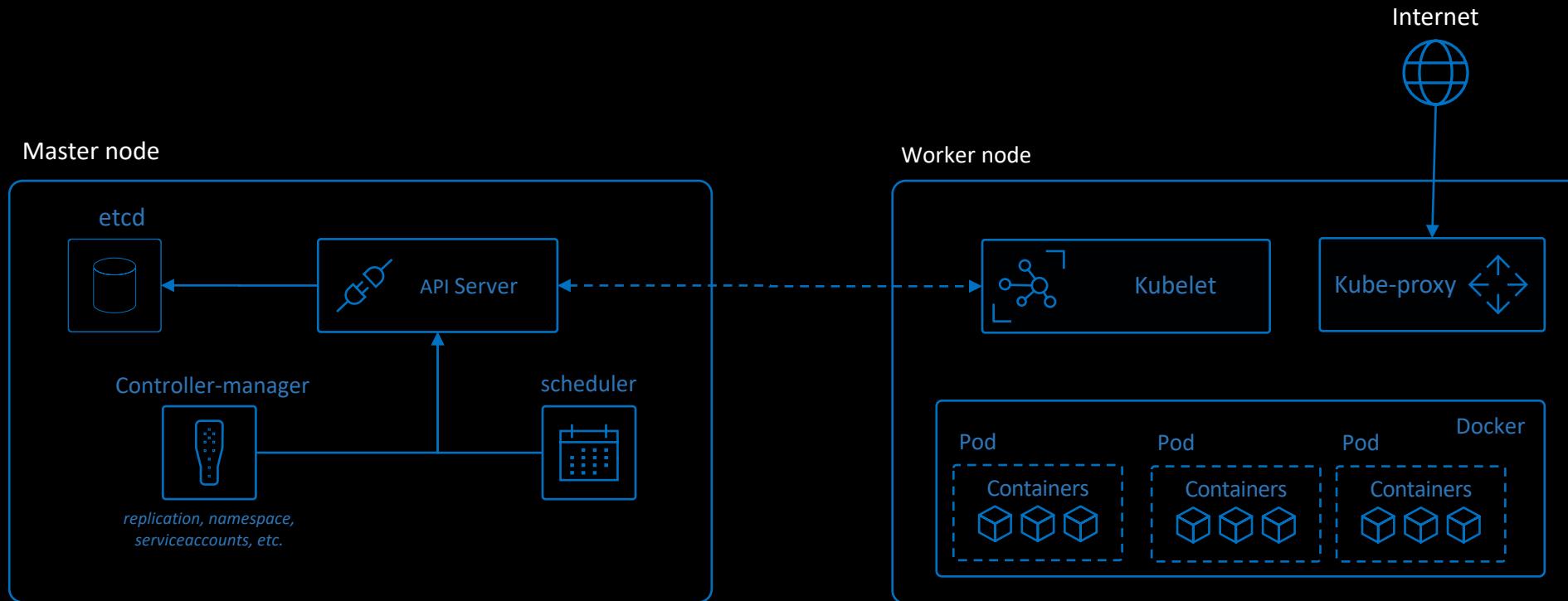


KubeCon



CloudNativeCon

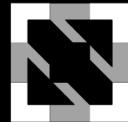
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Kubernetes+Windows 发展历程

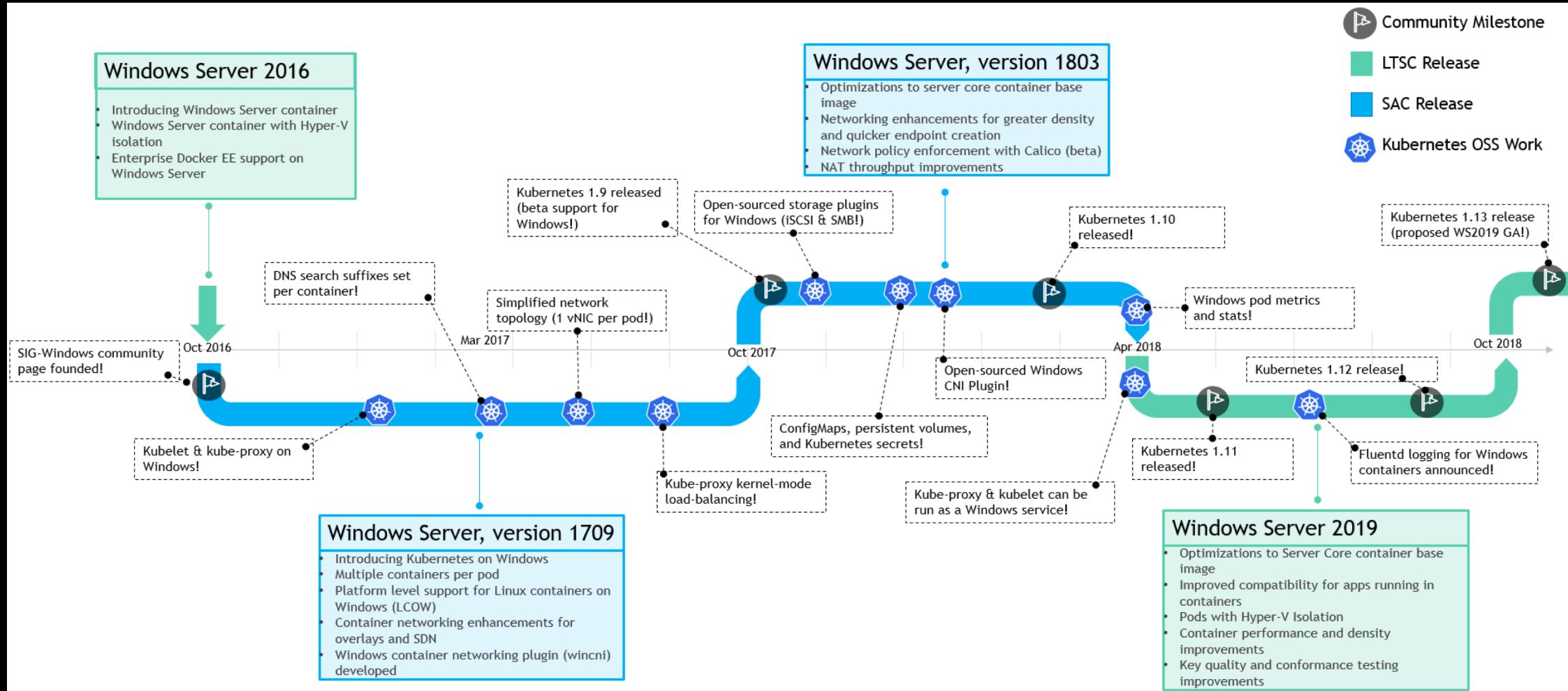


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核型特性



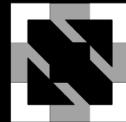
Alpha: v1.5
Beta: v1.9
GA: ETA v1.13



支持共享相同命名空间的
多容器 Pod



KubeCon



CloudNativeCon

China 2018



容器运行时接口 (CRI)
容器网络插件 (CNI)

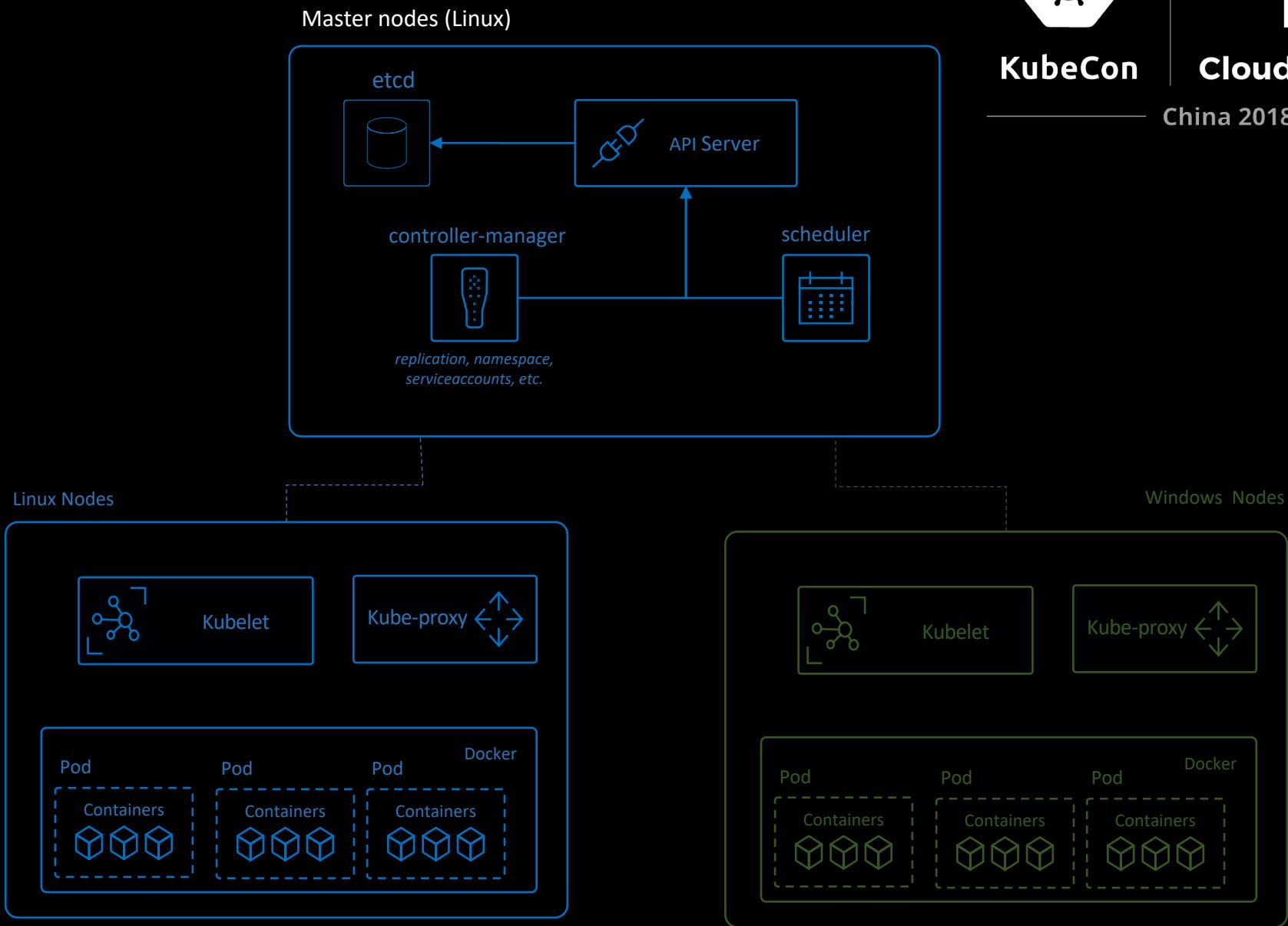


可使用 kubeadm 添加
Windows Server 节点



支持进程隔离和 Hyper-V
隔离

集群



KubeCon



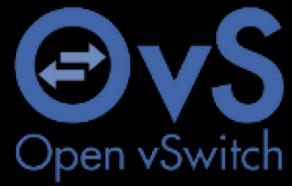
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网络插件



Azure CNI



ovn-kubernetes

wincni

win-bridge
win-overlay

flannel

overlay
l2bridge



Calico
(Policy Only)

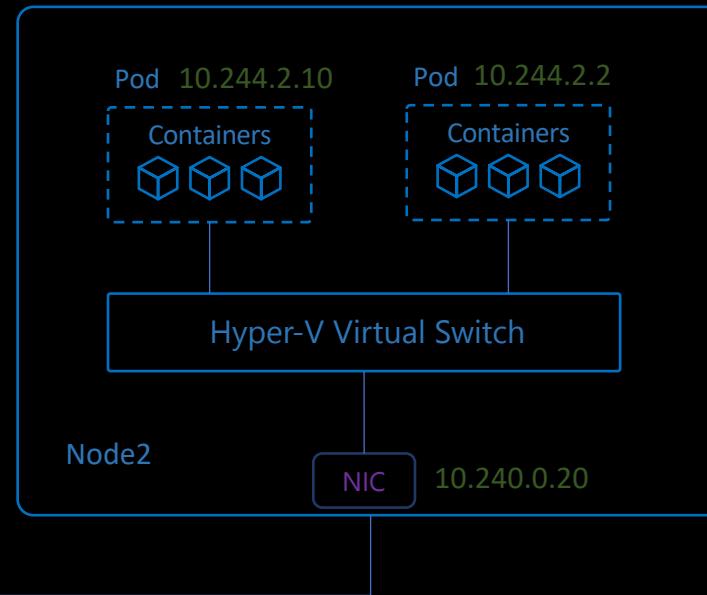
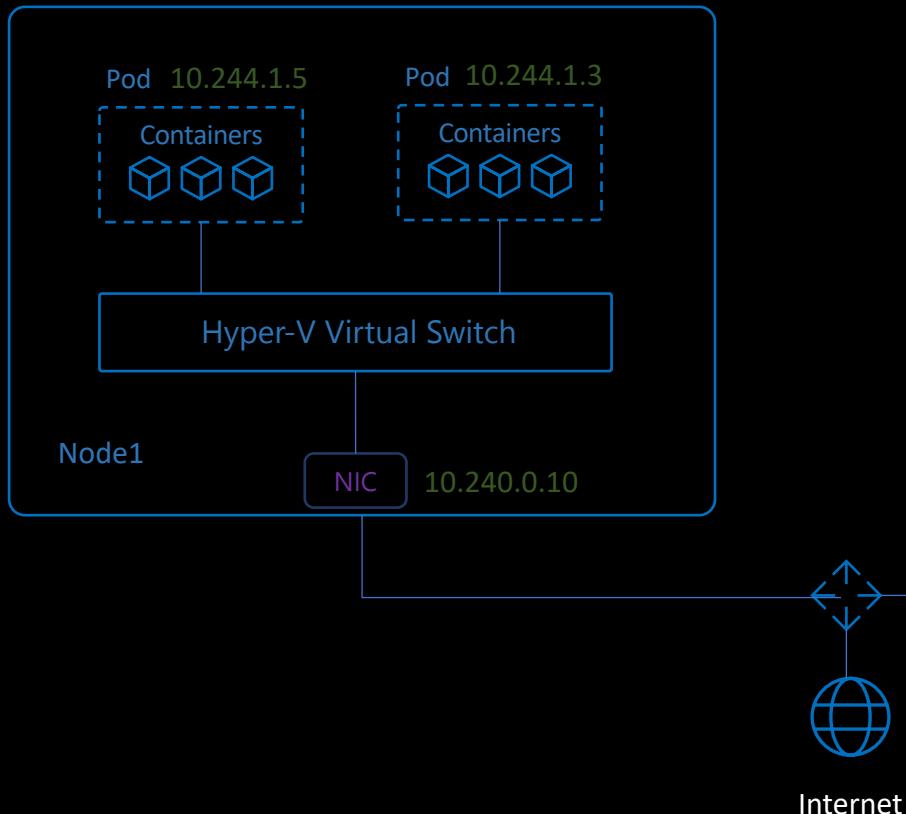


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CloudNativeCon

China 2018

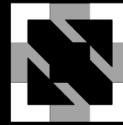


| Prefix | Next Hop |
|---------------|-------------|
| 10.244.1.0/24 | 10.240.0.10 |
| 10.244.2.0/24 | 10.240.0.20 |

存储卷



KubeCon



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In-tree volume

AzureDisk, AzureFile

HostPath, ...



Flex volume

KeyVault, blobfuse, SMB



CSI

Working In Process

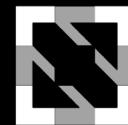
Pod示例

```
apiVersion: v1
kind: Pod
metadata:
  name: iis
  labels:
    name: iis
spec:
  containers:
    - name: iis
      image: microsoft/iis:windowsservercore-1709
      ports:
        - containerPort: 80
nodeSelector:
  "beta.kubernetes.io/os": windows
```

```
apiVersion: apps/v1
kind: DaemonSet
metadata:
  name: my-daemonset
  labels:
    app: foo
spec:
  selector:
    matchLabels:
      app: foo
  template:
    metadata:
      labels:
        app: foo
    spec:
      containers:
        - name: foo
          image: microsoft/windowsservercore:1709
nodeSelector:
  beta.kubernetes.io/os: windows
```



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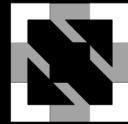
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已知问题



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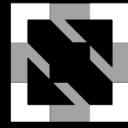
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China 2018

- 仅在 Windows Server 1709 或者以后版本的进程隔离模式才支持多容器 Pod
- Windows 容器的操作系统版本需要跟 Host 的操作系统版本匹配
- 通过网络插件为容器配置 DNS (而不是 resolv 文件)
- 仅支持有限的存储插件
- 不支持 Weave Net 和 Calico 网络插件
- 不支持本地网络策略 (Local traffic policy)



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CloudNativeCon

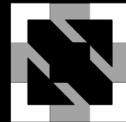
China 2018

3. 未来展望

预计 v1.13 GA



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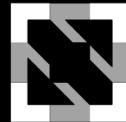
China 2018

- 支持 Windows Server 2019
- 更多的 Flex 存储卷: SMB, iSCSI
- 支持 Hyper-V 隔离的多容器 Pod
- 测试版的 Containerd 集成
- 集成测试完善，如 conformance tests 和 node e2e tests

未来工作



KubeCon



CloudNativeCon

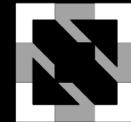
China 2018

- Windows Server 中的 Linux 容器
- Containerd 默认容器运行时
- 更多的存储卷: flexvolume, CSI
- 特权模式的 DaemonSet

参考文档



KubeCon



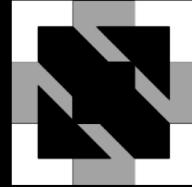
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- <https://docs.microsoft.com/en-us/virtualization/windowscontainers/kubernetes/getting-started-kubernetes-windows>
- <https://kubernetes.io/docs/getting-started-guides/windows/>
- <https://blogs.technet.microsoft.com/networking/2018/09/19/ws2019-kubernetes/>
- <https://www.youtube.com/watch?v=j2B7cLdTXMw>
- <https://github.com/Microsoft/SDN/tree/master/Kubernetes>
- <https://trello.com/b/rjTqrwjI/windows-k8s-roadmap>



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CloudNativeCon

China 2018

Thanks & QA