

Hyper-V ???IOPS??????

????? iostat -x ?????????? ?????? Hyper-V ?? ????

? ??iostat ????????????

????????????????

??	??	??
w/s	4300 460 /s	??? QPS???
wkB/s	4300 5900 KB/s ≈4-6 MB/s	?????
svctm	2.0 2.3 ms	?? IO ??????
await	2.3 2.8 ms	IO ??????
%util	90% 99%	??????????
aqu-sz	1.0 1.2	??????
wrqm/s	500 580	?????? → ?? 50%

? ??????????????????????????????????????

Hyper-V ??????????????????

???

- ?? SSD ?????????? IOPS NVMe???? 5k-10k IOPS SATA SSD
???????? ~450 IO/s?? ???? ?????????? ?
- util ?? 90% 99% → ?? ?????????????????? ?
- Hyper-V ?????????? ?????????? QoS ?????????????????? ?

□□□□□□

```
Get-VM | Get-VMHardDiskDrive | Get-StorageQoSFlow
```

□□□ I/O Read/Write Limit□□ 500 IOPS□□□□□□□□

□□□□

```
Set-VMHardDiskDrive -VMName "YourVM" -ControllerType SCSI -QoSPolicyID $null
```

? ?? 2????????? VHDX?Fixed VHDX?

□□□□□□□□ **VHDX**□ Dynamic□□□□□□ IOPS

□□ VHD □□□

```
Get-VHD -Path "D:\VM\xxx.vhdx"
```

□□□ **Dynamic** → □□□

□□□ **Fixed**□

```
Convert-VHD -Path "xxx.vhdx" -DestinationPath "xxx-fixed.vhdx" -VHDType Fixed
```

? ?? 3???? NVMe ????????????????

Hyper-V □□ "PCIe Pass-through□ DDA□ "□□□□ NVMe □□□□

□□ = □□□□ × 100%

? ?? 4?????????????????

```
Set-VMHardDiskDrive -VMName VMName -DiskNumber X -SupportPersistentReservations $True
```

■■■■■■■■■■

■■■■ → ■■ → ■■
✓ ■■ ■■■■

? ?? 5???? SCSI ?????? IDE

Hyper-V ■■■

- IDE■■■■■■■■■■
- SCSI■■■■■■■■■■■■■■■■■■■■

? ?? 6?????????????

■ VM ■■

```
echo 1024 | sudo tee /sys/block/sdb/queue/nr_requests
```

? ?? 7??? VHD ????? NVMe ? RAID10 ?

■■ VHD ■ SATA ■■ NAS ■ → ■■■■

? ????? Hyper-V ??????????????

■■■

```
fio --name=readtest --filename=/dev/sdb --rw=randread --bs=4k --iodepth=64 --numjobs=4 --  
runtime=10 --ioengine=libaio --direct=1
```

■■ IOPS < 50k ■ NVMe■■ < 8k ■ SATA SSD ■ → ■■■■■■■■

? ??? VHDX ?????? ?? ????????? / ?? 3~10 ? IOPS?

? ????? VHDX ??????

- [] VHDX []
[] → [] → []
[] Hyper-V []
- [] = [] = IO []

? ?????

```
# [ ] VHDX [ ]  
Convert-VHD -Path "D:\hyperv\rulr-7-mysqldb-sys\disk.vhdx" -DestinationPath "D:\hyperv\rulr-7-  
mysqldb-sys\disk_fixed.vhdx" -VHDType Fixed
```

[]

????????????

1. []
2. Hyper-V [] → [] → []
3. [] "[] " → [] fixed.vhdx
4. []

? ????? Windows ?????Defender ?? VHDX ?????????? IOPS 1?3 ??

Defender []

- [] VHDX []
- IOPS [] 50~80%[]

NUMA = 30 200

Hyper-V ???

Hyper-V → → →

“ NUMA ”

? I/O Scheduler?

Ubuntu / Debian?

scheduler **mq-deadline** OK

IOPS

? scheduler?

```
cat /sys/block/sda/queue/scheduler
```

? none ?

```
echo none | sudo tee /sys/block/sda/queue/scheduler
```

```
sudo nano /etc/default/grub
```

```
GRUB_CMDLINE_LINUX_DEFAULT="scsi_mod.use_blk_mq=1 elevator=none"
```

```
sudo update-grub
```

? ?????????? IOPS? fio ??????

????? IOPS ? ?

? ????? IOPS

```
fio --name=randread --ioengine=libaio --rw=randread --bs=4k --numjobs=4 --iodepth=32 \
--size=1G --runtime=30 --direct=1 --time_based --filename=/testfile
```

? ??? IOPS

```
fio --name=randwrite --ioengine=libaio --rw=randwrite --bs=4k --numjobs=4 --iodepth=32 \
--size=1G --runtime=30 --direct=1 --time_based --filename=/testfile
```

? ??????????????

```
fio --name=mix --ioengine=libaio --rw=randrw --rwmixread=70 \
--bs=4k --numjobs=4 --iodepth=32 --size=1G --runtime=30 --direct=1 \
--time_based --filename=/testfile
```

?????

- --direct=1 ???? ?
- iodepth=32 Hyper-V ? ?
- numjobs=4 ? ? CPU core ???? ?

? ????? Hyper-V ? Host Cache

??? IOPS ???

?? → ? → ? “? I/O ? ”
? IOPS ???????

? ???? IOPS??? HDD/SSD ???

配置	標準 VHDX	標準 VHDX 最適化
RAID1 HDD	150~300 IOPS	500~1200 IOPS
RAID5 HDD	50~200 IOPS	400~900 IOPS
SSD RAID10	10k~20k	30k~60k+

RAID1 / RAID5 3 6

????????????

✓ CPU NUMA

✓

✓ VHDX

✓ Hyper-V

PowerShell + Linux

1. Get-VMHostNumaNode
2. Get-VM | fl Name,ProcessorCount,MemoryAssigned
3. Get-VHD -Path *vhd*
4. RAID RAID

Hyper-V

Revision #2

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