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THP(Transparent Huge Pages)

: http://www.cubrid.com/zbxe/bbs_developer_faq/3550332

THP(Transparent Huge Pages) ?

THP

CPU Virtual address MMU가 Physical address
 Virtual address Physical address
 Page table TTB (Translation Table Base Address)

CPU가 TTB 가 가 Virtual
 address Physical address 가 Entry 가 가 TLB
 Physical address 가
 (Translation Lookaside Buffer)

CPU가 Virtual Address TLB Virtual Address Entry
 가 (hit) 가
 (miss) TTB(Translation Table Base Address) 1 Physical address
 Physical address 가

hit ratio가 miss 2 가 가
 . (, hit ratio가 TLB 가 .)

hit ratio가 TLB Entry ,
 page page table 가 TLB Entry가 . Entry
 page THP

THP 4KB 2MB 1GB
 RHEL 6

THP 가 disable

THP

•

```
[root@host]# cat /sys/kernel/mm/transparent_hugepage/enabled
```

```
[always] madvise never -> [always] 가 THP가
always madvise [never] -> [never] 가 THP가
```

•

```
[root@host]# cat /proc/meminfo
```

가 .

```
MemTotal: 1003184 kB
MemFree: 604844 kB
MemAvailable: 750616 kB
Buffers: 884 kB
Cached: 143904 kB
SwapCached: 0 kB
Active: 160624 kB
Inactive: 112368 kB
Active(anon): 128912 kB
Inactive(anon): 6356 kB
Active(file): 31712 kB
Inactive(file): 106012 kB
Unevictable: 0 kB
Mlocked: 0 kB
SwapTotal: 2097148 kB
SwapFree: 2097148 kB
Dirty: 92 kB
Writeback: 0 kB
AnonPages: 128300 kB
Mapped: 37492 kB
Shmem: 7064 kB
Slab: 60876 kB
SReclaimable: 23024 kB
SUnreclaim: 37852 kB
KernelStack: 8480 kB
PageTables: 6220 kB
NFS_Unstable: 0 kB
Bounce: 0 kB
WritebackTmp: 0 kB
CommitLimit: 2598740 kB
Committed_AS: 494544 kB
VmallocTotal: 34359738367 kB
VmallocUsed: 185924 kB
VmallocChunk: 34359535100 kB
HardwareCorrupted: 0 kB
```

```

AnonHugePages:      0 kB
HugePages_Total:    0
HugePages_Free:     0
HugePages_Rsvd:     0
HugePages_Surp:     0
Hugepagesize:       2048 kB
DirectMap4k:        61312 kB
DirectMap2M:        987136 kB
DirectMap1G:        0 kB

```

0 THP가

```

AnonHugePages:      0 kB
HugePages_Total:    0
HugePages_Free:     0
HugePages_Rsvd:     0
HugePages_Surp:     0

```

```

Linux
가 AnonHugePages
가 0
THP
THP disable
[never]
AnonHugePages
가

```

THP (in RHEL7)

```

RHEL 7
THP
THP tuned
2가
가

```

Step 1: Initially, we should create a customized version of the currently running profile. The customized version will disable THP. Find out which profile is active, create a copy. In the following example we currently use the throughput-performance profile:

- tuned profile active
- active tuned profile

```
[root@host]# tuned-adm active
```

```

OS가 가 virtual-guest,
throughput-performance

```

```
Current active profile: throughput-performance // in Server default configuration
```

```
Current active profile: virtual-guest // in Virtual OS
```

가) /etc/tuned . (

```
[root@host]# mkdir /etc/tuned/cubrid
```

tuned.conf

```
[root@host]# vi /etc/tuned/cubrid/tuned.conf
```

```
[main]
include= throughput-performance
[vm]
transparent_hugepages=never
```

```
[root@host]# chmod +x /etc/tuned/cubrid/tuned.conf
```

```
[root@host]# tuned-adm profile cubrid
```

• 가

/etc/sysconfig/grub transparent_hugepage=never 가 .

```
GRUB_TIMEOUT=5
GRUB_DEFAULT=saved
GRUB_DISABLE_SUBMENU=true
GRUB_TERMINAL_OUTPUT="console"
GRUB_CMDLINE_LINUX="rd.lvm.lv=centos/root rd.lvm.lv=centos/swap
crashkernel=auto rhgb quiet transparent_hugepage=never"
GRUB_DISABLE_RECOVERY="true"

/* GRUB_CMDLINE_LINUX transparent_hugepage=never 가 */
```

grub2-mkconfig grub.cfg .

```
[root@host]# grub2-mkconfig -o /boot/grub2/grub.cfg
```

가

```
[root@host]# reboot
```

```
[root@host]# cat /proc/cmdline
BOOT_IMAGE=/vmlinuz-3.10.0-229.20.1.el7.x86_64 root=/dev/mapper/centos-root
ro rd.lvm.lv=centos/root rd.lvm.lv=centos/swap crashkernel=auto rhgb quiet
transparent_hugepage=never
```

- <http://lunatine.net/thp-and-page-allocation-error/>
- <http://bloodguy.tistory.com/entry/Linux-%EC%8B%9C%EC%8A%A4%ED%85%9C%ED%94%84%EB%A1%9C%EC%84%B8%EC%8A%A4-%EB%A9%94%EB%AA%A8%EB%A6%AC-%EC%82%AC%EC%9A%A9%EB%9F%89-%ED%99%95%EC%9D%B8-check-systemprocess-memory-usage>

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