

- THP(Transparent Huge Pages)** 3
- THP(Transparent Huge Pages)*** ? 3
- THP*** 3
- THP (in RHEL7)*** 5
- tuned Profile 5
- 가 6
- 7

THP(Transparent Huge Pages)

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

THP(Transparent Huge Pages) ?

THP

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

CPU가 TTB 가 가 Virtual
 address Physical address 가 Entry 가 가 TLB
 (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 0 AnonHugePages
THP disable
[never]
AnonHugePages
가

```

THP (in RHEL7)

```

RHEL 7 THP
THP tuned 2가 가

```

tuned Profile

```

tuned profile active
tuned profile active

```

```
[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

```

/etc/tuned . (

cubrid 가)

```
[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
```

- <https://access.redhat.com/solutions/1578873>
- <https://lunatime.net/2014/10/29/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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