

# (SSD):

- SSD
- SSD
- TRIM
  - LVM
  - dm-crypt
- noatime
- SSD
  - TRIM (DRAT/DZAT)
  - TRIM
  - ATA- Secure Erase, Enhanced Erase

**i** :

- Astra Linux Special Edition .10015-01 ( 1.7)
- Astra Linux Special Edition .10152-02 ( 4.7)
- Astra Linux Special Edition .10015-01 ( 1.6)
- Astra Linux Special Edition .10015-16 . 1 . 2
- Astra Linux Special Edition .10015-01 ( 1.5) ()
- Astra Linux Special Edition .10265-01 ( 8.1)
- Astra Linux Common Edition 2.12

**!** , ( ) , , , ( ), .

(SSD-) ,.. 2019- . , , , , , , .

SSD- .  
Log- — SSD.

- , TRIM;
- SSD, SSD-, , , ;

## SSD

**i** SSD- FTL (Flash Translation Layer), , . SSD, . FTL , , , , , .  
SSD- .

- Ext{2,3,4} - . , .  
- (Ext2) Ext3/Ext4.  
, ( TRIM) Ext4.

**i** , Ext4 , Ext4 Astra Linux SE;  
« ( ) Ext2/Ext3/Ext4, (..) () »  
« , 1 » .10015-01 97 01-1, 2020., . 17.3.1 « »

- BTRFS - , Astra Linux Astra Linux Special Edition .10015-01 ( 1.5). SSD-, (, TRIM);, BTRFS , SSD, BTRFS SSD, (ssd, nossd, ssd\_spread) ,, BTRFS:

**i** ...  
SSD , , .  
...  
, , , SSD .  
...

Astra Linux SE BTRFS , Astra Linux.

- F2FS (Flash-Friendly File System) - , SSD-.  
Astra Linux SE F2FS .  
F2FS F2FS (Flash-Friendly File System).

**i** Ext{3,4} ( ):  
• , ;  
• :  

```
sudo
fsck -f
/dev
/sdf1
```

  
• :  


```
sudo
tune2fs
-O
^has_jou
rnal
/dev
/sdf1
```

  
• ;

## SSD


FTL , .  
SSD-, 75% . , FTL .  
, SSD- , , 120 128 , 8 .

## TRIM

 TRIM - ATA-, SSD-,  
, TRIM (, SSD), TRIM SSD, . , FTL , .

, TRIM hdparm (, ):

```
sudo apt install hdparm  
sudo hdparm -I /dev/sdf | grep TRIM
```

 TRIM ( ), offline ( , TRIM ).


Linux:

- TRIM Ext4, BTRFS, FAT, GFS2, JFS, XFS;
- offline TRIM Ext3, NILFS2, OCFS2.

TRIM NTFS Windows.

TRIM .

1. discard . TRIM ,.. SSD- . , . ( TRIM ).
2. fstrim.service/fstrim.timer

 Astra Linux Special Edition .10015-01 ( 1.5)

fstrim.service/fstrim.timer util-linux, .  
, , . :

- a. Astra Linux Special Edition .10015-01 1.6 , /usr/share/doc/util-linux/examples/ /etc/systemd/system:

```
sudo cp /usr/share/doc/util-linux/examples/fstrim.service /etc  
/systemd/system  
sudo cp /usr/share/doc/util-linux/examples/fstrim.timer /etc  
/systemd/system
```

Astra Linux Special Edition x.7 ;


- b. :

```
sudo systemctl enable fstrim.timer
```


( ) , ( -a.. ) TRIM , :

```
fstrim -av
```

### 3. fstrim cron

 Astra Linux Special Edition .10015-01 ( 1.5)

, /etc/crontab ( fstrim -av 10 ):


 # m h dom mon dow user command  
0 10 \* \* \* 1 root fstrim -av


## LVM

TRIM LVM issue\_discards 0 1 /etc/lvm/lvm.conf.  
TRIM ( ), ( lvremove, lvreduce ..).  
( lvm.conf (5) / /etc/lvm/lvm.conf). , -, , «» TRIM ( ).

## dm-crypt

TRIM dm-crypt discard /etc/crypttab, :

 # <target name> <source device> <key file> <options>  
sda2\_crypt /dev/sda2 none luks,discard

 TRIM dm-crypt , , .


## noatime

SSD- noatime, .  
, , , .

## SSD

∴ Astra Linux.

, SSD- FTL, .  
"" ( ), .  
,

 ( Astra Linux Special Edition ( **secdel secdelrnd**) SSD- , SSD-

 Astra Linux SE , ( ), ( , , .) . , , .

. ext4

, , , , , , , TRIM , , fstrim , ( ) , ... TRIM .

## TRIM (DRAT/DZAT)

, TRIM, Deterministic read data after TRIM (DRAT), ( - Deterministic read zero after TRIM (DZAT)). , DRAT , , , SSD- , ,  
"" , TRIM. , , , .

DRAT/DZAT hdparm:

```
$ sudo hdparm -I /dev/sdh | grep TRIM
* Data Set Management TRIM supported (limit 1 block)
* Deterministic read data after TRIM
```

## TRIM

```
Linux- SSD- Ext4 TRIM , , .
.. Ext4(, ).
, TRIM ( ,.. ) blkdiscard.
/dev/sdf1:
```

```
sudo blkdiscard /dev/sdf1
```

## ATA- Secure Erase, Enhanced Erase

```
ATA- Secure erase/Enhanced erase, ATA (Secure erase) (Enhanced erase) .
, SSD- TRIM ( )..
, , .
```

```
i , hdparm -l :
```

```
i ....
supported: enhanced erase
120min for SECURITY ERASE UNIT. 120min for ENHANCED SECURITY ERASE UNIT.
...
```

```
.. , , , .
```

```
.. , , .
```

```
, USB-.
```

```
.
```

[Coding for SSDs](#)

[Critical Role of Firmware and FTL in SSD Design](#)