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Description of NAT statistics

The output of statistics in `fastdpi_stat.log` is set by `dbg_log_mask`.

0x40000 - output of NAT initialization details (profiles, public addresses, etc.) to the alert log

0x100000 - output of statistics by blocks of public addresses (if 0x2000000 is set)

0x2000000 - NAT statistics output.

Example:

`dbg_log_mask=0x2000000`

Common for all profiles

```
[STAT    ][2021/12/22-17:33:17:513859] NAT statistics : itrns1=0, iprof=2,
profile 'cgnat', nttype=0, ref_cnt=1, cidr=94.140.198.84/30
[STAT    ][2021/12/22-17:33:17:513869] NAT statistics : itrns1=1, iprof=3,
profile 'nat1_1', nttype=1, ref_cnt=1, cidr=16.35.121.0/24

itrns1  - internal index of the private<-->public proile converter.
iprof   - internal index of the profile
profile - profile name
nttype  - profile type (0 - cgnat, 1 - 1:1)
ref_cnt - counter of references of converter usage by profiles
(Profiles can use one set of CIDR, but different number of restrictions
per session)
cidr    - list of profile's public addresses CIDR
```

CG-NAT Profile

```
[STAT    ][2021/12/22-17:33:19:252622] NAT statistics : itrns1=0, iprof=2,
profile 'cgnat', nttype=0, ref_cnt=1, cidr=94.140.198.84/30
k=0, itrnsld=0, cidr=94.140.198.84/30
    total TCP : 30/20/0/7/17/ 0/0/0 50/20/0/50/0 5516/8/121
    actual TCP : 0/0/0/0/0 0/0/0 0/0/0/0/0 0/0/0
    total UDP : 13/4/0/13/1/ 0/0/0 17/4/11/17/0 28/1/3
    actual UDP : 0/0/0/0/0 0/0/0 0/0/0/0/0 0/0/0
    total GRE : 0/0
```

Information on the data converter

```
    k=0, itrnsld=0, cidr=94.140.198.84/30
k      - itrnsld number
itrnsld - internal converter data index - the one serving the CIDR
cidr    - exact cidr
```

```
total    - total statistics
actual   - статистика изменений счетчиков за период вывода статистики
(delta_alarm parameter, 15 seconds by default)
```

```
total  TCP : 30/20/0/7/17 0/0/0 50/20/0/50/0 5516/8/121
```

Four groups группы:

1 group -- operations with public address ports

30/20/0/7/17:

```
30 - allocation of a new public port
20 - public port reuse
0  - errors of allocating a new public port
7  - performs decrement of number of subscriber sessions on flow releasing
17 - performs decrement of the number of subscriber sessions on public port reuse
```

2 group -- general statistics

0/0/0:

```
0 - calculated CRC by IP when accessed to allocate a public address. Should be == 0
0 - excessive number of sessions for subscribers
0 - different public addresses in flow and converters - Should be == 0
```

3 group -- cache statistics *private* → *public*

50/20/0/50/0:

```
50 - added records to cache
20 - deleted records from cache
0  - found records in cache when new public port is allocated
50 - no public address found for private
0  - errors of adding to cache
```

4 group -- conversion statistics *public* → *private* (*inet* → *subs*)

5516/8/121:

```
5516 - successful translation public --> private
8     - port is not in the allocated range of public ports
121  - translation public --> private was not found
```

For TCP/UDP and total/actual statistics are the same.

For GRE – it is GRE by default (when session is not found in PPTP). Only one such session can be created per public address.

```
total GRE : 0/0
0 - address used
0 - number of attempts to create sessions on an already allocated public
address
```

1:1 Profile

```
[STAT    ][2021/12/22-17:17:28:749622] NAT statistics : itrns1=1, iprof=3,
profile 'nat1_1', nttype=1, ref_cnt=1, cidr=16.35.121.0/24
      k=0, itrnsld=1, cidr=16.35.121.0/24
      total 256/256/0/0/0/0 0/0
```

Group 2 statistics:

1 group - 256/256/0/0/0/0

2 group - 0/0

Example:

dbg_log_mask=0x2100000

Output of public addresses statistics

```
[STAT    ][2021/12/22-21:14:48:385991] NAT statistics : itrns1=0, iprof=2,
profile 'cgat', nttype=0, ref_cnt=1, cidr=94.140.198.84/30
      k=0, itrnsld=0, cidr=94.140.198.84/30
      total TCP : 26/4/0/4/2/ 0/0/0 30/4/0/30/0 3045/1/36
      actual TCP : 0/0/0/0/0 0/0/0 0/0/0/0/0 0/0/0
      TCP whiteblk ip_mask=0x0, nwhaddr=2
      whip=94.140.198.84 : sb=64, lsb=64, nb=1008,
whpa=64512, whpb=0, whpf=64512, awhb=4, fwhb=1004, puwhb=0.40%
      thr=0, ublock=1, uport=0
      thr=1, ublock=1, uport=0
      thr=2, ublock=1, uport=0
      thr=3, ublock=1, uport=0
      whip=94.140.198.86 : sb=64, lsb=64, nb=1008,
whpa=64512, whpb=26, whpf=64486, awhb=4, fwhb=1004, puwhb=0.40%
      thr=0, ublock=1, uport=0
      thr=1, ublock=1, uport=0
      thr=2, ublock=1, uport=13
      thr=3, ublock=1, uport=13
```

TCP whiteblk ip_mask=0x0, nwhaddr=2 :

ip_mask - addresses mask

nwhaddr - the number of public addresses that are under the mask

```
whip=94.140.198.84 : sb=64 ( 64 ), nb=1008, whpa=64512, whpb=0, whpf=64512,
awhb=4, fwhb=1004, puwhb=0.40%
```

```
whip=94.140.198.84 - public address
sb=64             - port block size
lsb=64           - size of the last block
nb=1008          - number of port blocks
whpa=64512       - total ports
whpb=0           - ports occupied
whpf=64512       - free ports
awhb=4           - blocks issued
fwhb=1004        - free blocks
puwhb=0.40%      - percentage of blocks occupied
```

Added in version 12.1.0

```
whp_salfs - how many ports are in the 'short' queue
whp_lalfs - how many ports are in the 'long' queue
whp_ruse  - how many ports can be reused
whp_ruse_salfs - how many ports can be reused from the 'short' queue
whp_ruse_lalfs - how many ports can be reused from the 'long' queue
whp_dthr  - how many ports were created in one worker thread but used in
another thread
whp_dthr_salfs - how many ports were created in one worker thread but used
in another from the 'short' queue
whp_dthr_lalfs - how many ports were created in one worker thread but used
in another from the 'long' queue
```

Within the public address you can see the distribution of captured ports/blocks by worker threads

```
thr=0, ublock=1, uport=0
thr=0 - worker thread number
ublock=1 - public port blocks used
uport=0 - public port blocks used
```

```
thr_salfs - how many ports are in the 'short' queue
thr_lalfs - how many ports are in the 'long' queue
thr_ruse  - how many ports can be reused
thr_ruse_salfs - how many ports can be reused from the 'short' queue
thr_ruse_lalfs - how many ports can be reused from the 'long' queue
thr_dthr  - how many ports were created in one worker thread but used in
another thread
thr_dthr_salfs - how many ports were created in one worker thread but used
in another from the 'short' queue
thr_dthr_lalfs - how many ports were created in one worker thread but used
in another from 'long' queue
```

The output format is the same.

```
fdpi_ctrl list status --service 11 --ip 192.168.4.20
Autodetected fastdpi params : dev='em1', port=29001
connecting 94.140.198.68:29001 ...
```

```
=====
192.168.4.20      crcip=0xd649d853      ntttype=0      profile='cgnat'
itrnsl=0 itrnslld=0      whiteip=94.140.198.86      sess_tcp=127
sess_udp=108      indmtd=4
```

Output:

```
192.168.4.20      - private IP
crcip=0xd649d853  - CRC of the private IP
ntttype=0         - NAT type: 0 - cgnat, 1 - 1:1
profile='cgnat'   - profile name
itrnsl=0          - internal index of the converter private<-->public profile.
itrnslld=0        - internal converter data index
whiteip=94.140.198.86 - public address
sess_tcp=127      - number of TCP sessions
sess_udp=108      - number of UDP sessions
indmtd=4          - internal index of subscriber data (subscriber
metadata)

fdpi_ctrl list status --service 11 --ip 192.168.4.20 --outformat=json
fdpi_ctrl list status --service 11 --ip 192.168.4.20 --outformat=json | jq
.

fdpi_ctrl list all status --service 11
fdpi_ctrl list all status --service 11 --outformat=json
```

The format is the same.

Key to command to view NAT profile statistics via fdpi_ctrl

Command:

```
fdpi_ctrl list status --service 11 --profile.name cgnat
```

Output:

```
ntttype=0      profile='test_nat_cgnat'      itrnsl=0      nitrnslld=1
      itrnslld=0      cidr=94.140.198.84/30
      proto=TCP      ip_mask=0x0      nwhaddr=2
      proto=TCP      ip_mask=0x0      whip=94.140.198.84
sb=64  lsb=64  nb=1008 whpa=64512      whpb=0      whpf=64512      awhb=4
fwhb=1004      puwhb=0.40%      whp_salfs=0      whp_lalfs=0      whp_ruse=0
whp_ruse_salfs=0      whp_ruse_lalfs=0      whp_dthr=0
whp_dthr_salfs=0      whp_dthr_lalfs=0
      nthr=0  ublock=1      uport=0  thr_salfs=0
thr_lalfs=0      thr_ruse=0      thr_ruse_salfs=0      thr_ruse_lalfs=0
thr_dthr=0      thr_dthr_salfs=0      thr_dthr_lalfs=0
      nthr=1  ublock=1      uport=0  thr_salfs=0
thr_lalfs=0      thr_ruse=0      thr_ruse_salfs=0      thr_ruse_lalfs=0
```

thr_dthr=0 thr_dthr_salfs=0 thr_dthr_lalfs=0

Key:

nttype	- profile type (0 - cgnat, 1 - 1:1)
profile	- profile name
itrnsl	- internal index of private<-->public profile converter
nitrnsld	- number of profile converter data (number of CIDR)
itrnsld	- internal converter data index - the one serving the CIDR
cidr	- exact CIDR
proto	- TCP/UDP
ip_mask	- addresses mask
nwhaddr	- the number of public addresses which fall under the mask or CRC (depends on rx_dispatcher parameter)
whip	- public address
sb	- size of the block of ports to be allocated
lsb	- size of the last block
nb	- number of prot blocks
whpa	- ports in total
whpb	- ports occupied
whpf	- free ports
awhb	- blocks issued
fwhb	- free blocks
puwhb	- percentage of blocks occupied
whp_salfs	- is in the 'short' queue
whp_lalfs	- in the 'long' queue
whp_ruse	- can be used
whp_ruse_salfs	- can be used in 'short' queue
whp_ruse_lalfs	- can be used in 'long' queue
whp_dthr	- number of elements ithr_owner != ithr by queue
whp_dthr_salfs	- number of elements ithr_owner != ithr by 'short' queue
whp_dthr_lalfs	- number of elements ithr_owner != ithr by 'long' queue

Key to command to view the dump NAT profile statistics

Command:

```
fdpi_cli -r 127.0.0.1:29001 nat dump whaddr queue test_nat_cgnat
```

Output:

```
profile='test_nat_cgnat' itrnsl=0
  cidr='94.140.198.84/30' itrnsld=0
    whip=94.140.198.86
      proto=TCP
        entryp :
          ithr=0, ihead=0, itail=0
          ithr=1, ihead=0, itail=0
          ithr=2, ihead=133, itail=265
```



```

                                ithr=3, ihead=193, itail=327
                                data :
                                sind=129, inext=257, iprev=258,
whport=1152, graddr=192.168.4.20:60637 tml='2023/03/06 16:28:09,
-00:00:10.657 (7472516905147512 ticks)', lifetime=120, canreuse=0, ialf=1,
imtd=516, iown=2, ilst=2, subproto=0, decr_sess=0, ind_gcache_slice=1,
igcache=40
                                sind=130, inext=151, iprev=148,
whport=1153, graddr=192.168.4.20:52553 tml='2023/03/06 16:27:50,
-00:00:29.455 (7472459405058624 ticks)', lifetime=30, canreuse=0, ialf=0,
imtd=516, iown=2, ilst=2, subproto=0, decr_sess=0, ind_gcache_slice=1,
igcache=1

```

Key:

```

profile      - profile name
itrnsl       - internal index of the private<-->public profile converter

cidr         - exact CIDR
itrnsld      - internal converter data index - the one serving the CIDR

whip         - public address
proto        - TCP/UDP

```

The implementation of the used ports queue for public addresses uses a single array - let's call it WHP, of size 0xffff. It is used to build a list of used ports for the worker thread. Index 0 is used as a stub (empty).

Thread queues cannot be output as a list, because records in the queue are moved in the process, which may cause the output to loop. Therefore, the WHP array is output 'as is' for occupied entries.

```

entryp : sets entry points to the list of public ports of the worker thread
    ithr  - worker thread number
    ihead - top of the list
    itail - the last element of the list

```

```

data : WHP white port array data (only occupied entries are output)

    sind      - record index
    inext     - next record index
    iprev     - previous record index
    whport    - public port
    graddr    - private address, which the public address is assigned
to
    tml       - time of the last record access
    lifetime  - timeout, time in seconds, the record lifetime
(depend on the parameters for short/long queue)
    canreuse  - sign that the record can be used again
    ialf      - number of the processing queue :
                                en_nalfs_shrt = 0, # queue with a short
lifetime

```

```

        en_nalfs_long = 1, # long queue
    indmtd            - internal index of the subscriber's data (subscriber's
metadata)
    iown              - owner thread which has created the record
    ilst              - number of the thread which has last accessed the
record
    subproto          - the protocol the record was allocated for from UDP
                        typedef enum en_nat_borw_udp: u_int8_t
                        {
                            ennatborwu_ORG      = 0, # UDP/TCP
                            ennatborwu_DFLTGRE   = 1, # общий GRE
                            ennatborwu_MAX       = 2, # ICMP
                        } en_nat_borw_udp_t;
    decr_sess         - a mark that the port usage counter on the private
address has decremented
    ind_gcache_slice  - index of the 'private --> public' transcoding cache-
slice
    igcache           - index in the corresponding cache-slice recoding
'private --> public'

```