

Troubleshoot the DNS timeout Issues in MME

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Introduction

This document describes the issues related to Domain Name System (DNS) timeout for the queries towards DNS in Mobile Management Entity (MME) for Serving GateWay (SGW) and Packet Data Network Gateway (PGW) selection.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- StarOS
- MME functionality related to DNS

Components used

The information in this document is based on these software and hardware versions:

- DNS
- MME

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Background Information

DNS

The DNS turns domain names into IP addresses, which browsers use to load ABCD pages. Every device connected to the networks has its own IP address, which is used by other devices to locate the device.

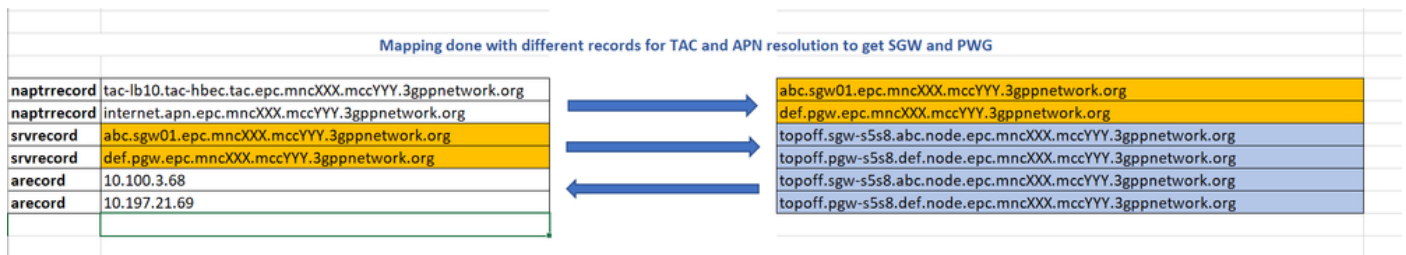
From a mobility perspective, DNS is the external server that is used for Access Point Name (APN) and URL resolution based on its connectivity with the nodes in the network.

1. MME to DNS connectivity: Used for APN resolution for SPGW selection
2. SPGW to DNS connectivity: Used for URL resolution to reach Internet Service Provider (ISP)

Types of Records used in DNS.

1. A/AAA record: Used to define IPv4 and IPv6 host address mapped to the fully qualified name of the host where A record used for IPv4 and Authentication, Authorization and Accounting (AAA) used for IPv6.
2. NAPTR record: Used as a lookup service that points towards a Service record (SRV) and A/AAA records for the SPGW selection process for the 4G APN and TAC resolution.
3. SRV record: Used as a lookup to map between a Name Authority Pointer (NAPTR) and A/AAA record.

Example: Observe how the A/SRV/NAPTR is mapped.



MME Functionality Related to DNS

- The basic function of MME related to DNS is for the purpose of SGW and PGW selection based on DNS queries.
- Cisco MME has its own DNS cache which helps to avoid frequent queries to external servers and stores every query performed in the MME DNS cache to reduce the need to send the query to an external DNS server.
- When the UE registers to an Evolved Packet System (EPS) network, it must be assigned the appropriate SGWs and PGWs. The MME makes the GW selection based on DNS.
- NAPTR query is used to make GW address resolution.
- Based on the DNS query, MME determines the interface between S-GW and P-GW.

The Procedure of SPGW Selection

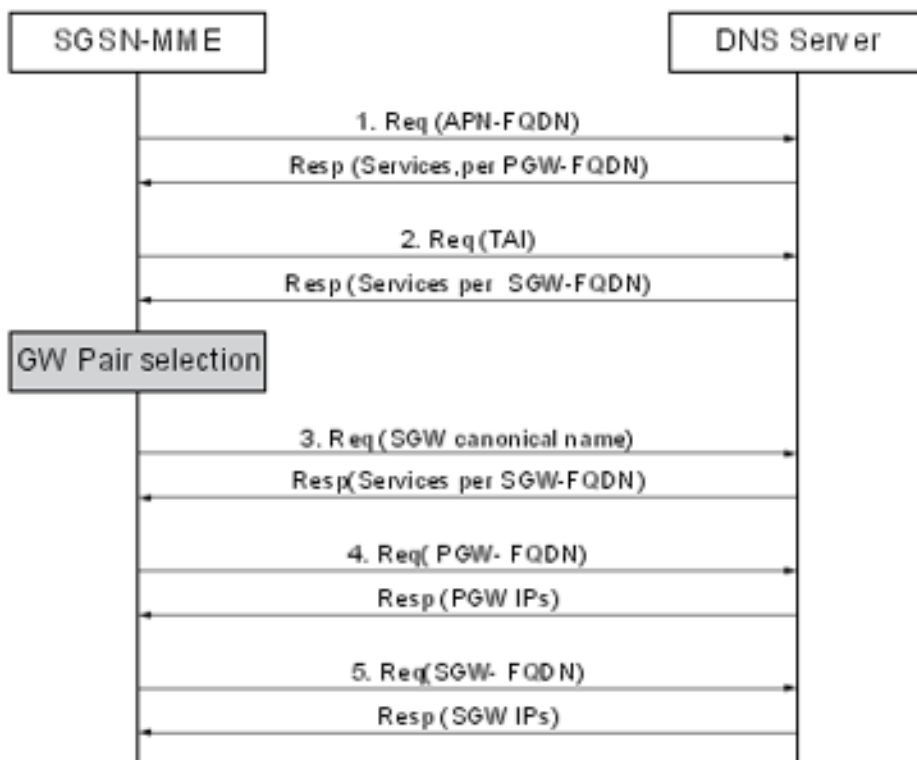
- MME performs an initial DNS query to obtain a list of GW identities and priorities
- S-GW selection done based on Tracking Area Identifier(TAI)
- P-GW selection done based on APN
- MME selects the GW based on priority information or MME configuration

- Then a second DNS query is made to get the IP addresses of the desired GW.

So as per the procedure, MME always makes 2 DNS queries to get GW IP addressed which is explained.

Query 1: For the first query done via APN or TAI, you get an SRV profile mapped with it or directly A record output mapped in response.

Query 2: Further it makes a query to the SRV profile and sends it as a replacement string to get the GW IP.



For example:

Query Name: abcd.apn.epc.mncXXX.mccYYY.3gppnetwork.org

Query Type: NAPTR TTL: 515 seconds

Answer:

Order: 100 Preference: 50000

Flags: a Service: x-3gpp-pgw:x-s5-gtp:x-s8-gtp:x-gn:x-gp

Regular Expression:

Replacement: _nodes._pgw.epc.mncXXX.mccYYY.3gppnetwork.org

Query Name: _nodes._pgw.epc.mncXXX.mccYYY.3gppnetwork.org

Query Type: NAPTR TTL: 515 seconds

Answer:

Order: 100 Preference: 50000

Flags: a Service: x-3gpp-pgw:x-s5-gtp:x-s8-gtp:x-gn:x-gp

Regular Expression: toff.pgw- s5s8.node.epc.mncXXX.mccYYY.3gppnetwork.org

Query Name: toff.pgw- s5s8.node.epc.mncXXX.mccYYY.3gppnetwork.org

Query Type: A TTL: 646 seconds

Answer:

IP Address: X.X.X.X

Problem

1. When you do NAPTR query from MME for APN abcd.apn.epc.mncXXX.mccYYY.3gppnetwork.org and get a DNS timeout at MME.

Note: String **+nc-nr** is the new string added to the 5G service and added against each NAPTR Resource Record (RR) to identify the service interface.

```
"x-3gpp-pgw:x-s5-gtp+nc-nr:x-s8-gtp:x-gn:x-gp"
```

Note: **+nc-nr** is the new string based on the 5G service so MME needs to support this service to work because when MME makes a DNS query and get a response to check that particular service is enabled or not in MME.

```
[gn]SGSN-MME# dns-client query client-name dnsclient query-type NAPTR query-name
abcd.apn.epc.mncXXX.mccYYY.3gppnetwork.org
Wednesday October 27 17:06:20 ICT 2021
Query Name: abcd.apn.epc.mncXXX.mccYYY.3gppnetwork.org
Query Type: NAPTR      TTL: 0 seconds
Answer: -Negative Reply-
Failure Reason: DNS query timed out
```

2. In PCAP traces, it was found that the DNS server receives the query and in response sends 30 to 35 replacements against each APN due to which packet size becomes 4186 bytes and MME initiates TCP connection.

3. You can see that DNS received query request and send the response but without any content with just one flag as "Message is truncated". This is observed only for the case where the response message is truncated and the rest of the 4G responses works fine when the message is not truncated.

The reason for the truncated message is when a number of replacements mapped against the APN are more than 30 and it increases the size of the message and sends the message flag truncated in response. The total size for the response message is 4181 bytes as a TCP payload (refer to the image).

Once receive this response at the MME, MME initiates the TCP connection with DNS.

No.	Time	Protocol	Length	Text Item	Info
31	2021-08-02 10:24:12.554886	DNS	4247	✓	Standard query response 0x7f65 NAPTR internet.apn.epc.mnc003.mcc262.3gppnetwork.org NAPTR 20
32	2021-08-02 10:24:12.555626	TCP	66	✓	47684 → 53 [ACK] Seq=78 Ack=1449 Win=36352 Len=0 TSval=2577277438 TSecr=384894079
40	2021-08-02 10:24:12.555636	TCP	66	✓	47684 → 53 [ACK] Seq=78 Ack=2897 Win=54784 Len=0 TSval=2577277438 TSecr=384894079
41	2021-08-02 10:24:12.555641	TCP	66	✓	47684 → 53 [ACK] Seq=78 Ack=4282 Win=56832 Len=0 TSval=2577277438 TSecr=384894079
42	2021-08-02 10:24:12.555644	TCP	66	✓	47684 → 53 [RST, ACK] Seq=78 Ack=4282 Win=56832 Len=0 TSval=2577277438 TSecr=384894079
43	2021-08-02 10:24:12.628832	DNS	117	✓	Standard query 0xf6fb NAPTR smys.ha.apn.epc.mnc000.mcc448.3gppnetwork.org OPT
44	2021-08-02 10:24:12.927438	DNS	385	✓	Standard query 0xc456 A rnc0000.lacfffe.mnc001.mcc258.gprs OPT
45	2021-08-02 10:24:13.071538	DNS	181	✓	Standard query 0x7f65 A rnc0000.lacfffe.mnc001.mcc258.gprs OPT

```

Acknowledgment number (raw): 3451854488
1800 .... = Header Length: 32 bytes (8)
> Flags: 0x008 (PSH, ACK)
Window: 327
[Calculated window size: 29968]
[Window size scaling factor: 128]
Checksum: 0x7882 [unverified]
[Checksum status: Unverified]
Urgent pointer: 0
> Options: (32 bytes), No-Operation (NOP), No-Operation (NOP), Timestamps
  [SEQ/ACK analysis]
    [RTT: 0.000028000 seconds]
    [Bytes in flight: 4282]
    [Bytes sent since last PSH flag: 4382]
  [Timestamps]
    TCP payload: (4185 bytes)
    [PSH Size: 4045]
  > Domain Name System (response)

```

From MME to DNS

- Frame 31 – MME sends a query to DNS
- Frame 32 – DNS sends a response with the flag set as “Message is truncated”
- Frame 33/34/35 – TCP connection established between MME and DNS and exchange their own capabilities

In the given snapshot, you can see Maximum Segment Size (MSS) send from MME is 9060.

When MME makes a query for which DNS send a response with "Message is truncated" and it has no other information after which based on DNS response MME initiates TCP connection.

No.	Time	Protocol	Length	Text Item	Info
31	2021-08-02 10:24:12.539211	DNS	117	✓	Standard query 0xffd5 NAPTR internet.apn.epc.mnc003.mcc262.3gppnetwork.org OPT
32	2021-08-02 10:24:12.539293	DNS	117	✓	Standard query response 0xffd5 NAPTR internet.apn.epc.mnc003.mcc262.3gppnetwork.org OPT
33	2021-08-02 10:24:12.539720	TCP	74	✓	47684 → 53 [SYN] Seq=0 Win=18120 Len=0 MSS=9060 SACK_PERM=1 TSval=2577277422 TSecr=0 WS=512
34	2021-08-02 10:24:12.539737	TCP	74	✓	53 → 47684 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len=0 MSS=1460 SACK_PERM=1 TSval=384894064 TSecr=2577
35	2021-08-02 10:24:12.540338	TCP	66	✓	47684 → 53 [ACK] Seq=1 Ack=1 Win=18432 Len=0 TSval=2577277423 TSecr=384894064
36	2021-08-02 10:24:12.554558	DNS	143	✓	Standard query 0xffd5 NAPTR internet.apn.epc.mnc003.mcc262.3gppnetwork.org OPT
37	2021-08-02 10:24:12.554570	TCP	66	✓	53 → 47684 [ACK] Seq=1 Ack=78 Win=29056 Len=0 TSval=384894079 TSecr=2577277437
38	2021-08-02 10:24:12.554686	DNS	4247	✓	Standard query response 0xffd5 NAPTR internet.apn.epc.mnc003.mcc262.3gppnetwork.org NAPTR 20 3276
39	2021-08-02 10:24:12.555626	TCP	66	✓	47684 → 53 [ACK] Seq=78 Ack=1449 Win=36352 Len=0 TSval=2577277438 TSecr=384894079

```

  > Domain Name System (response)
    Transaction ID: 0xffd5
  > Flags: 0x8380 Standard query response, No error
    1... .. = Response: Message is a response
    .000 0... .. = Opcode: Standard query (0)
    .... 0... .. = Authoritative: Server is not an authority for domain
    .... .1. .... = Truncated: Message is truncated
    .... ..1 .... = Recursion desired: Do query recursively
    .... .. 1... .. = Recursion available: Server can do recursive queries
    .... .. 0... .. = Z: reserved (0)
    .... .. 0... .. = Answer authenticated: Answer/authority portion was not authenticated by the server
    .... .. 0... .. = Non-authenticated data: Unacceptable
    .... .. 0000 = Reply code: No error (0)
  Questions: 1

```

```

29 2021-08-02 10:24:12.419414 DNS 126 ✓ Standard query 0x3b46 NAPTR tac-lbc4.tac-hb1c.tac.epc.mnc099.mcc250.3gppnetwork.org OPT
30 2021-08-02 10:24:12.419480 DNS 183 ✓ Standard query response 0x3b46 No such name NAPTR tac-lbc4.tac-hb1c.tac.epc.mnc099.mcc250.3gppnet
31 2021-08-02 10:24:12.539211 DNS 117 ✓ Standard query 0xffff5 NAPTR internet.apn.epc.mnc003.mcc262.3gppnetwork.org OPT
32 2021-08-02 10:24:12.539293 DNS 117 ✓ Standard query response 0xffff5 NAPTR internet.apn.epc.mnc003.mcc262.3gppnetwork.org OPT

```

```

.000 0... .. = Opcode: Standard query (0)
... .0... .. = Authoritative: Server is not an authority for domain
... ..1... .. = Truncated: Message is truncated
... ..1... .. = Recursion desired: Do query recursively
... ..1... .. = Recursion available: Server can do recursive queries
... ..0... .. = Z: reserved (0)
... ..0... .. = Answer authenticated: Answer/authority portion was not authenticated by the server
... ..0... .. = Non-authenticated data: Unacceptable
... ..0000 = Reply code: No error (0)

Questions: 1
Answer RRs: 0
Authority RRs: 0
Additional RRs: 1
Queries
  internet.apn.epc.mnc003.mcc262.3gppnetwork.org: type NAPTR, class IN
    Name: internet.apn.epc.mnc003.mcc262.3gppnetwork.org
    [Name Length: 46]
    [Label Count: 7]
    Type: NAPTR (Naming Authority Pointer) (35)
    Class: IN (0x0001)

```

From DNS to MME

- MME sends a query after TCP connection
- DNS acknowledges it.
- DNS sends a response with the flag set as “Message is not truncated” because MSS shared with DNS is set to 9060 bytes and it sends the entire response in one go.
- MME responds with an ACK with no content
- DNS sends the ACK to the content in Message 38 where the payload is 4181 bytes
- MME sends TCP to reset and close the connections as soon as it receives the last fragment.

```

36 2021-08-02 04:54:12.554518 DNS 143 Standard query 0xffff5 NAPTR [internet.apn.epc.mnc003.mcc262.3gppnetwork.org] OPT
37 2021-08-02 04:54:12.554579 TCP 66 SS = 47684 [ACK] Seq=1 Ack=78 Win=29956 Len=0 TSval=384894879 TSecr=257727317
38 2021-08-02 04:54:12.554680 DNS 4247 Standard query response 0xffff5 NAPTR [internet.apn.epc.mnc003.mcc262.3gppnetwork.org] NAPTR 20 32767 A NAPTR
39 2021-08-02 04:54:12.555426 TCP 66 47684 = 53 [ACK] Seq=78 Ack=5449 Win=36352 Len=0 TSval=257727318 TSecr=384894879
40 2021-08-02 04:54:12.555636 TCP 66 47684 = 53 [ACK] Seq=78 Ack=2897 Win=54784 Len=0 TSval=257727318 TSecr=384894879
41 2021-08-02 04:54:12.555643 TCP 66 47684 = 53 [ACK] Seq=78 Ack=4182 Win=54832 Len=0 TSval=257727318 TSecr=384894879
42 2021-08-02 04:54:12.555648 TCP 66 47684 = 53 [RST, ACK] Seq=78 Ack=4182 Win=0 Len=0 TSval=257727318 TSecr=384894879
43 2021-08-02 04:54:12.526832 DNS 117 Standard query 0xffff5 NAPTR [mnc03.ha.apn.epc.mnc001.mcc000.3gppnetwork.org] OPT
44 2021-08-02 04:54:12.927420 DNS 185 Standard query 0xc456 A [rac0000.lacffffe.mnc001.mcc150.gprs] OPT
45 2021-08-02 04:54:12.927530 DNS 185 Standard query 0xc3f82 A [rac0000.lacffffe.mnc001.mcc150.gprs] OPT
46 2021-08-02 04:54:12.969817 ARP 60 Gratuitous ARP for 217.138.72.1 (Reply)
47 2021-08-02 04:54:13.965622 DNS 116 Standard query response 0xc3f82 No such name A [rac0000.lacffffe.mnc001.mcc150.gprs] SOA [mnc001.mcc150.gprs]
48 2021-08-02 04:54:13.965696 DNS 116 Standard query response 0xc456 No such name A [rac0000.lacffffe.mnc001.mcc150.gprs] SOA [mnc001.mcc150.gprs]
49 2021-08-02 04:54:13.987374 DNS 114 Standard query 0xf681 NAPTR [rac0003.lac4269.rac.epc.mnc099.mcc250.3gppnetwork.org] OPT

```

```

> TCP Option - No-Operation (NOP)
> TCP Option - Timestamps: TSval 384894879, TSecr 257727317
< [MQ/ACK analysis]
  [RTT: 0.000618000 seconds]
  [Bytes in Flight: 4082]
  [Bytes sent since last PSN flag: 4082]
> [Timestamps]
  TCP payload (4181 bytes)
  [PSN size: 4082]
Domain Name System (response)
  Length: 4179
  Transaction ID: 0xffff5

```

When MME receives the whole payload in 2 to 3 segments or in one attempt from DNS, MME sends a TCP reset message.

DNS commands to troubleshoot

```

show dns-client statistics
show dns-client statistics client <DNS Client Name>
show dns-client cache client <client name> [query-name <query-name>[query-type <NAPTR | AAAA | A>] | [query-type <NAPTR | AAAA | A>]]
dns-client query client-name <client name> query-type <NAPTR | AAAA> [query-name <query name>].show port datalink counters

```

Commands to check if there were any problem internal to the starOS system where request is not able to reach from demux vpnmgr to DNS app in sessmgrs

```
show port npu counters
```

```

show cloud configuration
show iftask stats summary
show npu utilization table
show iftask port-stats card <card> ---- for all active SF cards
show iftask iomux-stats card <card> ---- for all active SF cards

```

MON SUB to be captured with options enabled (verbosity 5,Y,S,34,35,19,A,26)

PCAP traces to be captured

DNS cache flush commands

```
clear dns-client <client-name> cache
```

Test Scenario

1. Capture all required debug logs/traces with dedicated test and enable the logs at the same time when subscriber browses with problematic APN
2. Ensure every time a test scenario is performed, the subscriber needs to do a fresh attach to flush the subscriber.
3. For test purposes, assign one tester and that tester need to do a dedicated test with its IMSI and need to access that problematic APN: abcd.apn.epc.mncXXX.mccYYY.3gppnetwork.org.

```

logging filter active facility vpn level debug ----- debug level logs
logging filter active facility tcpdemux level debug ----- debug level logs
logging monitor msid <MSID number> ----- (these logging command to be
executed in config mode)

```

Troubleshoot

1. Check the outputs of all commands mentioned to confirm if there is any packet drop internal to the system.
2. Check the statistics to confirm the frequency of DNS timeouts increase in the node.

```
[gn]SGSN-MME# show dns-client statistics client dnsclient
```

Friday August 20 13:31:48 ICT 2021

DNS Usage Statistics:

Query Type	Attempts	Successes	Failures
A	2430996860	2410410937	20546467
SRV	1325520986	1325516557	4429
AAAA	3939810089	0	3939810089
NAPTR	480586697	432853033	47732791
PTR	0	0	0
Total	3881947336	4168780527	4008093776

...

```

Total Resolver Queries: 4480708
Successful Queries: 670040
Query Timeouts: 409717
Domain Not Found: 2455918
Connection Refused: 0
Other Failures: 580612

```

After you run these commands to capture the statistics for multiple iterations and observe that query timeouts are increased gradually but there were no packet drops between Demux and

sessmgrs so which concludes no problem with the internal system

Further to check any issues with external connectivity or configuration issue in DNS, you directly perform the query for the replacements values manually from MME instead of APN as shown in the image, where it gets resolved properly without any delay and concludes there is no problem with external connectivity and configuration as well.

```
[gn]SGSN-MME# dns-client query client-name dnsclient query-name
TOPON.test.NODE.EPC.MNCXXX.MCCYYY.3GPPNETWORK.ORG
Monday August 02 18:51:29 ICT 2021
Query Name: TOPON.test.NODE.EPC.MNCXXX.MCCYYY.3GPPNETWORK.ORG
Query Type: A          TTL: 1038 seconds
Answer:
IP Address: X.X.X.X ----- resolve properly and gave IP
```

The problem is between DNS and SGSN-MME where you can see DNS send responses with replacement values as topon and MME must query again for the topon entries but which did not happen otherwise if we manually do the query resolution is successful

As per the command outputs and traces, it was clear that when you query APN, you get responses with 30 replacements via TCP connection in fragments and while MME acknowledges these fragments it sends reset to DNS.

Since MME sends TCP to reset we can see in MME where DNS query shows error as query timeout and till this point of time we don't see those 30 replacements values in MME command outputs since fragments were not acknowledged completely and before completion of this process, MME sends TCP to reset.

Debug logs analysis

For abcd.apn.epc.mncXXX.mccYYY.3gppnetwork.org

```
2021-Oct-27+17:06:20.910 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpmngr_func.c:8011] [software
internal system syslog] query:14585, UDP, Sent time 1635329180, Timeout set 1635329183 ----
timer is set here
2021-Oct-27+17:06:20.910 [vpn 5919 info] [9/0/11730 <vpnmgr:6> dns_resolver.c:323] [software
internal system syslog] Sent out a DNS Query abcd.apn.epc.mncXXX.mccYYY.3gppnetwork.org to DNS
Server ----- DNS query is send for the first time
2021-Oct-27+17:06:20.911 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpmngr_func.c:8011] [software
internal system syslog] TCP Connection Init, While Sending Query
2021-Oct-27+17:06:20.911 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpmngr_func.c:8011] [software
internal system syslog] TCP Connection Open with DHost
2021-Oct-27+17:06:20.911 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpmngr_func.c:8011] [software
internal system syslog] query:14585, TCP, Sent time 1635329180, Timeout set 1635329183 -----
--- DNS query is send for the second time
2021-Oct-27+17:06:20.911 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpmngr_func.c:8011] [software
internal system syslog] TCP Connection Successful - DHost-Id = 6766924, Sock_fd = 21
2021-Oct-27+17:06:21.008 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpmngr_func.c:8011] [software
internal system syslog] TCP READ, Kernel Closed, EOF - DHost-Id = 6766924, Sock_fd = 21, errno =
115, req_read_len = 0
2021-Oct-27+17:06:21.008 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpmngr_func.c:8011] [software
internal system syslog] TCP Connection close - DHost-Id = 6766924, Sock_fd = 21
2021-Oct-27+17:06:23.019 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpmngr_func.c:8011] [software
internal system syslog] query:14585, TCP, Timeout detected: 1635329183 ----- Timeout
detected here
2021-Oct-27+17:06:23.019 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpmngr_func.c:8011] [software
internal system syslog] TCP Connection Init, While Sending Query ----- Query is
send again
```


2021-Oct-27+17:06:23.019 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] TCP Connection Open with DHost
2021-Oct-27+17:06:23.019 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] query:14585, TCP, Sent time 1635329183, Timeout set 1635329186 -----
Again send the query with new timer value set
2021-Oct-27+17:06:23.019 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] TCP Connection Successful - DHost-Id = 6504921, Sock_fd = 23
2021-Oct-27+17:06:26.036 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] query:14585, TCP, Timeout detected: 1635329186 ----- Timeout detected here
2021-Oct-27+17:06:26.036 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] query:35196, UDP, Timeout detected: 1635329186 ----- Timeout detected here

Another example abcd.apn.epc.mncXXX.mccYYY.3gppnetwork.org

2021-Oct-27+17:06:27.257 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] query:19140, UDP, Sent time 1635329187, Timeout set 1635329190 ---- timer is set here
2021-Oct-27+17:06:27.257 [vpn 5919 info] [9/0/11730 <vpnmgr:6> dns_resolver.c:323] [software internal system syslog] Sent out a DNS Query abcd.apn.epc.mncXXX.mccYYY.3gppnetwork.org to DNS Server ----- Query send for the first time
2021-Oct-27+17:06:27.258 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] TCP Connection Init, While Sending Query
2021-Oct-27+17:06:27.258 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] TCP Connection Open with DHost
2021-Oct-27+17:06:27.258 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] query:19140, TCP, Sent time 1635329187, Timeout set 1635329190 ----- Same Query send for the second time
2021-Oct-27+17:06:27.258 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] TCP Connection Successful - DHost-Id = 7201531, Sock_fd = 22
2021-Oct-27+17:06:27.309 [vpn 5921 debug] [7/0/12843 <sessmgr:79> dns_snaptr.c:1466] [software internal system syslog] VPN DEBUG : snaptr_match_valid_entries Initial ue_usage_type:0 nc_nr:0
---- snaptr match starts
2021-Oct-27+17:06:27.309 [vpn 5921 debug] [7/0/12843 <sessmgr:79> dns_snaptr.c:237] [software internal system syslog] VPN DEBUG : snaptr_compare_service_protocol_set rr_service_parameter x-3gpp-mme:x-gn, inp_svc_param x-3gpp-sgw:x-s5-gtp ue_usage_type_enabled:0 nc_nr_enabled:0 ---- -- nc_nr enabled which I mentioned earlier
2021-Oct-27+17:06:27.309 [vpn 5921 debug] [7/0/12843 <sessmgr:79> dns_snaptr.c:237] [software internal system syslog] VPN DEBUG : snaptr_compare_service_protocol_set rr_service_parameter x-3gpp-sgw:x-s5-gtp:x-s8-gtp, inp_svc_param x-3gpp-sgw:x-s5-gtp ue_usage_type_enabled:0 nc_nr_enabled:0
2021-Oct-27+17:06:27.309 [vpn 5921 debug] [7/0/12843 <sessmgr:79> dns_snaptr.c:279] [software internal system syslog] VPN DEBUG : 0.rr_prot_token x-s5-gtp, input token x-s5-gtp
2021-Oct-27+17:06:27.309 [vpn 5921 debug] [7/0/12843 <sessmgr:79> dns_snaptr.c:323] [software internal system syslog] VPN DEBUG : 4.Success Selected Protocol(Normal):x-s5-gtp ----- snaptr protocol matched
2021-Oct-27+17:06:30.057 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] query:19140, TCP, Timeout detected: 1635329190 ----- TCP timeout happens
2021-Oct-27+17:06:30.057 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] TCP Connection Init, While Sending Query ----- Again TCP connection initiated
2021-Oct-27+17:06:30.057 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] TCP Connection Open with DHost
2021-Oct-27+17:06:30.057 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] query:19140, TCP, Sent time 1635329190, Timeout set 1635329193 ----- New timer value set with send query
2021-Oct-27+17:06:30.057 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] TCP Connection Successful - DHost-Id = 7136007, Sock_fd = 21
2021-Oct-27+17:06:30.158 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software internal system syslog] TCP READ, Kernel Closed, EOF - DHost-Id = 7136007, Sock_fd = 21, errno = 115, req_read_len = 0 - Error because TCP connection is busy because previous connection is not closed

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2021-Oct-27+17:06:30.158 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software
internal system syslog] TCP Connection close - DHost-Id = 7136007, Sock_fd = 21 -----
Connection closed
2021-Oct-27+17:06:30.171 [vpn 5921 debug] [14/0/12709 <sessmgr:15> dns_snaptr.c:1466] [software
internal system syslog] VPN DEBUG : snaptr_match_valid_entries Initial ue_usage_type:0 nc_nr:0 -
-- again snaptr match takes place
2021-Oct-27+17:06:30.171 [vpn 5921 debug] [14/0/12709 <sessmgr:15> dns_snaptr.c:237] [software
internal system syslog] VPN DEBUG : snaptr_compare_service_protocol_set rr_service_parameter x-
3gpp-mme:x-gn, inp_svc_param x-3gpp-sgw:x-s5-gtp ue_usage_type_enabled:0 nc_nr_enabled:0
2021-Oct-27+17:06:30.171 [vpn 5921 debug] [14/0/12709 <sessmgr:15> dns_snaptr.c:237] [software
internal system syslog] VPN DEBUG : snaptr_compare_service_protocol_set rr_service_parameter x-
3gpp-sgw:x-s5-gtp:x-s8-gtp, inp_svc_param x-3gpp-sgw:x-s5-gtp ue_usage_type_enabled:0
nc_nr_enabled:0
2021-Oct-27+17:06:30.171 [vpn 5921 debug] [14/0/12709 <sessmgr:15> dns_snaptr.c:279] [software
internal system syslog] VPN DEBUG : 0.rr_prot_token x-s5-gtp, input token x-s5-gtp
2021-Oct-27+17:06:33.073 [vpn 5456 info] [9/0/11730 <vpnmgr:6> vpnmgr_func.c:8011] [software
internal system syslog] query:19140, TCP, Timeout detected: 1635329193 -----TCP timeout detected
```

From logs, it indicates that after the first timeout MME sends error 115 for the next retries because the first TCP connection is still not closed at the socket. Timeout for the first TCP connection has happened and the previous connection was not closed.

A new connection is initiated which is on the same socket where the previous connection was established and not cleared. You see the error 115 (operations in progress) even though the new connection was formed but somehow the socket did not close the previous connection after the first timeout.

Solution

Restart the vpnmgr of the DNS context. A software fix is yet to be provided.