

排除SMF/UPF上的使用者問題

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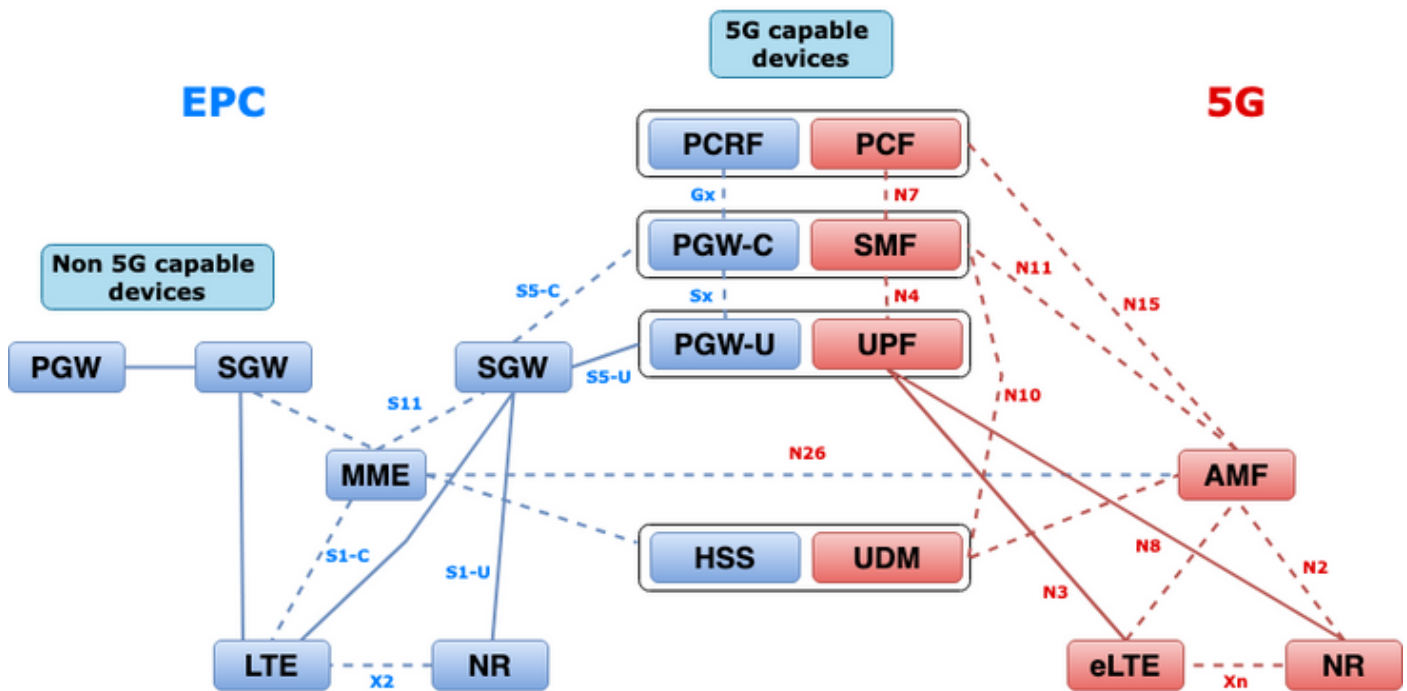
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簡介

本文檔介紹用於解決SMF/UPF上的使用者問題的CLI命令。此外，它還包括用於5G呼叫流分析的Wireshark過濾器。

1. 4G/5G網際網路架構



2. 5G核心 (基於服務) 架構

3GPP採用代表狀態轉移(Rest)架構設計模型支援5G核心上分散式應用與功能之間的通訊。

Rest依靠標準協定HTTP或HTTPS在實體之間傳輸呼叫，並在其中利用唯一的URL識別符號 (動詞或名詞)。為Rest指定的HTTP方法或動詞如下：

- GET:檢索請求中由URI定址的資源
- POST:請求伺服器建立新資源
- PUT:用請求的負載 (JSON格式) 替換 (完全) URI定址的資源
- 修補程式：更新資源 (部分)
- 刪除：刪除請求中由URI定址的資源

基於服務的體系結構(SBA):一種系統體系結構，其中系統功能通過網路功能(NF)實現。為使用服務的授權NF提供服務。

NF服務：NF服務是通過NF (NF服務生產者) 通過基於服務的介面向其他授權的NF (NF服務消費者) 公開的一種功能。

基於服務的介面(SBI):基於服務的介面表示給定的NF如何提供或暴露服務集。這是呼叫NF服務操作的介面。Namf、Nsmf、Ndm、Nnrf、Nnssf、Nausf、Nnef、Nsmsf等。

基於服務的介面(SBI)使用TCP上的HTTP/2協定在3GPP定義的NF服務之間通訊。TCP提供IETF RFC 5681中指定的傳輸級擁塞控制機制，可用於兩個TCP端點 (即逐跳) 之間的擁塞控制。HTTP/2還提供流控制機制和流併發限制 (如IETF RFC 7540中所指定)，可針對連線級擁塞控制進行配置。

3.統一資源識別符號

一種5G NF服務可包括可被訪問的多種資源。統一資源識別符號(URI)是標識特定資源的字串。

{apiRoot}/{apiName}/{apiVersion}/{apiSpecificResourceUriPart}

- apiRoot是http://或https://的串聯，加上一個授權（主機和可選埠）和一個可選的部署特定字串。
- apiName通常表示API呼叫的服務。
- apiVersion是API的版本號。
- apiSpecificResourceUriPart表示API用於訪問/操作的特定資源。

4. 作業階段管理功能(SMF)

思科會話管理功能(SMF)是5G核心網路(5GC)的控制平面網路功能(NF)之一。SMF負責會話管理，每個會話均支援各自的功能。

SMF支援會話管理（會話建立、修改、釋放）、UE IP地址分配和管理、DHCP功能、與會話管理相關的NAS信令的終止、DL資料通知，以及UPF的流量引導配置，以實現正確的流量路由。（AMF具有來自EPC世界的MME和PGW功能的一部分）。

5. 使用者平面功能

使用者平面功能(UPF)是5G核心網(5GC)的網路功能(NF)之一。UPF負責資料包路由和轉發、資料包檢測、QoS處理以及用於互聯資料網路(DN)的外部PDU會話（在5G架構中）。

UPF是一種獨特的虛擬網路功能(VNF)，可為使用者流量提供高效能轉發引擎。藉助向量資料包處理(VPP)技術，UPF實現了超快速資料包轉發，同時保持與所有使用者平面功能的相容性。

6. SMF CLI命令

6.1. 檢查特定使用者是否已連線

```
[smf/data] smf# show subscriber namespace smf supi imsi-123969789012404 gr-instance 1
subscriber-details
{
  "subResponses": [
    [
      "roaming-status:visitor-lbo",
      "ue-type:nr-capable",
      "supi:imsi-123969789012404",
      "gpsi:msisdn-22331010101010",
      "pei:imei-123456789012381",
      "psid:1",
      "dnn:testing.com",
      "emergency:false",
      "rat:nr",
      "access:3gpp access",
      "connectivity:5g",
      "udm-uecm:10.10.10.215",
      "udm-sdm:10.10.10.215",
      "auth-status:unauthenticated",
```

```

    "pcfGroupId:PCF-dnn=testing.com;",
    "policy:2",
    "pcf:10.10.10.216",
    "upf:10.10.10.150",
    "upfEpKey:10.10.10.150:20.20.20.202",
    "ipv4-addr:pool1/172.16.0.3",
    "ipv4-pool:pool1",
    "ipv4-range:pool1/172.16.0.1",
    "ipv4-startrange:pool1/172.16.0.1",
    "ipv6-pfx:pool1/2001:db0:0:2::",
    "ipv6-pool:pool1",
    "ipv6-range:pool1/2001:db0::",
    "ipv6-startrange:pool1/2001:db0::",
    "id-index:1:0:32768",
    "id-value:2/3",
    "amf:10.10.10.217",
    "peerGtpuEpKey:10.10.10.150:20.0.0.1",
    "namespace:smf",
    "nf-service:smf"
  ]
}
}

```

附註：如果啟用了GEO冗餘(GR)功能，則需要檢查訂閱伺服器連線到哪個GR例項。

6.2. 識別對等IP地址及其狀態

```

### NRF Peers
[smf/data] smf# show peers all rpc NRF
GR                                     POD
CONNECTED      ADDITIONAL  INTERFACE
INSTANCE ENDPOINT  LOCAL ADDRESS  PEER ADDRESS  DIRECTION  INSTANCE  TYPE  TIME
RPC  DETAILS  NAME
-----
1          <none>    192.168.109.94  20.20.20.219:8080  Outbound   rest-ep-0  Rest  21 hours
NRF <none>    nrf

### AMF Peers
[smf/data] smf# show peers all rpc AMF
GR                                     POD
CONNECTED      ADDITIONAL  INTERFACE
INSTANCE ENDPOINT  LOCAL ADDRESS  PEER ADDRESS  DIRECTION  INSTANCE  TYPE  TIME
RPC  DETAILS  NAME
-----
1          <none>    192.168.109.94  10.10.10.217:8086  Outbound   rest-ep-0  Rest  21 hours
AMF <none>    n11

### UDM Peers
[smf/data] smf# show peers all rpc UDM
GR                                     POD
CONNECTED      ADDITIONAL  INTERFACE
INSTANCE ENDPOINT  LOCAL ADDRESS  PEER ADDRESS  DIRECTION  INSTANCE  TYPE  TIME
RPC  DETAILS  NAME
-----
1          <none>    192.168.109.94  10.10.10.215:8000  Outbound   rest-ep-0  Rest  21 hours
UDM <none>    n10

### CHF Peers

```

```
[smf/data] smf# show peers all rpc CHF
GR
CONNECTIONS
-----
CONNECTED      ADDITIONAL INTERFACE
INSTANCE ENDPOINT LOCAL ADDRESS PEER ADDRESS DIRECTION INSTANCE TYPE TIME
RPC DETAILS NAME
-----
1 <none> 192.168.109.94 20.20.20.218:1090 Outbound rest-ep-0 Rest 21 hours
CHF <none> n40
```

PCF Peers

```
[smf/data] smf# show peers all rpc PCF
GR
CONNECTIONS
-----
CONNECTED      ADDITIONAL INTERFACE
INSTANCE ENDPOINT LOCAL ADDRESS PEER ADDRESS DIRECTION INSTANCE TYPE TIME
RPC DETAILS NAME
-----
1 <none> 192.168.109.94 10.10.10.216:8080 Outbound rest-ep-0 Rest 19 hours
PCF <none> n7
```

6.3. 識別UPF IP地址

從「show subscriber namespace smf supi imsi-xxxxxxxxxxxxxxxx」獲取UPF IP，然後從配置中篩選此特定IP地址以確認節點ID:

```
[smf/data] smf# show subscriber namespace smf supi imsi-123969789012404 gr-instance 1 | include
"upf:"
      "upf:10.10.10.150",
```

```
[smf/data] smf# show running-config profile network-element upf n4-peer-address ipv4
10.10.10.150
profile network-element upf upf1
node-id n4-peer-NAME
n4-peer-address ipv4 10.10.10.150
n4-peer-port 8805
upf-group-profile upf-group1
dnn-list [ testing.com ]
capacity 10
priority 1
exit
```

6.4 過濾特定使用者的DNN

```
[smf/data] smf# show subscriber namespace smf supi imsi-123969789012404 gr-instance 1 | include
"dnn:"
      "dnn:testing.com",
```

6.5. 啟用監控使用者

```
[smf/data] smf# monitor subscriber supi imsi-123969789012404 gr-instance 1 nf-service smf
capture-duration 3600 internal-messages yes
supi: imsi-123969789012404
captureDuration: 3600
enableInternalMsg: true
enableTxnLog: false
namespace(deprecated. Use nf-service instead.): none
```

```

nf-service: smf
gr-instance: 1
% Total      % Received % Xferd  Average Speed   Time    Time       Time  Current
           Dload  Upload   Total     Spent    Left     Speed
100  305  100  103  100  202  3678  7214  --:--:--  --:--:--  --:--:--  11296
Command: --header Content-type:application/json --request POST --data
{"commandname":"mon_sub","parameters":{"supi":"imsi-
123969789012404","duration":3600,"enableTxnLog":false,"enableInternalMsg":true,"action":"start",
"namespace":"none","nf-service":"smf","grInstance":1}} http://oam-pod:8879/commands
Result start mon_sub, fileName ->logs/monsublogs/smf.imsi-123969789012404_TS_2022-05-
24T18:27:21.343004358.txt
Starting to tail the monsub messages from file: logs/monsublogs/smf.imsi-
123969789012404_TS_2022-05-24T18:27:21.343004358.txt
Defaulting container name to oam-pod.
Use 'kubectl describe pod/oam-pod-0 -n cn-data' to see all of the containers in this pod.

```

附註：輸入Ctrl+C可停止捕獲。

7. UPF CLI命令

7.1.識別特定使用者的呼叫

```

[local]saegw-up1# show subscriber imsi 123969789012404
+-----Access (S) - pdsn-simple-ip (M) - pdsn-mobile-ip (H) - ha-mobile-ip
|   Type: (P) - ggsn-pdp-type-ppp (h) - ha-ipsec (N) - lns-l2tp
|   (I) - ggsn-pdp-type-ipv4 (G) - IPSP
|   (V) - ggsn-pdp-type-ipv6 (C) - cscf-sip
|   (z) - ggsn-pdp-type-ipv4v6 (A) - X2GW
|   (R) - sgw-gtp-ipv4 (O) - sgw-gtp-ipv6 (Q) - sgw-gtp-ipv4-ipv6
|   (W) - pgw-gtp-ipv4 (Y) - pgw-gtp-ipv6 (Z) - pgw-gtp-ipv4-ipv6
|   (B) - pgw-gtp-non-ip (J) - sgw-gtp-non-ip
|   (@) - saegw-gtp-ipv4 (#) - saegw-gtp-ipv6 ($) - saegw-gtp-ipv4-ipv6
|   (&) - samog-ip (^) - cgw-gtp-ipv6 (*) - cgw-gtp-ipv4-ipv6
|   (p) - sgsn-pdp-type-ppp (s) - sgsn (4) - sgsn-pdp-type-ip
|   (6) - sgsn-pdp-type-ipv6 (2) - sgsn-pdp-type-ipv4-ipv6
|   (L) - pdif-simple-ip (K) - pdif-mobile-ip (o) - femto-ip
|   (F) - standalone-fa
|   (e) - ggsn-mbms-ue (U) - pdg-ipsec-ipv4
|   (E) - ha-mobile-ipv6 (T) - pdg-ssl (v) - pdg-ipsec-ipv6
|   (f) - hnbgw-hnb (g) - hnbgw-iu (x) - sl-mme
|   (k) - PCC
|   (X) - HSGW (n) - ePDG (t) - hnbgw-ue
|   (m) - hnbgw-henb (q) - wsg-simple-ip (r) - samog-pmip
|   (D) - bng-simple-ip (l) - pgw-pmip (3) - GILAN
|   (y) - User-Plane (u) - Unknown
|   (+) - samog-eogre (%) - eMBMS-ipv4 (!) - eMBMS-ipv6
|
+-----Access (X) - CDMA 1xRTT (E) - GPRS GERAN (I) - IP
||   Tech: (D) - CDMA EV-DO (U) - WCDMA UTRAN (W) - Wireless LAN
||   (A) - CDMA EV-DO REVA (G) - GPRS Other (M) - WiMax
||   (C) - CDMA Other (J) - GAN (O) - Femto IPsec
||   (P) - PDIF (S) - HSPA (L) - eHRPD
||   (T) - eUTRAN (B) - PPPoE (F) - FEMTO UTRAN
||   (N) - NB-IoT (Q) - WSG (.) - Other/Unknown
||
+----Call (C) - Connected (c) - Connecting
||   State: (d) - Disconnecting (u) - Unknown
||   (r) - CSCF-Registering (R) - CSCF-Registered
||   (U) - CSCF-Unregistered

```

```

|||
|||+--Access (A) - Attached (N) - Not Attached
||| CSCF (.) - Not Applicable
||| Status:
|||
|||+--Link (A) - Online/Active (D) - Dormant/Idle
||| Status:
|||
|||+Network (I) - IP (M) - Mobile-IP (L) - L2TP
||| Type: (P) - Proxy-Mobile-IP (i) - IP-in-IP (G) - GRE
||| (V) - IPv6-in-IPv4 (S) - IPSEC (C) - GTP
||| (A) - R4 (IP-GRE) (T) - IPv6 (u) - Unknown
||| (W) - PMIPv6(IPv4) (Y) - PMIPv6(IPv4+IPv6) (R) - IPv4+IPv6
||| (v) - PMIPv6(IPv6) (/) - GTPv1(For SAMOG) (+) - GTPv2(For SAMOG)
||| (N) - NON-IP (x) - UDP-IPv4 (X) - UDP-IPv6
|||
vvvvvv CALLID MSID USERNAME IP TIME-IDLE
-----
y.C.AI 01317b22 123969789012404 - 2001:db0:0:3:0:1:317b:2201,172.16.0.4
00h00m00s

```

7.2. 獲取使用者級資訊 (如ruledefs、pdr、far、qer、urr)

```

show subs user-plane-only full callid 01317b22
show subs data-rate call 01317b22
show subscribers user-plane-only callid 01317b22 pdr full all
show subscribers user-plane-only callid 01317b22 far full all
show subscribers user-plane-only callid 01317b22 qer full all
show subscribers user-plane-only callid0 1317b22 urr full all

```

附註：在本例中，我們使用01317b22作為callid。但是，您需要根據從步驟7.1獲得的輸出使用小寫字母。

7.3. 啟用監控使用者

```
[local]saegw-up1# monitor subscriber imsi 123969789012404
```

```
-----
Matching Call Found:
```

```

-----
MSID/IMSI : 123969789012404 Callid : 01317b22
IMEI : 123456789012381 MSISDN : 22331010101010
Username : n/a SessionType : uplane-ipv4v6
Status : Active Service Name: upf
Src Context : up Dest Context: ISP
-----
C - Control Events (ON ) 11 - PPP (ON ) 21 - L2TP (ON )
D - Data Events (ON ) 12 - All (ON ) 22 - L2TPMGR (OFF)
E - EventID Info (ON ) 13 - RADIUS Auth (ON ) 23 - L2TP Data (OFF)
I - Inbound Events (ON ) 14 - RADIUS Acct (ON ) 24 - GTPC (ON )
O - Outbound Events (ON ) 15 - Mobile IPv4 (ON ) 25 - TACACS (ON )
S - Sender Info (OFF) 16 - AllMGR (OFF) 26 - GTPU (OFF)
T - Timestamps (ON ) 17 - SESSMGR (ON ) 27 - GTPP (ON )
X - PDU Hexdump (OFF) 18 - A10 (OFF) 28 - DHCP (ON )
A - PDU Hex/Ascii (OFF) 19 - User L3 (OFF) 29 - CDR (ON )
+/- Verbosity Level ( 1) 31 - Radius COA (ON ) 30 - DHCPV6 (ON )
L - Limit Context (OFF) 32 - MIP Tunnel (ON ) 53 - SCCP (OFF)
M - Match Newcalls (ON ) 33 - L3 Tunnel (OFF) 54 - TCAP (OFF)
R - RADIUS Dict: (no-override) 34 - CSS Data (OFF) 55 - MAP (ON )

```

```

G - GTPP Dict: (no-override) 35 - CSS Signal (OFF) 56 - RANAP (OFF)
Y - Multi-Call Trace (OFF) 36 - EC Diameter (ON ) 57 - GMM (ON )
H - Display ethernet (OFF) 37 - SIP (IMS) (OFF) 58 - GPRS-NS (OFF)
    39 - LMISF (OFF)
U - Mon Display (ON ) 40 - IPSec IKEv2 (OFF) 59 - BSSGP (OFF)
V - PCAP Hexdump (OFF) 41 - IPSP RADIUS (ON ) 60 - CAP (ON )
F - Packet Capture: (Full Pkt) 42 - ROHC (OFF) 64 - LLC (OFF)
/ - Priority ( 0) 43 - WiMAX R6 (ON ) 65 - SNDPCP (OFF)
N - MEH Header (OFF) 44 - WiMAX Data (OFF) 66 - BSSAP+ (OFF)
W - UP PCAP Trace (ON ) 45 - SRP (OFF) 67 - SMS (OFF)
    68 - OpenFlow(ON )
    46 - BCMCS SERV AUTH(OFF)
    47 - RSVP (ON )
    48 - Mobile IPv6 (ON ) 69 - X2AP (ON )
    77 - ICAP/UIDH (ON )
    50 - STUN (IMS) (OFF) 78 - Micro-Tunnel(ON )
    51 - SCTP (OFF)
    72 - HNBAP (ON ) 79 - ALCAP (ON )
    73 - RUA (ON ) 80 - SSL (ON )
    74 - EGTPC (ON )
    75 - App Specific Diameter (OFF)
    81 - S1-AP (ON ) 82 - NAS (ON )
    83 - LDAP (ON ) 84 - SGS (ON )
    85 - AAL2 (ON ) 86 - S102 (ON )
    87 - PPPOE (ON )
    88 - RTP(IMS) (OFF) 89 - RTCP(IMS) (OFF)
    91 - NPDB(IMS) (OFF)
    92 - SABP (ON )
    94 - SLS (ON )
    96 - SBc-AP (ON )
    97 - M3AP (ON )
    49 - PFCP (ON )
    76 - NSH (ON )

```

(Q)uit, <ESC> Prev Menu, <SPACE> Pause, <ENTER> Re-Display Options

```

*** User L3 PDU Decodes (ON ) ***
*** GTPU PDU Decodes (ON ) ***
*** CSS Data Decodes (ON ) ***
*** CSS Signaling (ON ) ***
*** session initiation protocol (SIP) decodes (ON ) ***
*** IPSEC IKE Subscriber (ON ) ***
*** Real Time Transport Protocol(RTP) decodes (ON ) ***
*** Real Time Transport Control Protocol(RTCP) decodes (ON ) ***
*** PDU Hex+Ascii dump (ON ) ***
*** PDU Hexdump (ON ) ***
*** Multi-Call Trace (ON ) ***
*** Verbosity Level ( 2) ***
*** Verbosity Level ( 3) ***
*** Verbosity Level ( 4) ***
*** Verbosity Level ( 5) ***

```

附註：根據使用者問題啟用必要的選項（最常見的是VoLTE呼叫的A、X、Y、19、26、34、35和37、40、88、89，以及詳細程度5）。輸入Q以停止監控訂戶。

7.4.獲取特定使用者的慢路徑/vpp PCAP

```

[local]saegw-up1# monitor subscriber imsi 123969789012404
-----
Matching Call Found:
-----
MSID/IMSI      : 123969789012404          Callid         : 01317b22

```



```

IMEI      : 123456789012381      MSISDN    : 22331010101010
Username  : n/a                  SessionType : uplane-ipv4v6
Status    : Active               Service Name: upf
Src Context : up                  Dest Context: ISP

```

```

-----
C - Control Events (ON )      11 - PPP (ON )      21 - L2TP (ON )
D - Data Events (ON )       12 - All (ON )     22 - L2TPMGR (OFF)
E - EventID Info (ON )     13 - RADIUS Auth (ON ) 23 - L2TP Data (OFF)
I - Inbound Events (ON )   14 - RADIUS Acct (ON ) 24 - GTPC (ON )
O - Outbound Events (ON )  15 - Mobile IPv4 (ON ) 25 - TACACS (ON )
S - Sender Info (OFF)      16 - AllMGR (OFF)   26 - GTPU (OFF)
T - Timestamps (ON )       17 - SESSMGR (ON )  27 - GTPP (ON )
X - PDU Hexdump (OFF)      18 - A10 (OFF)     28 - DHCP (ON )
A - PDU Hex/Ascii (OFF)    19 - User L3 (OFF)  29 - CDR (ON )
+/- Verbosity Level ( 1)   31 - Radius COA (ON ) 30 - DHCPV6 (ON )
L - Limit Context (OFF)    32 - MIP Tunnel (ON ) 53 - SCCP (OFF)
M - Match Newcalls (ON )   33 - L3 Tunnel (OFF) 54 - TCAP (OFF)
R - RADIUS Dict: (no-override) 34 - CSS Data (OFF) 55 - MAP (ON )
G - GTPP Dict: (no-override) 35 - CSS Signal (OFF) 56 - RANAP (OFF)
Y - Multi-Call Trace (OFF) 36 - EC Diameter (ON ) 57 - GMM (ON )
H - Display ethernet (OFF) 37 - SIP (IMS) (OFF) 58 - GPRS-NS (OFF)
    39 - LMISF (OFF)
U - Mon Display (ON )      40 - IPsec IKEv2 (OFF) 59 - BSSGP (OFF)
V - PCAP Hexdump (ON)     41 - IPsec RADIUS (ON ) 60 - CAP (ON )
F - Packet Capture: (Full Pkt) 42 - ROHC (OFF) 64 - LLC (OFF)
/ - Priority ( 0)         43 - WiMAX R6 (ON ) 65 - SNDCCP (OFF)
N - MEH Header (OFF)      44 - WiMAX Data (OFF) 66 - BSSAP+ (OFF)
W - UP PCAP Trace (ON )   45 - SRP (OFF) 67 - SMS (OFF)
    68 - OpenFlow(ON )
    46 - BCMCS SERV AUTH(OFF)
    47 - RSVP (ON )
    48 - Mobile IPv6 (ON ) 69 - X2AP (ON )
    77 - ICAP/UIDH (ON )
    50 - STUN (IMS) (OFF) 78 - Micro-Tunnel(ON )
    51 - SCTP (OFF)
    72 - HNBAP (ON ) 79 - ALCAP (ON )
    73 - RUA (ON ) 80 - SSL (ON )
    74 - EGTPC (ON )
    75 - App Specific Diameter (OFF)
    81 - S1-AP (ON ) 82 - NAS (ON )
    83 - LDAP (ON ) 84 - SGS (ON )
    85 - AAL2 (ON ) 86 - S102 (ON )
    87 - PPPOE (ON )
    88 - RTP(IMS) (OFF) 89 - RTCP(IMS) (OFF)
    91 - NPDB(IMS) (OFF)
    92 - SABP (ON )
    94 - SLS (ON )
    96 - SBc-AP (ON )
    97 - M3AP (ON )
    49 - PFCP (ON )
    76 - NSH (ON )

```

(Q)uit, <ESC> Prev Menu, <SPACE> Pause, <ENTER> Re-Display Options

附註：可使用選項V啟用監控訂戶，以便生成慢速路徑/vpp PCAP。從「dir /hd-raid/records/hexdump」下載慢速路徑/vpp PCAP。

8.每個SBI介面的Wireshark有用過濾器

8.1. NG應用協定

NG應用通訊協定(NGAP)提供NG-RAN節點與存取與行動管理功能(AMF)之間的控制平面訊號。在此有一些用於NG應用協定的有用的Wireshark過濾器：

```
ngap.RAN_UE_NGAP_ID == <NGAP_ID>
ngap.procedureCode == 29
ngap.pDUSessionID == 5
```

8.2. NRF介面

NF Repository功能(NRF)支援服務發現功能並維護NF配置檔案和可用的NF例項。(不在EPC世界中)。以下是NRF介面的一些有用Wireshark過濾器：

```
http2.header.value contains "/nnrf-nfm/v1/nf-instances/"
http2.header.value == "/nnrf-nfm/v1/nf-instances/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxxxx"
json.value.string == "REGISTERED"
json.value.string == "UNDISCOVERABLE"
```

8.3. UDM註冊/訂用 (N10介面)

統一資料管理(UDM)支援身份驗證和金鑰協定(AKA)憑證的生成、使用者標識處理、訪問授權和訂閱管理。(來自EPC世界的HSS功能的一部分)。以下是N10介面的一些有用Wireshark過濾器：

```
## Registration
http2.header.value contains "/nudm-uecm/v1/imsi-" && http2.header.value contains
"/registrations/smf-registrations"

## DELETE Registration
http2.header.value == "DELETE" && http2.header.value contains "/registrations/smf-registrations"

## Subscription
http2.header.value contains "/nudm-sdm/v2/imsi-" && http2.header.value contains "/sdm-
subscriptions"

## Subscription Fetch
http2.header.value contains "/nudm-sdm/v2/" && http2.header.value contains "/sm-
data?dnn=<dnn_name>&plmn-id="
```

8.4. AMF (N11介面)

訪問和移動性管理功能(AMF)支援NAS信令終止、NAS加密和完整性保護、註冊管理、連線管理、移動性管理、訪問身份驗證和授權以及安全情景管理。(AMF具有來自EPC世界的MME功能的一部分)。以下是N11介面的一些有用Wireshark過濾器：

```
## Filter all SM-Context packages
http2.header.value contains "/nsmf-pdusession/v1/sm-contexts"

## Filter SM-Context Release
http2.header.value contains "/nsmf-pdusession/v1/sm-contexts" && http2.header.value contains
"/release"

## Filter SM-Context Retrieve
http2.header.value contains "/nsmf-pdusession/v1/sm-contexts" && http2.header.value contains
"/retrieve"

## Filter SM-Context Modify
http2.header.value contains "/nsmf-pdusession/v1/sm-contexts" && http2.header.value contains
```

```
"/modify"
```

```
## Filter all UE-Context packages
```

```
http2.header.value contains "/namf-comm/v1/ue-contexts/imsi-"
```

```
## Filter all UE-Context Assign-EBi
```

```
http2.header.value contains "/namf-comm/v1/ue-contexts/imsi-" && http2.header.value contains  
"/assign-ebi"
```

```
## Filter all UE-Context N1N2-Message
```

```
http2.header.value contains "/namf-comm/v1/ue-contexts/imsi-" && http2.header.value contains  
"/n1-n2-message"
```

```
## Filter all UE-Context Assign-EBi/N1N2-Message for specific SUPI
```

```
http2.header.value == "/namf-comm/v1/ue-contexts/imsi-xxxxxxxxxxxxxxxx/assign-ebi"
```

```
http2.header.value == "/namf-comm/v1/ue-contexts/imsi-xxxxxxxxxxxxxxxx/n1-n2-messages"
```

8.5. PCF (N7介面)

策略控制功能(PCF)支援統一的策略框架，為CP功能提供策略規則，並訪問UDR中的策略決策訂閱資訊 (PCF具有來自EPC世界的PCRF功能的一部分) 身份驗證伺服器功能(AUSF)充當身份驗證伺服器 (來自EPC世界的HSS的一部分)。在此有一些用於N7介面的有用的Wireshark過濾器：

```
### Filter all SM-Policy packages
```

```
http2.header.value contains "/npcf-smpolicycontrol"
```

```
## Filter SM-Policy Create Request
```

```
http2.header.value == "/npcf-smpolicycontrol/v1/sm-policies"
```

```
## Filter all SM-Policy from specific SUPI
```

```
http2.header.value contains "/npcf-smpolicycontrol/v1/sm-policies" && http2.header.value  
contains "imsi-xxxxxxxxxxxxxxxx"
```

```
## Filter SM-Policy Update
```

```
http2.header.value contains "/npcf-smpolicycontrol/v1/sm-policies/ism.5.imsi-" &&
```

```
http2.header.value contains "/update"
```

```
#### Filter SM-Policy Delete
```

```
http2.header.value contains "/npcf-smpolicycontrol/v1/sm-policies/ism.5.imsi-" &&
```

```
http2.header.value contains "/delete"
```

```
#### Filter SM-Policy Update Notification
```

```
http2.header.value contains "smPoliciesUpdateNotification"
```

8.6. CHF (N40介面)

計費功能(CHF)是5G SA核心網路功能，支援3GPP融合計費系統功能。CHF支援多種服務的線上和離線計費功能，包括5G和4G核心整合。以下是N40介面的一些有用Wireshark過濾器：

```
http2.header.value == "/nchf-convergedcharging/v2/chargingdata/"
```

```
http2.header.value contains "/nchf-convergedcharging/"
```

8.7.其他有用的過濾器，如代碼錯誤和RST_STREAM

```
## PDU session establishment accept
```

```
nas_5gs.sm.message_type == 0xc2
```

```
## PDU session establishment reject
```

```

nas_5gs.sm.message_type == 0xc3

## GTPv2 (filter specific IMSI)
e212.imsi == xxxxxxxxxxxxxxxx

## GTPv2 (S5/S8 interface type)
gtpv2.f_teid_interface_type == 6

## GTPv2 (S2b ePDG interface type)
gtpv2.f_teid_interface_type == 30

## Search for Specific Errors
http2.header.value == 400
http2.header.value == 404
http2.header.value == 413
http2.header.value == 410
http2.header.value == 409
http2.header.value == 500
json.value.string == CONTEXT_NOT_FOUND
json.value.string == USER_NOT_FOUND

## RST_STREAM
http2.rst_stream.error

```

附註：考慮到，為了視覺化HTTP2協定，您需要從**Analyze**對Wireshark上的埠號進行相應的解碼。選擇**Decode**作為選項。

Field	Value	Type	Default	Current
TCP port	<port_number>	Integer, base 10	none	HTTP2

檔案名稱

diagram_internetworking.png
uri.png

建議的替換文字

4G/5G網際網路絡架構
統一資源識別符號