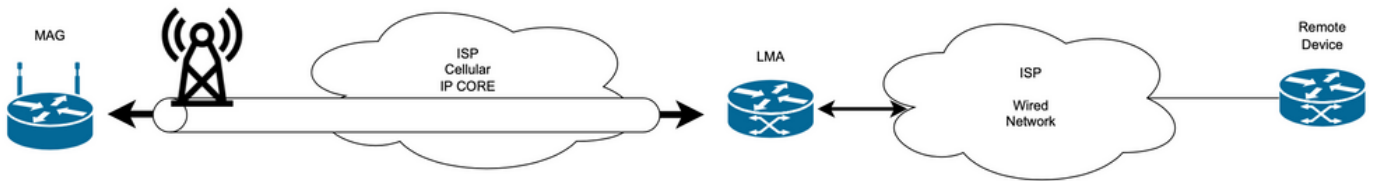


يساساً لغاشل لثمتي، اهال صإو ةلومحم ال IP تاي نقت ااطخأ فاشك تساب موقت امدنع (RNC). ةيكل سل ال ةكبش ال ي ف مكحت ال ةدحوو ل اوجل ال ةكبش ةهجاو ني ب ةديج ةراش ا دوجو ي ف لوصول ةرابع ني ب ق فن ال ةاشن ال ةمدخت ست يذل ال IP ناو نع (ISP) تنرتن ال ةمدخ ر فوم ر فوي (LMA). ةي ل حم ال ل قنن ال ةاسرا ةادأو (MAG) ل قنن ال ةانثأ

ةرادإل ةقطنم وحن PMIPv6 ق فن ةي حل ال ةي ر حبل ال ةرادإل ةومحم ئشنت ال ةئاضبل ال ةي ل حم ال

مسرل ا مدخت سا متي .MAG لى ة Tunnel ةاشن ال ةئاشل ال ةلكشم لل الح مسقلا اذ ه ر فوي ل اثمك اذ ه ةكبش لل ي طي طخت ال



LMA. هاجتاب ةق فن ال ةاشن ال MAG لى ل ر ذعتي ، ل كشل اذ ه ي ف

```
MAG#show ip interface brief | exclude unassigned
Interface          IP-Address      OK? Method Status Protocol
Cellular0/1/0     203.0.113.1    YES NVRAM  up      up
Ethernet0/1       198.51.100.254 YES NVRAM  up      up
```

ةلكشم ال صي خشت

ةحص نم ق قحتو (MAG) ةلومحم ال ةزهال ال لوصول ةرابع لى ل دوجوم ال ني وكنت ال عجار 1. ISP: لبق نم ةمدقم ال تامول عم ال

- APN = ةمزح ةكبش ب تانا ي بل لاصتا ددحي
- NAI = ISP لى ل MAG نم ةكبش ال فرعم
- لى ل حم ال ISP لبق نم ر فوم ال IP ناو نع = LMA ب صاخ ال IP ناو نع

ةي ولخل ال ةهجاو ال ي ف تامول عم ال هذ ه لى ل روثل عم ال

<#root>

```
Router#sh cellular 0/1/0 all
Hardware Information
=====
Modem Firmware Version = <version>
Modem Firmware built = 2015/03/04 21:30:23
Hardware Version = 1.0
Device Model ID: xxxx
Package Identifier ID: Cisco ID

International Mobile Subscriber Identity (IMSI) = 310410901877700
```

International Mobile Equipment Identity (IMEI) = xxxxxxxxxxxxxxxx

Integrated Circuit Card ID (ICCID) = < ICCID Number >

Mobile Subscriber Integrated Services

Digital Network-Number (MSISDN) = < MSISDN ID >

Modem Status = Online

Current Modem Temperature = 33 deg C

PRI SKU ID = <SKU ID>, PRI version = 005.026, Carrier = ISP

OEM PRI version = <version>

هجوم ال نيوكت لاثم.

نيوكت لاثم لوقح

<#root>

```
ipv6 mobile pmipv6-domain LMA-DOMAIN
replay-protection timestamp window 255
encap gre-ipv4
lma LMA_SVC
```

ipv4-address

nai IMSI@APN

lma LMA_SVC

ipv6 mobile pmipv6-mag

domain LMA-DOMAIN

role 3GPP

apn

```
address dynamic
roaming interface Cellular0/1/0 priority 1 egress-ATT LTE label MAG replay-protection timestamp window
no generate grekey
ignore grekey
```

```
interface Loopback0 < Logical Mobile Node Interface >
```

```
lma LMA_SVC LMA-DOMAIN
```

```
ipv4-address
```

```
encap gre-ipv4
```

```
logical-mn IMSI@
```

```
mobile network Ethernet0/1 < Interface to be advertised over the Tunnel0>
```

```
home interface Loopback0 < Logical Mobile Node Interface >
```

نيوكتال لاثم

```
<#root>
```

```
ipv6 mobile pmipv6-domain LMA-DOMAIN
replay-protection timestamp window 255
```

```
encap gre-ipv4
```

```
lma LMA_SVC
```

```
ipv4-address 203.0.113.10
```

```
nai 310410901877700@13511.mcs
```

```
lma LMA_SVC
```

```
ipv6 mobile pmipv6-mag MAG819 domain LMA-DOMAIN
```

```
role 3GPP
```

```
apn 13511.mcs
```

```
address dynamic
roaming interface Cellular0/1/0 priority 1 egress-ATT LTE label MAG replay-protection timestamp window
```

```

no generate grekey
ignore grekey
interface Loopback0
 lma LMA_SVC LMA-DOMAIN

ipv4-address 203.0.113.10

encap gre-ipv4

logical-mn 310410901877700@13511.mcs

mobile network Ethernet0/1

home interface Loopback0

```

2. LMA ب لاصتال لواجي MAG نأ لى INIT ةلاج ريشت . MAG ةلاج نم ققحت لال .

<#root>

a) non-working example

MAG#

```
show ipv6 mobile pmipv6 mag binding
```

```
Total number of bindings: 1
```

```
-----
[Binding][MN]: Domain: LMA-DOMAIN, Nai: 310410901877700@13511.mcs
[Binding][MN]:
```

```
State: INIT
```

```
[Binding][MN]: Interface: Loopback0
[Binding][MN]:
```

```
HoA: 0.0.0.0, Att: 4, l1id: 310410901877700@135
```

```
[Binding][MN]: HNP: 0
[Binding][MN]: APN: 13511.mcs
[Binding][MN][LMA]: Id: LMA_SVC
[Binding][MN][LMA]: Lifetime: 0
[Binding][MN]: Yes
[Binding][MN][Mobile Network]: Ethernet0/1
[Binding][MN][PATH]: interface: Cellular0/1/0, Label: MAG
State: PATH_INIT
Refresh time: 0(sec), Refresh time Remaining: 0(sec)
-----
```

b) working example

```
MAG#show ipv6 mobile pmipv6 mag binding
```

```
Total number of bindings: 1
```

```
-----  
[Binding][MN]: Domain: LMA-DOMAIN, Nai: 310410901877700@13511.mcs  
[Binding][MN]:
```

```
State: ACTIVE
```

```
[Binding][MN]: Interface: Loopback0  
[Binding][MN]:
```

```
Hoa: x.x.x.x, Att: 4, l1id: 310410901877700@135
```

```
[Binding][MN]: HNP: 0  
[Binding][MN]: APN: 13511.mcs  
[Binding][MN][LMA]: Id: LMA_SVC  
[Binding][MN][LMA]: Lifetime: 3600  
[Binding][MN]: Yes  
[Binding][MN][Mobile Network]: Ethernet0/1  
[Binding][MN][PATH]: interface: Cellular0/1/0, Label: MAG  
State: PATH_ACTIVE  
Tunnel: Tunnel0  
Refresh time: 300(sec), Refresh time Remaining: 299(sec)  
[Binding][MN][PATH][GREKEY]: Upstream: 0, Downstream: 0  
-----
```

3. درلواو بلطلال يهو، PBAs و PBUs يه مامتهالال لئاسر. هجومالال ىلع MAG ةلاح نم ققحتالال لال. LMA ىل MAG نم طبرلل

```
<#root>
```

```
MAG#show ipv6 mobile pmipv6 mag stats
```

```
-----  
[MAG819]: Total Bindings : 1
```

```
[MAG819]: PBU Sent : 6
```

```
[MAG819]: PBA Rcvd : 0
```

```
[MAG819]: PBRI Sent : 0
```

```
[MAG819]: PBRI Rcvd : 0
```

```
[MAG819]: PBRA Sent : 0
```

```
[MAG819]: PBRA Rcvd : 0
```

```
[MAG819]: No Of handoff : 0
```

```
Detailed Statistics Information
```

```
< snip >
```

4. ISP وحن ةديج ةراشالال ىلع يوتحت ةيولخالال ةهجالال تنالك اذا ام ةحص نم ققحتالال لال.

دنتس م ل اذ ق اطن ج راخ ا ه ا ل ص ا و ل ا و ج ل ا ة ك ب ش ا ط ا خ ا ف ا ش ك ت س ا : ة ظ ح ا ل م

لئاسرلا لدابت ةحص نم ققحتلل يس اساس ال ماظنلا لىلع اطاخ ال احيصت ني كمتب مق 5. ل MAG و LMA ني ب

<#root>

MAG#debug ipv6 mobile mag events

```
*Apr 14 20:53:30.772: PMIPv6 RIB_RWATCH: Debugging is ON
*Apr 14 20:53:30.773: [PMIPv6_LMN_EVENT]: Attach Timer expired
*Apr 14 20:53:30.773: [PMIPv6_LMN_EVENT]: Event received Attach timer expiry in state: LMN_READY, new s
*Apr 14 20:53:30.773: [PMIPv6_LMN_EVENT]: Logical MN (310410901877700@13511.mcs) sending Attach trigger
*Apr 14 20:53:30.773: [PMIPv6_LMN_EVENT]: Starting Logical MN attach timer, period (5000)
*Apr 14 20:53:30.773: [PMIPv6_MAG_EVENT]: Trigger request received (Session create trigger) from (31041
*Apr 14 20:53:30.773: [PMIPv6_MAG_EVENT]: Trigger attach request received
*Apr 14 20:53:30.773: [PMIPv6_MAG_EVENT]: Event received Old MN intf attached for Nai: 310410901877700@
*Apr 14 20:53:30.773: [PMIPv6_MAG_EVENT]: Event received First path created for Nai: 310410901877700@13
```

*Apr 14 20:53:33.397: [PMIPV6_MAG_EVENT]: Retx Timer expired for Nai: 310410901877700@13511.mcs
*Apr 14 20:53:33.397: [PMIPV6_MAG_EVENT]: Event received ReTx timer exhausted for Nai: 310410901877700@13511.mcs
*Apr 14 20:53:33.397: [PMIPV6_MAG_EVENT]: Event received Last path Down for Nai: 310410901877700@13511.mcs
*Apr 14 20:53:33.397: [PMIPV6_MAG_EVENT]:

Event received New MN intf attached for Nai: 310410901877700@13511.mcs in path state machine, path: Cell

*Apr 14 20:53:33.398: [PMIPV6_MAG_EVENT]: Starting Retx timer, period (1000)
*Apr 14 20:53:33.398: [PMIPV6_MM_EVENT]: Allocated packet of size 152 with tlv length 140
*Apr 14 20:53:33.398: [PMIPV6_MAG_EVENT]:

PBU message sent for Nai: 310410901877700@13511.mcs

*Apr 14 20:53:33.398: [PMIPV6_MAG_EVENT]: Event received First path created for Nai: 310410901877700@13511.mcs
*Apr 14 20:53:34.423: [PMIPV6_MAG_EVENT]: Retx Timer expired for Nai: 310410901877700@13511.mcs
*Apr 14 20:53:34.423: [PMIPV6_MAG_EVENT]:

Event received PBU Retx timer expired for Nai: 310410901877700@13511.mcs in path state machine, path: Cell

*Apr 14 20:53:34.423: [PMIPV6_MM_EVENT]: Allocated packet of size 152 with tlv length 140
*Apr 14 20:53:34.423: [PMIPV6_MAG_EVENT]: PBU message sent for Nai: 310410901877700@13511.mcs
*Apr 14 20:53:34.423: [PMIPV6_MAG_EVENT]: Starting Retx timer for Nai: 310410901877700@13511.mcs, period (1000)
*Apr 14 20:53:34.423: [PMIPV6_MAG_EVENT]: Event received First path created for Nai: 310410901877700@13511.mcs

اهي ف رظنل بجي يتلا ةماهل تال جسل:

أ) LMA ب لاصتال MAG أدب ي

*Apr 14 20:53:33.397: [PMIPv6_MAG_EVENT]: مت ل قفرم MN INTF ديدج ثدح لابق تسإ م ت ل ي ر ب أ: 310410901877700@13511.mcs
ةال جال: 0/1/0 لاول جال ةكبش: راسم ل، راسم ل ةال ج زا ه ج ي ف 310410901877700@13511.mcs
ةال جال ةال جال: Path_Init، لال جال، PATH_NULL

0 قونل ءاشن ل LMA ل ل PBU ةال س ر ل اسر ا ب

*Apr 14 20:53:33.398: [PMIPv6_MAG_EVENT]: مت ل قفرم PBU ل نAI: 310410901877700@13511.mcs

ل و ا ج ي و . ل م ع ل ق و س م ي ظ ن ت ة ئ ي ه ن م ر ا ر ق ا ل ي ل ع ي ر ك س ع ل م ا ع ل ب ئ ا ن ل ل و و ص ح م د ع ج
ق ف ن ل ء ا ش ن ل ي ر خ أ ة ي ن د م ة ي ا م ح ة د ح و ل ا س ر ا ي ر ك س ع ل م ا ع ل ب ئ ا ن ل ل

*Apr 14 20:53:34.423: [PMIPv6_MAG_EVENT]: مت ل قفرم PBU RETX ل ص ا خ ل نAI: 310410901877700@13511.mcs
ةال جال: 0/1/0 لاول جال ةكبش: راسم ل، راسم ل ةال ج زا ه ج ي ف 310410901877700@13511.mcs
ةال جال ةال جال: Path_Init، لال جال، PATH_INIT

6. ل ي ل د . PBA مزح لسري ال LMA نأ نم ققحتل (EPC) ةنمضم ةمزح طاقتل ي فرمت سا .
[نمضم ل مزح ل طاقتل نيوك ت](#)

<#root>

MAG#

monitor capture cap control-plane both access-list tac buffer size 10

MAG#

```
monitor capture cap start
```

< wait at least 3 minutes >

MAG#

```
show monitor capture cap buffer brief
```

#	size	timestamp	source	destination	dscp	protocol
0	194	0.000000	203.0.113.2	-> 203.0.113.10	0 BE	UDP
1	194	1.024000	203.0.113.2	-> 203.0.113.10	0 BE	UDP
2	194	3.075008	203.0.113.2	-> 203.0.113.10	0 BE	UDP
3	194	7.109994	203.0.113.2	-> 203.0.113.10	0 BE	UDP
4	194	15.178991	203.0.113.2	-> 203.0.113.10	0 BE	UDP
5	194	31.246041	203.0.113.2	-> 203.0.113.10	0 BE	UDP
6	194	65.757016	203.0.113.2	-> 203.0.113.10	0 BE	UDP
7	194	66.780010	203.0.113.2	-> 203.0.113.10	0 BE	UDP
8	194	68.828011	203.0.113.2	-> 203.0.113.10	0 BE	UDP
9	194	72.861014	203.0.113.2	-> 203.0.113.10	0 BE	UDP
10	194	80.931003	203.0.113.2	-> 203.0.113.10	0 BE	UDP

PBU مزح لسري (ISP لبق نم ني عمل ناو ناع) IP 203.0.113.2 ناو ناع نأ ة مزح ل طاق ت ل ا ح ض و ي
ل ل ا ناو ناع ل LMA IP 203.0.113.10.

(bootflash) ة ت ق و م ل ا د ي ه م ت ل ا ة ر ك ا ذ ل ل ا ط ا ق ت ل ا ل ا ر ي د ص ت ن ك م ي ، ل ي ص ا ف ت ل ا ن م د ي ز م ل
ل ع TFTP م دا خ ل ل ا ل ي م ح ت و <name>.pcap monitor capture cap export bootflash: رم ا ل ا م ا د خ ت س ا ب
.pcap ف ل م ة ئ ه

ل س ر ي ال LMA ن ك ل و ، ل LMA ل ر ا ر ق ل ا ل ا MAG ب ل ط ت ، ا ه ر ي د ص ت م ت ي ت ل ا ط ا ق ت ل ا ل ا ة ل م ع ي ف
م ز ح PBA.

No.	Time	Delta	Source	Destination	seq
1	2023-04-14 17:45:29.814945	0.000000	203.0.113.2	203.0.113.10	Binding Update
2	2023-04-14 17:45:30.838945	1.024000	203.0.113.2	203.0.113.10	Binding Update
3	2023-04-14 17:45:32.889953	2.051008	203.0.113.2	203.0.113.10	Binding Update
4	2023-04-14 17:45:36.924939	4.034986	203.0.113.2	203.0.113.10	Binding Update
5	2023-04-14 17:45:44.993936	8.068997	203.0.113.2	203.0.113.10	Binding Update
6	2023-04-14 17:46:01.060986	16.067050	203.0.113.2	203.0.113.10	Binding Update
7	2023-04-14 17:46:35.571961	34.510975	203.0.113.2	203.0.113.10	Binding Update
8	2023-04-14 17:46:36.594955	1.022994	203.0.113.2	203.0.113.10	Binding Update
9	2023-04-14 17:46:38.642956	2.048001	203.0.113.2	203.0.113.10	Binding Update
10	2023-04-14 17:46:42.675959	4.033003	203.0.113.2	203.0.113.10	Binding Update
11	2023-04-14 17:46:50.745948	8.069989	203.0.113.2	203.0.113.10	Binding Update

```

> Frame 1: 194 bytes on wire (1552 bits), 194 bytes captured (1552 bits)
> Ethernet II, Src: 00:00:00_00:00:00 (00:00:00:00:00:00), Dst: 00:00:00_00:00:00 (00:00:00:00:00:00)
> Internet Protocol Version 4, Src: 203.0.113.2, Dst: 203.0.113.10
> User Datagram Protocol, Src Port: 5436, Dst Port: 5436
v Mobile IPv6
  Payload protocol: No Next Header for IPv6 (59)
  Header length: 18 (152 bytes)
  Mobility Header Type: Binding Update (5)
  Reserved: 0x00
  Checksum: 0x0001
  v Binding Update
    Sequence number: 90
    1... .. = Acknowledge (A) flag: Binding Acknowledgement requested
    .1. .... = Home Registration (H) flag: Home Registration
    ..0. .... = Link-Local Compatibility (L) flag: No Link-Local Address Compatibility
    ...0 .... = Key Management Compatibility (K) flag: No Key Management Mobility Compatibility
    .... 0... = MAP Registration Compatibility (M) flag: No MAP Registration Compatibility
    .... .0.. = Mobile Router (R) flag: No Mobile Router Compatibility
    .... ..1. = Proxy Registration (P) flag: Proxy Registration
    .... ...0 = Forcing UDP encapsulation (F) flag: No Forcing UDP encapsulation
    .... .... 0... = TLV-header format (T) flag: No TLV-header format
    .... .... .0.. = Bulk-Binding-Update flag (B): Disable bulk binding update support
    Lifetime: 900 (3600 seconds)
  > Mobility Options

```

7. PMIP ةمدخ ني كم ت نع لأس او يلحم ال ISP ب لصتا . ISP ىل ةلوزعم ةلكشم ال هذه .

لدا بت) LMA ه اجت اب PMIPv6 ق فن عاش ن اب (MAG) ت ال ب ال ةراد ة عوم جم مقت مل (PBA و PBU مزح

ةلكشم ال صرخشت

1. (MAG) ةلومحم ال ةزهأل ال ىل لوصول ةرابع ىل ع دوجوم ال نيوكت ال عجار .

2. LMA و MAG ني ب طابتر ال نم ققحت .

<#root>

MAG

```
#sh ipv6 mobile pmipv6 mag binding
```

MAG#

3. PBA و PBU لئاسر ةحص نم ققحت ال .

<#root>

MAG#

```
show ipv6 mobile pmipv6 mag stats
```

```
-----  
[MAG819]: Total Bindings      : 0
```

```
[MAG819]: PBU Sent           : 48
```

```
[MAG819]: PBA Rcvd          : 36
```

```
[MAG819]: PBRI Sent         : 0
```

```
[MAG819]: PBRI Rcvd        : 0
```

```
[MAG819]: PBRA Sent         : 0
```

```
[MAG819]: PBRA Rcvd        : 0
```

```
[MAG819]: No Of handoff     : 0  
-----
```

<snip>

Trigger Sent Stats

```
Response to DHCP DISCOVER      : 0   Response to DHCP REQUEST      : 0
```

```
Response to ARP REQUEST        : 0
```

```
Response to GARP                : 0   Response to Rtr Solicitation  : 0
```

```
ATTACH QUERY Sent              : 0
```

```
CLEANUP INDICATION Sent        : 37
```

```
Resp to MCSA CREATE REQ        : 62
```

```
Resp to MCSA UPD REQ           : 0
```

```
Resp to MCSA DEL REQ           : 0
```

LMA ضفري امدن ع LMA ب لاصتال ب لطي MAG نأ لى لى MCSA Create REQ لى لى RESP ريشي أ) PBU، فيظنتل اةراش لى لاسرب MAG أدبي.

يذلا أطخل زمر قي قودتل IPv6 ب ةصاخلا ةلومحمل اةزهأل اةراد لى ةومجم شادح لى ني كم تب مق 4. MAG لى لع رهظي

<#root>

```
*Apr 17 18:13:22.885: [PMIPV6_LMN_EVENT]: Attach Timer expired
```

```
*Apr 17 18:13:22.885: [PMIPV6_LMN_EVENT]: Event received Attach timer expiry in state: LMN_READY, new s
```

```
*Apr 17 18:13:22.885: [PMIPV6_LMN_EVENT]: Logical MN (310410901877700@13511.mcs) sending Attach trigger
```

```
*Apr 17 18:13:22.885: [PMIPV6_LMN_EVENT]: Starting Logical MN attach timer, period (5000)
```

```
*Apr 17 18:13:22.885: [PMIPV6_MAG_EVENT]: Trigger request received (Session create trigger) from (31041
```

```
*Apr 17 18:13:22.885: [PMIPV6_MAG_EVENT]: Trigger attach request received
```

```
*Apr 17 18:13:22.885: [PMIPV6_MAG_EVENT]:
```

```
Event received New MN intf attached for Nai: 310410901877700@13511.mcs in path state machine, path: Cell
```

```
*Apr 17 18:13:22.885: [PMIPV6_MAG_EVENT]: Starting Retx timer, period (1000)
```

```
*Apr 17 18:13:22.885: [PMIPV6_MM_EVENT]: Allocated packet of size 160 with tlv length 148
```

```
*Apr 17 18:13:22.885: [PMIPV6_MAG_EVENT]:
```

```
PBU message sent for Nai: 310410901877700@13511.mcs
```

```
*Apr 17 18:13:22.885: [PMIPV6_MAG_EVENT]: Event received First path created for Nai: 310410901877700@13
```

```
*Apr 17 18:13:22.886: [PMIPV6_MAG_EVENT]:
```

```
message received: PBA
```

*Apr 17 18:13:22.886: [PMIPV6_MAG_EVENT]:

PBU rejected by LMA, NAI:310410901877700@13511.mcs, status: 130

*Apr 17 18:13:22.886: [PMIPV6_MAG_EVENT]:

PBA: nai(310410901877700@13511.mcs),nai len: 26, lli (310410901877700@135), ll len: 21, att:4, lifetime:

*Apr 17 18:13:22.886: [PMIPV6_MAG_EVENT]:

Event received PBA reject for Nai: 310410901877700@13511.mcs in path state machine, path: Cellular0/1/0,

<snip>

*Apr 17 18:13:22.886: [PMIPV6_MAG_EVENT]: S

ending cleanup ind reason Last path Down, orig_event PBA reject

*Apr 17 18:13:22.886: [PMIPV6_LMN_EVENT]:

Event received Cleanup request from MAG in state: LMN_READY, new state: LMN_READY

*Apr 17 18:13:22.886: [PMIPV6_MAG_EVENT]:

Nai: 310410901877700@13511.mcs, Sending IPv4 address cleanup indication for address (0.0.0.0)

*Apr 17 18:13:22.886: [PMIPV6_MAG_EVENT]: Nai: 310410901877700@13511.mcs, Binding Removed

اهي ف رظننل بجي يتل ةماهلا تالجسلا

أ) LMA ب لاصتال ءدبب MAG موقوي

*17 18:13:22.885: [PMIPv6_MAG_EVENT]: ل قفرم MN INTF دي دج ثدح لابقس مت
NAI: 310410901877700@13511.mcs ف راسملا ةلاح زاهج ف
ةلاحلا، ةلاوجل ةكبش: راسملا، راسملا ةلاح زاهج ف
Path_Init: ةديدل ةلاحلا، PATH_NULL

ب) لمعل ةرازو ل ةبطل نوؤشلا ةرازو نم لسرم وبل

*17 18:13:22.885: [PMIPv6_MAG_EVENT]: ل ناي ل PBU ةلاسرا لاسرا مت
310410901877700@13511.mcs

ج) LMA نم دراوال PBA

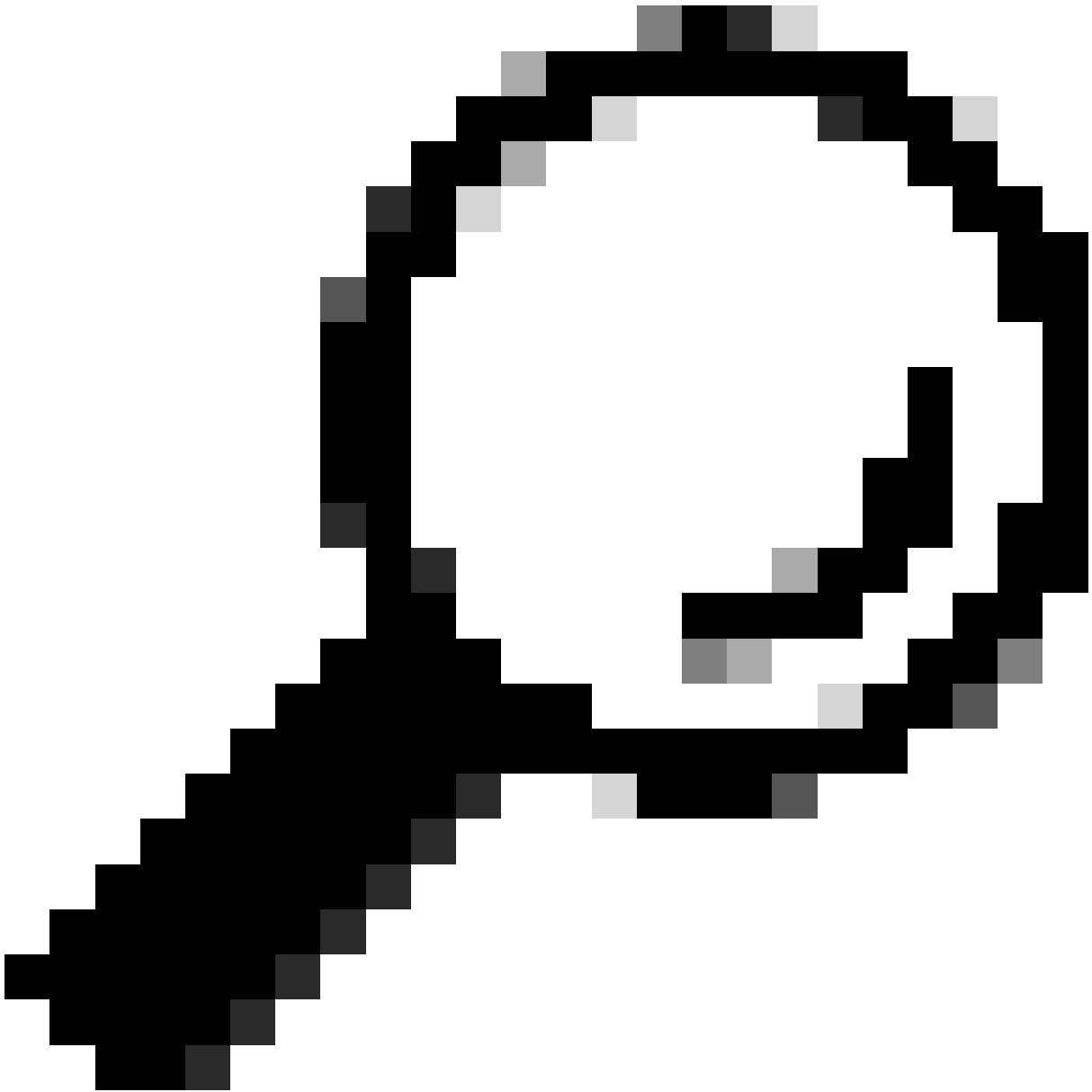
*17 18:13:22.886: [PMIPv6_MAG_EVENT]: ل ناي ل PBA ةلاسرا لاسرا مت

د) 130 زمرلا ببسب LMA ةطساوب PBU ةلاسرا صرفر

*17 18:13:22.886: [PMIPv6_MAG_EVENT]: ل ناي ل PBU ةطساوب صرفر مت
NAI:310410901877700@13511.mcs، ةلاحلا: 130

ه) 130 زمرلا ببسب MAG لبق نم PBA ةلاسرا صرفر

*17 18:13:22.886: [PMIPv6_MAG_EVENT]: PBA:
NAI(310410901877700@13511.mcs),Nai len: 26, LLI (310410901877700@135), ll len: 21، ف:4،
رمعل:0، ةلاحلا:130



وأق فنللا عاشن | لوبقل LMA ةطساوب ءاطخألا حيحصت ىلع ةلألا لاسرا متي :فرط
MAG لبق نم PBA يقلت متي امدنع زومرلا هذه ةيؤر نكمي .هضفر
PBA: NAI(310410901877700@13511.mcs),Nai len: 26، LLI
(310410901877700@135)، ll len: 21، ف:4، رمعلا، 0:لألا، 130:ةلألا

ميقلا زومر ىلا عوجرلا ىجري.

ةميقلا دوك	فصولا
0	طب رلا شي دحت لوبق مت
1	يرورضة ئدابلا فاشتك نكلو لوبقم
128	ددحم ريغ ببس

129	ايرادا روظحم
130	ةيفاك ريغ دراوم
131	م و عدم ريغ يلزنم لايحستلا
132	ةيلزنم ةيعرف ةكبش تسيل
133	هذه لقننتلا ةدقعل يسيسئرلا ليكولا سيل
134	ةرركم لانيوانعل نع فشكلا لشف
135	ةذفانلا جراخ يلسلسلا مقررلا
136	ةيصالصلا يهتنم يسيسئرلا Nonce سرهف
137	ةيصالصلا ةيهتنم ةيعرلا رشؤم
138	ةيصالصلا مدع تالاح
139	لايحستلا عون ريغيغت بحوم سم ريغ

ةمزح نم لاوجلل IPv6 سار نم ققحتو هجوملا يلع مكحتلا يوتسم طاقنتلا يف رمتسا 5. رارقالا.

ةنراقم تاطول

أطخ عم سار

```

User Datagram Protocol, Src Port: 5436, Dst Port: 5436
Mobile IPv6
  Payload protocol: No Next Header for IPv6 (59)
  Header length: 16 (136 bytes)
  Mobility Header Type: Binding Acknowledgement (6)
  Reserved: 0x00
  Checksum: 0x0000
  Binding Acknowledgement
    Status: Insufficient resources (130)
    0... .. = Key Management Compatibility (K) flag: No Key Management Mobility Compatibility
    .0.. .. = Mobile Router (R) flag: No Mobile Router Compatibility
    ..1. .... = Proxy Registration (P) flag: Proxy Registration
    ...0 .... = TLV-header format (T) flag: No TLV-header format
    .... 0... = Bulk-Binding-Update flag (B): Disabled bulk binding update support
    Sequence number: 149
    Lifetime: 0 (0 seconds)
  Mobility Options
    > MIPv6 Option - PadN
    > MIPv6 Option - Mobile Node Identifier: 310410901877700@13511.mcs
    MIPv6 Option - Pad1
    > MIPv6 Option - Handoff Indicator: Handoff state unknown
    > MIPv6 Option - Access Technology Type Option: IEEE 802.11a/b/g
    > MIPv6 Option - PadN
    > MIPv6 Option - Timestamp: May 8, 2023 17:33:10.175094604 UTC
    > MIPv6 Option - PadN
    > MIPv6 Option - Mobile Node Link-layer Identifier
    MIPv6 Option - Pad1
    > MIPv6 Option - IPv4 Home Address Reply: Virtual : 0.0.0.0
    > MIPv6 Option - GRE Key
    > MIPv6 Option - PadN
    > MIPv6 Option - Vendor Specific: 3GPP Protocol Configuration Options
    MIPv6 Option - Pad1
    MIPv6 Option - Pad1
    MIPv6 Option - Pad1
    MIPv6 Option - Pad1
    MIPv6 Option - Pad1
  
```

Code 130 insufficient information

LMA did not reply with a success address to establish the tunnel

أطخ نودب س آر


```

header length: 10 (152 bytes)
Mobility Header Type: Binding Acknowledgement (6)
Reserved: 0x00
Checksum: 0x0000
✓ Binding Acknowledgement
  Status: Binding Update accepted (0)
  Accepted Binding Code 0
  0... .... = Key Management Compatibility (K) flag: No Key Management Mobility Compatibility
  .0.. .... = Mobile Router (R) flag: No Mobile Router Compatibility
  ..1. .... = Proxy Registration (P) flag: Proxy Registration
  ...0 .... = TLV-header format (T) flag: No TLV-header format
  .... 0... = Bulk-Binding-Update flag (B): Disabled bulk binding update support
  Sequence number: 150
  Lifetime: 900 (3600 seconds)
  Mobility Options
  > MIPv6 Option - PadN
  > MIPv6 Option - Mobile Node Identifier: 310410901877700@13511.mcs
  > MIPv6 Option - Handoff Indicator: Handoff state unknown
  > MIPv6 Option - Access Technology Type Option: IEEE 802.11a/b/g
  > MIPv6 Option - PadN
  > MIPv6 Option - Timestamp: May 8, 2023 17:33:15.187896728 UTC
  > MIPv6 Option - PadN
  > MIPv6 Option - Mobile Node Link-layer Identifier
  MIPv6 Option - Pad1
  > MIPv6 Option - IPv4 Home Address Reply: Success : 1.1.1.2
  > MIPv6 Option - IPv4 Default-Router Address: 1.1.1.1
  > MIPv6 Option - GRE Key
  > MIPv6 Option - PadN
  > MIPv6 Option - Vendor Specific: 3GPP Protocol Configuration Options
  MIPv6 Option - Pad1
  MIPv6 Option - Pad1
  MIPv6 Option - Pad1
  MIPv6 Option - Pad1
  MIPv6 Option - Pad1
  MIPv6 Option - Pad1
  MIPv6 Option - Pad1
  MIPv6 Option - Pad1
  MIPv6 Option - Pad1
  > MIPv6 Option - Delegated Mobile Network Prefix: 192.168.1.0/24
  > MIPv6 Option - PadN

```

LMA replied with an IP address for establish the reverse Tunnel

6. يوتحي ال، ةلاجل هذه يف. يلحمل (ISP) تنرتنإل ةمدخ دوزم مادختساب ةحصل نم ققحتل. ل. يسكعلا قفنلا عاشنإل لزمنلا ناوئع ىل ع LMA در

LMA وحن PMIPv6 دتري

```

*May 8 23:09:33.631: %LINEPROTO-5-UPDOWN: Line protocol on Interface Tunnel0, changed state to up
*May 8 23:09:33.632: %PMIPV6-5-TUNNELUP: Bringing up the Proxy Mobile IPv6 tunnel Tunnel0
*May 8 23:15:39.067: %PMIPV6-5-TUNNELDELETE: Deleting the Proxy Mobile IPv6 tunnel Tunnel0
*May 8 23:17:16.655: %LINEPROTO-5-UPDOWN: Line protocol on Interface Tunnel0, changed state to up
*May 8 23:17:16.656: %PMIPV6-5-TUNNELUP: Bringing up the Proxy Mobile IPv6 tunnel Tunnel0

```

ةلكشملا صيخشت

1. ةديج ةراشإ ىل ع يوتحي يئاولا نأ نم دكأت.

دنتس م لا اذه قاطن جراخ اه حال ص او ل او جلا ة ك ب ش ء اطخ ا ف اش ك ت س ا : ة ظ ح الم

LMA. لى PBU مزح لسرى زاهجلا ناك اذا ام نم ققحت ل IPv6 mobile زاهج طيشنتب مق 2.

<#root>

*May 9 20:28:26.784: [PMIPv6_LMN_EVENT]:

Attach Timer expired

*May 9 20:28:26.784: [PMIPv6_LMN_EVENT]:

Event received Attach timer expiry in state: LMN_READY, new state: LMN_READY

*May 9 20:28:26.784: [PMIPv6_LMN_EVENT]: Logical MN (310410901877700@13511.mcs) sending Attach trigger

*May 9 20:28:26.784: [PMIPv6_LMN_EVENT]: Starting Logical MN attach timer, period (5000)

*May 9 20:28:26.784: [PMIPv6_MAG_EVENT]: Trigger request received (Session create trigger) from (31041

*May 9 20:28:26.784: [PMIPv6_MAG_EVENT]: Trigger attach request received

*May 9 20:28:26.784: [PMIPv6_MAG_EVENT]:

Event received Old MN intf attached for Nai: 310410901877700@13511.mcs in path state machine, path: Cel

*May 9 20:28:26.784: [PMIPV6_MAG_EVENT]:

Event received First path created for Nai: 310410901877700@13511.mcs in state: INIT, new state: INIT

At this point the MAG waits for a reply from the LMA to establish the tunnel. Since the timer expires,

*May 9 20:28:39.523: [PMIPV6_MAG_EVENT]:

Event received Last path Down for Nai: 310410901877700@13511.mcs in state: INIT, new state: NULL

*May 9 20:28:39.523: [PMIPV6_MAG_EVENT]: Trigger Reply sent in Bul Null state entry for Nai: 310410901

*May 9 20:28:39.523: [PMIPV6_LMN_EVENT]: Event received Trigger Attach Failure in state: LMN_READY, new

< snip >

*May 9 20:28:39.523: [PMIPV6_MAG_EVENT]:

sending cleanup ind reason Last path Down, orig_event Retx timer exhausted

*May 9 20:28:39.523: [PMIPV6_LMN_EVENT]:

Event received Cleanup request from MAG in state: LMN_READY, new state: LMN_READY

*May 9 20:28:39.523: [PMIPV6_MAG_EVENT]:

Nai: 310410901877700@13511.mcs, Sending IPv4 address cleanup indication for address (0.0.0.0)

*May 9 20:28:39.523: [PMIPV6_MAG_EVENT]:

Nai: 310410901877700@13511.mcs, Binding Removed

< Snip >

*May 9 20:28:41.955: [PMIPV6_MAG_EVENT]: Event received New MN intf attached for Nai: 310410901877700@13

*May 9 20:28:41.955: [PMIPV6_MAG_EVENT]: Starting Retx timer, period (1000)

*May 9 20:28:41.955: [PMIPV6_MM_EVENT]: Allocated packet of size 160 with tlv length 148

*May 9 20:28:41.955: [PMIPV6_MAG_EVENT]:

PBU message sent for Nai: 310410901877700@13511.mcs

*May 9 20:28:41.956: [PMIPV6_MAG_EVENT]: Event received First path created for Nai: 310410901877700@13

*May 9 20:28:42.979: [PMIPV6_MAG_EVENT]: Retx Timer expired for Nai: 310410901877700@13511.mcs

*May 9 20:28:42.979: [PMIPV6_MAG_EVENT]: Event received PBU Retx timer expired for Nai: 310410901877700

*May 9 20:28:42.979: [PMIPV6_MM_EVENT]: Allocated packet of size 160 with tlv length 148

*May 9 20:28:42.979: [PMIPV6_MAG_EVENT]:

PBU message sent for Nai: 310410901877700@13511.mcs

*May 9 20:28:42.979: [PMIPV6_MAG_EVENT]: Starting Retx timer for Nai: 310410901877700@13511.mcs,period

*May 9 20:28:42.979: [PMIPV6_MAG_EVENT]: Event received First path created for Nai: 310410901877700@13

*May 9 20:28:45.027: [PMIPV6_MAG_EVENT]: Retx Timer expired for Nai: 310410901877700@13511.mcs

*May 9 20:28:45.027: [PMIPV6_MAG_EVENT]: Event received PBU Retx timer expired for Nai: 310410901877700

*May 9 20:28:45.027: [PMIPV6_MM_EVENT]: Allocated packet of size 160 with tlv length 148

*May 9 20:28:45.027: [PMIPV6_MAG_EVENT]: PBU message sent for Nai: 310410901877700@13511.mcs

في MAG نم فيظنت بلط ثدحلا ىقلت : [PMIPv6_LMN_EVENT]: 20:28:39.523، ويام 9*
LMN_READY: ةديدحلا ةلاحلا، LMN_READY: ةلاحلا

لاسرا : 310410901877700@13511.mcs، ويام 9* : [PMIPv6_MAG_EVENT]:
0.0.0.0) ناونعلا ل IPv4 ناونع فيظنت ةراش

تمت : 310410901877700@13511.mcs، ويام 9* : [PMIPv6_MAG_EVENT]:
طبرلا ةلازا

ةئيهت ب PBA موقى، MAG ىقلت درجم بو 0. ديدج قفن ءاشنإل LMA ىلإ PBU ةلاسرا لسرت ج)
قفلل.

NAI: ل PBU ةلاسرا لسرا مت: [PMIPv6_MAG_EVENT]: 20:28:41.955، ويام 9*
310410901877700@13511.mcs

ةرارزلا ةرازو نداعملاو ةرارزلا ةرازو لبق نم هلوبقو PBA ىقلت د)

PBA: اه ىقلت مت ىتلا ةلاسرا ل: [PMIPv6_MAG_EVENT]: 20:28:45.228، ويام 9*
PBA: NAI(310410901877700@13511.mcs)، NAI: [PMIPv6_MAG_EVENT]: 20:28:45.228، ويام 9*
len: 26، LLI (310410901877700@135)، ll len: 21، في: 4، رمعل: 3600، ةلاحلا: 0
NAI: ل PBA ACCEPT ثدحلا ىقلت مت : [PMIPv6_MAG_EVENT]: 20:28:45.228، ويام 9*
310410901877700@13511.mcs في ةلاح زاغ ي: راسملا، راسملا ةلاح زاغ ي: ةلاحلا: 0/1/0،
PATH_INIT، ةديدحلا ةلاحلا: Path_Active

0. قفلل ءاشنإل ه)

Tunnel0 ل ناونعلا ريغت ثدح ىقلت مت : [PMIPv6_LMN_EVENT]: 20:28:45.229، ويام 9*
ىتلا ةلاحلا، ةلاحاولا قفن ىلع طخلا لوكوتورب : %Lineproto-5-updown: 20:28:45.229، ويام 9*
ىلعأ ىلإ اهريغت مت
Mobile لىكولل IPv6 Tunnel0 قفن راهظا : %PMIPv6-5-tunnelup: 20:28:45.230، ويام 9*

3. MAG و نيب مزحلا ةكراشم نم ققحتو هجوملا ىلع مكحتلا ىوتسم طاقتل في رمتسا
LMA.

No.	Time	Source	Destination	seq
3	2023-05-08 17:39:27.111994	203.0.113.2	203.0.113.10	Binding Update
5	2023-05-08 17:39:30.184528	203.0.113.2	203.0.113.10	Binding Update
11	2023-05-08 17:39:42.285758	203.0.113.2	203.0.113.10	Binding Update
19	2023-05-08 17:39:58.357894	203.0.113.2	203.0.113.10	Binding Update
20	2023-05-08 17:39:58.368576	203.0.113.10	203.0.113.2	Binding Acknowledgement
66	2023-05-08 17:44:59.532368	203.0.113.2	203.0.113.10	Binding Update
69	2023-05-08 17:45:13.679442	203.0.113.2	203.0.113.10	Binding Update
76	2023-05-08 17:45:44.998085	203.0.113.2	203.0.113.10	Binding Update
77	2023-05-08 17:45:48.062409	203.0.113.2	203.0.113.10	Binding Update
79	2023-05-08 17:45:48.083544	203.0.113.10	203.0.113.2	Binding Acknowledgement

نيزختلا ةرادا بيچتست LMA. ىلإ رارقلا MAG بلطي، ةردصملا ءاليتسالا ةيلمع في
هذه ىقلت متي ال، ةلكشم هب لقلنلا نأل ارطن، كلذ عمو؛ ةلاسرا ل هذه (LMA) لقلنلا لباقلل
MAG لبق نم تباث لكشب لئاسرلا.
ارقتسم قفلل ريصي تالصاوملا رقتست املاحو.

4. نيذو نيب اتباث لقلنلا ناك اذا ىلحملا (ISP) تنرتنإلا ةمدخ دوزم مادختساب كلذ نم ققحت
نيذو زاهلا.

ةففاضإ تامولعم

ءاشنإو لاصتالال علل لوصحلل .ISP نم اضرارفا اراسم PMIP ىقلتي الأ عقوتمل نم ةفولخلال ةهجالوال ةفاضإو LMA ب صاخلل IP ىل ريشي ففضم راسم ءو ورفورضل نم ،قفلل ةللال ةوطخلال ك.

لالم:

ip route 203.0.113.10 255.255.255.255 cellular0/1/0

حلطصملا	فصولا
ةفولودلا لومحملال فئاال كرتشم ةفوه (IMSI)	ةقابطل امقر 15 نم نوكم زمر مقرر نففعت مت SIM
ةلقننملا ءاعملل ةفولودلا ةفوهلا (IMEI)	ةلقننملا ءاعملل صصخم مقرر 15 نم زمر 15
ةلماكلتملا ةرفئالال ةقابط فرعم (ICCID)	هنففعت مت فذل زمرلل امقر 20 ىل 19 نم ةزهجالاب ةصاخلل SIM ةقابطل اصففصخ
ةطحملل ةفولودلا كرتشملا لفلد مقرر (MSIsdn) ةلقننملا	ISP لبق نم نففعملا لومحملال زاهجال مقرر .نففعملا مقررل او ءبلل زمر كل ء نمضتفو
ةكبشلال ىل لوصول فرعم (NAI)	ءانثأ لففعملا همءقو فذل مءختسملا فرعم ةكبشلال ىل لوصول ةقءاصم
لوصول ةطقن مسال (APN)	ءانافبب لاصتالل لومحملال زاهجال تامولعم (ROAM ةفلمعم) لوجل ةكبشل
ةلقننم ةءقعم (MN)	فف ةكراشملل IP هءوم وأ ففضم ءو و مزلف لقننملا ةفلبلابب صاخ IP فف
ةلومحملال ةزهجالال ىل لوصول ةرابعم (MAG)	ISP ب لاصتالال رفءف فذل لوصول زاهجال
لفلحملال لقننملا ةاسرم (LMA)	فف ةلقننملا ةءقعملل فسففئرلا لفلولال لفلولال لوجل (PMIPv6) لءم
لزنملا ناوئعم (HoA)	هنففعت مت فذل ففكمففانففءل IP ناوئعم LMAs عمء ةطساوب
لفلولال طبر ءفءء (PBU)	LMA نفف قففلل ءاشنإ MAG نم بلط ةءقعملا فرعم رافخ بلطال اءه نمضتفو .ةلقننملا
لفلولال طبر رارق (PBA)	نمضتت فئلالو ،MAG ىل LMA نم ةلاسرف قففل ءاشنإ لءشءو HoA ةكبشل ءاءاب هاءءل ففئانء

ةمچرتل هذه لوج

ةللأل تاي نقتل نم ةومچم مادختساب دن تسمل اذه Cisco تچرت
ملاعلاء انءمچ يف نيمدختسمل معدى وتحم مي دقتل ةيرشبلاو
امك ةقيد نوك تنل ةللأل ةمچرت لصف انءمچال مچرئى. ةصاغل مهتغب
Cisco يلخت. فرتحم مچرت مامدقي يتل ةيفارتحال ةمچرتل عم لالحا وه
ىل اءءاد ةوچرلاب يصوت و تامچرتل هذه ةقد نع اهتيل وئسم Cisco
Systems (رفوتم طبارلا) يلصلأل يزيلچنل دن تسمل