

802.16e MS-IPv6 Address Attachment Simulated Solution Approach

[IPv6-ASN Gateway & DHCPv6 Integration]

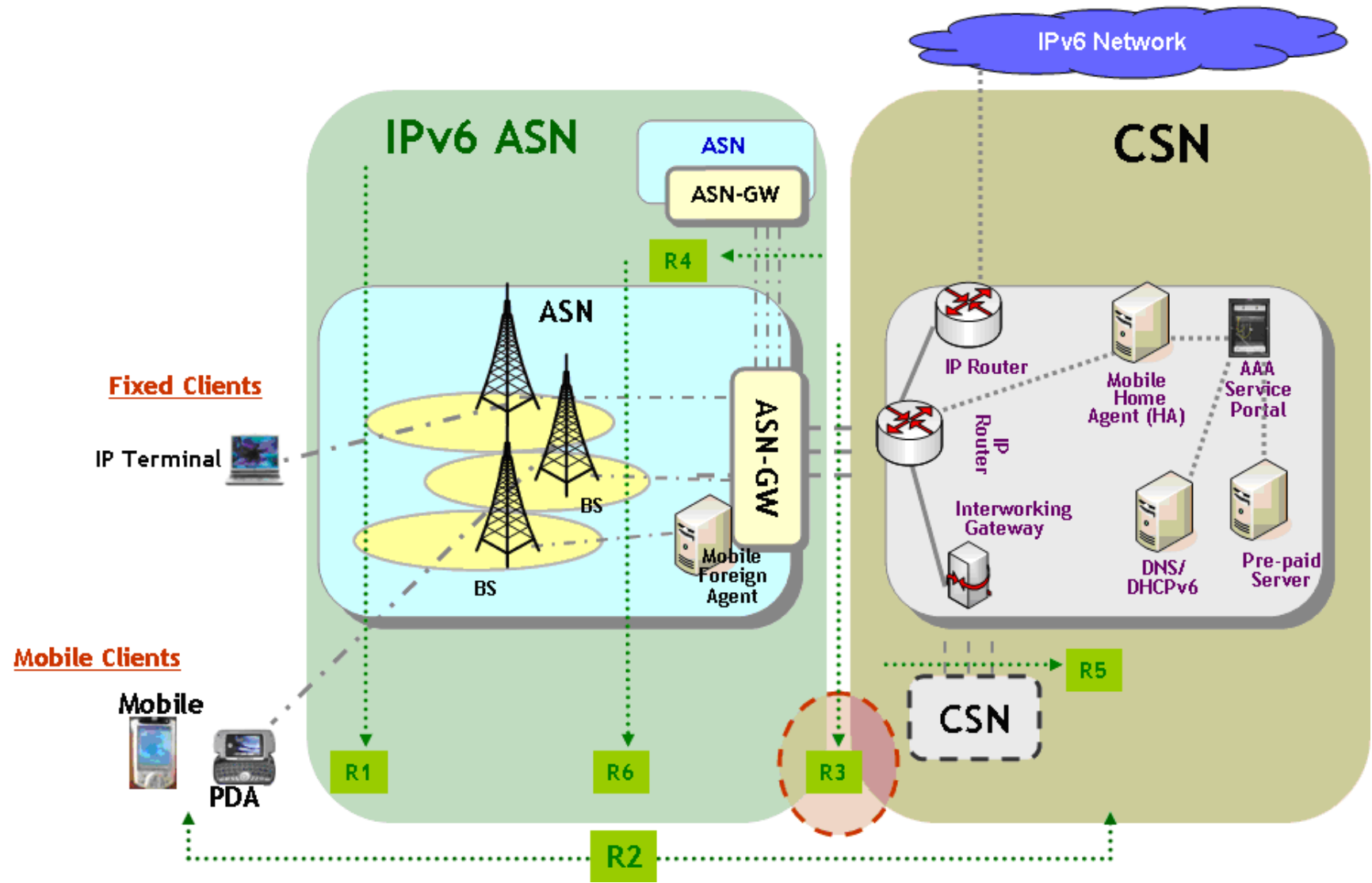


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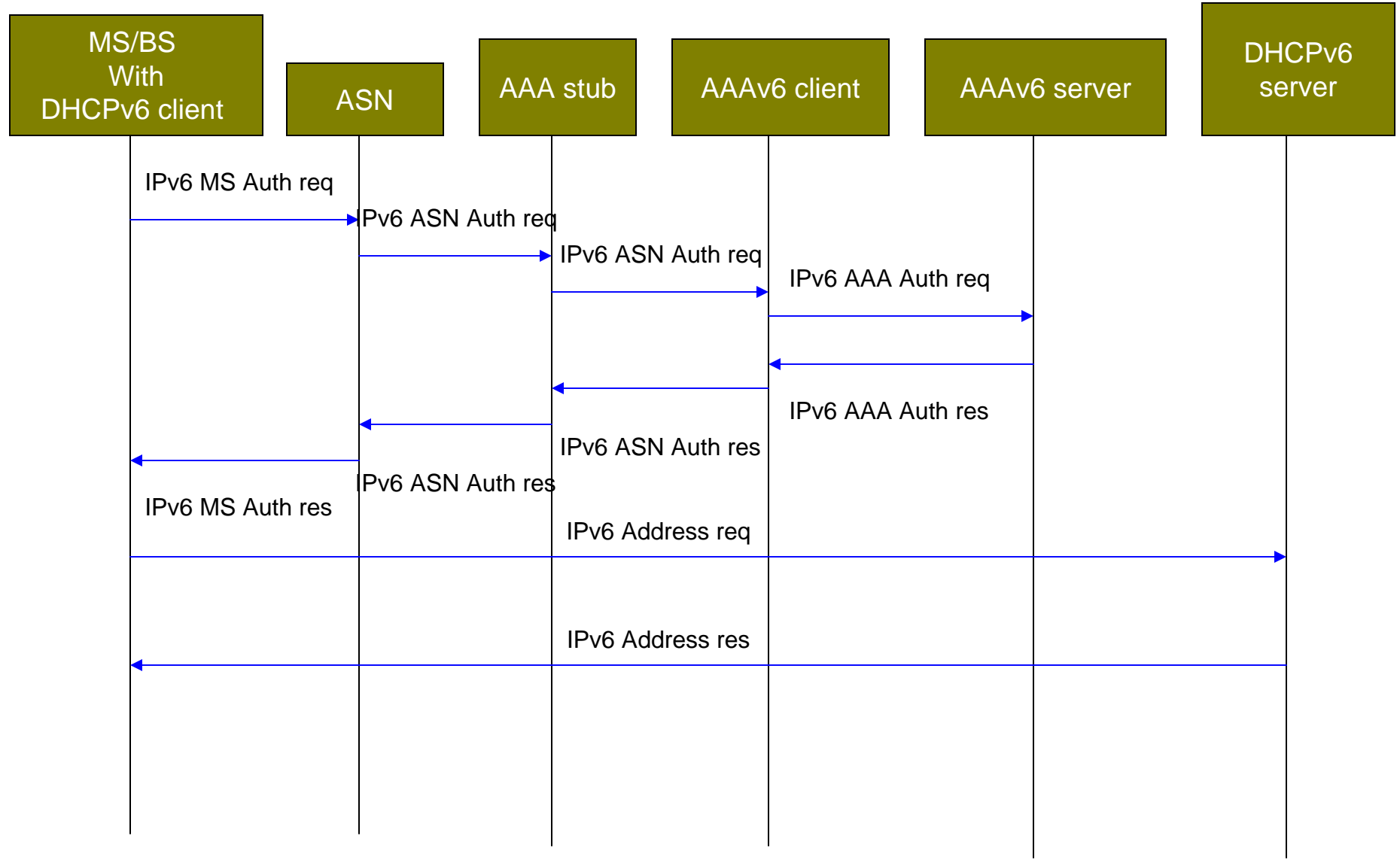
Need for IPv6 in WiMAX?

- WiMAX emerging standards are now mandating the usage of the IPv6 and subsequently there is a potential IPv6 deployments happening today around the world.
- WiMAX support for IPv6 is gaining momentum due to improved internet features supported by IPv6 like Mobility and Security.

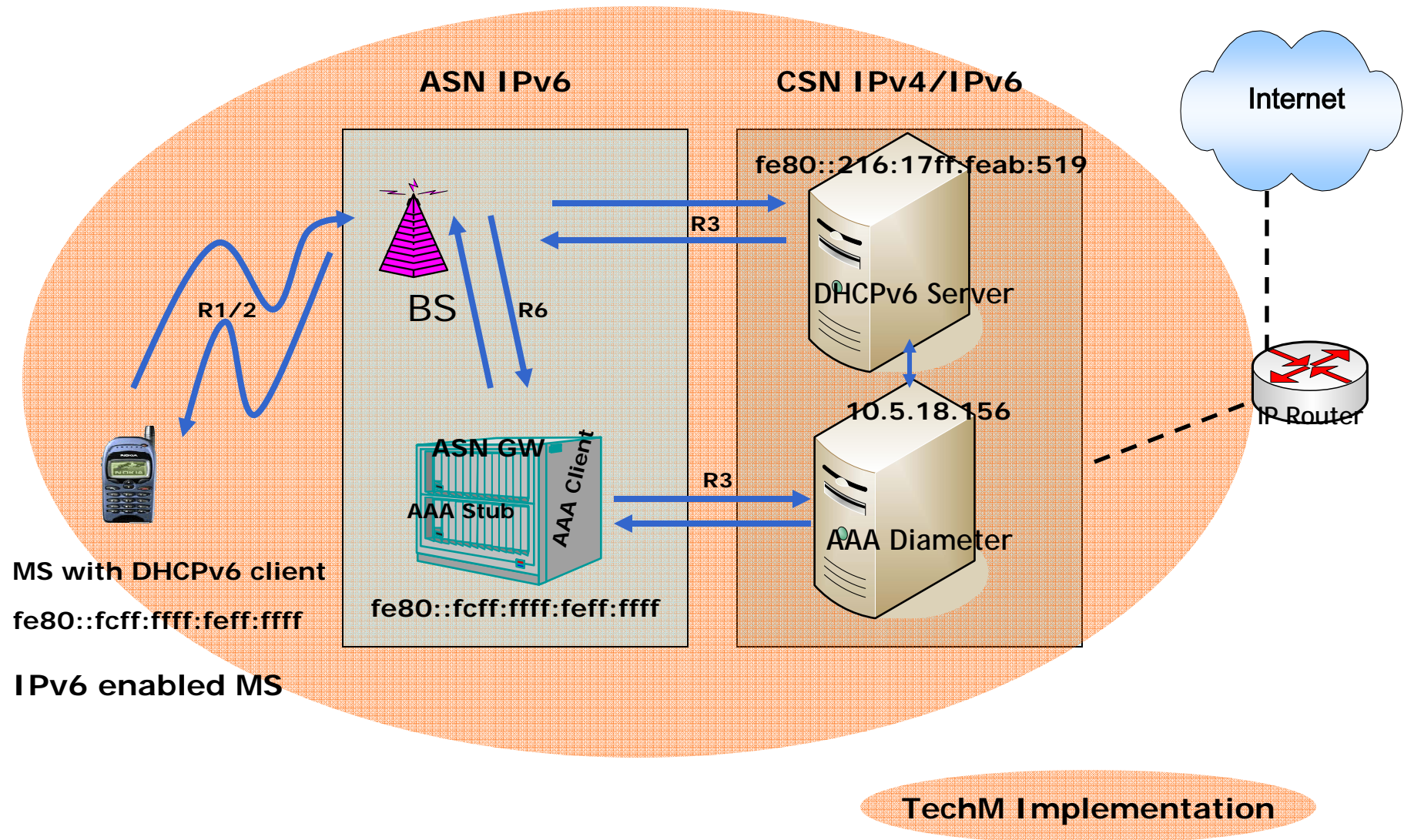


- Enabling the Mobile Station (MS) to dynamically acquire the IPv6 address upon successful authentication from AAA.
- DHCPv6 client is running in a simulated MS client.
- DHCPv6 Server integrated with AAA server.
- DHCPV6 and AAA messages pass through the ASN Gateway supporting the IPv6.

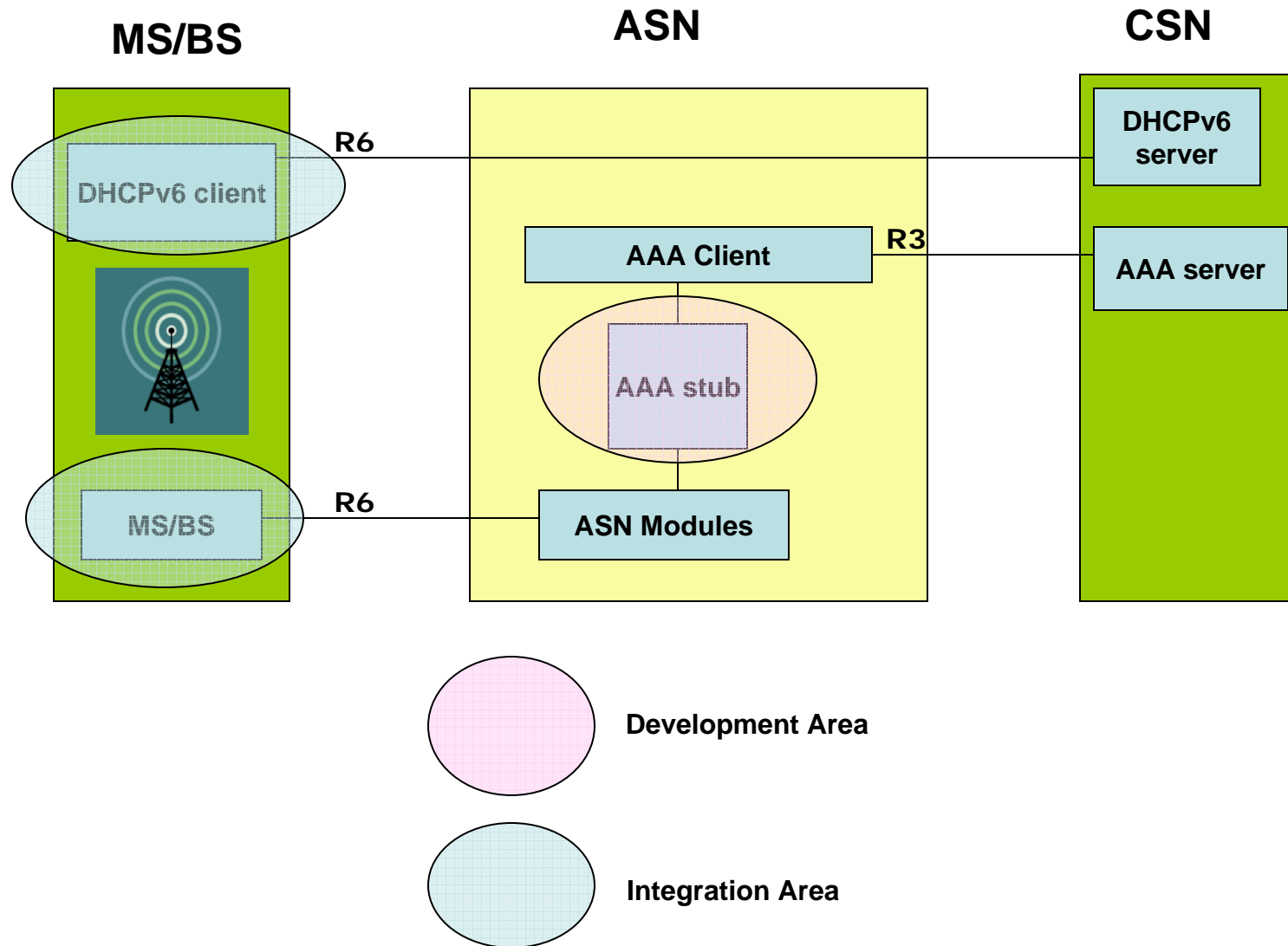
Solution Call flow [MS IPv6 Address Attachment]



Simulated Solution Demo Lab Setup



Deployment Scenario



- Enabling of IPv6 support for ASN Gateway, BS & MS simulators.
- Our method introduces user authentication and Diffie-Hellman key exchange to the DHCPv6 option.
- Introduced a stub to handle the AAA IPv6 Authentication using the AAAv6.
- Integration of DHCPv6 Client with MS.
- Integration of DHCPv6 Server with AAA.

- Integration of WiMAX-IPv6 for DSTM Networks.
- Integration of AAAv6 with WiMAX Network elements
- Integration of MobileIPv6 for Mobility Support.
- IPv6 Application support on the WiMAX IPv6 Networks.

Demo Screenshots

```
root@techm:/home/srk/WiMAX_IPv6/TechMWiMAXASNGateway/ASNGW27.IUJ
lassitude - languor; weariness

[root@techm ASNGW27JUL]# ifconfig vif0.3
vif0.3      Link encap:Ethernet  HWaddr FE:FF:FF:FF:FF:FF
           BROADCAST MTU:1500 Metric:1
           RX packets:0 errors:0 dropped:0 overruns:0 frame:0
           TX packets:3 errors:0 dropped:0 overruns:0 carrier:0
           collisions:0 txqueuelen:0
           RX bytes:0 (0.0 b)  TX bytes:290 (290.0 b)

[root@techm ASNGW27JUL]#
```

EAP –Authentication response flow

```
root@techm:/home/srk/WiMAX_IPv6/TechMWiMAXASNGateway/ASNGW27.IU1
unfrack - strip a priest or minister of church authority

SIZE of string at BS_Auth_Relay: 5
objEAP_Payload.shLength ===== 5
Inside EAP_Request after objEAPParser.parserawEAPpayload-----
*** Size of packet imm after parse** : 0
EAP Identity Request received from the Authenticator
*****ObjEAP Payload Length in network:9472
EAP Data Size in makeraw:32
Raw String Size: 37
Printing raw data:
2  9  0  25  1  7b  61  6d  3d  34  7d  77  69  6d  61  78  75  73  65  72  40
74  65  63  68  6d  61  68  69  6e  64  72  61  2e  63  6f  6d
*****
MESSAGE HEADER
*****
Version : 1          T-Bit : 0          R-Bit : 1
Function Type :8     OPID : 010        Message Type : 4
Length : 32767      MSID : 112233    Transaction Id : 1
*****
MESSAGE PAYLOAD
*****
NAME :EAP_Payload   VALUE : %(am=4)wimaxuser@techmahindra.com
*****
Size of Raw string64
Sending EAP Response to the Authenticator(ASN).....
PRINT ***** 9 ***** sending to 9010
EAP Response sent to Authenticator
Waiting for Response from ASN Authenticator
Message Received from Authenticator
Message Received from Authenticator before return
Inside while of DeCompose_EAP_Request -----
SIZE of sVAL: 6
Inside while of DeCompose_EAP_Request -----
SIZE of string at BS_Auth_Relay: 6
objEAP_Payload.shLength ===== 6
Inside EAP_Request after objEAPParser.parserawEAPpayload-----
*** Size of packet imm after parse** : 1
EAP -TLS Request packet received from AAAS
*** Size of packet** : 1
(EAPTLS) Recieved eap-tls start packet
Inside build of next packet Inside build of client hello packet (EAPTLS) Sending
client hello packet
*****ObjEAP Payload Length in network:15872
EAP Data Size in makeraw:57
Raw String Size: 62
Printing raw data:
```

Authentication Successful and Access granted message received from ASN

```
root@techm:/home/srk/WiMAX_IPv6/TechMWiMAXASNGateway/ASNGW27.IUJ
balk - foil

*****
Size of Raw string32
Sending EAP Response to the Authenticator (ASN).....
PRINT ***** 9 ***** sending to 9010
EAP Response sent to Authenticator
Waiting for Response from ASN Authenticator
Message Received from Authenticator
Message Received from Authenticator before return
Inside while of DeCompose_EAP_Request -----
SIZE of sVAL: 4
Inside while of DeCompose_EAP_Request -----
SIZE of string at BS_Auth_Relay: 4
objEAP_Payload.shLength ===== 4
Inside_EAP_Request after objEAPParser.parserawEAPpayload-----
*** Size of packet imm after parse**: 0
AUTHENTICATION SUCCESSFUL!! ACCESS GRANTED
***** Completed Authentication Successfully *****
*****Exiting Authentication Module *****
Waiting for Request
█
```

DHCPv6 message flows



```
root@techm:/home/srk/WiMAX_IPv6/TechMWiMAXASNGateway/ASNGW27.IUI
bogus - counterfeit; not authentic
Nov/11/2008 15:03:32 link local addr is fe80::fcff:ffff:feff:ffff
Nov/11/2008 15:03:32 res addr is fe80::fcff:ffff:feff:ffff%vif0.3/28
Nov/11/2008 15:03:32 found an interface peth0 hardware fe:ff:ff:ff:ff:ff
Nov/11/2008 15:03:32 create iaId 4294967294 for interface peth0
Nov/11/2008 15:03:32 found an interface eth1 hardware 00:02:b3:2a:40:bc
Nov/11/2008 15:03:32 create iaId 716374528 for interface eth1
Nov/11/2008 15:03:32 dhcpv6 doesn't support hardware type 776
Nov/11/2008 15:03:32 doesn't support sit0 address family 0
Nov/11/2008 15:03:32 found an interface vif0.0 hardware fe:ff:ff:ff:ff:ff
Nov/11/2008 15:03:32 create iaId 4294967294 for interface vif0.0
Nov/11/2008 15:03:32 found an interface eth0 hardware 00:16:17:ab:05:19
Nov/11/2008 15:03:32 create iaId 2870416896 for interface eth0
Nov/11/2008 15:03:32 found an interface vif0.1 hardware fe:ff:ff:ff:ff:ff
Nov/11/2008 15:03:32 create iaId 4294967294 for interface vif0.1
Nov/11/2008 15:03:32 found an interface veth1 hardware 00:00:00:00:00:00
Nov/11/2008 15:03:32 create iaId 0 for interface veth1
Nov/11/2008 15:03:32 found an interface vif0.2 hardware fe:ff:ff:ff:ff:ff
Nov/11/2008 15:03:32 create iaId 4294967294 for interface vif0.2
Nov/11/2008 15:03:32 found an interface veth2 hardware 00:00:00:00:00:00
Nov/11/2008 15:03:32 create iaId 0 for interface veth2
Nov/11/2008 15:03:32 found an interface vif0.3 hardware fe:ff:ff:ff:ff:ff
Nov/11/2008 15:03:32 create iaId 4294967294 for interface vif0.3
Nov/11/2008 15:03:32 found an interface veth3 hardware 00:00:00:00:00:00
Nov/11/2008 15:03:32 create iaId 0 for interface veth3
Nov/11/2008 15:03:32 found an interface xenbr0 hardware fe:ff:ff:ff:ff:ff
Nov/11/2008 15:03:32 create iaId 4294967294 for interface xenbr0
Nov/11/2008 15:03:32 found an interface eth1 hardware 00:02:b3:2a:40:bc
Nov/11/2008 15:03:32 create iaId 716374528 for interface eth1
Nov/11/2008 15:03:32 found an interface eth0 hardware 00:16:17:ab:05:19
Nov/11/2008 15:03:32 create iaId 2870416896 for interface eth0
Nov/11/2008 15:03:32 found an interface eth1 hardware 00:02:b3:2a:40:bc
Nov/11/2008 15:03:32 create iaId 716374528 for interface eth1
Nov/11/2008 15:03:32 found an interface vif0.0 hardware fe:ff:ff:ff:ff:ff
Nov/11/2008 15:03:32 create iaId 4294967294 for interface vif0.0
Nov/11/2008 15:03:32 found an interface eth0 hardware 00:16:17:ab:05:19
Nov/11/2008 15:03:32 create iaId 2870416896 for interface eth0
Nov/11/2008 15:03:32 found an interface vif0.3 hardware fe:ff:ff:ff:ff:ff
Nov/11/2008 15:03:32 create iaId 4294967294 for interface vif0.3
Nov/11/2008 15:03:32 found an interface xenbr0 hardware fe:ff:ff:ff:ff:ff
Nov/11/2008 15:03:32 create iaId 4294967294 for interface xenbr0
Nov/11/2008 15:03:32 found an interface vif0.3 hardware fe:ff:ff:ff:ff:ff
Nov/11/2008 15:03:32 found interface vif0.3 iaId 4294967294
Nov/11/2008 15:03:32 interface vif0.3 iaId is 4294967294
Nov/11/2008 15:03:32 netlink_socket_open called
Nov/11/2008 15:03:32 netlink_rtmsg_send called
Nov/11/2008 15:03:32 netlink_rtgenmsg_rcv called
```

Authentication received through AAA Stub



```
root@techm:/home/srk/WiMAX_IPv6/TechMWiMAXASNGateway/AAASStub

*****
MESSAGE HEADER
*****
Version : 1          T-Bit : 0          R-Bit : 1
Function Type :8     OPID : 010        Message Type : 4
Length : 30          MSID : 112233     Transaction Id : 1
*****
MESSAGE PAYLOAD
*****
NAME :EAP_Payload   VALUE :

*****
objEAP_Payload.shLength ===== 6
Sending EAP Message (Response) to the AAA Server(Diameter) in CSN.....
PRINT ***** 5 ***** sending at 9010
EAP Request/Identity Response sent to AAA Server

***** Waiting Response/Request from ASN/AAAClient *****

*****REQUEST/RESPONSE MESSAGE RECEIVED FROM ASN/AAAClient *****
SIZE of sVAL: 4

*****
MESSAGE HEADER
*****
Version : 1          T-Bit : 0          R-Bit : 1
Function Type :8     OPID : 001        Message Type : 4
Length : 28          MSID : 112233     Transaction Id : 1
*****
MESSAGE PAYLOAD
*****
NAME :EAP_Payload   VALUE :

*****
objEAP_Payload.shLength ===== 4
Sending EAP Message (Request/Success/Failure) to the Mobile Station.....
Length of message in AUTH: 28
PRINT ***** 6 ***** sending at 9010
EAP Message (Request/Success/Failure) sent to MS

SUCCESS SUCCESS SUCCESS
AUTHENTICATED!! EAP Success received from the DIAMETER
STUB IS WAITING FOR EAP REQUEST FROM ASN...
```

IPv6 address attached to MS

```
root@techm:~  
[root@techm ~]# ifconfig vif0.3  
vif0.3      Link encap:Ethernet  HWaddr FE:FF:FF:FF:FF:FF  
            inet6 addr: fe80::fcff:ffff:feff:ffff/64 Scope:Link  
            UP BROADCAST RUNNING MTU:1500 Metric:1  
            RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
            TX packets:2 errors:0 dropped:0 overruns:0 carrier:0  
            collisions:0 txqueuelen:0  
            RX bytes:0 (0.0 b)  TX bytes:200 (200.0 b)  
  
[root@techm ~]#
```

IPv6 address attachment application R6 Radioresourcestatusupdate

```
root@techm:/home/srk/WiMAX_IPv6/TechMWiMAXASNGateway/ASNGW27.IUI
beatific - giving bliss; blissful
Nov/11/2008 15:10:35 interface vif0.3 iaid is 4294967294
Nov/11/2008 15:10:35 netlink_socket_open called
Nov/11/2008 15:10:35 netlink_rtmsg_send called
Nov/11/2008 15:10:35 netlink_rtgenmsg_rcv called
Nov/11/2008 15:10:35 netlink_rtgenmsg_send called
Nov/11/2008 15:10:35 netlink_rtgenmsg_rcv called
Nov/11/2008 15:10:35 if_get_flags called
Nov/11/2008 15:10:35 if_get_flags called
Nov/11/2008 15:10:35 if_get_flags called
Nov/11/2008 15:10:35 if_get_flags called
Nov/11/2008 15:10:35 if_get_flags called
Nov/11/2008 15:10:35 if_get_flags called
Nov/11/2008 15:10:35 create an event 0x9ed5710 xid 0 for state 0
Nov/11/2008 15:10:35 reset a timer on vif0.3, state=INIT, timeo=0, retrans=779

*****IAM IN dhcp6c+++++.vif0.3
*****

BSApplicationHandler::receiveFromASN

*****
Waiting for Request
Nov/11/2008 15:10:36 ifp 0x9ed14b8 event 0x9ed5710 a new XID (d580e0) is generated
Nov/11/2008 15:10:36 set client ID
Nov/11/2008 15:10:36 set opt_8
Nov/11/2008 15:10:36 set opt_28
Nov/11/2008 15:10:36 set IA_NA iaidinfo: iaid 4294967294 renewtime 0 rebindtime 0
Nov/11/2008 15:10:36 set opt_3
Nov/11/2008 15:10:36 <<CLI-SER:SEND >>dst if vif0.3 addr is ff02::1:2%vif0.3 scope id is 11
Nov/11/2008 15:10:36 <<CLI-SER:SEND --->*SOLICIT*>>To ff02::1:2%vif0.3
Name:R6_PHY_Parameters_Req
Name:R6_PHY_Parameters_Rpt
Name:R4_R6_Spare_Capacity_Req
Name:R4_R6_Spare_Capacity_Rpt
Name:R6_Neighbor_BS_Resource_Status_Update
Tlv Name :RRM_BS_MS_PHY_Quality_InfoTlv Name :Relative_DelayTlv Name :Temporary_BS_IDTlv Name :HO_IDTlv Name :Service_Level_PredictionTlv Name :Preamble_Index_Sub_Channel_IndexTlv Name :BS_InfoTlv Name :Round_Trip_DelayTlv Name :DL_PHY_Quality_InfoTlv Name :DL_PHY_Service_LevelTlv Name :DL_RSSI_meanTlv Name :DL_RSSI_standard_devTlv Name :DL_CINR_meanTlv Name :DL_CINR_standard_devTlv Name :UL_PHY_Quality_InfoTlv Name :UL_PHY_Service_LevelTlv Name :UL_RSSI_meanTlv Name :UL_RSSI_standard_devTlv Name :UL_CINR_meanTlv Name :UL_CINR_standard_devTlv Name :N_Nei
```

EAP success received from DIAMETER ASN Side



```
root@techm:/home/srk/WiMAX_IPv6/TechMWiMAXASNGateway/ASNGW27JUL

***** Waiting for the Request/Response from BS/STUB*****

***** REQUEST/RESPONSE MESSAGE RECEIVED FROM THE BS/STUB *****
SIZE of sVAL: 4

*****
MESSAGE HEADER
*****
Version : 1          T-Bit : 0          R-Bit : 1
Function Type :8      OPID : 001        Message Type : 4
Length : 28          MSID : 112233     Transaction Id : 1
*****
MESSAGE PAYLOAD
*****
NAME :EAP_Payload      VALUE :

*****
objEAP_Payload.shLength ===== 4
*****EAP_CODE = 3*****
Sending EAP Message (Request/Success/Failure) to the Mobile Station.....
Length of message in AUTH: 28
PRINT ***** 6 ***** sending at 9006
EAP Message (Request/Success/Failure) sent to MS
AUTHENTICATED!! EAP Success received from the DIAMETER
PRINT ***** 17 ***** in RRM
SPARE CAPACITY REPORT RECEIVED
SIZE of sVAL: 4

*****
MESSAGE HEADER
*****
Version : 1          T-Bit : 0          R-Bit : 1
Function Type :7      OPID : 001        Message Type : 4
Length : 55          MSID : 112233     Transaction Id : 1
*****
MESSAGE PAYLOAD
*****
NAME :RRM_Spare_Capacity_Report_Type  VALUE :48
NAME :RRM_Reporting_Characteristics   VALUE :1
NAME :RRM_BS_Info                      VALUE : NESTED TLV
*****
SUB TLVs
*****
```

Thank You



For any queries about this please contact:

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