MOPex & CAP updates

RPL Extended Control Options

```
 0                   1                   2
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+----------
|X|   OptionType| Option Length |Opt Flags|J|I|C| Option Data
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+----------
```
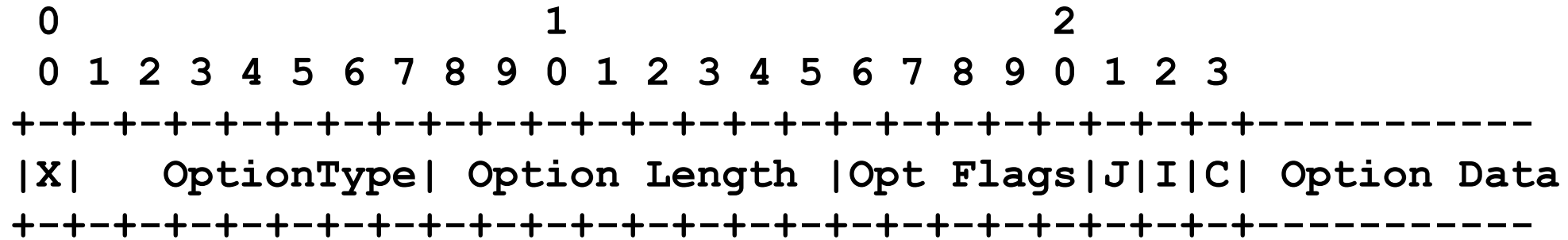
Currently, 0x80 to 0xFF reserved for RPL Extended Control Options

Another point: Set aside bigger range for ext control option from 0x40 to 0xff

Note: Extended Option can still serve as regular Options with an extra byte.

Capabilities Query/Response

- A node should be able to query the list of supported capabilities

- A node should be able to query specific capabilities details

- A set of capabilities to respond may exceed MTU. Thus a node should be able to send caps in multiple response messages.
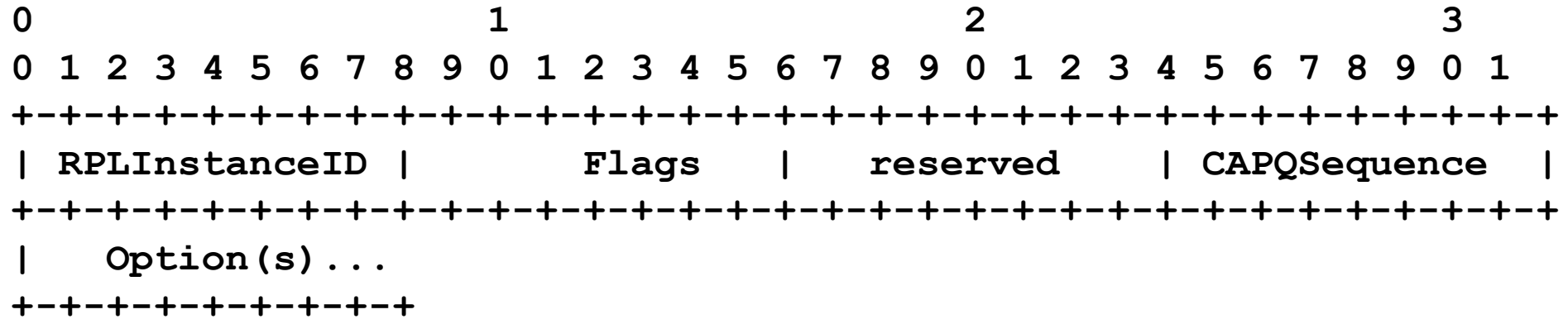
CAPQ

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| RPLInstanceID |      Flags      |     reserved   | CAPQSequence  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   Option(s)...
+-+-+-+-+-+-+-+
```
Figure 3: CAPQ base object

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   Type = TODO | Option Length |  CapType1     | CapType2      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  CapType3     |  .....
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
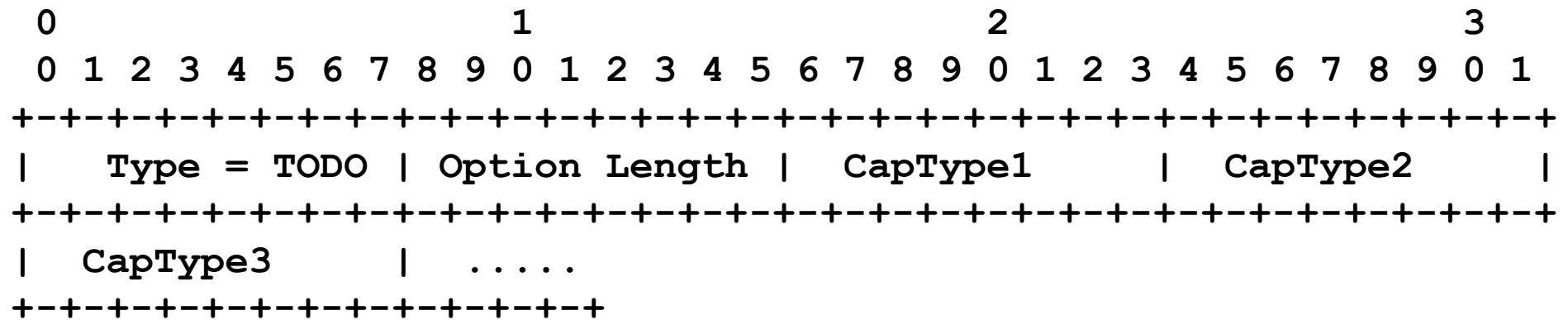
Figure 4: Capability Type List Control Option

CAPS response to CAPQ

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| RPLInstanceID |      Flags      |     Reserved      | CAPQSequence |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Option(s)...
+-+-+-+-+-+-+-+-+
```
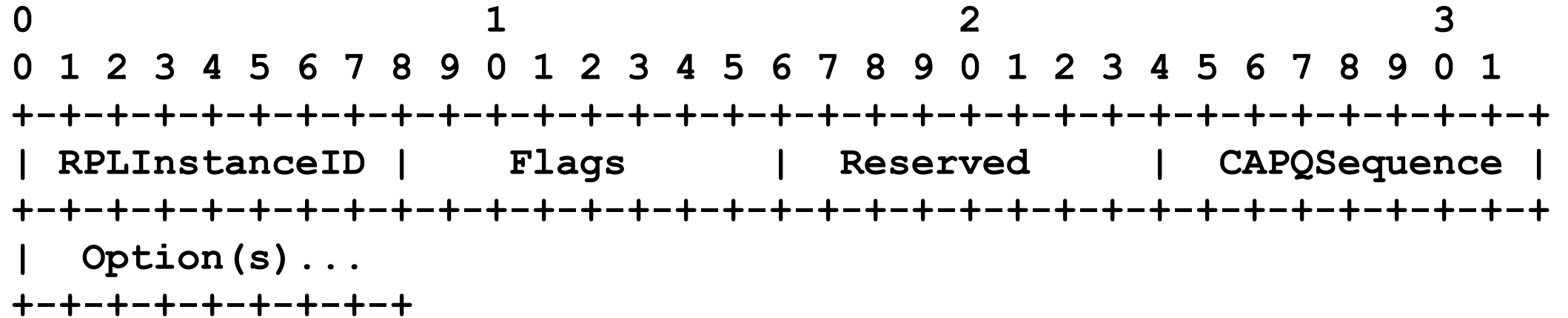
Figure 5: CAPS base object

The Options would be set of capabilities that are requested.
CAPS can only be sent in response to CAPQ.

Query supported Capability List
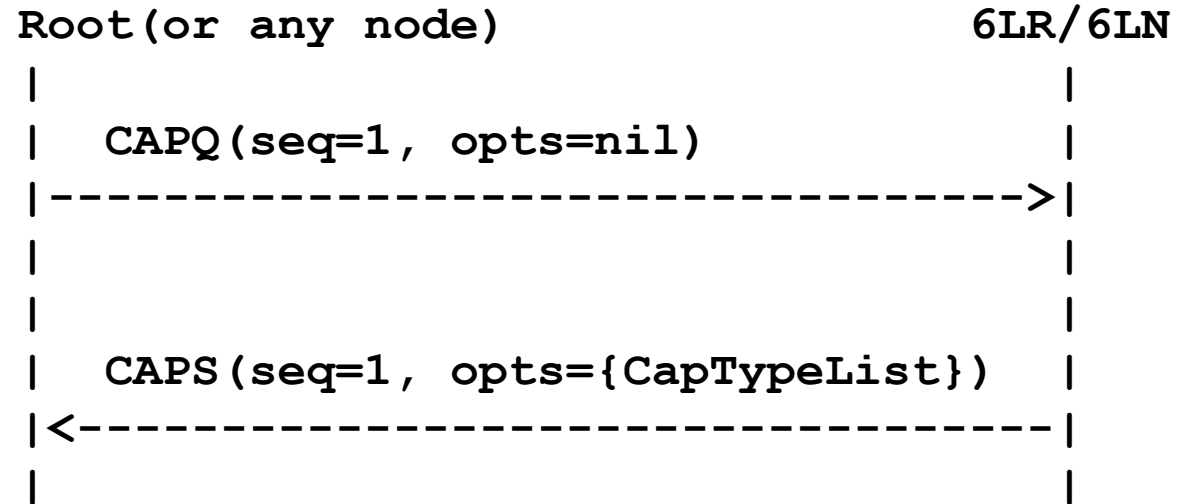
```
Root(or any node)                          6LR/6LN
 |                                            |
 |   CAPQ(seq=1, opts=nil)                    |
 |------------------------------------------->|
 |                                            |
 |                                            |
 |   CAPS(seq=1, opts={CapTypeList})          |
 |<-------------------------------------------|
 |                                            |

Figure 8: Query supported Cap Types
```

Query specific capability list

```
Root                                      6LR/6LN
|                                            |
|  CAPQ(seq=2,                               |
|   opts={CapTypeList=[Cap1, Cap2]})|
|------------------------------------------->|
|                                            |
|                                            |
|  CAPS(seq=2,                               |
|       opts={Cap1=Cap1Value,                |
|            Cap2=Cap2Value})                |
|<-------------------------------------------|
|                                            |

        Figure 9: Query specific Cap Set
```
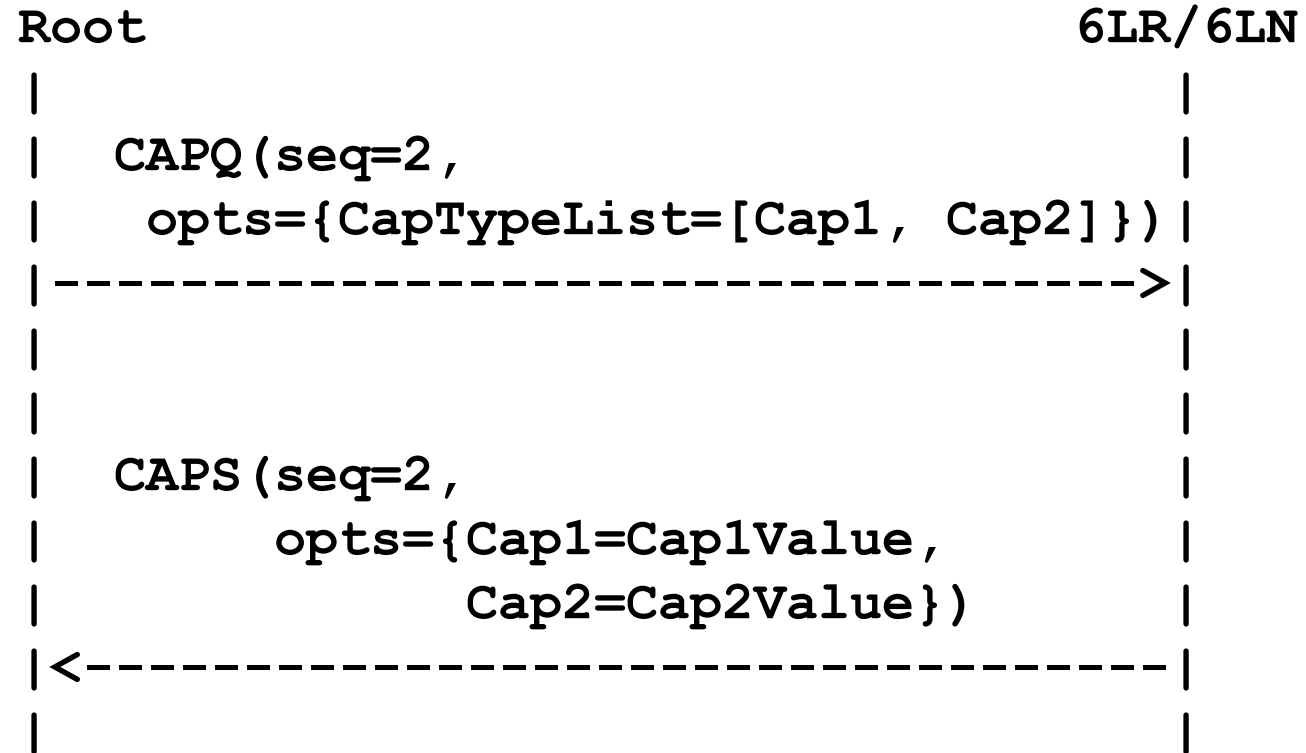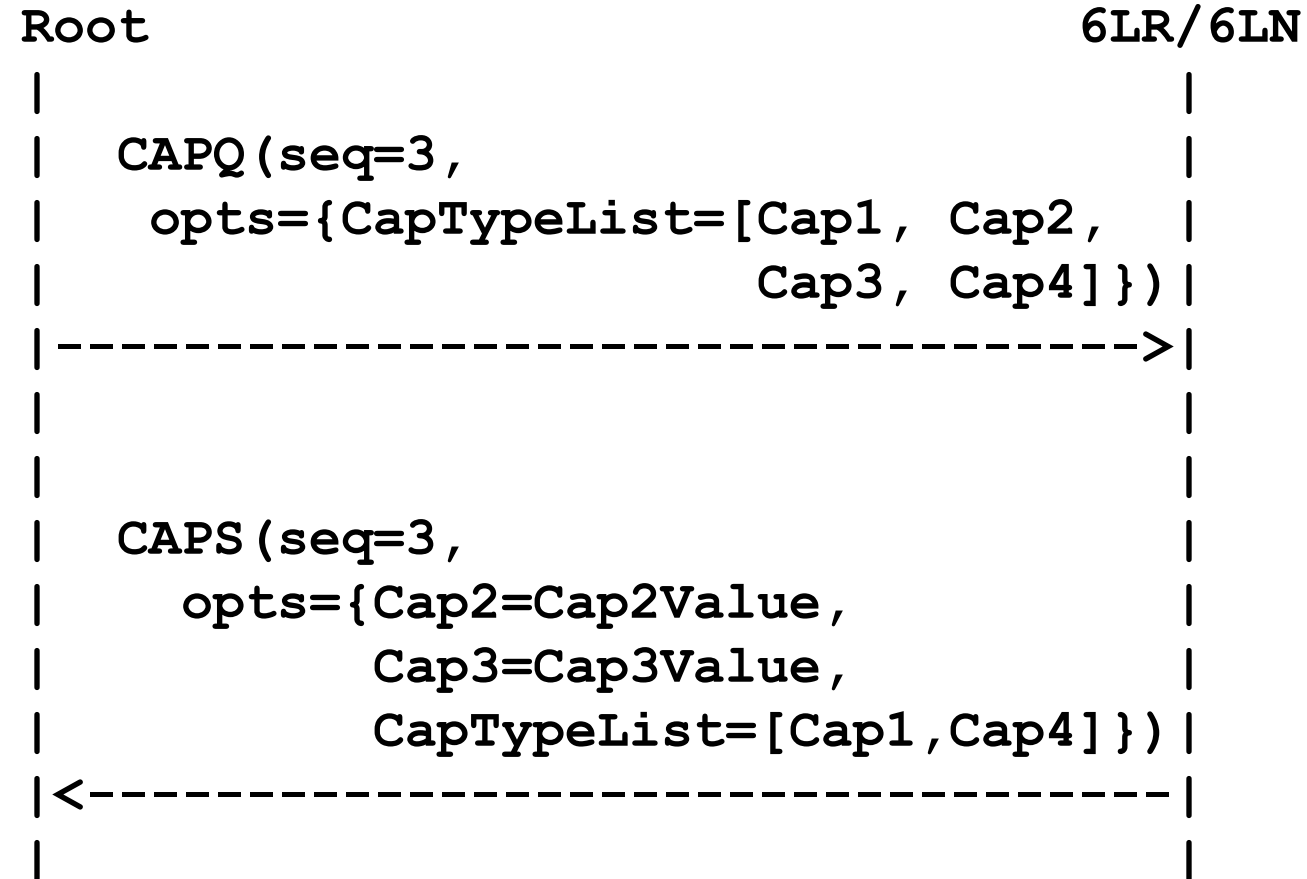
Query response with partial set

```
         Root                                6LR/6LN
          |                                     |
          |   CAPQ(seq=3,                       |
          |    opts={CapTypeList=[Cap1, Cap2,   |
          |                       Cap3, Cap4]})  |
          |------------------------------------>|
          |                                     |
          |                                     |
          |   CAPS(seq=3,                       |
          |     opts={Cap2=Cap2Value,           |
          |           Cap3=Cap3Value,           |
          |           CapTypeList=[Cap1,Cap4]}) |
          |<------------------------------------|
          |                                     |

             Partial Capability Set handshake
```