

EPoC Discover & Registration

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EPoC Discovery & Registration

- **Based on EPON Discovery & Registration**
- **Three Phases**
 - Initial Discovery – CNU 1st appears on the COAX segment
 - Training – CLT / CNU negotiation of PHY capabilities and channel operating mode(s)
 - Confirmation – CLT concludes training and move CNU to operational state
- **Starts with very simple low speed modulation and progresses to optimum operation**
- **Two approaches**

Assumptions

- **CNU joining the network can receive data from the CLT on some basic channel previously agreed to**
 - Discovery GATEs are distributed on this basic channel
 - Complex Channel descriptors are distributed on this basic channel via OAM or some other management scheme
- **CNU has received a list of Channels Descriptors from the basic channel before responding to a Discovery GATE**
- **A Channel Descriptor contain all information necessary to allow a CNU to transmit except that contained in the GATE message.**

EPoC DISCOVERY

Option 1

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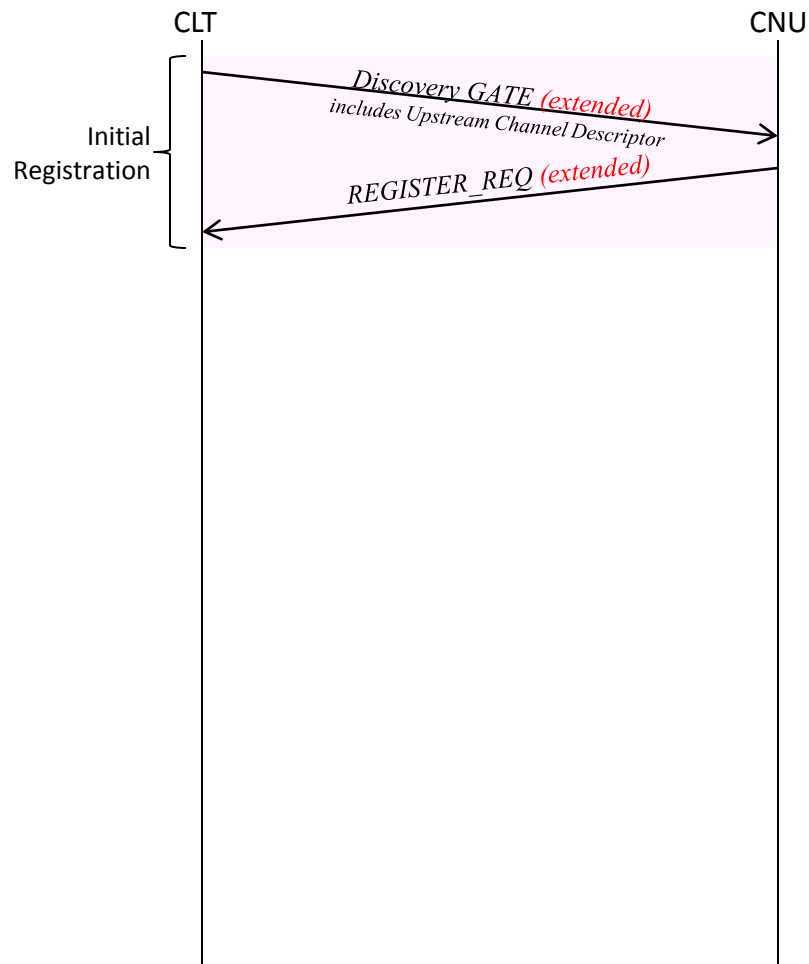


EPoC DISCOVERY

Initial Discovery

Option 1

- **Discovery GATE (extended)**
 - Extended to include upstream channel descriptor ID
- **REGISTER_REQ (extended)**
 - Initial response uses a very basic, channel modulation scheme, with low data rate to ensure basic communications established.
 - Used to transfer MAC address of joining CNU
 - Establishes the basic RTT
 - May need to be extended include additional information on CNU PHY capability



EPoC Discovery GATE

Option 1

- **DA**
 - MAC Control Multicast address
- **SA**
 - CLT MAC address
- **Timestamp**
 - CLT localTime in TQ (set in RS)
- **Flags**
 - Bit 0-2 – # of grants in GATE (==1)
 - Bit 3 – Discovery (==1)
 - Bit 4,5,6,7 – Force Report Grant #1,2,3,4 resp.
- **Sync Time**
 - synchronization time of the CLT

- **Proposed Extension**
 - Channel Descriptor ID
 - Length 1B

DA	6
SA	6
Len/Type = 88-08	2
Opcode = 00-02	2
Timestamp	4
# of grants / Flags	1
Grant #1 Start	0/4
Grant #1 Length	0/2
...	
Grant #4 Length	0/2
Sync Time	0/2
Channel Descriptor ID	2
Pad/Reserved	11-37
FCS	4

EPON REGISTER_REQ Option 1

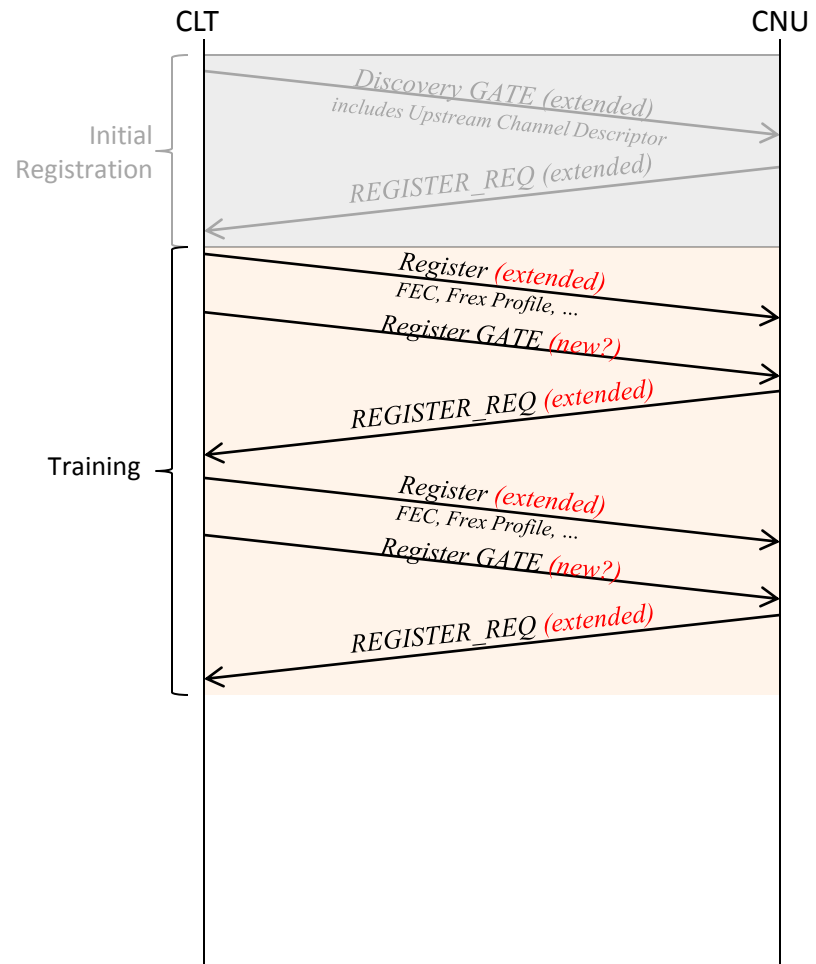
- SA – MAC address of CNU
- Flags (value)
 - 0 – reserved
 - 1 – register
 - 2 – reserved
 - 3 – Deregister
 - 4-255 – reserved
- **Extension**
 - CNU Receive Quality?
 - CNU PHY capability
 - Number of usable Channel Descriptor ID's
 - Usable Channel Descriptor ID #1
 - Usable Channel Descriptor ID #2
 - ...

DA	6
SA	6
Len/Type = 88-08	2
Opcode = 00-04	2
Timestamp	4
Flags	1
Pending Grants	1
PHY Receive Quality	TBD
PHY Capability	2/TBD
Pad/Reserved	TBD
FCS	4

EPoC DISCOVERY

- **Register Message (extended)**
 - Sent by CLT in response to REGISTER_REQ
- **Register GATE (extended)**
 - GATE type used to train the joining end station.
 - Discovery GATE with the DA == MAC address of joining station
 - CNU responds with additional REGISTER_REQ in response to Register GATE
- **REGISTER_REQ**
 - Same as previous
- **Iterate as needed to train joining CNU**

Training Phase Option 1



EPoC Register message

Option 1

- **Flags (value)**
 - 1 – Register
 - 2 – Deregister
 - 3 – Ack
 - 4 – Nack
 - 5-255 – Reserved
- **Extension Flags**
 - 5 – Train
 - 6-255 Reserved

DA	6
SA	6
Len/Type = 88-08	2
Opcode = 00-05	2
Timestamp	4
Assigned port	2
Flags	1
Sync Time	2
Echo pending grants	1
Pad/Reserved	34
FCS	4

Proposed Register GATE

Option 1

- **DA**
 - MAC address of joining CNU
(only difference from extended Discovery GATE already allowed by standard)
- **SA**
 - CLT MAC address
- **Timestamp**
 - CLT localTime in TQ (set in RS)
- **Flags**
 - Bit 0-2 – #of grants in GATE (== 1)
 - Bit 3 – Discovery (==1)
 - Bit 4,5,6,7 – Force Report Grant #1,2,3,4 resp.
- **Sync Time**
 - synchronization time of the CLT

- **Proposed Extension**
 - Channel Descriptor ID
 - Length 1B

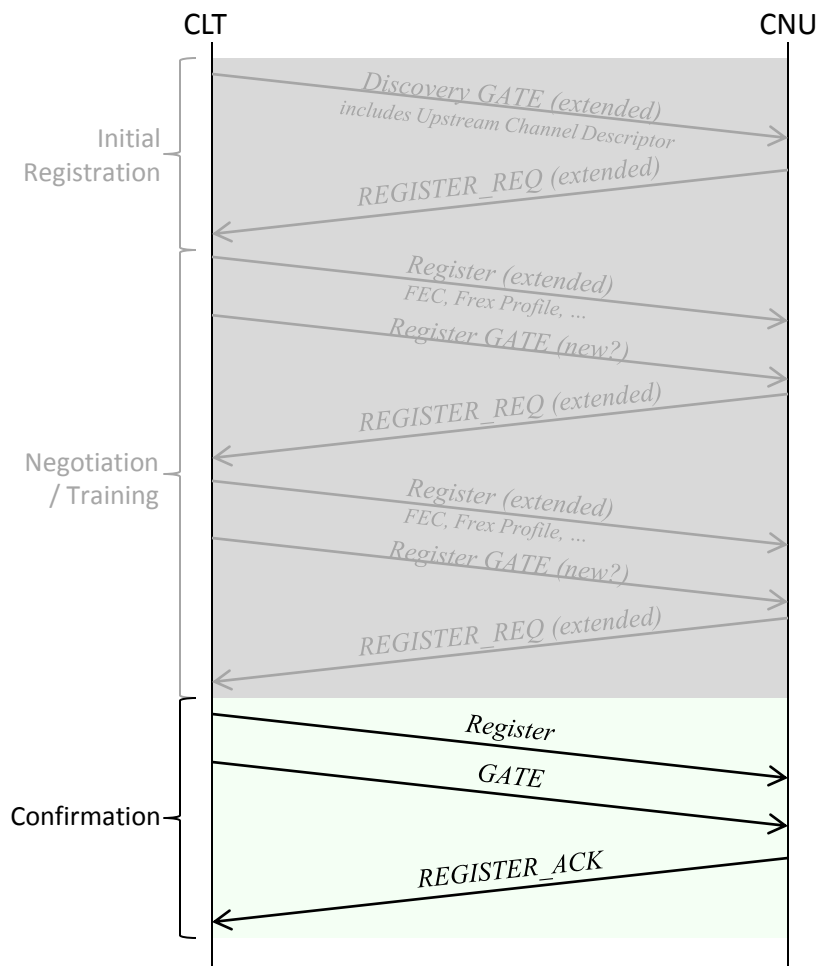
DA	6
SA	6
Len/Type = 88-08	2
Opcode = 00-02	2
Timestamp	4
# of grants / Flags	1
Grant #1 Start	0/4
Grant #1 Length	0/2
...	
Grant #4 Length	0/2
Sync Time	0/2
Channel Descriptor ID	1
Pad/Reserved	14/38
FCS	4

EPoC DISCOVERY

Confirmation

Option 1

- Once CNU training is complete
- Register Message
 - Indication from the CLT when it determines channel negotiations are complete
 - Flags == 1
- GATE (Extended)
 - Extended GATE type used to communicate channel parameters to be use by CNU
 - as previously propose with Flag bit 3 == 0
- REGISTER_ACK
 - No Change



GATE

Option 1

- **DA**
 - MAC address CNU
- **SA**
 - CLT MAC address
- **Timestamp**
 - CLT localTime in TQ (set in RS)
- **Flags**
 - Bit 0-2 – #of grants in GATE (per Std)
 - Bit 3 – Discovery (==0)
 - Bit 4,5,6,7 – Force Report Grant #1,2,3,4 resp.
- **Sync Time**
 - synchronization time of the CLT

- **Proposed Extension**
 - Channel Descriptor ID
 - Length 1B

DA	6
SA	6
Len/Type = 88-08	2
Opcode = 00-02	2
Timestamp	4
# of grants / Flags	1
Grant #1 Start	0/4
Grant #1 Length	0/2
...	
Grant #4 Length	0/2
Sync Time	0/2
Channel Descriptor ID	1
Pad/Reserved	14/38
FCS	4

EPoC DISCOVERY

Option 2

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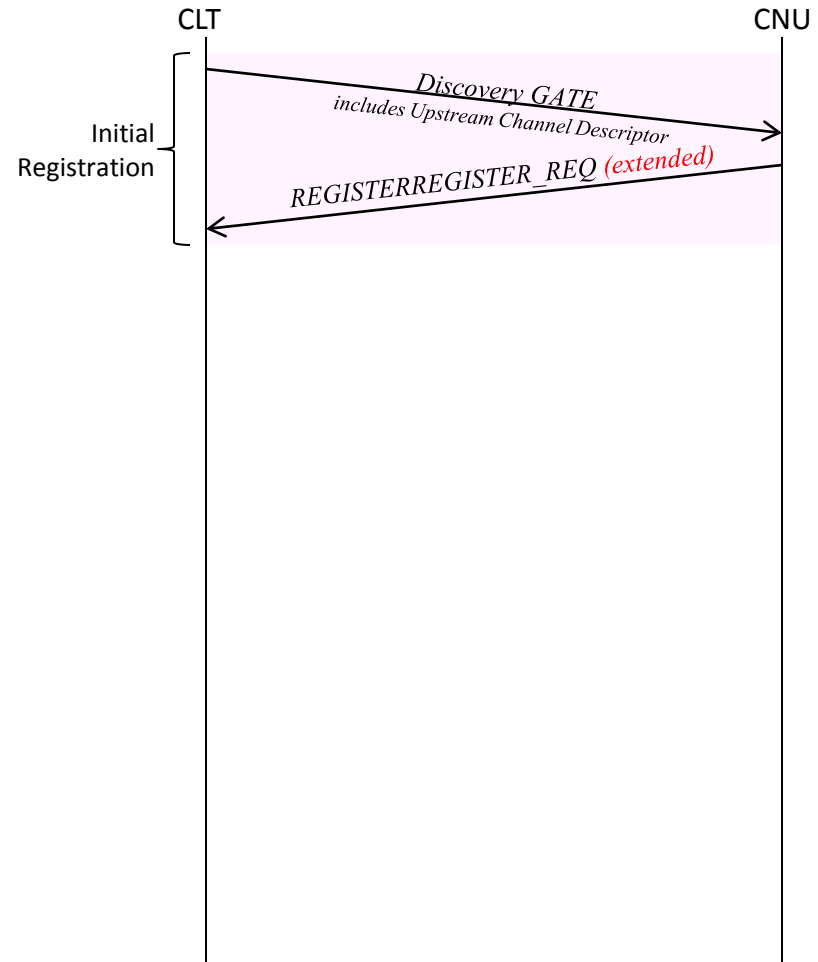
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EPoC DISCOVERY

Initial Discovery Option 2

- **Discovery GATE** (no change)
- **REGISTER_REQ** (extended, same as Opt 1)
 - Initial response uses a very basic, channel modulation scheme, with low data rate to ensure basic communications established.
 - Used to transfer MAC address of joining CNU
 - May need to be extended include additional information on CNU PHY capability



EPoC Discovery GATE

(no change)

Option 2

- **DA**
 - MAC Control Multicast address
- **SA**
 - CLT MAC address
- **Timestamp**
 - CLT localTime in TQ (set in RS)
- **Flags**
 - Bit 0-2 – # of grants in GATE (==1)
 - Bit 3 – Discovery (==1)
 - Bit 4,5,6,7 – Force Report Grant
#1,2,3,4 resp.
- **Sync Time**
 - synchronization time of the CLT

DA	6
SA	6
Len/Type = 88-08	2
Opcode = 00-02	2
Timestamp	4
# of grants / Flags	1
Grant #1 Start	0/4
Grant #1 Length	0/2
...	
Grant #4 Length	0/2
Sync Time	0/2
Pad/Reserved	13-39
FCS	4

EPON REGISTER_REQ

Option 2

- SA – MAC address of CNU
- Flags (value)
 - 0 – reserved
 - 1 – register
 - 2 – reserved
 - 3 – Deregister
 - 4-255 – reserved
- **Extension**
 - CNU Receive Quality?
 - CNU PHY capability
 - Number of usable Channel Descriptor ID's
 - Usable Channel Descriptor ID #1
 - Usable Channel Descriptor ID #2
 - ...

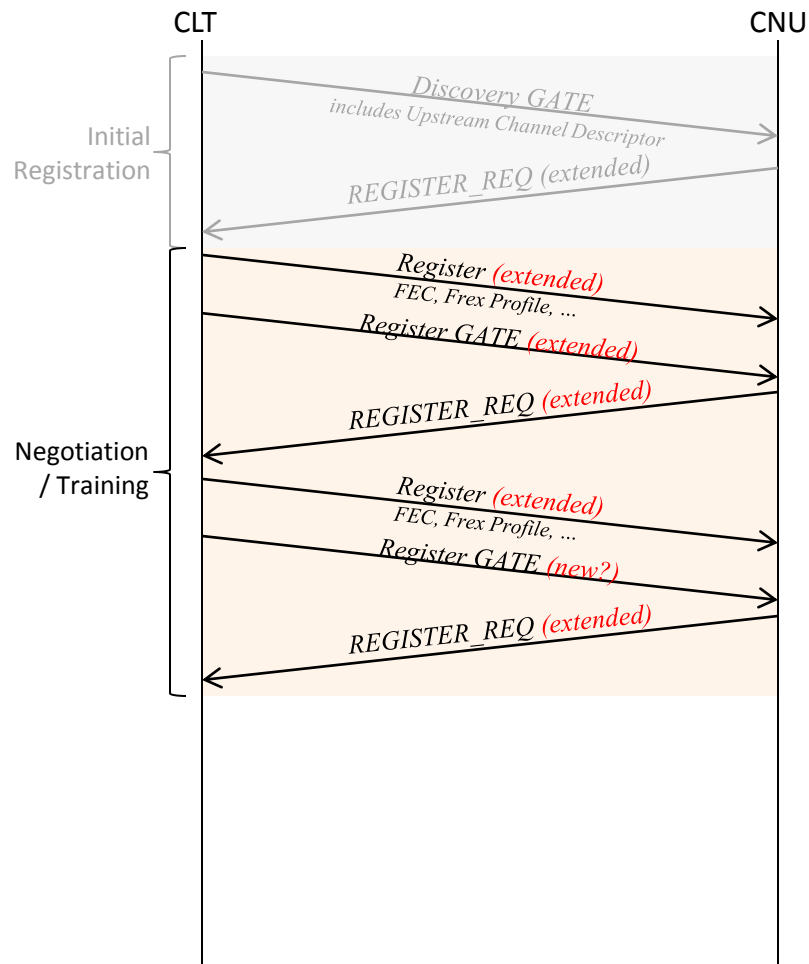
DA	6
SA	6
Len/Type = 88-08	2
Opcode = 00-04	2
Timestamp	4
Flags	1
Pending Grants	1
PHY Receive Quality	TBD
PHY Capability	2/TBD
Pad/Reserved	TBD
FCS	4

EPoC DISCOVERY

Training Phase

Option 2

- **Register Message (extended)**
 - Sent by CLT in response to REGISTER_REQ
 - Extended to include upstream channel descriptor (initial channel characteristics) for 1st REGISTER_REQ message
- **Register GATE (extended)**
 - GATE type used exclusively to train the joining end station.
 - Discovery GATE with the DA == MAC address of joining station
 - CNU only allowed to send additional REGISTER_REQ in response to Register GATE
- **REGISTER_REQ**
 - Same as previous
- **Iterate as needed to negotiate / train joining CNU**



EPoC Register message

Option 2

- **Flags (value)**
 - 1 – Register
 - 2 – Deregister
 - 3 – Ack
 - 4 – Nack
 - 5-255 – Reserved
- **Extension Flags**
 - 5 – Train
 - 6-255 Reserved

DA	6
SA	6
Len/Type = 88-08	2
Opcode = 00-05	2
Timestamp	4
Assigned port	2
Flags	1
Sync Time	2
Echo pending grants	1
Pad/Reserved	34
FCS	4

Proposed Register GATE

Option 2

- **DA**
 - MAC address of joining CNU
(only difference from Discovery GATE)
(already allowed by standard)
- **SA**
 - CLT MAC address
- **Timestamp**
 - CLT localTime in TQ (set in RS)
- **Flags**
 - Bit 0-2 – #of grants in GATE (== 1)
 - Bit 3 – Discovery (==1)
 - Bit 4,5,6,7 – Force Report Grant
#1,2,3,4 resp.
- **Sync Time**
 - synchronization time of the CLT

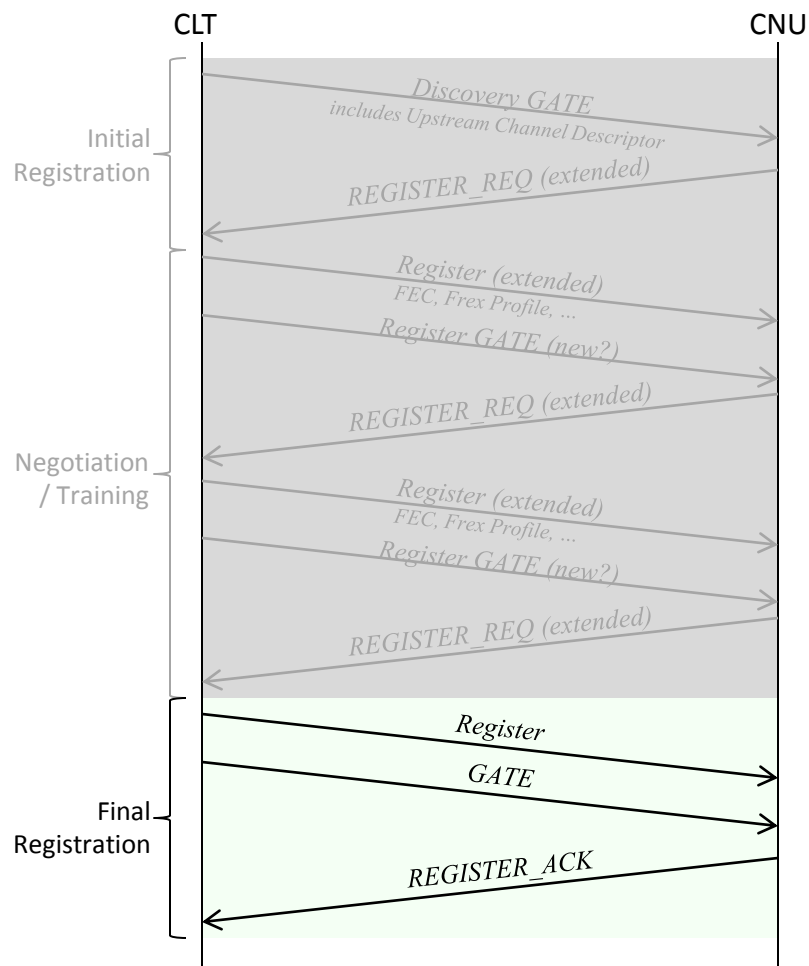
DA	6
SA	6
Len/Type = 88-08	2
Opcode = 00-02	2
Timestamp	4
# of grants / Flags	1
Grant #1 Start	0/4
Grant #1 Length	0/2
...	
Grant #4 Length	0/2
Sync Time	0/2
Pad/Reserved	13-39
FCS	4

EPoC DISCOVERY

Confirmation

Option 1

- **Once CNU training is complete**
- **Register Message**
 - Indication from the CLT when it determines channel negotiations are complete
 - Flags == 1
- **GATE**
 - No change
- **REGISTER_ACK**
 - No Change



Option Comparisons

MPCP Message	Option 1 (GATE driven)	Option 2 (REGISTER driven)
GATE	<ul style="list-style-type: none"> • Add Channel Descriptor 	<ul style="list-style-type: none"> • No change
REGISTER_REQ	<ul style="list-style-type: none"> • Add CNU PHY capability 	<ul style="list-style-type: none"> • Add CNU PHY capability
Register	<ul style="list-style-type: none"> • Add code point for “Training” 	<ul style="list-style-type: none"> • Add code point for “Training” • Add Channel Descriptor
Register GATE ¹	<ul style="list-style-type: none"> • Specify Unicast Discovery GATE 	<ul style="list-style-type: none"> • Specify Unicast Discovery GATE
Pros	<ul style="list-style-type: none"> • Flexible control & distribution of Channel Descriptor • No timing issues in control plane 	<ul style="list-style-type: none"> • Fewer changes
Cons	<ul style="list-style-type: none"> • More changes 	<ul style="list-style-type: none"> • Must reregister LLID in order to change Channel Descriptor

Notes:

1) Already allowed in specification, just a new formal definition and use case

Thank you

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