

# Clause 64

## Option #2

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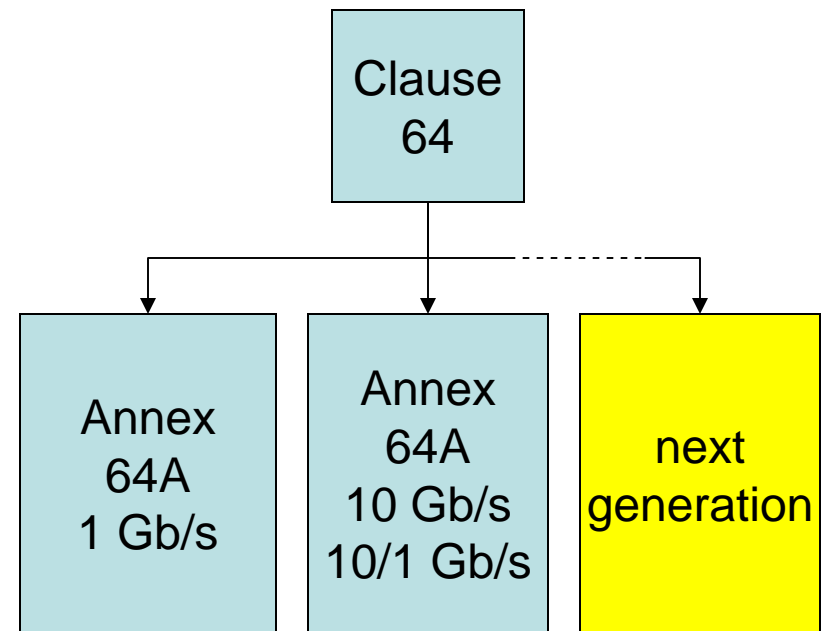
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# Overview of C64, option #2 [1]

(adopted from 3av\_0801\_kramer\_5.pdf)

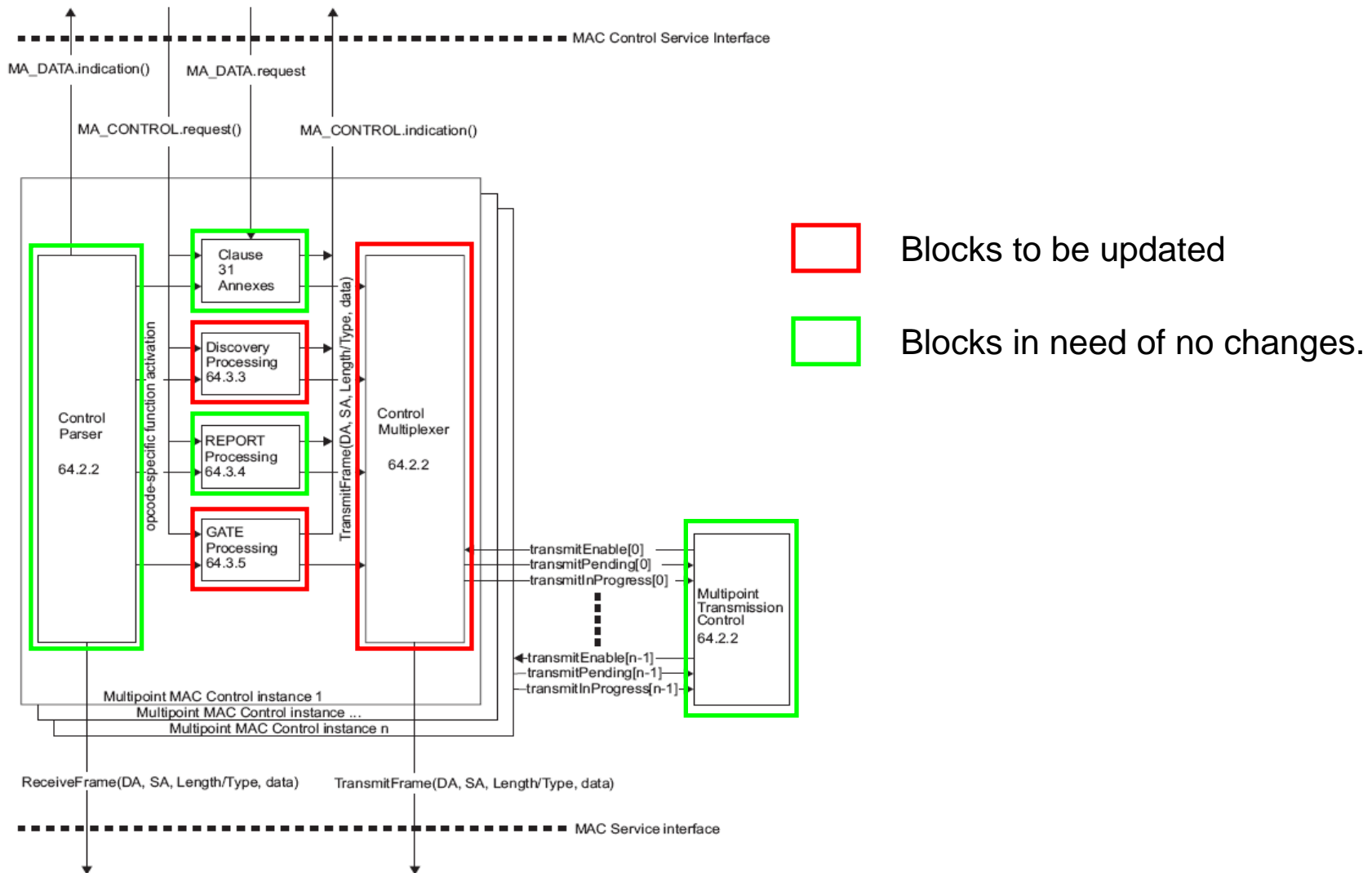
- Modelled after Clause 31
- Clause 64 contains only data-rate agnostic functions and definitions
- All parameters and functions which are speed agnostic moved to Annexes (normative):
  - 64A for legacy, 1Gb/s EPONs
  - 64B for emerging, 10Gb/s and 10/1Gb/s EPONs
- Cleaner solution – a framework clause ready for future additions, data rates, extensions etc.
- Requires some additional (parallel) work on Clause 64



# Overview of C64, option #2 [2]

- Pros
  - Clause 64 become data rate agnostic (all MAC-related clauses are supposed to be so)
  - Avoid problems with incorporation of 10G specific extensions to Clause 64
  - Facilitate any future extensions to the standard
- Cons
  - Complex splitting process
    - Clause 64 is long and can be easily damaged for 1G EPONs
  - Questions regarding the readability of the resulting split clause structure
  - Additional work load due to parallel preparation of the clause in an ad-hoc

# Clause 64 – current state



# Clause 64 – subclause overview

- [-] 64. Multipoint MAC Control
  - [+] 64.1 Overview ✓
  - [-] 64.2 Multipoint MAC Control operation
    - [+] 64.2.1 Principles of Multipoint MAC Control ✓
    - [+] 64.2.2 Multipoint transmission control, Control Parser, and Control Multiplexer ✎
  - [-] 64.3 Multipoint Control Protocol (MPCP)
    - [-] 64.3.1 Principles of Multipoint Control Protocol ✓
    - [+] 64.3.2 Compatibility considerations ✓
    - [+] 64.3.3 Discovery Processing ✎
    - [+] 64.3.4 Report Processing ✓
    - [+] 64.3.5 Gate Processing ✎
    - [-] 64.3.6 MPCPDU structure and encoding ✓
      - [-] 64.3.6.1 GATE description ✎
      - [-] 64.3.6.2 REPORT description ✎
      - [-] 64.3.6.3 .REGISTER\_REQ description ✎
      - [-] 64.3.6.4 REGISTER description ✎
      - [-] 64.3.6.5 REGISTER\_ACK description ✓
  - [+] 64.4 Protocol implementation conformance statement (PICS) proforma for Clause 64, Multipoint MAC Control ✓

- ✓ Subclause OK. No changes needed. Remains as defined C64
- ✎ Subclause is speed-dependent / was extended in 802.3av. Requires modifications + new features in the Annexes

# Clause 64 – block overview

- Multipoint Transmission Control:
  - signals each MAC control when to start/stop transmission
  - already speed independent as defined in C64 in 802.3-2005
- Control Parser:
  - determines whether received PDUs go to the MAC Control Client or to the regular MAC Client
  - some changes needed to C64 in 802.3-2005
    - guard times must be defined as variables rather than constants
    - add a function to determine the size of the guard time (constant value for 1G EPONs, negotiable value for 10G EPONs)
- Control Multiplexer:
  - selects PDUs for transmission from MAC Control Client / regular MAC Client
  - responsible for back-off for IPG and FEC overhead
  - in ONU, checks before transmitting each frame whether the frame transmission will complete before the end of the ONU's transmission slot
  - some changes needed to C64 in 802.3-2005
    - dependencies on the data rate and FEC type exist

# Overview of necessary changes

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# Changes [1]

- Main changes to be introduced:
  - C64 will be rewritten in some parts to exclude any data rate dependent references (e.g. all values expressed in ns will be converted into time\_quanta units).
  - Add Annex 64A for 1GEPON and Annex 64B for 10GEPON definitions, variables and extensions
  - Extend the structure of some of the MPCPDUs:
    - GATE will have Discovery Information field, the contents of which is defined in Annex 64A for 1GEPON and Annex 64B for 10GEPON
    - REGISTER\_REQ will have Discovery Information, laser on fields and laser off time fields, the values of which are specified in Annex 64A for 1GEPON and Annex 64B for 10GEPON
    - REGISTER will have the echoed lased on time and echoed laser off time, the values of which are specified in Annex 64A for 1GEPON and Annex 64B for 10GEPON
    - this way the extended MPCPDUs are backward compatible (new fields are transmitted as 0s for 1GEPONs).



# Changes [2]

- Main changes to be introduced (con'd):
  - Discovery Processing and Gate Processing primitives need to be extended:
    - need to include a set of new parameters carried by MPCPDUs i.e. discovery information, laser on time and laser off time
    - primitives are modified only when necessary e.g. MA\_CONTROL.indication(REGISTER, SA, LLID, status) is not altered even though it is called for REGISTER message (reason: echoed parameters are historically not delivered to MAC Client).
  - Discovery Processing and Gate Processing state machines need to be extended:
    - need to parse the extended parameter fields in the MPPCDUs i.e. discovery information, laser on time and laser off time, where appropriate
    - add new functions, variables and constants where necessary e.g. GetLaserTime(data) to produce correct values of laserOnTime/laserOffTime variables
    - change the state of some of the constants, variables e.g. laserOnTime/laserOffTime become variables instead of constants, tqSize becomes a function instead of a constant (definitions in Annexes)

# Changes [3]

- Main changes to be introduced (con'd):
  - Modify some of the functions which depend on 1G EPON mechanisms:
    - change the FEC overhead calculation, since the FEC mechanism in 10G EPONs is different
    - Modify the description of the synchronization period, during which IDLE characters are transmitted in 1GEAPON, while a burst delimiter and IDLE characters are transmitted in 10GEAPON.
  - Modify the description of the Discovery Process
    - new parameters carried by the MPCPDUs i.e. discovery information, laser on time and laser off time need to be reflected in the description of the process
    - modify the figure representing the Discovery Process
  - Modify the SCB MAC support:
    - leave the main body of the section describing SCB MAC support in C64, adding extensions (additional SCB MAC and a new LLID) in Annex 64B

# Changes [4]

## 64B.3.2 REGISTER\_REQ description

The internal structure of the 16 bit wide Discovery Information field is presented in Table 64B-2.

Table 64B-2—REGISTER\_REQ MPCPDU Discovery Information Fields

Bit	Flag Field	Values
0	ONU is 1G upstream capable	0 – ONU transmitter not support 1000 Mb/s transmission in the upstream direction 1 – ONU transmitter supports 1000 Mb/s transmission in the upstream direction
1	ONU is 10G upstream capable	0 – ONU transmitter supports 10 Gb/s transmission in the upstream direction 1 – ONU transmitter does not support 10 Gb/s transmission in the upstream direction
2 – 3	reserved	Ignored on reception.
4	1G registration attempt	0 – 1 G registration is not attempted 1 – 1 G registration is attempted
5	10 G registration attempt	0 – 10 G registration is not attempted 1 – 10 G registration is attempted
6 – 15	reserved	Ignored on reception.

The Laser On Time and the Laser Off Time values transmitted by a 10 Gb/s ONU (either supporting symmetric or asymmetric data rates) shall be equal to the time necessary to turn the laser on and off, respectively, expressed in the units of time\_quanta.

Annex 64B  
REGISTER\_REQ definitions

## 64A.3.2 REGISTER\_REQ description

The internal structure of the 16 bit wide Discovery Information field is presented in Table 64A-2.

Table 64A-2—GATE MPCPDU Discovery Information Fields

Bit	Flag Field	Values
0 - 15	reserved	All 16 bits set to 0. Ignored on reception.

The Laser On Time and the Laser Off Time values shall be equal to 0, when transmitted by a 1000 Mb/s ONU.

Annex 64A  
REGISTER\_REQ definitions

# Overview of open issues

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# Open issues in draft of new C64

- Main identified issues with the draft of C64, option #2:
  - The FEC overhead calculation mechanism for 10GEPONs is partially missing. Eric submitted a comment (#963), though the location of the proposed calculation mechanism is not clear
  - Discovery process requires further clarification in the case of 10G EPON ONUs processing an incoming Discovery GATE:
    - an OLT may open 1G and 10G Discovery Window
    - a dual rate ONU must know which window to transmit in
    - currently, this topic is not specified. Do we need to determine that in the standard or leave it open for implementation?
  - Any other ?