

Joint ITU-T/IEEE Workshop on Next Generation Optical Access Systems



Inter-Connected Concepts: Towards a Unified PON System

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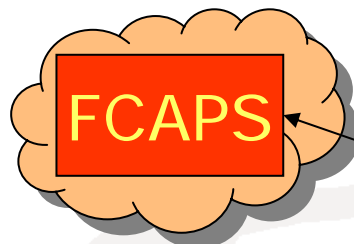


Introduction

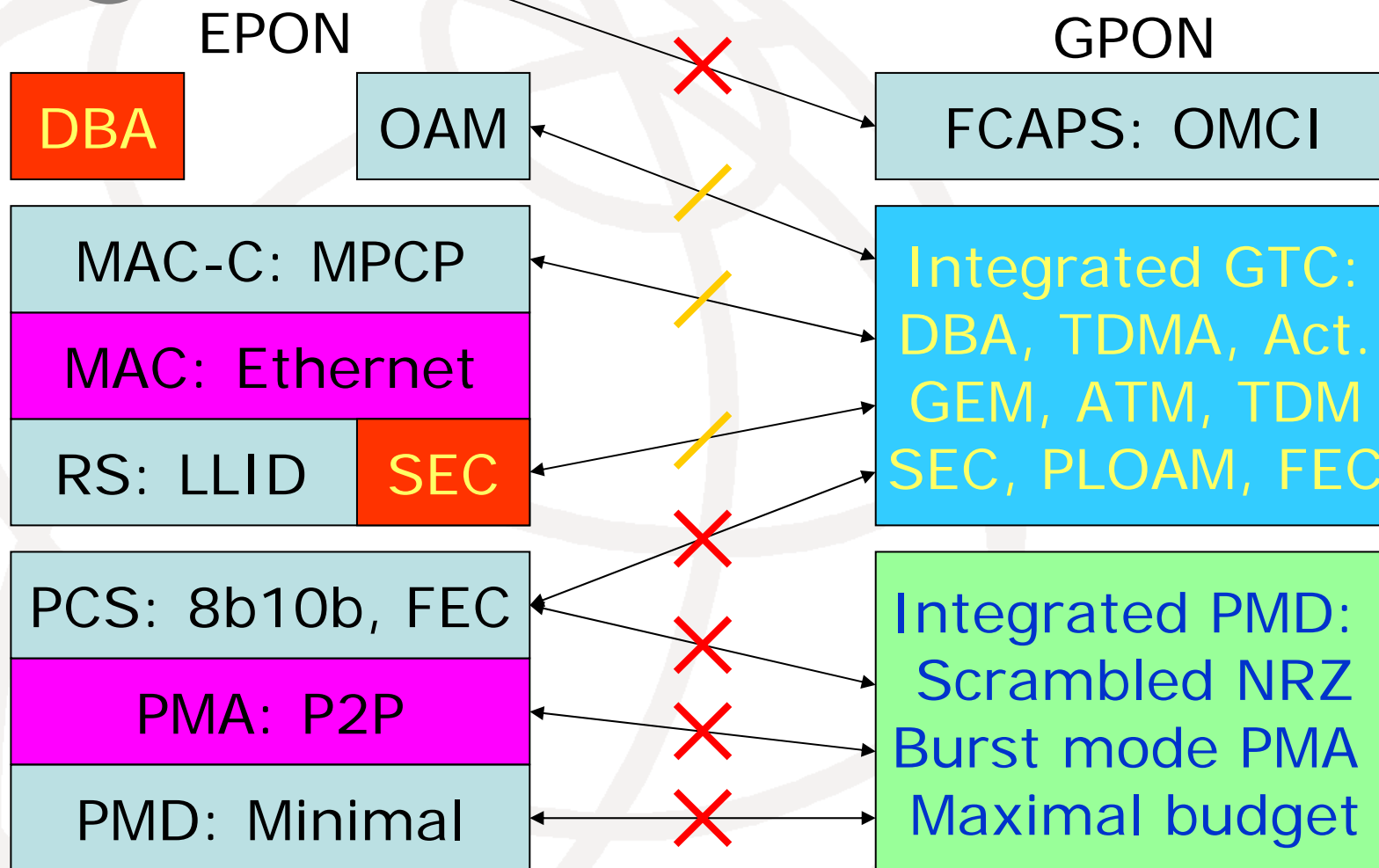
- Current 1Gb/s generation of PONs
- Comparison of EPON and GPON
- The next generation 10Gb/s PONs
- Harmonization of the standards

Gb/s PONs

- G-PON
 - Created by the FSAN/ITU (operators)
 - Top-down design (requirements > technology)
 - Supports full service in an integrated way
 - Mainly deployed in NA and Europe
- EPON
 - Created by IEEE (vendors)
 - Bottom-up design (technology > capabilities)
 - Supports packet transport, all else over the top
 - Mainly deployed in Asia



Gb/s Systems



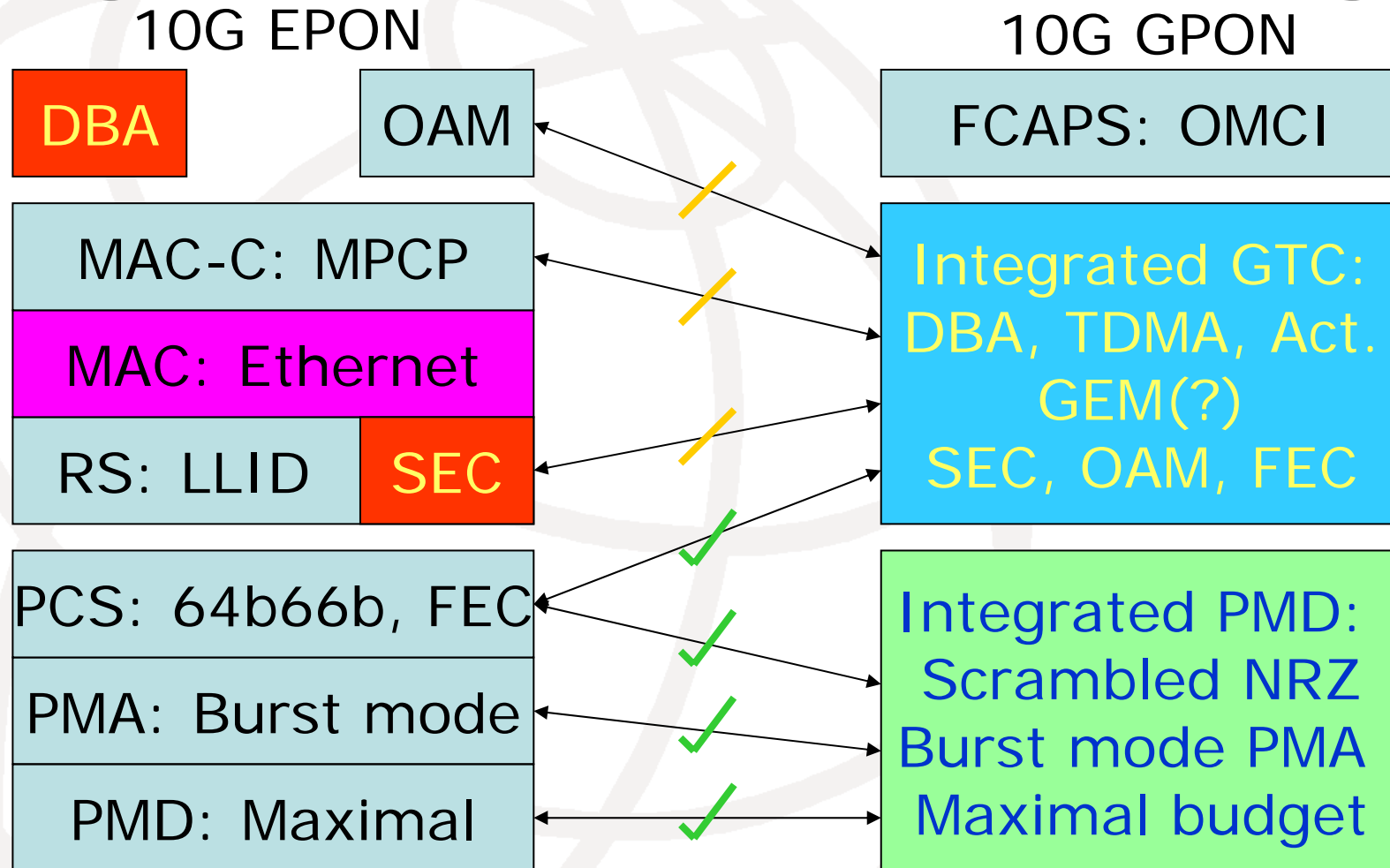
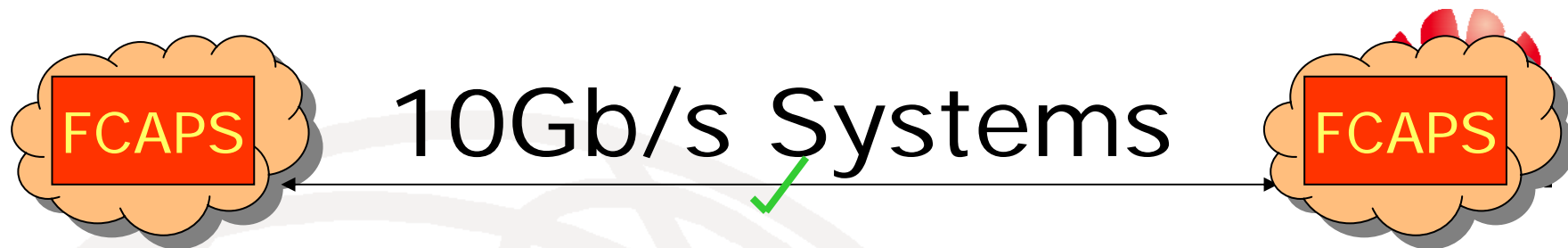
Comments

- So many differences... Why?
 - Most can be traced to the desire to reuse 1Gb/s PHYs
 - Some arise from compliance to Ethernet MAC architecture
 - The gaps come from scope of 802.3
- Despite this, there are similar concepts
 - LLID = GEM Port-ID
 - Gate = BWmap
 - Report = DBRu
 - OAM = PLOAM



History

- The relationship between 802.3ah and Q2/15 was not ideal
 - Deep suspicion of each others motives
 - Competing for the same technology
 - A very different constituency base
 - An opposite design approach
- But, time heals all wounds – we hope!
- Many in Q2/15 have realized
 - You shouldn't ask for every possible feature
 - Industrial/vendor input is important
 - Efficiency/cost tradeoffs should be considered
- Many in 802.3av have learned
 - Leaving important features undefined is dangerous
 - You need to listen to operator requirements



Comments

- Many of the differences are gone
 - 10Gb/s PHY drives the change: Maximal optical budget, scrambled code, burst-mode PMA, and streaming FEC
- At the 10G rate, EPON has come much closer to the ITU design
- What remains?
 - TC-layer “similar concepts”
 - Standardization gaps

Drivers to commonality



- Service models
 - As the all-IP network (finally) gets off the ground, the “over the top” model is gaining more and more acceptance
 - We would hope it is the dominant model by the time 10G PON is hitting the street
- Technical implications
 - The efficiency gained by fragmenting frames is 10x smaller at 10G upstream
 - It is not worth the complexity cost at this speed
- Technology costs
 - 10G components and systems are difficult to build and tend to carry a cost premium
 - If ever we needed a single market to drive volume up and cost down, 10G PON is it!

Converging 10G PONs



- IEEE standard defines the “transport”
 - PHY and much of the TC layer
- ITU and DSL-F defines the “system”
 - DBA
 - Security
 - FCAPS management
 - Service model

ITU out of the optics biz?



- In a word, no.
- 10G symmetric ("XG-PON2") is a challenge and a question
 - It might not become cost-effective
 - It has difficulty reaching long distances / large power budgets
 - The coexistence with some deployments is difficult
- The alternative is a 10G down/~2.5G upstream PON system: "XG-PON1"
- Both XG-PONs would belong to the common "system" standard

Converged 10Gb/s PONs HUAWEI

XG-PON1

XG-PON2

In-Band FCAPS: DSL-F WT-155 (TR-69 for PON)

Service Model: DSL-F WT-156 (TR-101 for PON)

Out-of-band FCAPS: OMCI

X-PON Common functions: DBA, SEC, PLOAM

XG-PON1 TC
TDMA, Act.
GEM, FEC

XG-PON1 PMD
10G/2.5G

MAC-C: MPCP

MAC: Ethernet

RS: LLID

PCS: 64b66b, FEC

PMA: Burst mode

PMD: Maximal



Thank you!