CL148 (PLCA) unresolved CSD related comments

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V.02

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Comments Summary

- Broad Market Potential
- Compatibility

- As a PHY amendment to IEEE Std 802.3, the proposed project will remain in conformance with IEEE Std 802, IEEE Std 802.1AC, and IEEE Std 802.1Q.
  # 605 – Media Loopback
  - As a PHY amendment to IEEE Std 802.3, the proposed project will use MII, and follow the existing format and structure of IEEE 802.3 protocol-independent specification of managed objects.
  #288 #290, gRS, #289 RS layer function, #292, #294, #295 #599 MII funct mod,
  - The proposed amendment will conform to the IEEE 802.3 MAC.
  #287 Carrier-Sense, #604 ”TokenBus-like” beacon,
- #273 – config node ID. #286 Node ID=0 assignment

- Distinct Identity
- Technical Feasibility
- Economic Feasibility

- The cost factors for Ethernet components and systems are well known. The proposed project may introduce new cost factors which can be quantified.
- The reduction in the number of legacy networks requiring specialized components, expertise, and gateways in the targeted markets is anticipated to result in a significant drop in both installation and operational costs.

#273 – config node ID. #286 Node ID=0 assignment. (both compatibility and economic feasibility).

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Compatibility – MII and RS (1) - Background

What does RS sub-layer do?

Translates PLS Services from the AUI (the original 10 Mbps media independent interface) to a new MII that serves both 10 Mbps and 100 Mbps. Both AUI and MII are exposed conformance test point, where the internal (implementation) design is exposed to external behaviors as specified in the standard.

1.4.425 Reconciliation Sublayer (RS): A mapping function that reconciles the signals at the Media Independent Interface (MII) to the Media Access Control (MAC)-Physical Signaling Sublayer (PLS) service definitions. (See IEEE Std 802.3, Clause 22.)

Ah, what about use of CRS in EEE?

The use qualifies as “A mapping function that reconciles the signals…”

Compatibility – MII and RS (2) – Statements in 802.3cg CSD

CSD Link➔ https://mentor.ieee.org/802-ec/dcn/18/ec-18-0079-00-ACSD-802-3cg.pdf

States "**As a PHY amendment to IEEE Std 802.3, the proposed project will use MII,** and follow the existing format and structure of IEEE 802.3 protocol - independent specification of managed Objects".

"As a PHY amendment to IEEE Std 802.3, the proposed project will use MII," It does not say, it will put appropriate modifications to [this exposed interoperability conformance test point] MII and then be compatible with the modified MII.

Would you accept modifications to CL4 MAC and define a PHY such that only when the PHY is used, the CL4 MAC modifications become relevant? Would you deem this as being compatible with existing MAC?
No. You cannot claim compatibility to existing (exposed interoperability) interface and then go change the interface definition.

Just an example. GE MAC that implements carrier extension (or packet aggregation if frames available) changed the CL4 MAC. Would you have claimed compatibility to the "existing" MAC, because it optionally became relevant for GE speed and CSMA/CD?

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Compatibility – MII and RS (3) – Conclusion

802.3cg draft does not meet the compatibility statement WRT to MII, due to CL148 requiring changes to CL22.

Full stop.

Summary References

PAR Title says “Standard for Ethernet Amendment: Physical Layer Specifications and Management Parameters for 10 Mb/s Operation And Associated Power Delivery Over a Single Balanced Pair of Conductors”

Scope says “Specify additions to and appropriate modifications of IEEE Std 802.3 to add 10 Mb/s Physical Layer (PHY) specifications and management parameters for operation, and associated optional provision of power, using a single balanced pair of conductors

CSD Compatibility says “- As a PHY amendment to IEEE Std 802.3, the proposed project will use MII, and follow the existing format and structure of IEEE 802.3 protocol-independent specification of managed objects.”

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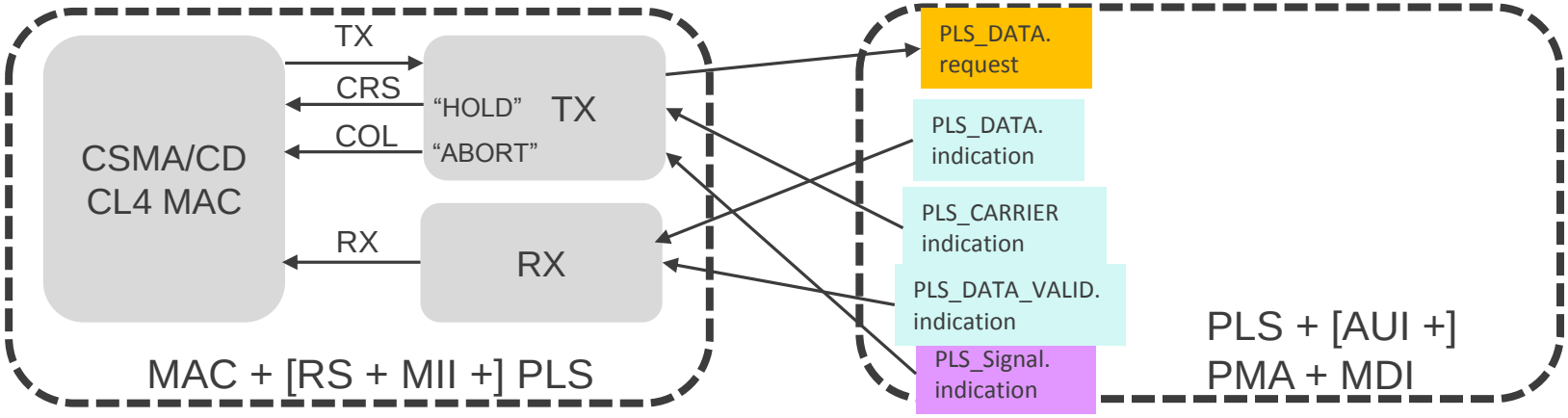
Compatibility – MAC (1) – CSMA/CD MAC Background



Observations:

CSMA/CD MAC is specified ("architected") to be a full-duplex datapath – as in TX path has no dependency to RX states. And vice versa. COL and TX states has no effect on RX path.

- Transmitter honors CRS as "HOLD the TX" before starting to transmit. CRS is no-op until CRS deasserts.
- Transmitter honors COL as "ABORT TX" with appropriate abort procedure (send rest of preamble + JAM 32)
- Receiver receives so long as data is valid, and processes with appropriate procedure (FCS check, address filters, etc)

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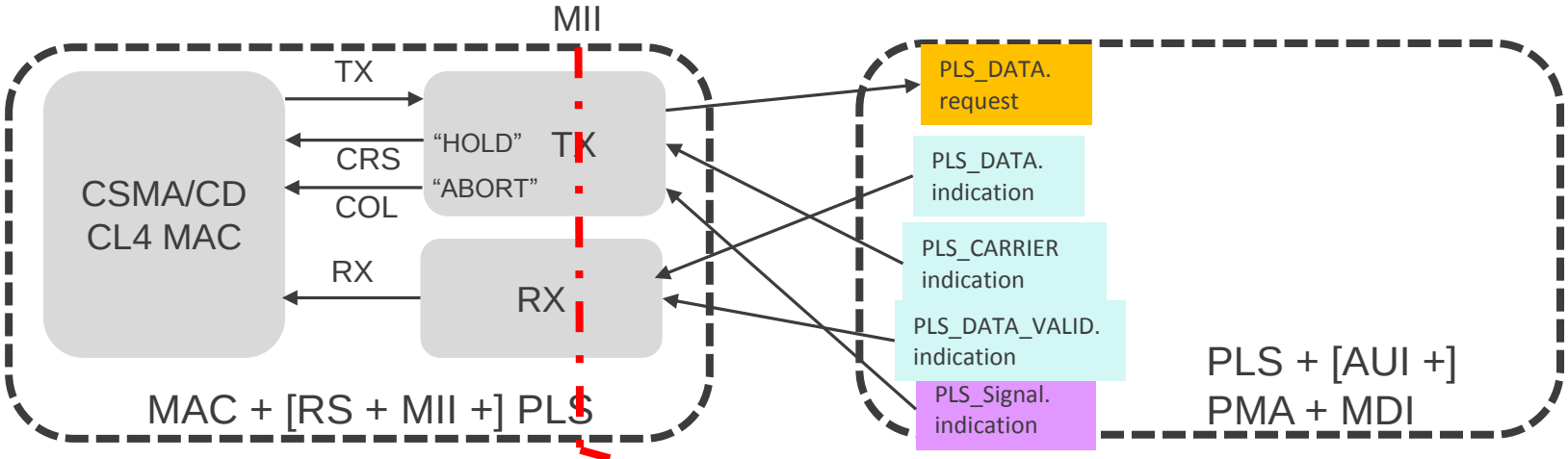
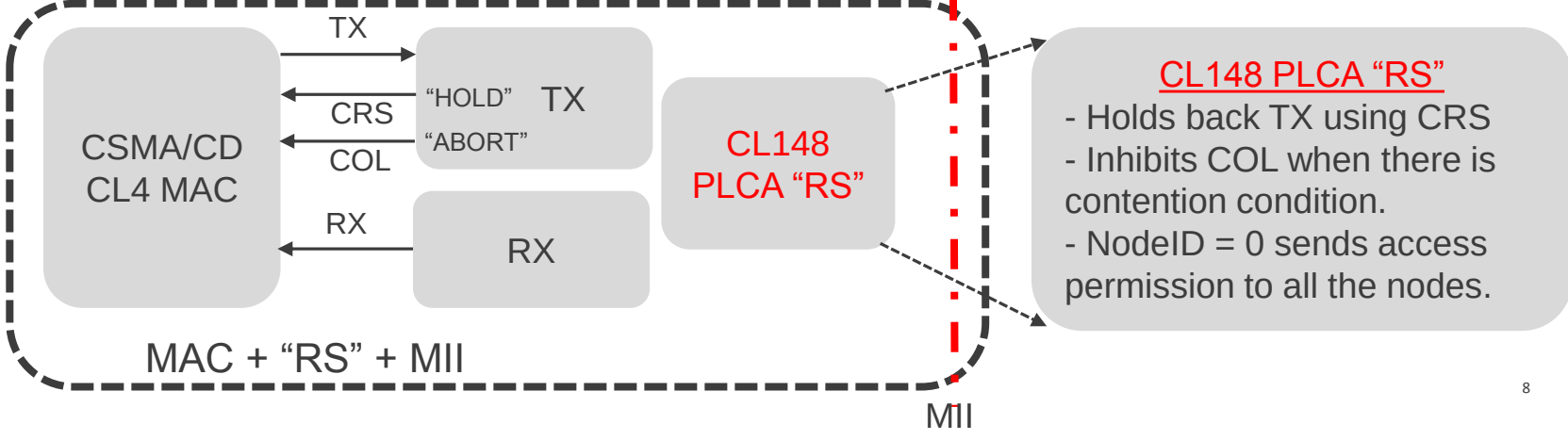
Compatibility – MAC (2) – PLCA “RS” in CL148



CL148 uses these independent TX and RX datapath definitions in CL4. And then inserts its **own Media Access Control** – that uses Node=0 as the master transmit opportunity sync generator, et cetera.

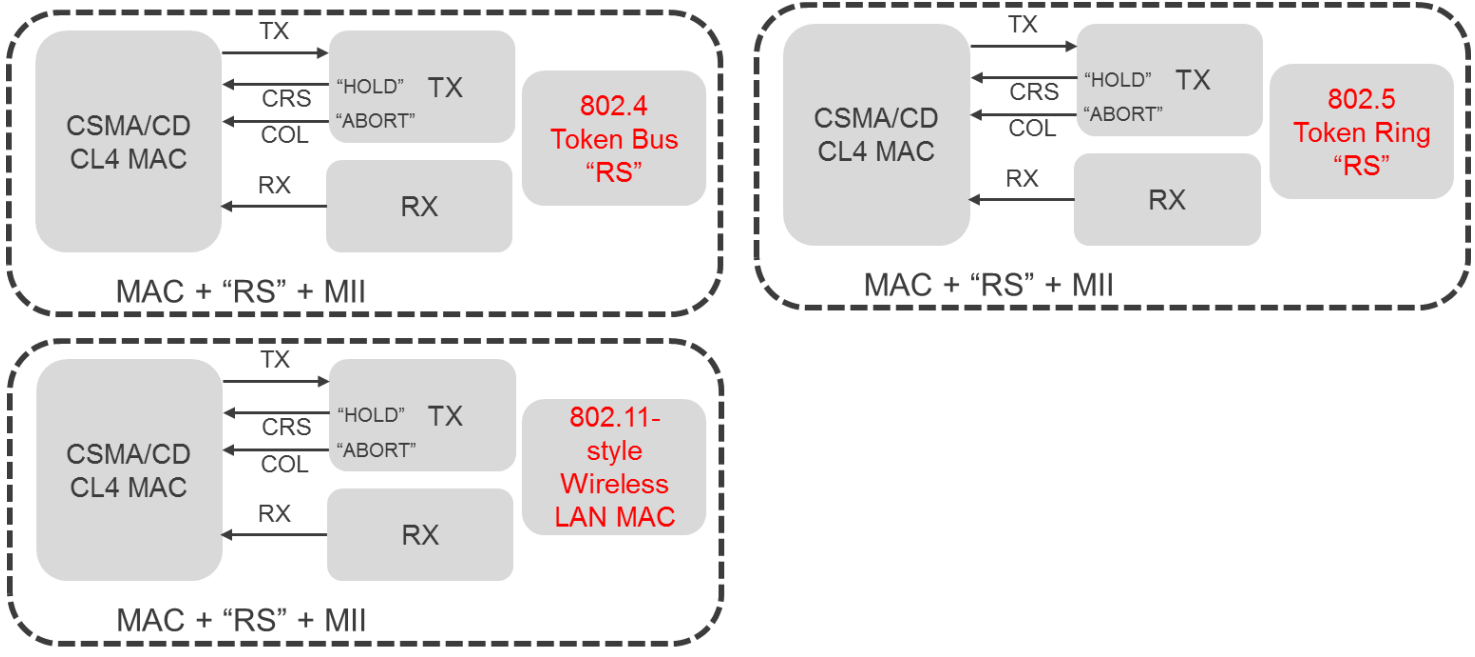


Compatibility – MAC (3) – Conclusions and consequences

CL148 (PLCA) is a new MAC.

The fact that it interfaces to the CL4 MAC without modification is a distraction to seeing what CL148 is – a new MAC.

But if CL148 is declared to be just an alternate RS Sub-Layer, then I could see some very liberating possibilities and consequences of new class of RS sub-layers (assuming >75% approval) 🡐 being a bit silly here.



Compatibility – MAC (4) – What Std says (a few referenced text as a backup)

1.4 - Media Access Control (MAC): The data link sublayer that is responsible for transferring data to and from the Physical Layer.

2.2.1 General description of services provided by the layer. The services provided by the MAC sublayer allow the local MAC client entity to exchange LLC data units with peer LLC sublayer entities. Optional support may be provided for resetting the MAC sublayer entity to a known state.

4.1 Functional model of the MAC method

4.1.1 Overview

…..The MAC sublayer defines a medium-independent facility, built on the medium-dependent physical facility provided by the Physical Layer, and under the access-layer-independent LAN LLC sublayer (or other MAC client). It is applicable to a general class of local area broadcast media suitable for use with the media access discipline known as Carrier Sense Multiple Access with Collision Detection (CSMA/CD). …… the partitioning of functions presented in this standard **requires two main functions generally associated** with a data link control procedure to be performed in the MAC sublayer. They are as follows:

a) **Data encapsulation** (transmit and receive)

1) Framing (frame boundary delimitation, frame synchronization)
2) Addressing (handling of source and destination addresses)
3) Error detection (detection of physical medium transmission errors)

b) **Media Access Management**

1) Medium allocation (collision avoidance)
2) Contention resolution (collision handling)

Compatibility – Node ID etc (1) –Background

IEEE 802.3 compatibility means that two or more compliant implementations would interoperate (with a high degree of probability) – this has been hallmark of 802.3 Ethernet brand, and most of 802 standards.

Management is optional.

All parameters required to assure compatibility (interoperability) are defined. E.g. Link training required for interoperability is defined in respective PHY clauses. These are not optional.

Compatibility – Node ID etc (2) – CL148

In CL148, parameters required to operate, and interoperate, and provide compatible behaviors are missing.

- How NodeID = 0 is assigned (or how the node is elected/assigned to be node 0)
- How NodeID = 0 is unique (no duplication), lost (power down), etc
- How other Nodes get their IDs. Et cetera, et cetera, et cetera.

These are examples of necessary specifications to assure interoperability that are declared to be out-of-scope of CL148.

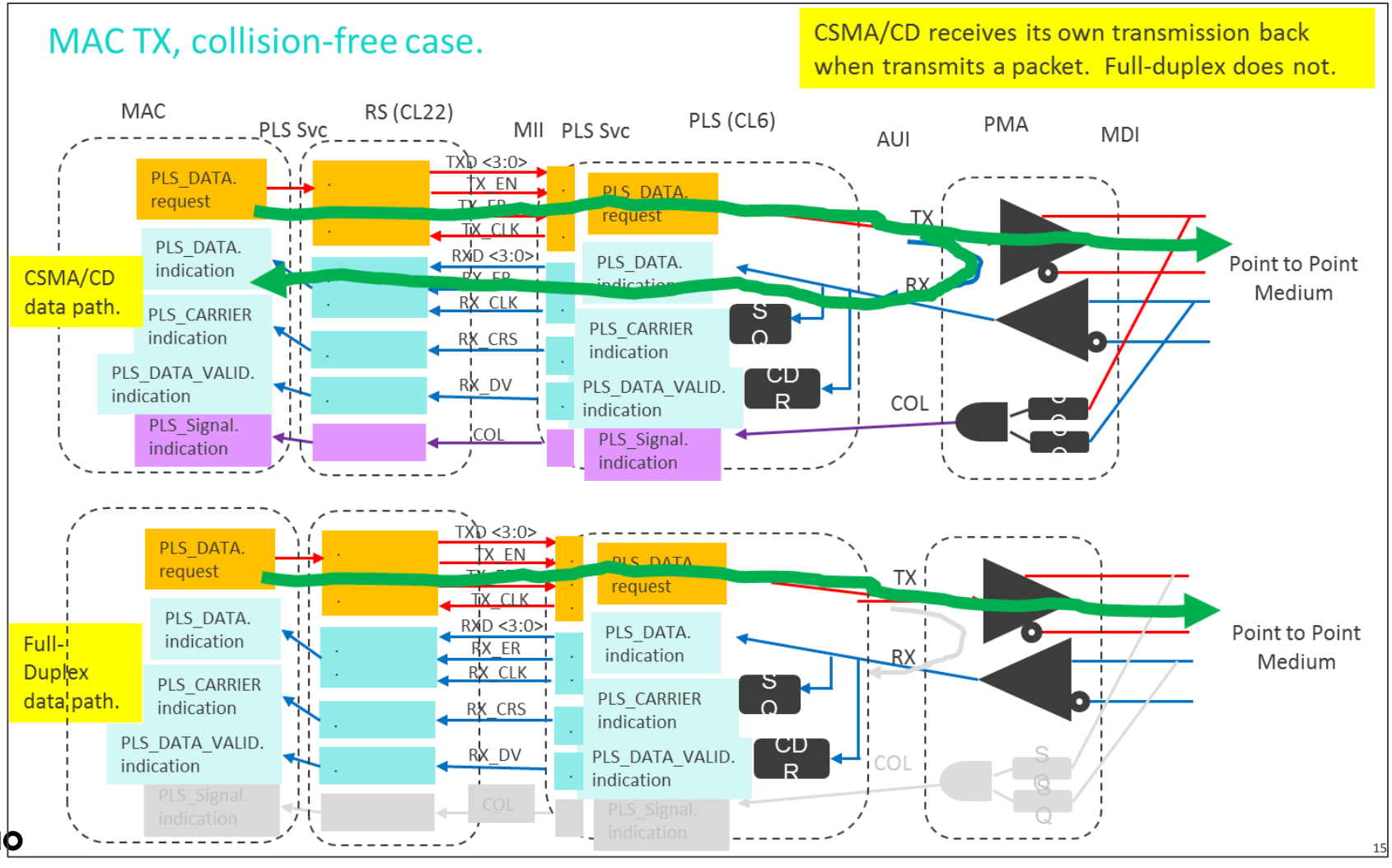
Compatibility – Node ID etc (3) – Conclusions.

CL148 (PLCA) draft specification is incomplete and no way for two compliant implementations to interconnect and operate.

Due to these incomplete specification, it is not obvious that the stated Economic Feasibility statement of "- The cost factors for Ethernet components and systems are well known" is applied to this standard. All prior Ethernet components are assured to be complete and two or more compliant implementations interconnects and operates without optional management or out-of-band unspecified management actions.

Media Loopback Concern ← an effect. Only relevant if CL148 moves forward as-is with >75% approval.

Compatibility - Media Loopback (1) – from before



Compatibility - Media Loopback (2)

- **But systems do not treat the reflected RX (associated with a TX) same as as RX frame from other sources in half-duplex mode.**
  - System ignores the reflected RX (apart from diagnostic purposes)
  - E.g. ARP frame from IP stack does not get reflected back to its own RX when CSMA/CD MAC is used.
- **According to the stds, 802.1D/Q bridge must process reflected frame. They don't. -- from 802.1AC-2012 references**
- **11.1 Service primitives and parameters**

NOTE 2—This non-reflective behavior is a change from that previously specified in ISO/IEC 15802-1 [B8][***1995***], where an indication primitive was invoked by the MAC entity to the originating MAC service user if the local MSAP was designated by the destination_address parameter. Consequently, if the former behavior is desired, it would be necessary to provide it locally. This change was made to bring the definition of the MAC service into line with the requirements of MAC bridging. In an underlying MAC whose natural behavior is for such local indications to be invoked, the MAC entity is the only point at which this reflection can be suppressed.

- **12.1.1 Support of the Internal Sublayer Service by IEEE Std 802.3-2008 (CSMA/CD)**

No considerations for loopback behavior.

2.1 Scope and field of application

This clause specifies the services provided by the Media Access Control (MAC) sublayer to the client of the MAC (see Figure 1–1). MAC clients may include the Logical Link Control (LLC) sublayer, Bridge Relay Entity, or other users of ISO/IEC LAN International Standard MAC services (see Figure 2–1). The services are described in an abstract way and do not imply any particular implementation or any exposed interface. Other clauses in this standard may add optional protocol sublayers directly above the MAC that preserve the service interface to the MAC client. Any augmentations to the MAC client interface are specified in the relevant sublayer clause (e.g., Clause 31).

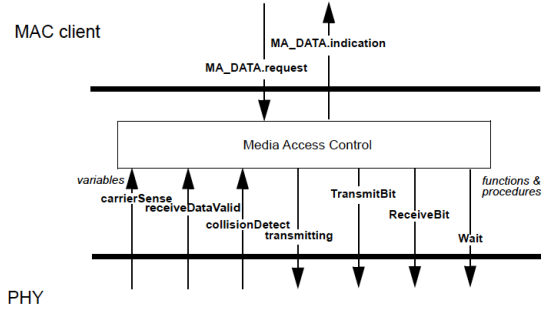


Figure 2–1—Service specification primitive relationships

From 802.1AC

Even if all implementations moved to bit-by-bit compare (they didn't) @ 2012 (802.1AC), and deemed to be a requirement (it's not clear, no shall), MACs between 1995~2012 has the definition.

Compatibility - Media Loopback (3) - why do we care, why now.

Conclusion: System behavior cannot be different for the same condition. PLCA sends good RX (no FCS error and valid length) even when simultaneous TX is active and in collision (it almost count on it for access control).

Why do we care?

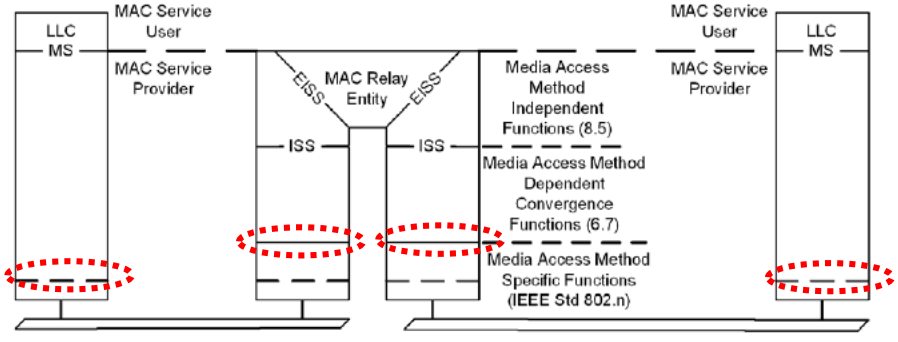
FACT: Whether the MAC client is a station (Fig 7-1 in 802.1AC) or a Bridge (Fig 6-1 in 802.1Q), the MAC service interface is unaware of full or half-duplex Ethernet.

REASONABLE CERTAINTY: A MAC client sees a transmitted frame reflected back, ignores its receipt (except for diagnostics purposes) when the MAC is in half-duplex. Otherwise, any broadcast frame in a bridged network will circulate forever (regardless of spanning tree). Stations will see its own broadcast (e.g. ARP) and multicast (that of which it is a member). ← none of this is in Stds.

Why now?

FACT: PLCA (proposed RS in 802.3cg) send good FCS RX ("collision free") regardless of TX state (collision or no collision), and expect RX to be processed by the MAC client.

REASONABLE CERTAINTY: : IF PLCA is used, THEN RX frame will be lost when simultaneous TX in process (in half-duplex)



NOTE—The notation "IEEE Std 802.n" in this figure indicates that the specifications for these functions can be found in the relevant standard for the media access method concerned; for example, n would be 3 (IEEE Std 802.3) in the case of Ethernet.

Figure 6-1—Internal organization of the MAC sublayer

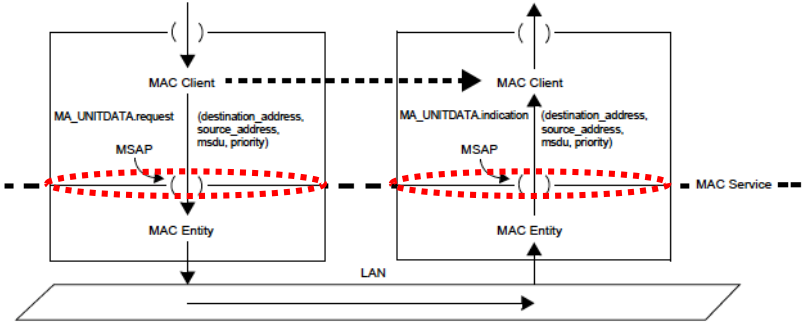


Figure 7-1—MAC entities, the MAC Service, and MAC Service users (clients)

Compatibility - Media Loopback (4) – Conclusion

- IEEE 802.3 Half-duplex (CSMA/CD) and Full-duplex modes of operation should be distinguishable to the upper layer if it were to handle reflected RX from half-duplex medium correctly. MAC client sees a transmitted frame reflected back, ignores its receipt (except for diagnostics purposes) when the MAC is in half-duplex.
- System behavior cannot be different for the same condition. PLCA sends good RX (no FCS error and valid length) even when simultaneous TX is active and in collision (it almost count on it for access control).
- REASONABLE CERTAINTY: : IF PLCA is used, THEN RX frame will be lost when simultaneous TX in process (in half-duplex) at the MAC Client interface, both to 802.1D/Q bridge as well as to stations.
- 1.1.3.1 "…The architectural model is based on a set of interfaces that may be different from those emphasized in implementations. One critical aspect of the design, however, shall be addressed largely in terms of the implementation interfaces: compatibility." ← past rational on internal full-duplex media loopback behavior model vs implementation.

This "Compatibility - Media Loopback" issue is a result, an effect, of the fact below.

- Reconciliation sub-layer (RS) is a signal translation layer (conveys the same data and control planes through different services interface. RS does NOT perform media access control, or parts thereof, function. The proposed PLCA explicitly perform alternate TDMA Media Access Control function in RS layer.
- The proposed CL148, PLCA, an RS sub-layer, performing alterative Media Access Control (MAC) function is out of scope.