IEEE 1904.2 Universal Management Tunnel

Proposed Layering Diagram and UMTPDU Format

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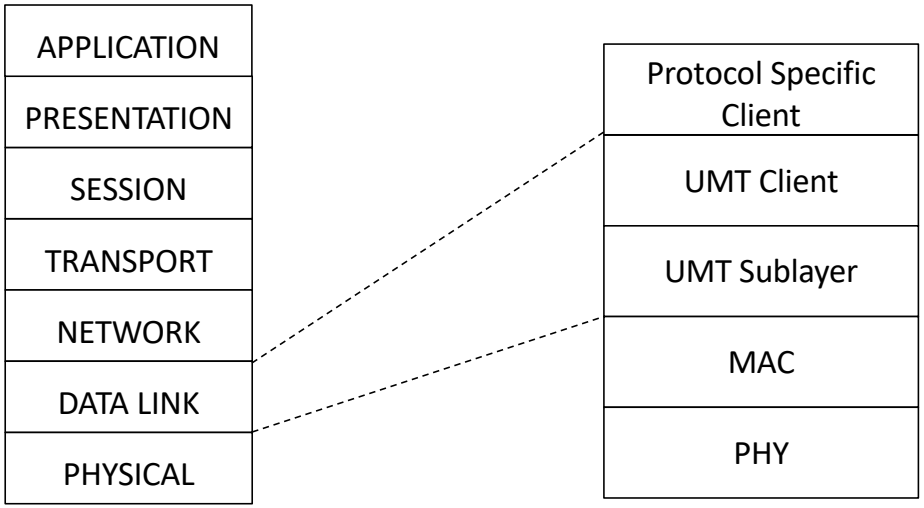
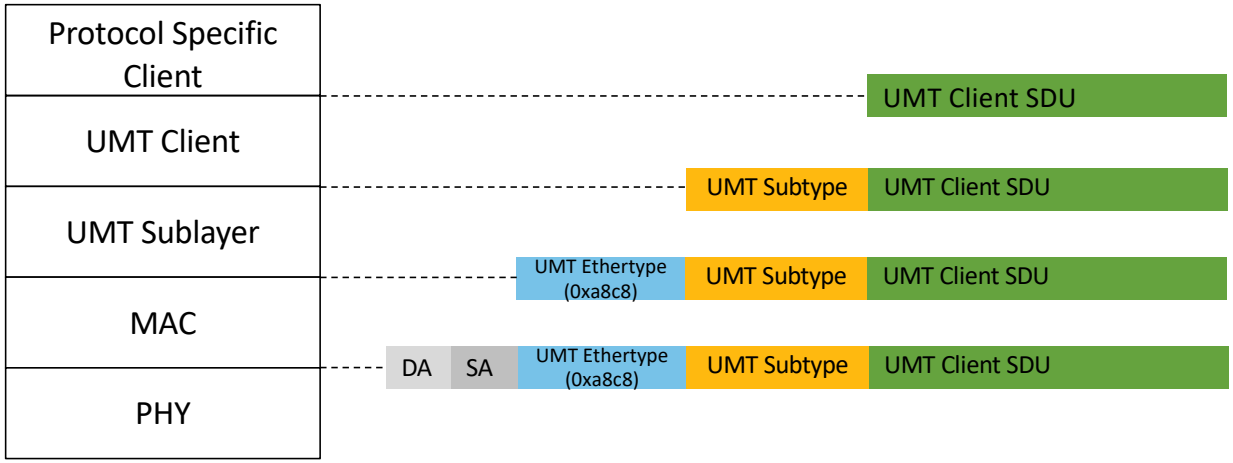
UMT Stack in OSI Model



- UMT Exists in the Data Link Layer of the OSI Model

UMT Stack and UMTPDU Format



- UMT Sublayer supplies Ethertype (0xa8c8) to identify it at the MAC layer
- UMT Client supplies UMT Subtype to identify it in the UMT Sublayer
  - UMT Client will need to have knowledge of the Protocol Specific Client
  - This departs from the principle of “Superior sublayer provides identifying information”

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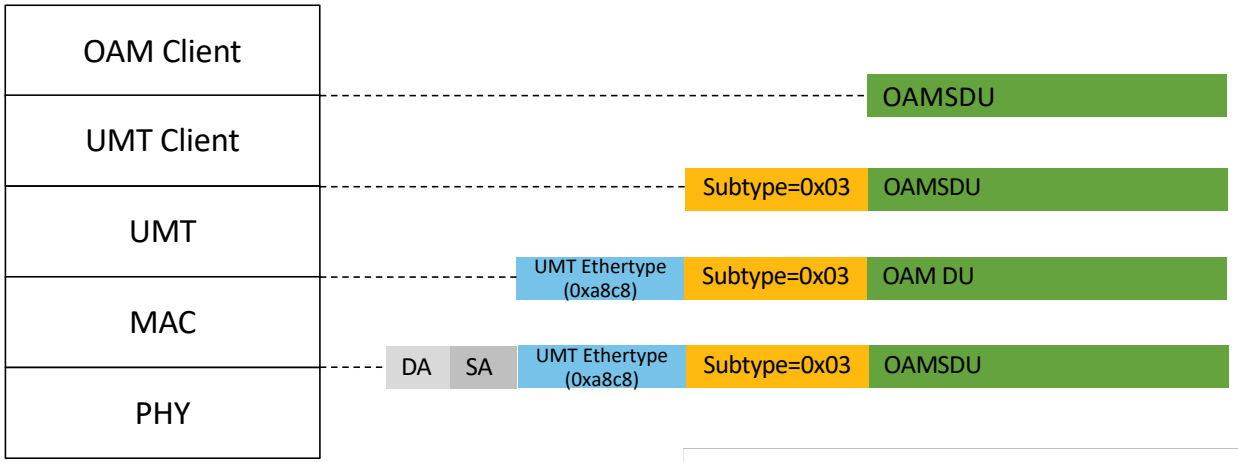
OAM in a UMTPDU



- OAMPDU: Is defined in IEEE 802.3 Clause 57
- OAMSDU: OAMPDU without the SA, DA, Slow Protos Subtype, Ethertype, and FCS

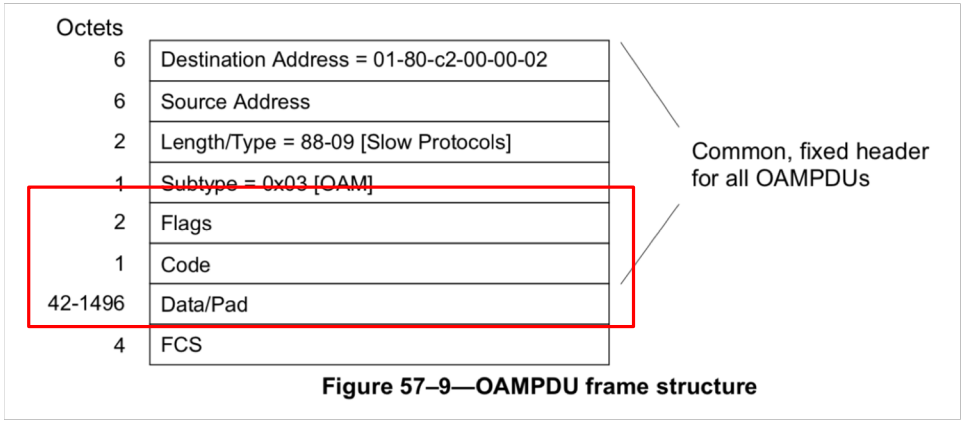


Figure 57–9—OAMPDU frame structure

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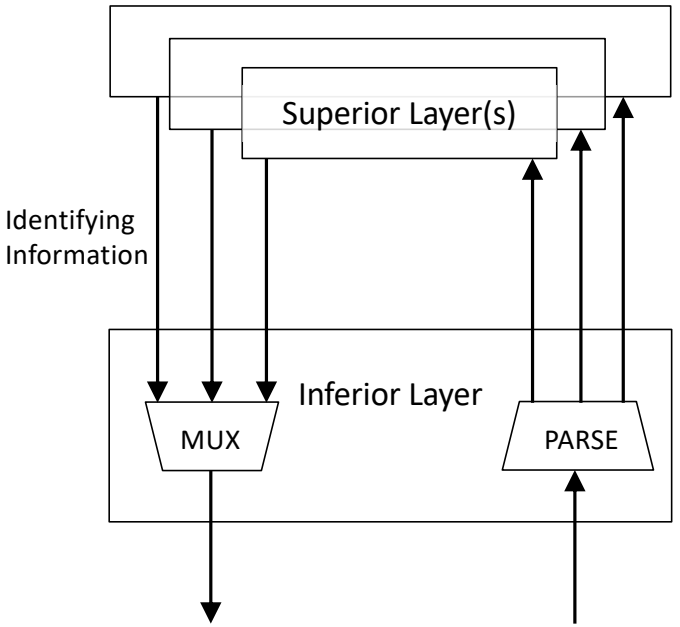
Layering Models

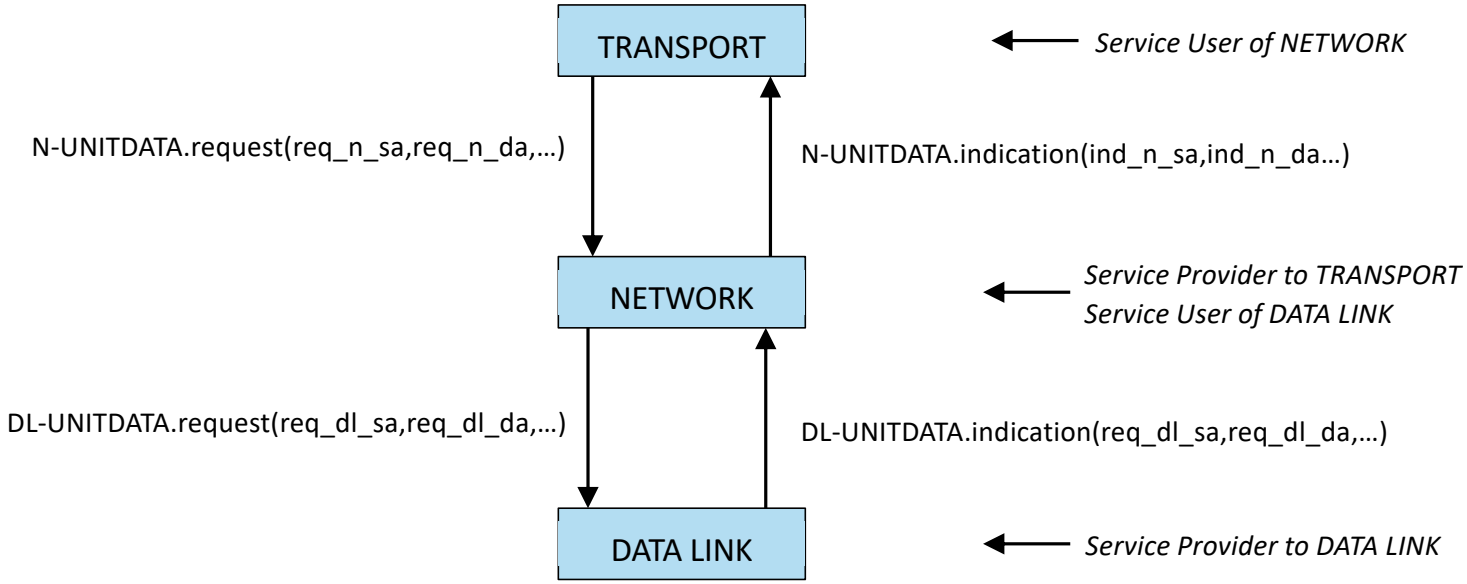
Principles, Examples, Observations

Principles for Layering

- Superior (sub)Layer – Service User
  - is the User of the inferior (sub)Layer
  - supplies identifying information
- Inferior (sub)Layer – Service Provider
  - provides a service to the superior (sub)Layer
  - performs multiplexing and parsing



A subset of Service Users, Service Providers and Service Primitives in the OSI model (connectionless-mode)



- ind = indicated
- req = requested
- n_sa = network layer source address
- n_da = network layer destination
- dl_sa = data link layer source address
- dl_da = data link layer destination address

Examples from 802.3 – MAC Control

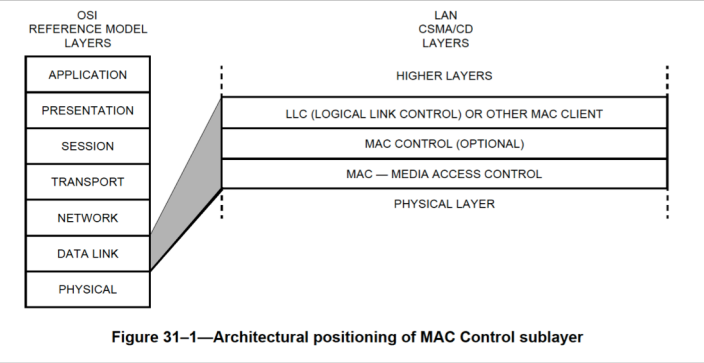


Figure 31–1—Architectural positioning of MAC Control sublayer

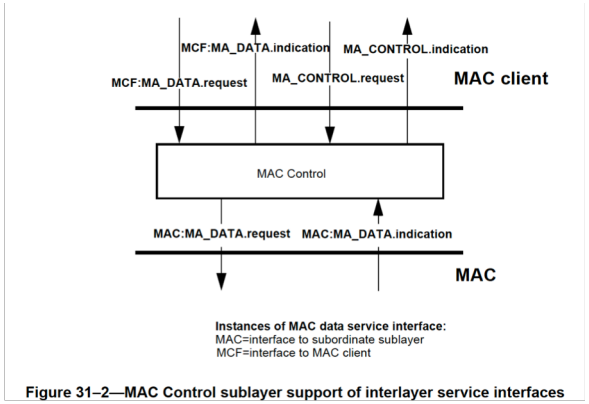


Figure 31–2—MAC Control sublayer support of interlayer service interfaces

- MAC Control Falls in the Data Link Layer
- MAC Control is composed of two entities
  - MAC Control Sublayer
  - MAC Control Client
- MAC Control Client supplies (da, opcode, request operand list)
- MAC Control Sublayer adds (sa, mac control ethertype)
- MAC Control Sublayer Multiplexes MAC Control Client with MAC Client (outbound)
- MAC Control Sublayer Parses MAC Frames to determine MAC Control Client or MAC Client as destination (inbound)

Examples from 802.3 – OAM

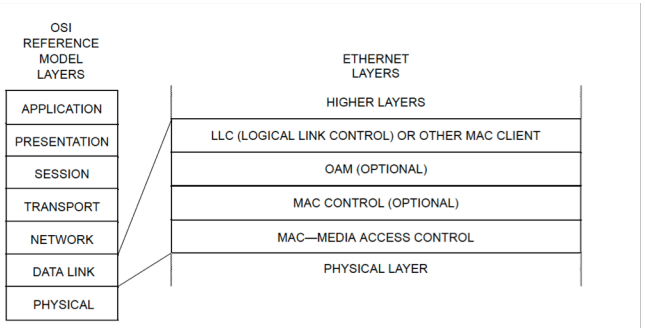


Figure 57–1—OAM sublayer relationship to the ISO/IEC Open Systems Interconnection (OSI) reference model and the IEEE 802.3 Ethernet model

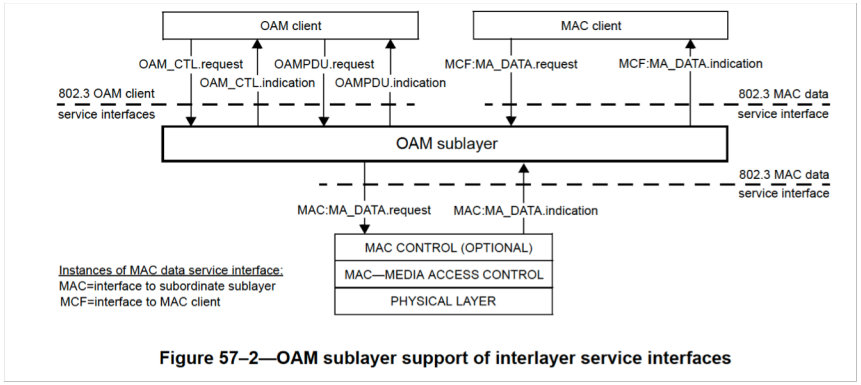


Figure 57–2—OAM sublayer support of interlayer service interfaces

- OAM Falls in the Data Link Layer
- OAM is composed of two entities
  - OAM Client
  - OAM Sublayer
- OAM Client supplies (sa, code, flags, data)
- OAM Sublayer adds (da, slow protos ethertype, slow protos subtype 0x03)
- OAM Sublayer Multiplexes OAM Client with MAC Client (outbound)
- OAM Sublayer Parses MAC Frames to determine OAM Client or MAC Client as destination (inbound)
- OAM Sublayer provides *Control Functional Block: OAM Discovery, Maintains State*

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MAC Client

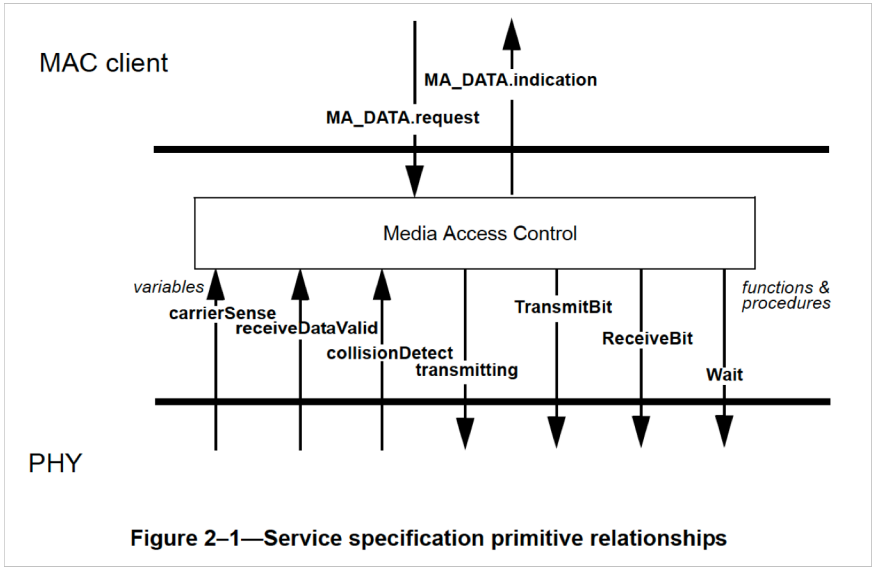


Figure 2–1—Service specification primitive relationships

- MAC Client asserts MA_DATA.request(da, sa, mac service data unit, fcs)
- MAC Client receives MA_DATA.indication(da, sa, mac service data unit, fcs, reception status)
- OAM Sublayer and MAC Control Sublayer are both MAC Clients

MAC Sublayer

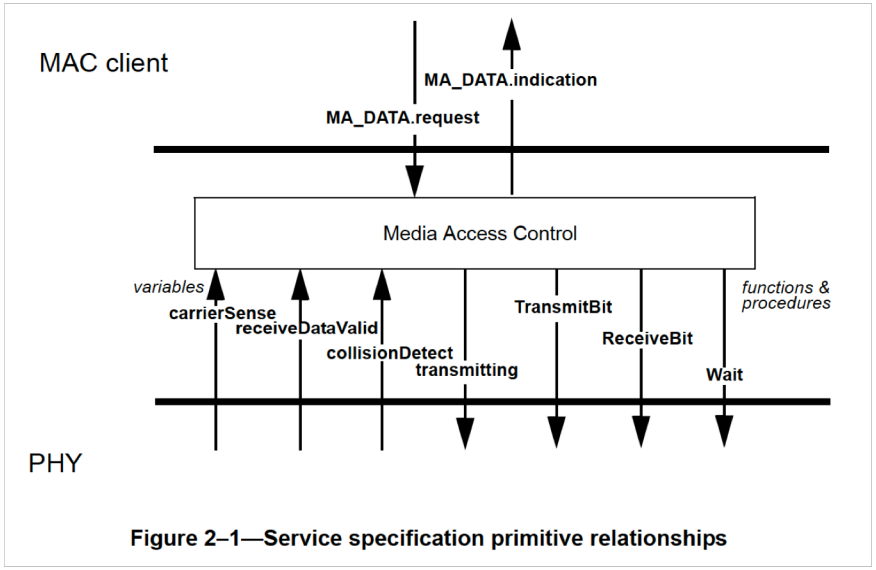
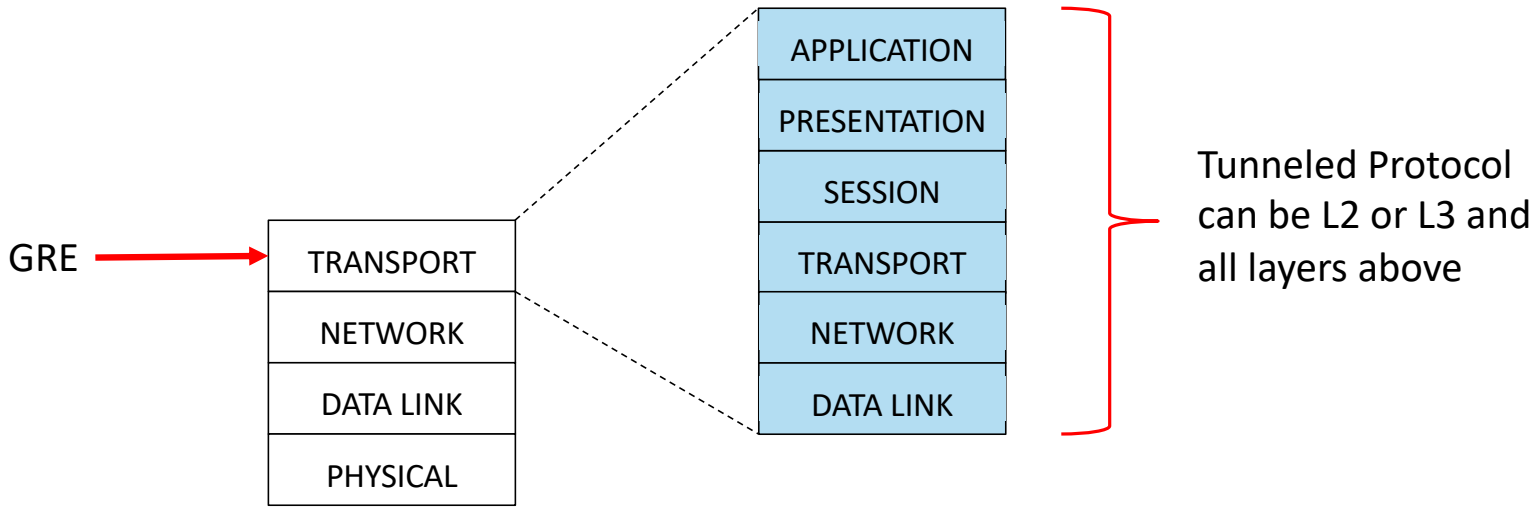


Figure 2–1—Service specification primitive relationships

- MAC Sublayer receives MA_DATA.request(da, sa, mac service data unit, fcs)
- MAC Sublayer asserts MA_DATA.indication(da, sa, mac service data unit, fcs, reception status)
- OAM Sublayer and MAC Control Sublayer are both Pass-Through for MA_DATA.request and MA_DATA.indication

Tunneling in the OSI model (GRE as an example)

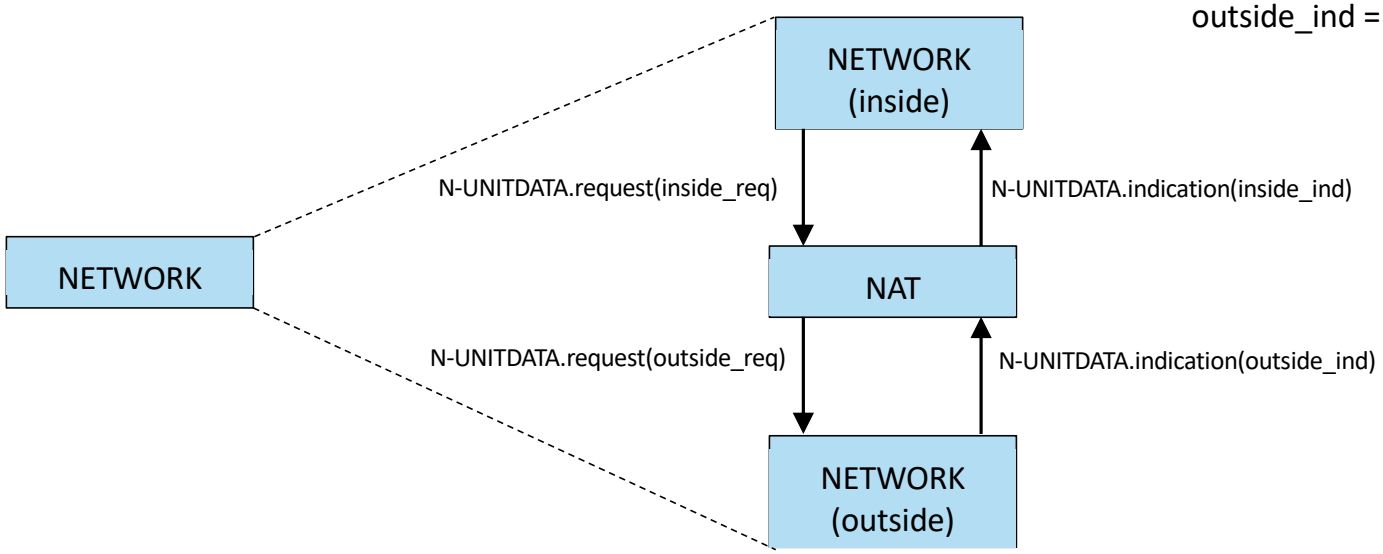


- Tunneling Protocols don't fit nicely into the OSI model
- GRE is at the OSI Transport Layer when viewed from the context of the underlying network
- How, then, does an OSI Data Link protocol or OSI Network protocol use an OSI Transport protocol?
  - Tunnels do not fit nicely into the OSI model.

IPv4 NAT in the OSI model

inside_req = (req_n_sa(inside), req_n_da(inside),…)
inside_ind = (ind_n_sa(inside), ind_n_da(inside),…)

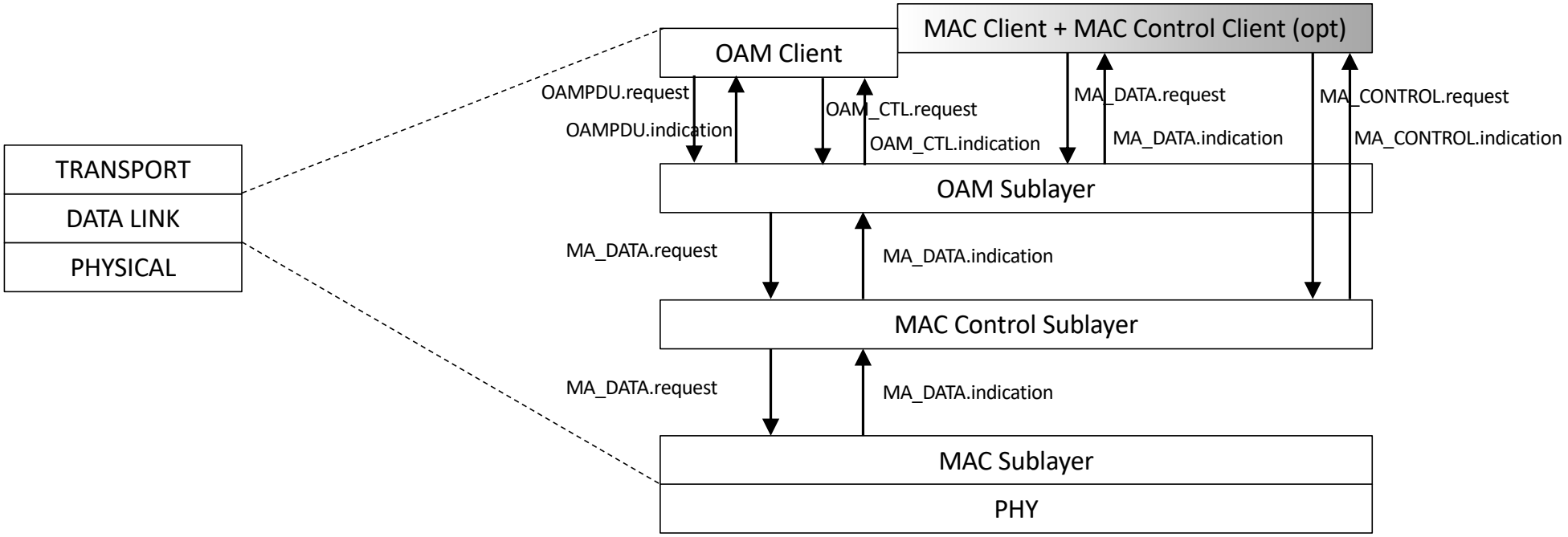
outside_req = (req_n_sa(outside), req_n_da(outside),…)
outside_ind = (ind_n_sa(outside), ind_n_da(outside),…)



- Network Address Translation is a shim that operates at the NETWORK layer
  - NAT converts the *inside* IPv4SA and/or IPv4DA to a SA/DA that is compatible with the *outside* network
- NAT is not defined in the OSI Model

OAM and MAC Control in the MAC Sublayer

MAC Sublayer with OAM and MAC Control

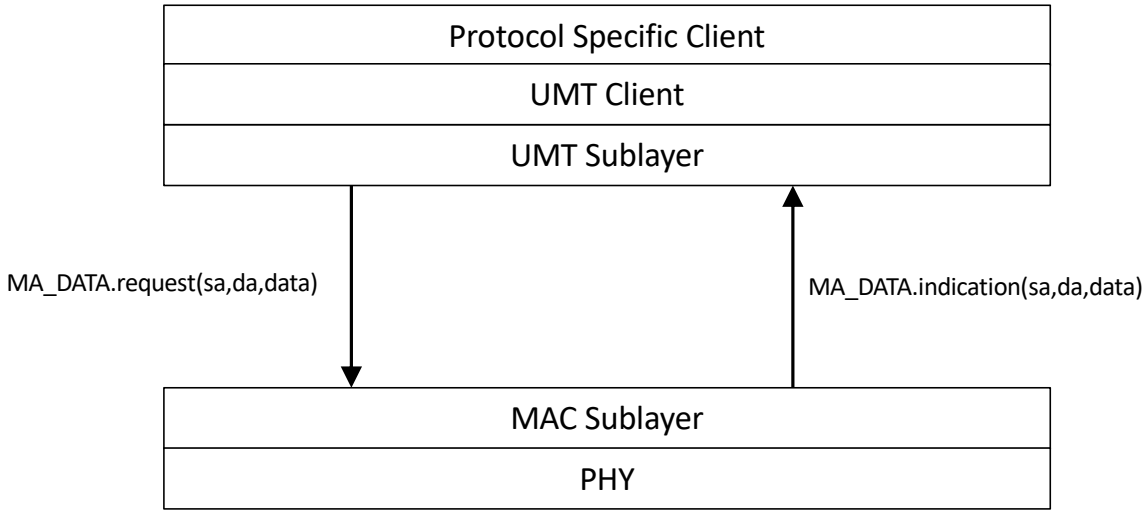


- 57.1.5.4 Interface to MAC Control client
- MAC Client is offset to indicate that the MAC Client could exist in the Data Link layer, or could exist in the Transport layer… or could straddle the boundary

Development of the UMT Layering Model

Is UMT a MAC Client?

- Is UMT a MAC Client? ----- YES!



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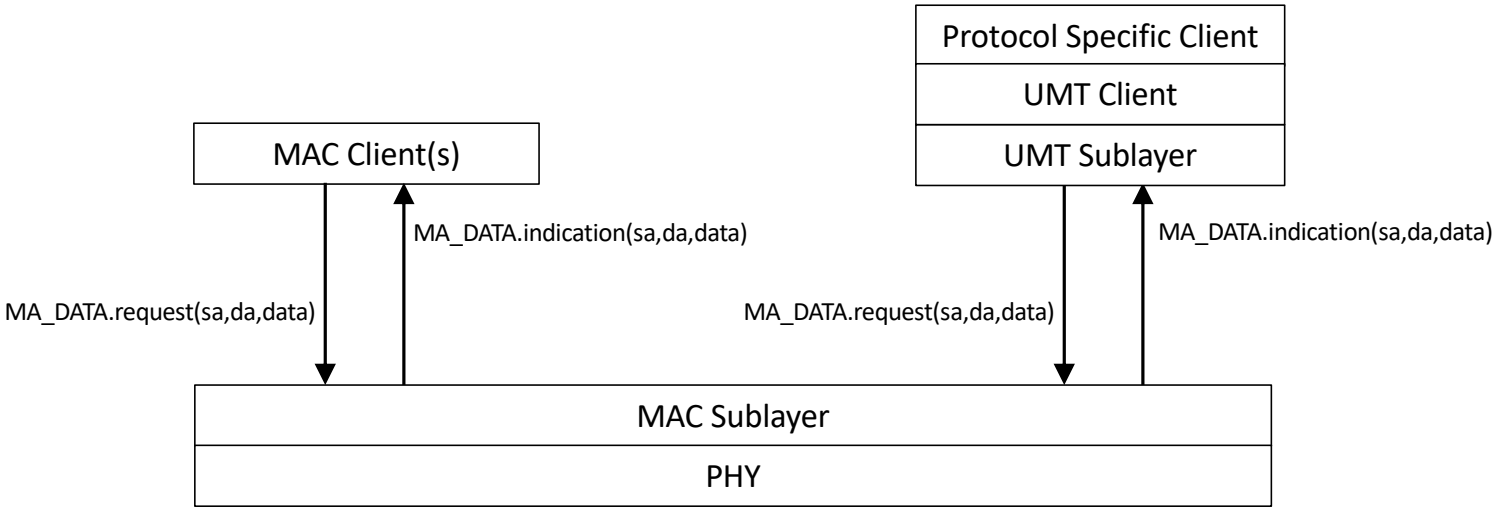
Can UMT Co-Exist with other MAC Clients?

- Can UMT Co-Exist with other MAC Clients? ---- YES!



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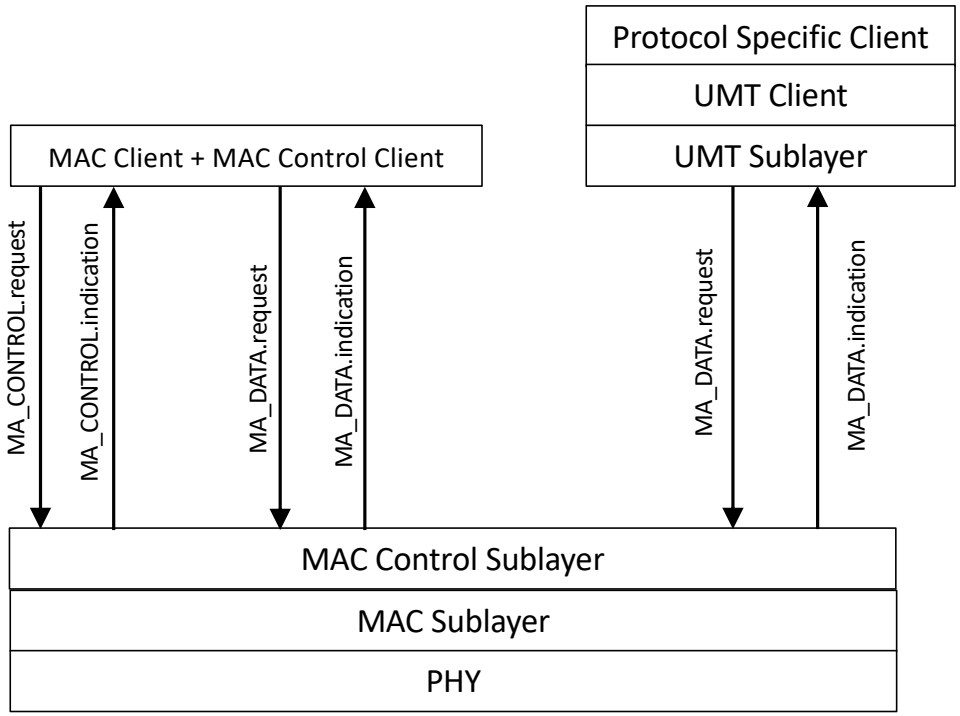
Can UMT Coexist with MAC Control on the Local Link?

- Can UMT Coexist with MAC Control on the Local Link? ----- YES!



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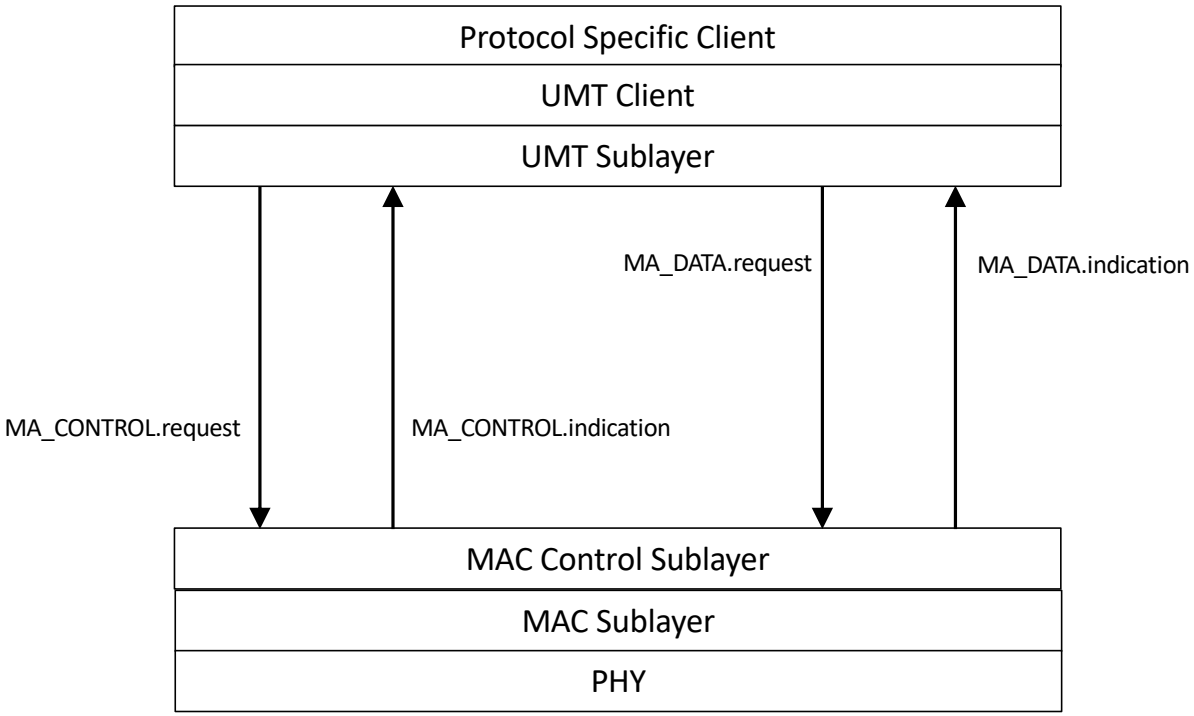
Can UMT be a MAC Control Client on the Local Link?

- Can UMT be a MAC Control Client? ----- YES!



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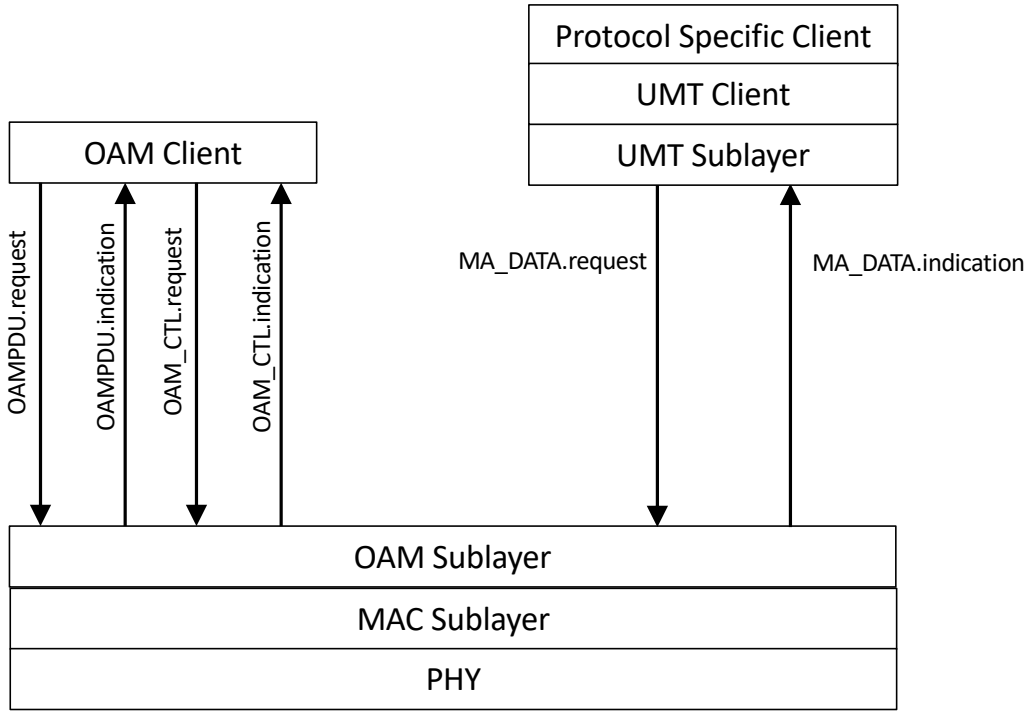
Can OAM and UMT Co-Exist on the Local Link?

- Can OAM Exist on the Local Link when UMT is also operating? ----- YES!



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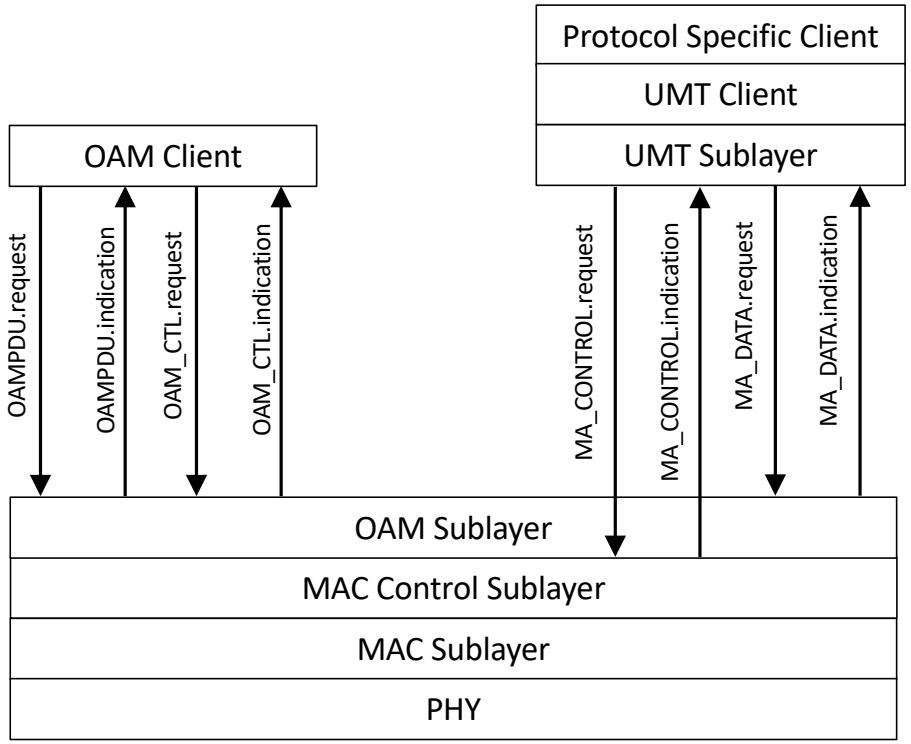
Can OAM, MAC Control and UMT Co-Exist on the Local Link?

- Can OAM, MAC Control and UMT Co-Exist on the Local Link? ----- YES!



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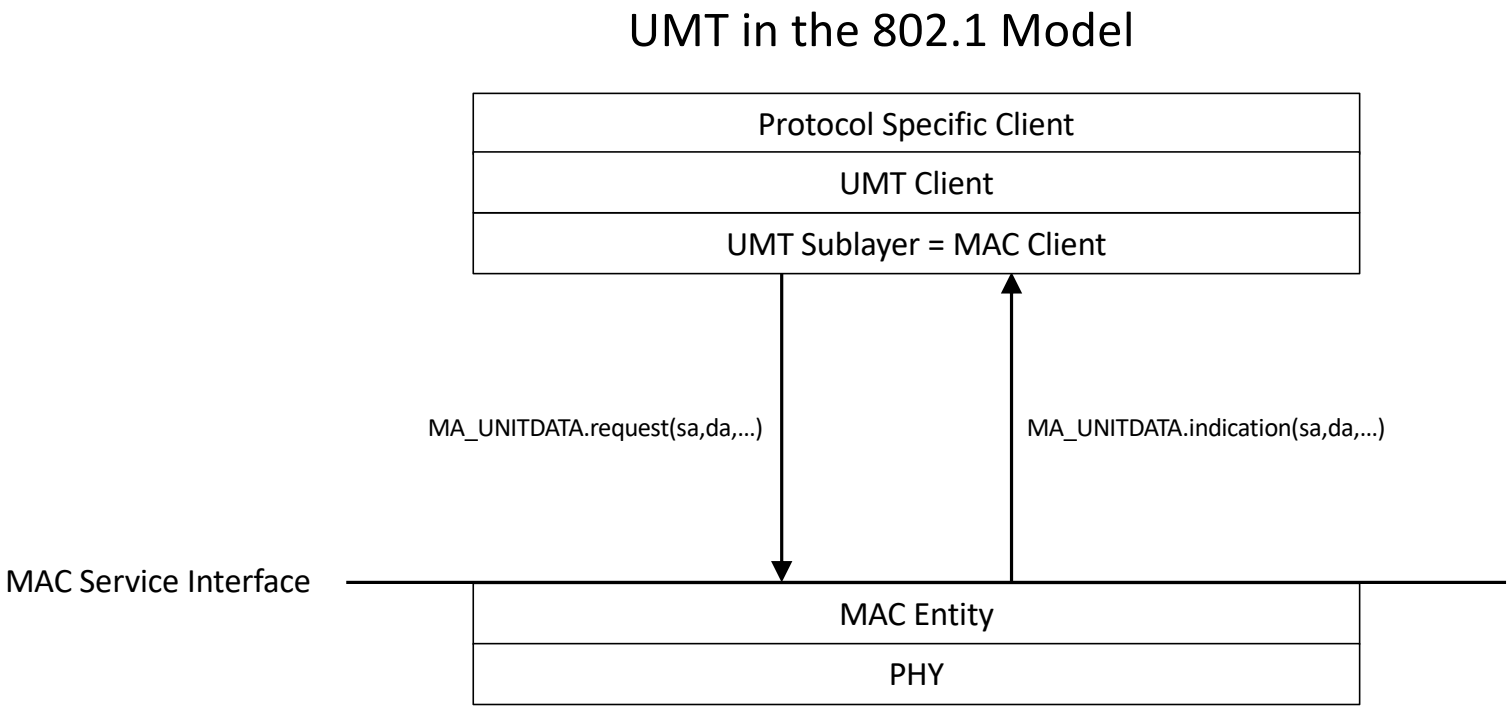
Can UMT operate on 802.1 networks?

- Can UMT operate on 802.1 networks? ----- YES!



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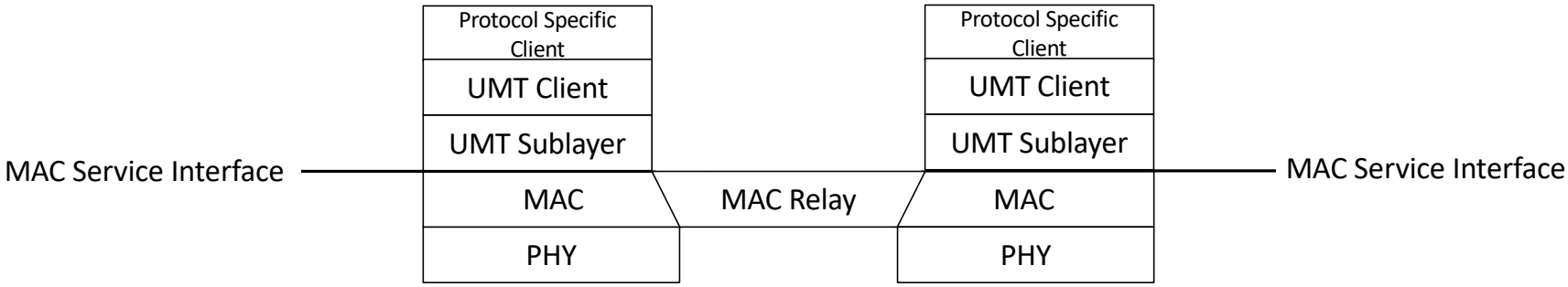
Can UMT operate on 802.1D MAC bridged networks?

- Can UMT operate on 802.1D MAC bridged networks? ----- YES!
- Does 1904.2 need to specify any use cases related to 802.1D?



UMT in the 802.1D Model

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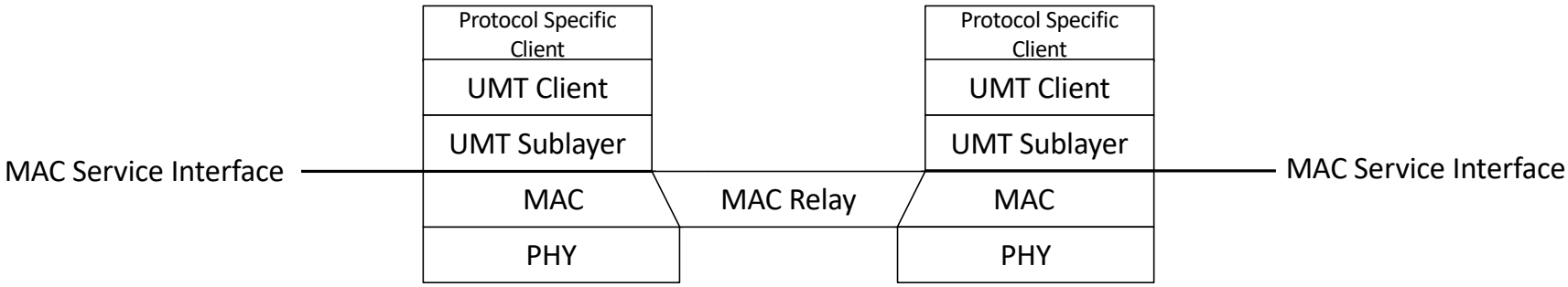
Can UMT operate on 802.1Q VLAN bridged networks?

- Can UMT operate on 802.1Q VLAN bridged networks? ----- YES!
- Does 1904.2 need to specify any use cases related to 802.1Q?



UMT in the 802.1Q Model

**MAC Relay Entity forwards based on MAC or VLAN

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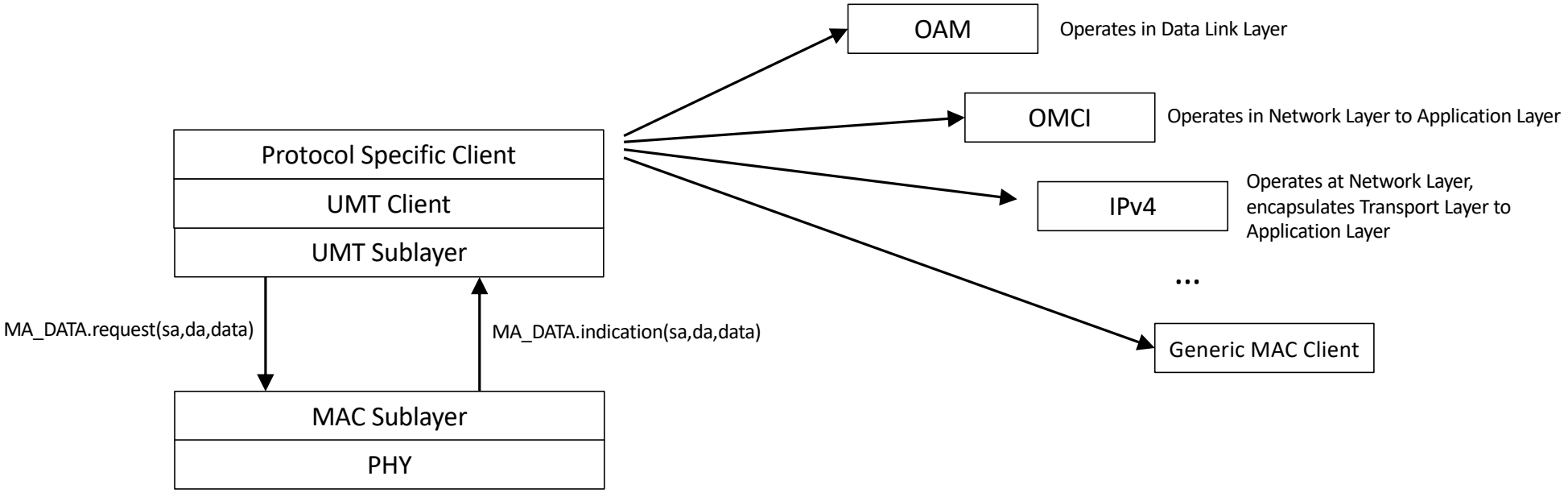
UMT as a Tunnel

- UMT is a tunnel – It will encapsulate other protocols
- Tunnels don't cleanly fit into layering models – especially UMT
- UMT interoperation with each Protocol Specific Client will need to be specified – WHY?
  - Protocol-specific clients operate at varying levels in the OSI model
  - Unlike other tunneling protocols, UMT does not necessarily encapsulate the original addressing



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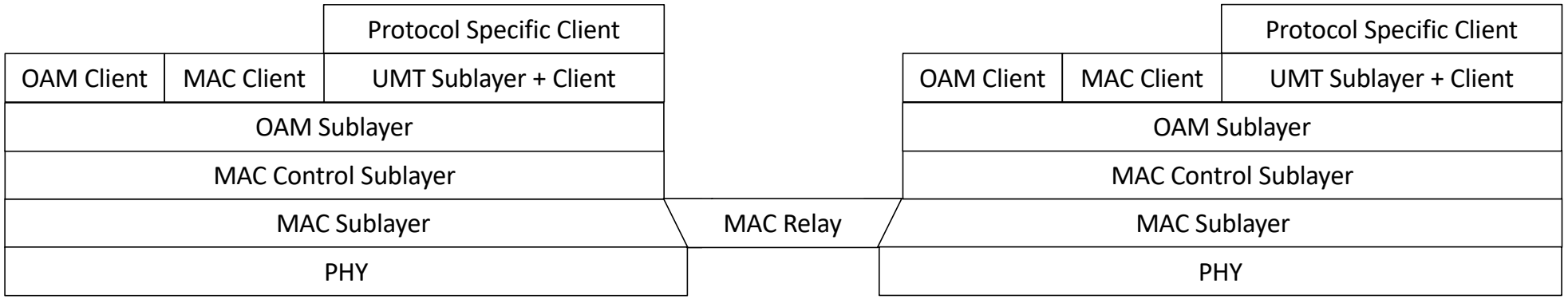
Conclusions?

Composite Layering for 1904.2

- These interfaces and operations are well specified in 802.3 and 802.1.
- Does IEEE 1904.2 need to enhance those specifications in any way?



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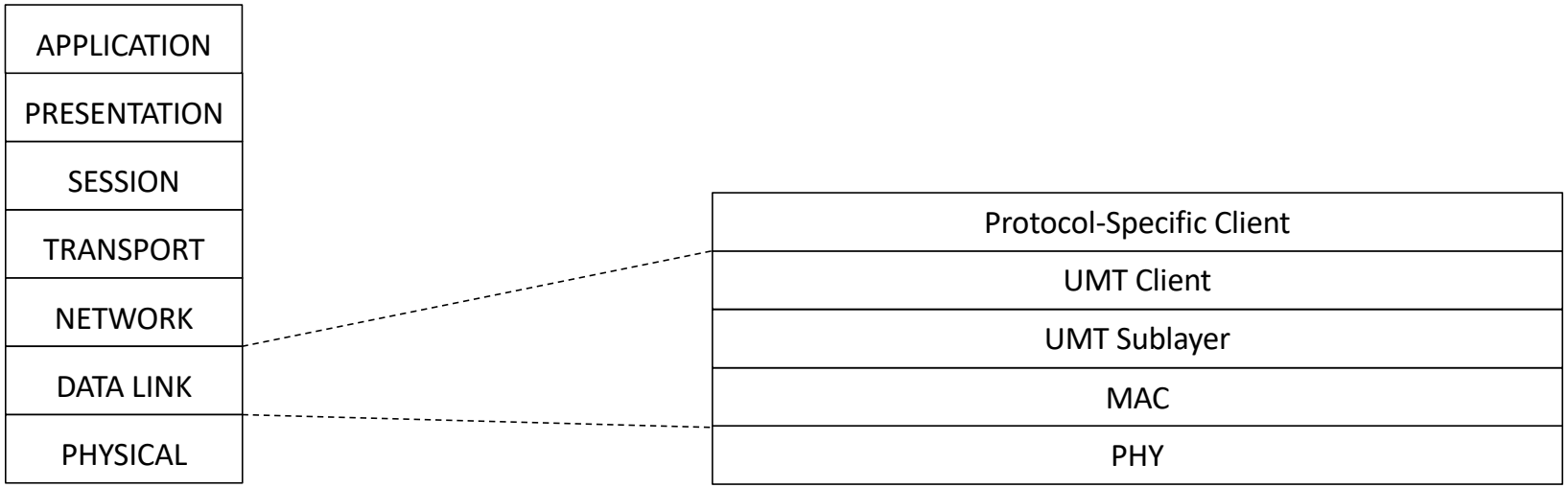
UMT Layering Diagram

- Is it necessary to specify in IEEE 1904.2 how to interoperate with OAM coexisting on the local link?
  - No – If UMT is a MAC Client, then this is well specified by IEEE 802.3
- Is it necessary to specify in IEEE 1904.2 how to interoperate with MAC Control coexisting on the local link?
  - No – If UMT is a MAC Client, then this is well specified by IEEE 802.3
- Is it necessary to specify in IEEE 1904.2 how to interoperate with MAC Bridged and VLAN Bridged Networks?
  - No – If UMT is a MAC Client, then this is well specified by IEEE 802.1AC, IEEE 802.1D, IEEEE 802.1Q

UMT Layering Diagram

- Is more required?



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Thank You!
Additional Q&A

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