IEEE 1904.2 Universal Management Tunnel

Proposed Layering Diagram and UMTPDU Format

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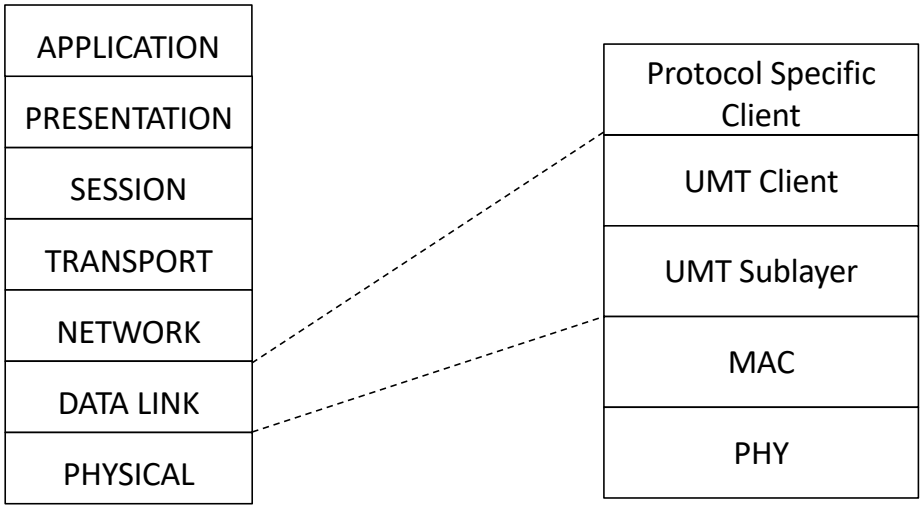
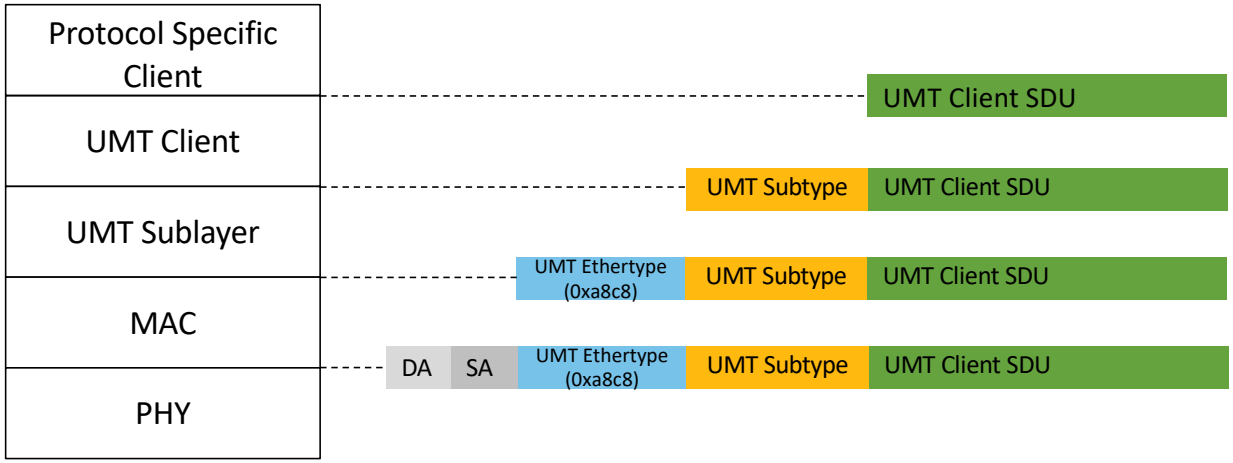
UMT Stack in OSI Model



- 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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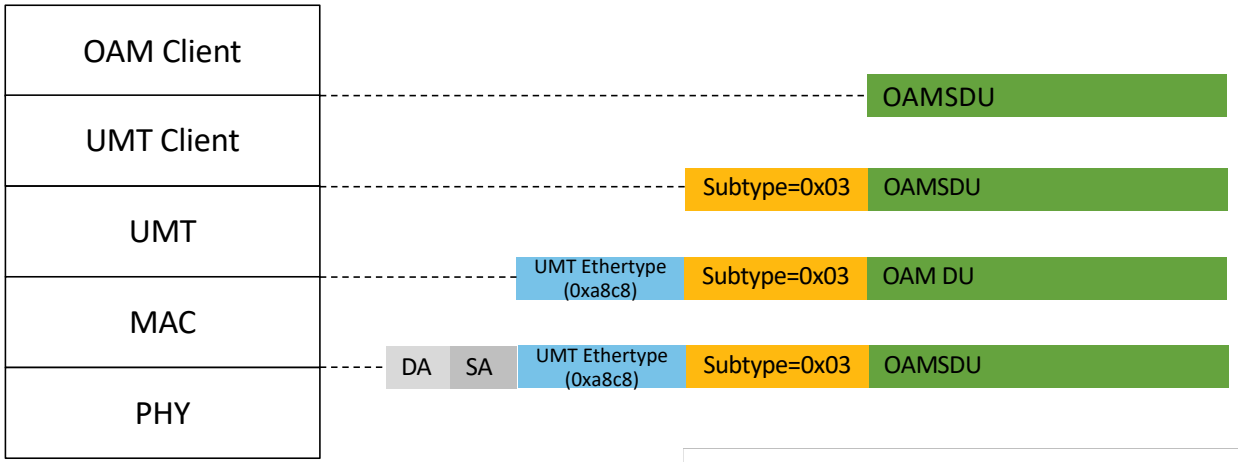
OAM in a UMTPDU



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

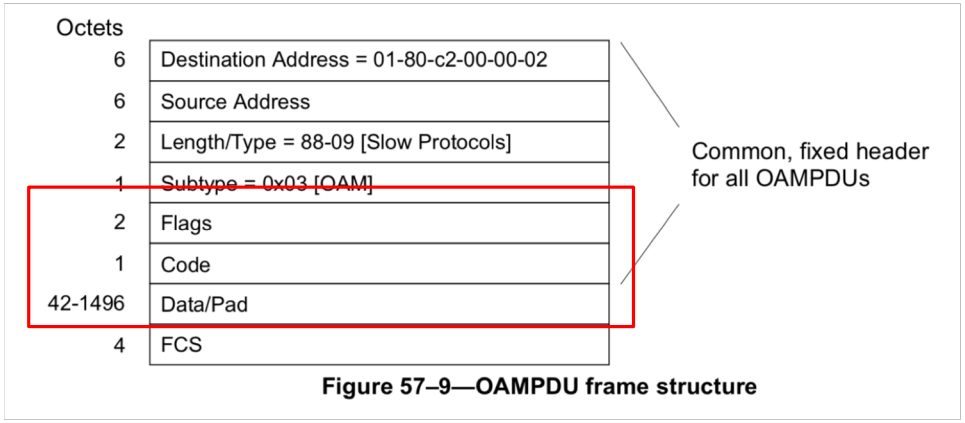


Figure 57–9—OAMPDU frame structure

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Layering Models

Principles, Examples, Observations

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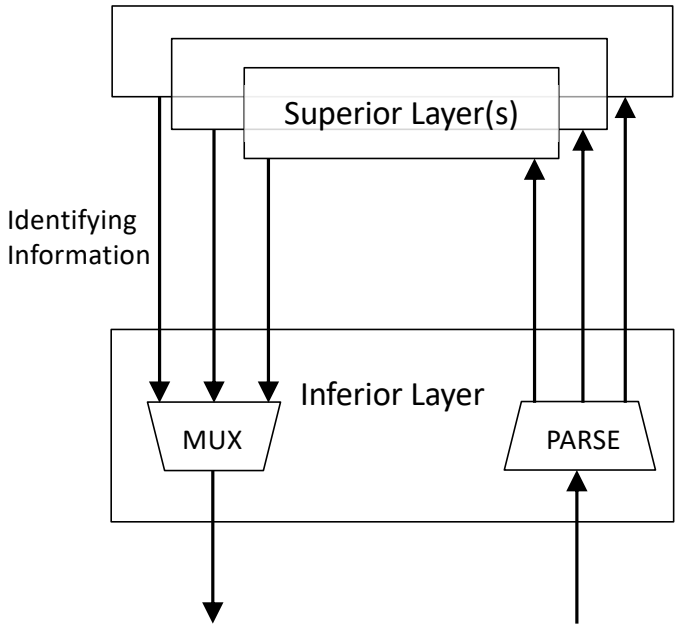
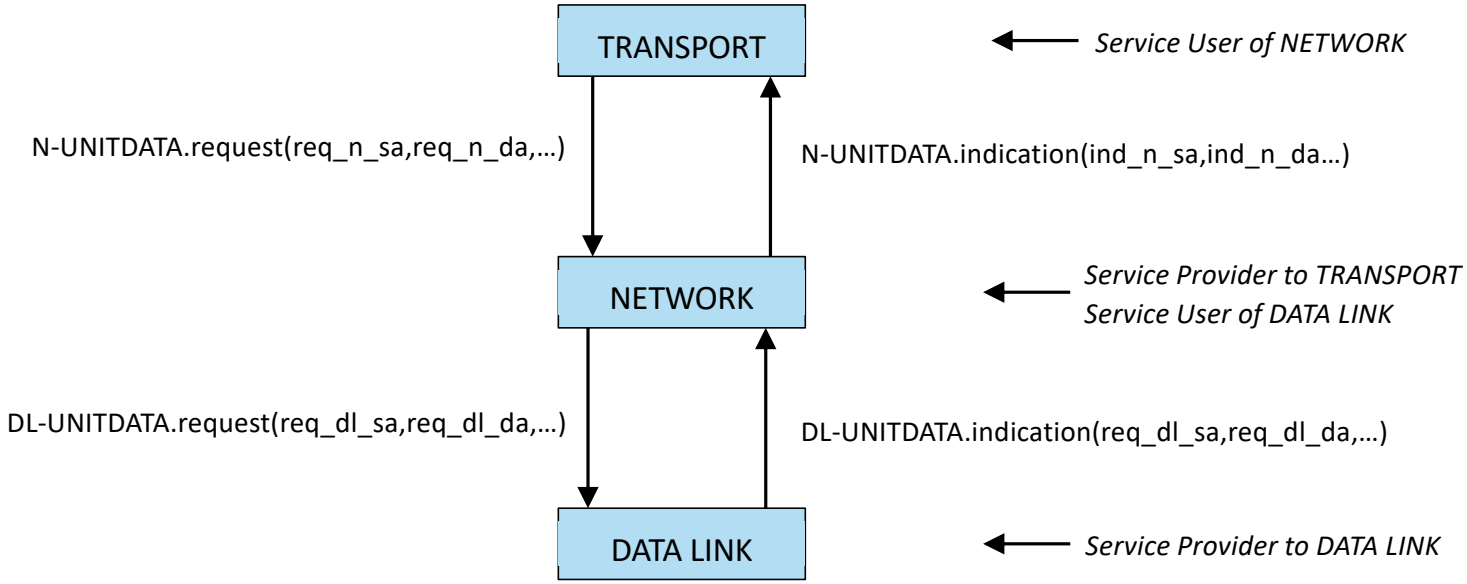
Principles for Layering

- 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

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Examples from 802.3 – MAC Control

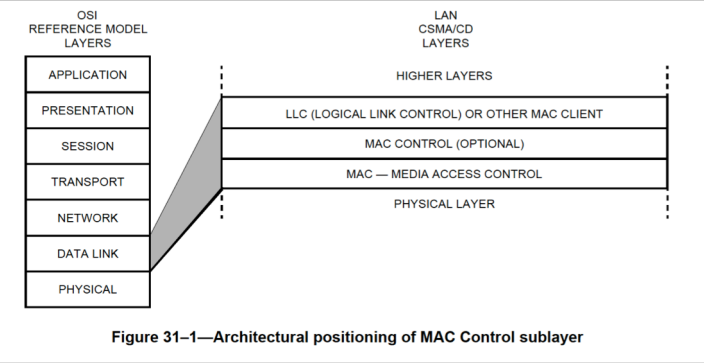

Figure 31–1—Architectural positioning of MAC Control sublayer

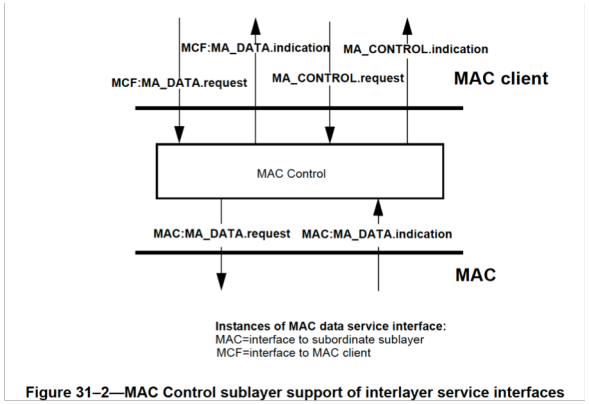

Figure 31–2—MAC Control sublayer support of interlayer service interfaces

- 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)

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Examples from 802.3 – OAM

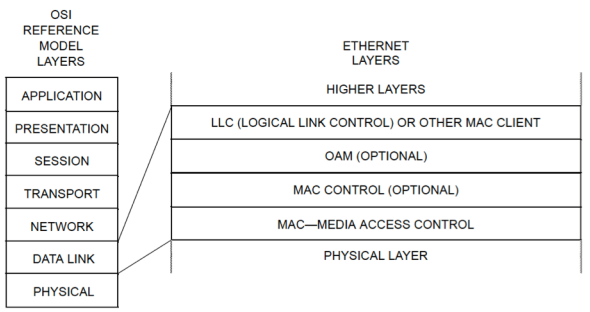

Figure 57–1—OAM sublayer relationship to the ISO/IEC Open Systems Interconnection (OSI) reference model and the IEEE 802.3 Ethernet model

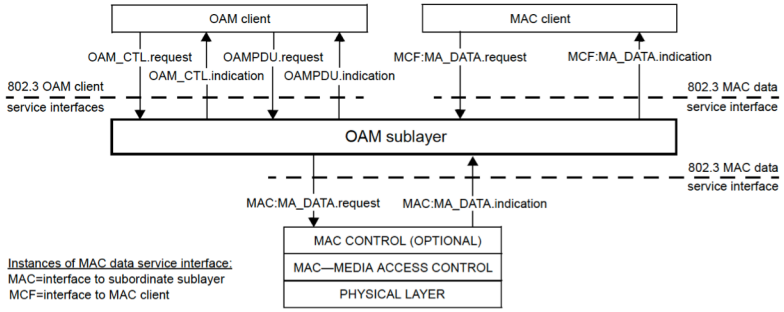

Figure 57–2—OAM sublayer support of interlayer service interfaces

- 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

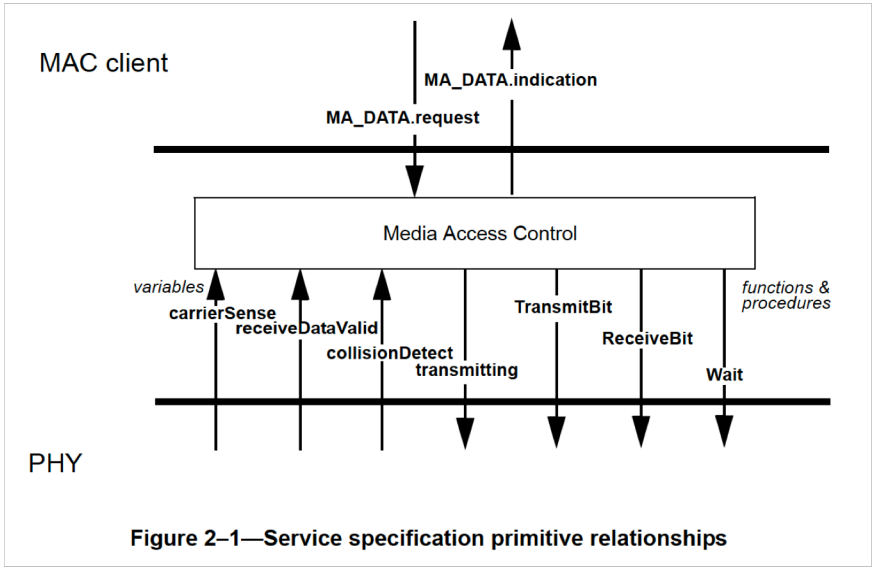

Figure 2–1—Service specification primitive relationships

- 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

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MAC Sublayer

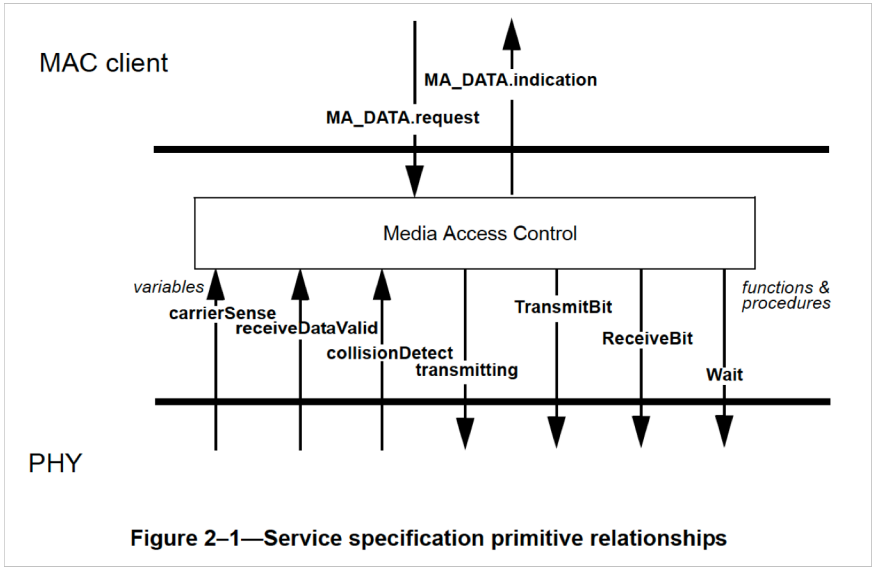

Figure 2–1—Service specification primitive relationships

- 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

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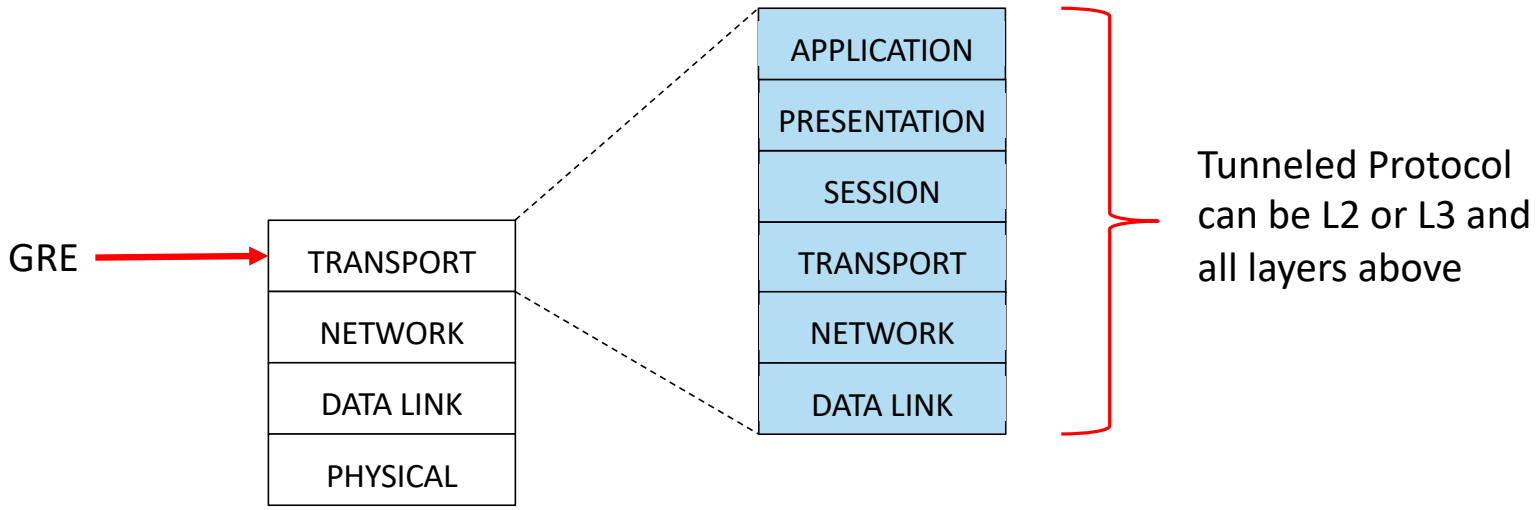
Tunneling in the OSI model (GRE as an example)



- 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.

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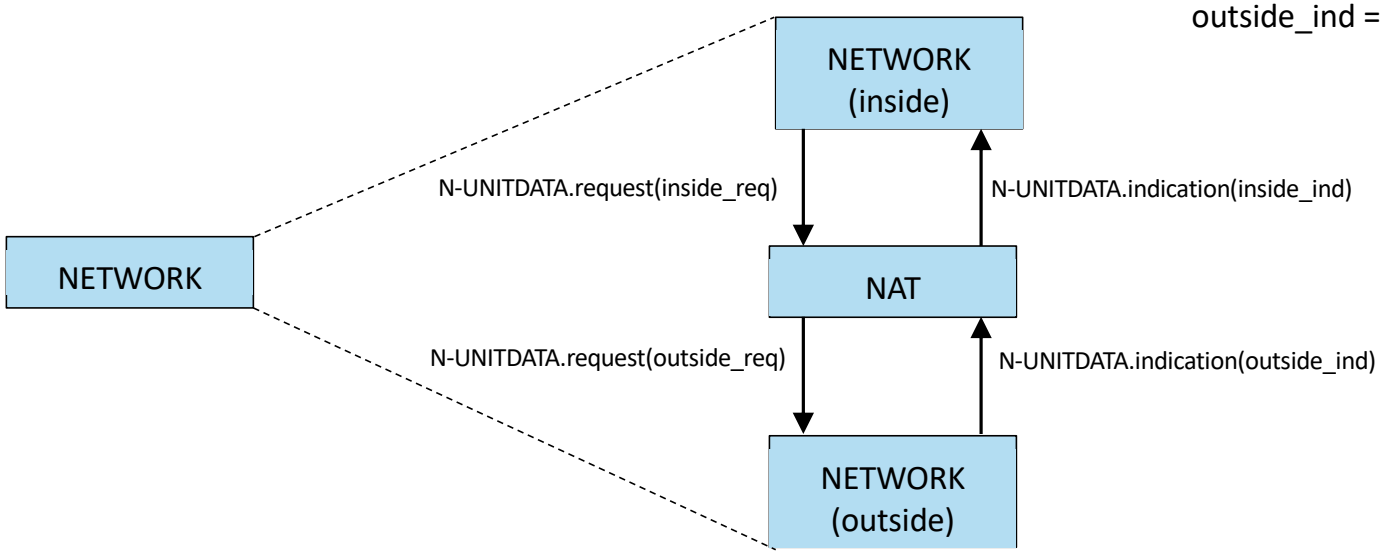
IPv4 NAT in the OSI model

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

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OAM and MAC Control in the MAC Sublayer

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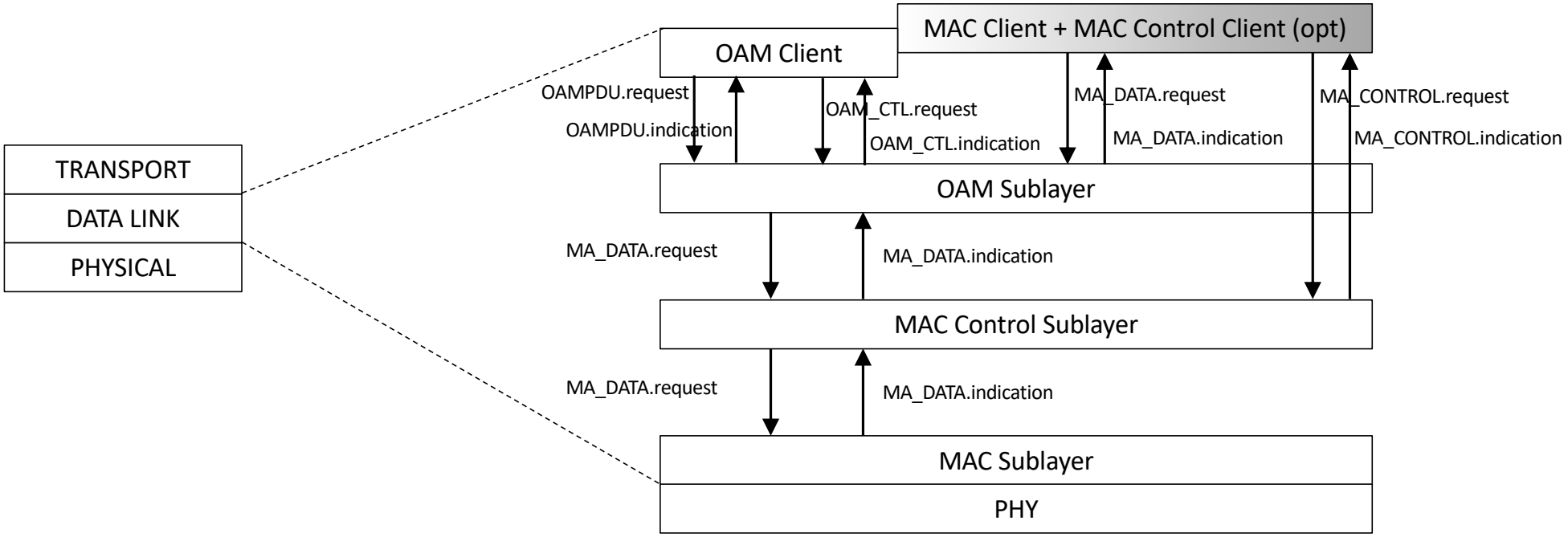
MAC Sublayer with OAM and MAC Control



- 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

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Development of the UMT Layering Model

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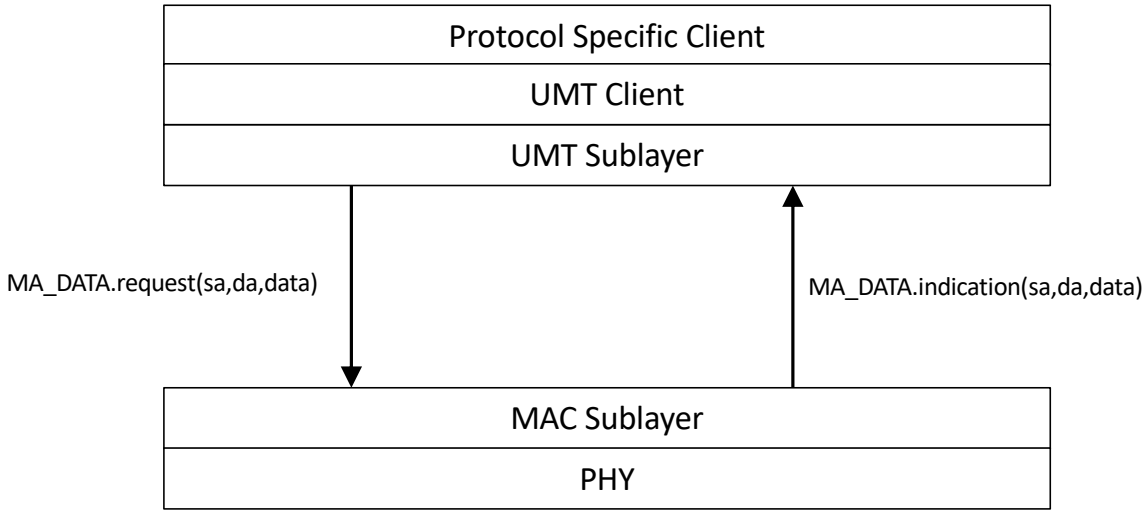
Is UMT a MAC Client?

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



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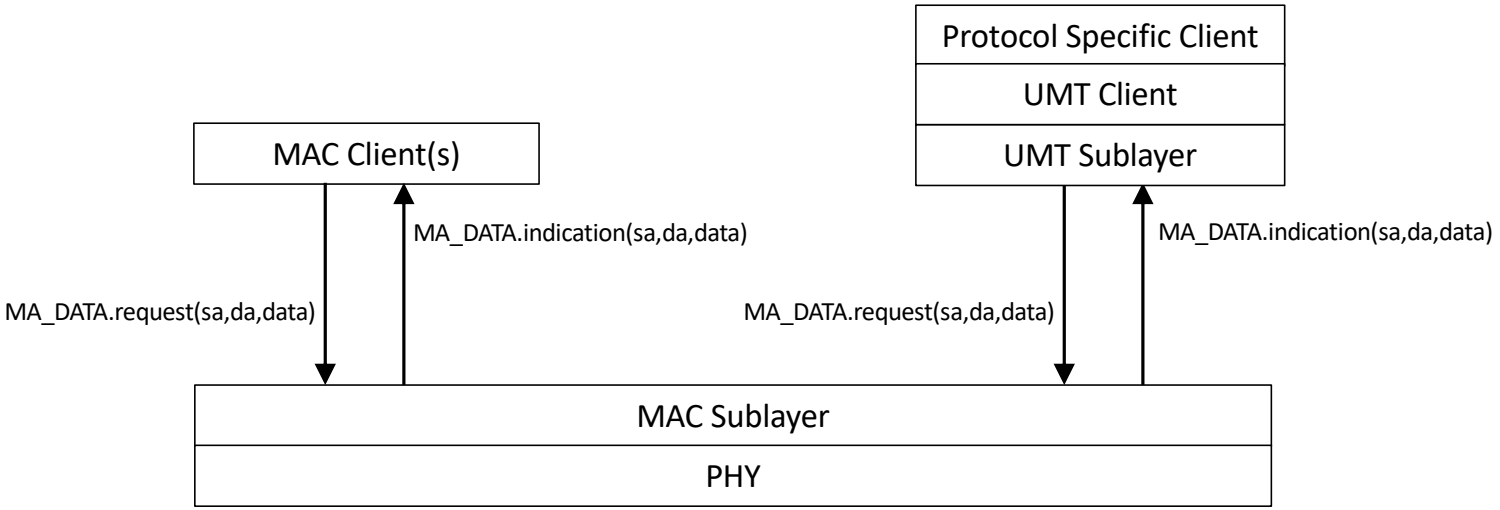
Can UMT Co-Exist with other MAC Clients?

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



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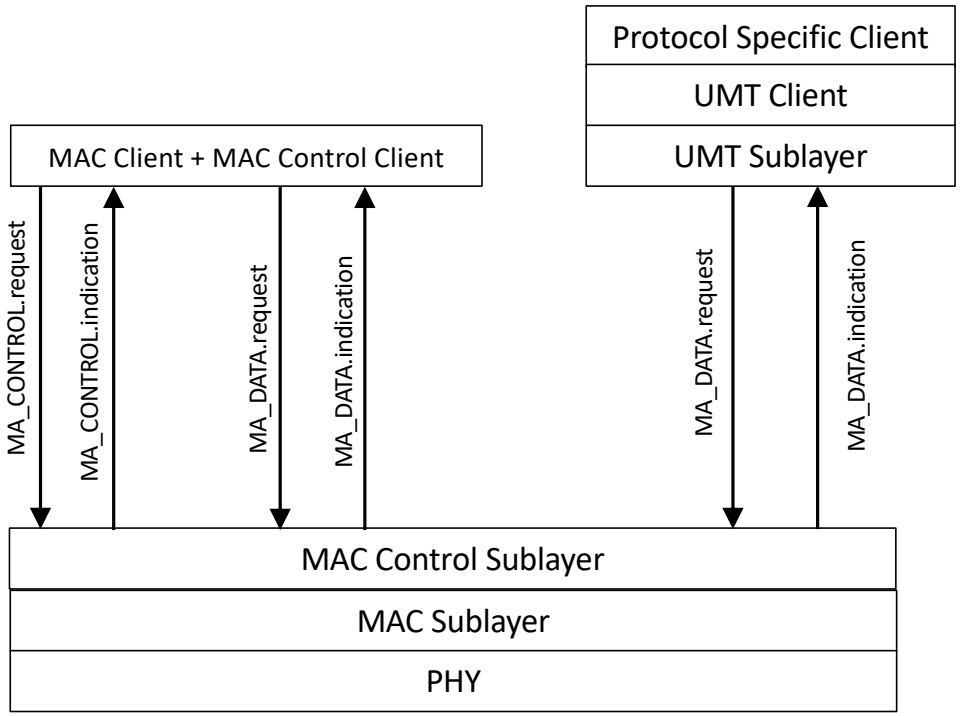
Can UMT Coexist with MAC Control on the Local Link?

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



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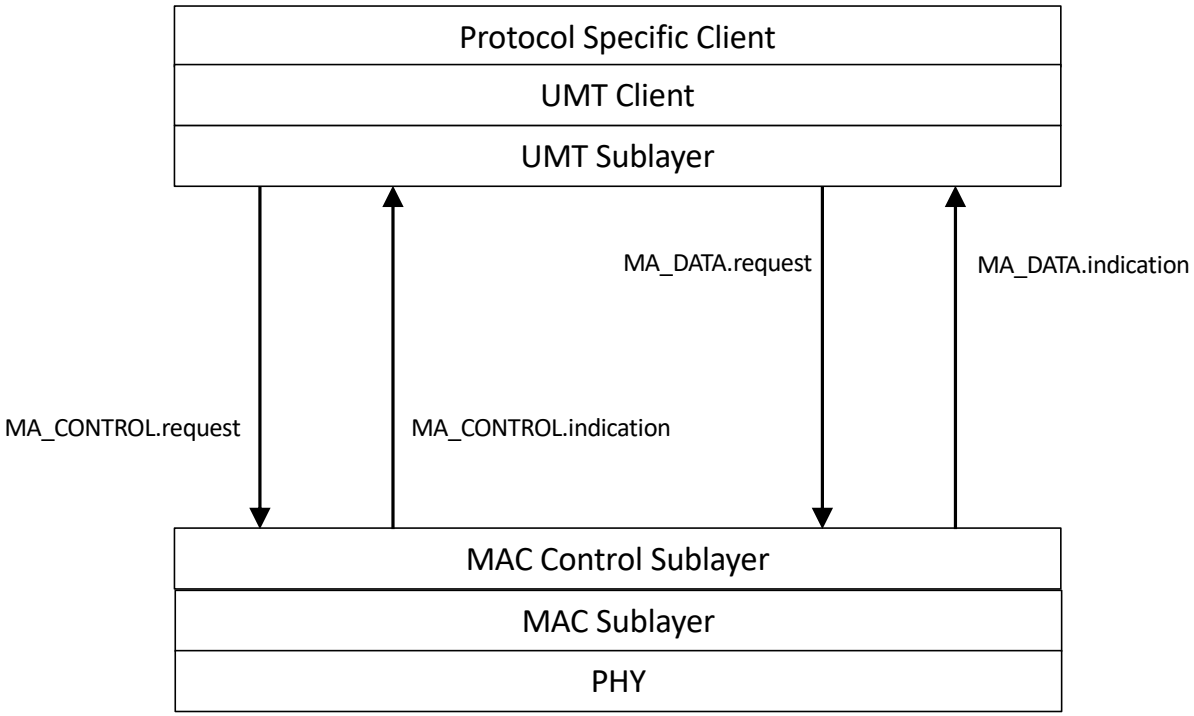
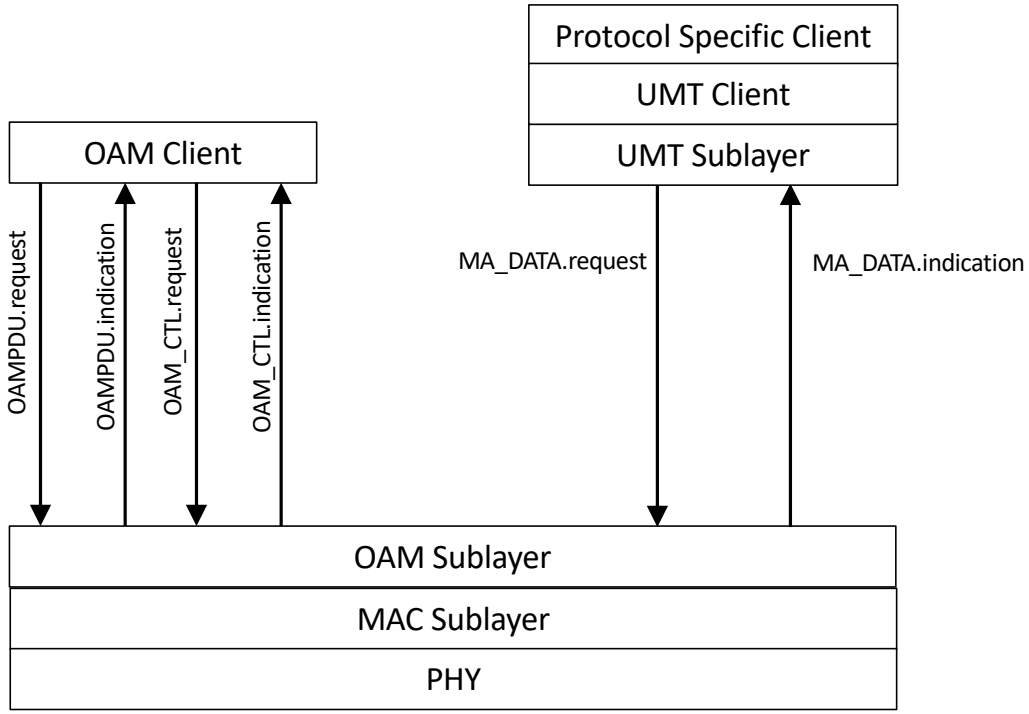
Can UMT be a MAC Control Client on the Local Link?

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



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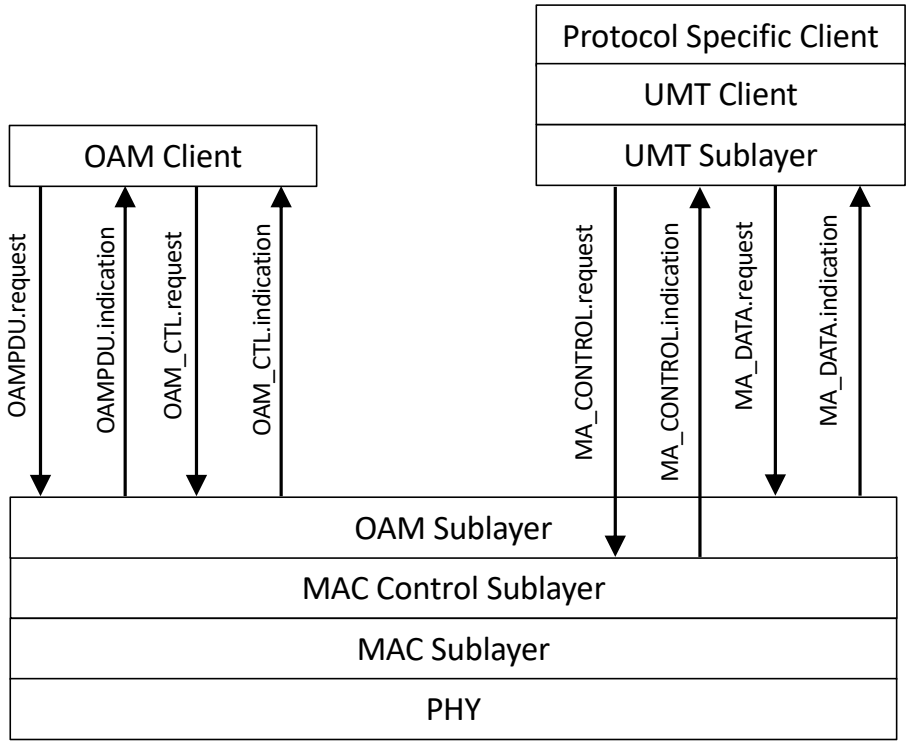
Can OAM, MAC Control and UMT Co-Exist on the Local Link?

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



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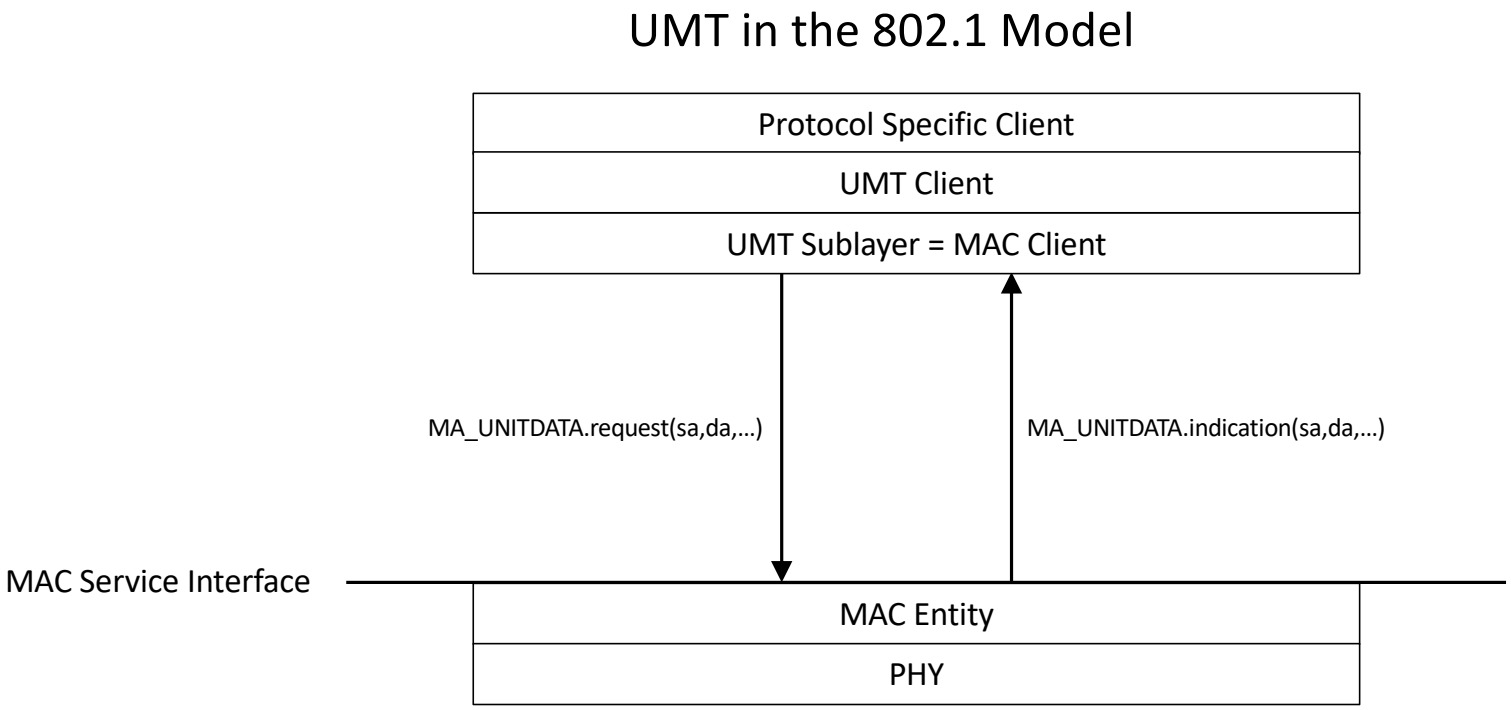
Can UMT operate on 802.1 networks?

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



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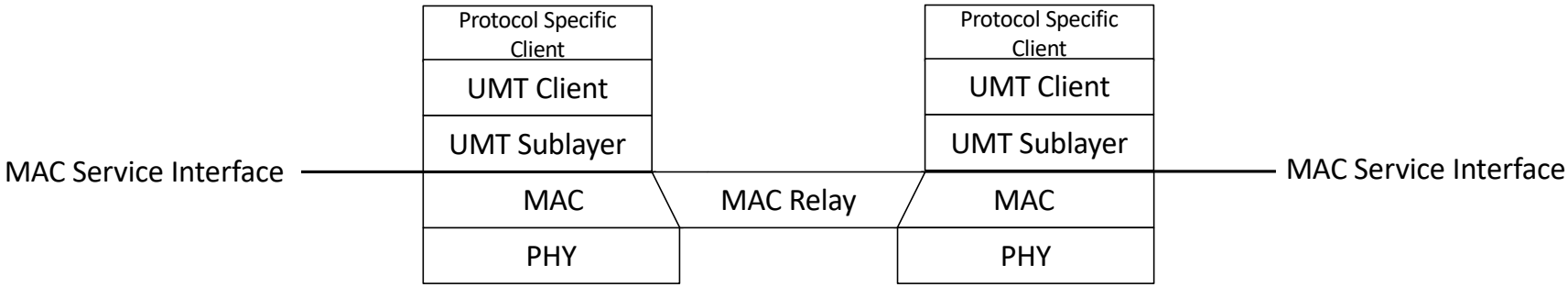
Can UMT operate on 802.1D MAC bridged networks?

- 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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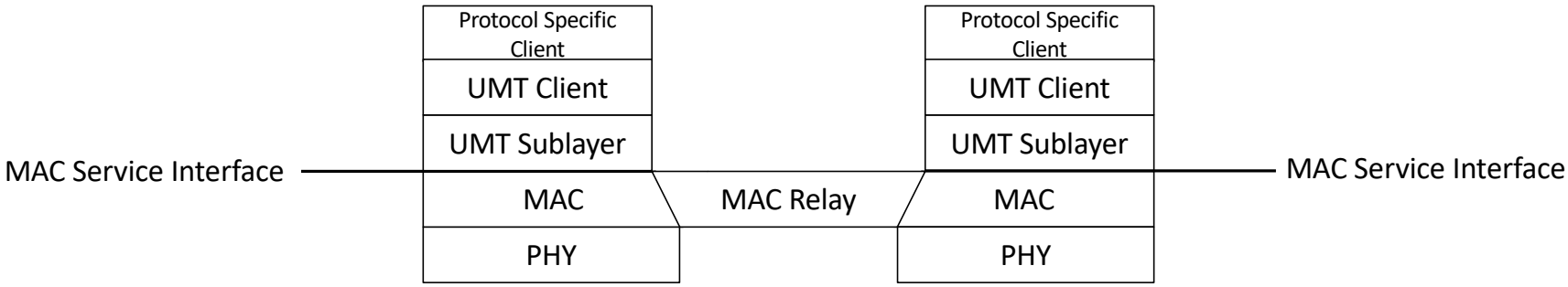
Can UMT operate on 802.1Q VLAN bridged networks?

- 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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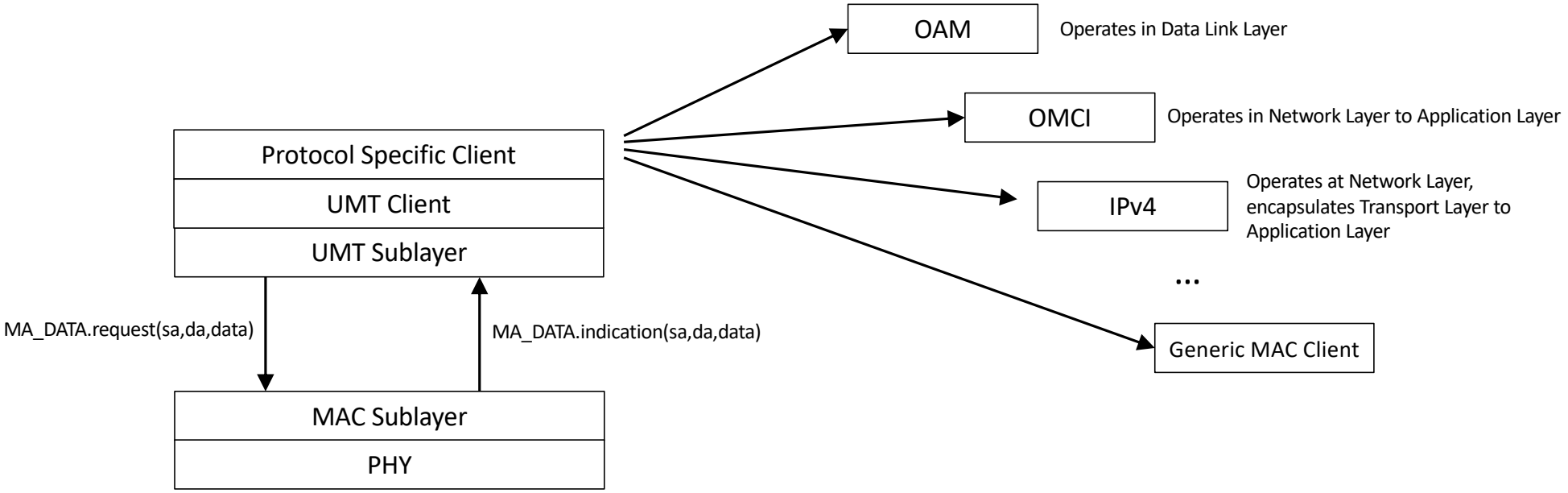
UMT as a Tunnel

- 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



Conclusions?

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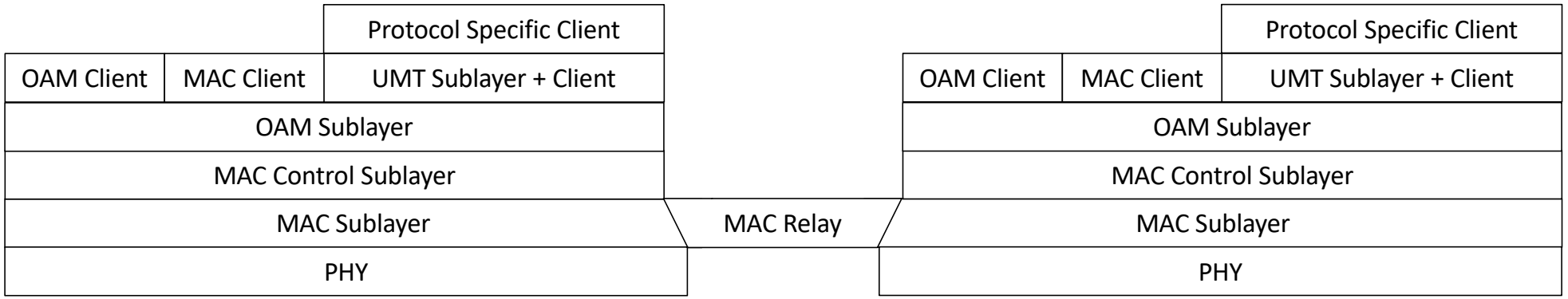
Composite Layering for 1904.2

- 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

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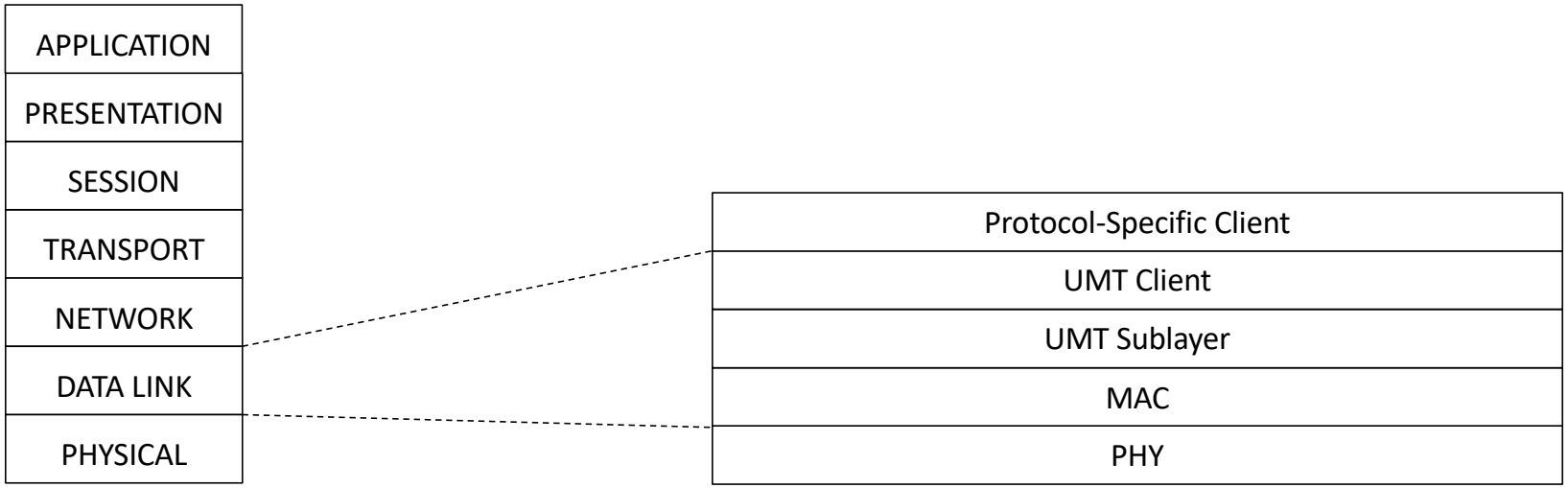
UMT Layering Diagram

- Is more required?



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Thank You!
Additional Q&A

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