Backwards compatibility with MSRP

Contribution to P802.1DD

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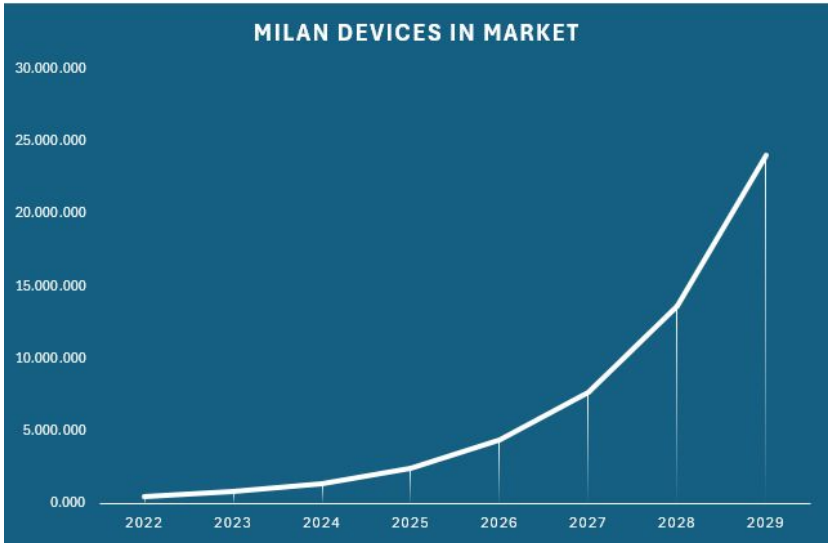
Motivation: ProAV Context

Large install base of devices using Milan / MSRP:

- Milan: Avnu Alliance specification for professional audio AVB devices
- Multiple Stream Reservation Protocol (MSRP) is a requirement for Milan devices



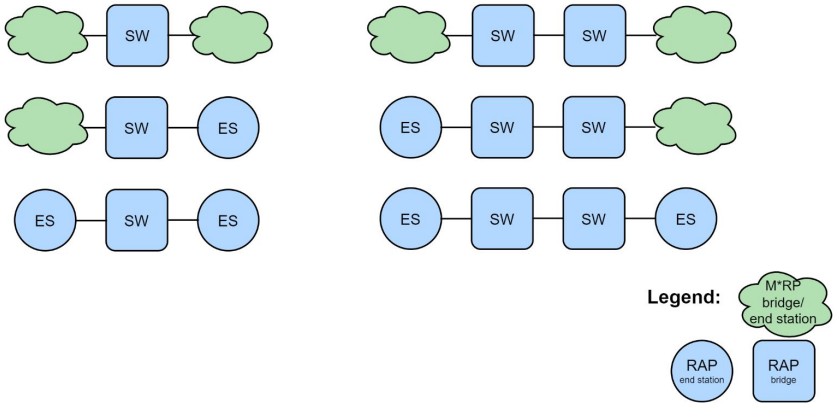
*POSSIBLE DEVELOPMENT / PROJECTION

More details:
https://www.ieee802.org/1/files/public/docs2024/dd-gutierrez-et-al-backwards-compatibility-0724-v02.pdf

Backwards compatibility requirements

MSRP devices to work seamlessly with RAP devices.

→ MSRP backward compatible RAP bridges support end-to-end reservation of streams from an MSRP-to-MSRP device, MSRP-to-RAP devices and RAP-to-MSRP devices.



Contribution to P802.1DD

What is needed to achieve backwards compatibility with MSRP?

- MSRP components
- MSRP/RAP Adapter
  - Primitive Translation
  - Attribute Translation
  - Error code Translation
- New RA Class Template: “802.1BA”
- Managed Objects

MSRP components

From IEEE Std 802.Q-2022:

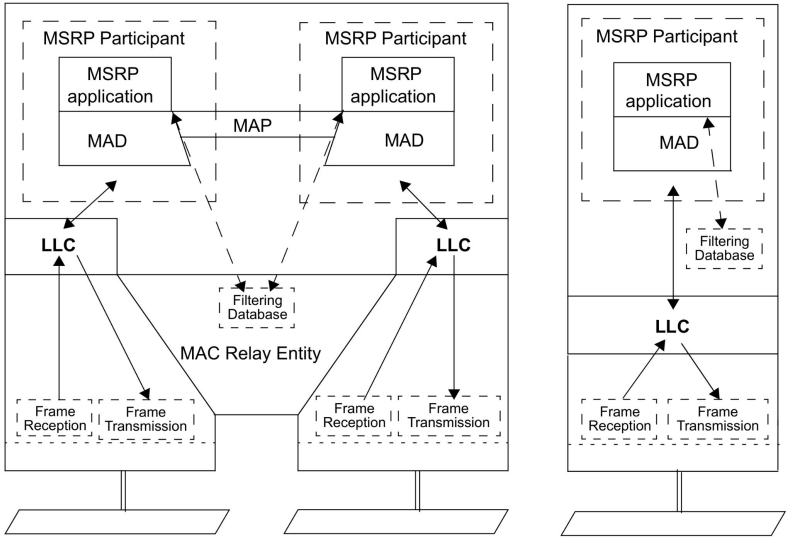


Figure 35-1—Operation of MSRP

MRP Attribute Declaration (MAD):

- needed for the reception of MRPDUs

MSRP application:

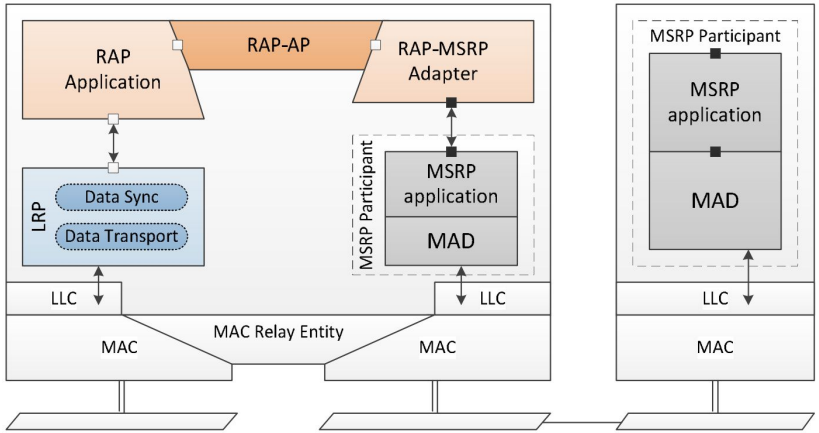
- needed for the interpretation of the attributes

MRP Attribute Propagation (MAP):

- not needed!
- RAP will do the propagation

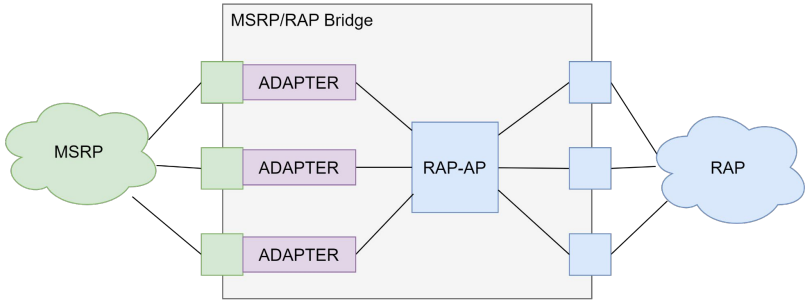
MSRP/RAP Adapter: Overview

From: https://www.ieee802.org/1/files/public/docs2017/tsn-chen-RAP-whitepaper-1117-v02.pdf



RAP-MSRP bridge

MSRP
end station



MSRP/RAP Adapter: Interfaces

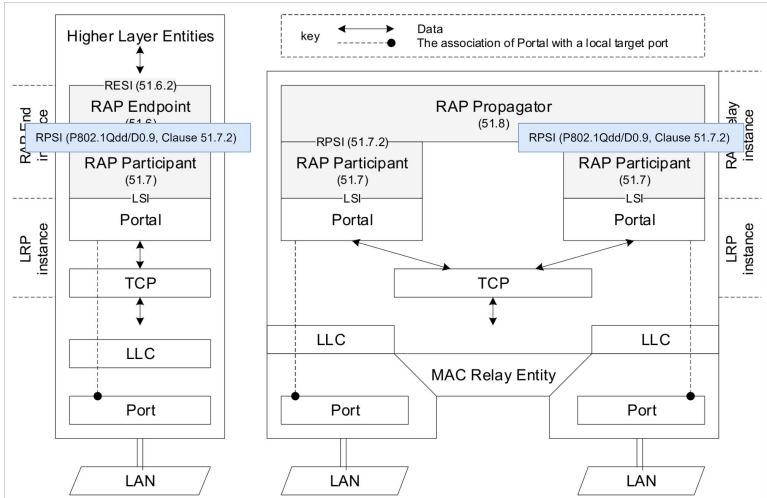


Figure 51-2—RAP architecture using TCP

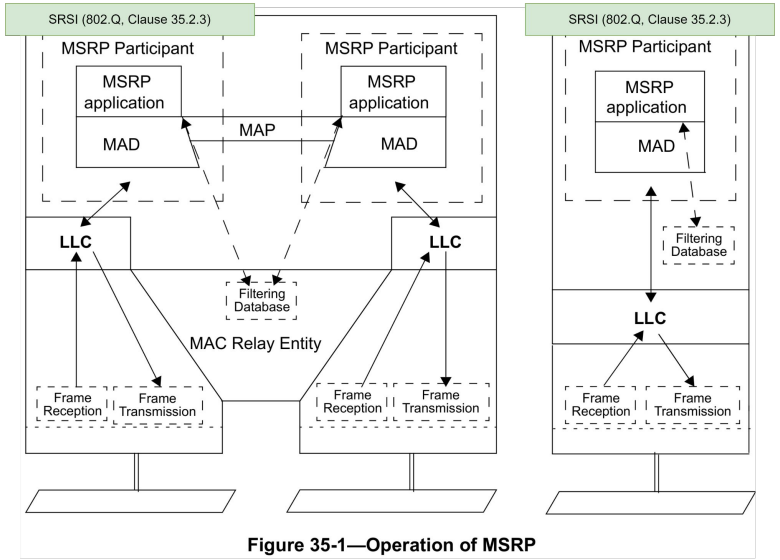


Figure 35-1—Operation of MSRP

RAP:

RPSI between **RAP Participant** and **RAP Participant user (RAP Propagator or Endpoint)**

MSRP:

SRSI between **MSRP Participant** and **Application (Talker or Listener)**

MSRP/RAP Adapter: Interfaces

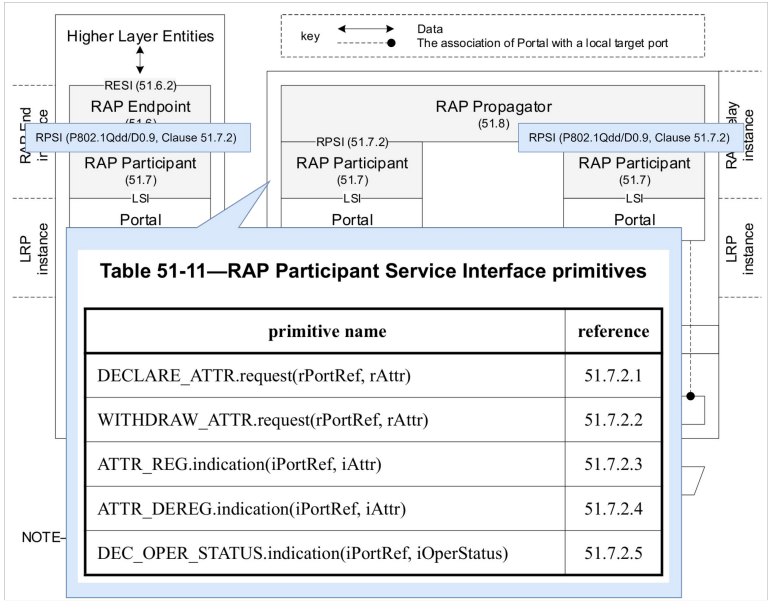


Table 51-11—RAP Participant Service Interface primitives

primitive name	reference
DECLARE_ATTR.request(rPortRef, rAttr)	51.7.2.1
WITHDRAW_ATTR.request(rPortRef, rAttr)	51.7.2.2
ATTR_REG.indication(iPortRef, iAttr)	51.7.2.3
ATTR_DEREG.indication(iPortRef, iAttr)	51.7.2.4
DEC_OPER_STATUS.indication(iPortRef, iOperStatus)	51.7.2.5

RAP:

RPSI between **RAP Participant** and **RAP Participant user (RAP Propagator or Endpoint)**

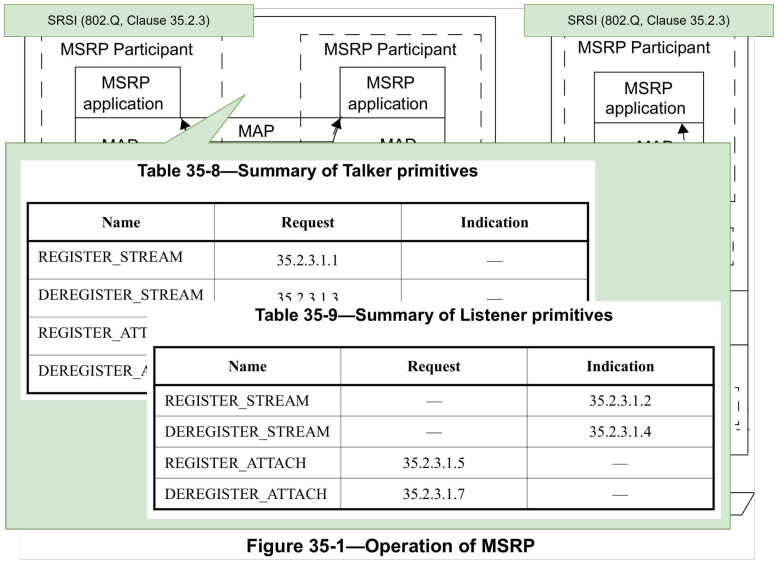


Table 35-8—Summary of Talker primitives

Name	Request	Indication
REGISTER_STREAM	35.2.3.1.1	—
DEREGISTER_STREAM	35.2.3.1.3	—
REGISTER_ATT		
DEREGISTER_		

Table 35-9—Summary of Listener primitives

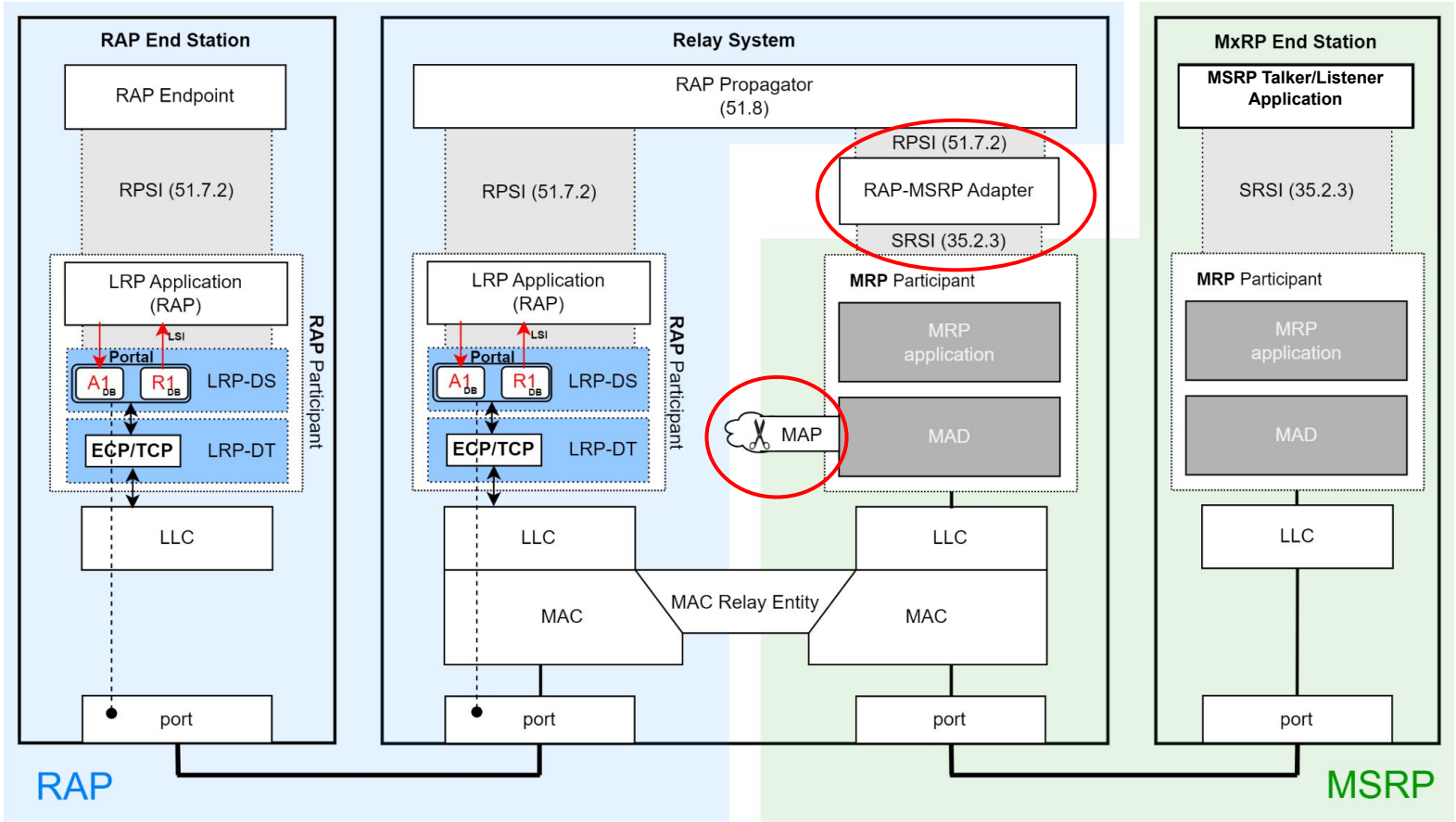
Name	Request	Indication
REGISTER_STREAM	—	35.2.3.1.2
DEREGISTER_STREAM	—	35.2.3.1.4
REGISTER_ATTACH	35.2.3.1.5	—
DEREGISTER_ATTACH	35.2.3.1.7	—

Figure 35-1—Operation of MSRP

MSRP:

SRSI between **MSRP Participant** and **Application (Talker or Listener)**

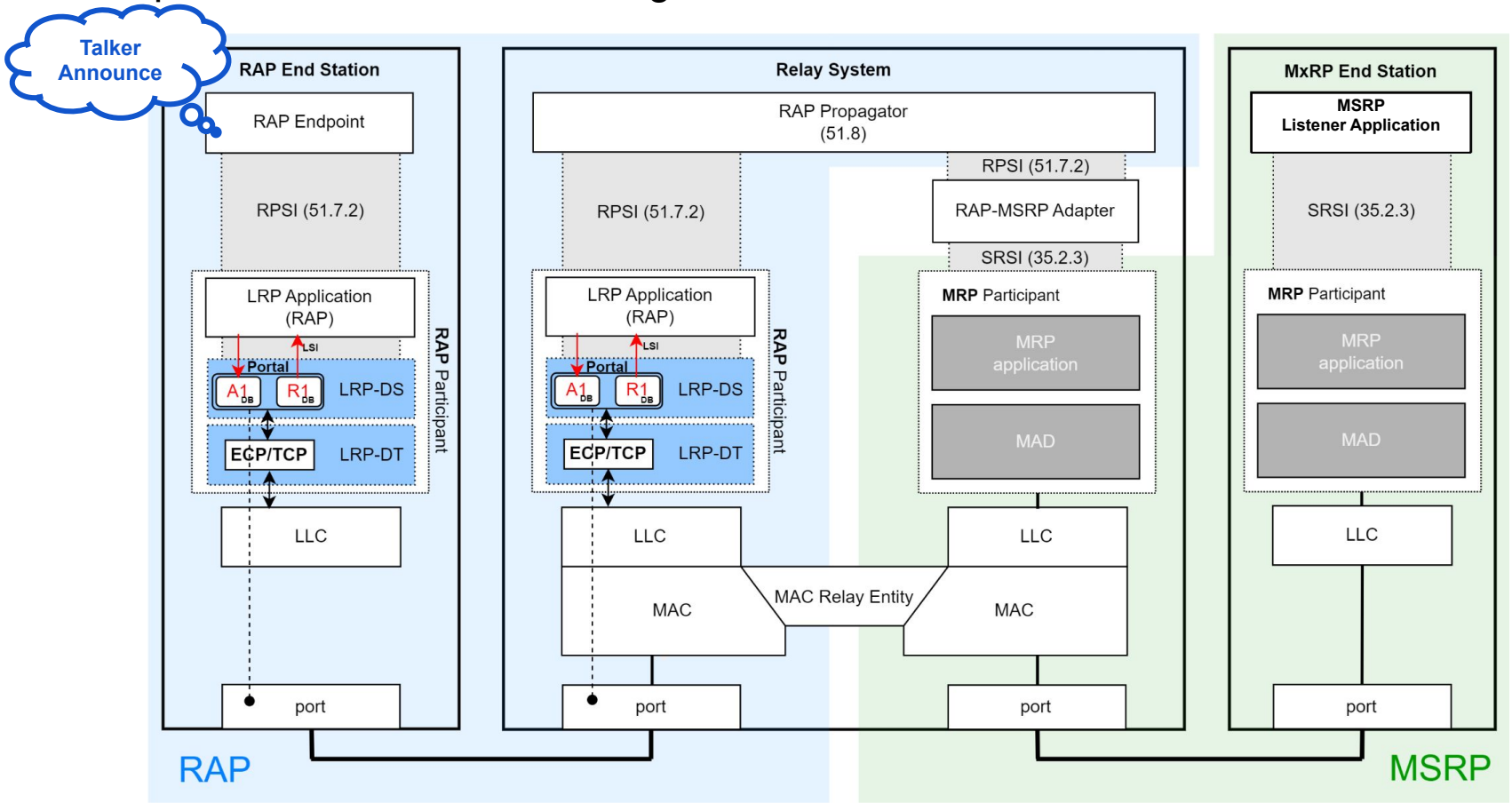
Summary: MSRP/RAP bridge architecture



MSRP/RAP Adapter: Primitive Translation

Interface	Primitive received	Attribute	Translated to	Attribute
SRSI	REGISTER_STREAM.indication	Talker Advertise or Talker Failed	ATTR_REG.indication	Talker Announce
	DEREGISTER_STREAM.indication	Talker Advertise or Talker Failed	ATTR_DEREG.indication	Talker Announce
	REGISTER_ATTACH.indication	Listener	ATTR_REG.indication	Listener Attach
	DEREGISTER_ATTACH.indication	Listener	ATTR_DEREG.indication	Listener Attach
	Domain attribute registration	Domain	ATTR_REG.indication	RA
RPSI	DECLARE_ATTR.request	Talker Announce	REGISTER_STREAM.request	Talker Advertise or Talker Failed
	WITHDRAW_ATTR.request	Talker Announce	DEREGISTER_STREAM.request	Talker Advertise or Talker Failed
	DECLARE_ATTR.request	Listener Attach	REGISTER_ATTACH.request	Listener
	WITHDRAW_ATTR.request	Listener Attach	DEREGISTER_ATTACH.request	Listener

Example: RAP/MSRP Stream Registration/Attach Process



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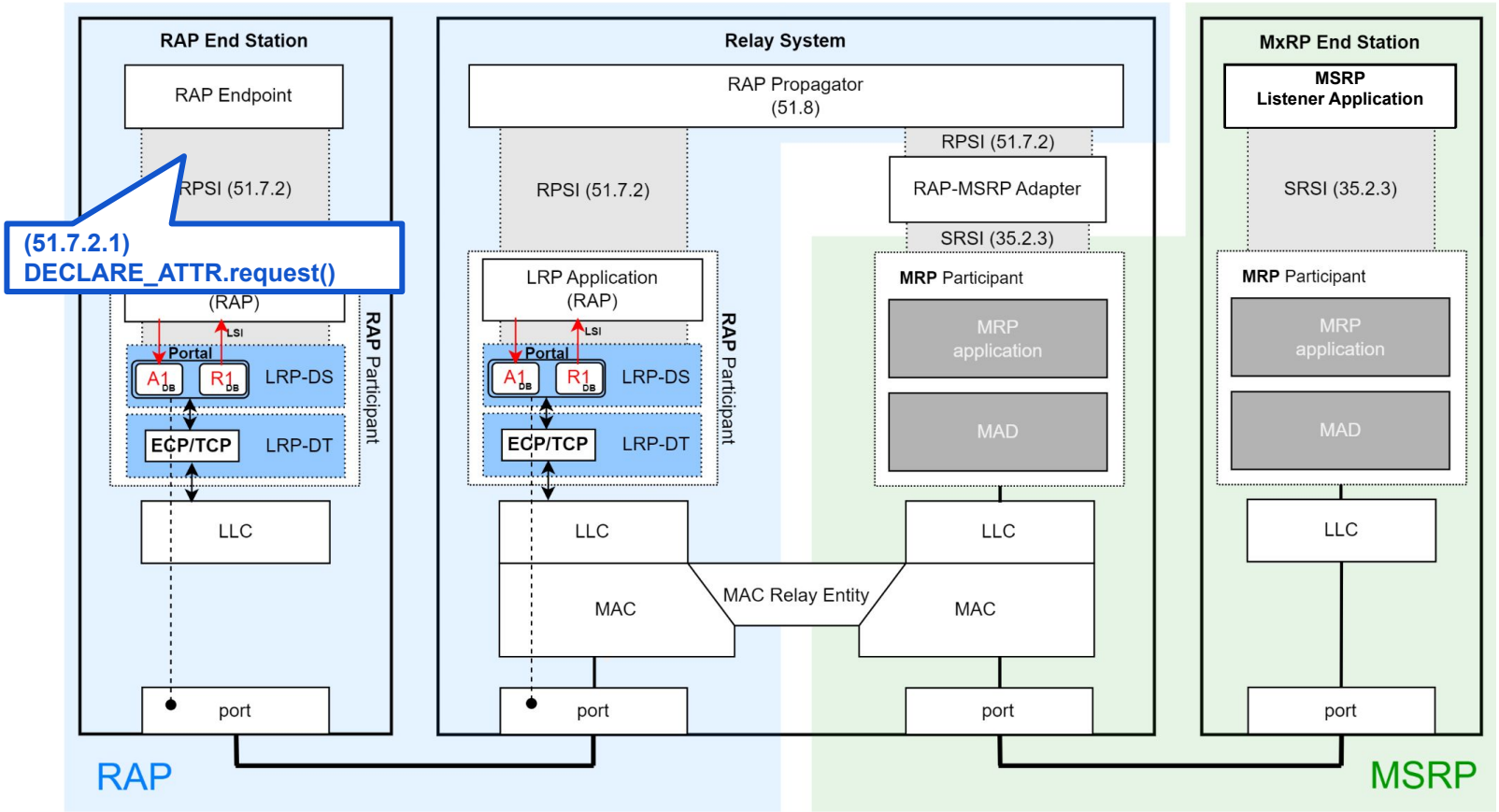

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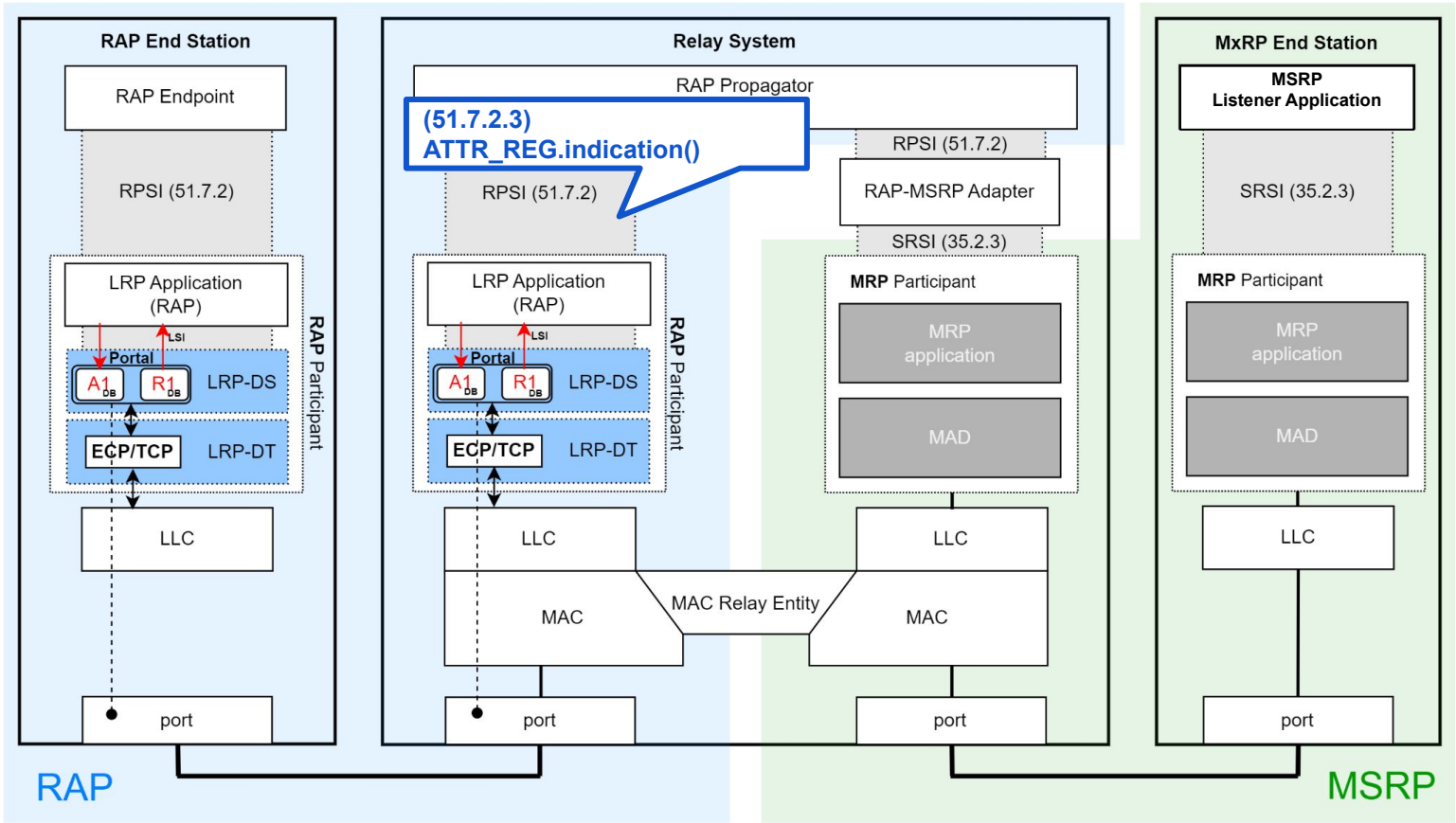
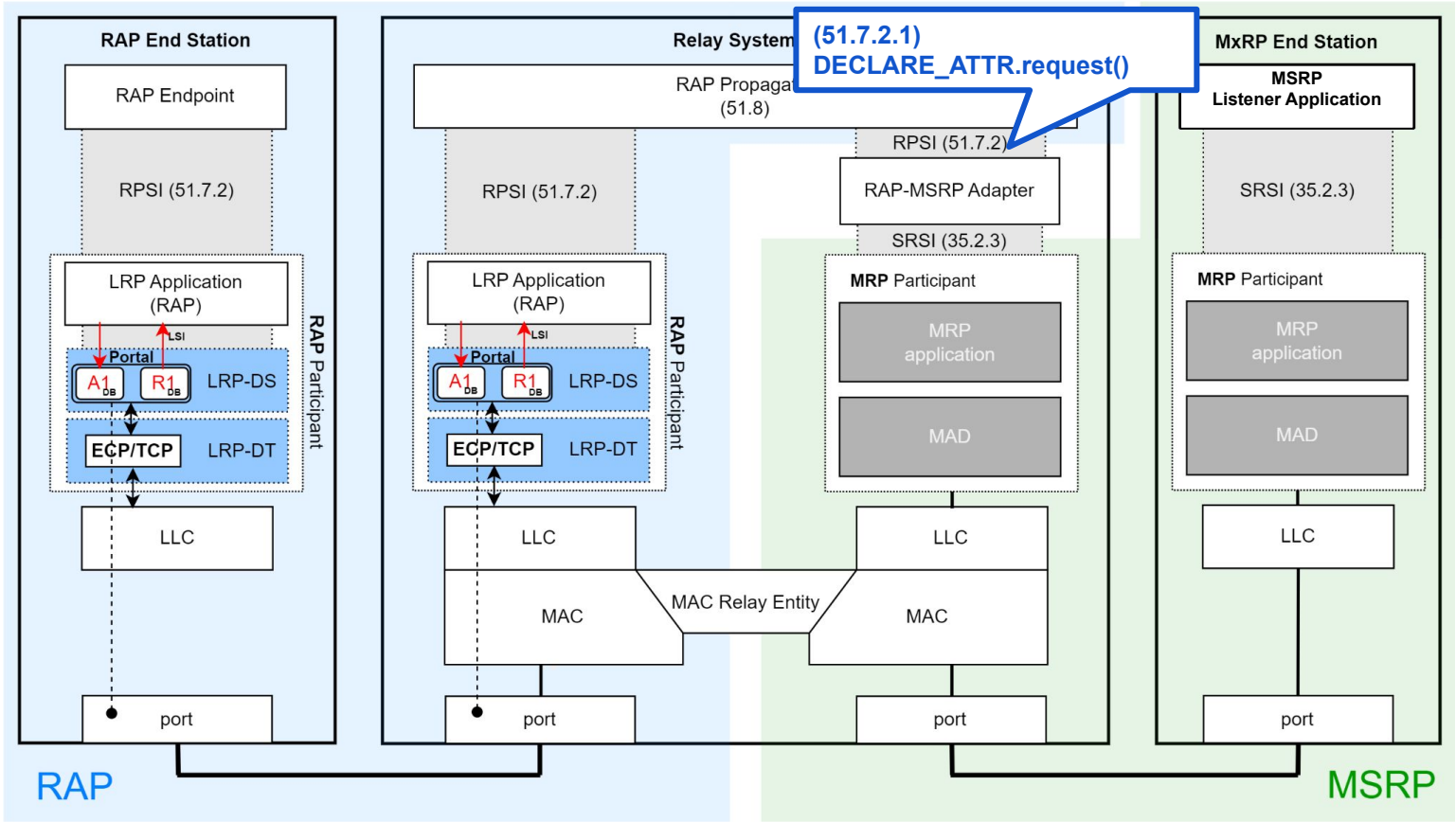


Example: RAP/MSRP Stream Registration/Attach Process



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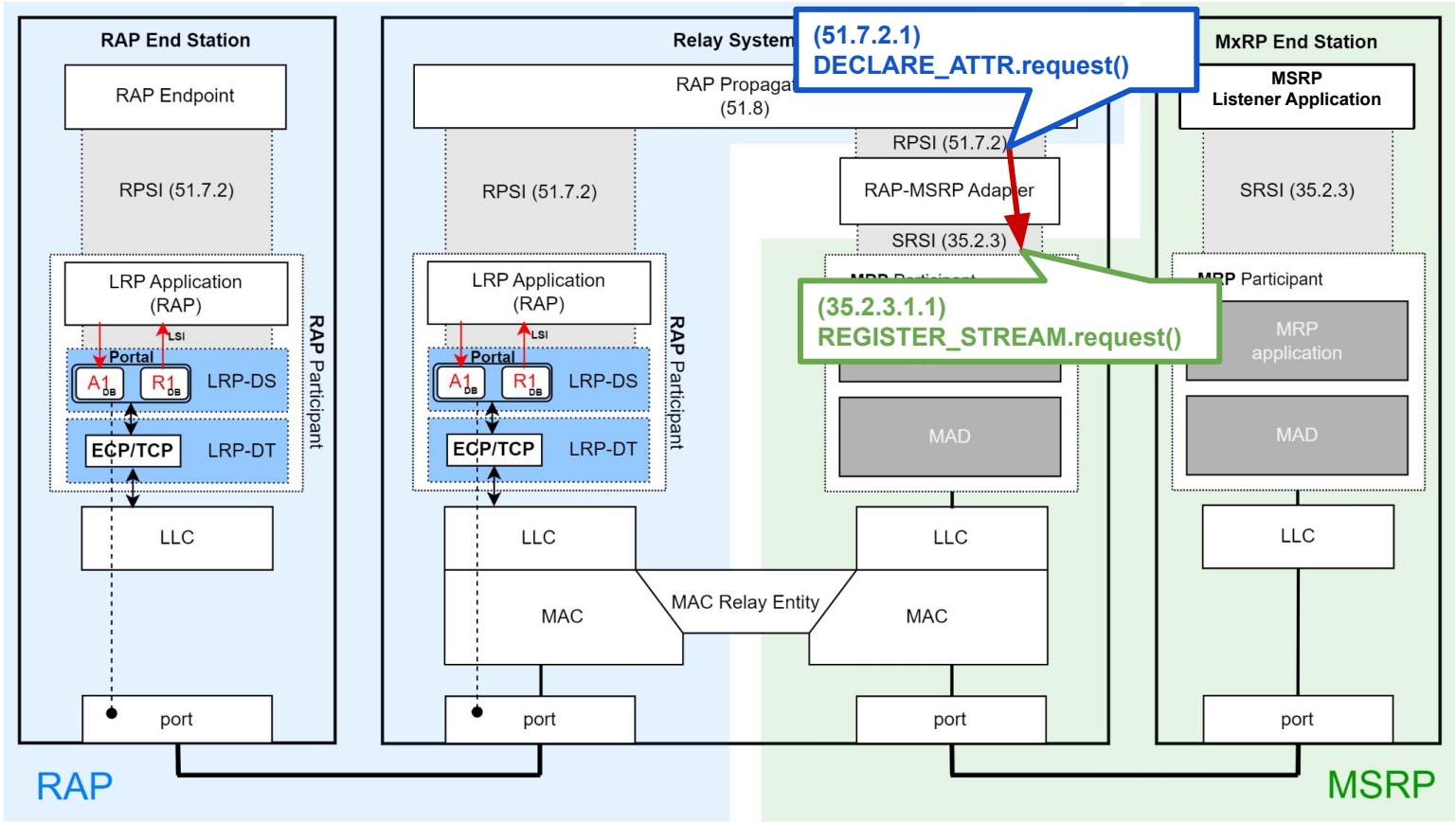

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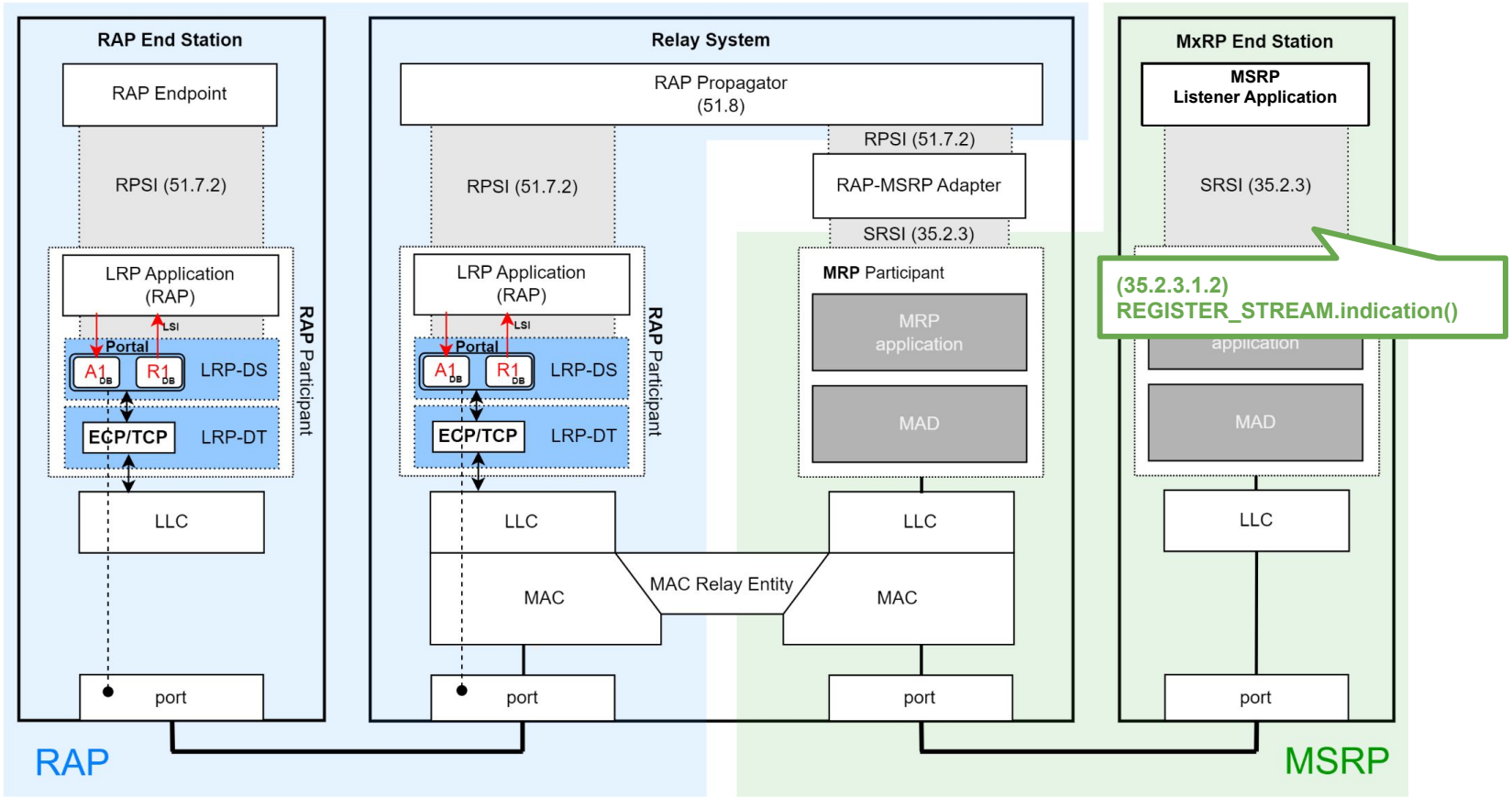
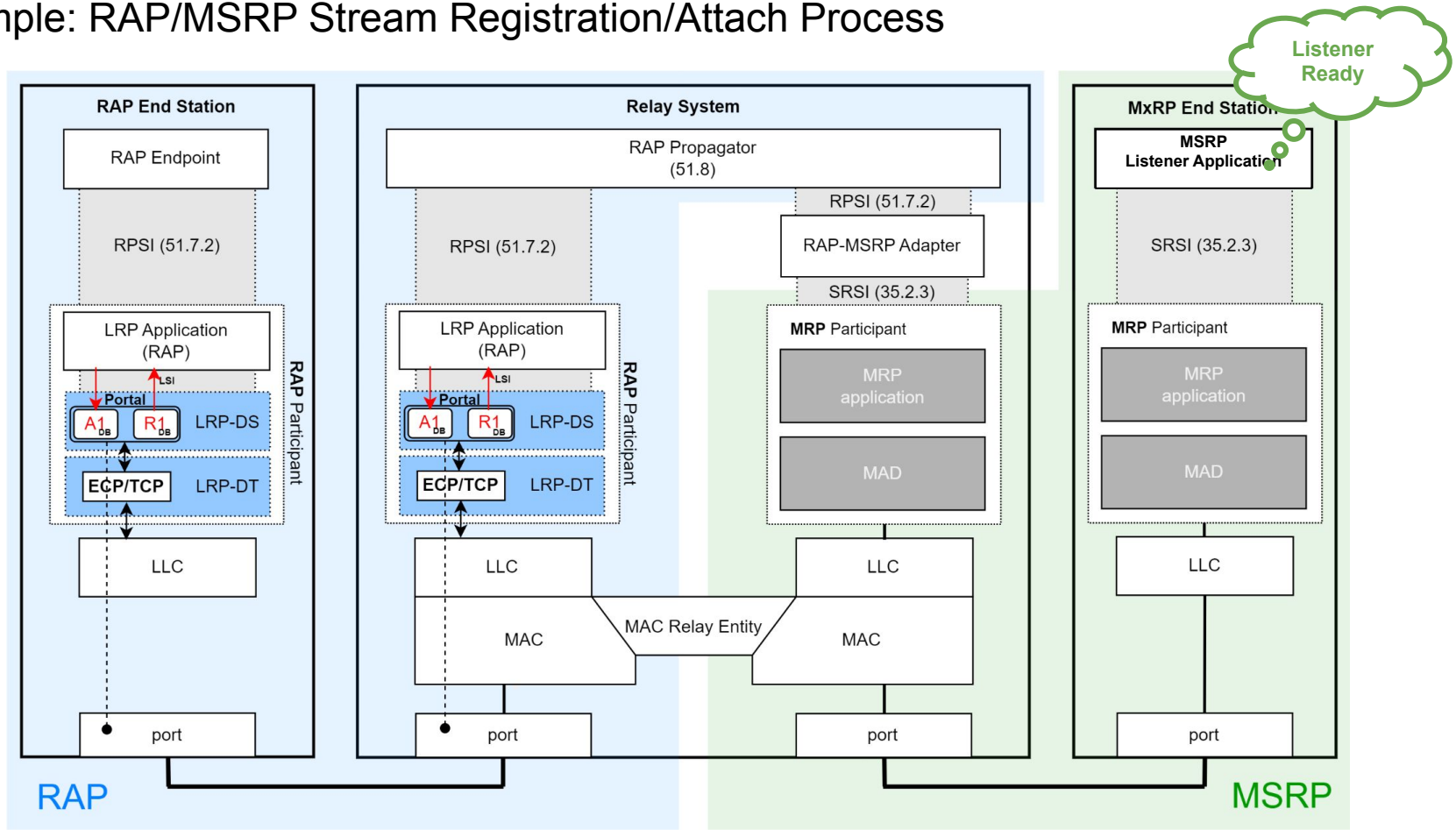


Example: RAP/MSRP Stream Registration/Attach Process



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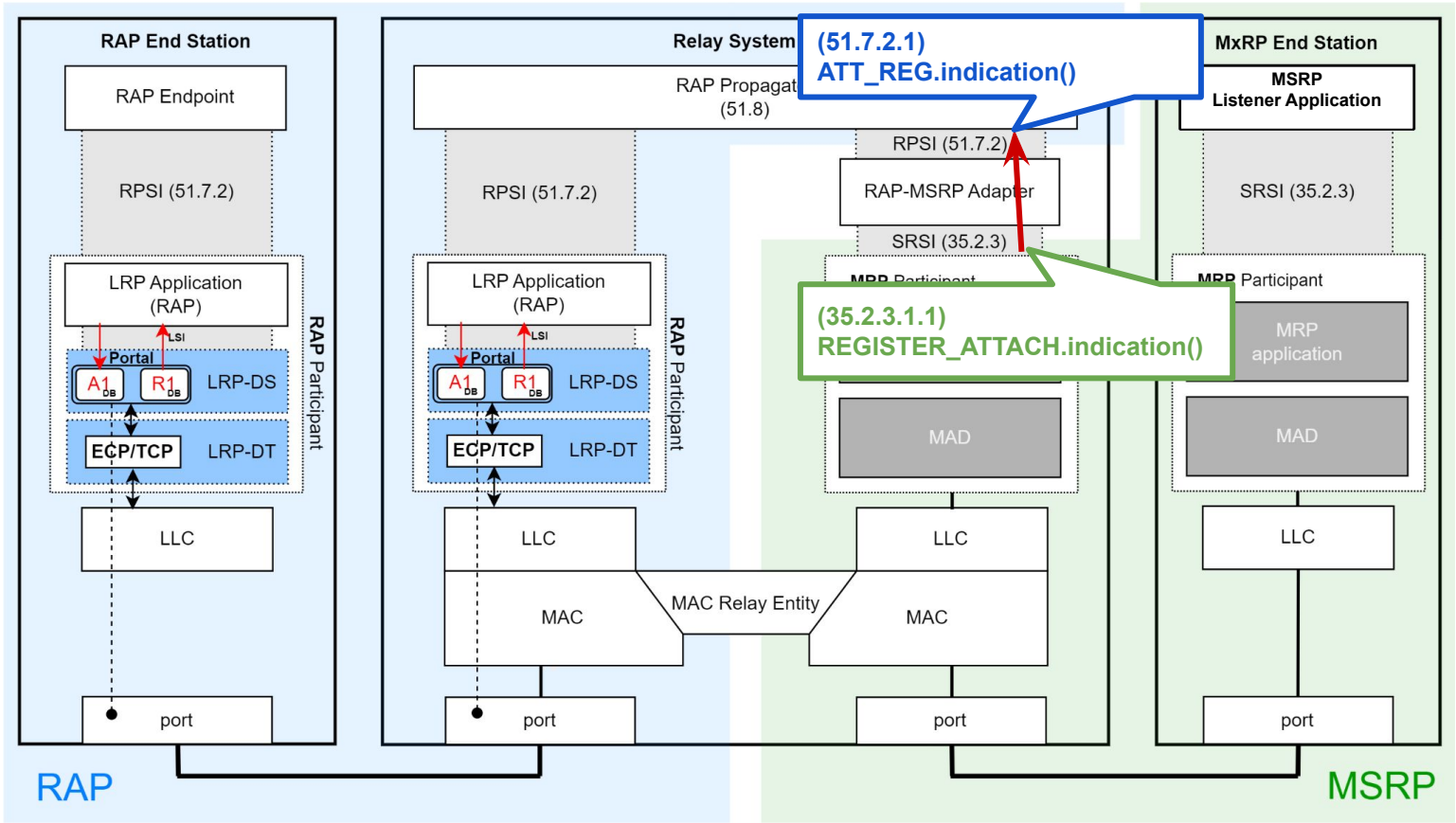
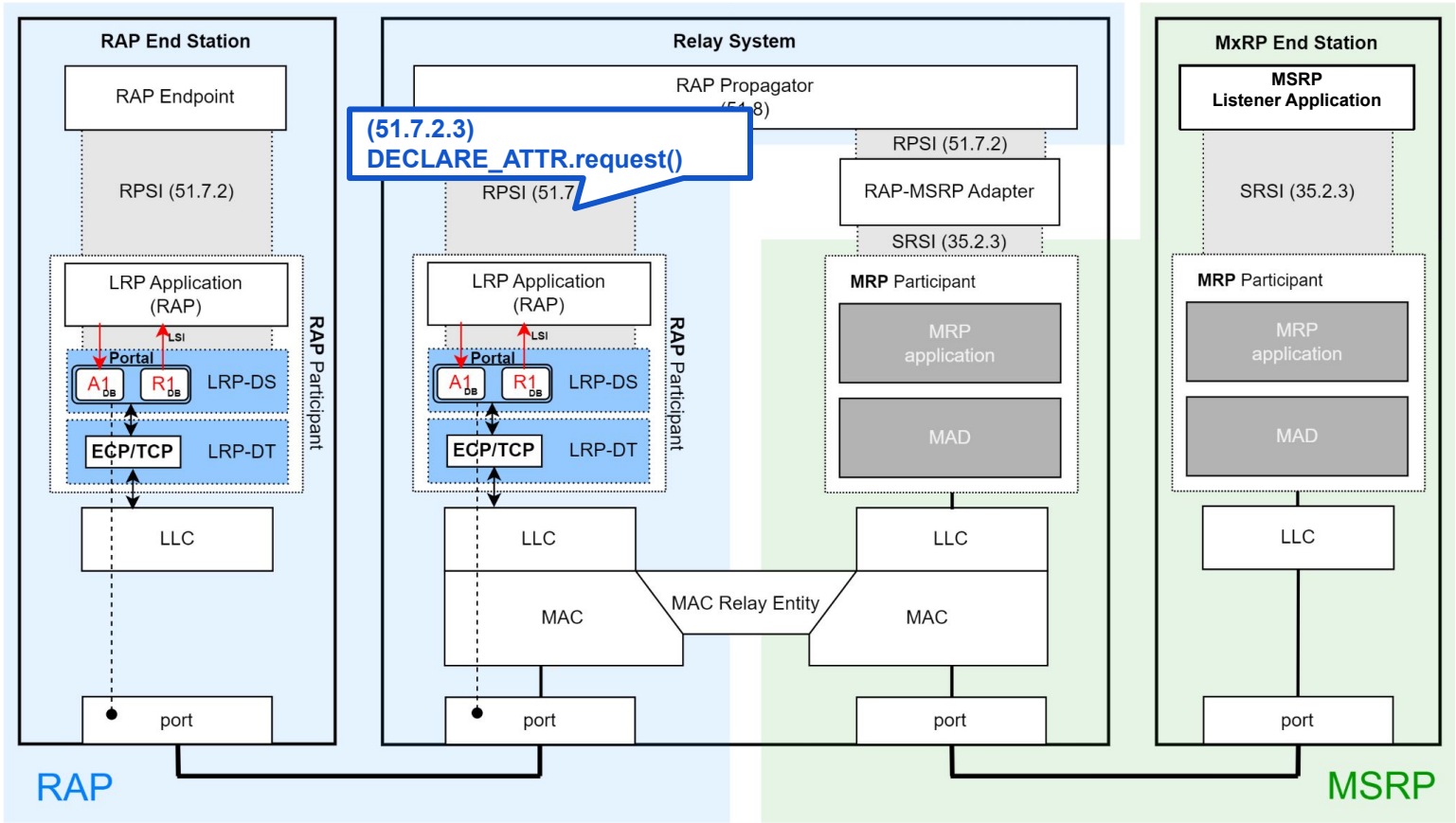
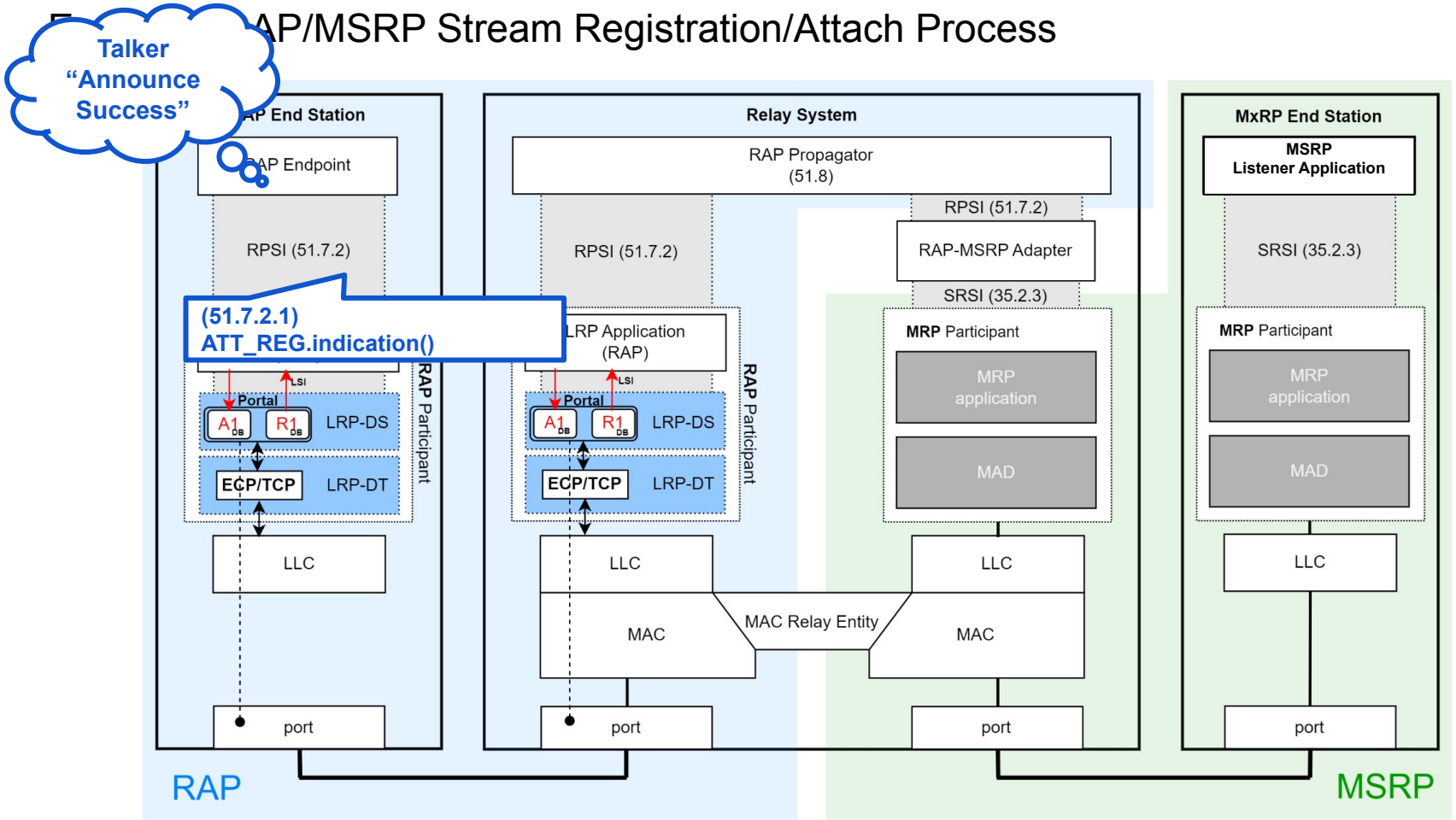


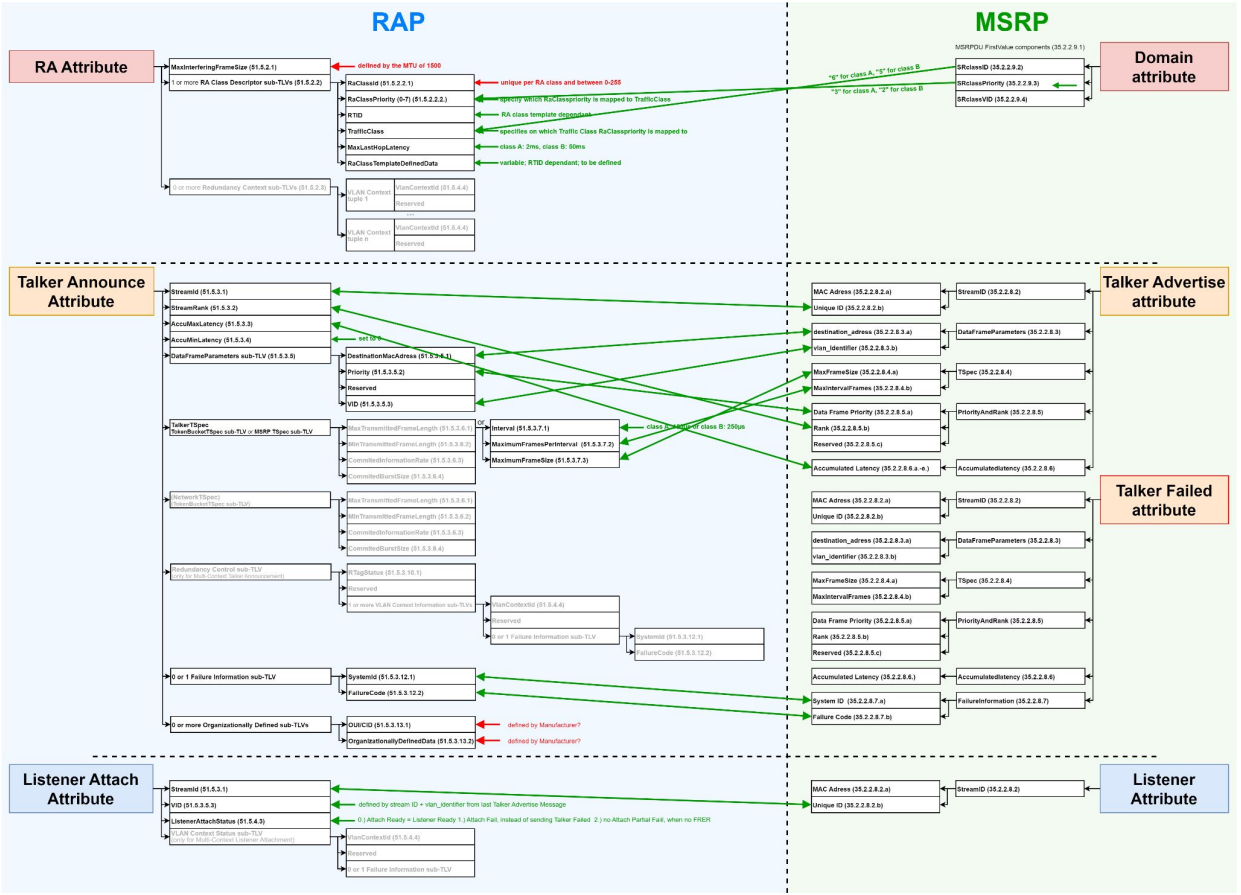
Example: RAP/MSRP Stream Registration/Attach Process



AP/MSRP Stream Registration/Attach Process

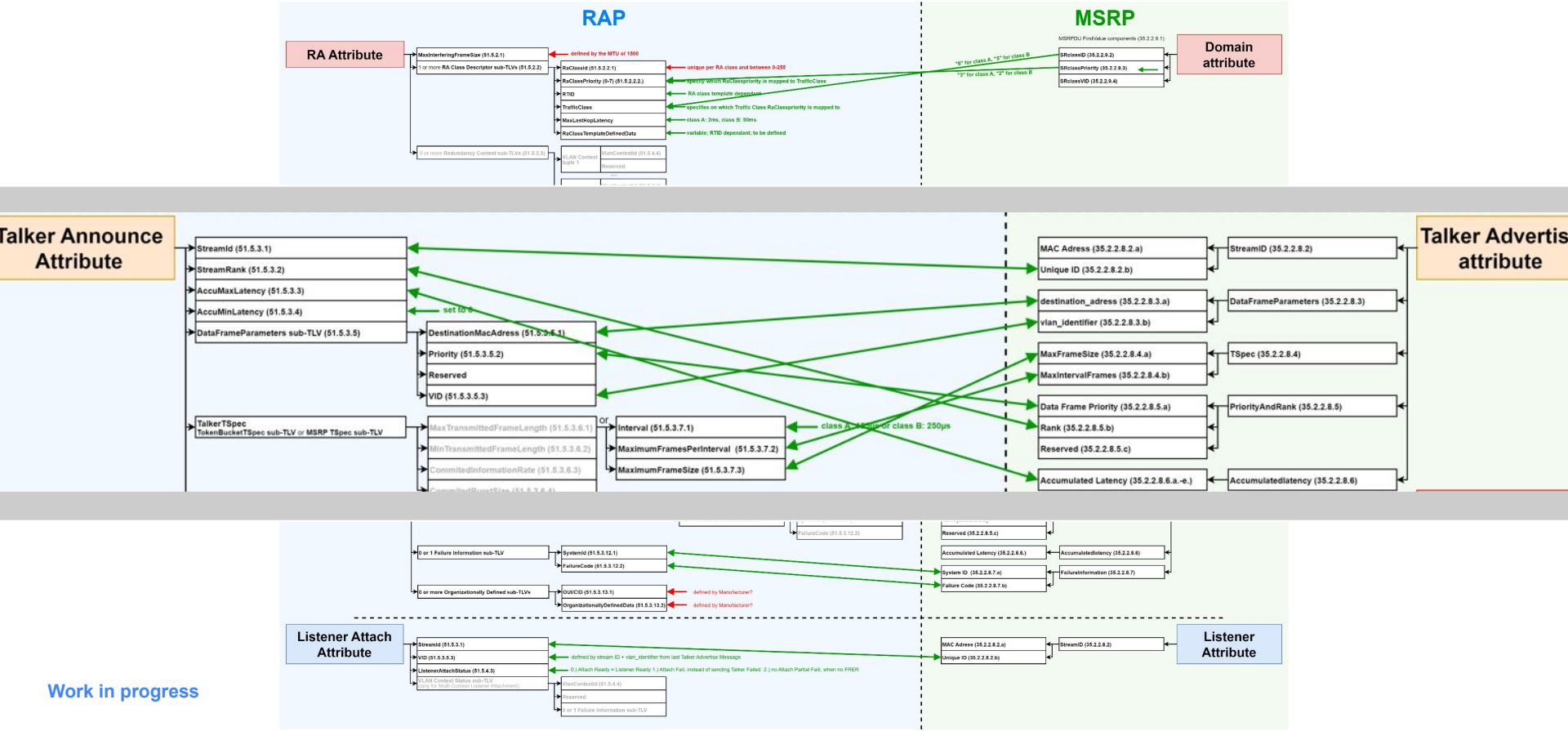


MSRP/RAP Adapter: Attribute Translation



Work in progress

MSRP/RAP Adapter: Attribute Translation



Work in progress

MSRP/RAP Adaptor: Failure Code Association

Table 51-9—RAP Failure Codes

Name	Value	Description	Reference
InvalidTaReg [a]	0x01	Invalid Talker Announce registration	51.8.5.3
LatencyExceeded	0x02	Latency constraint not met	51.3.6.1
BandwidthExceeded	0x03	Bandwidth constraint not met	51.3.6.2
ResourceExceeded	0x04	Resource constraint not met	51.3.6.3
CrossingDomainBoundary	0x05	Talker Announcement across RA Class domain boundary	51.3.6.4
ResourceAllocationFailed	0x06	Resource allocation failed	51.8.5.[illegible]
ReservationPreempted	0x07	Reservation preempted by Rank zero streams	51.8.5.35
RTagFailed	0x08	Requirements for redundancy (un)tagging not fullfilled	51.3.8.3
StreamSplitFailed	0x09	Requirements for Stream splitting not fulfilled	51.3.8.4
MissingTalkerAnnounce	0x0A	Missing Talker Announce at a Stream merging point	51.8.5.9
ListenerLackingFrer	0x0B	Listener lacking FRER capability	51.6.3.7
InconsistentRedundancy-Context	0x0C	Inconsistent configuration of Redundancy Context	51.3.8.2

RA class domain dependant

out of MSRP scope

Work in progress

Table 46-15—TSN Failure Codes

Failure Code	Description of cause
1	Insufficient bandwidth
2	Insufficient Bridge resources
3	Insufficient bandwidth for traffic class
4	StreamID in use by another Talker
5	Stream destination_address already in use
6	Stream preempted by higher rank
7	Reported latency has changed
8	Egress Port is not AVB capable [a]
9	Use a different destination_address (i.e., MAC DA hash table full)
10	Out of MSRP resources
11	Out of MMRP resources
12	Cannot store destination_address (i.e., Bridge is out of MAC DA resources)
13	Requested priority is not an SR Class (3.262) priority
14	MaxFrameSize [item a) in 35.2.2.8.4] is too large for media
15	msrpMaxFanInPorts [item f) in 35.2.1.4] limit has been reached
16	Changes in FirstValue, other than AccumulatedLatency, for a registered StreamID
17	VLAN is blocked or filtered on this egress Port [b]
18	VLAN tagging is disabled on this egress Port (untagged set)
19	SR class priority mismatch
20	Enhanced feature cannot be propagated to original Port
21	MaxLatency exceeded
22	Nearest Bridge cannot provide network identification for stream transformation
23	Stream transformation not supported
24	Stream identification type not supported for stream transformation
25	Enhanced feature cannot be supported without a CNC

MSRP/RAP Adaptor: Failure Code Association

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CrossingDomainBoundary	0x05	Talker Announcement across RA Class domain boundary	51.8.5.4
ResourceAllocationFailed	0x06	Resource allocation failed	51.8.5.38
ReservationPreempted	0x07	Reservation preempted by Rank zero streams	51.8.5.39
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StreamSplitFailed	0x09	Requirements for Stream splitting not fulfilled	51.3.8.4
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RA class domain dependant

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Work in progress

RA Class Template “802.1BA”

- Transmission selection algorithm: Credit Based Shaper (CBS)
- Algorithms for latency calculation: as defined in 802.1BA
- Resource reservation method: RAP
- Contains SR classes A & B

→ streams coming from SRP domain will be mapped to this RA class

→ only streams of this RA class will be propagated to the SRP domain

Managed Objects

MRP, MSRP and CBS managed objects.

When used with RA class “802.1BA”, some values as defined in:

- 802.1BA
- Avnu Alliance Milan specification

Examples:

- deltaBandwidth: 75%
- CMI: 125us (SR class A), 250us (SR class B)

Summary of the contribution

Elements and architecture to add backwards compatibility with MSRP

Next Steps

Detailed tables for attribute and error code translation

RA class template details