IEEE P802.15
Wireless Personal Area Networks

Project	IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)	
Title	**FCSL/PAL - MAC/MLME SAP Proposal**	
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Re:	[]	
Abstract	[This document contains a list or proposed changes to IEEE Std 802.15.3.]	
Purpose	[The purpose of this document is to propose changes to IEEE Std 802.15.3 to improve compatibility, performance and clarity in the standard.]	
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Release	The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15.	

1. Introduction

At the July 2004 802.15.3b meeting in Portland it was determined that MLME SAP defined in IEEE Std 802.15.3-2003 should be modified in consideration to the DME functionality defined in the standard be part of the MLME entity. This allows the MLME SAP to be a defined exposed interface for a FCSL. This document proposes this new MLME SAP. Because the MLME SAP is to be an exposed interface, the MAC SAP would be assumed to be exposed as well. Therefore, a new more implementable MAC SAP interface is also presented in this document.

2. FCSL - MAC/MLME Functional Division

Document 297/r2 presented a division of functionality between the FCSL, DME, PME (Piconet Management Entity), and MAC/MLME. This same functional division is shown below with the DME and PME functionality of 297/r2 moved under MAC/MLME functionality. The functional division shown below was used as a guide when development the MLME SAP and MAC SAP primitives in this document.

FCSL/PAL

- Map Upper layer identifier (e.g., MAC address) to DEVID for data frames
- Maintain List of available DEVs
- Map upper layer stream IDs to 15.3 indices
- Pass data to MAC
- Fragmentation
- Maintain list of DEVIDs
- Convert Async Data to MAC SAP Async Data Requests
- Rate adjustment decisions

PNC MAC/MLME

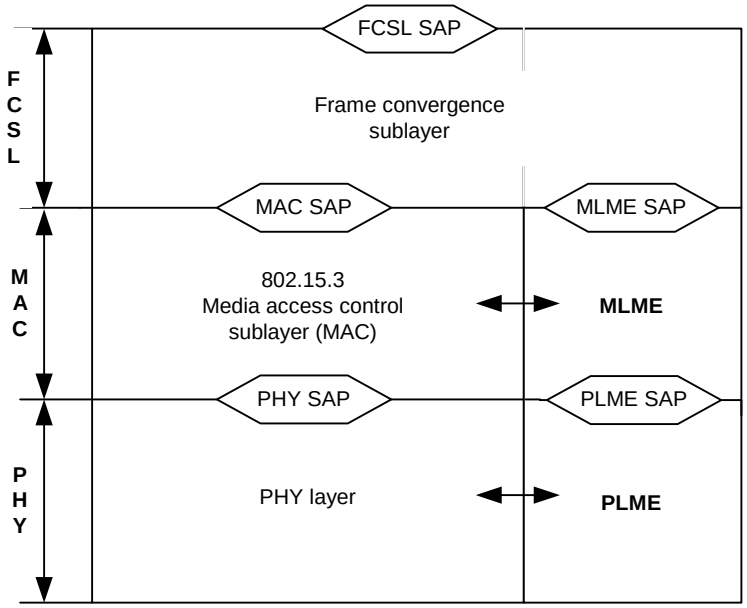
- Select Piconet channel
- Associate/disassociate DEVs
- Handover
- Scan for interference
- Start/stop network (including child/neighbor)
- Change PNID/BSID
- Maintain list of associate DEVs
- Allocate channel time
- Track PM DEVs
- ***Change Superframe Duration***
- Change Superframe Location

DEV MAC/MLME

- Master MAC Address - DEVID table
- Stream index only
- Start/Stop scan
- Associate/disassociate
- Track Security Problems
- Determine PM Mode
- ***Convert stream requirements to CT requests***
- Determine when to scan and process results
- KOME (Key originator management entity)
- Change Data keys
- DEVID and Stream Index only
- Data queues
- 15.3 Fragmentation/Reassembly
- ACKs
- On-air timing – data, command, beacon
- Keep data and management keys (because this is where encryption happens)
- Secure frame processing
- Channel quality (e.g. FER and retry), TX power adaptation
- Perform scan and report capacity (status, scan)
- Rate adaptation implementations (affects CTAs)
- Identify current Piconet (BSID, PNID and PNC MAC address)
- Prepare Async CTRq’s and tracks async. time requirements.
- Manage ATP to stay associated (DEV)
- Track ATPs for DEVs (PNC)

3. Standard Reference Model

Because it is being proposed that the DME functionality define in IEEE Std 802.15.3-2003 be considered part of the MLME functionality, the reference model shown in Figure 3 of the standard would no longer be valid. The figure below shows a proposal for a new reference model to be included in Clause 6 (and in Appendix A).



Proposed Reference Model (Figure 3)

4. Proposed MLME SAP Primitives

The table in this section proposes MLME primitives, their purpose, and their parameters based on a MLME entity that contains the DME functionality currently define in IEEE Std 802.15.3-2003. This interface would be the SAP for a FCSL using the 802.15.3 MLME.

Note that the MLME SAP as specified does not inherently support multiple FCSLs at one time (for example, two separate FCSLs requiring piconets with very different superframe durations). It is assumed that an additional coordination and multiplexing layer of some sort will be required above the MAC SAP and MLME SAP to support multiple FCSLs at one time.

The MLME/SAP presented below would be identified in the standard as the minimal required interface to support higher layers.

MLME Primitive	Purpose	New Parameters (Values)
MLME-RESET.request	A request to reset the MAC/MLME.	SetDefaultPIB
MLME-RESET.confirm	After any reset (self initiated or MLME-RESET.request) the MAC/MLME will send a MLME-RESET.confirm to the FCSL to indicate that it is ready to accept requests.	ResultCode (READY, ERROR) ReasonCode
MLME-SCAN.request	A request to scan all channels for piconets. The FCSL can optionally supply a BSID, PNID, or PNCAddress to scan for.	ScanForBSID (TRUE, FALSE) BSID ScanForPNID (TRUE, FALSE) PNID ScanForPNCAddress (TRUE, FALSE) PNCAddress
MLME-SCAN.confirm	Report the piconets found as a result of a MLME-SCAN.request. Basic information about each piconet found is returned including any Application Specifc Data broadcast by a PNC in the Beacon. *Note that Piconet Services are not broadcast in the Beacon and can therefore not be supplied as part of a scan result.*	ResultCode (SUCCESS, FAILURE) ReasonCode NumberOfPiconets PiconetDescriptionSet - BSID - PNID - PNCAddress - ChannelIndex - SECMode - ApplicationSpecificDataSet - VendorOUI - Length - ApplicationSpecificData **ChannelRatingSet** **- ChannelIndex** **- ChannelRating**

MLME Primitive	Purpose	New Parameters (Values)
MLME-START.request	A request to start operation as a PNC. The FCSL specifies the BSID, SuperframeDuration, SECMode, and MaxTXPowerLevel for the piconet. ***Note: A start request while associated will result in the start of a dependent piconet.***	BSID SuperframeDuration SECMode (TRUE, FALSE) MaxTXPowerLevel
MLME-START.confirm	Report result of the start request. A ResultCode of FAILURE is returned if the MLME can not support the parameters supplied in the MLME-START.request	ResultCode (SUCCESS, FAILURE) ReasonCode DEVID (for DEV identity) DEVAddress (for DEV identiy)
MLME-STOP.request	A request to stop operation as a PNC. The FCSL/ MAC can specify if the shutdown of the piconet should be immediate or if there is time for an attempt to handover control of PNC operations to another DEV.	RequestType (**SHUTDOWN, HANDOVER**) AllowedTime (if RequestType = **HANDOVER**) **HandoverTrgtSet** **- DEVID**
MLME-STOP.confirm	Report result of the stop request	ResultCode (SUCCESS, FAILURE) ReasonCode
MLME-ASSOCIATE.request	A request to associate with a specifc piconet.The MLME will automatically synch with the target piconet before attempting to send an Association Request command. The capabilities of the DEV are implementation specific or are obtained from the PIB. The FCSL may request the PNC return the available Piconet Services after successful association.	BSID PNID PNCAddress **ChannelIndex** PiconetServicesInquiry (TRUE, FALSE)
MLME-ASSOCIATE.confirm	Report the result of associate request. *Note, the Association Response command as currently defined may return a single Vendor IE.*	ResultCode (SUCCESS, FAILURE) ReasonCode DEVID DEVAddress VendorOUI Length VendorSpecificInformation

MLME Primitive	Purpose	New Parameters (Values)
MLME-ASSOCIATE.indication	Report the association of a new DEV in the piconet.	DEVID DEVAddress
MLME-DISASSOCIATE.request	A request to disassociate from the current piconet. ***Note: An FCSL acting as PNC should not send this request.***	ReasonCode
MLME-DISASSOCIATE.indication	Report the disassociation of a DEV from the pico-net. It may be this DEV that is now disassociated.	DEVID DEVAddress ReasonCode
MLME-HANDOVER.indication	**Report that this DEV is the target, or is no longer the target of a PNC handover**	**Status (STARTED, CANCELLED)**
MLME-NEW-PNC.indication	Report a change in PNC due to handover event. ~~*Note: If this DEV is the new PNC the MLME will send this indication to the FCSL upon receipt of the first Handover IE in the Beacon. The FCSL shall recognize that it will be the new PNC FCSL and shall request the necessary security information from the previous PNC.*~~	~~BSID~~ ~~PNID~~ PNCAddress ~~SuperframeSize~~ ~~ChannelIndex~~ SECMode
MLME-DEV-INFO.request	A request for the membership status of one or more DEVs associated with the piconet.	RequestType (SINGLE, ALL) QueriedDEVID
MLME-DEV-INFO.confirm	Result of the request for membership status of one or more DEVs associated with the piconet.	ResultCode (SUCCESS, FAILURE) ReasonCode NumberOfDevs DevInfoSet - DEVID - DEVAddress - MembershipStatus

MLME Primitive	Purpose	New Parameters (Values)
MLME-DEV-INFO.indication	Report a change in the mebership status of one or more DEVs associated with the piconet	NumberOfDevs DevInfoSet - DEVID - DEVAddress - MembershipStatus (ASSOCIATED, MEMBER)
MLME-APPLICATION-SPECIFIC-DATA.request	A request to announce, remove, or modify application specific information. *NOTE: A new request command is required to support this primitive*	RequestType (ADD, REMOVE, ~~MODIFY~~, **COUNT**) ApplicationSpecificID (if RequestType = REMOVE) **CountValue (if RequestType = COUNT)** VendorOUI Length ApplicationSpecificData
MLME-APPLICATION-SPECIFIC-DATA.confirm	Result of the request to announce, remove, or modify application specific information. *NOTE: A new response command is required to support this primitive*	ResultCode (SUCCESS, FAILURE) ReasonCode ApplicationSpecificID (assigned by PNC)
MLME-APPLICATION-SPECIFIC-DATA.indication	Report a change in application specific information. *NOTE: In order for this primitive to only report changes to application specific data, the ApplicationSpecificID would need to be added to the ASIE.*	NumberOfData ApplicationSpecificDataSet - **ApplicationSpecificID** - **Status (ADDED, REMOVED)** - VendorOUI - Length - ApplicationSpecificData
MLME-ANNOUNCE-SERVICE.request	A request to announce~~ or remove~~ the availability of a piconet service provided by this DEV. *NOTE: If we need the ability to remove a service previously announced to the PNC then a new request command is required to support this primitive*	~~RequestType (ADD, REMOVE, MODIFY)~~ ~~ServiceID (if RequestType /= ADD)~~ VendorOUI Length PiconetServicesData
MLME-ANNOUNCE-SERVICE.confirm	The result of the request to announce or remove the availability of a piconet service provided by this DEV.	ResultCode (SUCCESS, FAILURE) ReasonCode ~~ServiceID (assigned by PNC)~~

MLME Primitive	Purpose	New Parameters (Values)
MLME-PICONET-SERVICES.request	Request information about the piconet services offered by the piconet or by a specific DEV.	TrgtID
MLME-PICONET-SERVICES.confirm	Report result of the request for piconet services information.	**ResultCode (SUCCESS, FAILURE)** **ReasonCode** NumberOfServices PiconetServicesSet - DEVID - VendorOUI - Length - PiconetServicesData
MLME-PICONET-SERVICES.indication	Report the piconet services offered by the piconet. ***Note: This primitive will be generated any time piconet services information is received.***	NumberOfServices PiconetServicesSet - DEVID - VendorOUI - Length - PiconetServicesData
MLME-VENDOR-SPECIFIC.request	Request to send vendor specific information to another device in the piconet as either an Information Element or as a Command.	RequestType (INFORMATION, COMMAND) ElementId (RequestType = INFORMATION) CommandType (RequestType = COMMAND) TrgtId VendorOUI Length VendorSpecificData
MLME-VENDOR-SPECIFIC.confirm	The result of the request to send vendor specific information to another device in the piconet. *Note: If an Vendor Specific command is generated from the MLME-VENDOR-SPECIFIC.request, then this confirm can only indicate that the command was transmitted and not that a cooresponding Response command was received.*	ResultCode (SUCCESS, FAILURE) ReasonCode

MLME Primitive	Purpose	New Parameters (Values)
MLME-VENDOR-SPECIFIC.indication	Report the reception of vendor specific information. *Note: This indication would be generated any time a VendorSpecifc IE or VendorSpecific command was received.*	IndicationType (INFORMATION, COMMAND) ElementId (IndicationType = INFORMATION) CommandType (IndicationType = COMMAND) OrigID VendorOUI Length VendorSpecificData
MLME-CREATE-STREAM.request	A request to create an an isochronous stream from the requesting DEV to another DEV in the piconet. *Note: There is a question about whether the FCSL should supply the default number of retries per frame (NumRetries), or if the MLME should determine the proper number of retries depending on the value of MaxDroppedFrames. Note also that it is being proposed that the NumRetries value can be modified with each MAC-xxx-DATA.request.*	StreamRequestID TrgtID DSPSSetIndex ACKPolicy NumRetries UserPriority PMCTRqType MaxThroughput (MSDU payload in Kbytes per second) MaxFrameSize (Maximum MSDU payload in bytes) MaxLatency (msec) MaxJitter (msec) MaxDroppedFrames (% if ACKPolicy = Imm-ACK)
MLME-CREATE-STREAM.confirm	The result of the request to create an an isochronous stream from the requesting DEV to another DEV in the piconet.	ResultCode (SUCCESS, FAILURE) ReasonCode StreamRequestID StreamIndex MaxThroughput (MSDU payload in Kbytes per second) MaxLatency (msec) MaxJitter (msec)
MLME-CREATE-STREAM.indication	An indication to a DEV that it is the destination of an isochronous stream.	StreamIndex, OrigID

MLME Primitive	Purpose	New Parameters (Values)
MLME-MODIFY-STREAM.request	A request to modify an an isochronous stream from the requesting DEV to another DEV in the piconet	StreamIndex UserPriority PMCTRqType DSPSSetIndex ACKPolicy NumRetries MaxThroughput (MSDU payload in Kbytes per second) MaxFrameSize (Maximum MSDU payload in bytes) MaxLatency (msec) MaxJitter (msec) MaxDroppedFrames (% if ACKPolicy = Imm-ACK)
MLME-MODIFY-STREAM.confirm	The result of the request to modify an an isochronous stream from the requesting DEV to another DEV in the piconet	ResultCode (SUCCESS, FAILURE) ReasonCode StreamIndex MaxThroughput (MSDU payload in Kbytes per second) MaxLatency (msec) MaxJitter (msec)
MLME-MODIFY-STREAM.indication	An indication to the originator of an isochronous stream of a change in the quality parameters for the stream	StreamIndex MaxThroughput (MSDU payload in Kbytes per second) MaxFrameSize (Maximum MSDU payload in bytes) MaxLatency (msec) MaxJitter (msec)
MLME-TERMINATE-STREAM.request	A request by either the originator or the target of an isochronous stream to terminate the stream	StreamIndex
MLME-TERMINATE-STREAM.confirm	The result of the request by either the originator or the target of an isochronous stream to terminate the stream	ResultCode (SUCCESS, FAILURE) ReasonCode StreamIndex

MLME Primitive	Purpose	New Parameters (Values)
MLME-TERMINATE-STREAM.indication	An indication that an isochronous stream has been terminated. If received by the originator it is an indication that the stream was terminated by the target DEV for the stream or the PNC. If received by the target it is an indication that the stream was terminated by the source DEVID for the stream or terminated by the PNC. *Note: In order to provide a reason code with this primitive, the definition of a Null CTA must be modified to pass a reason code.*	StreamIndex ReasonCode
MLME-STREAM-STATUS.request	A request by the originator of an isochrohous stream for a measurment of the quality parameters for the stream.	StreamIndex
MLME-STREAM-STATUS.confirm	The result of a request by the originator of an isochrohous stream for a measurment of the quality parameters for the stream.	ResultCode (SUCCESS, FAILURE) ReasonCode StreamIndex MeasurementWindowSize MeasuredThroughput (Bps) MeasuredLatency (msec) MeasuredJitter (msec) MeasuredDroppedFrames (if ACKPolicy = Imm-ACK)
MLME-PICONET-PARM-CHANGE.request	A request by a DEV currently acting as PNC to change the BSID, Superframe Size, or Max TX Power Level for the picoinet.	ChangeType (BSID, SIZE, POWER) BSID SuperframeDuration MaxTXPowerLevel
MLME-PICONET-PARM-CHANGE.confirm	The result of the request by a DEV currently acting as PNC to change the BSID, Superframe Size, or Max TX Power Level for the picoinet.	ResultCode (SUCCESS, FAILURE) ReasonCode

MLME Primitive	Purpose	New Parameters (Values)
MLME-PICONET-PARM-CHANGE.indication	An indication to a DEV not acting as a PNC that the BSID, Superframe Size, or Max TX Power Level of the piconet has changed.	ChangeType (PNID, BSID, SIZE, POWER, CHANNEL) PNID (ChangeType = PNID) BSID (ChangeType = BSID) SuperframeDuration (ChangeType = SIZE) MaxTXPowerLevel (ChangeType = POWER) ChannelIndex (ChangeType = CHANNEL)
MLME-BEACON-EVENT.request	Request activation of the MAC synchronization support facility	RequestType (START, STOP)
MLME-BEACON-EVENT.confirm	Report result of request to activate the MAC synchronization support facility	ResultCode (SUCCESS, FAILURE) ReasonCode
MLME-BEACON-EVENT.indication	Report beginning of Beacon PHY preamble	~~TimeSinceBeaconStart~~ **BeaconNumber**
MLME-MEMBERSHIP-UPDATE.request	A request that the membership status, SECID and keying information associated with a security relationship be included or updated.	TrgtID MembershipStatus SECID KeyType KeyOriginator KeyInfoLength KeyInfo
MLME-SECURITY-MESSAGE.request	A request to send security related information to another DEV in the piconet.	TrgtID VendorOUI Length SecurityMessage
MLME-SECURITY-MESSAGE.indication	Report security related information received from another DEV in the piconet.	OrigID VendorOUI Length SecurityMessage

MLME Primitive	Purpose	New Parameters (Values)
MLME-SECURITY-ERROR.indication	Report failed security operation	~~ReceivedMACHeader~~ ~~ReceivedPayloadLength~~ ~~ReceivedFramePayload~~ **SrcID** ReasonCode **(UNAVAILABLE-KEY, FAILED-SECURITYCHECK, BAD-TIME-TOKEN)**
MLME-SECURITY-INFO.request	A request for security information regarding either a single DEV or all of the DEVs in the piconet.	TrgtID QueriedDEVID
MLME-SECURITY-INFO.indication	Indicates the reception of a request by a DEV for security information it manages regarding either a specific DEV or all of the DEVs in the pico-net.	OrigID QueriedDEVID
MLME-SECURITY-INFO.response	A response to the reception of a request by a DEV for security information it manages regarding either a specific DEV or all of the DEVs in the pico-net.	OrigID NumSecurityRecordSet SecurityRecordSet - DEVAddress - DEVID - VerificationInfoLength - VerificationInfo
MLME-SECURITY-INFO.confirm	An indication of the receipt of sercurity information.	ResultCode (SUCCESS, FAILURE) ReasonCode TrgtID NumSecurityRecordSet SecurityRecordSet - DEVAddress - DEVID - VerificationInfoLength - VerificationInfo
~~MLME-MULTICAST-INFORMATION.request~~	~~Request information about existing Multicast groups.~~	~~<none>~~

MLME Primitive	Purpose	New Parameters (Values)
~~MLME-MULTICAST-INFORMATION.confirm~~	~~Result of request for information about existing Multicast groups.~~	~~ResultCode (SUCCESS, FAILURE)~~ ~~ReasonCode~~ ~~MaxSupportedMulticastGroups~~ ~~NumCurrentMulticastGroups~~ ~~MulticastGroupSet~~ ~~- MulticastGroupID~~ ~~- MembersSet~~ ~~- DEVID~~
MLME-MULTICAST-CONFIGURATION.request	Request to join or leave a Multicast group.	Operation (JOIN, LEAVE) MulticastAddress
MLME-MULTICAST-CONFIGURATION.confirm	Result of request to join or leave a Multicast group.	ResultCode (SUCCESS, FAILURE) ReasonCode MulticastAddress McstGrpID (assigned by PNC)
MLME-PS-SET-INFORMATION.request	A request for the power save set information from the PNC.	<none>
MLME-PS-SET-INFORMATION.confirm	Result of the request for the power save set information from the PNC.	ResultCode (SUCCESS, FAILURE) ReasonCode MaxSupportedPSSets NumCurrentPSSets PSSetStructureSet - PSSetIndex - BeaconWakeInterval - MembersSet - DEVID
MLME-SPS-CONFIGURE.request	Request to create, join, or leave a power save group.	OperationType (**CREATE**, JOIN, LEAVE) SPSSetIndex (**OperationType /= CREATE**) BeaconWakeInterval

MLME Primitive	Purpose	New Parameters (Values)
MLME-SPS-CONFIGURE.confirm	Result of the request to create, join, or leave a power save group.	ResultCode (SUCCESS, FAILURE) ReasonCode OperationType (**CREATE**, JOIN, LEAVE) SPSSetIndex BeaconWakeInterval
MLME-PM-MODE-CHANGE.request	A request to change the current power save mode.	PMMode
MLME-PM-MODE-CHANGE.confirm	Result of the request to change the current power save mode.	ResultCode (SUCCESS, FAILURE) ReasonCode PMMode
MLME-PM-MODE-CHANGE.indication	Report an unrequest change to the current power save mode.	PMMode PMActiveEvent (if PMMode = ACTIVE)
MLME-MONITOR-PM-MODE.request	Request to enable or disable the monitoring of the power save mode of another DEV in the piconet.	OperationType (ENABLE, DISABLE) TrgtID
MLME-MONITOR-PM-MODE.confirm	The result of the request to enable or disable the monitoring of the power save mode of another DEV in the piconet.	ResultCode (SUCCESS, FAILURE) ReasonCode OperationType (ENABLE, DISABLE) TrgtID PMMode (of TrgtID)
MLME-MONITOR-PM-MODE.indication	Report a change in the power save mode of a DEV in the piconet that is currently being monitored.	TrgtID PMMode (of TrgtID)

5. MLMEs Removed or Renamed

This section lists the MLME primitives that are no longer required due to the fact that DME functionality is contained in the MLME entity.

5.1 MLME-START-DEPENDENT

If the MLME receives a request to start a piconet an attempt to start a dependent piconet will automatically be started if there are no open channels for a new piconet.

5.2 MLME-SYNCH

If the MLME receives a request to associate with a piconet, the MLME will automatically synch with the target piconet before attempting an association.

5.3 MLME-ATP-EXPIRED

The MLME will maintain an ATP timer required by the standard. If the ATP timer expires, the MLME will notify the FCSL with a MLME-DISASSOCIATE.indication. The ReasonCode will indicate that the reason for the disassociation was that the ATP timer expired.

5.4 MLME-DEV-ASSOCIATION-INFO (replaced with MLME-DEV-INFO)

The new MLME-DEV-INFO.confirm primitive will be used to report info requested by the FCSL about one or all DEVs in the piconet. The new MLME-DEV-INFO.indication primitive will report unsolicited information about one or all DEVs in the piconet to the FCSL.

5.5 MLME-REQUEST-KEY

Key origination is done in the MAC/MLME.

5.6 MLME-DISTRIBUTE-KEY

Key origination is done in the MAC/MLME.

5.7 MLME-PNC-HANDOVER

Handover of PNC operations will be initiated by the MLME itself.

5.8 MLME-PNC-INFO

The new MLME-DEV-INFO.request primitive is now used to request information about one or all DEVs in the piconet.

5.9 MLME-PROBE

Probe commands are issued by the MLME as needed.

5.10 MLME-ANNOUNCE

Announce commands are issued by the MLME as needed.

5.11 MLME-MULTICAST-RX-SETUP

The new primitives MLME-MULTICAST-INFORMATION and MLME-MULTICAST-CONFIGURATION are now used to inquiry about and configure multicast groups respectively.

5.12 MLME-CHANNEL-STATUS

The FCSL needs to know the overall quality of a stream due to many factors and not just the current status of the channel. The new primitive MLME-STREAM-QOS-STATUS replaces this primitive. The MLME may still issue Channel Status commands.

5.13 MLME-REMOTE-SCAN

The MAC/ MLME independently issues a Remote Scan Request command to other devices in the piconet as needed for interference mitigation.

5.14 MLME-TX-POWER-CHANGE

The MLME independently issues a TX Power Change Request command to other devices it is communicating with to increase QOS.

5.15 MLME-PM-MODE-ACTIVE

Replaced be MLME-PM-MODE-CHANGE.indication.

6. Proposed MAC SAP Primitives

The table in this section proposes MAC primitives, their purpose. This interface would be the SAP for a FCSL using the 802.15.3 MAC.

Note that the MAC SAP as specified does not inherently support multiple FCSLs at one time. It is assumed that an additional coordination and multiplexing layer of some sort will be required above the MAC SAP (and MLME SAP) to support multiple FCSLs at one time.

The MAC SAP presented below would be identified in the standard as the minimal required interface to support higher layers.

MAC Primitive	Purpose	New Parameters (Values)
MAC-ASYNC-DATA.request	Request the transfer asynchronous data to another DEV.	RequestID (to support concurrent requests) TrgtID UserPriority ACKPolicy TransmissionTimeout NumRetires (allows per frame control) SECMode (TRUE, FALSE) ConfirmRequested (TRUE, FALSE) Length Data
MAC-ASYNC-DATA.confirm	Result of request to transfer asynchronous data to another DEV (only generated if confirmation was requested).	ResultCode (SUCCESS, FAILURE) ReasonCode RequestID
MAC-ASYNC-DATA.indication	Report the reception of asynchronous data from another DEV.	OrigID SECMode (TRUE, FALSE) Length Data
MAC-ISOCH-DATA.request	Request the transfer isochronous data associated with a specific stream to another DEV.	RequestID (to support concurrent requests) StreamIndex TrgtID ACKPolicy TransmissionTimeout NumRetries (allows per frame control) SECMode (TRUE, FALSE) ConfirmRequested (TRUE, FALSE) Length Data
MAC-ISOCH-DATA.confirm	Result of request to transfer isochronous data associated with a specific stream to another DEV (only generated if confirmation was requested).	ResultCode (SUCCESS, FAILURE) ReasonCode RequestID SteamIndex

MAC Primitive	Purpose	New Parameters (Values)
MAC-ISOCH-DATA.indication	Report the reception of isochronous data associated with a specific stream data from another DEV.	StreamIndex OrigID SECMode (TRUE, FALSE) Length Data

7. Modified MSCs

This section provides suggested new MSCs for those MSCs that currently exist in the standard. The suggested MSCs assume the MAC/MLME SAPs defined in this document.

Current

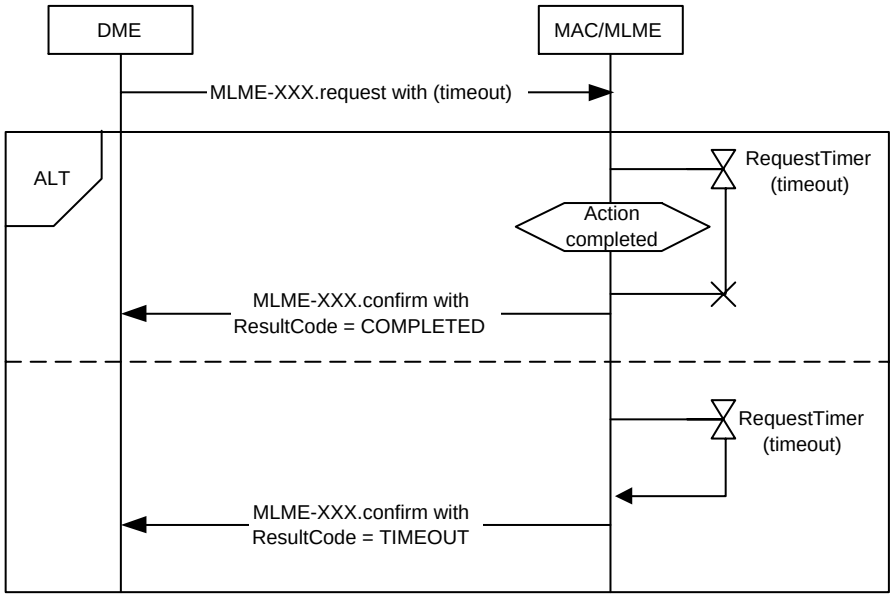


Figure 91 - MSC showing examples of primitive timers

Suggested

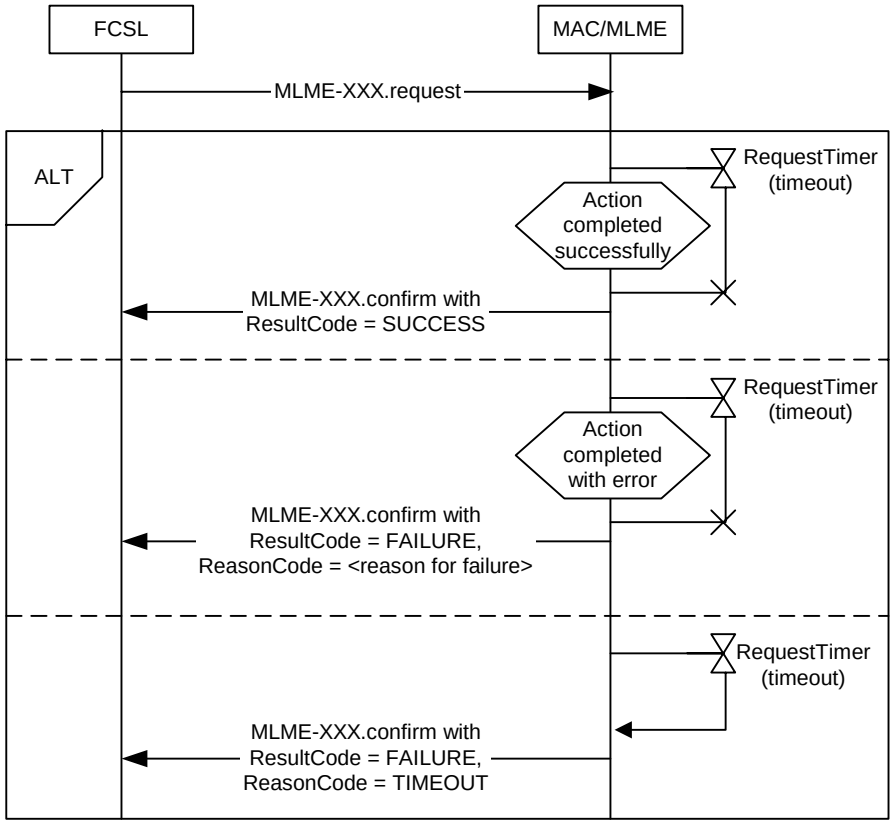


Figure 91 - MSC showing the possible results of a primitive request

Current

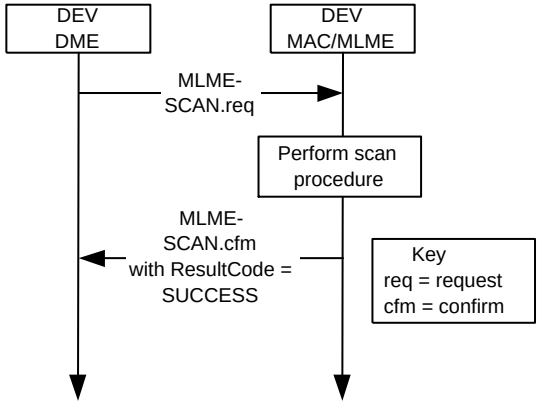


Figure 92 -MSC for scan operation

Suggested

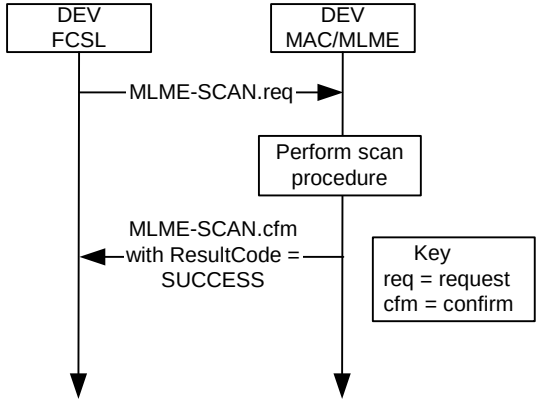


Figure 92 -MSC for scan operation

Current

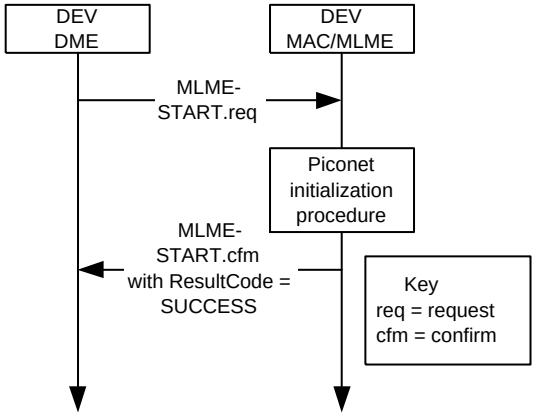


Figure 93 - MSC for starting a piconet

Suggested

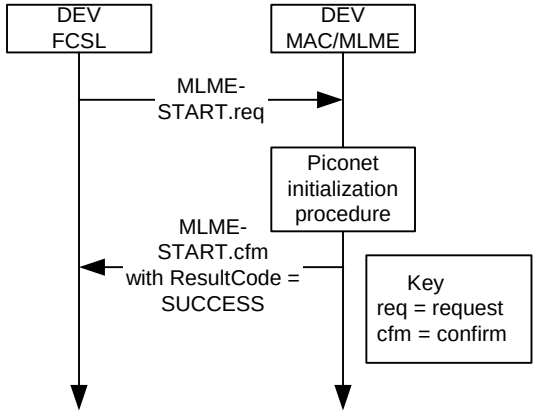


Figure 93 - MSC for starting a piconet

Current

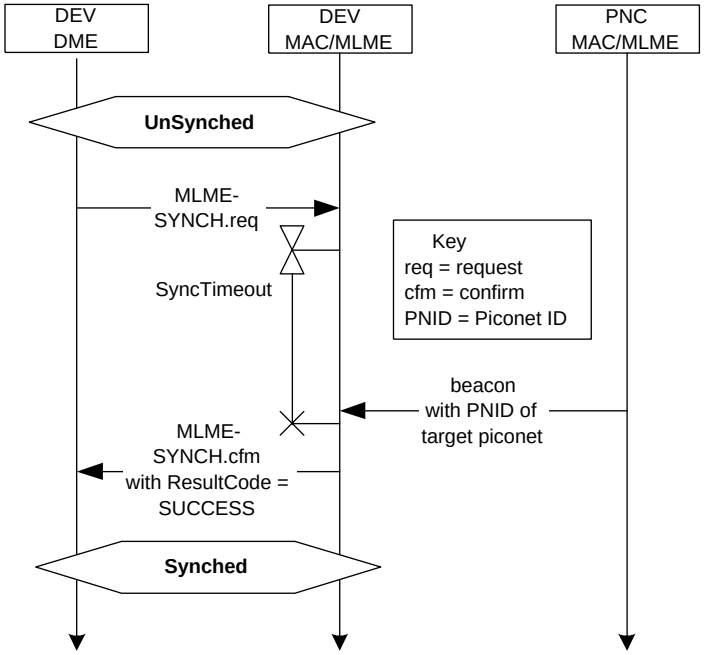


Figure 125 - MSC of a DEV synchronizing with a PNC

Suggested

REMOVED

Figure 125 - MSC of a DEV synchronizing with a PNC

- Synching now part of the association process.

Current

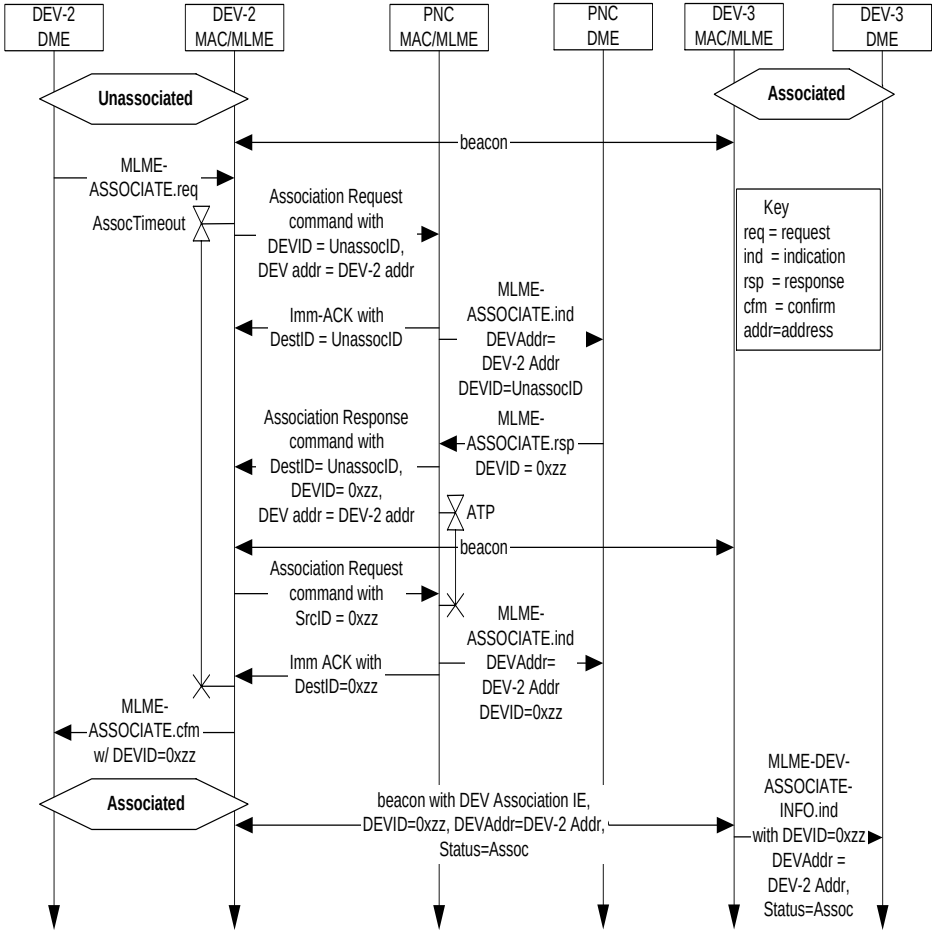


Figure 102 - MSC of DEV-2 associating

Suggested

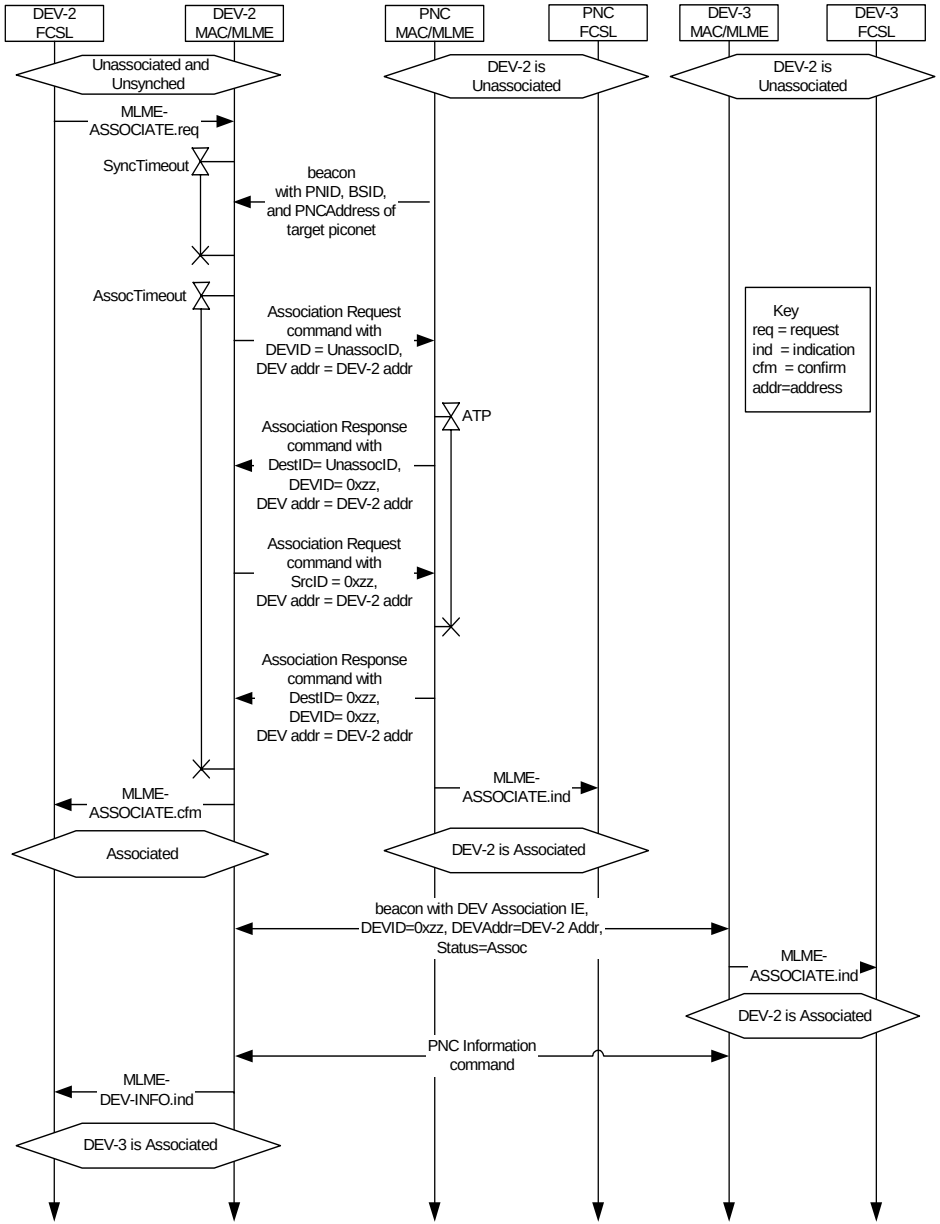


Figure 102 - MSC of DEV-2 associating

Current

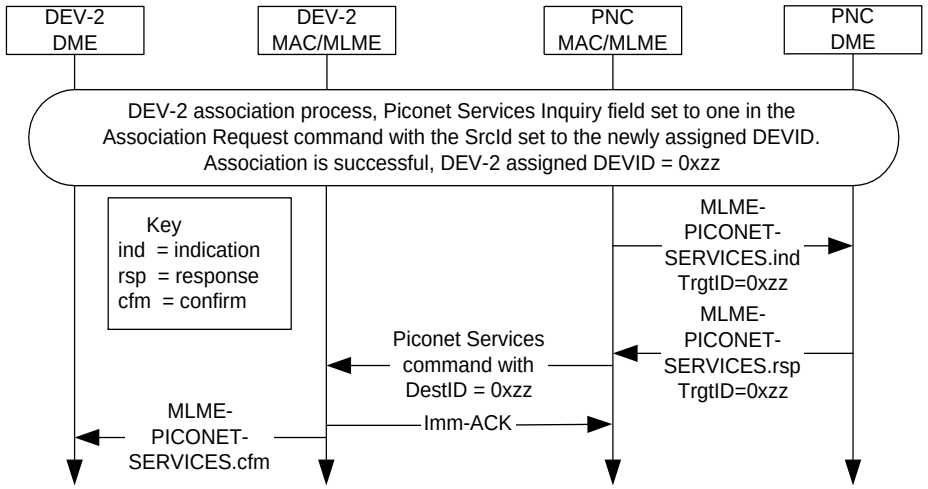


Figure 103 - PNC sending the Piconet Services command to a newly associated DEV in response to a request in the association process

Suggested

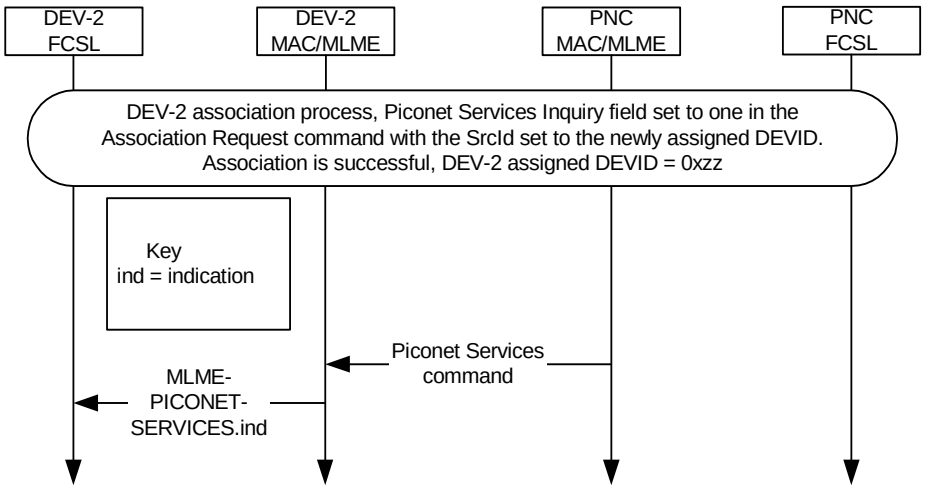


Figure 103 - PNC sending the Piconet Services command to a newly associated DEV in response to a request in the association process

Current

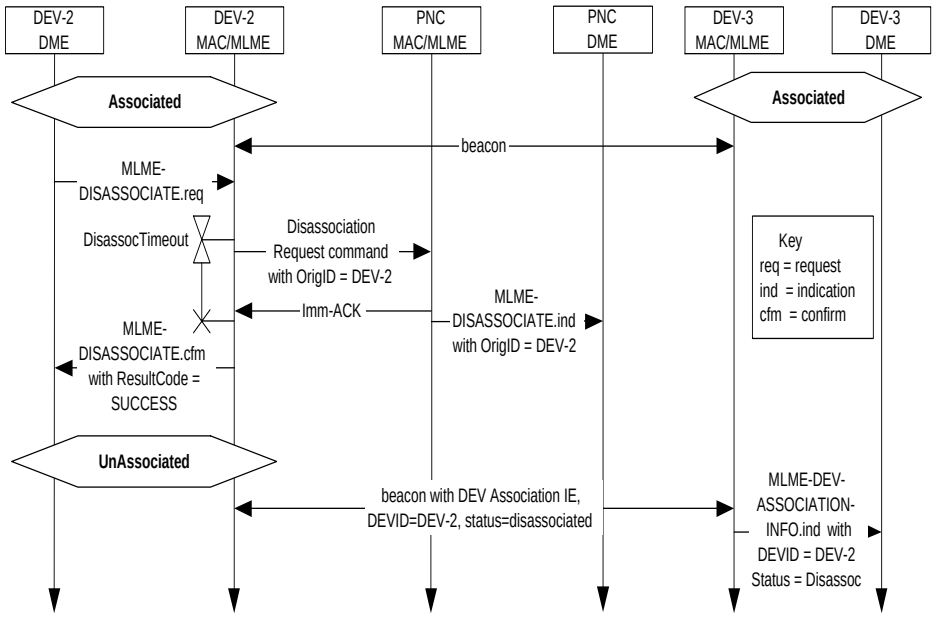


Figure 104 - DEV initiated disassociation MSC

Suggested

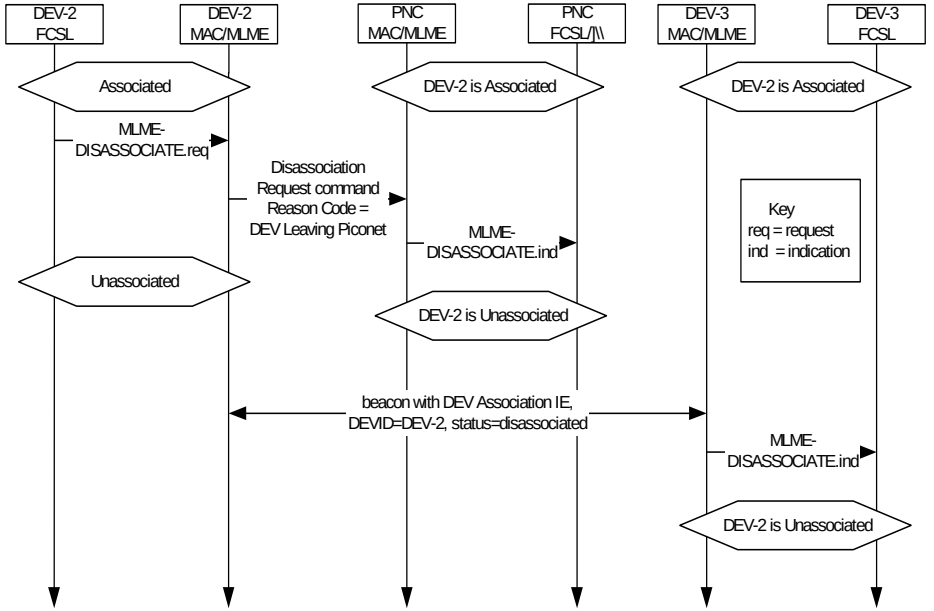


Figure 104 - DEV initiated disassociation MSC

Current

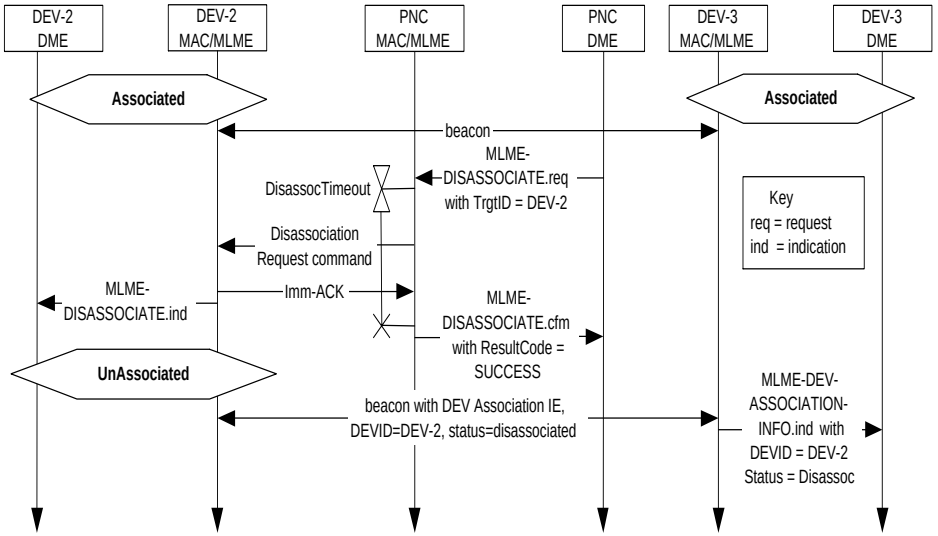


Figure 105 - PNC initiated disassociation MSC

Suggested

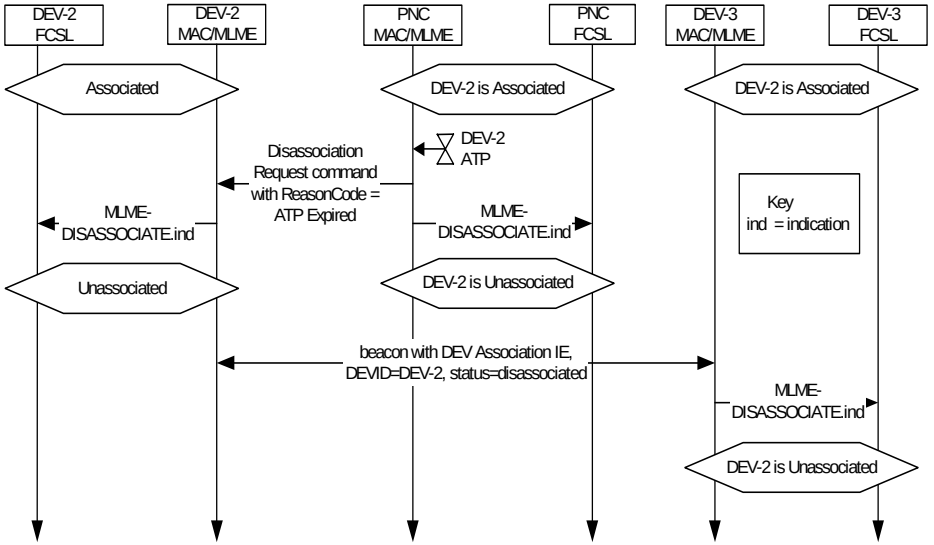


Figure 105 - PNC initiated disassociation MSC

Current

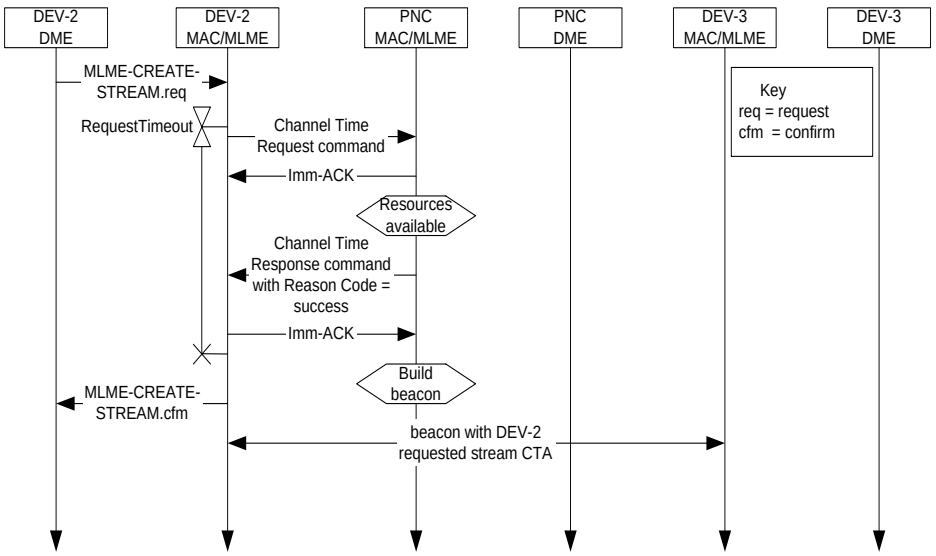


Figure 114 - MSC for creating a DEV-2 to DEV-3 stream

Suggested

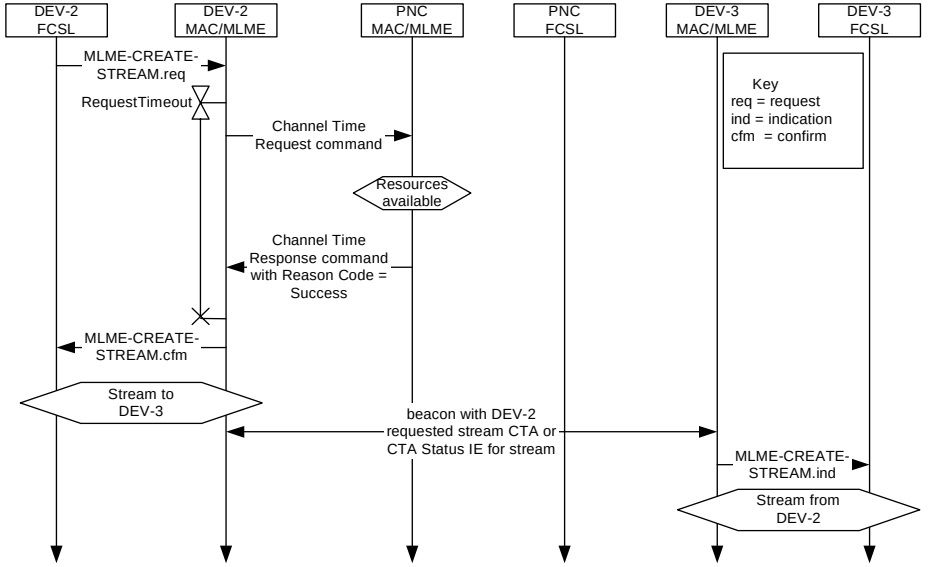


Figure 114 - MSC for creating a DEV-2 to DEV-3 stream

Current

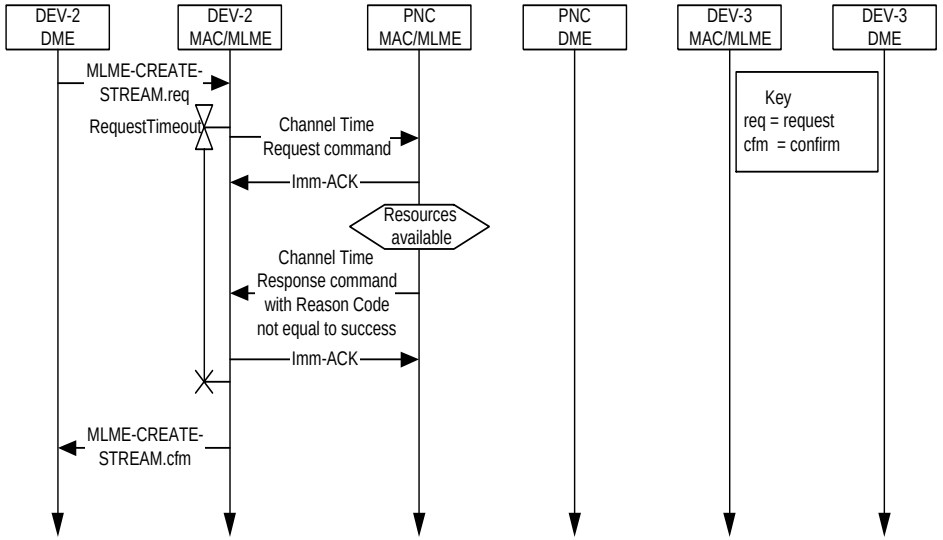


Figure 115 - MSC for a denied DEV-2 to DEV-3 stream

Suggested

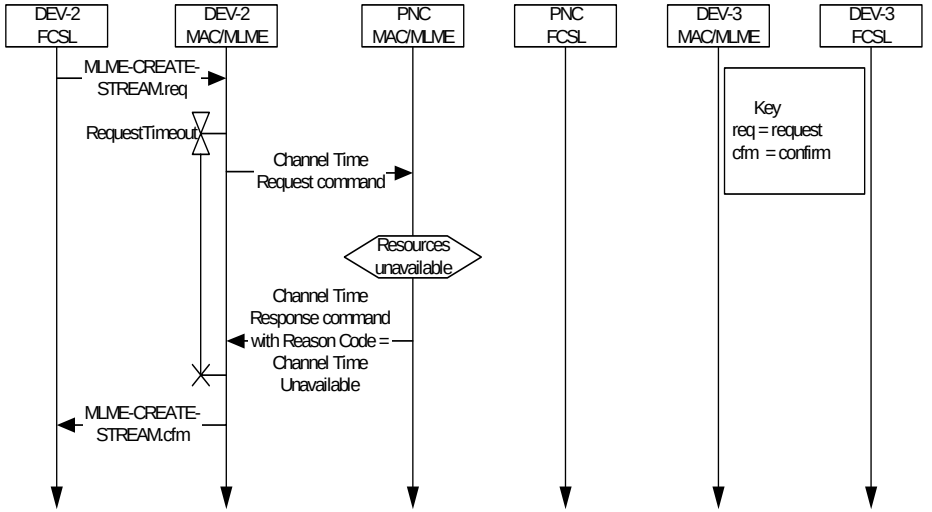


Figure 115 - MSC for a denied DEV-2 to DEV-3 stream

Current

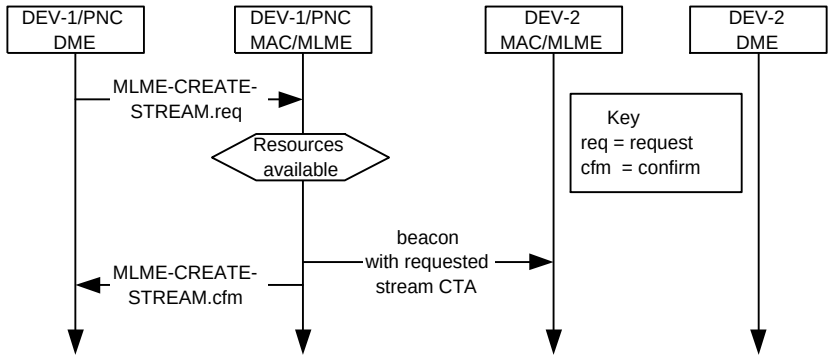


Figure 116 - MSC for creating a DEV-1/PNC to DEV-2 stream

Suggested

REMOVED

- Suggest removing this MSC and add text to standard that describes that the DEV component of the PNC does not send commands over the air when it wishes to communicate with the PME.

Current

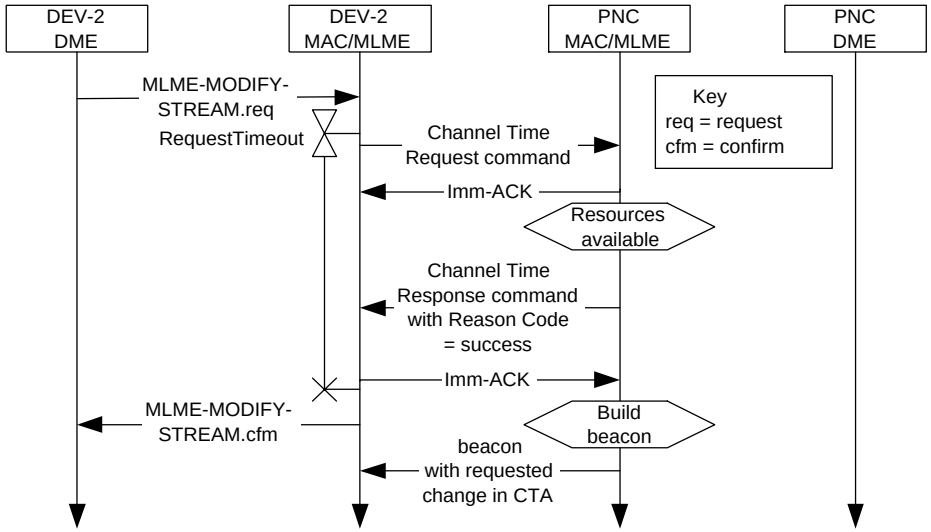


Figure 117 - MSC for modifying a stream

Suggested

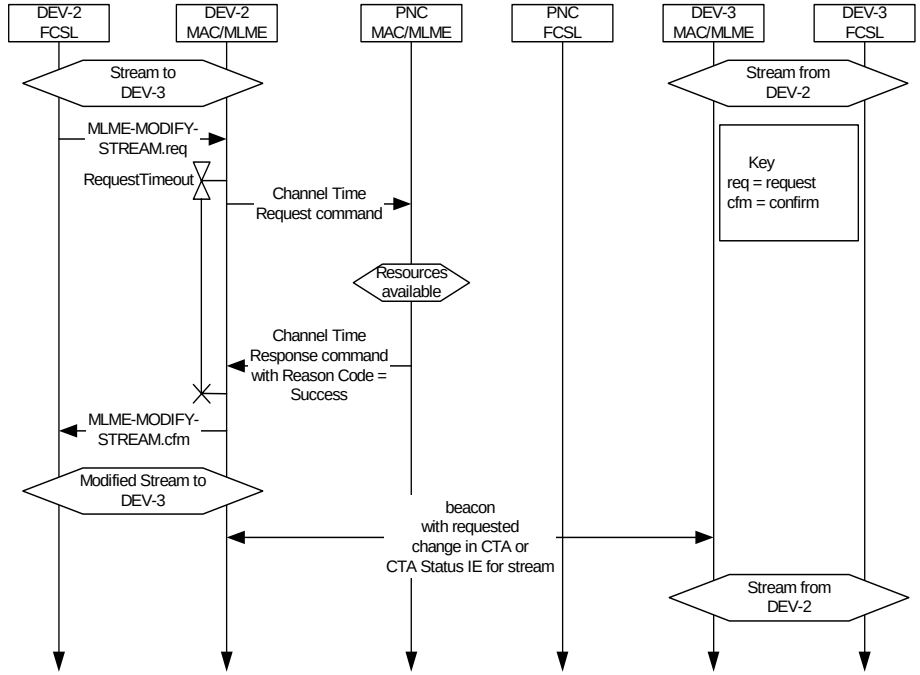


Figure 117 - MSC for modifying a stream

Current

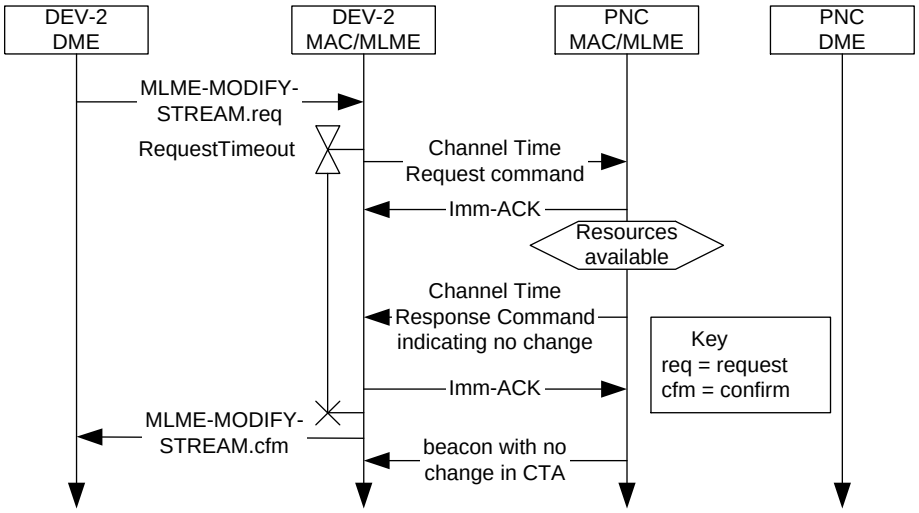


Figure 118 - MSC for a denied stream modification

Suggested

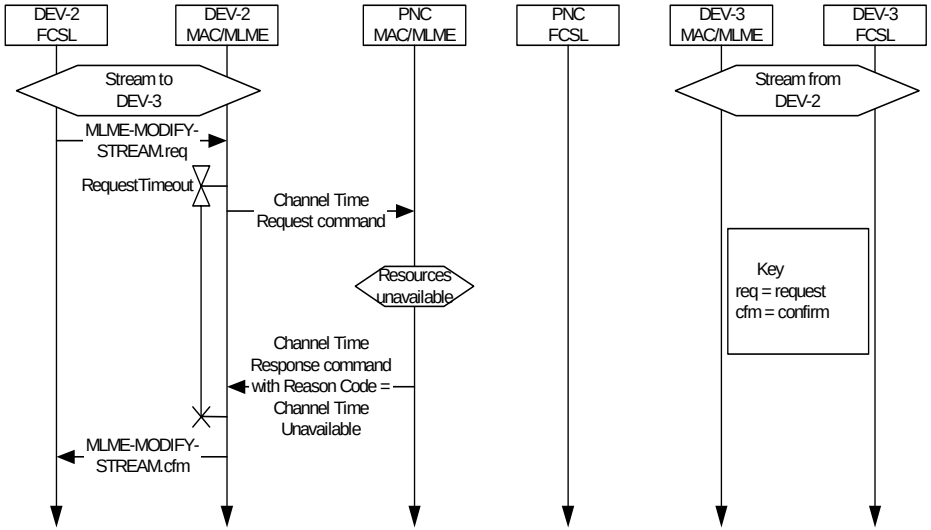


Figure 118 - MSC for a denied stream modification

Current

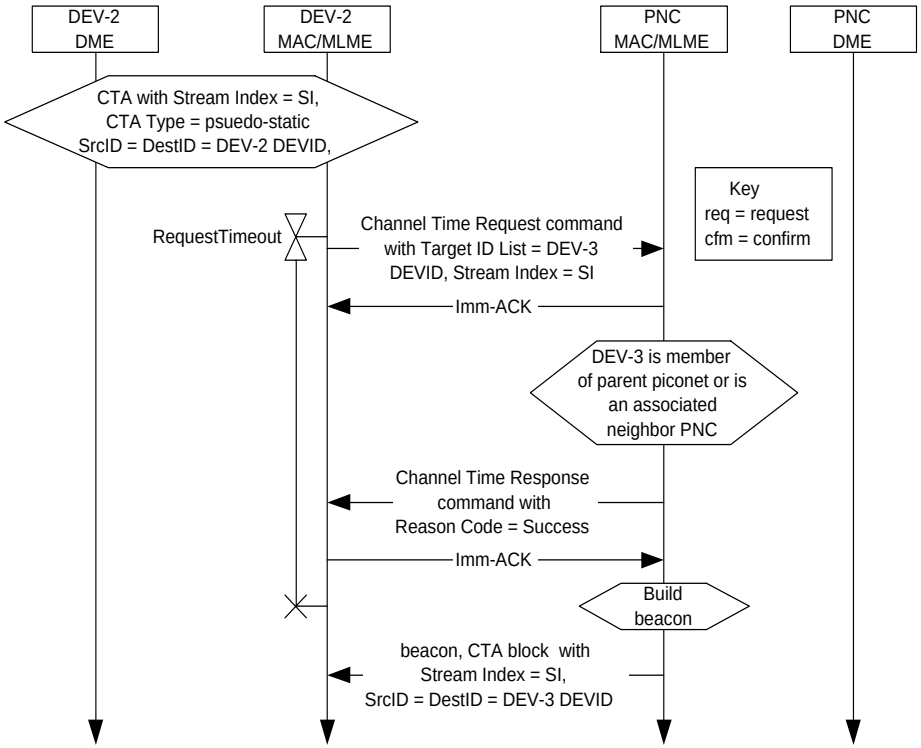


Figure 119 - MSC for the handing over control of a private, pseudo-static CTA

Suggested

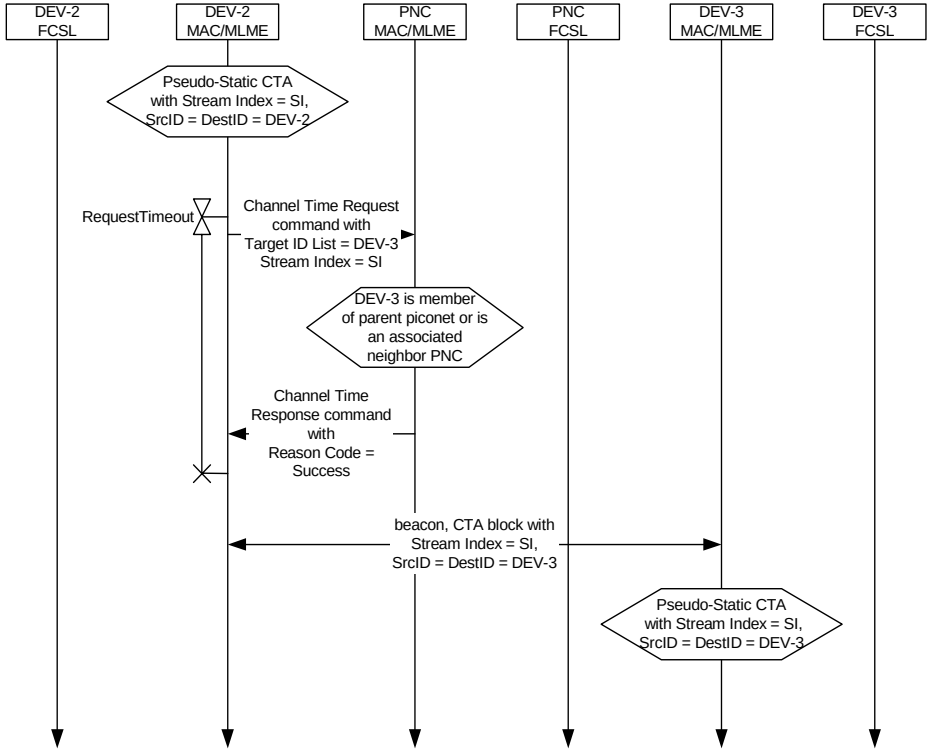


Figure 119 - MSC for the handing over control of a private, pseudo-static CTA

Current

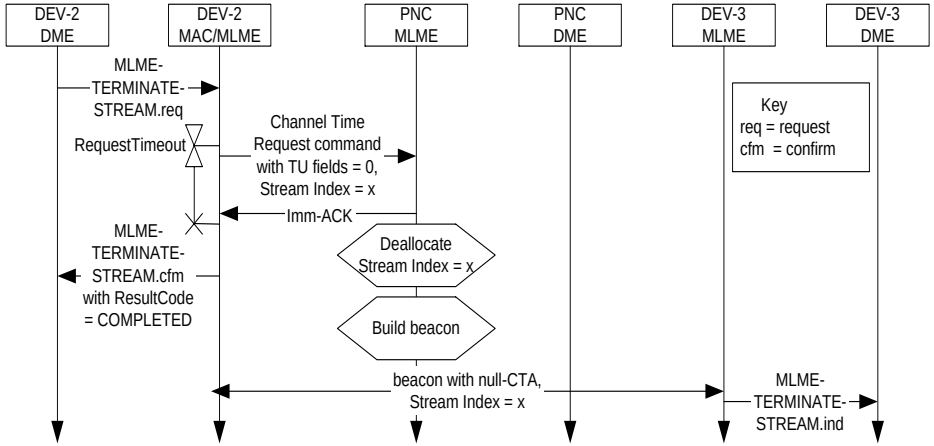


Figure 120 - MSC of source DEV-2 requesting termination of its stream

Suggested

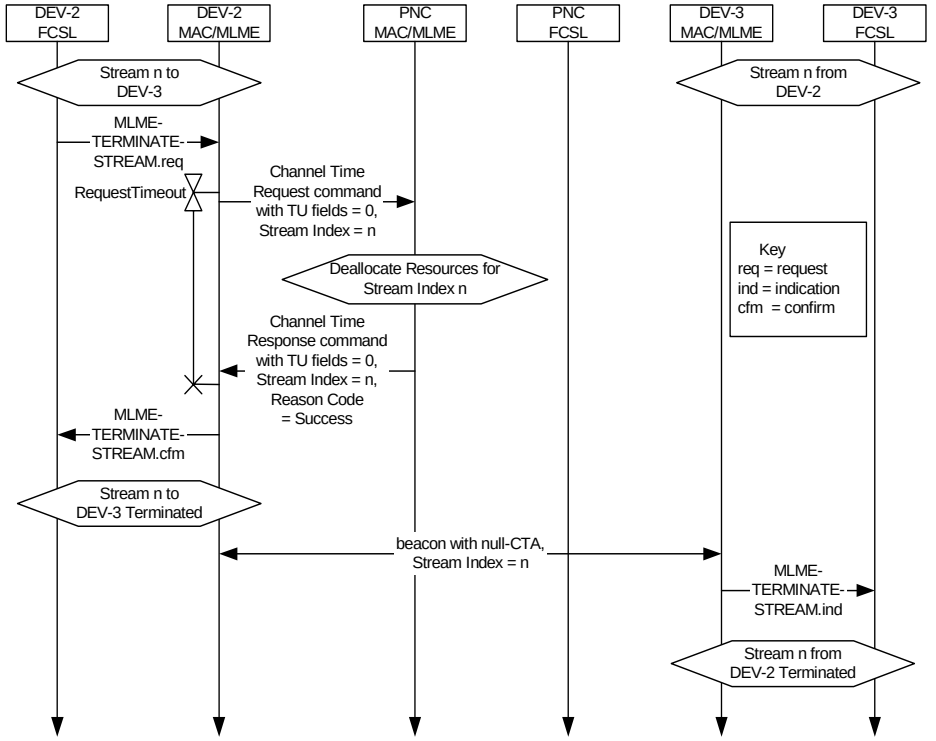


Figure 120 - MSC of source DEV-2 requesting termination of its stream

- Suggest defining NULL CTA such that a reason code for the stream termination can be provided to the Target DEV for the stream.

Current

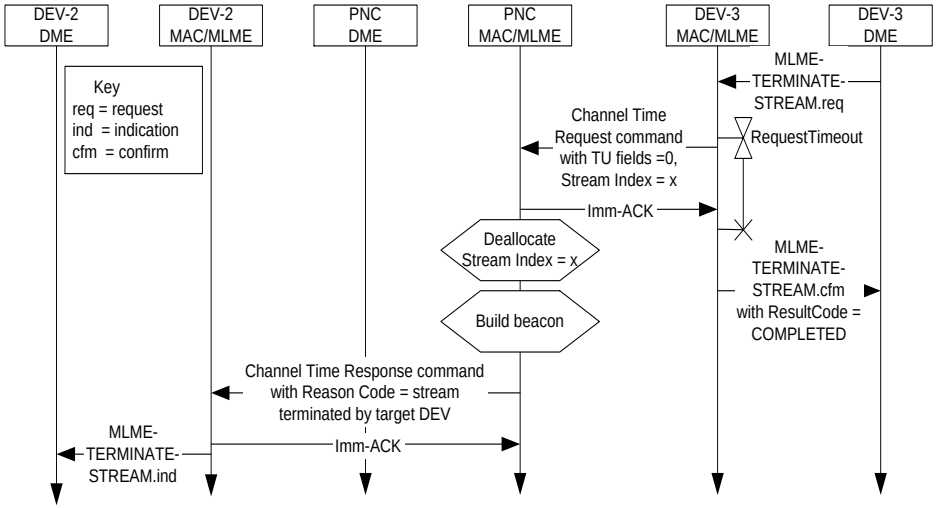


Figure 121 - MSC of target DEV-3 requesting termination of source DEV-2's stream

Suggested

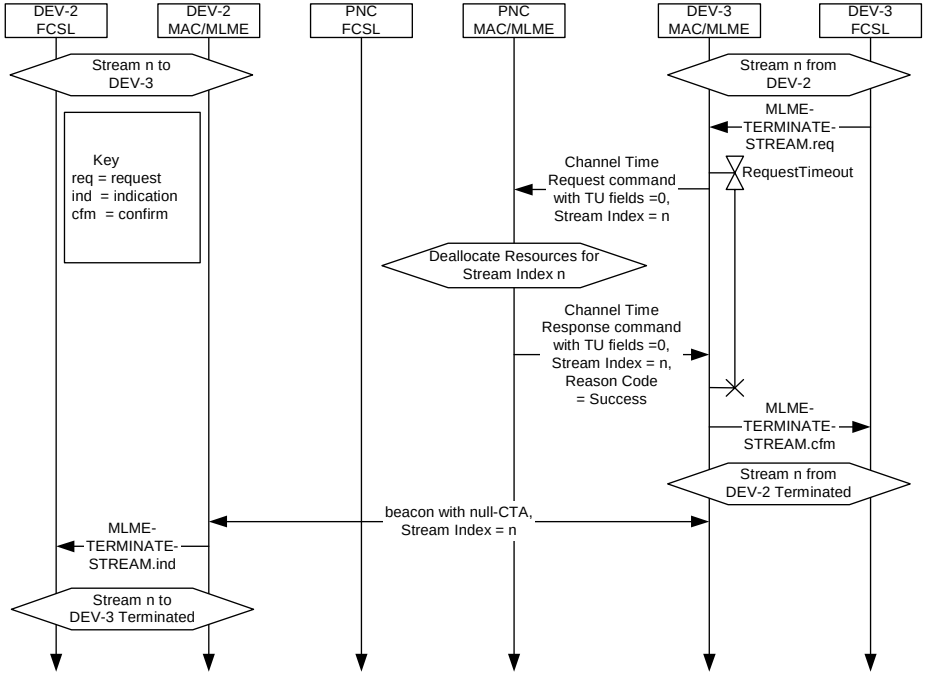


Figure 121 - MSC of target DEV-3 requesting termination of source DEV-2's stream

- Suggest defining NULL CTA such that a reason code for the stream termination can be provided to the Source DEV for the stream.

Current

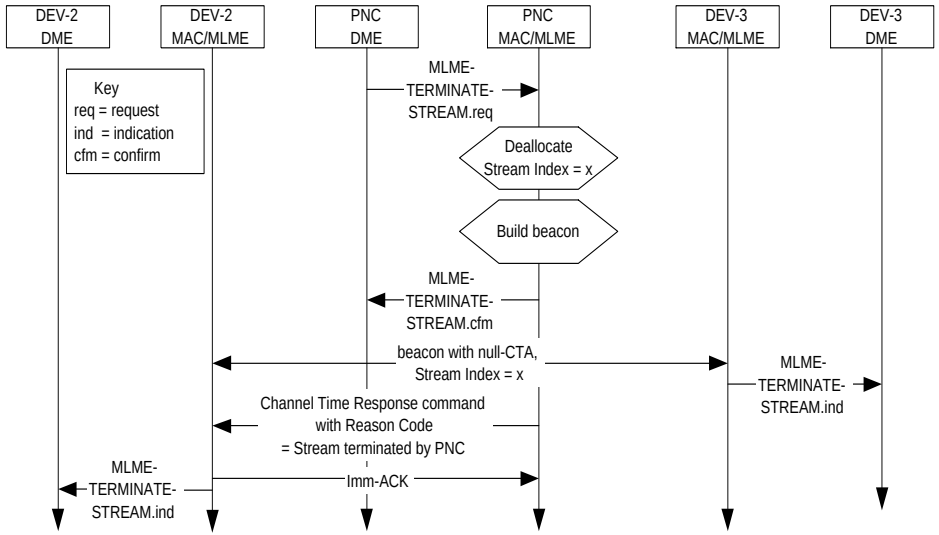


Figure 122 - MSC of PNC terminating a stream

Suggested

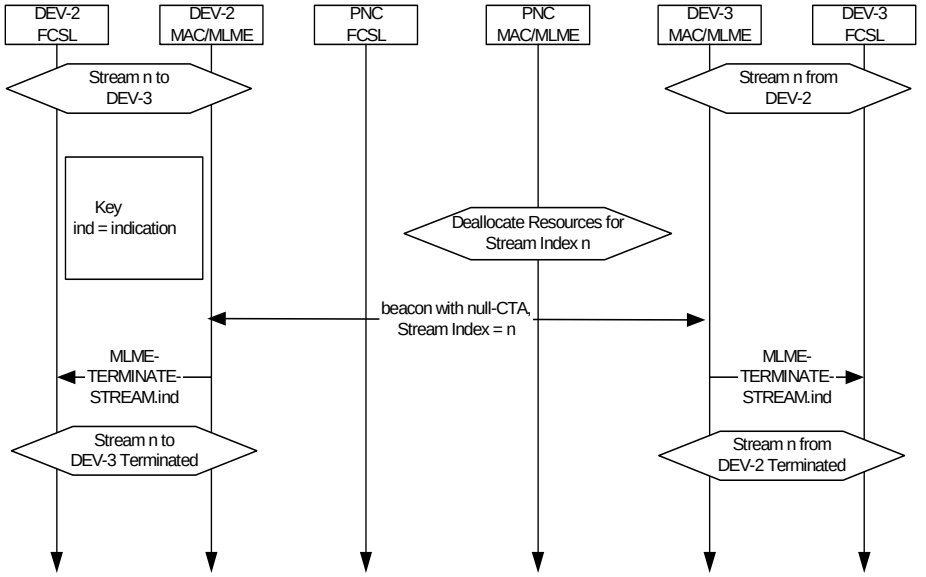


Figure 122 - MSC of PNC terminating a stream

- Suggest defining NULL CTA such that a reason code for the stream termination can be provided to both the Source and Target DEVs for the stream.

Current

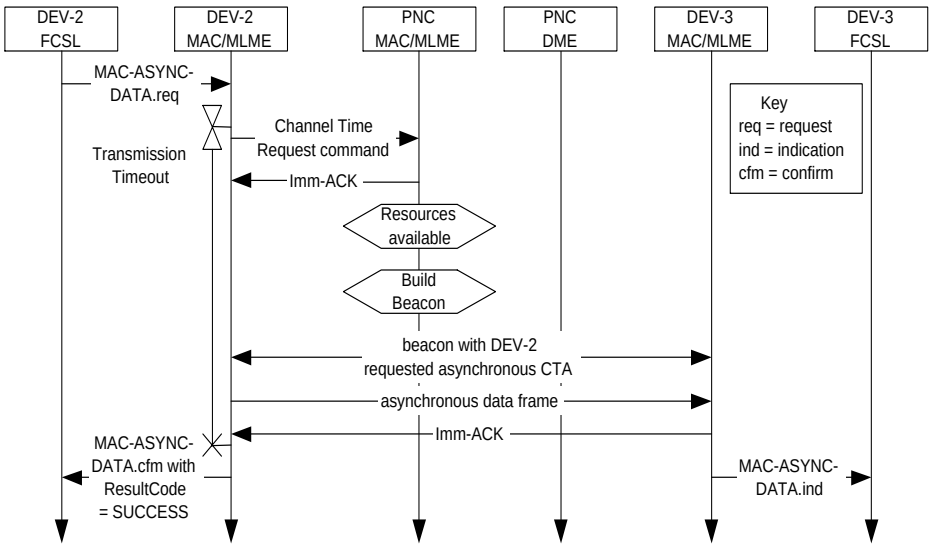


Figure 123 - MSC for reserving asynchronous data channel time

Suggested

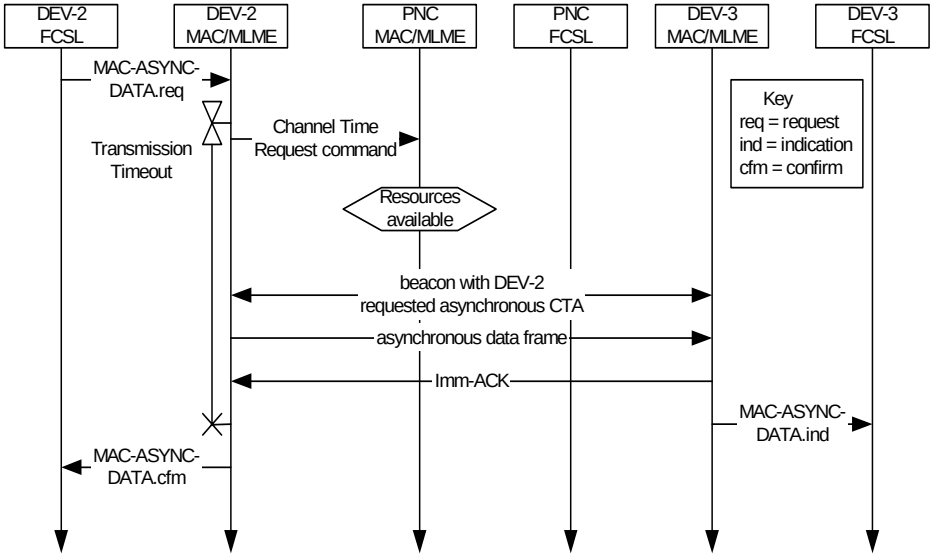


Figure 123 - MSC for reserving asynchronous data channel time

Current

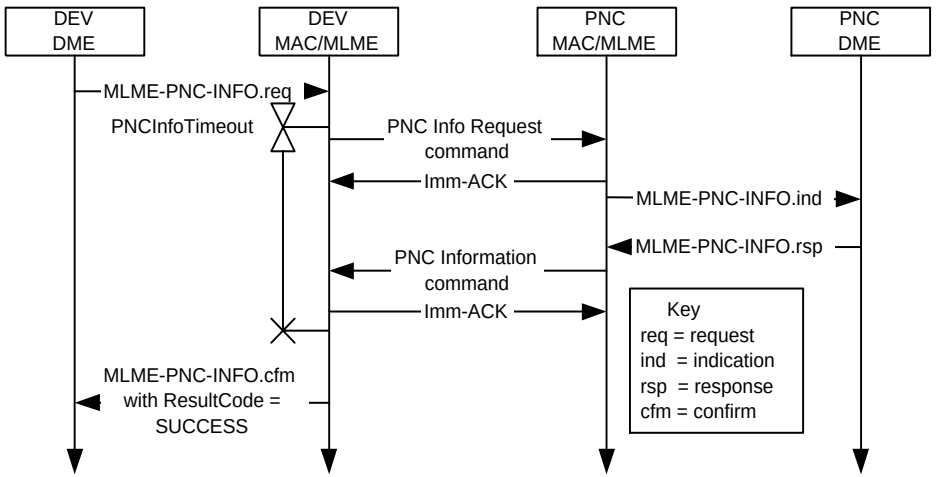


Figure 127 - MSC for acquiring information regarding a specific DEV or all of the DEVs from the PNC using the PNC Information Request and PNC Information commands

Suggested

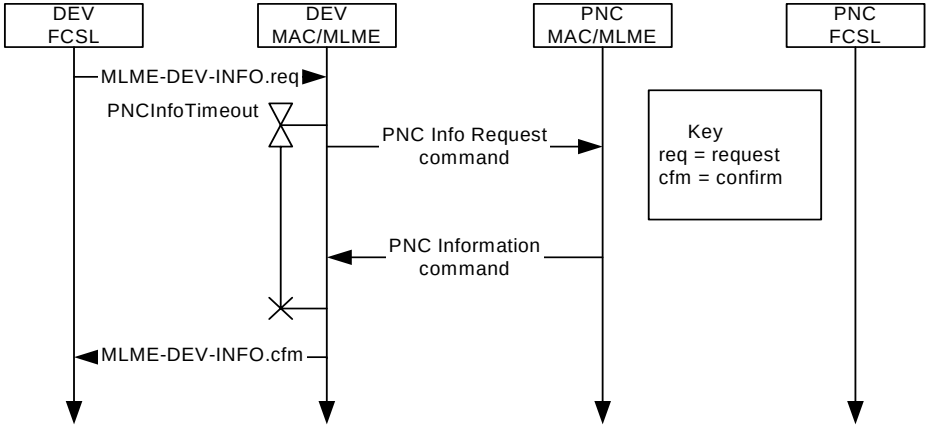


Figure 127 - MSC for acquiring information regarding a specific DEV or all of the DEVs from the PNC using the PNC Information Request and PNC Information commands

Current

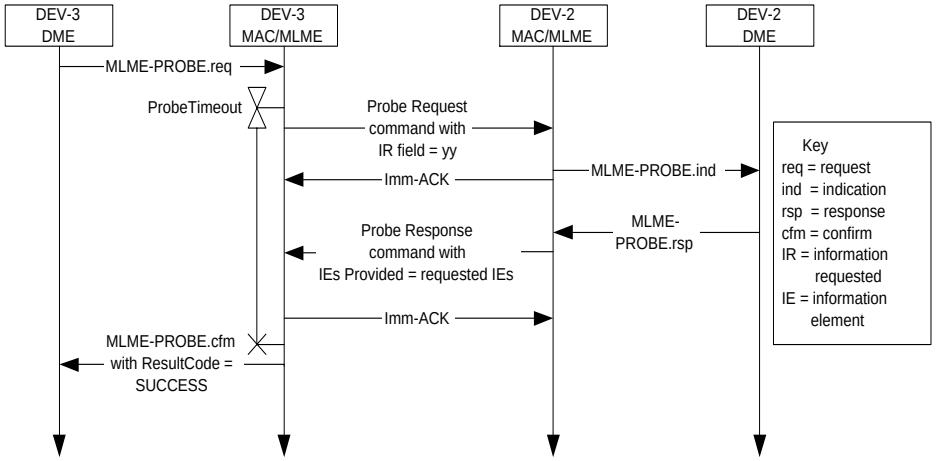


Figure 128 - MSC for acquiring DEV IEs using the Probe Request and Probe Response commands

Suggested

REMOVED

Figure 128 - MSC for acquiring DEV IEs using the Probe Request and Probe Response commands

Current

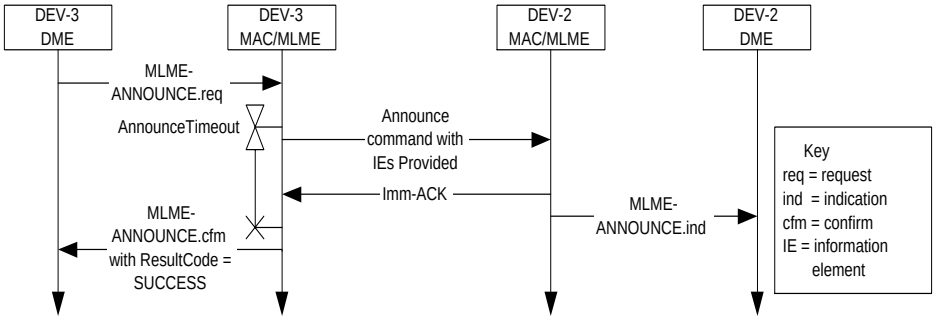


Figure 129 - MSC showing sending of information using the Announce command

Suggested

REMOVED

Figure 129 - MSC for sending unrequested DEV IEs using the Announce Request and Announce Response commands

Current

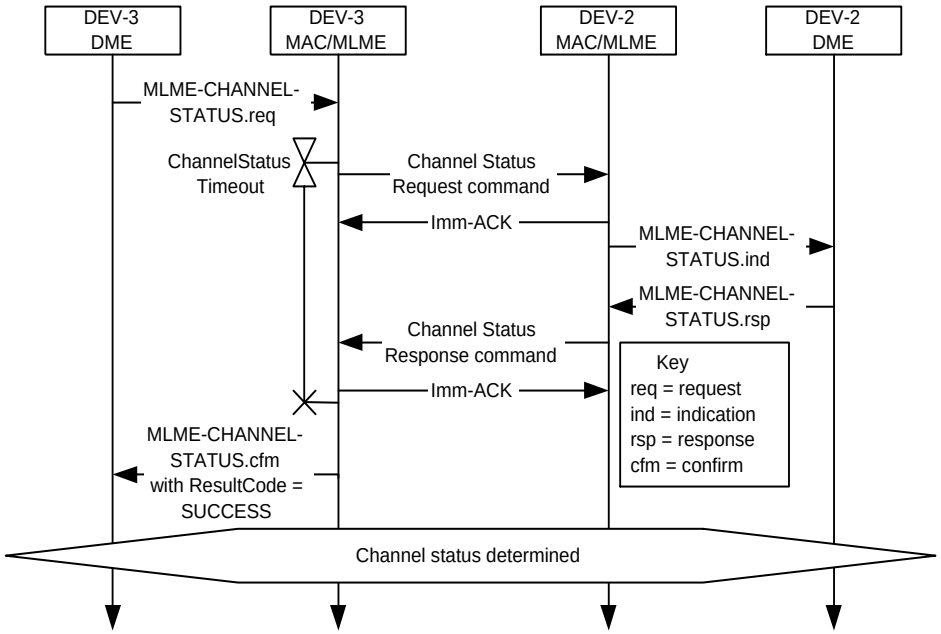


Figure 130 - MSC for determining the channel status between two DEVs using the Channel Status Request and Channel Status Response commands

Suggested

REMOVED

Figure 130 - MSC for determining the channel status between two DEVs using the Channel Status Request and Channel Status Response commands

Current

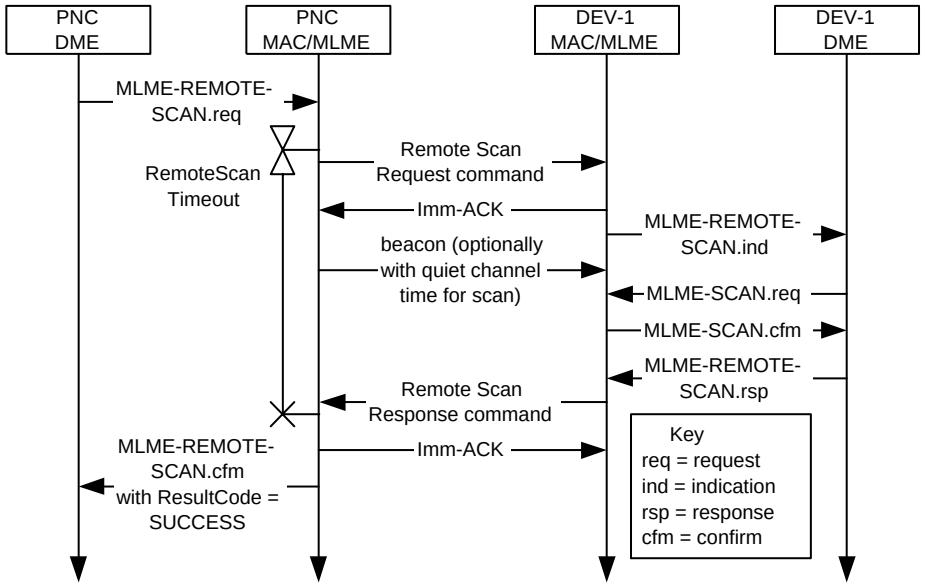


Figure 131 - Remote scan MSC

Suggested

REMOVED

Figure 131 - Remote scan MSC

Current

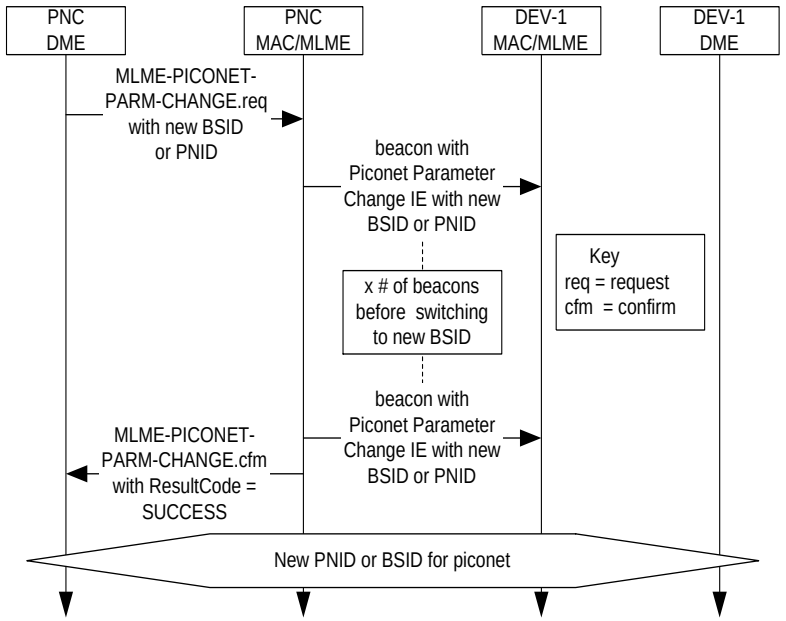


Figure 134 - MSC for changing either the PNID or BSID for a piconet

Suggested

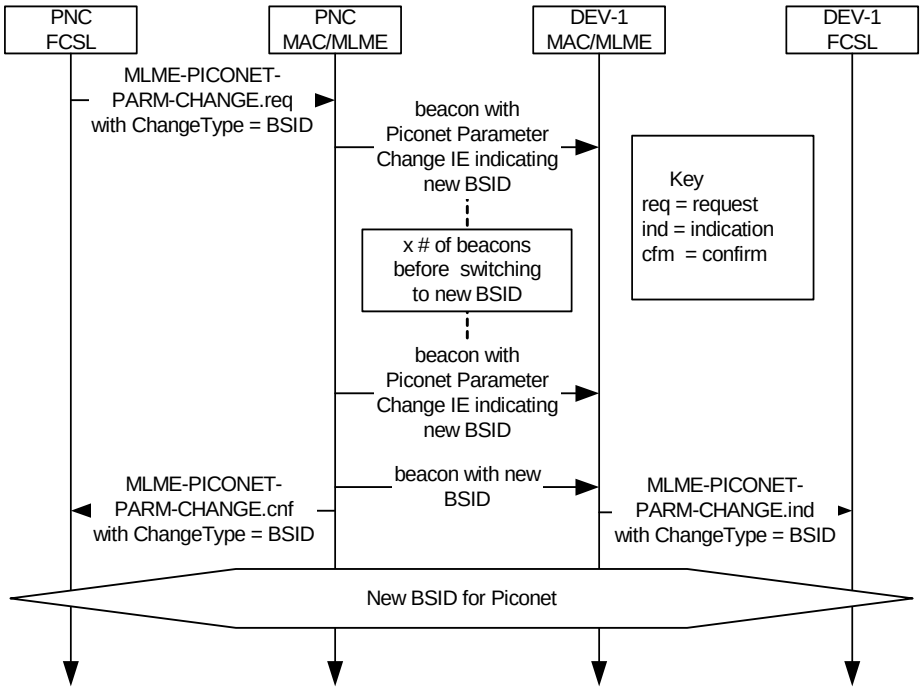


Figure 134 - MSC for changing the BSID for a piconet

Current

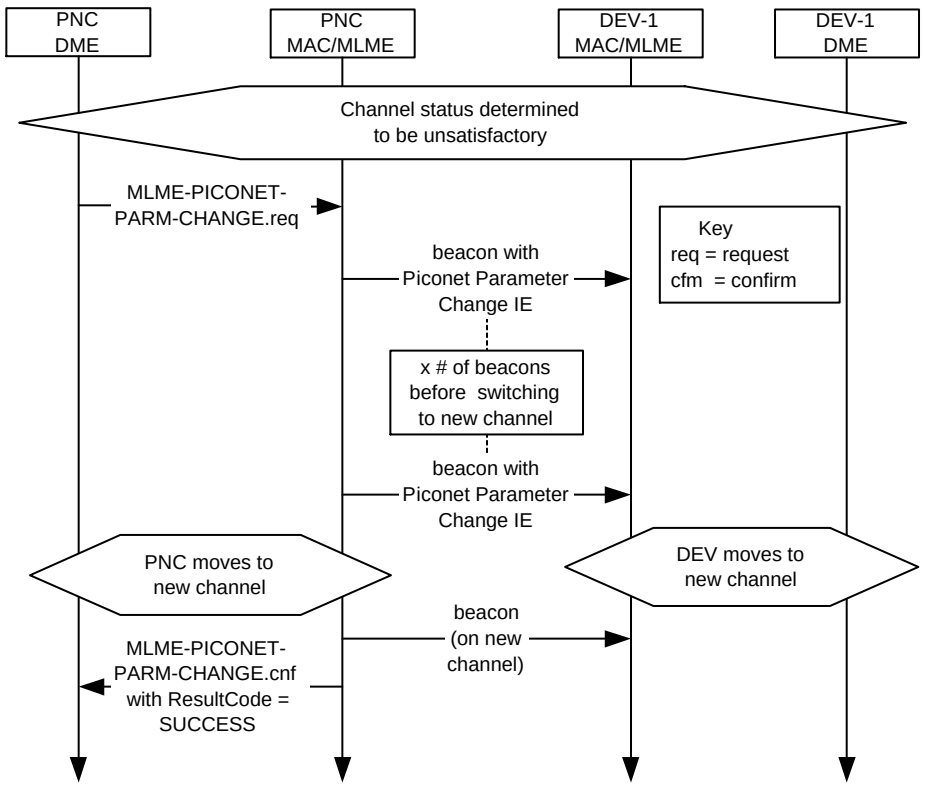


Figure 135 - MSC for changing piconet parameters

Suggested

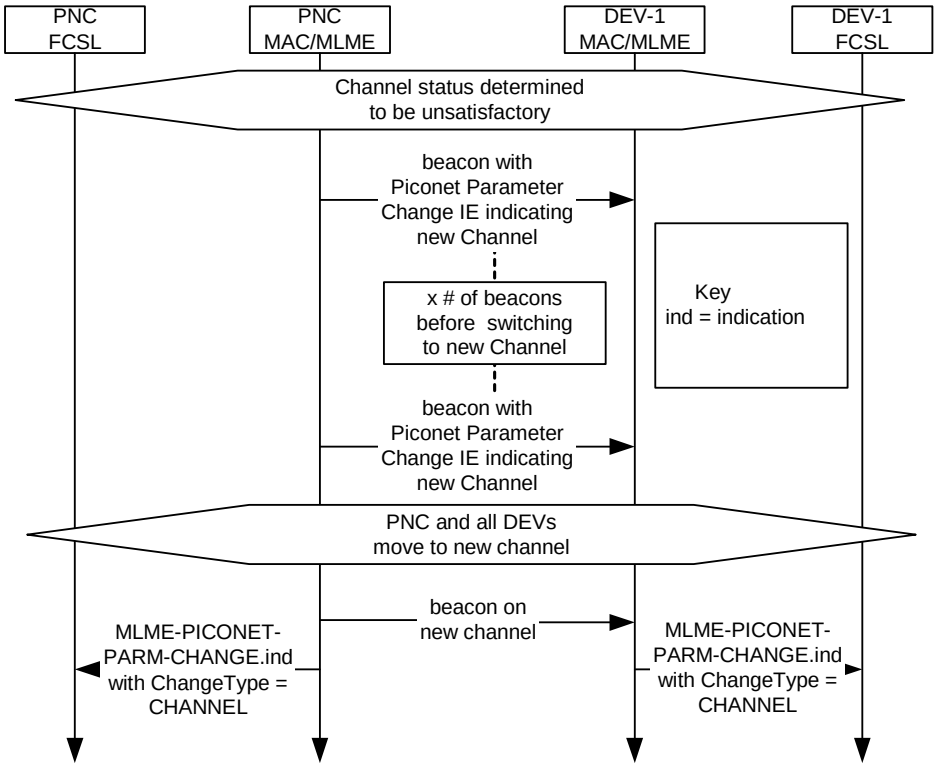


Figure 135 - MSC for changing the channel for a piconet

Current

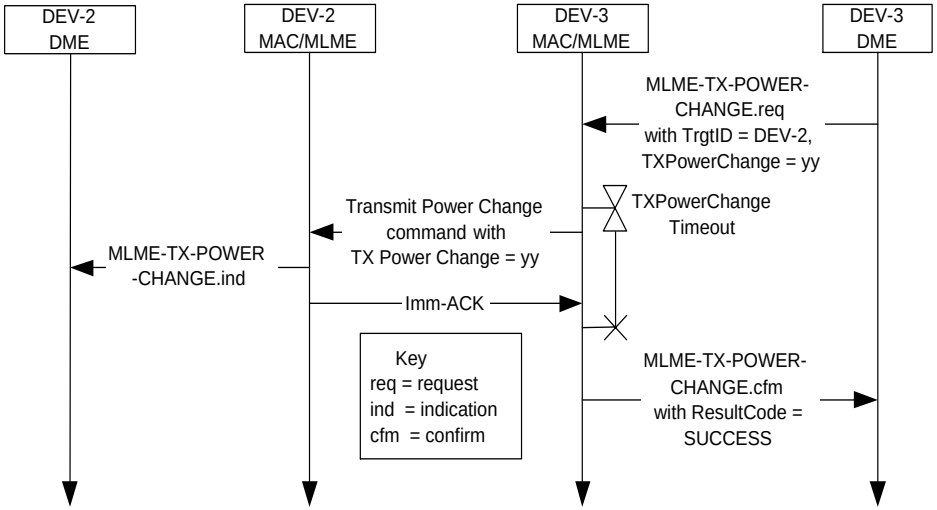


Figure 136 - Transmit power change MSC

Suggested

REMOVED

Figure 136 - Transmit power change MSC

Current

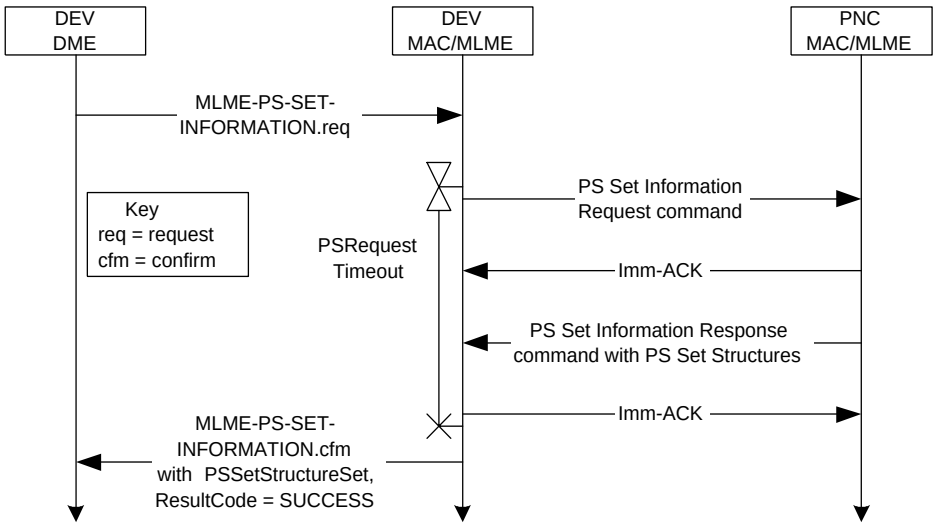


Figure 140 - MSC for PS set information exchange

Suggested

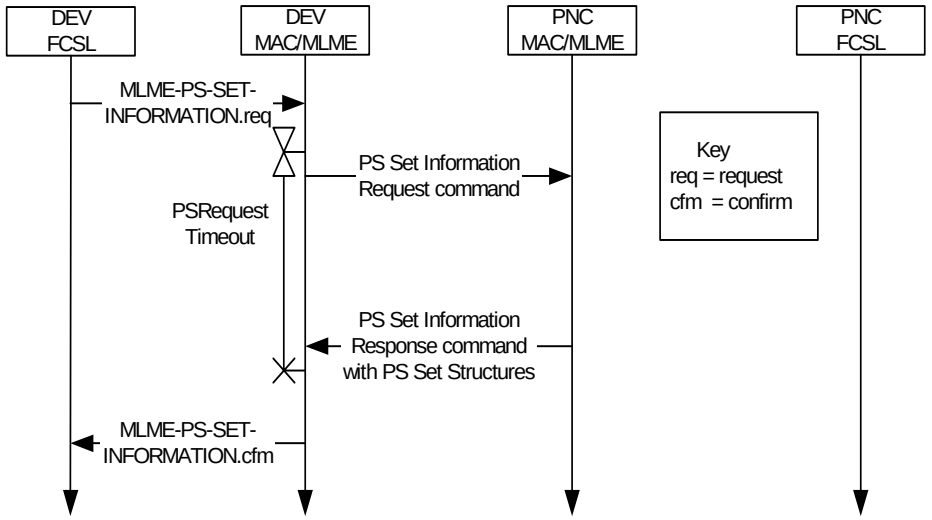


Figure 140 - MSC for PS set information exchange

Current

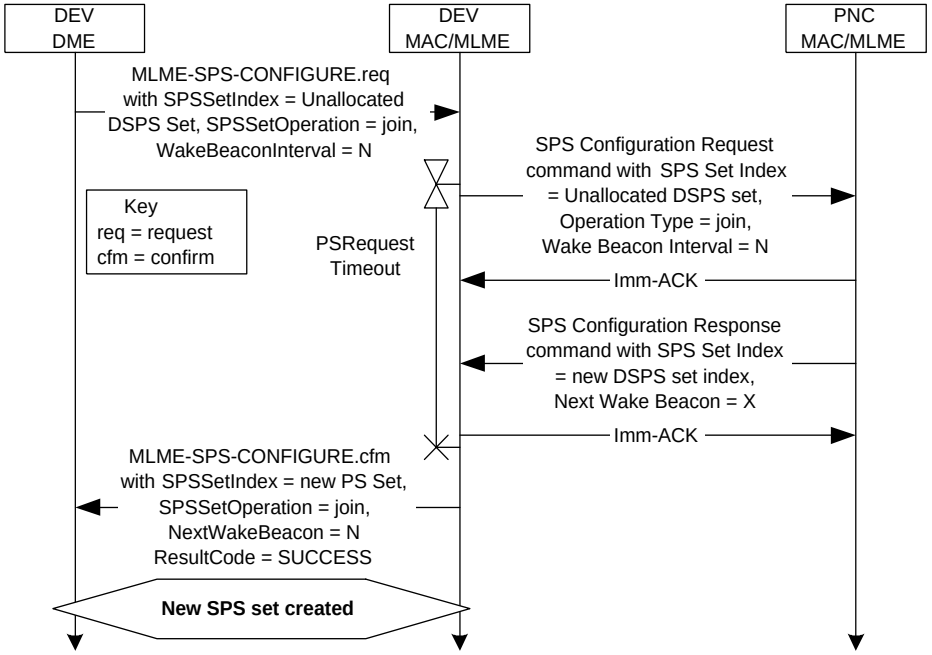


Figure 141 - MSC for DSPS set creation

Suggested

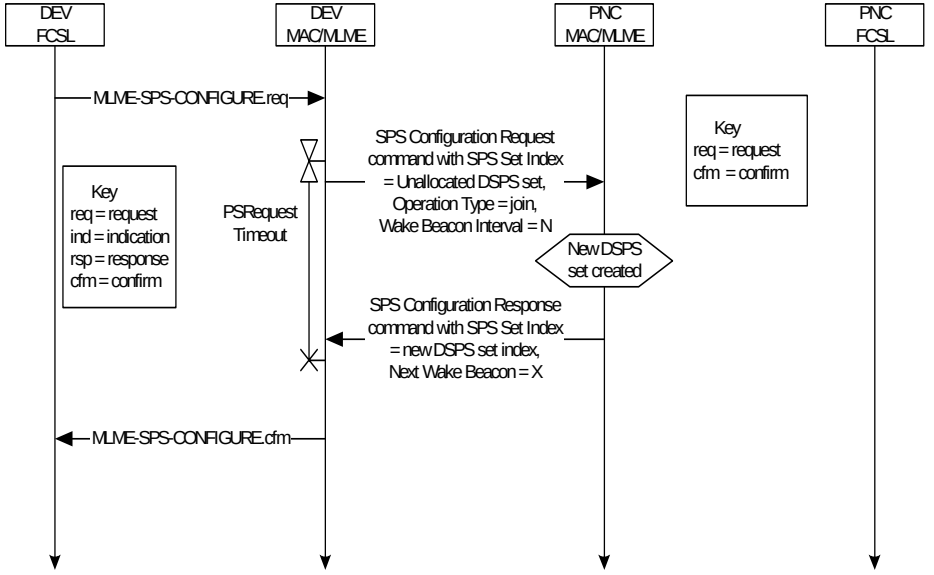


Figure 141 - MSC for DSPS set creation

Current

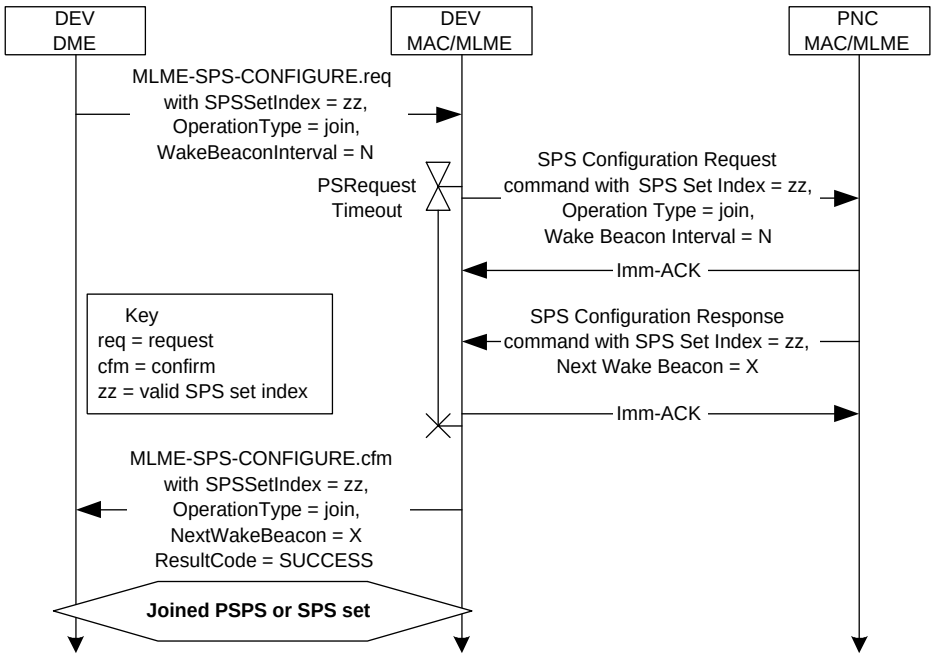


Figure 142 - MSC showing a DEV joining an existing SPS set

Suggested

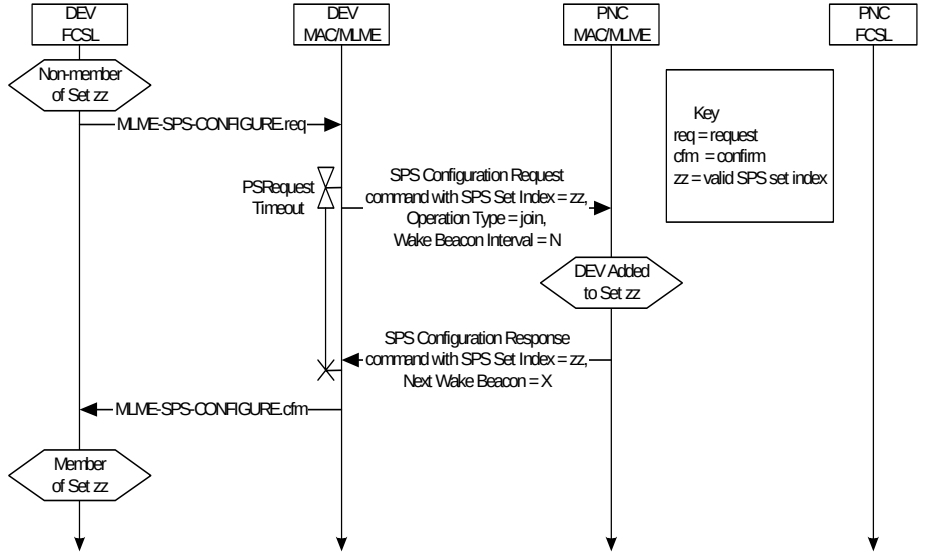


Figure 142 - MSC showing a DEV joining an existing SPS set

Current

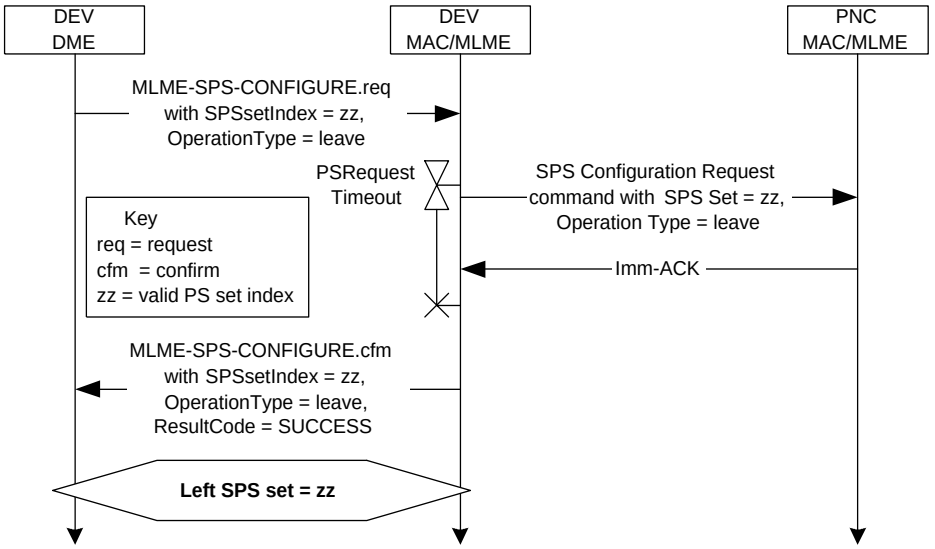


Figure 143 - MSC showing a DEV leaving an SPS set

Suggested

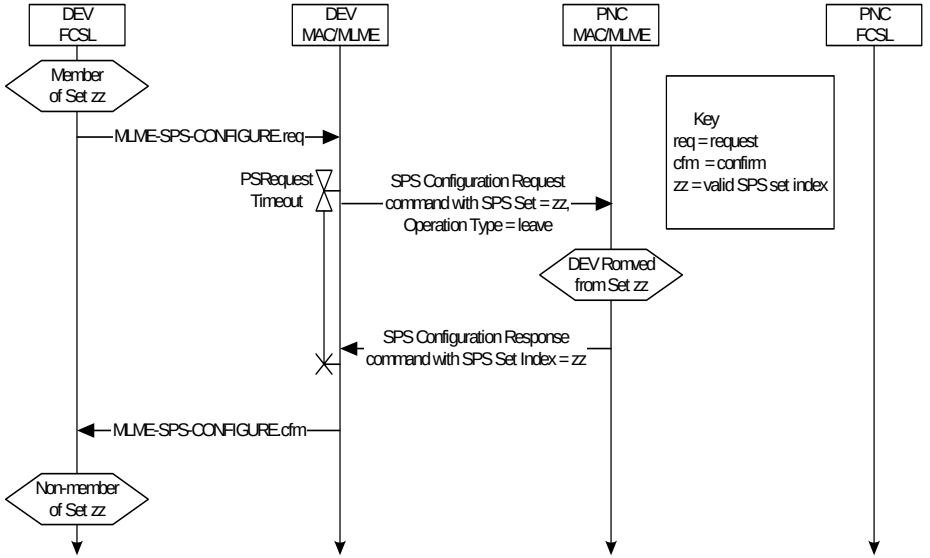


Figure 143 - MSC showing a DEV leaving an SPS set

Current

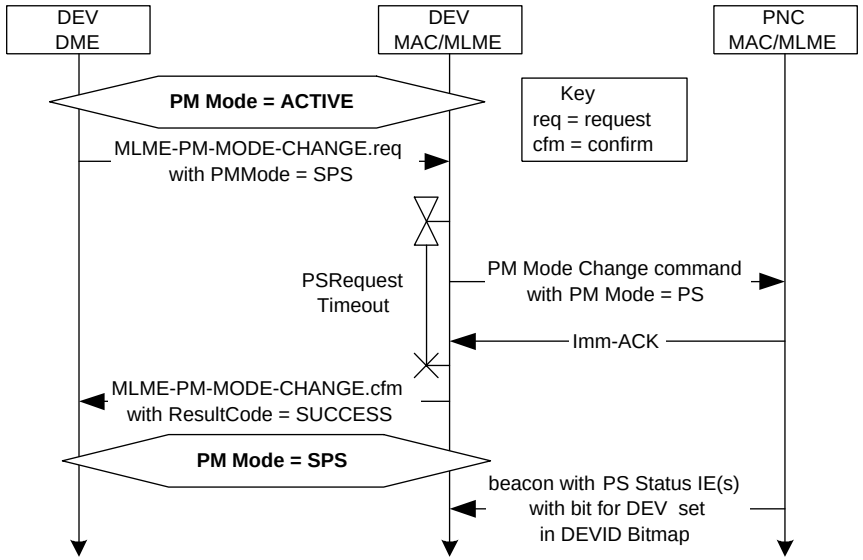


Figure 144 - MSC showing DME initiated PM mode change from ACTIVE to an SPS mode

Suggested

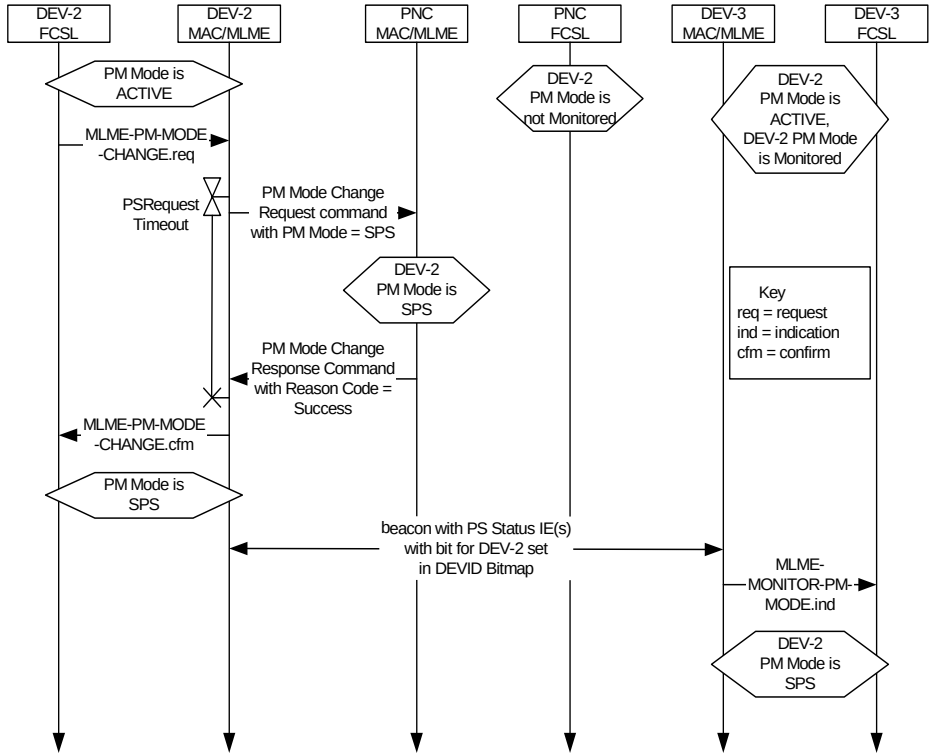


Figure 144 - MSC showing DME initiated PM mode change from ACTIVE to an SPS mode

Current

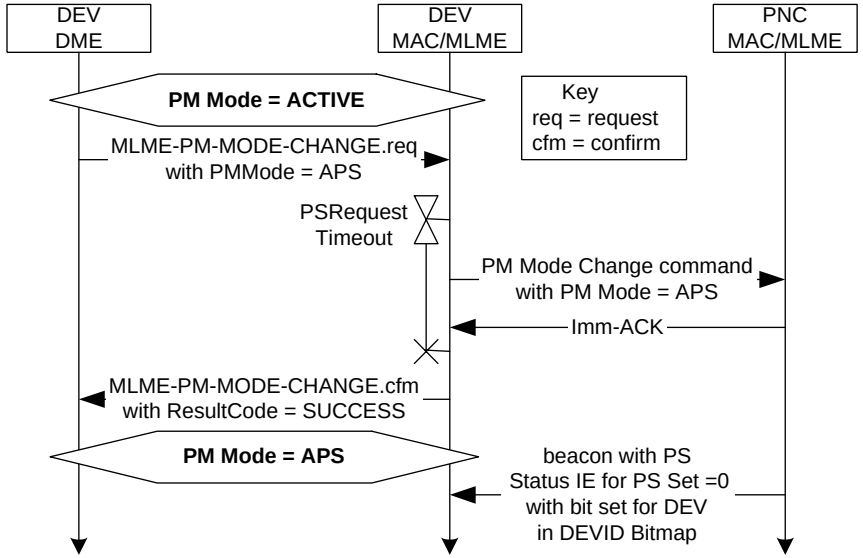


Figure 145 - MSC showing DME initiated PM mode change from ACTIVE to APS

Suggested

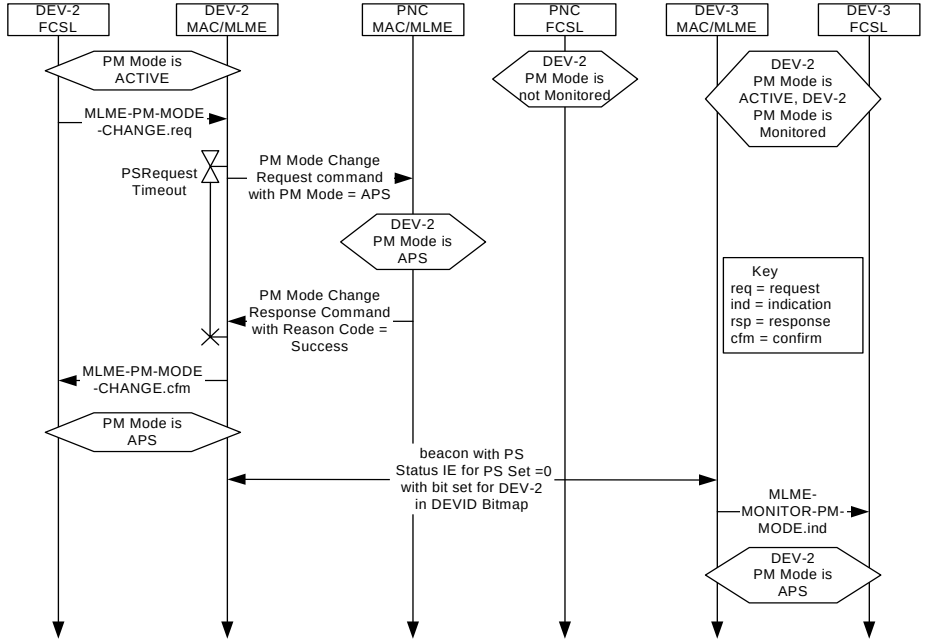


Figure 145 - MSC showing DME initiated PM mode change from ACTIVE to APS

Current

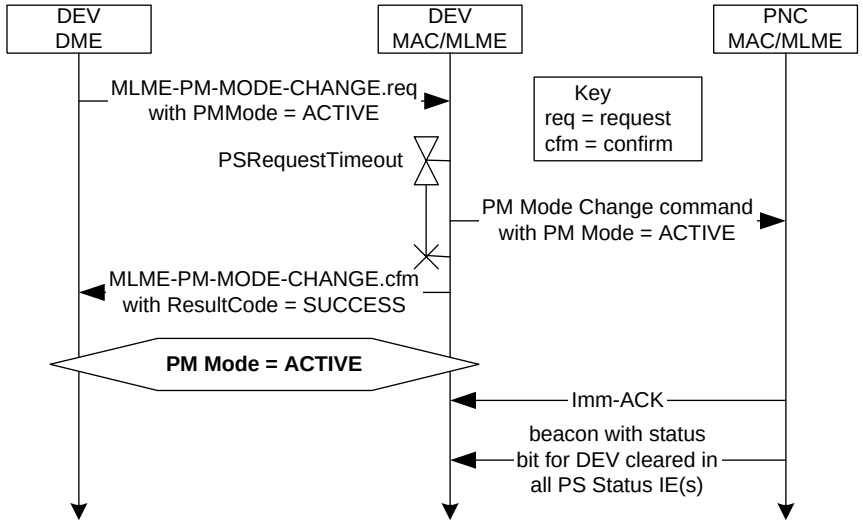


Figure 146 - MSC showing DME initiated PM mode change from any PS mode to ACTIVE

Suggested

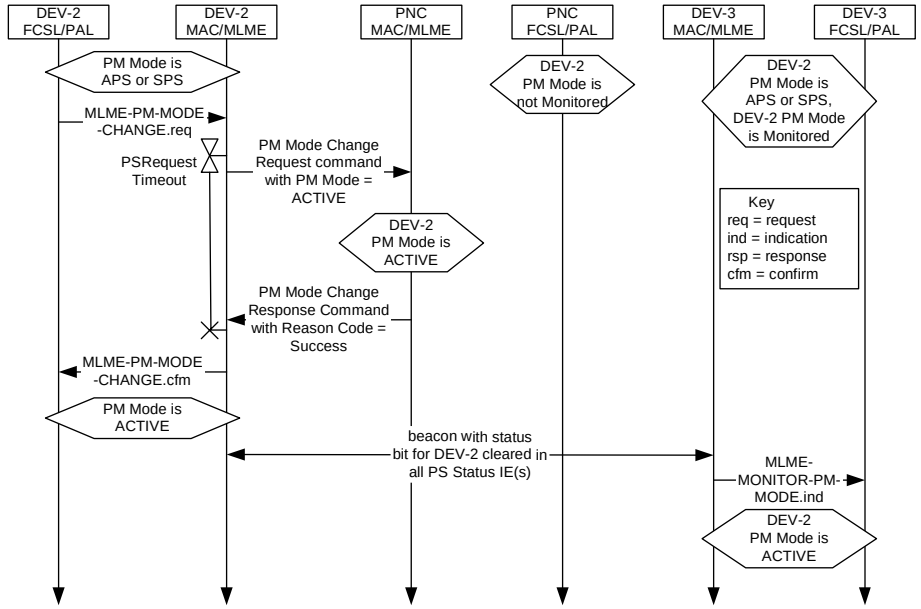


Figure 146 - MSC showing DME initiated PM mode change from any PS mode to ACTIVE

Current

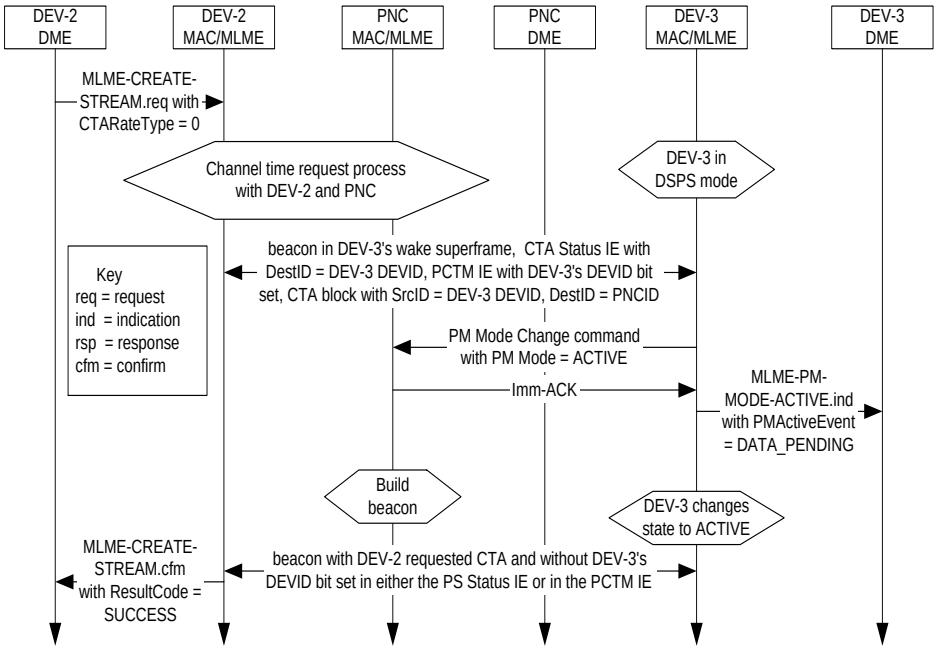


Figure 147 - Message sequence showing MLME initiated PM mode change from DSPS to ACTIVE in response to a new chanel time allocation

Suggested

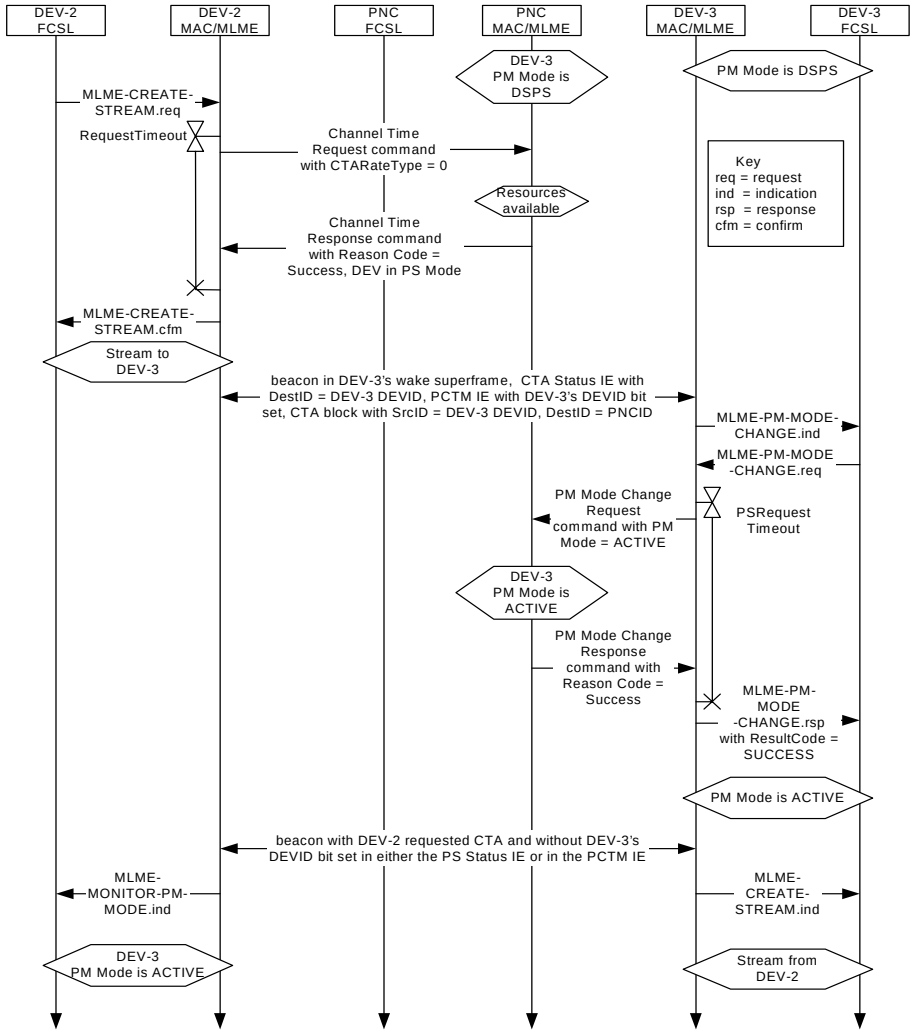


Figure 147 - Message sequence showing MLME initiated PM mode change from DSPS to ACTIVE in response to a new chanel time allocation

- Suggest monitoring of target DEV PS Mode be automatically activated in channel time request is received for a PS DEV.

urrent

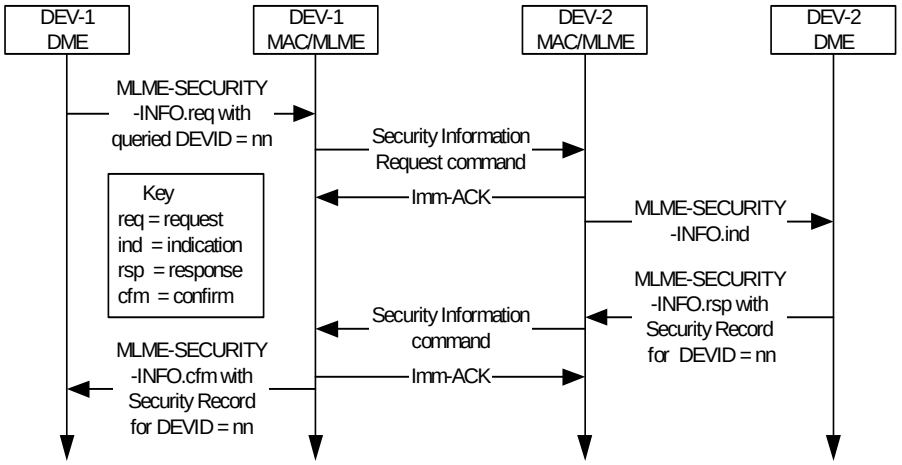


Figure 148—Message sequence chart for DEV-DEV Security information request

Suggested

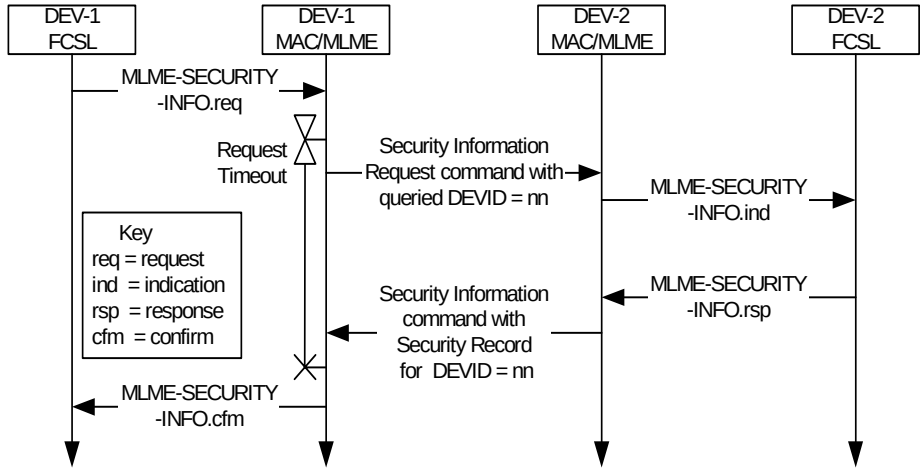


Figure 148—Message sequence chart for DEV-DEV Security information request

Current

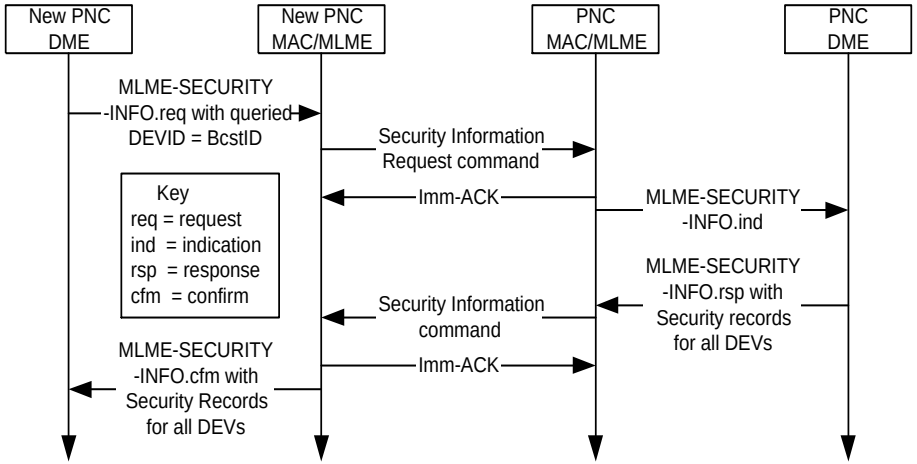


Figure 149—Message sequence chart for New PNC-Old PNC Security Information transfer

Suggested

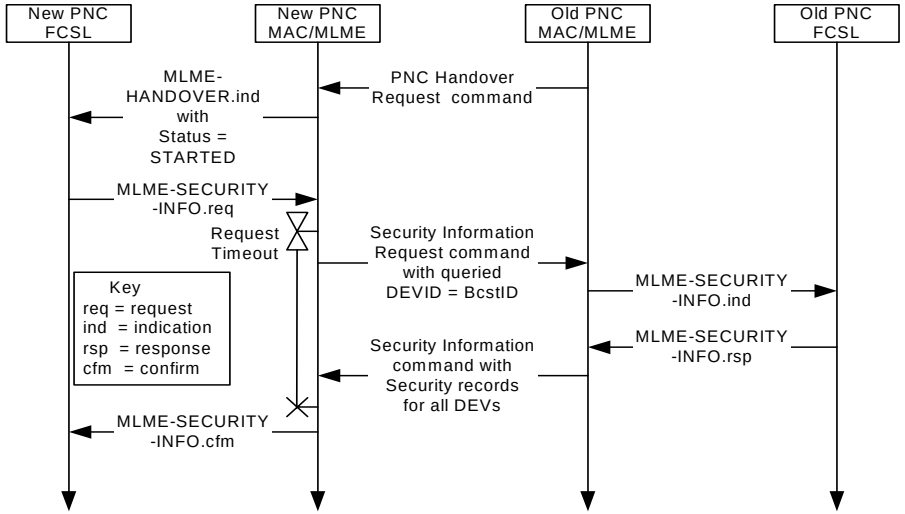


Figure 149—Message sequence chart for New PNC-Old PNC Security Information transfer

Current

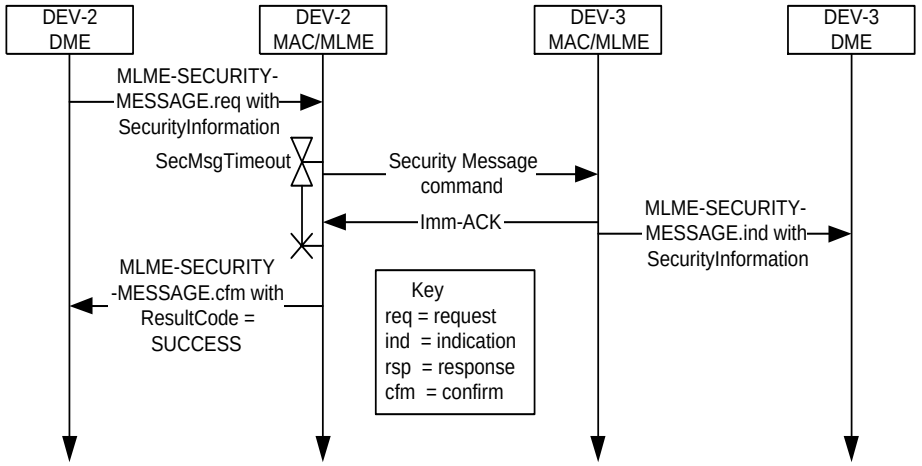


Figure 150—Message sequence chart for sending security information with the Security Message command

Suggested

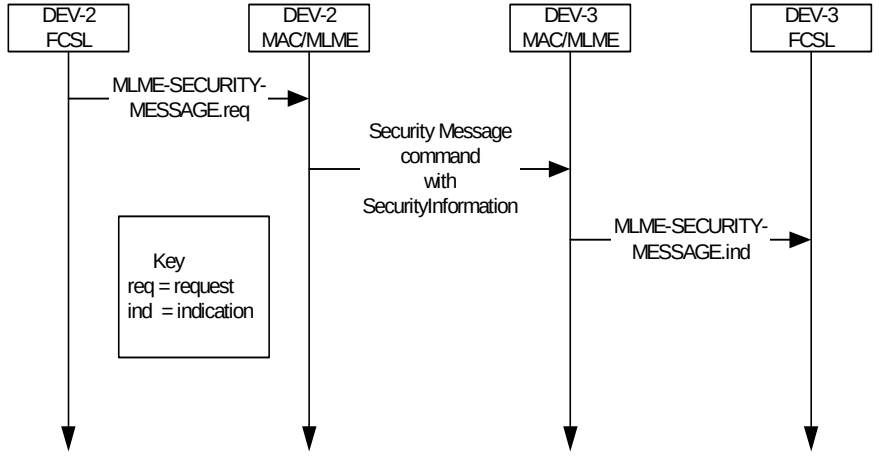


Figure 150—Message sequence chart for sending security information with the Security Message command

Current

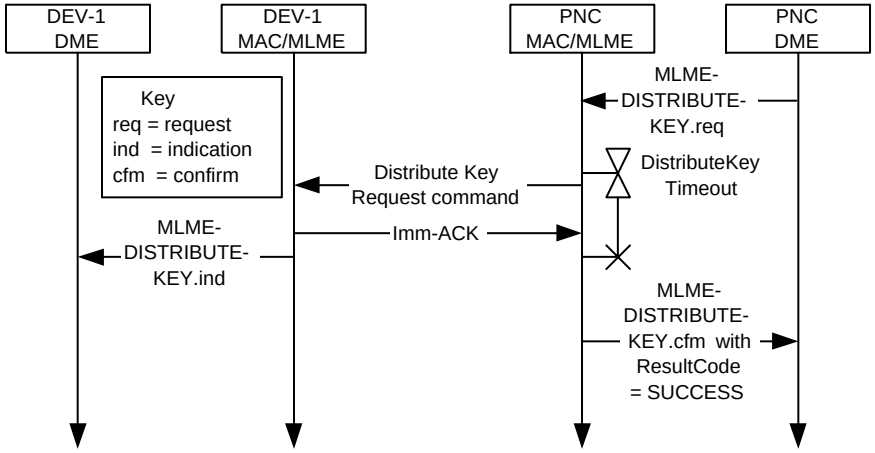


Figure 151—Message sequence chart for PNC-DEV key distribution

Suggested

REMOVED

Figure 151—Message sequence chart for PNC-DEV key distribution

Current

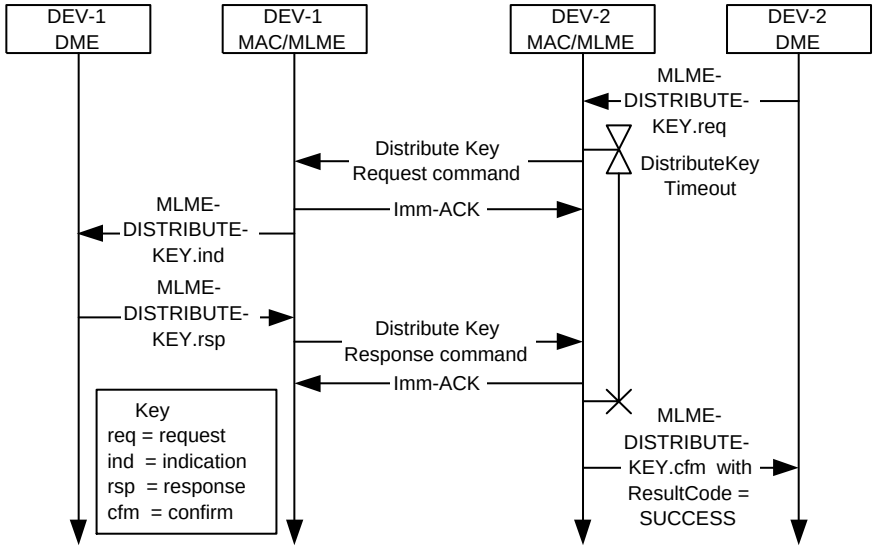


Figure 152—Message sequence chart for peer-to-peer key distribution

Suggested

REMOVED

Figure 152—Message sequence chart for peer-to-peer key distribution

Current

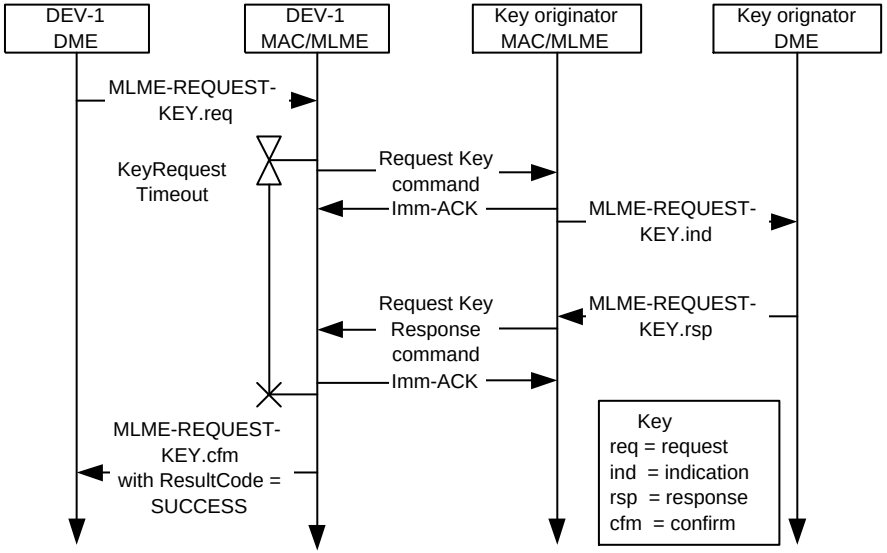


Figure 153—Message sequence chart for DEV key request

Suggested

REMOVED

Figure 153—Message sequence chart for DEV key request

Current

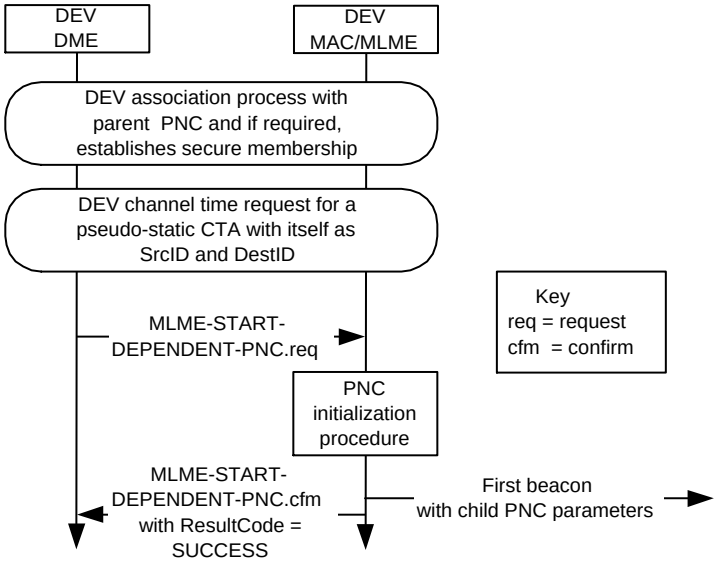


Figure 99 - MSC for creating a child piconet

Suggested

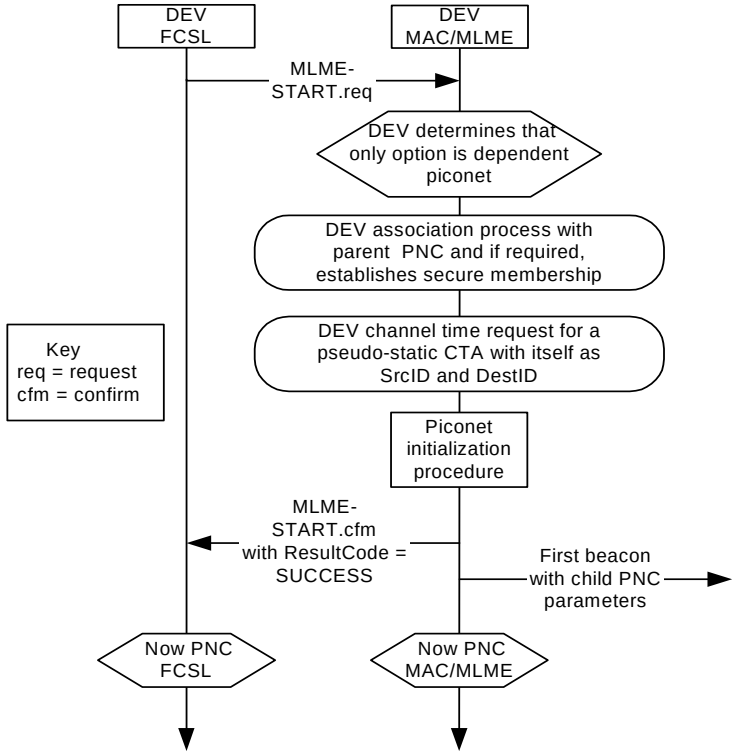


Figure 99 - MSC for creating a child piconet

•

Current

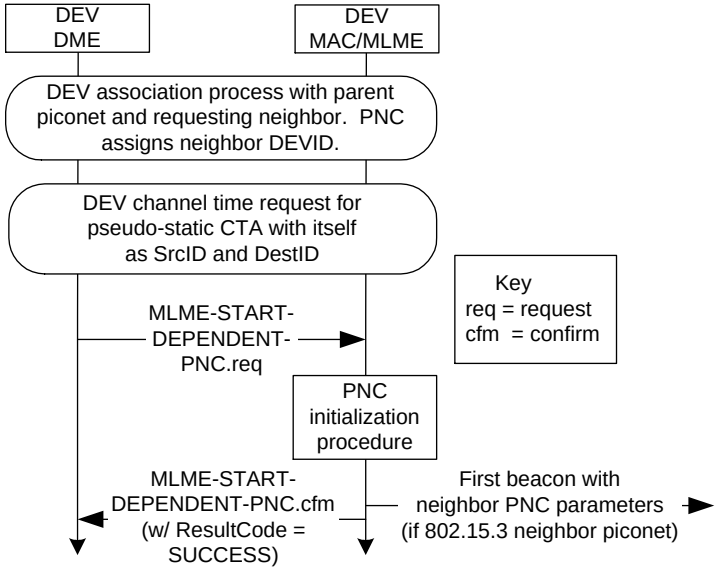


Figure 101 - MSC for initiating a neighbor piconet

Suggested

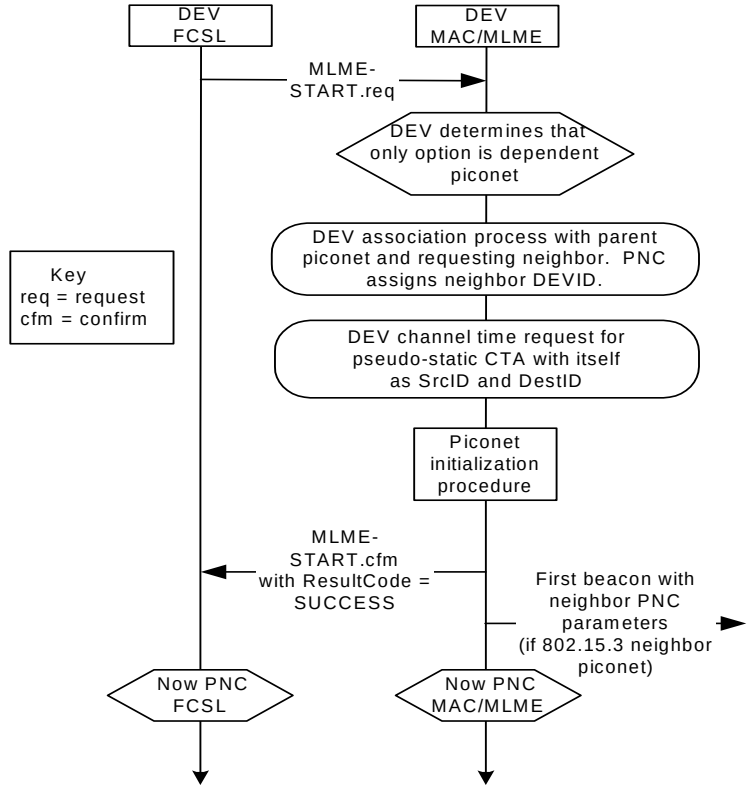


Figure 101 - MSC for initiating a neighbor piconet

Current

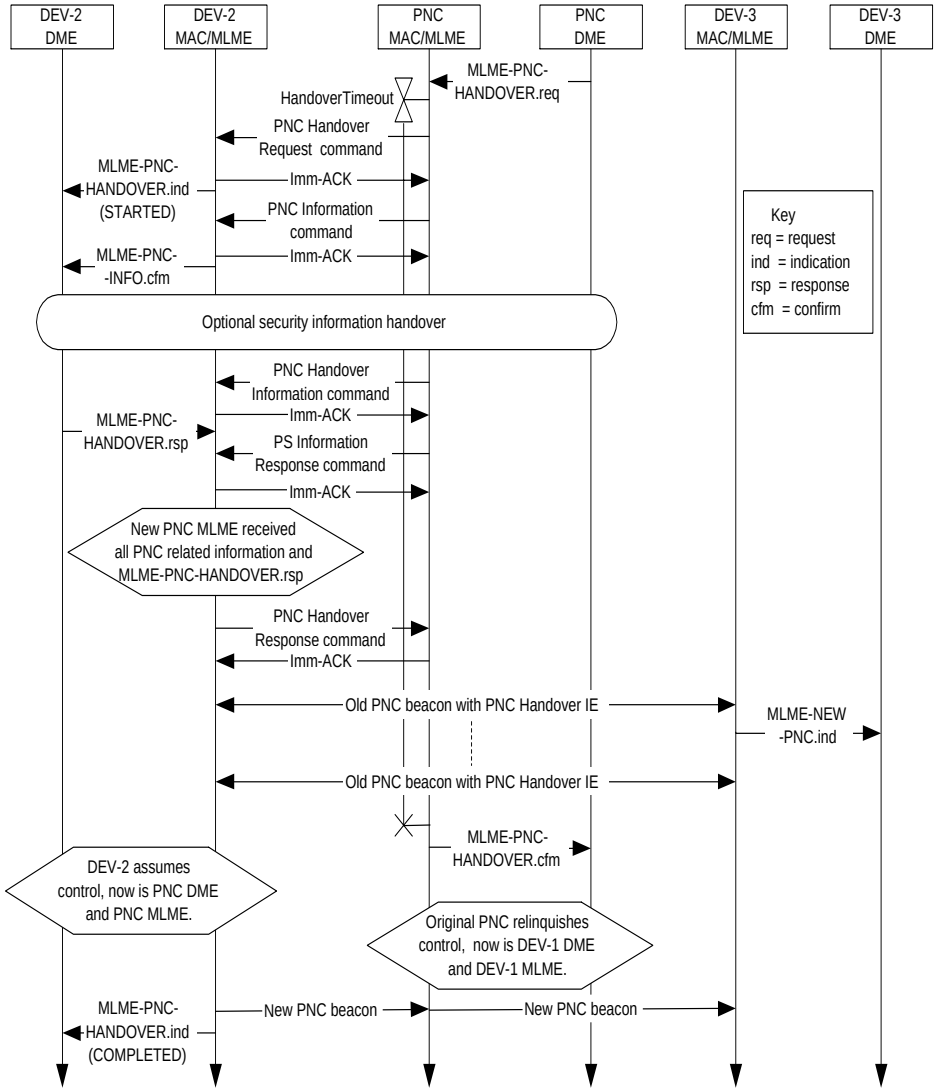


Figure 94 - PNC handover MSC

Suggested

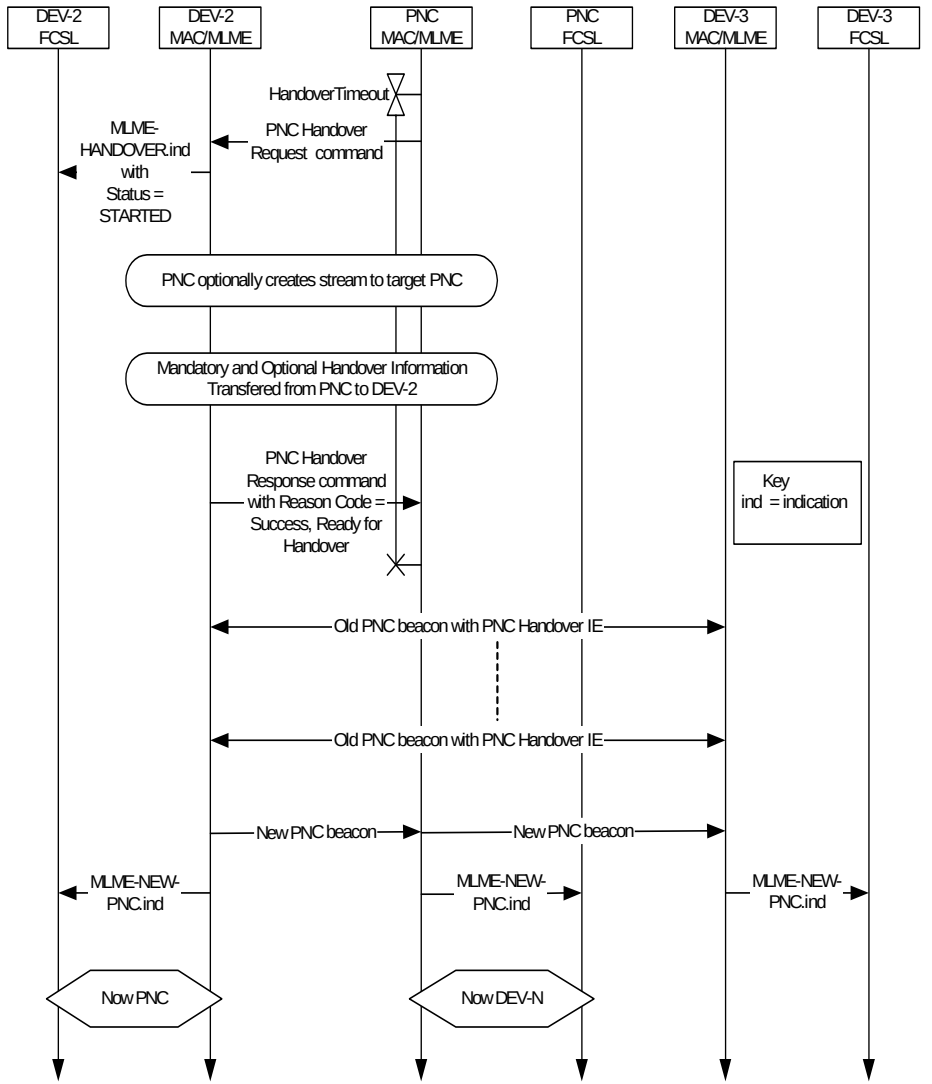


Figure 94 - PNC handover MSC

Current

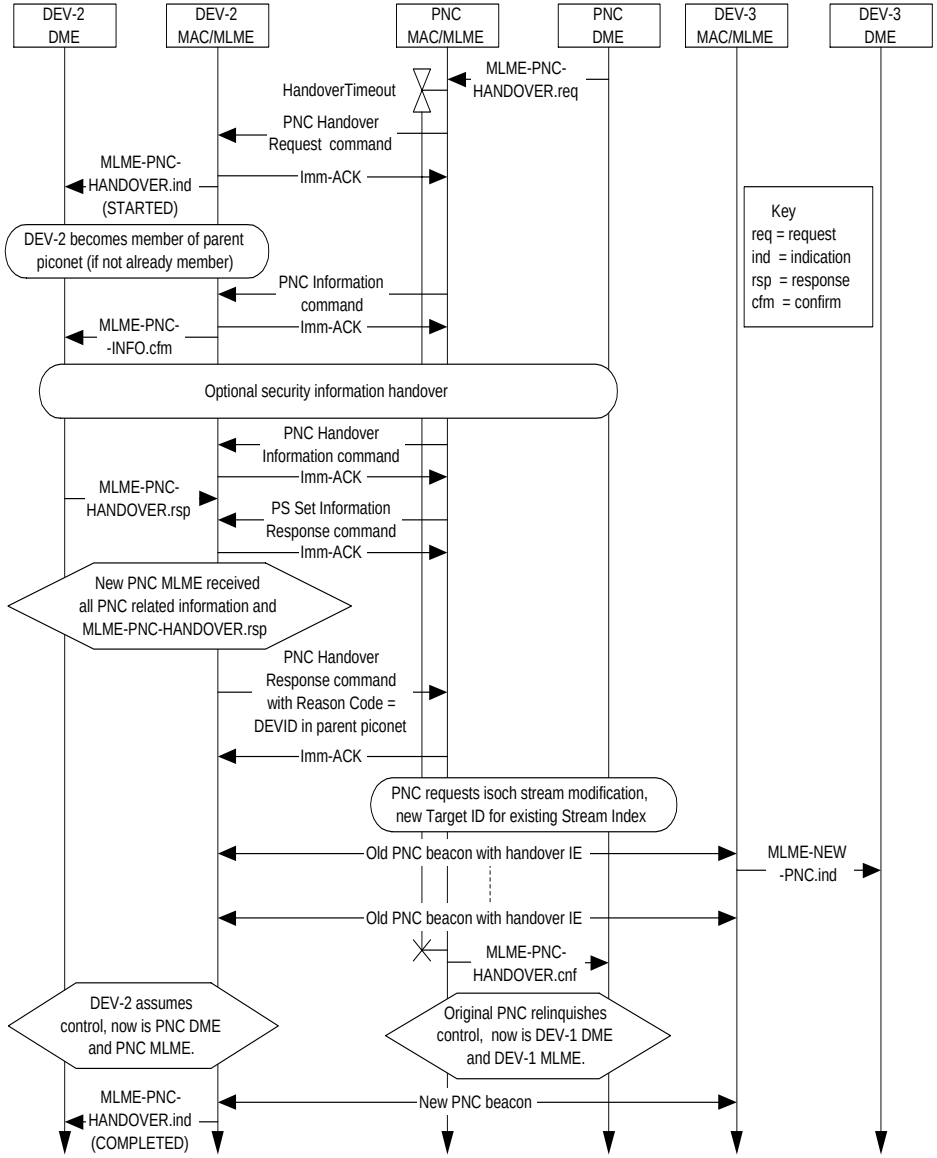


Figure 95 - Successful PNC handover in a dependent piconet

Suggested

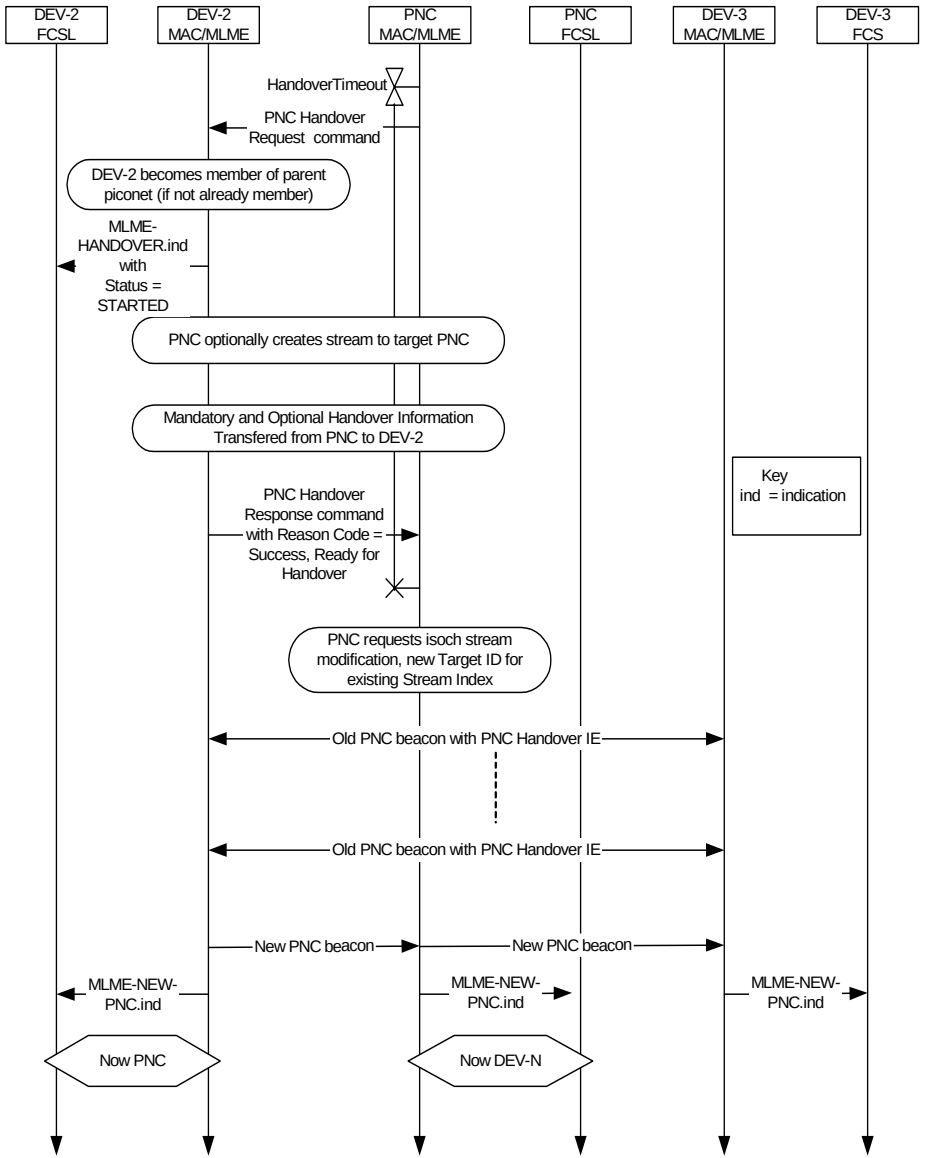


Figure 95 - Successful PNC handover in a dependent piconet

Current

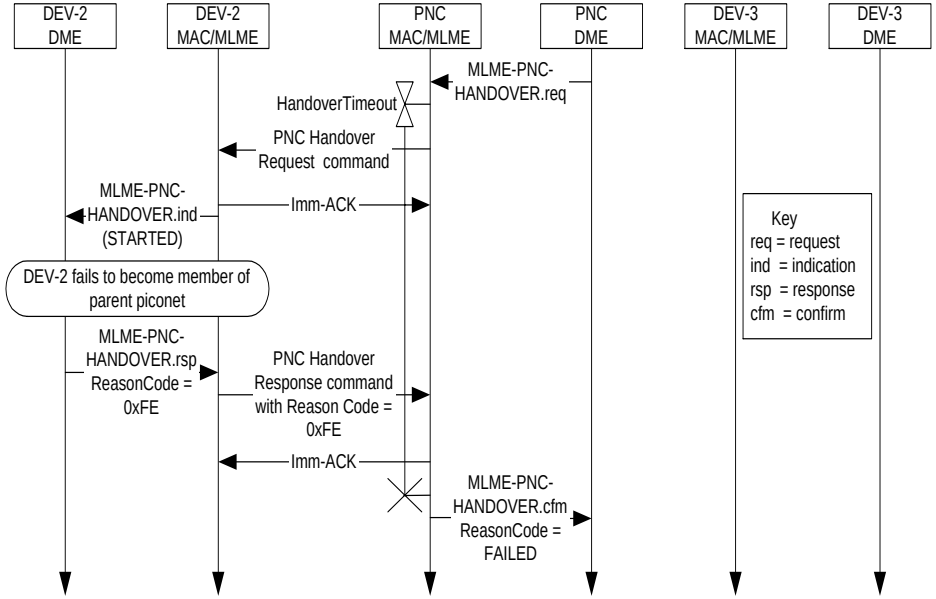


Figure 96 - Failed dependent PNC handover when target DEV fails to join parent piconet

Suggested

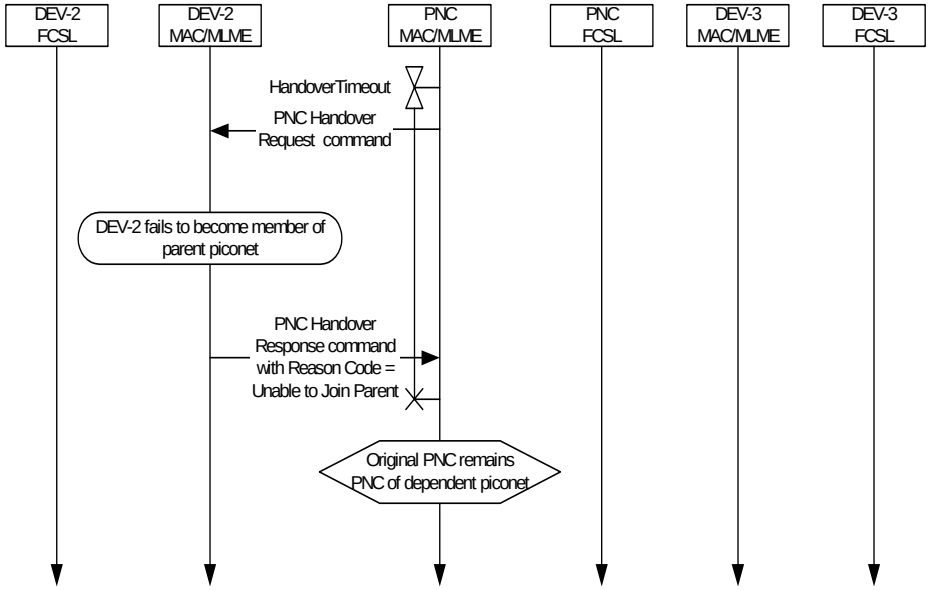


Figure 96 - Failed dependent PNC handover when target DEV fails to join parent piconet

Current

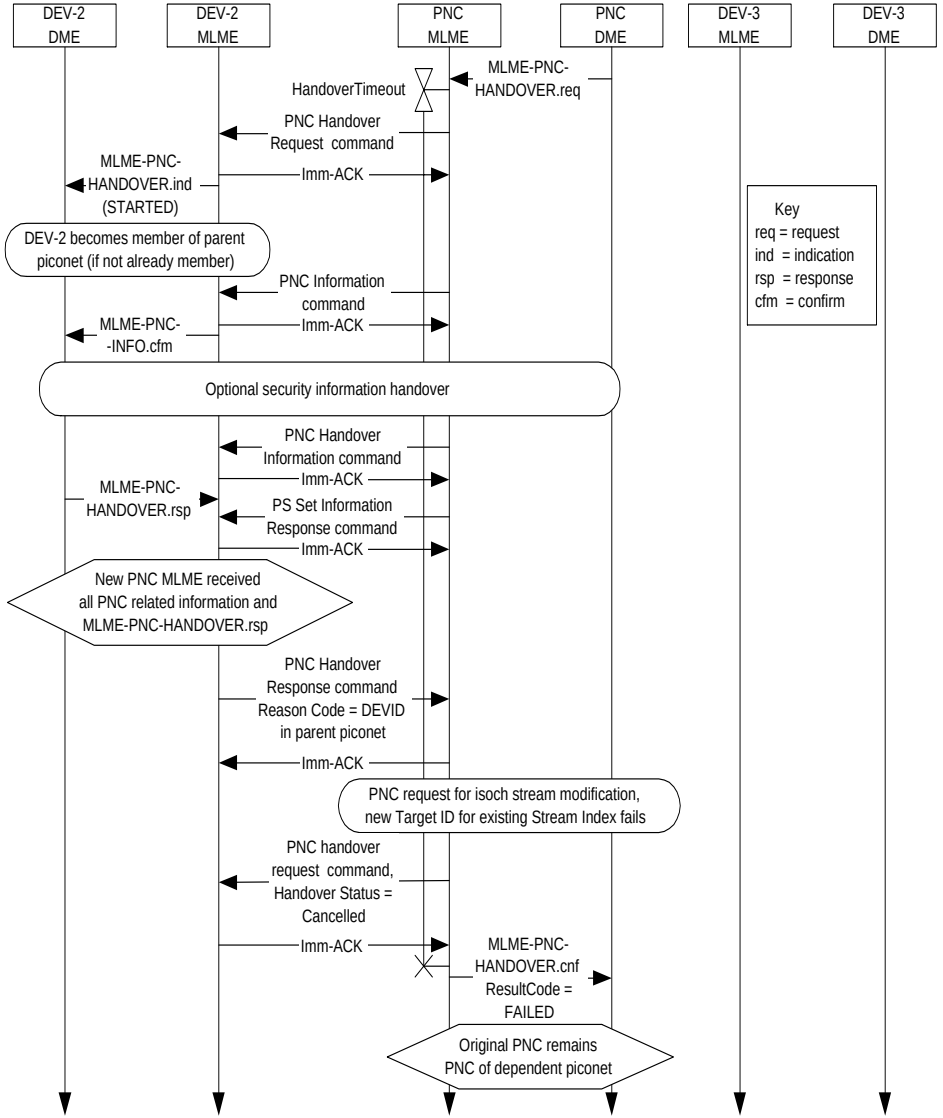


Figure 97 - Failed dependent PNC handover when control for the dependent piconet CTA is handed over in the parent piconet

Suggested

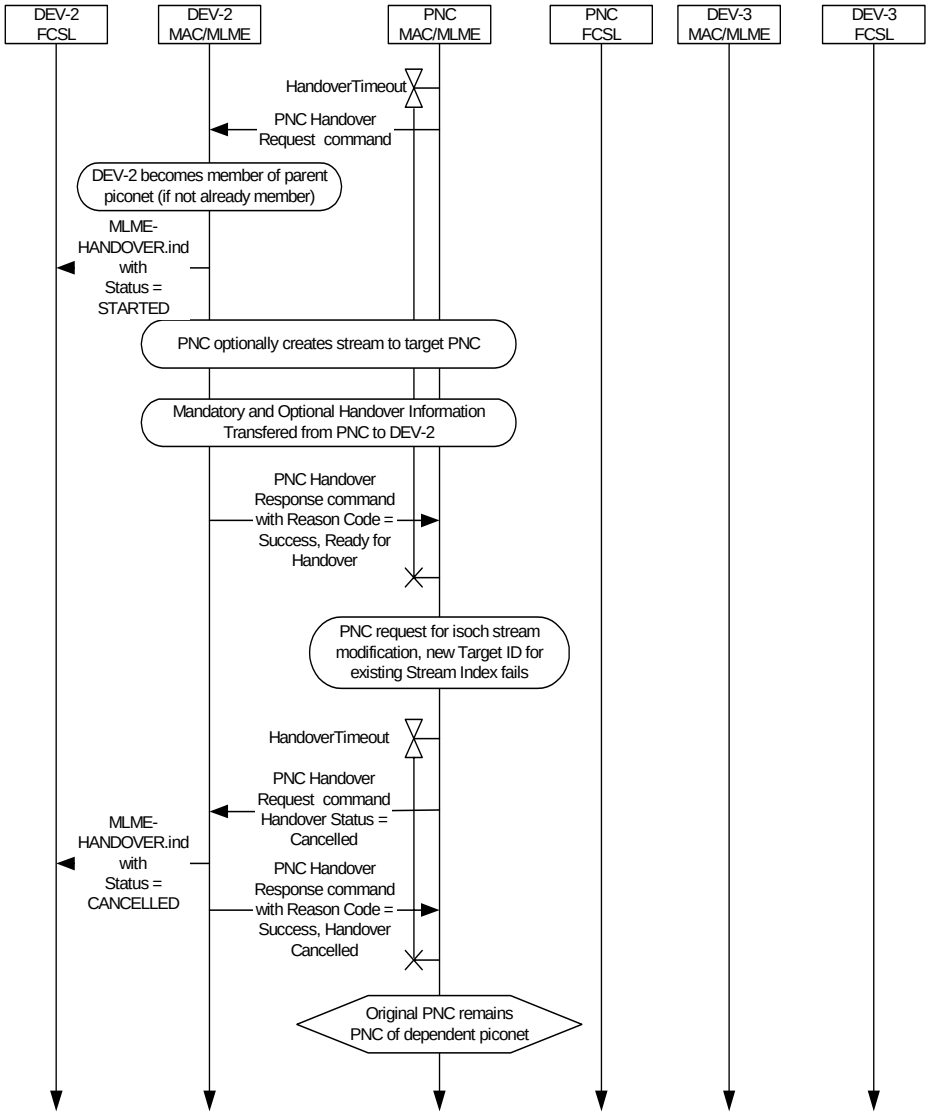
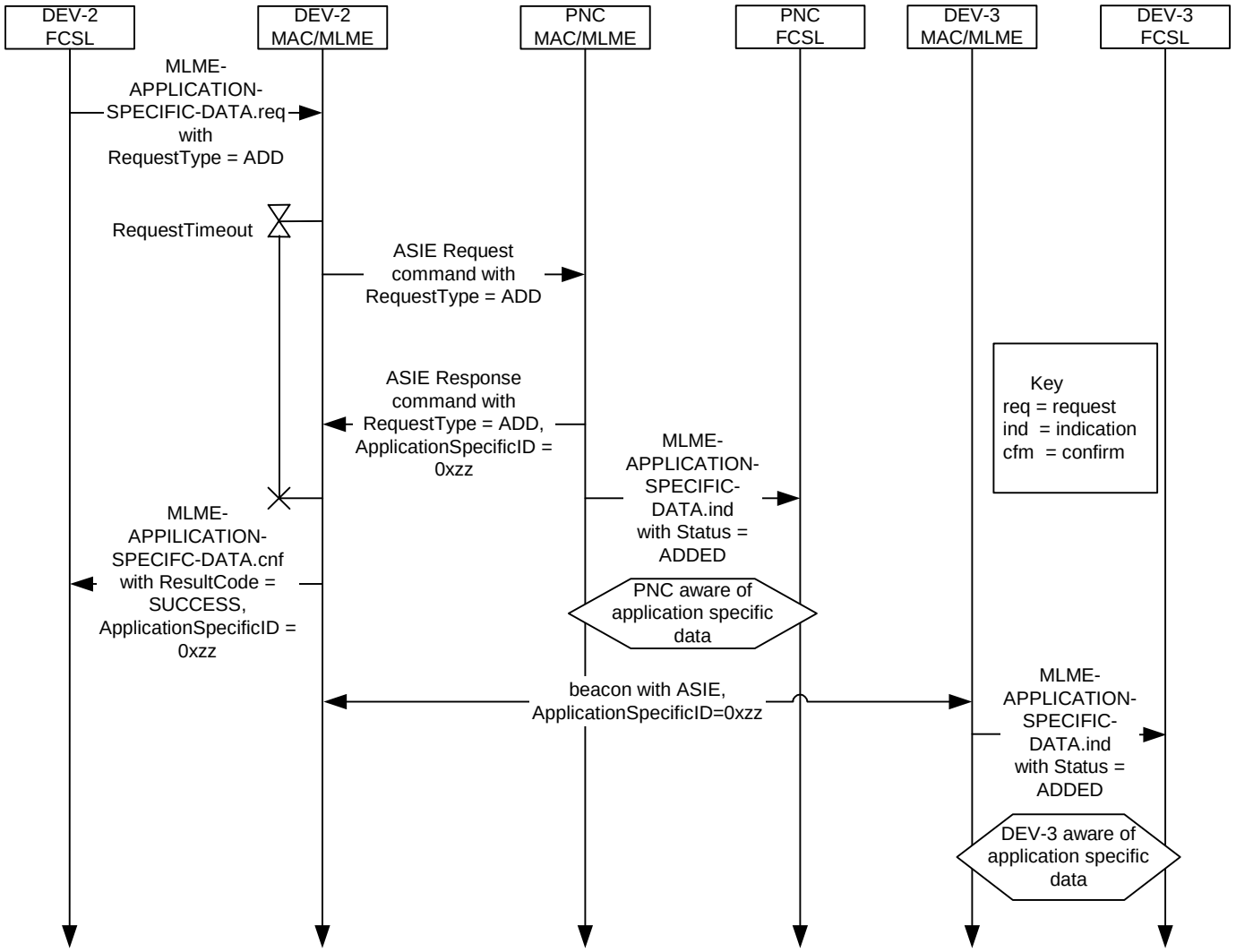


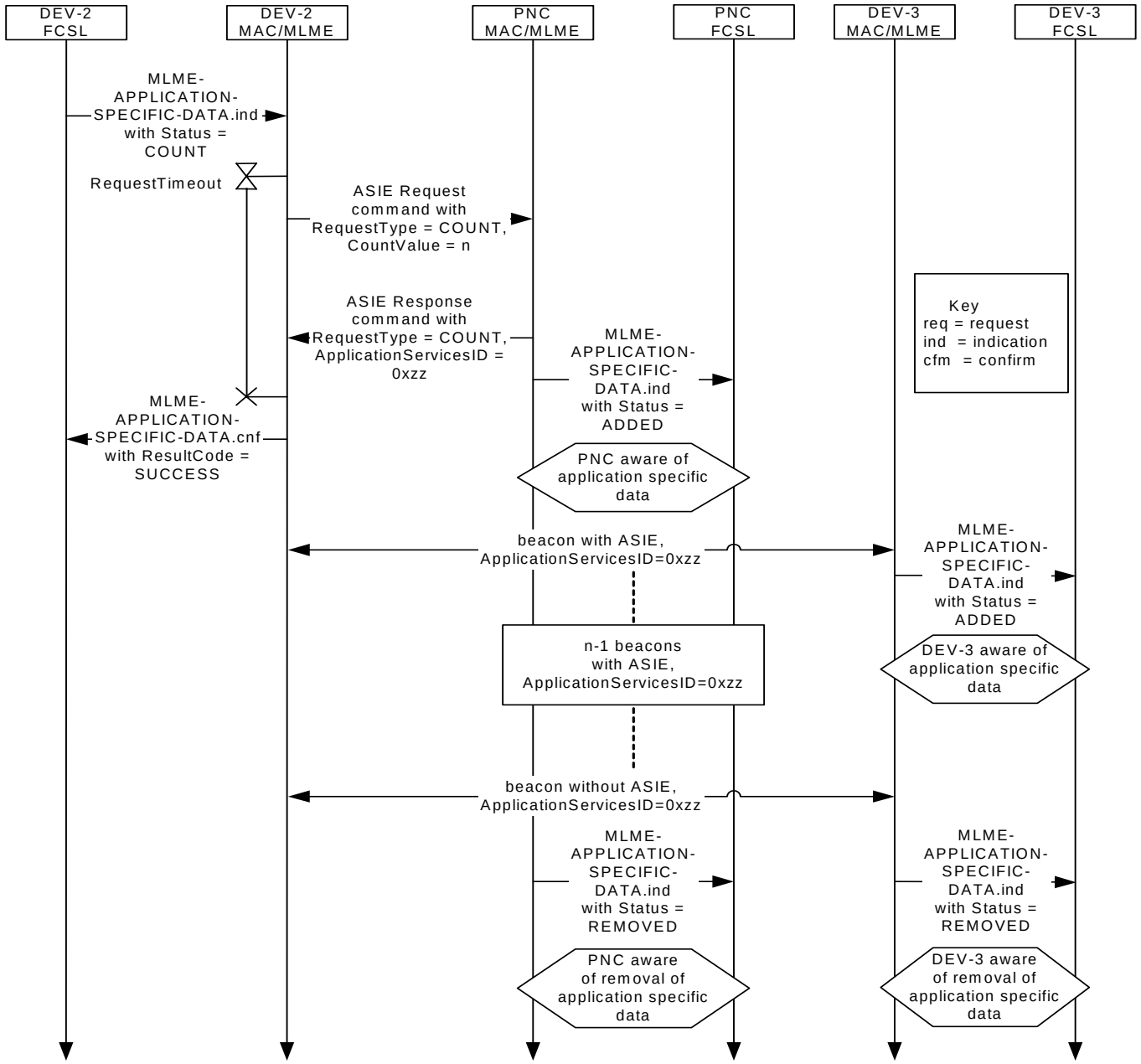
Figure 97 - Failed dependent PNC handover when control for the dependent piconet CTA is handed over in the parent piconet

8. New MSCs

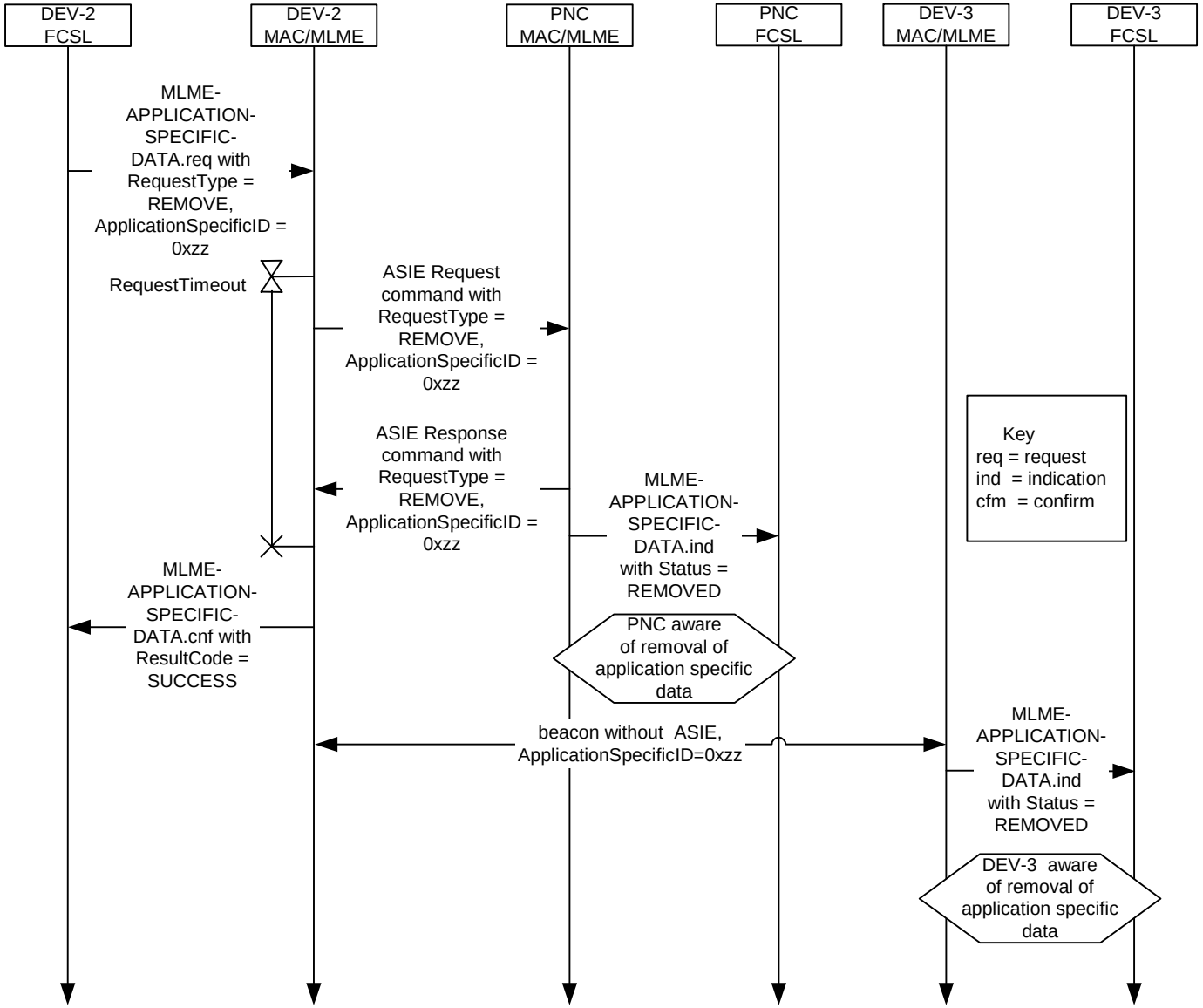
This section provides suggested new MSCs for functionality that was not previously documented with MSCs.



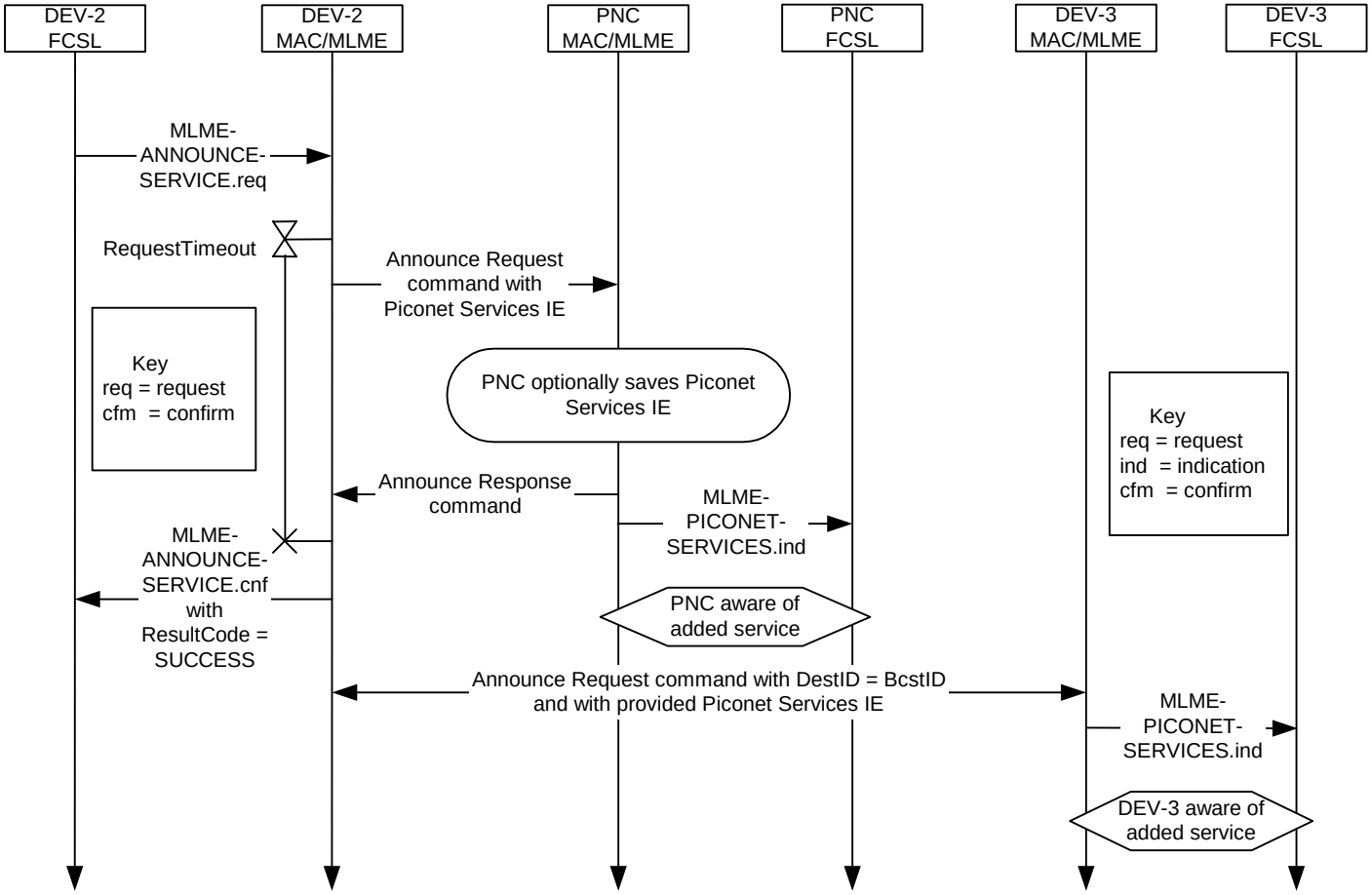
New - DEV adding application specific data to beacon



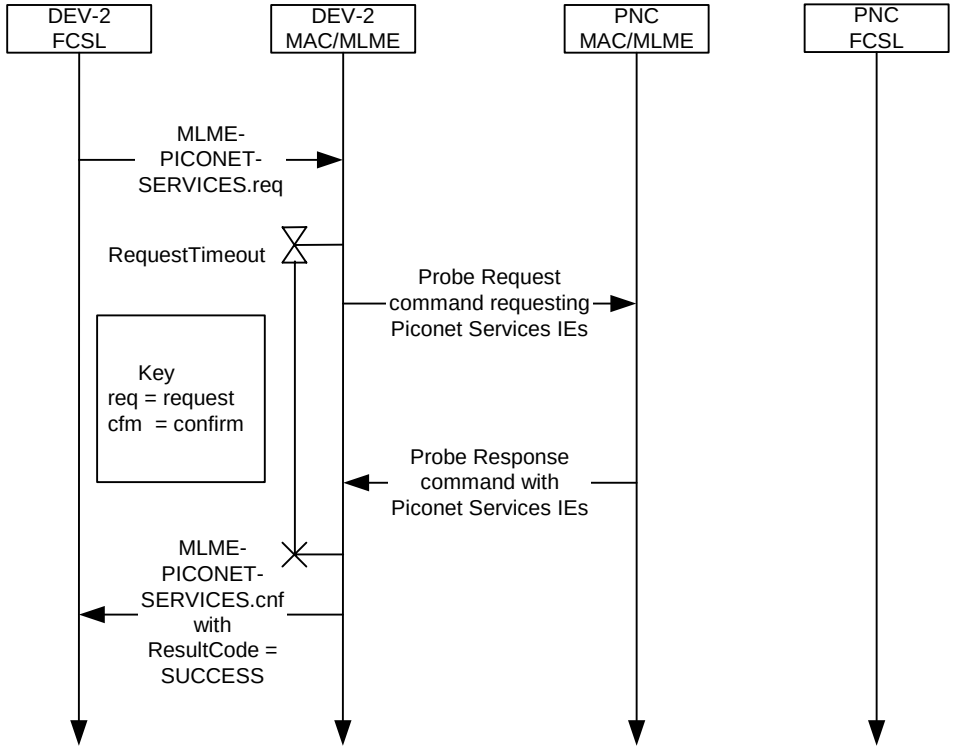
New - DEV adding application specific data to the beacon for a specific number of beacons



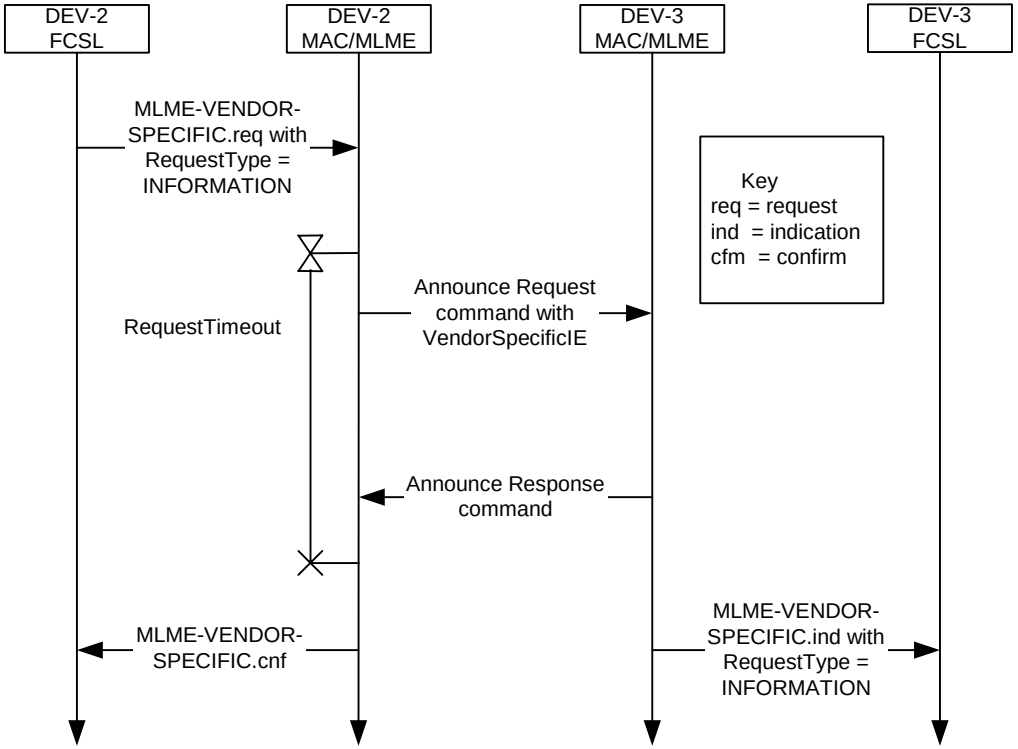
New - DEV removing application specific data from a beacon



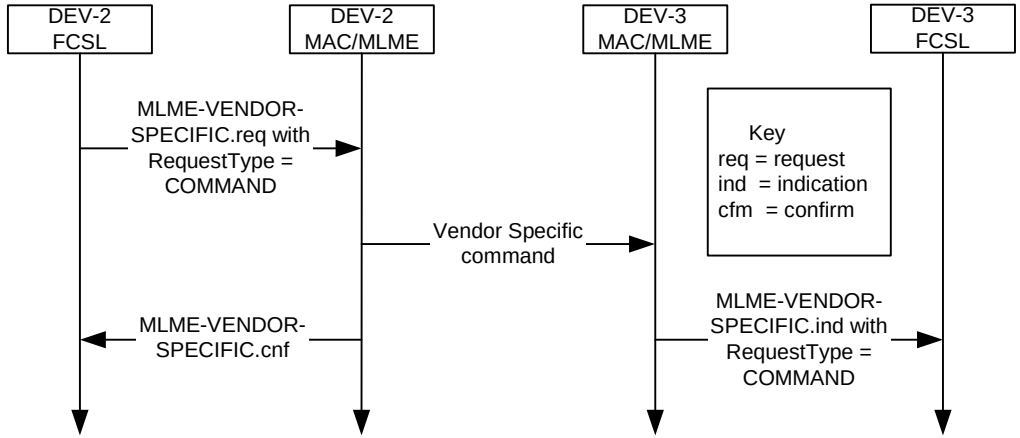
NEW - DEV announcing the availability of a piconet service to the PNC



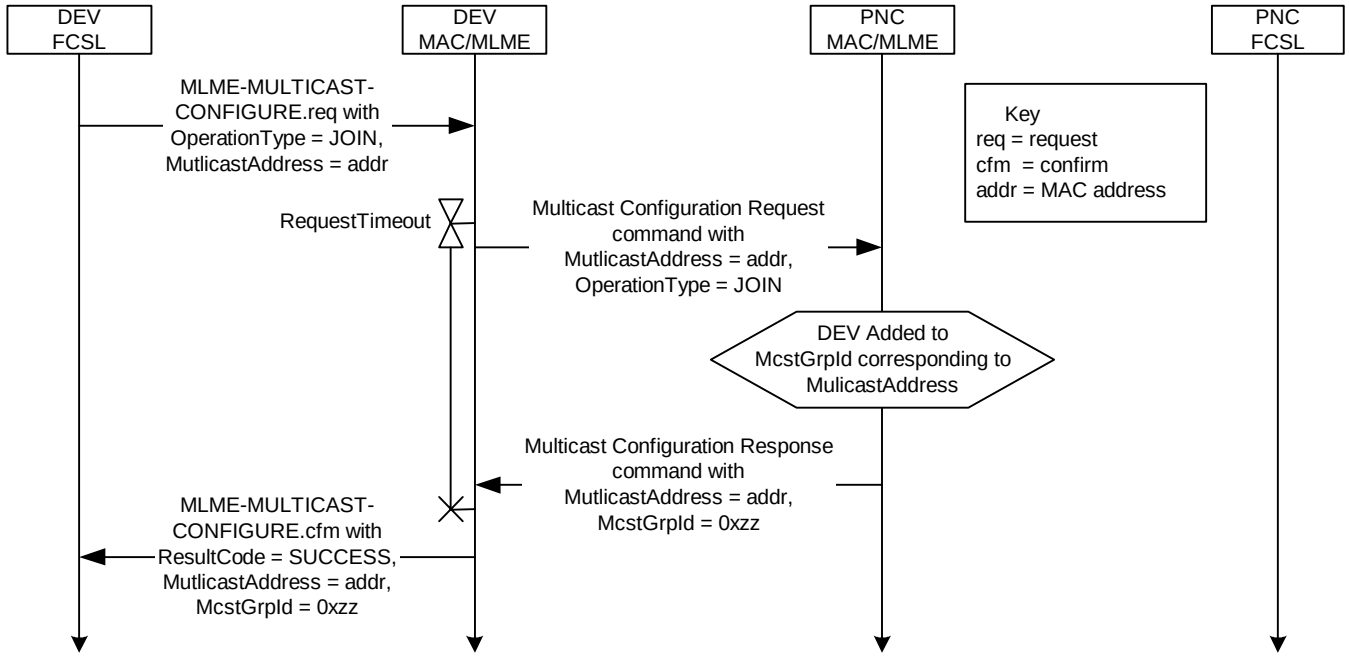
NEW - DEV requesting available piconet services from PNC



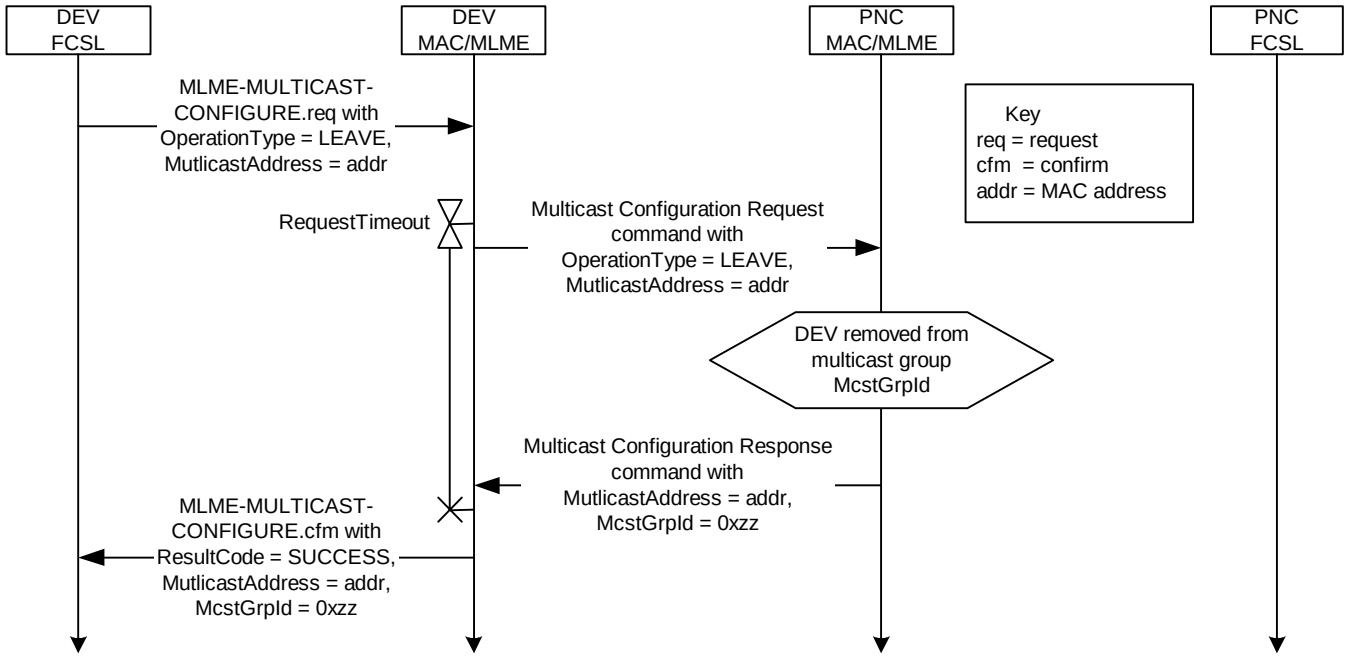
NEW - DEV sending vendor specific information to another DEV



NEW - DEV sending a vendor specific command to another DEV



NEW - DEV joining multicast group



NEW - DEV leaving multicast group