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AUTOSAR IpduM User Manual		

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1 Overview

본 문서는 현대오토에버 AUTOSAR 플랫폼 IpduM 모듈에서 사용자가 파라미터 설정 또는 시스템 설계를 할 때 주의하거나 참고할 사항을 제공한다. AUTOSAR 표준 SRS/SWS 를 기반으로 작성 되었으며, 모듈 사용시 보다 자세한 기능적인 설명이 필요한 경우, 아래 Reference 문서를 참고한다.

설정관련 Category 의 해석은 다음과 같다.

- Changeable (C) : User 에 의해서 설정 가능한 항목
- Fixed (F) : User 에 의한 변경이 불가능한 항목
- NotSupported (N) : 사용되지 않는 항목

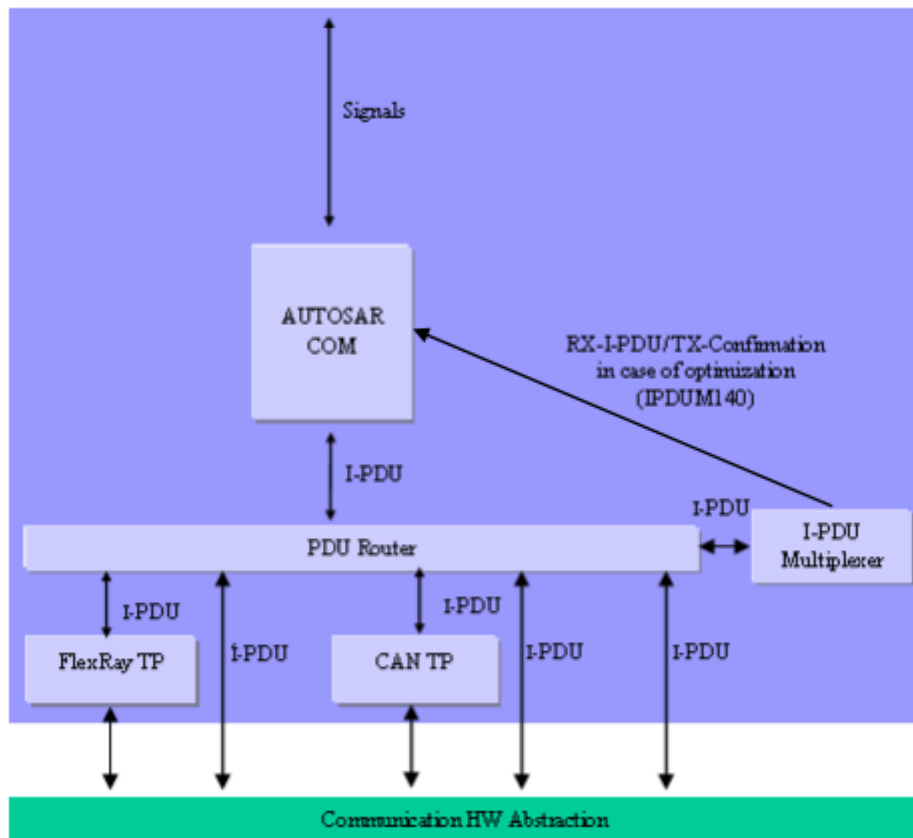
2 Reference

Sl. No.	Title	Version
1	AUTOSAR_SWS_IPDUMultiplexer.pdf	2.2.0
2	AUTOSAR_SWS_COM.pdf	4.2.0

3 AUTOSAR System

3.1 IpduM Module

IpduM 모듈은 Multiplexed PDU 를 송신 시 조합하고, 수신 시 해석하여 상위 레이어로 전달하는 역할을 한다. PDU Multiplexing 이란 같은 PCI(Protocol Control Information)을 사용해서 selector field 에 따라 하나 이상의 유니크한 SDU(Service Data Unit)를 조합하는 것을 의미한다. 현재는 CAN 에서 사용하지만, 하위 레이어에 제약사항은 없다.



4 Product Release Notes

4.1 Overview

이 Chapter 에서는, IpduM 모듈에 대한 release 관련 내용을 제공하는데 목적이 있으며, IpduM Software product release version 에 대한 제한사항 및 특이사항을 기술하고 있다.

4.2 Scope of the Release

이 문서에 대한 모든 내용은, 다음의 IpduM 모듈에 한정한다.

Module name	AUTOSAR version	SWS version	Module version
IpduM	4.0.3	2.2.0	2.1.1

※ Module version 은 각 모듈의 BswModule Description(Bswmd)파일의 Sw version 을 의미한다.

4.3 Change Log

4.3.1 Version 2.1.1.0

➤ Improvement

■ UNECE Cyber Security

Cause	UNECE Cyber Security
Operation effect	None
Setting effect	None
ASW Action	None

4.3.2 Version 2.1.0.0

➤ Feature

■ Add ModuleEnable configuration to enable/disable IpduM by User

Cause	If user wants to configure Multiplexed Msg, then user should request platform containing IpduM module
Operation effect	None
Setting effect	None
ASW Action	None

4.3.3 Version 2.0.5.0

➤ 개선 사항

■ MISRA-C Violation 수정 건

원인	MISRA-C 위반 사항 수정 건
동작영향	없음
설정영향	없음
ASW 조치 필요 사항	없음

4.3.4 Version 2.0.4.0

➤ 개선 사항

■ 소스 코드 오픈을 위한 구조 및 문서 변경

원인	소스 코드 오픈을 위한 구조 및 문서 변경
동작영향	없음
설정영향	없음
ASW 조치 필요 사항	없음

4.3.5 Version 2.0.4

➤ 신규 기능

■ N/A

➤ 개선 사항

■ DET Validation code관련 Library의존성 개선

원인	Library와 const 변수 미적용
동작영향	없음
설정영향	없음
ASW 조치 필요 사항	없음

4.3.6 Version 2.0.3

➤ 신규 기능

■ N/A

➤ 개선 사항

■ IpduM_RxIndication 함수 인자값 타입 변경(const type)

원인	PduR 모듈 업데이트에 따른 Interface함수 정의 변경
동작영향	없음
설정영향	없음
ASW 조치 필요 사항	없음

4.3.7 Version 2.0.2

➤ 신규 기능

■ N/A

➤ 개선 사항

■ 연관 모듈(PduR,Com) PDU Handle ID Type uint16지원하도록 개선

원인	대용량 DB로 인한 256이상의 PDU 지원 필요
동작영향	없음
설정영향	없음
ASW 조치 필요 사항	없음

4.4 Module Release Notes

4.4.1 Limitations

➤ **Just-In-Time update of parts 미지원**

Multiplexed 메시지 전송 요청을 Upper layer 에서 받는 경우, 요청 받은 Static/Dynamic 외의 나머지 part 에 대하여, TriggerTransmit 처리를 통해 최신 정보로 업데이트 하여 메시지를 전송하는 기능.

4.4.2 Deviations

None

5 Configuration Guide

현대오토에버가 배포한 AUTOSAR 플랫폼의 IpduM 설정은 DB 기반으로 설정이 되며, IpduM 모듈의 추가 및 삭제 시 반드시 현대오토에버와 상의해야 한다.

- Configuration 통합 관련
 - Multiplexed 메시지가 있는 경우에만 integration 하는 모듈임.
 - DB 가 변경 되는 경우 Multiplexed 메시지 존재를 확인할 필요가 있음.
- Configuration 수정 관련
 - Harmonize 시에 static part 에 trigger 로 기본 처리가 되며, 변경을 원하는 경우 configuration 에서 직접 수정해야 한다.(DB 에는 관련 정보가 없기 때문에)

5.1 IpduMGeneral 설정

Parameter Name	Value	Category
IpduMConfigurationTimeBase	-	F
IpduMDevErrorDetect	True	C
IpduMStaticPartExists	Automated	C
IpduMVersionInfoApi	False	C
IpduMEnableModule	False	C

1) IpduMDevErrorDetect

- DET 기능 On/Off 설정
- 기본적으로 True 로 사용하며, 사용자 요청 및 협의에 의해 False 로 설정할 수 있다.

2) IpduMConfigurationTimeBase

- MainFunction 주기 설정

3) IpduMStaticPartExists

- Multiplexed 메시지에 Static Part 가 있는지 여부, Harmonize 시에 자동으로 판단이 되어 설정되는 값

4) IpduMEnableModule

- IpduM Module 을 사용하는 경우 Enable, 미사용 하는 경우 False 로 설정한다

5.2 IpduMPublishedInformation 설정

Parameter Name	Value	Category
IpduMRxDirectComInvocation	False	C

1) IpduMRxDirectComInvocation

- False 를 기본으로 사용하며, True 로 설정하는 경우 PduR 모듈을 거치지 않고 바로 Com 으로 Rx 처리를 한다.

5.3 IpduMConfig-IpduMRxPathway-IpduMRxRequest-IpduMRxIndication 설정

Parameter Name	Value	Category
IpduMByteOrder	Automated	C
IpduMRxHandleId	Automated	C
IpduMRxIndicationPduRef	Automated	C

1) IpduMByteOrder

- Automated
- DB 값을 기반으로 Byte Order 를 설정한다.

2) IpduMRxHandleId

- Multiplexed 메시지의 Pdu Handle ID

3) IpduMRxIndicationPduRef

- Automated

5.4 IpduMConfig-IpduMRxPathway-IpduMRxRequest-IpduMRxIndication-IpduMRxDynamicPart 설정

Parameter Name	Value	Category
IpduMRxSelectorValue	Automated	C
IpduMOutgoingDynamicPduRef	Automated	C

1) IpduMRxSelectorValue

- Dynamic part 의 selector 값을 설정한다.

2) IpduMOutgoingDynamicPduRef

- Dynamic Part 에 해당되는 PDU reference 정보

5.5 IpduMConfig-IpduMRxPathway-IpduMRxRequest-IpduMRxIndication-IpduMRxDynamicPart-IpduMSegment 설정

Parameter Name	Value	Category
IpduMSegmentLength	Automated	C
IpduMSegmentPosition	Automated	C

1) IpduMSegmentLength

- Dynamic PDU 에 포함된 signal 의 bit size 값

2) IpduMSegmentPosition

- Dynamic PDU 에 포함된 signal 의 bit position 값

5.6 IpduMConfig-IpduMRxPathway-IpduMRxRequest-IpduMRxIndication-IpduMSelectorFieldPosition 설정

Parameter Name	Value	Category
IpduMSelectorFieldLength	Automated	C
IpduMSelectorFieldPosition	Automated	C

- 1) IpduMSelectorFieldLength
 - Selector Field(Multiplexor)의 bit size
- 2) IpduMSelectorFieldPosition
 - Selector Field(Multiplexor)의 bit position

5.7 IpduMConfig-IpduMRxPathway-IpduMRxRequest-IpduMRxIndication-IpduMRxStaticPart 설정

Parameter Name	Value	Category
IpduMOutgoingStaticPduRef	Automated	C

- 1) IpduMOutgoingStaticPduRef
 - Static Part 에 해당되는 PDU reference 정보

5.8 IpduMConfig-IpduMRxPathway-IpduMRxRequest-IpduMRxIndication-IpduMRxStaticPart-IpduMSegment 설정

Parameter Name	Value	Category
IpduMSegmentLength	Automated	C
IpduMSegmentPosition	Automated	C

- 1) IpduMSegmentLength
 - Static PDU 에 포함된 signal 의 bit size 값
- 2) IpduMSegmentPosition
 - Static PDU 에 포함된 signal 의 bit position 값

5.9 IpduMConfig-IpduMTxPathway-IpduMTxRequest 설정

Parameter Name	Value	Category
IpduMByteOrder	Automated	C
IpduMTxConfirmationPduld	Automated	C
IpduMTxTriggerMode	Automated	C
IpduMIPduUnusedAreasDefault	Automated	C

Parameter Name	Value	Category
IpduMOutgoingPduRef	Automated	C
IpduMInitialDynamicPart	Automated	C
IpduMTxConfirmationTimeout	User Defined	C

1) IpduMByteOrder

- Automated
- DB 값을 기반으로 Byte Order 를 설정한다.

2) IpduMTxConfirmationPduId

- Multiplexed 메시지의 Pdu Handle ID

3) IpduMTxTriggerMode

- Trigger 되는 Part 를 선택 한다.
- Default 로 STATIC_OR_DYNAMIC_PART_TRIGGER 로 설정 된다.
- 설정 가능 항목
 DYNAMIC_PART_TRIGGER : Dynamic Part 에 의해 trigger 됨
 NONE : Static/Dynamic Part 에 의해 trigger 되지 않음(TriggerTransmit 사용 시)
 STATIC_OR_DYNAMIC_PART_TRIGGER : Static/Dynamic Part 에 의해 trigger 됨
 STATIC_PART_TRIGGER : Static Part 에 의해 trigger 됨

4) IpduMIPduUnusedAreasDefault

- 0 으로 Automated, 필요한 default 값이 있으면 셋팅한다.

5) IpduMOutgoingPduRef

- Automated

6) IpduMInitialDynamicPart

- Automated
- 상위 Layer 에서 Dynamic Part 전송 요청 전에, 메시지가 나가는 경우 사용할 Default Dynamic Part 설정
- 설정을 바꾸고자 하는경우, 해당 되는 Dynamic Part 를 reference 하면 된다.

7) IpduMTxConfirmationTimeout

- TriggerTransmit 에는 사용하지 않으며, 전송 Timeout 값을 셋팅 한다.
- Confirmation 이 오지 않으면 Timeout 설정 시간 동안 상위 Layer 의 전송요청을 막는다.

5.10 IpduMConfig-IpduMTxPathway-IpduMTxRequest-IpduMTxDynamicPart 설정

Parameter Name	Value	Category
IpduMJitUpdate	-	N

Parameter Name	Value	Category
IpduMTxDynamicConfirmation	Automated	C
IpduMTxDynamicHandleId	Automated	C
IpduMTxDynamicPduRef	Automated	C

1) IpduMJitUpdate

- Just-In-Time update 기능으로 지원하지 않음

2) IpduMTxDynamicConfirmation

- Dynamic Part 에 전송완료 정보를 상위 layer 로 알려줄지 여부를 설정

3) IpduMTxDynamicHandleId

- Dynamic part 의 Pdu Handle ID

4) IpduMTxDynamicPduRef

- Dynamic Part 에 해당되는 PDU reference 정보

5.11 IpduMConfig-IpduMTxPathway-IpduMTxRequest-IpduMTxDynamicPart-IpduMSegment 설정

Parameter Name	Value	Category
IpduMSegmentLength	Automated	C
IpduMSegmentPosition	Automated	C

1) IpduMSegmentLength

- Dynamic PDU 에 포함된 signal 의 bit size 값

2) IpduMSegmentPosition

- Dynamic PDU 에 포함된 signal 의 bit position 값

5.12 IpduMConfig-IpduMTxPathway-IpduMTxRequest-IpduMSelectorFieldPosition 설정

Parameter Name	Value	Category
IpduMSelectorFieldLength	Automated	C
IpduMSelectorFieldPosition	Automated	C

1) IpduMSelectorFieldLength

- Selector Field(Multiplexor)의 bit size

2) IpduMSelectorFieldPosition

- Selector Field(Multiplexor)의 bit position

5.13 IpduMConfig-IpduMTxPathway-IpduMTxRequest-IpduMTxStaticPart 설정

Parameter Name	Value	Category
IpduMJitUpdate	-	N
IpduMTxStaticConfirmation	Automated	C
IpduMTxStaticHandleId	Automated	C
IpduMTxStaticPduRef	Automated	C

1) IpduMJitUpdate

- Just-In-Time update 기능으로 지원하지 않음

2) IpduMTxStaticConfirmation

- Static Part 에 전송완료 정보를 상위 layer 로 알려줄지 여부를 설정

3) IpduMTxStaticHandleId

- Static part 의 Pdu Handle ID

4) IpduMTxStaticPduRef

- Static Part 에 해당되는 PDU reference 정보

5.14 IpduMConfig-IpduMTxPathway-IpduMTxRequest-IpduMTxStaticPart-IpduMSegment 설정

Parameter Name	Value	Category
IpduMSegmentLength	Automated	C
IpduMSegmentPosition	Automated	C

1) IpduMSegmentLength

- Static PDU 에 포함된 signal 의 bit size 값

2) IpduMSegmentPosition

- Static PDU 에 포함된 signal 의 bit position 값

6 Application Programming Interface (API)**6.1 Type Definitions**

None

6.2 Macro Constants

None

6.3 Functions

None

7 Generator

7.1 Generator Option

Options	Description
-H/-Help	To display help regarding usage of the tool.
-O/-Output	To generate the output files in the specified directory location.
-V/-Version	To display the copyright information and the tool version.
-L/-Log	To generate "\$BswConfig::Lis_File_Name" file.
-D/-DryRun	To execute in validation mode.
-I/-Info	To disable an Information Message(s).
-W/-Warn	To disable Warning Message(s).
-DDT	Not to generate the time stamp in the generated files.

7.2 Generator Message

This section helps to analyze the errors or warnings displayed during the execution of the tool. It ensures conformance of input file(s) with syntax and semantics.

The Generation Tool displays errors or warnings or information when the user has configured incorrect inputs. The format of Error/Warning/Information message is as shown below:

- ERR/WRN/INF<mid><xxx>: < Error/Warning/Information Message>
Where,
<mid>: 051 – IpduM Module Id (052) for user configuration checks.
000 – for command line checks.
<xxx>: 001 – 999 – Message ID.
- File Name : Name of the file in which the error has occurred
- Path : Absolute path of the container in which the parameter is present

'File Name' and 'Path' are optional.

Below section provides the list of module specific error, warning and information messages.

7.2.1 Error Messages

ERR052005: The parameter 'Parameter name' in the container 'Container name' should be configured.

This error occurs, if any of the following parameters present in the container is not configured:

Container Name	Parameter Name
IpduMRxIndication	IpduMRxHandleId
IpduMRxDynamicPart	IpduMRxSelectorValue

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Container Name	Parameter Name
IpduMSegment	IpduMSegmentLength
	IpduMSegmentPosition
IpduMSelectorField	IpduMSelectorFieldLength
	IpduMSelectorFieldPosition
IpduMTxRequest	IpduMTxConfirmationPduld
	IpduMTxTriggerMode
	IpduMIPduUnusedAreasDefault
IpduMTxDynamicPart	IpduMTxDynamicConfirmation
	IpduMTxDynamicHandleId
IpduMGeneral	IpduMConfigurationTimeBase
	IpduMPackageld
	IpduMDevErrorDetect
	IpduMStaticPartExists
	IpduMVersionInfoApi
	IpduMTransmissionRequired
	IpduMReceiveRequired
	IpduMTransmissionConfirmationRequired
	IpduMTxStaticRequired
	IpduMRxStaticRequired
IpduMPublishedInformation	IpduMRxDirectComInvocation
IpduMTxStaticPart	IpduMTxStaticConfirmation
	IpduMTxStaticHandleId

ERR052006: The value configured for the parameter 'Parameter Name' in the container 'Container Name' should follow the pattern: <Pattern>

This error occurs, when the parameter 'Parameter Name' is not configured as per the pattern.

Parameter Name	Container Name	Pattern	Example
AR-RELEASE-VERSION	BSW-IMPLEMENTATION	<4.[0-9]+.[0-9]+>	4.0.3

Parameter Name	Container Name	Pattern	Example
SW-VERSION			

ERR052013: The reference path <value> provided for the parameter 'parameter name' in the container 'container name', having short name 'short name' is incorrect.

This error occurs, if reference provided for any of the below mentioned parameters is incorrect:

Parameter Name	Container Name
IpduMRxIndicationPduRef	IpduMRxIndication
IpduMOutgoingDynamicPduRef	IpduMRxDynamicPart
IpduMOutgoingStaticPduRef	IpduMRxStaticPart
IpduMInitialDynamicPart	IpduMTxRequest
IpduMOutgoingPduRef	IpduMTxRequest
IpduMTxDynamicPduRef	IpduMTxDynamicPart
IpduMTxStaticPduRef	IpduMTxStaticPart

ERR052022: Value of parameter 'value of the parameter IpduMConfigurationTimeBase' should be greater than 0 in the container 'IpduMGeneral'.

This error occurs, if value of the parameter 'IpduMConfigurationTimeBase' in the container 'IpduMGeneral' is configured as 0.

ERR052051: Value of the parameter 'IpduMTxStaticHandleId' of the container 'IpduMTxStaticPart' should follow 'IpduMTxDynamicHandleId' of the container 'IpduMTxDynamicPart'.

This error occurs, if the value configured for the parameter IpduMtxStaticHandleId in the container IpduMTxStaticPart is not following IpduMTxDynamicHandleId in the container IpduMTxDynamicPart.

ERR052052: At least one 'IpduMTxPathway' or 'IpduMRxPathway' container should be configured in the input file.

This error occurs, if Container 'IpduMTxPathway' or 'IpduMRxPathway' is not configured.

ERR052053: Tx Handle ID is repeated across the below paths.

Path1: <Path of the container IpduMTxStaticPart or IpduMTxDynamicPart>

Path2: <Path of the container IpduMTxStaticPart or IpduMTxDynamicPart>

This error occurs, if Tx Handle ID repeated across. Handle Id should be unique across the following parameters:

Parameter Name	Container Name
IpduMTxStaticHandleId	IpduMTxStaticPart
IpduMTxDynamicHandleId	IpduMTxDynamicPart

ERR052054: Handle ID is repeated across the below paths.

Path1: <Path1 of the container IpduMRxIndication>

Path2: <Path2 of the container IpduMRxIndication>

This error occurs, if Handle ID repeated across the container:

Parameter Name	Container Name
IpduMRxHandleId	IpduMRxIndication

ERR052055: Value of reference parameter 'parameter name' in the I-PDU 'I-PDU name' does not have an equivalent I-PDU in the <module name> module.

This error occurs, if the reference path configured for any of the following parameters of the container is not found in PduR/Com module.

Parameter Name	Container Name	Module Name
IpduMOutgoingDynamicPduRef	IpduMRxDynamicPart	Com/PduR
IpduMOutgoingStaticPduRef	IpduMRxStaticPart	
IpduMOutgoingPduRef	IpduMTxRequest	PduR

ERR052056: Start Bit <Value> and End Bit <Value> of the Selector Field should lie in the same byte.

If the sum of parameters IpduMSelectorFieldPosition and IpduMSelectorFieldLength decremented by 1 i.e. $((\text{IpduMSelectorFieldPosition} + \text{IpduMSelectorFieldLength}) - 1)$ does not lie within the same byte for the selector field in the container 'IpduMSelectorField'.

For example,

IpduMSelectorFieldPosition	IpduMSelectorFieldLength	Validity
0	7	Valid
0	8	Invalid
5	7	Valid
14	17	Invalid
20	26	Invalid

ERR052057: Referred 'PduLength' configured in the container Pdu in EcuC module should be greater than or equal to the Maximum End bit divided by 8 and truncated to its higher value of 'IpduMTxRequest' in IpduM Module.

This error occurs, if the reference length configured for the container Pdu in EcuC which is referred from the parameter 'IpduMOutgoingPduRef' in the container 'IpduMTxRequest' is less than the Maximum End bit divided by 8 and truncated to its higher value.

ERR052058: The reference path <Shortname of the Path> configured for the parameter 'Parameter Name' in the container 'Container Name' is not matching with the reference configured in the EcuC module.

This error occurs, if reference path configured for the Parameter 'Parameter Name' in the container 'Container Name' is not matching with the reference configured in the EcuC module.

Parameter Name	Container Name
IpduMOutgoingStaticPduRef	IpduMRxStaticPart
IpduMOutgoingDynamicPduRef	IpduMRxDynamicPart
IpduMTxStaticPduRef	IpduMTxStaticPart
IpduMTxDynamicPduRef	IpduMTxDynamicPart
IpduMOutgoingPduRef	IpduMTxRequest

ERR052059: The reference path <Shortname of the Path> configured for the parameter 'Parameter Name' in the container 'Container Name' is not configured with the reference configured in the EcuC module.

This error occurs, if Parameter 'Parameter Name' in the container 'Container Name' is not configured in the EcuC module.

Parameter Name	Container Name
IpduMOutgoingStaticPduRef	IpduMRxStaticPart
IpduMOutgoingDynamicPduRef	IpduMRxDynamicPart
IpduMTxStaticPduRef	IpduMTxStaticPart
IpduMTxDynamicPduRef	IpduMTxDynamicPart
IpduMOutgoingPduRef	IpduMTxRequest

ERR052060: Parameter 'IpduMStaticPartExists' should be configured as <false>, since no static part is configured in the IpduM module.

This error occurs, if the value of the parameter 'IpduMStaticPartExists' is configured as true, and both the below mentioned containers are not configured.

Container Name	Parent Container Name
IpduMTxStaticPart	IpduMTxRequest
IpduMRxStaticPart	IpduMRxIndication

ERR052061: Value of the parameters 'IpduMTxStaticHandleId' and 'IpduMTxDynamicHandleId' should start with <0> and should be sequential in the container 'IpduMTxStaticPart' and 'IpduMTxDynamicPart' respectively.

This error occurs, if the values of parameters TxStaticHandleId and TxDynamicHandleId together do not start with 0 or are not sequential.

ERR052062: Referred 'PduLength' configured in the container 'Pdu' in EcuC module should be greater than or equal to the calculated IpduSize of 'IpduMRxIndication' in IpduM Module.

This error occurs, if the Pdulength configured in the container Pdu in EcuC module is less than the calculated IpduSize of 'Parameter Name' in IpduM module.

ERR052063: Module Com is not present in the input file(s). Com should be given as input, since the parameter 'value of the parameter IpduMRxDirectComInvocation' is configured as <true/1> in the container 'IpduMPublishedInformation'.

This error occurs, if Com module is not present in the input file(s).

ERR052064: Start Bits in Segments are overlapping in the below paths.

Path1: <Path of the container IpduMSegment>

Path2: <Path of the container IpduMSegment>

This error occurs, if IpduM Dynamic part segments 'provided in Path1' is overlapping with static part segments 'provided in pat00682' in a container 'Container Name' within a Configuration Set.

Container Name	Path1	Path2
IpduMRxPathway	"IpduMRxIndication"--> "IPduMRxDynamicPart"-- >"IpduMSegment"	"IpduMRxIndication"--> "IPduMRxStaticPart"-- >"IpduMSegment"
IpduMTxPathway	"IpduMTxRequest"--> "IPduMTxDynamicPart"-- >"IpduMSegment"	"IpduMTxRequest"--> "IPduMTxStaticPart"-- >"IpduMSegment"

ERR052065: The value configured for the parameter 'IpduMTxConfirmationPduld' should be unique in the container 'IpduMTxRequest'.

This error occurs, if the value of the parameter IpduMTxConfirmationPduld in the container IpduMTxRequest is not unique.

ERR052066: The value configured for the parameter 'IpduMTxConfirmationPduld' should start with <0> and should be sequential in the container 'IpduMTxRequest'.

This error occurs, if the value of the parameter IpduMTxConfirmationPduld in the container IpduMTxRequest doesn't start from 0 and is not sequential.

ERR052067: Value of the parameter 'ComIPduHandleId' in the container 'ComIPdu' is not configured, since parameter 'ComIPduHandleId' is referred by the reference path ComPduldRef for the parameter 'Parameter Name' in the container 'Container Name'.

This error occurs, if the parameter "ComIPduHandleId" in the container "ComIPdu" is not configured.

Parameter Name	Container Name
IpduMOutgoingDynamicPduRef	IpduMRxDynamicPart
IpduMOutgoingStaticPduRef	IpduMRxStaticPart
IpduMTxStaticPduRef	IpduMTxStaticPart
IpduMTxDynamicPduRef	IpduMTxDynamicPart

ERR052068: Value of reference parameter 'IpduMTxStaticPduRef/ IpduMTxDynamicPduRef ' in the I-PDU IpduMTxStaticPart/ IpduMTxDynamicPart does not have an equivalent I-PDU in the Com module.

This error occurs, if the reference path for the parameter IpduMTxStaticPduRef/ IpduMTxDynamicPduRef is not equal to the reference path of parameter ComPduldRef

ERR052069: Value of the parameter 'IpduMTxConfirmationPduld' should be configured, when value configured for the parameter 'IpduMTxTriggerMode' is 'NONE'

This error occurs, if Value of the parameter 'IpduMTxConfirmationPduld' is not configured, when value configured for the parameter 'IpduMTxTriggerMode' is 'NONE'

ERR052070: EcuC_PduLength in the module EcuC should be greater than endbit value <value> for segment.

This error occurs, if EcuC_PduLength in the module EcuC is not greater than endbit value.

ERR052071: Value of the parameter 'IpduMJitUpdate' should be false, when value configured for the parameter 'IpduMTxTriggerMode' is 'STATIC_OR_DYNAMIC_PART_TRIGGER'.

This error occurs, if Value of the parameter 'IpduMJitUpdate' is not configured as false, when value configured for the parameter 'IpduMTxTriggerMode' is 'STATIC_OR_DYNAMIC_PART_TRIGGER'

7.2.2 Warning Messages

WRN052051: Parameter 'IpduMStaticPartExists' should be configured as <true>, since static part is configured in the IpduM module.

This warning message occurs, if value of the parameter 'IpduMStaticPartExists' is configured as false, and the lower multiplicity of the below containers is greater than 0.

Container Name	Sub-container Name
IpduMTxStaticPart	IpduMTxRequest
IpduMRxStaticPart	IpduMRxIndication

WRN052052: Value of the parameter 'IpduMTxConfirmationTimeout' should be multiple of the parameter 'IpduMConfigurationTimeBase'.

This warning message occurs, when value of the parameter 'IpduMTxConfirmationTimeout' is not configured as exact multiple of value the parameter 'IpduMConfigurationTimeBase'.

7.2.3 Information Messages

INF000001: Command line arguments: arguments on the command line provided.

This information message is displayed with all the arguments (input file(s), options, executable) specified on the command line.

INF000002: The valid inputs are provided below.

AUTOSAR IpduM Generation Tool

USAGE:

Tool Executable [<Options>] [<Input Filename>]

Input Filename: ECU Configuration Description File

Options: [-H/-Help -V/-Version -O/-Output -L/-Log -D/-Dryrun -W/-Warn -I/-Info]

Please run the exe Tool Executable using -H option.

This information message is displayed, if no inputs for tool are provided on the command line.

INF000003: Opened file <file name> at [opening date and time].

This information message displays the date and time at the opening of C Source and C Header file(s). In this message, the format of opening date and time is as follows:

[DD Mmm YYYY - HH:MM:SS]

In case of 1-9 day, a space will be provided before DD with considering DD as single digit in above format.

For example,

[21 Sep 2008 - 14:25:04] and [1 Sep 2008 - 14:22:34]

INF000004: <Number of errors> Error(s) and <number of warnings> Warning(s) detected.

This information message displays the total number of error(s) and warning(s).

INF000005: Execution completed successfully.

This information message is displayed, if the execution of the Generation Tool completes successfully without error(s) and warning(s).

INF000006: Execution completed successfully with warnings.

This information message is displayed, if the execution of the Generation Tool completes successfully with warning(s).

INF000007: Execution terminated due to command line errors.

This information message is displayed, if the execution of the Generation Tool terminates due to command line error(s).

INF000008: Execution terminated due to error in the input file.

This information message is displayed, if the execution of the Generation Tool terminates due to

error(s) in user configuration.

INF000009: Execution terminated due to error with structure generation in output file.

This information message is displayed, if the execution of the Generation Tool terminates due to error(s) with structure generation in output file.

INF052051: Dynamic part selector bit <value> is not part of any dynamic part segments in the dynamic part.

This information message is displayed, if Dynamic part selector bit <value> is not part of any dynamic part segments in the dynamic part.

8 Det Error

Detected development errors shall be reported to the Det_ReportError(uint16 ModuleId, uint8 InstanceId, uint8 Apid, uint8 ErrorId) service of the Development Error Tracer (DET) if the pre-processor switch IPDUM_DEV_ERROR_DETECT is set "on".

8.1 Error Classification

Type of error	Relevance	Related error code	Value
This error used with wrong parameter	Development	IPDUM_E_PARAM	0x10
This error used with a NULL pointer. In case of this error, the API service shall return immediately without any further action, except for reporting	Development	IPDUM_E_PARAM_POINTER	0x11
This error used when service used without module initialization	Development	IPDUM_E_UNINIT	0x20

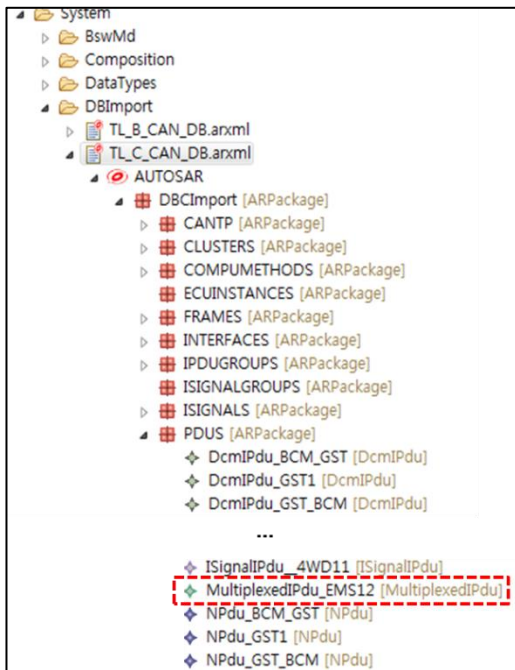
8.1.1 Service ID

CanIf function name	Service ID[hex]
IpduM_Init	0x00
IpduM_GetVersionInfo	0x01
IpduM_Transmit	0x03
IpduM_MainFunction	0x10
IpduM_TxConfirmation	0x40
IpduM_TriggerTransmit	0x41
IpduM_RxIndication	0x42

9 Appendix

9.1 Multiplexed Message 유/무 확인

CAN DB Import 가 끝난 후, DBImport 폴더 아래에 추가된 DB arxml 파일을 확인한다.
PDUS 경로에서 Multiplex Message 가 있는지 확인한다. (MultiplexedIPdu)



9.2 Multiplexed Message 사용 시 유의점

- Multiplexed Message의 Multiplexor에 해당하는 Signal은 RTE를 통해서 Write를 하면 안됨
- 아래 화면에서 MUL_CODE Signal은 Multiplexor에 해당하는 값으로, Com의 Init Value을 유지 해야 한다.(업데이트가 되어서는 안된다)
- 해당 시그널은 각각의 Dynamic PDU에 포함이 되어 있으며 Com 모듈에 설정 된 Init Value가 Selector Field와 맞지 않다면, 확인 후 초기 값(아래 화면에서는 1혹은 3)을 설정해야 한다.

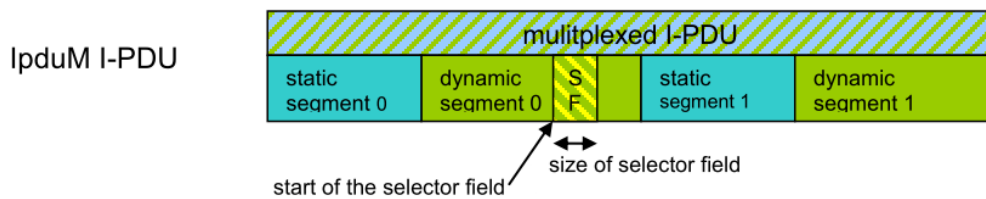
Name	Message	Multiplexing/Group
TQ_STND	EMS12	MUL_CODE = 0x3
CONF_TCU	EMS12	MUL_CODE = 0x1
MUL_CODE	EMS12	Multiplexor
TEMP_ENG	EMS12	-
BRAKE_ACT	EMS12	-
ENG_CHR	EMS12	-
TPS	EMS12	-
PV_AV_CAN	EMS12	-
ENG_VOL	EMS12	-

9.3 Multiplexed Message 의 수신정책

- Multiplexed Message(multiplexed I-PDU)는 static part와 dynamic part로 구성된다.

Static part : 아래 그림의 파란색에 해당되는 부분으로, multiplexer(selector field)에 영향을 받지 않고 고정적으로 송/수신 되는 부분.

Dynamic part : 아래 그림의 녹색에 해당되는 부분으로, multiplexer(selector field)에 따라 signal(segment) 종류 및 배치가 달라지는 부분.



- Dynamic part(dynamic I-PDU)에 해당되는 부분은 AUTOSAR에서는 아래 그림과 같이 multiplexer(selector field)와 dynamic signal(dynamic segment)을 포함하며, 이렇게 두 개 부분이 합쳐진 것을 Com Module에서는 하나의 PDU로 정의하여 처리한다. Dynamic part 각각에 대해서 Com Module에서는 개별적인 PDU로 정의하며 multiplexer(selector field)는 각각의 PDU에 포함된 하나의 signal로 처리한다.

COM I-PDU

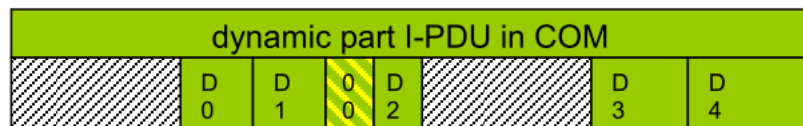
static part
containing signals
S0, S1, S2 and S3



static part
I-PDU may be
shortened

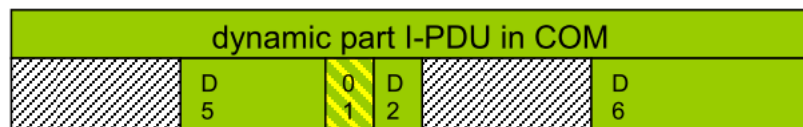
COM I-PDU

dynamic part layout 00
containing signals D0,
D1, D2, D3 and D4



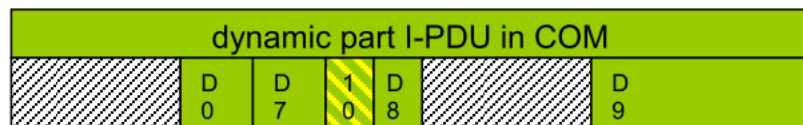
COM I-PDU

dynamic part layout 01
containing signals D2,
D5 and D6



COM I-PDU

dynamic part layout 10
containing signals D0,
D7, D8 and D9



- IpduM Module은 configuration된 multiplexer(selector field)외의 값을 가지는 Multiplexed Message(Multiplexed I-PDU)의 dynamic part(dynamic I-PDU)는 버린다. 즉, Com Module로 전달하지 않는다. 마찬가지로 Com Module에서도 수신받기로 되어있는 dynamic part(dynamic I-

PDU)만 정의한다.

- Com Module에서는 수신받지 않는 PDU의 signal을 정의할 수 없으므로, 결론적으로 application에서는 IpduM Module에 설정되지 않은 multiplexer(selector field)은 읽을 수 있는 방법은 없다. IpduM Module에 설정이 되지 않았다는 것은 CAN DB상에서 수신받지 않는 signal로 정의가 되었다는 의미이다.
- 예를들어 아래의 경우, MUL_CODE가 1이나 3에 해당되는 TQ_STND signal과 CONF_TCU signal은 Com Module에 아래와 같이 dynamic part(dynamic I-PDU)에 정의가 되며, IpduM Module에서 수신처리를 한다.

Dynamic I-PDU1(TQ_STND signal + MUL_CODE1 signal)

Dynamic I-PDU3(CONF_TCU signal + MUL_CODE3 signal)

Name	Message	Multiplexing/Group
TQ_STND	EMS12	MUL_CODE = 0x3
CONF_TCU	EMS12	MUL_CODE = 0x1
MUL_CODE	EMS12	Multiplexor
TEMP_ENG	EMS12	-
BRAKE_ACT	EMS12	-
ENG_CHR	EMS12	-
TPS	EMS12	-
PV_AV_CAN	EMS12	-
ENG_VOL	EMS12	-

- IpduM에서 수신처리를 한다. 하지만 MUL_CODE가 0이나 2로 들어오는 경우는 버리게 되며 Com Module에도 정의되어 있지 않다. 위에설명한 것과 같이 multiplexer(selector field)는 각 dynamic part(dynamic I-PDU)에 포함된 signal이기 때문에, application에서는 MUL_CODE signal값을 읽는 경우, 1과 3이외의 값을 받을 수 없다.

9.4 IpduM 모듈 활성화 방법

- Multiplexed Msg. 관련 설정 요구사항이 SRS 상에 없더라도 기본적으로 프로젝트에 배포된다 (/AUTRON/IpduM/IpduMGeneral/IpduMEnableModule 이 False)
- 만약 사용자가 목적에 따라 IpduM을 사용하고자 하면, 관련 DB를 Import 및 Harmonize 하고, IpduMEnableModule 을 True로 변경 하면 된다.