Document Title	Specification of Service Discovery
Document Owner	AUTOSAR
Document Responsibility	AUTOSAR
Document Identification No	616
Document Status	Final
Part of AUTOSAR Standard	Classic Platform
Part of Standard Release	4.4.0

Document Change History

Date	Release	Changed by	Change Description
2018-10-31	4.4.0	AUTOSAR Release Management	• Retry subscription feature added • Load Balancing Option added • Minor bugfixes
2017-12-08	4.3.1	AUTOSAR Release Management	• Several minor bugfixes • Editorial changes
2016-11-30	4.3.0	AUTOSAR Release Management	• Major improvement (SoAd interaction) • Several bugfixes • Editorial changes
2015-07-31	4.2.2	AUTOSAR Release Management	• Debugging support marked as obsolete • Clarifications • Minor bugfixes
2014-10-31	4.2.1	AUTOSAR Release Management	• Fixed Service Migration support at client side • Support for more efficient SoAd interface • Optimized StopSubscribe/Subscribe load
2014-03-31	4.1.3	AUTOSAR Release Management	• Editorial changes • More detailed endpoint handling • More detailed message building
2013-10-31	4.1.2	AUTOSAR Release Management	• No major changes have been made • Editorial changes • Removed chapter(s) on change documentation
2013-03-15	4.1.1	AUTOSAR Administration	• Initial Release

Disclaimer

Table of Contents

1 Introduction and functional overview

The AUTOSAR Service Discovery module offers functionality to detect and offer available services – i.e. functional entities – within the vehicle network. To do so, it makes use of the IP Multicast and so called SOME/IP-SD messages.

The Service Discovery module (Sd) is located between the AUTOSAR BSW Mode Manager module (BswM) and the AUTOSAR Socket Adaptor module (SoAd).

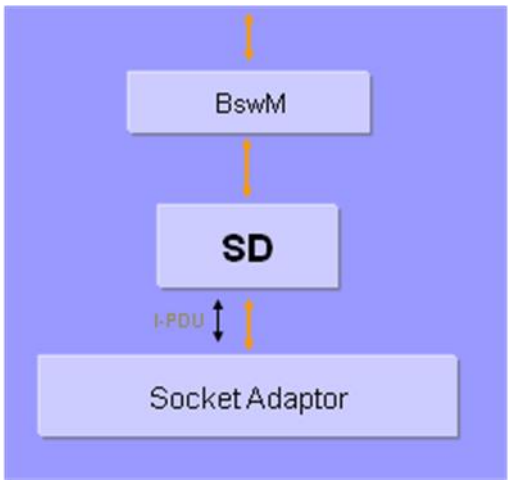


Figure 1 – Interaction of the AUTOSAR Service Discovery module

2 Acronyms and abbreviations

Abbreviation / Acronym:	*Description:*
BswM	Basis software manager
ECU	Electronic Control Unit
DEM	Diagnostic Event Manager
DET	Default Error Tracer
SD	Service Discovery
Sd	Service Discovery Module in AUTOSAR
SoAd	Socket Adaptor
SOME/IP	Scalable service-Oriented MiddlwarE over IP
SOME/IP-SD	SOME/IP Service Discovery

3 Related documentation

3.1 Input documents

[1] AUTOSAR Layered Software Architecture:
AUTOSAR_EXP_LayeredSoftwareArchitecture.pdf

[2] AUTOSAR Basis Software Mode Manager:
AUTOSAR_SWS_BSWModeManager.pdf

[3] AUTOSAR Socket Adaptor:
AUTOSAR_SWS_SocketAdaptor.pdf

[4] AUTOSAR SRS BSW General
AUTOSAR_SRS_BSWGeneral.pdf

[5] AUTOSAR PRS SOME/IP Service Discovery Protocol
AUTOSAR_PRS_SOMEIPServiceDiscoveryProtocol.pdf

[6] AUTOSAR RS SOME/IP Service Discovery Protocol
AUTOSAR_RS_SOMEIPServiceDiscoveryProtocol.pdf

3.2 Related standards and norms

N/A

4 Constraints and assumptions

4.1 Limitations

Although the AUTOSAR SD is able to respond to wildcard requests (ANY) for Service ID, Instance ID, Major Version, and Minor Version, this module is only able to send wildcard finds for Minor Version.

This document does not yet contain trace links to the SRS Ethernet, therefore, the trace table is empty.

Load Balancing Option (Priority field and Weight field) can be configured for the OfferServices. However, the Client does not evaluate these fields.

4.2 Applicability to car domains

N/A

5 Dependencies to other modules

5.1 AUTOSAR BSW Scheduler

The BSW Scheduler calls the main functions of the Service Discovery module, which is necessary for the cyclic processes of the Service Discovery.

5.2 AUTOSAR BSW Mode Manager

The BswM module provides the link between the generic mode requests and the service requests.

5.3 AUTOSAR Socked Adaptor

The Socked Adaptor hands over service requests between the Ethernet Stack and the Service Discovery Module.

The Service Discovery module shall be able to activate and de-activate the PDU routing from and to TCP/IP-sockets and trigger the initial transport of events (triggered transmit).

The SoAds Socket Connection Table needs to be pre-configured to receive the unicast and multicast messages sent by Service Discovery modules of other ECUs. As the ECU might be connected to multiple (virtual) networks, there can exist multiple Service Discovery Instances, which may have multiple Socket Connection Table entries. The triples of Unicast Rx, Multicast Rx, and Tx PduIDs for each (virtual) interface need to be configured in the SoAd and known to the Service Discovery module.

Additionally the Service Discovery module updates endpoint information (IP address and port number) in socket connections (SoAdSocketConnection), which the Service Discovery module extracts from received Service Discovery messages.

For robustness reasons these UDP Sockets should only be used for SD messages and the option `SoAdSocketUdpStrictHeaderLenCheckEnabled`should be turned on.

5.4 AUTOSAR Default Error Tracer

In order to be able to report development errors, the Service Discovery module has to have access to the error hook of the Default Error Tracer.

5.5 AUTOSAR Diagnostic Event Manager

In order to be able to report production errors the Service Discovery module has to have access to the Diagnostic Event Manager.

5.6 File structure

5.6.1 Code file structure

[SWS_SD_00001]⌈
The code file structure shall not be defined within this specification completely. At this point it shall be pointed out that the code-file structure shall include the following files named:

- Sd_Lcfg.c – for link time configurable parameters and
- Sd_PBcfg.c – for post build time configurable parameters.

These files shall contain all link time and post-build time configurable parameters.
⌋()

5.6.2 Header file structure

[SWS_SD_00003] ⌈
The module shall include the Dem.h file. By this inclusion, the APIs to report errors as well as the required Event Id symbols are included.
⌋()

6 Requirements traceability

Requirement	Description	Satisfied by

7 Functional specification

7.1 Background & Rationale

The main tasks of the Service Discovery Module are managing the availability of functional entities called *services* in the in-vehicle communication as well as controlling the send behavior of event messages. This allows sending only event messages to receivers requiring them (Publish/Subscribe). The solution described here is also known as SOME/IP-SD (Scalable service-Oriented MiddlewarE over IP – Service Discovery).

With Service Discovery different ECUs can offer Service Instances and find available Service Instances within the vehicle network. An ECU can stop offering a Service Instance it was offering before. Later finds to such a service instance will remain unanswered. Service Instances are single implementations of a service that is defined by its service interface. In the AUTOSAR context, a find is an operation to identify available Service Instances and their locations.

In addition to the status of Service Instances, the Service Discovery is able to control sending special messages called events. These events are grouped into Eventgroups, which the Service Discovery can turn on/off in a Publish/Subscribe manner; thus, turning the sending and receiving of the events of this Eventgroup on/off.

For the remainder of this document, the following definitions apply:

- Service – A functional entity that offers an interface.
- Service Instance – A single instance of the Service.
- Offer – A message entry that offers a Service Instance.
- Stop Offer – A message that stops offering a Service Instance.
- Find – A message entry used to find a Service Instance.
- Event – a message send by an ECU implementing a Service Instance to an ECU using this Service Instance.
- Eventgroup – A logical grouping of 1 or more events. An Eventgroup is part of a Service.

Figure 2 shows the interaction between Services and Eventgroups. On the abstract level, the service can contain zero to many Eventgroups. However, when creating the overall system, this information has to be configured into different ECUs with different roles (clients and servers). When instancing the Services and the contained Eventgroups, the ServerServices and ClientServices as well as the EventHandlers and ConsumedEventgroups are instantiated from the Services and Eventgroups.

A local ECU needs to deal with two different kinds of services:

- Server Services – The local ECU **offers** *Server Service Instances* (i.e. located locally) to the rest of the vehicle and can be considered the server for this Service Instance.
- Client Services – The local ECU **may use** *Server Service Instances* offered by another ECU inside the vehicle and can be considered a client to this Service Instance.

For Server Services the local ECUs Service Discovery module has to (server role):

- Offer the local service, when it is available; i.e. the SWC(s) offering the service are ready and the service is available in the current state of the ECU.
- Take back the offer of the local service (stop offer), when the service is no longer available.
- Answer and respond to finds of other ECUs.

For Client Services the local ECUs Service Discovery module has to (client role):

- Listen for offers and finds depending of the configuration store this information in volatile memory.
- Listen for stop offers and depending of the configuration store this information in volatile memory.
- Send finds depending on the state of the current ECU and its SWCs.

Service Discovery can be used to manage Publish/Subscribe relationships as well. In the Service Discovery based Publish/Subscribe use-case one ECU (Publish/Subscribe Client with ConsumedEventgroup) is interested in receiving some data from (subscribing to) another ECU (Publish/Subscribe Server with EventHandler).

While the Subscribe is defined explicitly in the SD message, the Publish is based on the availability of the service Instance itself (OfferService entry). Based on the offered Service Instance the Publish/Subscribe Client may subscribe via SubscribeEventgroup entries. The Publish/Subscribe Server will now use this subscription to register the Publish/Subscribe Client as an interested party in some information specified by the subscription and start sending that information to the Publish/Subscribe Client pending some event or time-out.

As optimization, the SD supports sending event messages to multiple clients using single multicast messages instead of a unicast message per client.

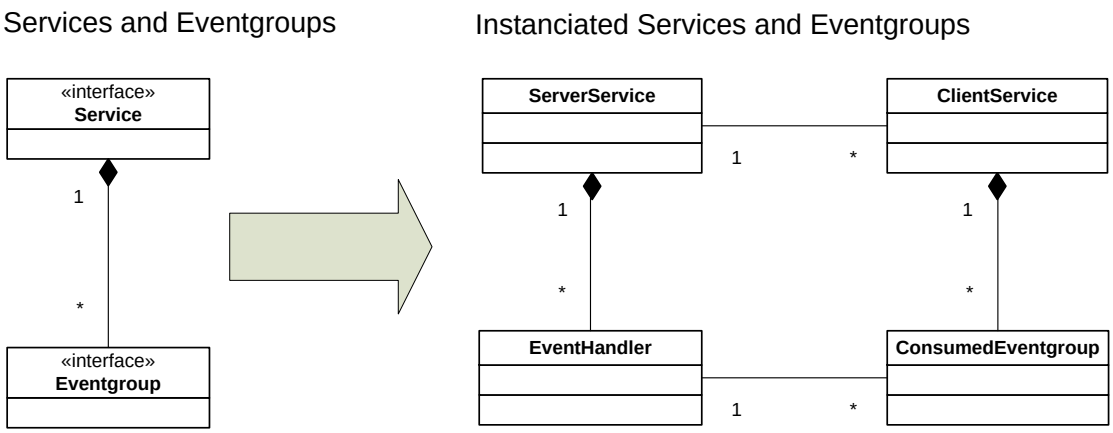


Figure 2 – Overview of Services and Eventgroups

7.2 Requirements

7.2.1 General requirements

[SWS_SD_00400]⌈
It shall be possible to configure the Service Discovery module as an optional AUTOSAR BSW Module. Please refer to the SystemTemplate for configuration.
⌋()

[SWS_SD_00004]⌈
The Service Discovery shall implement a main function, which shall be called cyclically according to configuration parameter `SdMainFunctionCycleTime`.
⌋()

[SWS_SD_00005]⌈
The Service Discovery module shall store the ServiceModeRequest, which is provided via the BswM by calling the
APIs `Sd_ServerServiceSetState()`, `Sd_ClientServiceSetState()`, and `Sd_ConsumedEventGroupSetState()` respectively.
`Sd_EventHandlerSetState()` does currently not exist, since this state is directly deduced from the state of Server Service by the Service Discovery.
⌋()

Note:
Based on the interaction with SWCs, the following modes can be requested by the BswM module:

Server SWCs via `Sd_ServerServiceSetState()`:
- `SD_SERVER_SERVICE_DOWN`
- `SD_SERVER_SERVICE_AVAILABLE`

Client SWCs via `Sd_ClientServiceSetState()`:
- `SD_CLIENT_SERVICE_RELEASED`
- `SD_CLIENT_SERVICE_REQUESTED`

Client SWCs via `Sd_ConsumedEventGroupSetState()`
- `SD_CONSUMED_EVENTGROUP_RELEASED`
- `SD_CONSUMED_EVENTGROUP_REQUESTED`

"`SD_SERVER_SERVICE_DOWN`" implies that the local SWC(s) offering this Service Instance are not ready to communicate,

"`SD_SERVER_SERVICE_AVAILABLE`" implies that the local SWC(s) offering this Service Instance are ready to communicate,

"`SD_CLIENT_SERVICE_RELEASED`" implies that the local SWC(s) using this Service Instance do not need to communicate with this Service Instance,

“SD_CLIENT_SERVICE_REQUESTED” implies that the local SWC(s) using this service is ready to communicate with this Service Instance and needs this Service Instance,

“SD_CONSUMED_EVENTGROUP_RELEASED” implies that the local SWC(s) using this Consumed Eventgroup do not need the events of this Consumed Eventgroup,

“SD_CONSUMED_EVENTGROUP_REQUESTED” implies that the local SWC(s) using this Consumed Eventgroup need the events of this Consumed Eventgroup.

[SWS_SD_00007]⌈
The following CurrentStates shall be available for reporting to BswM module via BswM_Sd_ClientServiceCurrentState(), BswM_Sd_ConsumedEventGroupCurrentState(), and BswM_Sd_EventHandlerCurrentState() respectively:

- SD_CLIENT_SERVICE_DOWN
- SD_CLIENT_SERVICE_AVAILABLE

- SD_CONSUMED_EVENTGROUP_DOWN
- SD_CONSUMED_EVENTGROUP_AVAILABLE

- SD_EVENT_HANDLER_RELEASED
- SD_EVENT_HANDLER_REQUESTED

⌋()

Note:
“SD_CLIENT_SERVICE_DOWN” tells the local SWC(s) that this Service Instance is not available,

“SD_CLIENT_SERVICE_AVAILABLE” tells the local SWC(s) that this Service Instance is available,

“SD_CONSUMED_EVENTGROUP_DOWN” tells the local SWC(s) that this Consumed Eventgroup is not currently subscribed,

“SD_CONSUMED_EVENTGROUP_AVAILABLE” tells the local SWC(s) that this Consumed Eventgroup is currently subscribed (i.e. events are received),

“SD_EVENT_HANDLER_RELEASED” tells the local SWC(s) that no client is currently subscribed to this Eventgroup,

“SD_EVENT_HANDLER_REQUESTED” tells the local SWC(s) that at least one client is currently subscribed to this Eventgroup.

[SWS_SD_00011]⌈
Every configured Server Service Instance shall have an ECU wide, unique SdServerServiceHandleId.
⌋()

[SWS_SD_00437]⌈
Every configured Client Service Instance shall have an ECU wide, unique `SdClientServiceHandleId`.
⌋()

[SWS_SD_00438]⌈
Every configured Consumed Event Group shall have an ECU wide, unique `SdConsumedEventGroupHandleId`.
⌋()

[SWS_SD_00439]⌈
Every configured Event Handler shall have an ECU wide, unique `SdEventHandlerHandleId`.
⌋()

Note for SWS_SD_00011, _00437, _00438, and _00439:
The IDs defined by the above requirements are needed in order to identify the Service Instances and Eventgroups in the control API between Sd and BswM.

This is even valid for Instances or Eventgroups with the same Service ID and/or the same Service Instance ID.

7.2.2 Ethernet Communication

[SWS_SD_00013]⌈
Every Service Discovery Configuration Instance (see configuration container `SdInstance`) shall have at least one TxPdu ID, one RxPdu ID for Unicast, and one RxPdu ID for Multicast (see configuration parameter `SdInstanceTxPdu`, `SdInstanceUnicastRxPdu`, and `SdInstanceMulticastRxPdu` respectively).
⌋()

[SWS_SD_00017]⌈
For different links, separate Service Discovery instance containers shall be configured.
⌋()

Note:
Links in this regards also includes different virtual links using Ethernet VLANs.

[SWS_SD_00697]⌈
A SD Instance does only support a single Address Family (i.e. IPv4 or IPv6). This address family shall be learned by means of the SoAd configuration of SdInstanceTxPdu, SdInstanceUnicastRxPdu, and SdInstanceMulticastRxPdu (local address).
⌋()

[SWS_SD_00723]⌈

During initialization of the SD module, the API SoAd_OpenSoCon() shall be called for all Socket Connections associated with SdInstanceTxPdu, SdInstanceUnicastRxPdu and SdInstanceMulticastRxPdu.
](

Note:
The SoAd module needs to be initialized before the SD module is initialized.

Note:
An implementer has to guarantee that SoAd_SetUniqueRemoteAddr(), SoAd_GetLocalAddr(), and SoAd_SetRemoteAddr() can never return errors by validating the source code and configuration of Service Discovery and Socket Adaptor. Failures of SoAd_SetUniqueRemoteAddr(), SoAd_GetLocalAddr(), and SoAd_SetRemoteAddr() cannot be recovered from.

7.2.3 State Handling

[SWS_SD_00019][
The Service Discovery module shall store the status of all statically configured Service Instances and Eventgroups separately.
](

[SWS_SD_00020][
After initialization of the Service Discovery module by the call of the API Sd_Init(), all configured Server Service Instances shall have the state "SD_SERVER_SERVICE_DOWN", unless a Server Service Instance has SdServerServiceAutoAvailable set to true, then the state shall be set to "SD_SERVER_SERVICE_AVAILABLE".
](

[SWS_SD_00021][
After initialization of the Service Discovery module by calling of the API Sd_Init(), all configured Client Service Instances shall have the state "SD_CLIENT_SERVICE_RELEASED", unless a Client Service Instance has SdClientServiceAutoRequired set to true, then the state shall be set to "SD_CLIENT_SERVICE_REQUESTED".
](

[SWS_SD_00440][
After initialization of the Service Discovery module by calling of the API Sd_Init(), all configured Eventgroups shall have the state "SD_CONSUMED_EVENTGROUP_RELEASED", unless a Consumed Eventgroup has "SdConsumedEventGroupAutoRequired" set to true, then the state shall be set to "SD_CONSUMED_EVENTGROUP_REQUESTED" as soon as the associated Client Service Instance is requested.
](

[SWS_SD_00402]⌈
The Service Discovery module shall store all IP address assignment states referenced by server and client Service Instances.
⌋()

[SWS_SD_00442]⌈
If `Sd_ConsumedEventGroupSetState` is called with `SD_CONSUMED_EVENTGROUP_REQUESTED` while its Client Service Instance is still released (`SD_CLIENT_SERVICE_RELEASED`) E_NO_OK shall be returned.
⌋()

[SWS_SD_00443]⌈
If `Sd_ClientServiceSetState()` is called with `SD_CLIENT_SERVICE_RELEASED` while one or more of its Eventgroups are still requested (`SD_CONSUMED_EVENTGROUP_REQUESTED`) the Service Discovery shall interpret this the same way as these Eventgroups were called with `SD_CONSUMED_EVENTGROUP_RELEASED` first.
⌋()

7.2.4 Interaction with Socket Adaptor

[SWS_SD_00024]⌈
The Service Discovery module shall be able to enable/disable routing groups within the SoAd module using the APIs `SoAd_EnableRouting()`, `SoAd_DisableRouting()`, `SoAd_EnableSpecificRouting()`, and `SoAd_DisableSpecificRouting()` for Server- and Client Service Instances.
⌋()

[SWS_SD_00699]⌈The Service Discovery module shall be able to trigger the sending of initial Events using the API `SoAd_IfSpecificRoutingGroupTransmit()`.
⌋()

[SWS_SD_00026]⌈
The Service Discovery module shall be able to reference RoutingGroup(s) per Service Instance/Eventgroup. See the following configuration parameters:

- `SdClientServiceActivationRef (in SdConsumedMethods)`
- `SdConsumedEventGroupMulticastActivationRef`
- `SdConsumedEventGroupTcpActivationRef`
- `SdConsumedEventGroupUdpActivationRef`
- `SdServerServiceActivationRef (in SdProvidedMethods)`
- `SdEventActivationRef (in SdEventHandlerMulticast)`
- `SdEventActivationRef (in SdEventHandlerTcp)`
- `SdEventTriggeringRef (in SdEventHandlerTcp)`
- `SdEventActivationRef (in SdEventHandlerUdp)`
- `SdEventTriggeringRef (in SdEventHandlerUdp)`

⌋()

[SWS_SD_00700]⌈
The Service Discovery module shall be able to reference SocketConnections and SocketConnectionGroups per Service Instance/Eventgroup. See the following configuration parameters:

- `SdClientServiceTcpRef` (Service Instance and Eventgroups)
- `SdClientServiceUdpRef` (Service Instance and Eventgroups)
- `SdConsumedEventGroupMulticastGroupRef` (Eventgroup)
- `SdServerServiceTcpRef` (Service Instance and Eventgroups)
- `SdServerServiceUdpRef` (Service Instance and Eventgroups)
- `SdMulticastEventSoConRef` in `SdEventHandlerMulticast` (Eventgroup)

](

[SWS_SD_00029][
The Service Discovery module shall only call `SoAd_IfTransmit()` if an IP address is assigned; i.e.: `Sd_LocalIpAddrAssignmentChg()` has been called with the current state `TCPIP_IPADDR_STATE_ASSIGNED`.
](

[SWS_SD_00709][
Ignore, if `SoAd_IfTransmit()` returns `E_NOT_OK`.
](

[SWS_SD_00459][
For all SD messages sent and received via the Socket Adaptor module, the header mode shall be activated.
](

[SWS_SD_00460][
For all SD messages sent and received via the Socket Adaptor module, the `SoAdTxPduHeaderId` and the `SoAdRxPduHeaderId` shall be set to 0xFFFF8100 respectively.
](

Note: This ensures that the SoAd creates the first part of the SOME/IP header (32bit Message ID followed by a 32bit Length field) as needed for SOME/IP-SD. The remainder of the SD messages is created by this module (see chapter 7.3).

[SWS_SD_00481][
Every wildcard socket connection shall be reset to wildcard using `SoAd_ReleaseRemoteAddr()` if all of the following conditions apply:

- The remote address of a socket connection has been set by SD.
- The socket connection is not used by a ClientService anymore. I.e. no Offer was received, a Stop Offer was received or the TTL has expired.
- The socket connection is not used by an Eventhandler anymore. I.e. the client has unsubscribed all Eventgroups using this socket connection. The socket connection shall not be reset if the routings get disabled because the `SdEventHandlerMulticastThreshold` was reached.

](

Note: This requirement does not apply to the socket connections used for service discovery.

7.2.5 Subscribe Eventgroup retry handling

The Subscribe Eventgroup retry mechanism is an optional feature for ClientServices. This can be used for ServerServices
which have their TLL (SdServerTimerTTL) set to 0xFFFFFF and their interval between cyclic offers in the main phase (`SdServerTimerOfferCyclicDelay`) set to 0.

[SWS_SD_00735]⌈
The subscribe Eventgroup retry handling shall only be processed for Eventgroups of a ServerService where

- the TTL of the received OfferService is set to 0xFFFFFF, and
- `SdSubscribeEventgroupRetryMax` is greater than 0,
- and only if `SdSubscribeEventgroupRetryEnable` is set to TRUE.

⌋()

[SWS_SD_00736]⌈
If `SdSubscribeEventgroupRetryEnable` is set to TRUE and `SdSubscribeEventgroupRetryMax` is set to a value greater than 0, every time a Consumed Eventgroup of a corresponding OfferServices with TTL set to 0xFFFFFF switches to the state `SD_CONSUMED_EVENTGROUP_REQUESTED`, the following actions shall be done:

- the corresponding client service subscription retry delay timer shall be started and set to `SdSubscribeEventgroupRetryDelay`, if the timer is not already running
- the Eventgroup subscription retry counter shall be initialized with 1

⌋()

[SWS_SD_00737]⌈
If the client service subscription retry delay timer elapsed and the counts of retries of subscription (`SdSubscribeEventgroupRetryMax`) did not exceed for a configured Eventgroup, the subscription for the Eventgroup shall be re-triggered by sending a combination of StopSubscribeEventgroup/SubscribeEventgroup, and the retry counter shall be incremented. If the counts of retries of subscription (`SdSubscribeEventgroupRetryMax`) exceeds, the ServiceDiscovery module shall raise the runtime error
"`SD_E_COUNT_OF_RETRY_SUBSCRIPTION_EXCEEDED`".
⌋()

[SWS_SD_00738]⌈
The retry of a subscription for a requested Eventgroup shall be stopped for the following conditions:

- If a SubscribeEventGroupAck or SubscribeEventGroupNack was received for the requested Eventgroup.
- If the count of retries exceeds `SdEventgroupSubscribeRetryMax` of the requested Eventgroup.

- If the requested Eventgroup is set to "SD_CONSUMED_EVENTGROUP_RELEASED".
- If an OfferService of the corresponding ServerService with TTL set to another value then 0xFFFFFF was received.

](

[SWS_SD_00739][
If SdSubscribeEventgroupRetryEnable is set to TRUE and SubscribeEventgroupRetryMax is set to 0xFF, the retries of subscription shall continue as long as all of the following conditions are fulfilled:

- the corresponding Eventgroup is set to "SD_CONSUMED_EVENTGROUP_REQUESTED"
- no SubscribeEventGroupAck or no SubscribeEventGroupNack was received
- no OfferService of the corresponding ServerService with TTL set to another value than 0xFFFFFF was received

](

[SWS_SD_00740][
The client service subscription retry delay timer shall be cancelled, if the retry is finished for all Eventgroups of a ClientService according to SWS_SD_00738.
](

7.3 Message format

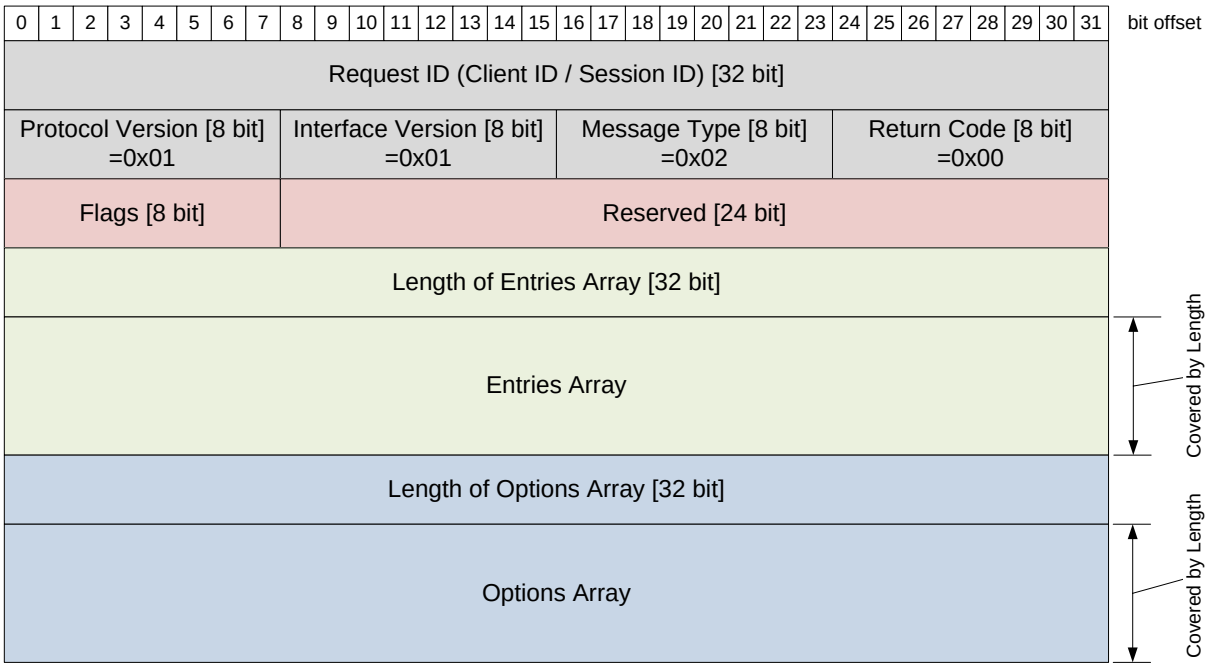


Figure 3 – Overview of the Service Discovery message format

[SWS_SD_00037]⌈
If not defined otherwise, all fields in the Service Discovery messages shall be in Network Byte Order (i.e. Big Endian Byte Order).
⌋()

[SWS_SD_00030]⌈
All Service Discovery messages shall follow the Service Discovery Message layout shown in Figure 3.
⌋()

[SWS_SD_00031]⌈
The Service Discovery message format shall contain the following fields in the following order:

- Request ID (Client ID / Session ID) [32 Bit]
- Protocol Version [8 bit]
- Interface Version [8 Bit]
- Message Type [8 bit]
- Return Code [8 bit]
- Flags [8 bit]
- Reserved [24 bit]
- Length of Entries Array [32 bit]
- Entries Array (length in bytes defined by the “Length of Entries Array”)
- Length of Options Array [32 bit]
- Option Array (length in bytes defined by the “Length of Options Array”)

⌋()

7.3.1 Request ID

This chapter describes the requirements related to the Request ID field. The Request ID is made up of Client ID and Session ID. While the Client ID is not used for Service Discovery, the Session ID is used to detect the reboot or restart of other Service Discovery instances in the vehicle in order to repair the local state of the Service Discovery module.

[SWS_SD_00032]⌈
The Request ID field shall consist of a Client ID field [16 bits] and a Session ID field [16 bits].
⌋()

[SWS_SD_00033]⌈
The Client ID shall be set statically to 0x0000.
⌋()

[SWS_SD_00034]⌈
After initialization of the Service Discovery Module, the Session ID for messages sent by the local ECU shall be 0x0001.
⌋()

[SWS_SD_00035]⌈
The Session ID shall be incremented and stored separately for multicast and every single unicast communication partner every time `SoAd_IfTransmit()` is called.
⌋()

Note to SWS_SD_00034 and SWS_SD_00035: This means that the first SD message sent out to the multicast address has Session ID 0x0001 as well as the first SD message sent out to any unicast communication partner has the Session ID 0x0001 as well.
⌋()

[SWS_SD_00036]⌈
Every time, the Session ID wraps around, the Session ID shall restart with the value 0x0001.
⌋()

Note to SWS_SD_00036: Wrap around means that the current value of the Session ID is the max value (0xFFFF) and the next increment would mean the counter must start again.

7.3.2 Protocol Version field

The Protocol Version field is used to describe the current version of SOME/IP.

[SWS_SD_00140]⌈
The length of the Protocol Version field shall be 8 bits.
⌋()

[SWS_SD_00141]⌈
The value for the Protocol Version field shall be statically set to 0x01.
⌋()

7.3.3 Interface Version field

The Interface Version field is used to describe the current version of the SOME/IP service; i.e. the current version of SOME/IP-SD itself.

[SWS_SD_00142]⌈
The length of the Interface Version field shall be 8 bits.
⌋()

[SWS_SD_00143]⌈
The value for the Interface Version field shall be statically set to 0x01.
⌋()

7.3.4 Message Type field

The Message Type field is used to differentiate the types of SOME/IP messages. SOME/IP-SD uses only event messages; thus, it always uses the same type.

[SWS_SD_00144]⌈
The length of the Message Type field shall be 8 bits.
⌋()

[SWS_SD_00145]⌈
The value for the Message Type field shall be statically set to 0x02.
⌋()

7.3.5 Return Code field

The Return Code is used to signal whether a request was successfully been processed. This is not applicable for SOME/IP-SD; therefore, the return code will be statically set to 0x00.

[SWS_SD_00146]⌈
The length of the Return Code field shall be 8 bits.
⌋()

[SWS_SD_00147]⌈
The Return Code field shall be statically set to 0x00.
⌋()

7.3.6 Flags field

With the Flags field the SOME/IP-SD header starts. It is used to signal global Service Discovery information, which includes currently the state of the last reboot as well as the capability of receiving unicast messages.

[SWS_SD_00149]⌈
The length of the Flags field shall be 8 bits.
⌋()

[SWS_SD_00150]⌈
The first bit of the Flags field (highest order bit) shall be called Reboot Flag.
⌋()

[SWS_SD_00151]⌈
The Reboot Flag shall be set to ‘1’ for all messages after reboot until the Session ID of the Request ID field wraps and thus starts with 0x0001 again. After that the Reboot Flag shall be set to ‘0’.
⌋()

[SWS_SD_00445]⌈
The Service Discovery shall keep track of the last received of a communication partner Session ID value and Reboot Flag value independently for unicast and multicast. This means that the communication partners values received over multicast shall not be updated by a unicast message.
⌋()

[SWS_SD_00446]⌈
A reboot of the communication partner shall be detected based on consecutive Service Discovery messages (for communication partner; unicast and multicast separated) in the following two ways:

- Reboot Flag changes from ‘0’ to ‘1’ or
- Session ID does not increase, while Reboot Flag stays ‘1’.

⌋()

[SWS_SD_00447]⌈
The Service Discovery may also detect reboots based on the unicast information.
⌋()

[SWS_SD_00448]⌈
A reboot detected with Session ID and Reboot Flag shall lead to expiration of the local state that is controlled by this communication partner.

In case of a reboot of a server, of which the client uses a service, the client shall handle the reboot as if a Stop Offer entry was received (see also SWS_SD_00367 for further details)

In case of a reboot of a server, of which the client uses a service, the server shall handle the reboot as if a StopSubscribeEventgroup entry was received (see also

SWS_SD_00345 for further details).
](

[SWS_SD_00152][
The second bit of the Flag field (second highest order bit) shall be called Unicast Flag.
](

[SWS_SD_00153][
The Unicast Flag of the Flag field shall be set to Unicast Flag and shall be set to ‘1’, meaning: This ECU supports receiving Unicast messages.
](

[SWS_SD_00154][
Undefined bits within the Flag field shall be statically set to ‘0’.
](

7.3.7 Reserved field

This Reserved field is not currently used and left empty for further enhancements of the SOME/IP-SD protocol.

[SWS_SD_00155][
The length of the Reserved field shall be 24 bits.
](

[SWS_SD_00156][
All bits of the Reserved field shall be statically set to 0 binary.
](

7.3.8 Entries Array

When SOME/IP-SD find or offers Service Instances or handles subscriptions this is done by so called entries, which are transported in the entry array of the SOME/IP-SD message (see Figure 3).

7.3.8.1 Length of Entries Array

[SWS_SD_00157][
The length of the first field of the Entries Array shall be 32 bits.
](

[SWS_SD_00158][
The first field of the Entries Array shall carry the amount of bytes of the Entries Array (excluding this 32 bit field carrying the length information).
](

7.3.8.2 Entry Format Type 1

Two types of Entries exist: Type 1 Entries for Services and Type 2 Entries for Eventgroups.

[SWS_SD_00159]⌈
The Type 1 Entries shall have the following layout:

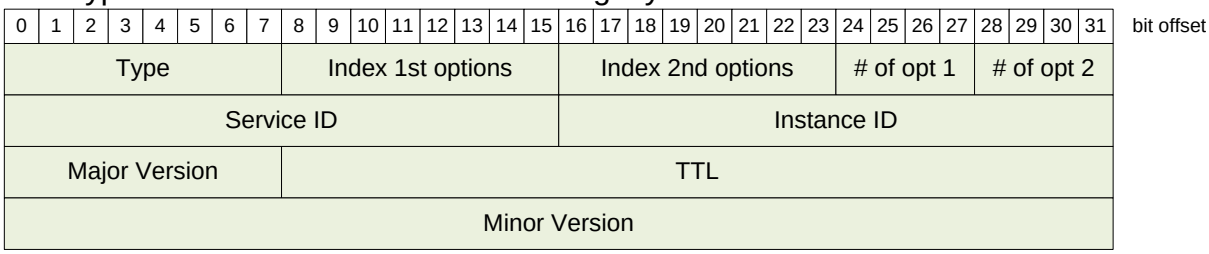


Figure 4 – Layout of Type 1 Entries (Entries for Services)

⌋()

[SWS_SD_00160]⌈
The length of the Type 1 Entry shall be 16 bytes.
⌋()

[SWS_SD_00161]⌈
The Type 1 format shall contain the following fields in the following order and sizes:

- Type [8 bits]
- Index 1st option [8 bits]
- Index 2nd option [8 bits]
- # of opt 1 [4 bits]
- # of opt 2 [4 bits]
- Service ID [16 bits]
- Instance ID [16 bits]
- Major Version [8 bits]
- TTL [24 bits]
- Minor Version [32 bits]

⌋()

[SWS_SD_00162]⌈
The Type field of the Type 1 Entry format layout shall carry one of the following values:

- 0x00 to encode FindService
- 0x01 to encode OfferService and StopOfferService

⌋()

[SWS_SD_00163]⌈
The “Index First Option Run” field of the Type 1 Entry format layout shall have a fixed size of 8 bits.
⌋()

[SWS_SD_00164]⌈
The “Index First Option Run” field of the Type 1 Entry format layout shall carry the index of the first option of the first option run of this entry in the option array.
⌋()

[SWS_SD_00165]⌈
The “Index Second Option Run” field of the Type 1 Entry format layout shall have a fixed size of 8 bits.
⌋()

[SWS_SD_00166]⌈
The “Index Second Option Run” field of the Type 1 Entry format layout shall carry the index of the first option of the second option run of this entry in the option array.
⌋()

[SWS_SD_00167]⌈
The “Number of Option 1” field of the Type 1 Entry format layout shall have a fixed size of 4 bits.
⌋()

[SWS_SD_00168]⌈
The “Number of Option 1” of the Type 1 Entry format layout shall carry the number of options the first option run uses.
⌋()

[SWS_SD_00169]⌈
The “Number of Option 2” field of the Type 1 Entry format layout shall have a fixed size of 4 bits.
⌋()

[SWS_SD_00170]⌈
The “Number of Option 2” field of the Type 1 Entry format layout shall carry the number of options the second option run uses.
⌋()

[SWS_SD_00622]⌈
If the number of options is set to zero, the option run is considered empty.
⌋()
[SWS_SD_00623]⌈
For empty runs the Index (i.e. Index First Option Run and/or Index Second Option Run) shall be set to zero.
⌋()

[SWS_SD_00624]⌈
Implementations shall accept and process incoming SD messages with option run length set to zero and option index not set to zero.
⌋()

[SWS_SD_00172]⌈
The Service ID field of the Type 1 Entry format shall have a fixed size of 16 bits.
⌋()

[SWS_SD_00173]⌈
The Service ID field of the Type 1 Entry format layout shall carry the Service ID of the service, statically configured using the parameter `SdServerServiceID` and

SdClientServiceID, depending on being a server or client entry.
](

[SWS_SD_00174][
The Instance ID field of the Type 1 Entry format layout shall have a fixed size of 16 bits.
](

[SWS_SD_00175][
The Instance ID field of the Type 1 Entry format layout shall carry the Instance ID of the service, statically configured using the parameter SdServerServiceInstanceID and SdClientServiceInstanceID, depending on being a server or client entry.
](

[SWS_SD_00176][
If not a single but all instances are addressed, the Instance ID field of the Type 1 Entry format layout shall be set to 0xFFFF.
](

[SWS_SD_00177][
The Major Version field of the Type 1 Entry format layout shall have a fixed size of 8 bits.
](

[SWS_SD_00178][
The Major Version field of the Type 1 Entry format layout shall carry the SdServerServiceMajorVersion and SdClientServiceMajorVersion, depending on being a server or client entry.
](

[SWS_SD_00179][
The TTL field of the Type 1 Entry format layout shall have a fixed size of 24 bits.
](

[SWS_SD_00180][
The TTL field of the Type 1 Entry format layout defines the lifetime of the entry in seconds configured using the parameter SdServerTimerTTL and SdClientTimerTTL, except for Stop-Entries, which have a TTL of 0.
](

[SWS_SD_00181][
The Minor Version field of the Type 1 Entry format layout shall have a fixed size of 32 bits.
](

[SWS_SD_00182][
The Minor Version field of the Type 1 Entry format layout shall carry the

`SdServerServiceMinorVersion` and `SdClientServiceMinorVersion`.
](

7.3.8.3 Entry Format Type 2

The Type 2 Entries format shall be used for Eventgroups.

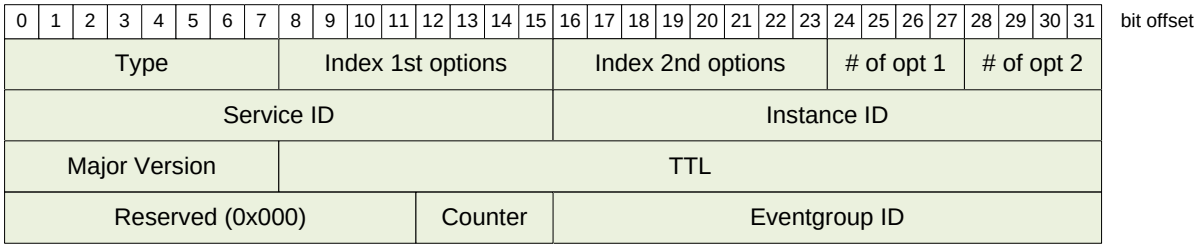


Figure 5 – Layout of Type 2 Entries (Entries for Eventgroups)

[SWS_SD_00183][
The length of Type 2 Entries shall be 16 bytes.
](

[SWS_SD_00184][
The Type 2 format shall contain the following fields in the following order and sizes:

- Type [8 bits]
- Index 1st option [8 bits]
- Index 2nd option [8 bits]
- # of opt 1 [4 bits]
- # of opt 2 [4 bits]
- Service ID [16 bits]
- Instance ID [16 bits]
- Major Version [8 bits]
- TTL [24 bits]
- Reserved [12 bits]
- Counter [4 bits]
- Eventgroup ID [16 bits]

](

[SWS_SD_00385][
The Type field of the Type 2 Entry format layout shall carry one of the following values, depending on the purpose of the message sent:

- 0x06 to encode SubscribeEventgroup and StopSubscribeEventgroup
- 0x07 to encode SubscribeEventgroupAck and SubscribeEventgroupNack](

[SWS_SD_00386][
The “Index First Option Run” field of the Type 2 Entry format layout shall carry the index of the first option of the first option run of this entry in the option array.
](

[SWS_SD_00185][
The “Index First Option Run” field of the Type 2 Entry format layout shall have a fixed

size of 8 bits.
](

[SWS_SD_00187][
The “Index Second Option Run” field of the Type 2 Entry format layout shall carry the index of the first option of the second option run of this entry in the option array.
](

[SWS_SD_00186][
The “Index Second Option Run” field of the Type 2 Entry format layout shall have a fixed size of 8 bits.
](

[SWS_SD_00387][
The “Number of Option 1” field of the Type 2 Entry format layout shall have a fixed size of 4 bits.
](

[SWS_SD_00188][
The “Number of Option 1” field of the Type 2 Entry format layout shall carry the number of options the first option run uses.
](

[SWS_SD_00189][
The “Number of Option 2” field of the Type 2 Entry format layout shall have a fixed size of 4 bits.
](

[SWS_SD_00190][
The “Number of Option 2” field of the Type 2 Entry format layout shall carry the number of options the second option run uses.
](

[SWS_SD_00625][
If the number of options is set to zero, the option run is considered empty.
](

[SWS_SD_00626][
For empty runs the Index (i.e. Index First Option Run and/or Index Second Option Run) shall be set to zero.
](

[SWS_SD_00627][
Implementations shall accept and process incoming SD messages with option run length set to zero and option index not set to zero.
](

[SWS_SD_00192][
The Service ID field of the Type 2 shall have a fixed size of 16 bits.
](

[SWS_SD_00193]⌈
The Service ID field of the Type 2 Entry format layout shall carry the Service ID of the eventgroups service, statically configured using the parameter `SdServerServiceID` and `SdClientServiceID`, depending on being a server or client entry.
⌋()

[SWS_SD_00194]⌈
The Instance ID field of the Type 2 Entry format layout shall have a fixed size of 16 bits.
⌋()

[SWS_SD_00195]⌈
The Instance ID field of the Type 2 Entry format layout shall carry the Instance ID of the eventgroups service statically configured using the parameter `SdServerServiceInstanceID` and `SdClientServiceInstanceID`, depending on being a server or client entry.
⌋()

[SWS_SD_00197]⌈
The Major Version field of the Type 2 Entry format layout shall have a fixed size of 8 bits.
⌋()

[SWS_SD_00198]⌈
The Major Version field of the Type 2 Entry format layout shall carry the `SdServerServiceMajorVersion` and `SdClientServiceMajorVersion`, depending on being a server or client entry.
⌋()

[SWS_SD_00199]⌈
The TTL field of the Type 2 Entry format layout shall have a fixed size of 24 bits.
⌋()

[SWS_SD_00200]⌈
The TTL field of the Type 2 Entry format layout defines the lifetime of the entry in seconds configured using the parameter `SdServerTimerTTL` and `SdClientTimerTTL`, except for Stop- or Nack-Entries, which use a TTL of 0.
⌋()

[SWS_SD_00201]⌈
The Reserved field of the Type 2 Entry format layout shall have a fixed size of 12 bits.
⌋()

[SWS_SD_00202]⌈
The Reserved field, which follows the TTL field of the Type 2 Entry format layout, shall be statically set to 0x000.
⌋()

[SWS_SD_00691]⌈
The Counter field of the Type 2 Entry format layout shall have a fixed size of 4 bits.
⌋()

[SWS_SD_00692]⌈
The Counter field, which follows the Reserved filed of the Type 2 Entry format layout, is used to differentiate identical Type 2 Entries (e.g. multiple subscriptions to same Eventgroup).
⌋()

[SWS_SD_00203]⌈
The Eventgroup ID field of the Type 2 Entry format layout shall have a fixed size of 16 bits.
⌋()

[SWS_SD_00204]⌈
The Eventgroup ID field of the Type 2 Entry format layout shall carry the ID of an Eventgroup, configured using the parameter `SdConsumedEventGroupID`.
⌋()

[SWS_SD_00476]⌈
Type 2 Entries (Entries for Eventgroups) shall not use “any values” as Service ID (i.e. 0xFFFF), Instance ID (i.e. 0xFFFF), Eventgroup ID (i.e. 0xFFFF), and/or Major Version (i.e. 0xFF).
⌋()

7.3.9 Options Array

The Option array is the last part of the Service Discovery Message (see Figure 3). The options in the options array carry additional information.

7.3.9.1 Configuration Option

The Configuration Option transports additional attributes of entries in the Service Discovery messages. Between 0 and n configuration items can be transported using the Configuration Option. These configuration items can include for example the name of the host or the Service.

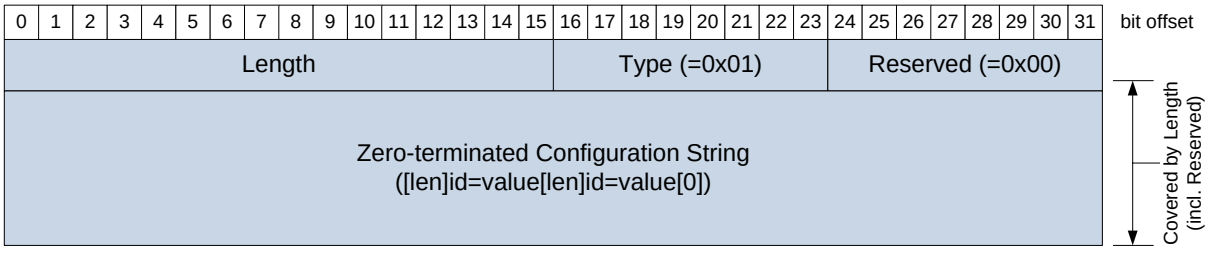


Figure 6 – Configuration Option

[SWS_SD_00715]⌈
The use of configuration options is limited to Type 1 Entries of any Service-ID and Type 2 Entries of Service-ID 0xFFFE.
⌋()

[SWS_SD_00205]⌈
The option format shall contain the following fields in the following order and sizes:

- Length [16 bits]
- Type [8 bits]
- Reserved [8 bits]
- Zero-terminated Configuration String (format e.g. for two configuration items [len]id=value[len]id=value[0])

⌋()

[SWS_SD_00206]⌈
The Length field shall carry the total number of bytes occupied by the configuration option, excluding the 16 bit Length field and the 8 bit type flag.
⌋()

[SWS_SD_00207]⌈
The Type field of the Configuration Option field shall be statically set to 0x01.
⌋()

[SWS_SD_00208]⌈
The Reserved field of the Configuration Option field shall be statically set to 0x00.
⌋()

[SWS_SD_00292]⌈
The Configuration String shall be constructed as follows from the `SdServerCapabilityRecord` and `SdClientCapabilityRecord` (Eventgroups of Services with ID 0xFFFE shall include the Services CapabilityRecord):

- For every `SdServerCapabilityRecordKey/ SdServerCapabilityRecordValue` or `SdClientServiceCapabilityRecordKey/ SdClientServiceCapabilityRecordValue` pair:
  - A *config_item_string* is constructed of the concatenation of key, “=”, and value.
  - The length of this *config_item_string* is written as uint8 to the configuration string.
  - The *config_item_string* is appended to the configuration string.
- Append a 0x00 uint8 at the end. This means no further *config_item_string* follows.

⌋()

Example for Configuration Option:

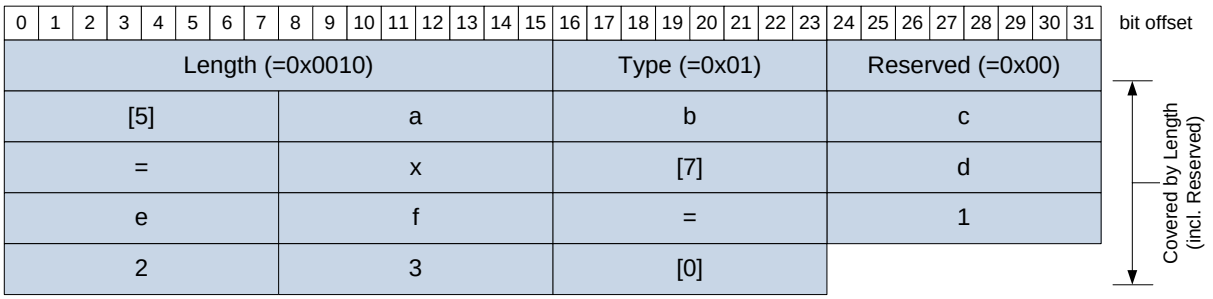


Figure 7 – Example for Configuration Option

[SWS_SD_00461]⌈
`SdServerCapabilityRecordValue` and `SdClientServiceCapabilityRecordValue` are allowed to be empty. This means that after "=" the next length uint8 or "0" follows.
⌋()

[SWS_SD_00466]⌈
Receiving a config_item_string without an "=" sign shall be interpreted as key present without value.
⌋()

[SWS_SD_00467]⌈
Multiple config_item_string with the same key in a single configuration option shall be supported.
⌋()

[SWS_SD_00468]⌈
If `SdInstanceHostname` exists, a key "hostname" with the value set to the string of this configuration item shall be added to the Configuration Option.
⌋()

[SWS_SD_00293]⌈
Non-SOME/IP-Services exist, that are not identified by a unique 16 Bit Service ID but a unique value of the key *otherserv*. These services use the Service ID 0xFFFE and must always carry a configuration option with an *otherserv* record. ECUs receiving an entry with Service ID 0xFFFE shall use the configuration option and the *otherserv* record within in order to identify the relevant Service or Eventgroup configuration item.
⌋()

7.3.9.2 IPv4 Endpoint Option

This chapter describes the fields and values of the IPv4 Endpoint Option, which transports IP Address, Layer 4 Protocols (e.g. UDP or TCP), and Port Number; thus, the information needed to communicate with a service.

When receiving a Service Discovery message offering a service and transporting an IPv4 Endpoint Option, ECUs receiving this message can dynamically configure the Socket Adaptor for using this service by updating a Socket Connection.

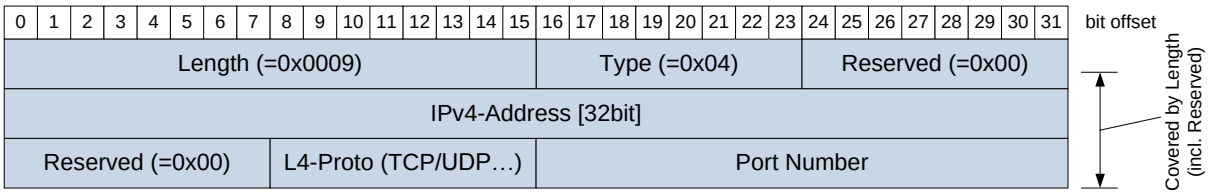


Figure 8 – IPv4 Endpoint Option format

[SWS_SD_00653]⌈
Every OfferService entry shall reference up to two IPv4 Endpoint Options (up to one for UDP and up to one for TCP) that describe endpoint(s) (IP and Port) the server accepts methods on and sends events from for this service instance.
⌋()

[SWS_SD_00654]⌈
Different service instances of the same service on the same ECU shall use different endpoints, so that they can be differentiated by the endpoints. Different services may share the same endpoints.
⌋()

[SWS_SD_00655]⌈
Every SubscribeEventgroup entry shall reference up to two IPv4 Endpoint Options (up to one for UDP and up to one for TCP) that describe(s) the endpoints (IP and Port) the client wishes to receive events. The client shall use these endpoints for sending methods as well.
⌋()

[SWS_SD_00209]⌈
The *Length* field of the IPv4 Endpoint Option shall be set to 0x0009.
⌋()

Note: That is the size of this option not including the length and type fields.

[SWS_SD_00210]⌈
The *Type* field of the IPv4 Endpoint Option shall be statically set to 0x04.
⌋()

[SWS_SD_00211]⌈
The *Reserved* field of the IPv4 Endpoint Option (followed by the IPv4-Address field) shall be statically set to 0x00.
⌋()

[SWS_SD_00212]⌈
The *IPv4-Address* field [32 bits] of the IPv4 Endpoint Option shall be set to the local IP address of the relevant Service or Eventgroup.
⌋()

[SWS_SD_00213]⌈
The *Reserved* field of the IPv4 Endpoint Option shall statically be set to 0x00.
⌋()

[SWS_SD_00214]⌈
The Layer 4 Protocol field [8 bits] (*L4-Proto*) of the IPv4 Endpoint Option shall be set to one of the following values, depending on the port specified:

- 0x06: TCP
- 0x11: UDP

⌋()

[SWS_SD_00215]⌈
The *Port Number* field [16 bits] of the IPv4 Endpoint Option shall carry the UDP or TCP port number for the service instance or Eventgroup.
⌋()

7.3.9.3 IPv6 Endpoint Option

This chapter describes the fields and values of the IPv6 Endpoint Option, which is the same as the IPv4 Endpoint Option except that it transport IPv6 Addresses instead IPv4 Addresses.

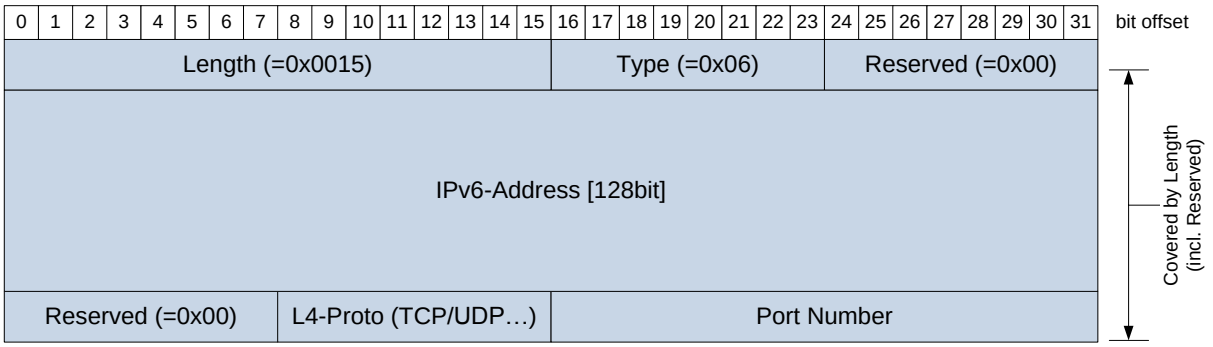


Figure 9 – IPv6 Endpoint Option format

[SWS_SD_00656]⌈
Every OfferService entry shall reference up to two IPv6 Endpoint Options (up to one for UDP and up to one for TCP) that describe endpoint(s) (IP and Port) the server accepts methods on and sends events from for this service instance.
⌋()

[SWS_SD_00657]⌈
Different service instances of the same service on the same ECU shall use different endpoints, so that they can be differentiated by the endpoints. Different services may share the same endpoints.
⌋()

[SWS_SD_00658]⌈
Every SubscribeEventgroup entry shall reference up to two IPv6 Endpoint Options (up to one for UDP and up to one for TCP) that describe(s) the endpoints (IP and Port) the client wishes to receive events. The client shall use these endpoints for sending methods as well.
⌋()

[SWS_SD_00216]⌈
The *Length* field [16 bits] of the IPv6 Endpoint Option shall be set to 0x0015.
⌋()

Note: That is the size of this option not including the length and type fields.

[SWS_SD_00217]⌈
The *Type* field [8 bits] of the IPv6 Endpoint Option shall be statically set to 0x06.
⌋()

[SWS_SD_00218]⌈
The *Reserved* field [8 bits] of the IPv6 Endpoint Option (followed by the IPv6-Address field) of the Configuration Option segment shall be statically set to 0x00.
⌋()

[SWS_SD_00219]⌈
The *IPv6-Address* field [128 bits] of the IPv6 Endpoint Option shall be set to the local IP address of the relevant Service or Eventgroup.
⌋()

[SWS_SD_00220]⌈
The *Reserved* field [8 bits] of the IPv6 Endpoint Option shall statically be set to 0x00.
⌋()

[SWS_SD_00221]⌈
The Layer 4 Protocol field [8 bits] (*L4-Proto*) of the IPv6 Endpoint Option shall be set to one of the following values, depending on the port specified:
- 0x06: TCP
- 0x11: UDP

⌋()

[SWS_SD_00222]⌈
The *Port Number* field [16 bits] of the IPv6 Endpoint Option shall carry the UDP or TCP port number for the service instance or Eventgroup.
⌋()

7.3.9.4 IPv4 Multicast Option

The IPv4 Multicast Option is used by the server to announce the IPv4 multicast address, the transport layer protocol (ISO/OSI layer 4), and the port number the multicast events and multicast notification events are sent to. As transport layer protocol, only UDP is supported.

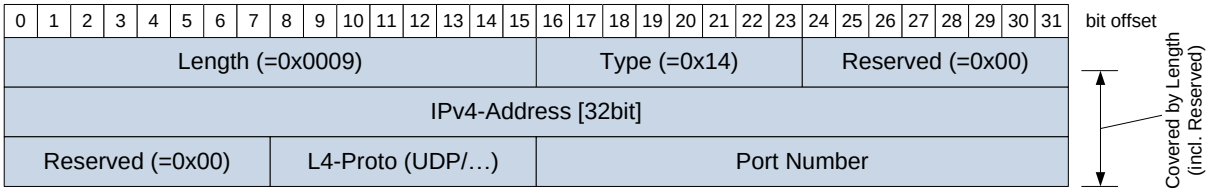


Figure 10 – IPv4 Multicast Option format

[SWS_SD_00659]⌈
IPv4 Multicast Options shall be only referenced by SubscribeEventgroupAck entries, describing the multicast destination IP address and port multicast events shall be sent to.
⌋()

[SWS_SD_00390]⌈
The *Length* field [16 bits] of the IPv4 Multicast Option shall be set to 0x0009.
⌋()

Note: That is the size of this option not including the length and type fields.

[SWS_SD_00391]⌈
The *Type* field [8 bits] of the IPv4 Multicast Option shall be statically set to 0x14.
⌋()

[SWS_SD_00392]⌈
The *Reserved* field [8 bits] of the IPv4 Multicast Option (followed by the IPv4-Address field) of the Configuration Option segment shall be statically set to 0x00.
⌋()

[SWS_SD_00393]⌈
The *IPv4-Address* field [32 bits] of the IPv4 Multicast Option shall be set to the Multicast IP address of the Eventgroup.
⌋()

[SWS_SD_00394]⌈
The *Reserved* field [8 bits] of the IPv4 Multicast Option shall statically be set to 0x00.
⌋()

[SWS_SD_00395]⌈
The Layer 4 Protocol field [8 bits] (*L4-Proto*) of the IPv4 Multicast Option shall be set to 0x11 (UDP).
⌋()

[SWS_SD_00396]⌈
The *Port Number* field [16 bits] of the IPv4 Multicast Option shall carry the port number for transporting Multicast Events of the Eventgroup.
⌋()

7.3.9.5 IPv6 Multicast Option

The IPv6 Multicast Option is used by the server to announce the IPv6 multicast address, the transport layer protocol (ISO/OSI layer 4), and the port number the multicast events and multicast notification events are sent to. As transport layer protocol, only UDP is supported.

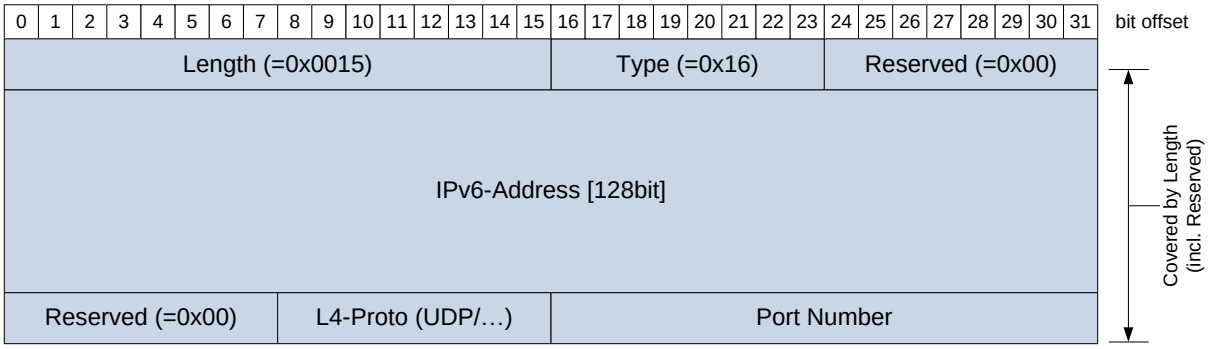


Figure 11 – IPv6 Multicast Option format

[SWS_SD_00660]⌈
IPv6 Multicast Options shall be only referenced by SubscribeEventgroupAck entries, describing the multicast destination IP address and port multicast events shall be

sent to.
](

[SWS_SD_00397][
The *Length* field [16 bits] of the IPv6 Multicast Option shall be set to 0x0015.
](

Note: That is the size of this option not including the length and type fields.

[SWS_SD_00398][
The *Type* field [8 bits] of the IPv6 Multicast Option shall be statically set to 0x16.
](

[SWS_SD_00399][
The *Reserved* field [8 bits] of the IPv6 Multicast Option (followed by the IPv6-Address field) shall be statically set to 0x00.
](

[SWS_SD_00404][
The *IPv6-Address* field [128 bits] of the IPv6 Multicast shall be set to the Multicast IP address of the Eventgroup.
](

[SWS_SD_00413][
The *Reserved* field [8 bits] of the IPv6 Multicast Option shall statically be set to 0x00.
](

[SWS_SD_00414][
The Layer 4 Protocol field [8 bits] (*L4-Proto*) of the IPv6 Multicast Option shall be set 0x11 (UDP).](

[SWS_SD_00415][
The *Port Number* field [16 bits] of the IPv6 Multicast Option shall carry the port number for transporting Multicast Events of the Eventgroup.
](

7.3.9.6 IPv4 SD Endpoint Option

The IPv4 SD Endpoint Option transports the endpoint (i.e. IP-Address and Port) of the senders SD implementation. This is used to identify the SOME/IP-SD Instance in cases in which the IP-Address and/or Port Number cannot be used.

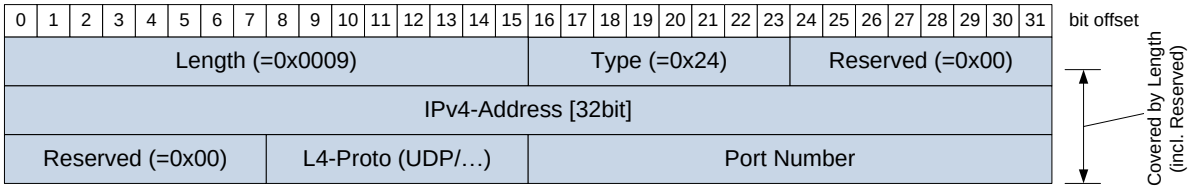


Figure 12 – IPv4 SD Endpoint Option

[SWS_SD_00670]⌈
The IPv4 SD Endpoint Option shall be included in any SD Options Array up to one time.
⌋()

[SWS_SD_00671]⌈
The IPv4 SD Endpoint Option shall only be included if the SOME/IP-SD message is transported over IPv4.
⌋()

[SWS_SD_00672]⌈
The IPv4 SD Endpoint Option shall be the first option in the options array, if it exists.
⌋()

[SWS_SD_00673]⌈
If more than one IPv4 SD Endpoint Option is received, only the first shall be processed and all further IPv4 SD Endpoint Options shall be ignored.
⌋()

[SWS_SD_00674]⌈
No SD Entry shall reference the IPv4 SD Endpoint Option.
⌋()

[SWS_SD_00675]⌈
If the IPv4 SD Endpoint Option is included in the SD message, the receiving SD implementation shall use the content of this option instead of the Source IP Address and Source Port Number.
⌋()

Note: This is important for answering the received SD message (e.g. Offer after Find or Subscribe after Offer or Subscribe Ack after Subscribe) as well as the reboot detection (channel based on SD Endpoint Option and not the addresses in the message).

[SWS_SD_00676]⌈
The IPv4 SD Endpoint Option shall use the Type 0x24.
⌋()

[SWS_SD_00677]⌈
The IPv4 SD Endpoint Option shall specify the IPv4-Address, the transport layer protocol (ISO/OSI layer 4) used, and a Port Number.
⌋()

[SWS_SD_00678]⌈
The Format of the IPv4 SD Endpoint Option shall be as follows:

- Length [uint16]: Shall be set to 0x0009.
- Type [uint8]: Shall be set to 0x24.
- Reserved [uint8]: Shall be set to 0x00.
- IPv4-Address [uint32]: Shall transport the unicast IP-Address of SOME/IP-SD as four Bytes.
- Reserved [uint8]: Shall be set to 0x00.
- Transport Protocol (L4-Proto) [uint8]: Shall be set to the transport layer protocol of SOME/IP-SD (currently: 0x11 UDP).
- Transport Protocol Port Number (L4-Port) [uint16]: Shall be set to the transport layer port of SOME/IP-SD (e.g. 30490).

⌋()

7.3.9.7 IPv6 SD Endpoint Option

The IPv6 SD Endpoint Option transports the endpoint (i.e. IP-Address and Port) of the senders SD implementation. This is used to identify the SOME/IP-SD Instance in cases in which the IP-Address and/or Port Number cannot be used.

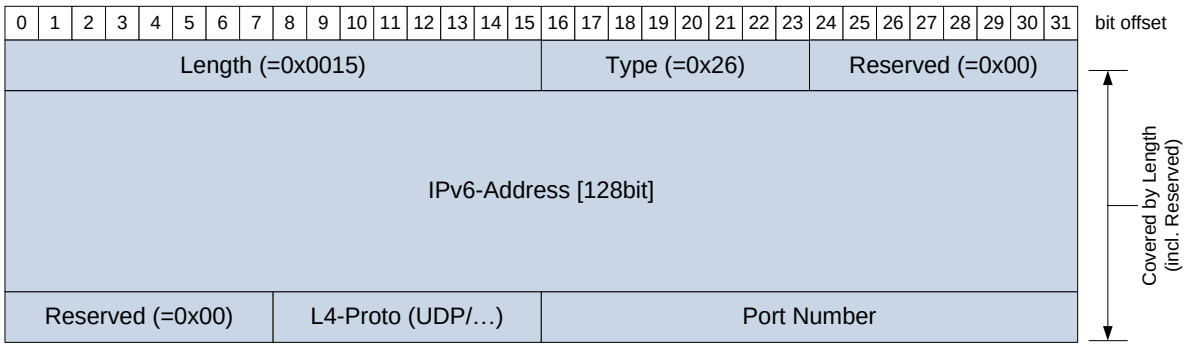


Figure 13 – IPv6 SD Endpoint Option

[SWS_SD_00679]⌈
The IPv6 SD Endpoint Option shall be included in any SD message up to one time.
⌋()

[SWS_SD_00680]⌈
The IPv6 SD Endpoint Option shall only be included if the SOME/IP-SD message is transported over IPv6.
⌋()

[SWS_SD_00681]⌈
The IPv6 SD Endpoint Option shall be the first option in the options array, if existing.
⌋()

[SWS_SD_00682]⌈
If more than one IPv6 SD Endpoint Option is received, only the first shall be processed and all further IPv6 SD Endpoint Options shall be ignored.
⌋()

[SWS_SD_00683]⌈
No SD Entry shall reference the IPv6 SD Endpoint Option.
⌋()

[SWS_SD_00684]⌈
If the IPv6 SD Endpoint Option is included in the SD message, the receiving SD implementation shall use the content of this option instead of the Source IP Address and Source Port for answering this SD messages.
⌋()

This is important for answering the received SD messages (e.g. Offer after Find or Subscribe after Offer or Subscribe Ack after Subscribe) as well as the reboot detection (channel based on SD Endpoint Option and not the addresses in the message).

[SWS_SD_00685]⌈
The IPv6 SD Endpoint Option shall use the Type 0x26.
⌋()

[SWS_SD_00686]⌈
The IPv6 SD Endpoint Option shall specify the IPv6-Address, the transport layer protocol (ISO/OSI layer 4) used, and the Port Number.
⌋()

[SWS_SD_00687]⌈
The Format of the IPv6 SD Endpoint Option shall be as follows:

- Length [uint16]: Shall be set to 0x0015.
- Type [uint8]: Shall be set to 0x26.
- Reserved [uint8]: Shall be set to 0x00.
- IPv6-Address [uint128]: Shall transport the unicast IP-Address of SOME/IP-SD as 16 Bytes.
- Reserved [uint8]: Shall be set to 0x00.
- Transport Protocol (L4-Proto) [uint8]: Shall be set to the transport layer protocol of SOME/IP-SD (currently: 0x11 UDP).
- Transport Protocol Port Number (L4-Port) [uint16]: Shall be set to the transport layer port of SOME/IP-SD (e.g. 30490).

⌋()

7.3.9.8 Handling missing, redundant, and conflicting Options

This section describes the error handling of received options.

[SWS_SD_00661]⌈
If an entry references an unknown option, this option shall be ignored.
⌋()

[SWS_SD_00662]⌈
If an entry references an redundant option (option that is not needed by this specific entry), this option shall be ignored.
⌋()

[SWS_SD_00663]⌈
If a SubscribeEventgroup entry references two or more options that are in conflict, this entry shall be answered with a SubscribeEventgroupNack entry.
⌋()

[SWS_SD_00714]⌈
If an entry other than a SubscribeEventgroup entry references two or more options that are in conflict, this entry shall be silently discarded.
⌋()

[SWS_SD_00710]⌈
If a received entry does not reference at least the configured options, this entry shall be ignored or a SubscribeEventgroupNack (for SubscribeEventgroup entries) shall be sent. Missing Multicast Endpoint Options shall be ignored by the client, if unicast communication via UDP was set up (UDP Endpoint Option in Offer and Subscribe).
⌋()

Note:
For Service Endpoints Options see SdClientServiceTcpRef and SdClientServiceUdpRef. For Eventgroup Endpoint Options see SdEventActivationRef at SdEventHandlerUdp/SdEventHandlerTcp/SdEventHandlerMulticast.
See also SWS_SD_00662 and SWS_SD_00420.

[SWS_SD_00664]⌈
When two different Configuration Options are referenced by an entry, the configuration sets shall be merged.
⌋()

[SWS_SD_00665]⌈
If the two Configuration Options have conflicting items (same name), all items shall be handled. There shall be no attempt been made to merge duplicate items.
⌋()

7.3.9.9 Security considerations for Options

[SWS_SD_00688]⌈

A SOME/IP-SD implementation shall always check that the IP Addresses received in Endpoint options and SD Endpoint options are topological correct (reference IP Addresses in the IP subnet for which SOME/IP-SD is used) and shall ignore IP Addresses that are not topological correct as well as the entries referencing those options.

⌋()

Note:
This means that only Clients and Servers in the same subset are accessible. An example for checking the IP Addresses (Endpoint-IP) for topological correctness is:

SOME/IP-SD-IP-Address AND Netmask = Endpoint-IP AND Netmask.

[SWS_SD_00720]⌈
For checking whether endpoints are topological correct, the value of ECUC_Sd_00128 shall be used in order to determine on how many leading bits shall be compared when checking if an address is local. If not present, the value of the locally configured netmask for the IP address shall be used.
⌋()

7.3.10 Entries referencing Options

This chapter describes how Entries can reference two runs of Options with zero to fifteen options each in order to reference additional information.

Note: Entries support two option runs to allow referencing the same Options by different Entries. With a single option run, sharing Endpoint Options while having different Configuration Options per Entry would not have work efficiently.

[SWS_SD_00223]⌈
The first option run starts with the option referenced by the field *Index 1st options* and references zero to fifteen options.
⌋()

[SWS_SD_00224]⌈
The number of options referenced by the first option run is determined by the field # *of opt 1*.
⌋()

[SWS_SD_00225]⌈
The second option run starts with the option referenced by the field *Index 2nd options* and references zero to fifteen options.
⌋()

[SWS_SD_00226]⌈
The number of options referenced by the second option run is determined by the field *# of opt 2*.
⌋()

Note to SWS_SD_00226: Figure 14 shows an SD message example, which has an entry referencing two options in the first run:

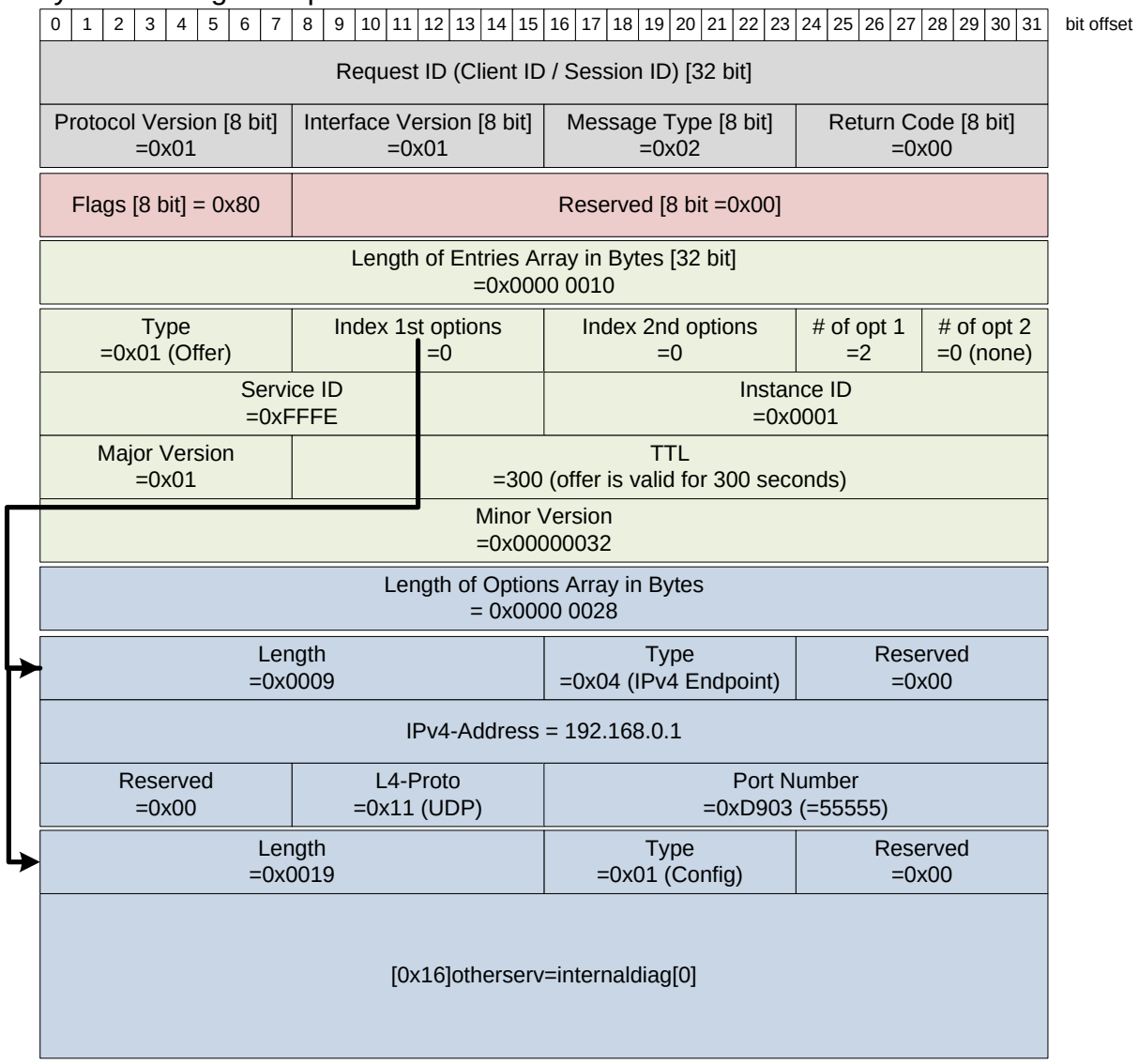


Figure 14 – Example with Entries referencing Options

[**SWS_SD_00477**]⌈
The following table shows which Option is allowed to be carried by different Entries (all other combinations shall not be used):

	Endpoint Options (IPv4 and IPv6)	Multicast Options (IPv4 and IPv6)	Configuration Option
FindService			Allowed
OfferService	Allowed		Allowed
StopOfferService	Allowed		Allowed
SubscribeEventgroup	Allowed		Allowed
StopSubscribeEventgroup	Allowed		Allowed
SubscribeEventgroupAck		Allowed	Allowed
SubscribeEventgroupNack			Allowed

Table 1 – Allowed Options per Entry

](

Note: Usage of these Options depends on other factors that are not shown in this table. Consult the appropriate requirements in this document.

7.4 Service Discovery Entry Types

ECUs shall distribute available Service Instances and Service Instances needed as well as the Eventgroups of these Service Instances. For this purpose, they exchange entries using Service Discovery messages. This chapter describes how these entries are encoded to offer and find services as well as find and subscribe Eventgroups.

The following overview table shows to which value the Type field and the TTL field have to be set:

	TTL>0		TTL=0	
Type	0x00	0x04	0x00	0x04
0x00	FindService			
0x01	OfferService		StopOfferService	
0x02		SubscribeEventgroup		StopSubscribeEventgroup
0x03		SubscribeEventgroupAck		SubscribeEventgroupNack

Table 2 – Overview of currently supported Entry Types

7.4.1 Entries for Services (common requirements)

These requirements are valid for all Entries concerning Services including Entries of Type 0x00, 0x01, 0x02, and 0x03.

Note: Currently only Service Entries of type 0x00 and 0x01 are defined in this specification.

[SWS_SD_00294][
All entries concerning Services (FindService, OfferService, StopOfferService) shall be of Entry Format Type 1.
](

[SWS_SD_00295]⌈
An Instance ID of 0xFFFF shall mean any possible instances and are not allowed for OfferService and StopOfferService entries.
⌋()

[SWS_SD_00296]⌈
FindService entries shall carry Service ID, Service Instance ID, Major Version, and Minor Version as configured in `SdClientServiceID`, `SdClientServiceInstanceID`, `SdClientServiceMajorVersion`, and `SdClientServiceMinorVersion`.
⌋()

[SWS_SD_00297]⌈
OfferService and StopOfferService shall carry Service ID, Service Instance ID, Major Version, Minor Version, and as configured in `SdServerServiceID`, `SdServerServiceInstanceID`, `SdServerServiceMajorVersion`, and `SdServerServiceMinorVersion`.
⌋()

[SWS_SD_00298]⌈
FindService entries shall carry the TTL as configured in `SdClientTimerTTL`.
⌋()

[SWS_SD_00299]⌈
OfferService entries shall carry the TTL as configured in `SdServerTimerTTL`.
⌋()

[SWS_SD_00253]⌈
A StopOfferService (type 0x01) entry shall set the TTL field to 0x000000.
⌋()

[SWS_SD_00267]⌈
All entries concerning Services (FindService, OfferService and StopOfferService shall carry – i.e. reference – the options as configured.
⌋()

Note: see also chapter 7.3.9.6.

[SWS_SD_00281]⌈
A StopOfferService (type 0x01), shall carry – i.e. reference – the same options as the entries trying to stop.
⌋()

7.4.2 FindService entry

FindService entries allow finding Service Instances.

[SWS_SD_00240]⌈
A FindService entry has the type field set to 0x00.
⌋()

[SWS_SD_00444]⌈
Service ID shall be set to the Service ID of the service that shall be found.
⌋()

[SWS_SD_00501]⌈
Instance ID shall be set to 0xFFFF, if all Service Instances shall be returned. It shall be set to the Instance ID of a specific Service Instance, if just a single Service Instance shall be returned.
⌋()

Note: This means that when receiving Instance ID 0xFFFF for all appropriate Service Instances must be answered as if separate Find Entries were received.

Example:
ECU1 offers Service 0x1234 with Instance 0xabcd. This instance is in Main Phase.
ECU2 send out find with Service ID 0x1234 and Instance ID 0xFFFF.
ECU1 shall answer with Offer (Service ID 0x1234, Instance ID 0xabcd).

[SWS_SD_00502]⌈
Major Version shall be set to 0xFF, that means that services with any version shall be returned. If set to value different than 0xFF, services with this specific major version shall be returned only.
⌋()

Note: It is expected that the Major Version on client side is configured to a specific value in normal operation since the client should look for an specific interface version. Different Major Versions are not compatible to each other.

[SWS_SD_00503]⌈
Minor Version shall be set to 0xFFFF FFFF, that means that services with any version shall be returned. If set to a value different to 0xFFFF FFFF, services with this specific minor version shall be returned only.
⌋()

Note: It is expected that the Minor Version on client side is configured to 0xFFFF FFFF in normal operation since the client should accept all different Minor Versions. Different Minor Versions shall be compatible to each other.

[SWS_SD_00504]⌈
TTL shall be set according to the configuration.
⌋()

[SWS_SD_00506]⌈
TTL shall not be set to 0x000000 since this is considered to be the Stop entry for this entry.
⌋()

[SWS_SD_00652]⌈
If TTL is set to 0xFFFFFF, the SubscribeEventgroup entry shall be considered valid until shutdown (i.e. next reboot).
⌋()

[SWS_SD_00505]⌈
FindServer entries shall never reference Endpoint or Multicast Options. They shall reference configuration options, if configured to do so.
⌋()

7.4.3 OfferService entry

To offer Service Instances, the OfferService entry shall be used.

[SWS_SD_00254]⌈
An OfferService entry shall set the type to 0x01.
⌋()

[SWS_SD_00509]⌈
Service ID shall be set to the Service ID of the Service Instance offered.
⌋()

[SWS_SD_00510]⌈
Instance ID shall be set to the Instance ID of the Service Instance offered.
⌋()

[SWS_SD_00511]⌈
Major Version shall be set to the Major Version of the Service Instance offered (see `SdServerServiceMajorVersion`).
⌋()

Note: Since `SdServerServiceMajorVersion` can be only a value up to 0xFE, the value 0xFF (any) cannot occur in an OfferService entry.

[SWS_SD_00512]⌈
Minor Version shall be set to the Minor Version of the Service Instance offered.
⌋()

[SWS_SD_00513]⌈
TTL shall be set to the lifetime of the Service Instance. After this lifetime the Service

Instance shall considered not been offered.
](

[SWS_SD_00514][
If TTL is set to 0xFFFFFF, the OfferService entry shall be considered valid until the next reboot.
](

[SWS_SD_00515][
TTL shall be set to another value than 0x000000 since 0x000000 is considered to be the Stop entry for this entry.
](

[SWS_SD_00416][
OfferService entries shall always reference at least an IPv4 or IPv6 Endpoint Option to signal how the service is reachable.
](

[SWS_SD_00417][
For each L4 protocol needed for the service (i.e. UDP and/or TCP) an IPv4 Endpoint option shall be added if IPv4 is supported.
](

[SWS_SD_00418][
For each L4 protocol needed for the service (i.e. UDP and/or TCP) an IPv6 Endpoint option shall be added if IPv6 is supported.
](

[SWS_SD_00419][
The IP addresses and port numbers of the Endpoint Options shall also be used for transporting events and notification events.
](

[SWS_SD_00420][
In the case of UDP this information is used for the source address and the source port of the events and notification events.
](

[SWS_SD_00421][
In the case of TCP this is the IP address and port the client needs to open a TCP connection to in order to receive events using TCP.
](

[SWS_SD_00610]⌈
If the Load Balancing Option is used, the Weight field shall be set to the configured value of SdServerServiceLoadBalancingWeight.
⌋()

[SWS_SD_00611]⌈
If the Load Balancing Option is used, the Priority field shall be set to the configured value of SdServerServiceLoadBalancingPriority.
⌋()

7.4.4 Building OfferService entries

[SWS_SD_00478]⌈
This chapter describes how to derive all necessary data to assemble an OfferService Message:

1) Derive all static data from the configuration container. These are e.g:
   - Container SdServerService: SdServerServiceId
   - Container SdServerService: SdServerServiceInstanceId
   - Container SdServerService: SdServerServiceMajorVersion
   - Container SdServerService: SdServerServiceMinorVersion
   - Container SdServerTimer: SdServerTimerTTL
   - Container SdInstance: SdInstanceHostname

2) If TCP is configured for this service (configuration item `SdServerServiceTcpRef` exists):
   a. The generator derives a SoConID out of the `SoConGroup` referenced by the configuration parameter `SdServerServiceTcpRef`
   b. Call the Socket Adaptor's API SoAd_GetLocalAddr() with the derived SoConID to get back the IP Address, Transport protocol (Layer 4), and the port number needed for the Endpoint Option.
   c. Build the relevant Endpoint Option with L4-Protocol set to TCP (shall be same as in LocalAddr) .

3) If UDP is configured for this service (configuration item `SdServerServiceUdpRef` exists):
   a. The generator derives a SoConID out of the `SoConGroup` referenced by the configuration parameter `SdServerServiceUdpRef`
   b. Call the Socket Adaptor's API SoAd_GetLocalAddr() with the derived SoConID to get back the IP Address, Transport protocol (Layer 4), and the port number needed for the Endpoint Option.
   c. Build the relevant Endpoint Option with L4-Protocol set to TCP (shall be same as in LocalAddr) .

4) Build Configuration Option if configured (see configuration item `SdServerCapabilityRecord` and `SdInstanceHostname`).

5) Build OfferService Entry as described above.

⌋()

7.4.5 StopOfferService entry

To stop offering Service Instances, the StopOfferService entry shall be used.

[SWS_SD_00422]⌈
The StopOfferService entry type shall be used to stop offering Service Instances.
⌋()

[SWS_SD_00423]⌈
A StopOfferService entry shall set the type to 0x01.
⌋()

[SWS_SD_00424]⌈
StopOfferService entries shall set the entry fields exactly like the OfferService entry they are stopping, except TTL.
⌋()

[SWS_SD_00425]⌈
TTL shall be set to 0x000000.
⌋()

7.4.6 Eventgroup Entries (Common requirements)

The following requirements are valid for all Entries concerning Eventgroups including Entries of Type 0x04, 0x05, 0x06, and 0x07.

Note: Currently only Eventgroup Entry of Type 0x06 and 0x07 are defined in this specification.

[SWS_SD_00289]⌈
Eventgroups entries include:

- SubscribeEventgroup and StopSubscribeEventgroup
- SubscribeEventgroupAck and SubscribeEventgroupNack

⌋()

[SWS_SD_00290]⌈
All Eventgroup entries shall use the Entry Format Type 2.
⌋()

[SWS_SD_00291]⌈
Eventgroup entries shall set the Eventgroup ID to the ID of the Eventgroup (configuration parameters `SdConsumedEventGroupId` and `SdEventHandlerEventGroupId`).
⌋()

[SWS_SD_00300]⌈
Eventgroup entries shall set the Reserved fields to 0x00 and 0x000.
⌋()

[SWS_SD_00301]⌈
SubscribeEventgroup, and StopSubscribeEventgroup entries shall set the Service IDs, Service Instance IDs, and Eventgroup IDs based on the configuration (configuration parameters `SdClientServiceId` and `SdClientServiceInstanceId`).
⌋()

[SWS_SD_00303]⌈
The Service Instance ID shall not be set to 0xFFFF for any “Instance”.
⌋()

[SWS_SD_00304]⌈
SubscribeEventgroup entries shall have the TTL field set to the configured value (configuration parameter `SdClientTimerTTL` of `SdConsumedEventGroup`) and the SubscribeEventgroupAck entry shall use the TTL value of the SubscribeEventgroup entry it acknowledges.
⌋()

[SWS_SD_00306]⌈
A StopSubscribeEventgroup (type 0x06), and SubscribeEventgroupNack (type 0x07) entry shall set the TTL field to 0x000000.
⌋()

[SWS_SD_00307]⌈
Eventgroup entries shall carry the options as configured.
⌋()

7.4.7 SubscribeEventgroup entry

To subscribe to Eventgroups, the SubscribeEventgroup entry shall be used.

[SWS_SD_00312]⌈
A SubscribeEventgroup entry shall set the type to 0x06.
⌋()

[SWS_SD_00693]⌈
The Counter field in the Type 2 Entry format is used to differentiate different Subscribe Eventgroups to otherwise identical Eventgroups (i.e. same Service ID, same Instance ID, same Eventgroup ID, and same Major Version). The Counter field shall be reflected by the Server to the Subscribe Eventgroup Ack and Nack entries.

If identical Consumed Eventgroups are configured with different Endpoints, then the SD shall use the Counter to differentiate the different Subscriptions. The value of the Counter can be determined by the implementation.
⌋()

Note:
A width of 4 bits limits this to 16 different Subscriptions to the same Eventgroup.

7.4.8 StopSubscribeEventgroup entry

To stop subscribing to an Eventgroup, the StopSubscribeEventgroup entry shall be used.

[SWS_SD_00313]⌈
A StopSubscribeEventgroup entry shall set the type to 0x06.
⌋()

[SWS_SD_00427]⌈
StopSubscribeEventgroup entries shall set the entry fields exactly like the SubscribeEventgroup entry they are stopping, except the TTL field.
⌋()

[SWS_SD_00694]⌈
A Stop Subscribe Eventgroup Entry shall reference the same options the Subscribe Eventgroup Entry referenced. This includes but is not limited to Endpoint and Configuration options.
⌋()

[SWS_SD_00426]⌈
The TTL shall be set to 0x000000.
⌋()

7.4.9 SubscribeEventgroupAck entry

To acknowledge a SubscribeEventgroup entry, the SubscribeEventgroupAck entry shall be used and shall be used with the values as in the SubscribeEventgroup entry it stops.

[SWS_SD_00314]⌈
A SubscribeEventgroupAck entry shall set the type to 0x07.
⌋()

[SWS_SD_00428]⌈
Service ID, Instance ID, Major Version, Eventgroup ID, TTL, Counter, and Reserved shall be the same value as in the Subscribe that is being answered.
⌋()

[SWS_SD_00315]⌈
A SubscribeEventgroupAck entry shall set the TTL field to the value of the SubscribeEventgroup entry, it acknowledges.
⌋()

[SWS_SD_00429]⌈
SubscribeEventgroupAck entries referencing events and notification events that are transported via multicast shall reference an IPv4 Multicast Option and/or and IPv6 Multicast Option. The Multicast Options state to which Multicast address and port the events and notification events will be sent to.
⌋()

7.4.10 SubscribeEventgroupNack entry

[SWS_SD_00430]⌈
The SubscribeEventgroupNegativeAcknowledgment entry type shall be used to indicate that SubscribeEventgroup entry was NOT accepted. It shall be always sent instead of a SubscribeEventgroupAck if such an error occurred. Reasons for sending a SubscribeEventgroupNegativeAcknowledgment include:

- Combination of Service ID, Instance ID, Eventgroup ID, and Major Version is unknown
- Required TCP-connection was not opened by client
- Problems with the references options occurred (wrong values, missing endpoint, or conflicting endpoints)
- Resource problems at the Server

⌋()

[SWS_SD_00698]⌈
If a SubscribeEventgroup entry referencing two conflicting Endpoint Options (UDP or TCP) is received then a SubscribeEventgroupNack shall be generated. Endpoint

options are considered conflicting if they are of the same type but hold different values, like different IP or Port number.
](

[SWS_SD_00431][
Service ID, Instance ID, Major Version, Eventgroup ID, Counter, and Reserved shall be the same value as in the subscribe that is being answered.
](

[SWS_SD_00316][
A SubscribeEventgroupNack entry shall set the type to 0x07.
](

[SWS_SD_00432][
The TTL shall be set to 0x000000.
](

7.4.11 Building SubscribeEventgroup entries

[SWS_SD_00701][
This requirement describes how to derive all necessary data to assemble a SubscribeEventgroup Message:

1) Derive all static data from the configuration container. These are e.g:
   - Container SdClientService: SdClientServiceId
   - Container SdClientService: SdClientServiceInstanceId
   - Container SdClientService: SdClientServiceMajorVersion
   - Container SdClientService: SdClientServiceMinorVersion
   - Container SdConsumedEventGroupTimerRef - SdClientTimer: SdClientTimerTTL
   - Container SdInstance: SdInstanceHostname

2) If TCP is configured for this service (configuration item `SdClientServiceTcpRef` exists):
   a. Find the relevant SocketConnection based on the `SdClientServiceTcpRef` (finding `SoConGroup`) and the Endpoint Option of the OfferService entry (finding SoCon within).
   b. Call the Socket Adaptor's API `SoAd_GetLocalAddr()` with the derived SoConID to get back the IP Address, Transport protocol (Layer 4), and the port number needed for the Endpoint Option.
   c. Build the relevant Endpoint Option with L4-Protocol set to TCP (shall be same as in LocalAddr).

3) If UDP is configured for this service (configuration item `SdClientServiceUdpRef` exists):
   a. Find the relevant SocketConnection based on the `SdClientServiceUdpRef` (finding `SoConGroup`) and the Endpoint Option of the OfferService entry (finding SoCon within).

b. Call the Socket Adaptor's API `SoAd_GetLocalAddr()` with the derived SoConID to get back the IP Address, Transport protocol (Layer 4), and the port number needed for the Endpoint Option.
c. Build the relevant Endpoint Option with L4-Protocol set to UDP (shall be same as in LocalAddr).

4) Build Configuration Option if configured (see configuration item `SdClientCapabilityRecord` and `SdInstanceHostname`).

5) Build SubscribeEventgroup Entry as described above.

]()

7.5 Sending and Receiving of Messages

This chapter describes how messages are transmitted and received using the Socket Adaptor module.

[SWS_SD_00039]⌈
The Service Discovery module sends Service Discovery messages (Offer, StopOffer, Find,..) using the `SoAd_IfTransmit()` API carrying the referenced TxPdu (see configuration parameter `SdInstanceTxPdu`).
⌋()

[SWS_SD_00040]⌈
The Service Discovery module receives Service Discovery messages via the API `Sd_SoAdIfRxIndication()` and the configuration items `SdInstanceUnicastRxPdu` and `SdInstanceMulticastRxPdu`. The remote address must be saved in the call context of the Sd_RxIndication.
⌋()

[**SWS_SD_00479**]⌈
When receiving Service Discovery messages the values of all reserved fields shall be ignored.
⌋()

[**SWS_SD_00708**]⌈
Every time the Service Discovery module receives a SOME/IP-SD message, the consistency of this message has to be checked. This includes but is not limited to:

- Validating that the SOME/IP-SD message is long enough to fit the entries and options arrays (total length = 12 + length of entries array + length of options array).
- Check that entries reference existing options.

In case a malformed message has been received, the extended production error `SD_E_MALFORMED_MSG` shall be reported.
⌋()

7.5.1 Sequence for message transmission

[SWS_SD_00480]⌈
This chapter describes the interaction with the Socket Adaptor module to send Service Discovery messages:

1) Precondition: Service Discovery message is assembled

2) In case the message shall be sent via unicast:
   - Call the Socket Adaptor's API SoAd_SetRemoteAddr

3) In case the message shall be sent via multicast:
   - Call the API SoAd_SetRemoteAddr to set the destination

4) Call SoAd_IfTransmit() to send the message on the bus

Please also refer to the sequence "CLIENT/SERVER: TransmitSdMessage" shown in Chapter 9.
⌋()

Note:
This can be achieved for example by checking the status of all Service Instances and Eventgroups cyclically and afterwards assembling the Service Discovery Messages.

[SWS_SD_00650]⌈
Entries received with the unicast flag set to 0, shall not be answered with unicast but ignored⌋()

[SWS_SD_00651]⌈
The amount of separate Service Discovery messages shall be reduced, i.e.: Combine as much information as possible into one Service Discovery message before calling the Socket Adaptor's transmit API. This means that when a entry is sent after waiting the appropriate delay (i.e. based on Request-Response-Delay) all other entries for this communication partner may be packed into the Service Discovery message as well.⌋()

7.5.2 Sequence for message reception

[SWS_SD_00482]⌈
This chapter describes the interaction with the Socket Adaptor on how Service Discovery messages are received:

1) When the SocketAdaptor receives a Service Discovery message, the API Sd_RxIndication() is called.

2) Using the indicated RxPduId, the associated SoConId for this SD Instance has to be determined.

3) Call API SoAd_GetRemoteAddr() with this SoConId.

4) Store address and message for further processing.

5) Reset the SoCon back to Wildcard using SoAd_ReleaseRemoteAddr()

6) The entries shall be processed exactly in the order they arrived.

Please also refer to the sequence "CLIENT/SERVER: Sd_RxIndication" shown in Chapter 9.
⌋()

Note:
For deriving the SoConId, the SoAdSocketRoute corresponding to this RxPduId should refer either to a SoAdSocketConnection or to a SoAdSocketConnectionGroup containing a single SoAdSocketConnection.

[SWS_SD_00696]⌈
If the entries of a single Service Discovery Message would lead to closing and opening the same Socket Connection in the Socket Adaptor, the Service Discovery shall not close the Socket Connection first.
⌋()

Note: Closing and opening Socket Connections (especially with TCP), conflicts with the behavior of the Service Discovery and leads to suboptimal reaction times.

[SWS_SD_00483]⌈
When receiving Service Discovery messages, the receiver shall ignore Entries of unknown type.
⌋()

[SWS_SD_00484]⌈
When receiving Service Discovery messages, the receiver shall ignore Options of unknown type.
⌋()

[SWS_SD_00485]⌈
When receiving Service Discovery messages, the receiver shall ignore the values of reserved fields.
⌋()

7.5.3 Receiving Entries

When receiving entries the relevant Service Instance or Eventgroups have to be identified, which is explained in this section.

[SWS_SD_00486]⌈
When receiving a FindService Entry Service ID, Instance ID, Major Version, and Minor Version must match exactly to the configured values to identify a Service Instances and its associated Eventgroups, except if “any values” are in the Entry (i.e. 0xFFFF for Service ID, 0xFFFF for Instance ID, 0xFF for Major Version, and 0xFFFFFF for Minor Version.)

See configuration parameters `SdServerServiceServiceId`, `SdServerServiceInstanceId`, `SdServerServiceMajorVersion`, and `SdServerServiceMinorVersion`.
⌋()

Note:

When receiving a FindService with Service ID 0x0001, Instance ID 0xFFFF, Major Version 0x02, and Minor Version 0xFFFFFF, only the Service ID and the Major Version shall be used to match the local Service Instances and its associated Eventgroups fitting to this FindService.

[SWS_SD_00487]⌈
When receiving an OfferService or StopOfferService the Service ID, Instance ID, Major Version must match exactly to the configured values to identify a Service Instances and its associated Eventgroups.

See configuration parameters `SdClientServiceServiceId`, `SdClientServiceInstanceId`, and `SdClientServiceMajorVersion`.
⌋()

[SWS_SD_00488]⌈
If `SdClientServiceMinorVersion` is set to 0xFFFFFF the Minor Version in a received OfferService or StopOfferService entry is not checked for identifying Service Instances and its associated Eventgroups.
⌋()

[SWS_SD_00489]⌈
If `SdClientServiceMinorVersion` is set to any value except 0xFFFFFF the Minor Version in a received OfferService or StopOfferService shall be checked for identifying Service Instances and its associated Eventgroups.
⌋()

[SWS_SD_00490]⌈
When receiving Eventgroup entries (i.e.SubscribeEventgroup, StopSubscribeEventgroup, SubscribeEventgroupAck, and SubscribeEventgroupNack) the Service ID, Instance ID, Eventgroup ID, and Major Version shall be exactly matched to identify the Eventgroup.
⌋()

Note:
We call each configured service instance fulfilling the SWS items [SWS_SD_00486] - [SWS_SD_00489] a service instance match candidate.

[SWS_SD_00716]⌈
If either the received Type 1 SD entry references a configuration option or a service match candidate has capability records configured (i.e., SdServerCapabilityRecord in case of a received FindService entry or SdClientCapabilityRecord in case of a OfferService or a StopOfferService entry), the configured SdCapabilityRecordMatchCallout shall be invoked by the SD implementation.
⌋()

[SWS_SD_00717]⌈
A received Type 2 SD entry with Service ID 0xFFFE shall be matched accordingly to **SWS_SD_00716** with the capability records of the Service (SdServerCapabilityRecord in case of a received SubscribeEventgroup or

StopSubscribeEventgroup entry or SdClientCapabilityRecord in case of SubscribeEventgroupAck or SubscribeEventgroupNack entry).
](

[SWS_SD_00718][
If the invoked SdCapabilityRecordMatchCallout returns true, the respective service instance match candidate actually provides a match for the received SD message including the configured capability records.
](

[SWS_SD_00719][
If the invoked SdCapabilityRecordMatchCallout returns false, the respective service instance match candidate actually does not provide a match for the received SD message due to the mismatch with respect to the configured capability records.
](

7.5.3.1 Receiving Entries using Multicast

When receiving Service Discovery messages using multicast, these messages may be received by multiple ECUs at once and multiple ECUs may answer to such a message in parallel. This could lead to overload situations of the ECU that sent the first message. In order to cope with this problem the Service Discovery shall allow delaying answers to multicast as described in this section.

[SWS_SD_00491][
Answers to Entries received using multicast shall be delayed based on the appropriate configuration items:

- For ServerServices:
  - `SdServerTimerRequestResponseMinDelay`
  - `SdServerTimerRequestResponseMaxDelay`
- For ConsumedEventgroups:
  - `SdClientTimerRequestResponseMinDelay`
  - `SdClientTimerRequestResponseMaxDelay`

](

[SWS_SD_00492][
The configuration parameters for delaying OfferService entries as response to FindService entries received by multicast shall be taken from the Timer containers referenced by the Service container:

- `SdServerService`

](

[SWS_SD_00493][
The configuration parameters for delaying SubscribeEventgroup entries as response to OfferService entries received by multicast shall be taken from the Timer containers referenced by the Eventgroup containers:

- `SdConsumedEventGroup`

](

[SWS_SD_00494][

There shall be a random delay between the appropriate MinDelay and MaxDelay before answering to an Entry received via multicast.
](

[SWS_SD_00724][
If `SdServerTimerRequestResponseMinDelay` and `SdServerTimerRequestResponseMaxDelay` are set to the same value, this value shall be used as delay.
If `SdServerTimerRequestResponseMinDelay` and `SdServerTimerRequestResponseMaxDelay` are set to 0, no delay shall be introduced.
](

[SWS_SD_00725][
If `SdClientTimerRequestResponseMinDelay` and `SdClientTimerRequestResponseMaxDelay` are set to the same value, this value shall be used as delay.
If `SdClientTimerRequestResponseMinDelay` and `SdClientTimerRequestResponseMaxDelay` are set to 0, no delay shall be introduced.
](

[SWS_SD_00495][
Delayed answering Entries received via multicast (as in SWS_SD_00494) shall no influence other timers (e.g. for handling the Repetition Phase).
](

7.6 Timings and repetitions for Server Service and Event Handlers

Especially after starting multiple ECUs, the multicast messages of the Service Discovery come with the risk of overflowing ECUs with too many messages. Therefore, the Service Discovery can be configured with a suitable message sending behavior.

For every Server Service Instance different phases are defined as shown in Figure 15:

- Down
- Available
  - Initial Wait Phase
  - Repetition Phase
  - Main Phase

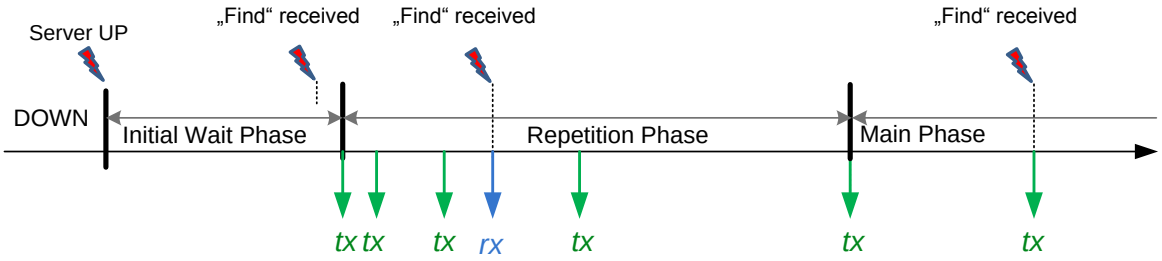


Figure 15 – Communication phases Server

[SWS_SD_00605] ⌈
When the Down Phase is entered (coming from states other than init), the API `SoAd_CloseSoCon()` shall be called for all Socket Connections associated with this Server Service Instance.
⌋()

7.6.1 Initial Wait Phase for Server Services

This chapter describes the behavior of the Service Discovery in regard of a Server Service Instance in the Initial Wait Phase.

[SWS_SD_00317]⌈
If the following conditions apply, the Initial Wait Phase for this configured Server Service Instance shall be entered:

- `Sd_Init()` has been called
- `Sd_ServerServiceSetState()` with `SD_SERVER_SERVICE_AVAILABLE` has been called

- `Sd_LocalIpAddrAssignmentChg()` with state "`TCPIP_IPADDR_STATE_ASSIGNED`" has been called for the first `IpAddrId` associated with the `SdInstanceTxPdu`.

]()

Note: Service Discovery expects that the IP address of the data/control path to be always the same. This means that a call of `Sd_LocalIpAddrAssignmentChg()` affects the control path and data path simultaneously.

[SWS_SD_00330][
When the Initial Wait Phase is entered, the routing of the Server Service shall be enabled. See `SdServerServiceActivationRef` of this Server Service Instance.
]()

[SWS_SD_00318][
When entering the Initial Wait Phase, a random timer shall be started, using a random value within the configured range of `SdServerTimerInitialOfferDelayMin` and `SdServerTimerInitialOfferDelayMax`.
]()

[SWS_SD_00319][
If a FindService Entry is received within the Initial Wait Phase for this Server Service Instance, it shall be ignored.
]()

[SWS_SD_00320][
If a SubscribeEventgroup Entry or StopSubscribeEventgroup Entry are received within the Initial Wait Phase (or other phases) for an Event Handler of this Server Service Instance, it shall only be processed within the Service Discovery. Please refer to the according sequence diagrams and section 7.6.4.
]()

[SWS_SD_00321][
When the calculated random timer based on the min and max values `SdServerTimerInitialOfferDelayMin` and `SdServerTimerInitialOfferDelayMax` expires, the first OfferService entry shall be sent out.
]()

[SWS_SD_00434][
When the calculated random timer expires and the parameter `SdServerTimerInitialOfferRepetitionsMax` does not equals '0', the Repetition Phase shall be entered.
]()

[SWS_SD_00435][
When the calculated random timer expires and the parameter `SdServerTimerInitialOfferRepetitionsMax` equal '0', the Main Phase shall

be entered.
](

[SWS_SD_00323][
If `Sd_ServerServiceSetState()` is called with a state other than `SD_SERVER_SERVICE_AVAILABLE` while being in Initial Wait Phase:

- Enter the Down Phase.
- Set all associated EventHandler to `SD_EVENT_HANDLER_RELEASED` and report it to the BswM by calling the API `BswM_Sd_EventHandlerCurrentState`.
- Cancle all relevant timers for service instance (see SWS_SD_00318).

](

[SWS_SD_00325][
If `Sd_LocalIpAddrAssignmentChg()` is called with a state other than "`TCPIP_IPADDR_STATE_ASSIGNED`" while being in Initial Wait Phase, this phase shall be left and the Down Phase shall be entered.
](

[SWS_SD_00606][
When the Initial Wait Phase is entered, the API `SoAd_OpenSoCon()` shall be called for all Socket Connections associated with this Server Service Instance.
](

Note: As soon as an IP address is assigned again and no `SD_SERVER_SERVICE_DOWN` was received, the Initial Wait Phase shall be reentered with the random timer reset to the random value.

7.6.2 Repetition Phase for Server Services

This chapter describes the timing behavior of the Service Discovery in regard of Server Service Instances in the Repetition Phase.

[SWS_SD_00329][
If the Repetition Phase is entered, the Service Discovery shall wait `SdServerTimerInitialOfferRepetitionBaseDelay` and send an OfferService Entry.
](

[SWS_SD_00336][
After the amount of cyclically sent OfferServices within the Repetition Phase equals the amount of `SdServerTimerInitialOfferRepetitionsMax`, the Main Phase shall be entered.
](

Note:
Additionally sent OfferService messages which have been triggered by received FindService messages shall have no influence on the counter value of the cyclically OfferService messages.

[SWS_SD_00331]⌈
In the Repetition Phase up to `SdServerTimerInitialOfferRepetitionsMax` OfferService Entries shall be sent with doubling intervals (BaseDelay, first OfferService Entries, 2x BaseDelay, second OfferService Entries, 4x BaseDelay, third OfferService Entries).
⌋()

Note: Example config and resulting behavior:

`SdServerTimerInitialOfferRepetitionBaseDelay=30`
`SdServerTimerInitialOfferRepetitionsMax=3`

[Initial Wait Phase starts]
Wait Initial Wait Delay based on Configured Min and Max
Send entry.
[Initial Wait Phase ends]
[Repetition Phase starts]
Wait 30ms (=30ms * 2^0).
Send entry.
Wait 60ms (=30ms * 2^1).
Send entry.
Wait 120ms (=30ms * $2^{2)}$.
Send entry.
[Repetition Phase ends]

[SWS_SD_00332]⌈
If the Service Discovery Module receives a FindService Entry, the following step(s) shall be performed in the following order:

- Send an “OfferService Entry” considering the appropriate delay (see chapter 7.5.3) without changing the current counter value and without influencing the current running repetition timer.

⌋()

Note: Currently this specification does not allow sending “FindService Entries” using unicast. For compatibility reasons receiving such entries shall be supported.

[SWS_SD_00333]⌈
If the Service Discovery Module receives a “SubscribeEventgroup” entry, the following step(s) shall be performed in the following order:

- Send a SubscribeEventgroupAck / Nack entry using Unicast considering the appropriate delay (see chapter 7.5.3) without changing the current counter value and without influencing the current running repetition timer.
- Call the BswM with the API `BswM_Sd_EventHandlerCurrentState()` with state `SD_EVENT_HANDLER_REQUESTED` only if the state for this EventHandler changed (i.e. has not been `SD_EVENT_HANDLER_REQUESTED`)
- Start the TTL timer according to the value received via the SubscribeEventgroup Entry.

⌋()

Note: Currently this specification does not allow sending “SubscribeEventgroup Entries” using multicast. For compatibility reasons receiving such entries shall be supported.

[SWS_SD_00334]⌈
If the Service Discovery Module receives a StopSubscribeEventgroup Entry, the following step(s) shall be performed in the following order:

- Stop the TTL timer for this client
- Update State
- If this has been the last subscribed client, report “SD_EVENT_HANDLER_RELEASED” to the BswM by calling the API BswM_Sd_EventHandlerCurrentState().

⌋()

[SWS_SD_00458]⌈
If the TTL of a received SubscribeEventgroup Entry expires, the following step shall be performed in the following order:

- If this has been the last subscribed client, report “SD_EVENT_HANDLER_RELEASED” to the BswM by calling the API BswM_Sd_EventHandlerCurrentState() and update the state within the Service Discovery Module

⌋()

[SWS_SD_00338]⌈
If Sd_ServerServiceSetState() is called with a state other than SD_SERVER_SERVICE_AVAILABLE (i.e. SD_SERVER_SERVICE_DOWN) while being in Repetition Phase:

- Leave this phase and enter the Down Phase.
- Sent a StopOfferService.
- All associated EventHandler which state is not SD_EVENT_HANDLER_RELEASED shall be changed to SD_EVENT_HANDLER_RELEASED and indicated to the BswM by calling the API BswM_Sd_EventHandlerCurrentState().

⌋()

[SWS_SD_00340]⌈
If Sd_LocalIpAddrAssignmentChg()is called with a state other than “TCPIP_IPADDR_STATE_ASSIGNED” while being in Repetition Phase, this phase shall be left and the Down Phase shall be entered.
⌋()

[SWS_SD_00732]⌈
If the TCP/IP connection has been lost (Socket connection is other than SOAD_SOCON_ONLINE), the Service Discovery Module shall leave the Repetition Phase and enter the Wait Phase.
⌋()

[SWS_SD_00341]⌈
When the state SD_SERVER_SERVICE_DOWN is set by

`Sd_ServerServiceSetState()` in Repetition Phase, the routing of this Server Service Instance shall be disabled. See `SdServerServiceActivationRef` of this Server Service Instance.
](

7.6.3 Main Phase for Server Services

[SWS_SD_00342][
The Service Discovery Module shall stay in the Main Phase for the configured Server Service as long as the following conditions apply:

- Server Service is in state “AVAILABLE” (i.e. `Sd_ServerServiceSetState()` has been called with State “`SD_SERVER_SERVICE_AVAILABLE`”)
- IP address is assigned and can be used (i.e. `Sd_LocalIpAddrAssignmentChg` has been called with status `TCPIP_IPADDR_STATE_ASSIGNED`)

](

[SWS_SD_00449][
If `SdServerTimerOfferCyclicDelay` is greater than 0, in the Main Phase an OfferService entry shall be sent cyclically with an interval defined by configuration item `SdServerTimerOfferCyclicDelay`.
](

[SWS_SD_00450][
The first OfferService is sent `SdServerTimerOfferCyclicDelay` after the beginning of the Main Phase.
](

[SWS_SD_00451][
If `SdServerTimerOfferCyclicDelay` is 0, no OfferService entries shall be sent in Main Phase for this Server Service Instance.
](

[SWS_SD_00343][
If the Service Discovery Module receives a FindService Entry the following step shall be performed:

- Send an “OfferService Entry” considering the appropriate delay (see chapter 7.5.3).

](

Note: Currently this specification does not allow sending “FindService Entries” using unicast. For compatibility reasons receiving such entries shall be supported.

[SWS_SD_00344][
If the Service Discovery Module receives a “SubscribeEventgroup”, the following step(s) shall be performed in the following order:

- Send a SubscribeEventgroupAck / Nack entry using Unicast considering the appropriate delay (see chapter 7.5.3) without influencing the current running main phase timer.
- Report to the BswM SD_EVENT_HANDLER_REQUESTED by calling the API BswM_Sd_EventHandlerCurrentState().
- Start the TTL timer according to the value received via the "SubscribeEventgroup".

](

Note: Currently this specification does not allow sending "SubscribeEventgroup Entries" using multicast. For compatibility reasons receiving such entries shall be supported.

[SWS_SD_00345][
If the Service Discovery Module receives a StopSubscribeEventgroup", the following step(s) shall be performed in the following order:

- Stop the TTL timer and remove it from the notification list
- If no other client is subscribed to this Eventgroup anymore, enter the State "SD_EVENT_HANDLER_RELEASED" and report it to the BswM by calling the API BswM_Sd_EventHandlerCurrentState () with state SD_SERVER_SERVICE_AVAILABLE.

](

[SWS_SD_00347][
If the API LocalIpAddrAssignmentChg has been called with a state other than TCPIP_IPADDR_STATE_ASSIGNED,

- The Service Discovery Module shall leave the Main Phase and enter the DOWN Phase
- All EventHandler which are not in state SD_EVENT_HANDLER_RELEASED shall be set to SD_EVENT_HANDLER_RELEASED and be indicated to the BswM module by calling the API BswM_Sd_EventHandlerCurrentState

](

[SWS_SD_00733][
If the TCP/IP connection has been lost (Socket connection is other than SOAD_SOCON_ONLINE), the Service Discovery Module shall leave the Main Phase and enter the Wait Phase.](

[SWS_SD_00348][
If the API Server Sd_ServerServiceSetState() is called with state "SD_SERVER_SERVICE_DOWN" while the IP address is still assigned (i.e. Sd_LocalIpAddrAssignmentChg has been called with state TCPIP_IPADDR_STATE_ASSIGNED), the Service Discovery module shall

- send a StopOfferService
- enter the DOWN Phase
- all subscriptions of the eventgroup(s) of this service instance shall be deleted and SD_EVENT_HANDLER_RELEASED and reported to BswM using the API BswM_Sd_EventHandlerCurrentState

](

[SWS_SD_00349]⌈
When the Main Phase is left, the routing of this Server Service Instance shall be disabled. See `SdServerServiceActivationRef` of this Server Service Instance.
⌋()

[SWS_SD_00403]⌈
When the TTL timer (contained in TTL field find or Subscribe entry) expires in state `"SD_EVENT_HANDLER_REQUESTED"`,
enter the state `SD_EVENT_HANDLER_RELEASED` and report it to the BswM by calling the `BswM_Sd_EventHandlerCurrentState()`.
⌋()

7.6.4 Fan out control

This chapter describes the interaction between Service Discovery and Socket Adaptor (SoAd) in order to configure the TX path for sending out events (fan out).

[SWS_SD_00452]⌈
The Service Discovery shall keep track of the subscribed clients per Event Handler and remove clients from the fan out, if the last SubscribeEventgroup entry was longer ago than the time specified in its TTL field of that SubscribeEventgroup entry.
⌋()

[SWS_SD_00453]⌈
If SdEventHandlerTCP is configured: For every SubscribeEventgroup entry of this Event Handler, the following shall be done:

- The relevant Routing Groups shall be identified by `SdEventHandlerTcp`.
- The relevant TCP Socket Connection of this client shall be identified using the Address/Port of Endpoint Option (UDP) referenced in the SubscribeEventgroup entry and the `SdServerServiceTcpRef`, or shall be set up, if not existed before.
- Check state of incoming TCP connection using SoAd_GetSoConMode. If mode is not SOAD_SOCON_ONLINE, answer using SubscribeEventgroupNack. Only if the client was not subscribed before receiving the aforementioned entry:
  - `SoAd_EnableSpecificRouting` with `SdEventActivationRef` and the Socket Connection.
  - `SoAd_IfSpecificRoutingGroupTransmit` with `SdEventTriggeringRef` and the Socket Connection.
- Answer using SubscribeEventgroup entry.

⌋()

[SWS_SD_00454]⌈
If `SdEventHandlerUDP` is configured: For every SubscribeEventgroup entry of this Eventhandler, the following shall be done:

- The relevant Routing Groups shall be identified by `SdEventHandlerUdp`.
- The relevant UDP Socket Connection of this client shall be identified using the Address/Port of Endpoint Option (UDP) referenced in the

SubscribeEventgroup entry and the `SdServerServiceUdpRef`, or shall be set up (`SoAd_SetUniqueRemoteAddr()`), if not existed before.
    - If no Wildcard Socket Connection is left, `SD_E_OUT_OF_RES` shall be reported.
- Only if the client was not subscribed before receiving this entry:
    - `SoAd_EnableSpecificRouting` with `SdEventActivationRef` and the Socket Connection depending on current number of subscribed clients and the `SdEventHandlerMulticastThreshhold`.
    - `SoAd_IfSpecificRoutingGroupTransmit` with `SdEventTriggeringRef` and the Socket Connection.

](

[SWS_SD_00455]⌈
The SdEventHandlerMulticastThreshhold shall be used to control when to enable/disable Unicast/Multicast by using `SoAd_EnableSpecificRouting` and `SoAd_DisableSpecificRouting`**:**

- If `SdEventHandlerMulticastThreshhold` = 0: Setup Unicast to every subscribed client (Multicast always disabled).
- If `SdEventHandlerMulticastThreshhold` = 1: Setup Multicast if one or more clients are subscribed (Unicast always disabled).
- If `SdEventHandlerMulticastThreshhold` > 1:
  - Setup Unicast for all subscribed clients if number of subscribed clients < `SdEventHandlerMulticastThreshhold`,
  - else setup Multicast. Switch dynamically based on the number of subscribed clients:
    - With 0 clients: nothing enabled.
    - With clients < threshold: unicast for subscribed clients enabled. Multicast disabled.
    - With clients ≥ threshold: multicast enabled. Unicast disabled.

⌋()

7.7 Timings and repetitions for Client Service and Consumed Eventgroups

The Service Discovery phases allow minimizing the number of Service Discovery messages sent while allowing for very fast synchronization upon ECU start.

This de-emphasis is realized by the following Phases:

- Down
- Requested
  - Initial Wait Phase
  - Repetition Phase
  - Main Phase

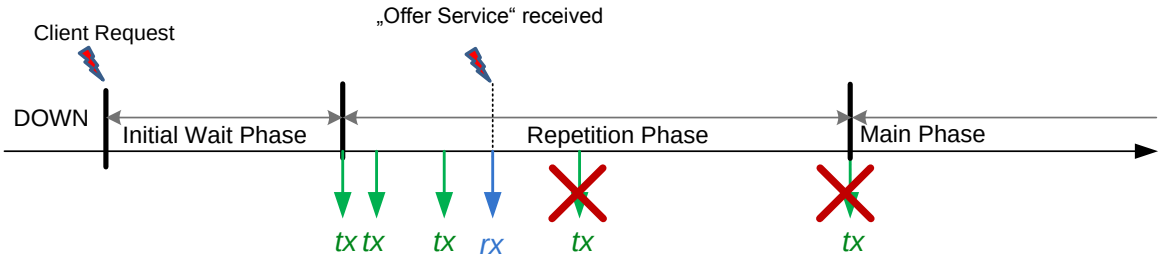


Figure 16 – Communication phases Client

7.7.1 Down Phase for Client Services

[SWS_SD_00462]⌈
As long as a service is not requested by the BswM, the Service Discovery shall not send FindService Entry entries.
⌋()

[SWS_SD_00463]⌈
If an OfferService Entry is received during Down Phase,

- The Service Discovery shall store the state of this Service instance.
- A timer shall be set/reset to the TTL value of the received OfferService entry (TTL timer).
- Until the TTL Timer expires or a StopOfferService entry is received, the Service instance is considered Available.

⌋()

[SWS_SD_00464]⌈
If `Sd_ClientServiceSetState`() is called with state `SD_CLIENT_SERVICE_REQUESTED` while being in Down Phase:

- If no OfferService entry was received before or its TTL timer expired already:
  - The Initial Wait Phase shall be entered,
- If an OfferService entry was received and its TTL timer did not expire yet:

- If `SoAd_OpenSoCon()` was not called before, the API `SoAd_OpenSoCon()` shall be called for all Socket Connections associated with this Client Service Instance.
- The API `SoAd_EnableSpecificRouting()` shall be called with `SdClientServiceActivationRef` (see `SdConsumedMethods`) and the relevant Socket Connections for this Client Service Instance.
- Open TCP connection if `SdClientServiceTcpRef` is configured and was not opened before.
- The Main Phase shall be entered.

](

7.7.2 Initial Wait Phase for Client Services

This chapter describes the behavior of the Service Discovery in regard of a Client Service Instance in the Initial Wait Phase.

[SWS_SD_00350][
If the following conditions apply, the Initial Wait Phase for this configured Client Service Instance shall be entered:

- `Sd_Init()` has been called.
- `Sd_ClientServiceSetState()` with `SD_CLIENT_SERVICE_REQUESTED` has been called OR `SdClientServiceAutoRequired = TRUE`.
- `Sd_LocalIpAddrAssignmentChg()` with state "TCPIP_IPADDR_STATE_ASSIGNED" has been called for the first `IpAddrId` associated with the `SdInstanceTxPdu`.

](

[SWS_SD_00604][
When a OfferService for a required Client Service is received and `SoAd_OpenSoCon()` was not called before, the API `SoAd_OpenSoCon()` shall be called for all Socket Connections associated with this Client Service Instance.
] ()

[SWS_SD_00351][
This Client Service Instance shall stay in the Initial Wait Phase for a time within the configured range of `SdClientTimerInitialFindDelayMin` and `SdClientTimerInitialFindDelayMax` unless an OfferService entry for this Client Service Instance is received or this random timer expires.
](

[SWS_SD_00352][
If an OfferService Entry for this Client Service Instance is received within the Initial Wait Phase,

- The calculated random timer, which has been started when entering the Initial Wait Phase, shall be canceled.
- If received TTL is not equal to the max value, set the TTL timer for this entry to the received TTL value.

- Open TCP connection if SdClientServiceTcpRef is configured and was not opened before.
- Leave the Initial Wait Phase Enter the Main Phase.

](

[SWS_SD_00353][
When the calculated random timer based on the parameters SdClientTimerInitialFindDelayMin and SdClientTimerInitialFindDelayMax expires (i.e. no OfferService has been received within this timespan), the following shall be done in the following order:

- FindService Entry shall be sent.
- If the SdClientTimerInitialFindRepetitionsMax>0, enter the Repetition Phase
- If the SdClientTimerInitialFindRepetitionsMax=0, enter the Main Phase

](

[SWS_SD_00355][
If Sd_ClientServiceSetState() is called with state SD_CLIENT_SERVICE_RELEASED while being in Initial Wait Phase, this phase shall be left and the Service shall enter Down Phase.
]()

[SWS_SD_00456][
If for any reasons the Initial Wait Phase is left, the calculated random timer (of the Initial Wait Phase) for this Service Instance shall be stopped.
](

[SWS_SD_00357][
If Sd_LocalIpAddrAssignmentChg() is called with a state other than "TCPIP_IPADDR_STATE_ASSIGNED" while being in Initial Wait Phase, the Down Phase shall be entered.
](

[SWS_SD_00354][
If the API Sd_Init() is called while being in Initial Wait Phase, the Down Phase shall be entered.
](

7.7.3 Repetition Phase for Client Services

[SWS_SD_00358][
When the Repetition Phase is entered, the Service Discovery Module shall start the timer SdClientTimerInitialFindRepetitionsBaseDelay
](

[SWS_SD_00457]⌈
When the timer `SdClientTimerInitialFindRepetitionsBaseDelay` expires within the Repetition Phase, a FindOffer Message shall be sent.
⌋()

[SWS_SD_00363]⌈
In the Repetition Phase up to `SdClientTimerInitialFindRepetitionsMax` FindServer entries shall be sent with doubling intervals (BaseDelay, first FindService Entry, 2x BaseDelay, second FindService Entry, 4x BaseDelay, third FindService Entry, …).
⌋()

Note: Example config and resulting behavior (no OfferService received during example):

`SdClientTimerInitialFindRepetitionBaseDelay=30`
`SdClientTimerInitialFindRepetitionMax=3`

[Initial Wait Phase starts]
Wait Initial Wait Delay based on Configured Min and Max
Send entry.
[Initial Wait Phase ends]
[Repetition Phase starts]
Wait 30ms (=30ms * 2^0).
Send entry.
Wait 60ms (=30ms * 2^1).
Send entry.
Wait 120ms (=30ms * $2^{2)}$.
Send entry.
[Repetition Phase ends]

[SWS_SD_00365]⌈
If the Service Discovery Module receives an OfferService Entry while the current state `SD_CLIENT_SERVICE_REQUESTED` is for this Client Service Instance, the following step(s) shall be performed in the following order:

- Cancel the repetition timer.
- If received TTL is not equal to the max value, set the TTL timer for this entry to the received TTL value.
- Open TCP connection if `SdClientServiceTcpRef` is configured and was not opened before.
- Leave the Repetition Phase immediately and enter the Main Phase.

⌋()

[SWS_SD_00369]⌈
After sending the maximum amount of repetitions (defined by `SdClientTimerInitialFindRepetitionsMax) of FindService` entries, the Repetition Phase shall be left and the Main Phase shall be entered.
⌋()

[SWS_SD_00371]⌈
If Sd_ClientServiceSetState `()` is called with state `SD_CLIENT_SERVICE_RELEASED` while being in Repetition Phase, this phase shall be left and the service instance shall enter Down Phase.
⌋()

[SWS_SD_00373]⌈
If `Sd_LocalIpAddrAssignmentChg()` is called with a state other than "`TCPIP_IPADDR_STATE_ASSIGNED`" while being in Repetition Phase the Down Phase shall be entered.
⌋()

[SWS_SD_00730]⌈
If the TCP/IP connection has been lost (Socket connection is other than SOAD_SOCON_ONLINE), the Service Discovery Module shall leave the Repetition Phase, enter the Wait Phase, and stop the TTL timers of the associated Client Service Instances and EventGroups.
⌋()

7.7.4 Main Phase for Client Services

[SWS_SD_00375]⌈
The Service Discovery Module shall stay in the Main Phase as long as the following conditions apply:

- Client Service is needed (i.e. `Sd_ClientServiceSetState()` has been called with State "`SD_CLIENT_SERVICE_REQUESTED`")
- IP address assigned and can be used (i.e. `Sd_LocalIpAddrAssignmentChg` has been called with status `TCPIP_IPADDR_STATE_ASSIGNED`).

⌋()

[SWS_SD_00376]⌈
If the Service Discovery Module receives an OfferService Entry, the following step(s) shall be performed in the following order:

- If received TTL is not equal to the max value, update the timer by the received TTL value.
- Open TCP connection if `SdClientServiceTcpRef` is configured and was not opened before.

⌋()

Note: The amount of separate Service Discovery messages shall be reduced, i.e.: Combine as much information as possible into one Service Discovery message before calling the Socket Adaptor's transmit API.

[SWS_SD_00721]⌈
If an OfferService entry was received and its TTL timer did not expire yet, the associated Socket Connections are in state SOAD_SOCON_ONLINE in the Main phase:

- If the client service has not been reported as SD_CLIENT_SERVICE_AVAILABLE:
    - the API `SoAd_EnableSpecificRouting()` shall be called with `SdClientServiceActivationRef` (see `SdConsumedMethods`) and the relevant Socket Connections for this Client Service Instance.
    - SD_CLIENT_SERVICE_AVAILABLE shall be indicated to the BswM module by calling the API `BswM_Sd_ClientServiceCurrentState()`.
- For each currently requested Consumed Eventgroup of this Client Service Instance (Consumed Eventgroups are requested using `Sd_ConsumedEventGroupSetState()` and with state SD_CONSUMED_EVENTGROUP_REQUESTED or automatically on startup if `SdConsumedEventGroupAutoRequire` is configured to true), the following shall be done in exactly this order:
    - StopSubscribeEventgroup entry shall be sent out, if the last SubscribeEventgroup entry was sent as reaction to an OfferService entry received via Multicast, it was never answered with a

SubscribeEventgroupAck, and the current OfferService entry was received via Multicast.
    - A SubscribeEventgroup entry shall be sent out.
- If `SdSubscribeEventgroupRetryEnable` is set to TRUE and if `SdSubscribeEventgroupRetryMax` is greater 0, the Eventgroup subscription retry counter shall be reset to 1.

](

Note:
Refer to SWS_SD_00702, SWS_SD_00703 and SWS_SD_00704 for the enabling of routing groups. The transmission of a response to an Offer received via multicast shall be delayed with the configured delay. When the request response delay elapses before the associated Socket Connections are in state SOAD_SOCON_ONLINE, the StopSubscribeEventgroup and SubscribeEventgroup shall be delayed until the Socket Connections are online and shall not be considered as reaction to an OfferService entry received via Multicast. When the request response delay elapses while the ClientService is in state RELEASED, there shall be no response to this Offer entry.

[SWS_SD_00722][
When the Client Service is reported as SD_CLIENT_SERVICE_DOWN to the BswM by calling the API BswM_Sd_ClientServiceCurrentState()
- the API SoAd_DisableSpecificRouting() shall be called with SdClientServiceActivationRef (see `SdConsumedMethods`) and the relevant Socket Connections for this Client Service Instance.

](

[SWS_SD_00695][
If a StopSubscribeEventgroup and SubscribeEventgroup for the same Eventgroup (i.e. same Service ID, Instance ID, Eventgroup ID, Counter, and Major Version) have to be sent out, these entries have to be directly after each other in the same SD message (no entry between them).
- For each currently requested Consumed Eventgroup of this Client Service Instance (Consumed Eventgroups are requested using `Sd_ConsumedEventGroupSetState and` with state `SD_CONSUMED_EVENTGROUP_REQUESTED` or automatically on startup if `SdConsumedEventGroupAutoRequire` is configured to true), the following shall be done in exactly this order:
    - StopSubscribeEventgroup entry shall be sent out, if the last SubscribeEventgroup entry was sent as reaction to an OfferService entry received via Multicast, it was never answered with a SubscribeEventgroupAck, and the current OfferService entry was received via Multicast.
    - A SubscribeEventgroup entry shall be sent out

- If SdSubscribeEventgroupRetryEnable is set to TRUE and if SdSubscribeEventgroupRetryMax is greater 0, the Eventgroup subscription retry counter shall be reset to 1.

](

[SWS_SD_00377][
If the Service Discovery Module receives a SubscribeEventgroupAck fitting a Consumed Eventgroup that is not yet available, the following steps shall be performed in the following order:

- If the SubscribeEventgroupAck references a Multicast Endpointoption
  - The relevant Socket Connection Group shall be identified using SdConsumedEventGroupMulticastGroupRef with the local Address and Port of the Multicast Endpoint Option or set one up using SoAd_RequestIpAddrAssignment().
  - The relevant Socket Connection of this service shall be identified using the Address and Port of the Endpoint Option referenced in the Offer entry of this service or shall be set up (SoAd_SetUniqueRemoteAddr()), if not existed before.
    - If no Wildcard Socket Connection is left, SD_E_OUT_OF_RES shall be reported.
  - The relevant Routing Group shall be identified by following SdConsumedEventGroupMulticastActivationRef.
  - Call SoAd_EnableSpecificRouting() with the SocketID and the RoutingGroupID .
- Call BswM_Sd_ConsumedEventGroupCurrentState with SD_CONSUMED_EVENTGROUP_AVAILABLE if the datapath was set up successfully.
- Setup the TTL timer with the TTL of the SubscribeEventgroupAck entry if the datapath was set up successfully.

](

[SWS_SD_00465][
If a Service Discovery Message contains only a SubscribeEventgroupNack entry but no SubscribeEventgroupAck entry for the same Eventgroup, Service Discovery shall do the following:

- Report the DEM error SD_E_SUBSCR_NACK_RECV (see ECUC_SD_00123)
- If SdClientServiceTcpRef is configured for this service, determine the used SoCon and call the API SoAd_CloseSoCon() with the SoConID and parameter abort set to TRUE
- If SdClientServiceTcpRef is configured for this service, determine the used SoCon and call the API SoAd_OpenSoCon() with the SoConID.

](

[SWS_SD_00367][
If the Service Discovery Module receives a StopOfferService Entry, the following step(s) shall be performed in the following order:

- Stop the TTL timers of this Client Service Instance and all related Consumed Eventgroups.

- Report this Client Service as DOWN if it was reported AVAILABLE before (call `BswM_Sd_ClientServiceCurrentState` with `SD_CLIENT_SERVICE_DOWN` and the Client Service's handle ID).
- Report all Consumed Eventgroups as DOWN that were reported AVAILABLE before (call `BswM_Sd_ConsumedEventGroupCurrentState` with `SD_CONSUMED_EVENTGROUP_DOWN` and the Consumed Eventgroup's handle ID).
- If `SdSubscribeEventgroupRetryEnable` is set to TRUE and if `SdSubscribeEventgroupRetryMax` is greater 0, cancel the corresponding client service subscription retry delay timer and reset subscription retry counter of all corresponding Eventgroups to 0.
- Close all Socket Connections associated with this Client Service Instance that have been opened before.
- Stay in Main Phase and do not send FindService entries.

](

[SWS_SD_00741][
If a Consumed Eventgroup switches to the state `SD_CONSUMED_EVENTGROUP_REQUESTED` while the corresponding state of the requested Service Instance was already set to `SD_CLIENT_SERVICE_AVAILABLE` (due to an already received Offer Service with TTL 0xFFFFFF), a SubscribeEventgroup entry shall be sent out only if all of the following conditions apply:

- `SdSubscribeEventgroupRetryEnable` is set to TRUE,
- `SdSubscribeEventgroupRetryMax` is greater 0,

](

Note:
Requirement [SWS_SD_00741] ensures that a Client can still subscribe to Eventgroups at any point in time when it is needed, even though cyclic Offers of the corresponding ServerService are not present in the main phase (`SdServerTimerOfferCyclicDelay` set to 0). In this case, no cyclic Offer is needed for triggering the transmissions of SubscribeEventgroup entries.

[SWS_SD_00712]⌈
If `Sd_LocalIpAddrAssignmentChg()` is called with a state other than "`TCPIP_IPADDR_STATE_ASSIGNED`" while being in Main Phase:

- The Down Phase shall be entered.
- "`SD_CLIENT_SERVICE_DOWN`" shall be indicated to the BswM module by calling the API BswM_Sd_ClientServiceCurrentState(), if the present state is `SD_CLIENT_SERVICE_AVAILABLE`.
- "`SD_CONSUMED_EVENTGROUP_DOWN`" shall be indicated to the BswM module by calling the API BswM_Sd_ConsumedEventGroupCurrentState() for all associated ConsumedEventgroups, if the present state is `SD_CONSUMED_EVENTGROUP_AVAILABLE`.
- If SdSubscribeEventgroupRetryEnable is set to TRUE and if SdSubscribeEventgroupRetryMax is greater 0, cancel the corresponding client service subscription retry delay timer and reset subscription retry counter of all corresponding Eventgroups to 0.

⌋()

[SWS_SD_00731]⌈
If the TCP/IP connection has been lost (Socket connection is other than SOAD_SOCON_ONLINE), the Service Discovery Module shall leave the Main Phase, enter the Wait Phase, and stop the TTL timers of the associated Client Service Instances and EventGroups.
⌋()

[SWS_SD_00380]⌈
The Service Discovery Module shall leave the Main Phase and enter the state `SD_CLIENT_SERVICE_DOWN` if at least one of the listed conditions described in SWS_SD_00375 does not apply any more.
⌋()

[SWS_SD_00381]⌈
If the Client goes DOWN which is indicated by a call of Sd_ClientServiceSetState () with State "`SD_CLIENT_SERVICE_RELEASED`" while all other conditions listed in SWS_SD_00375 still apply, the Service Discovery module shall perform the following steps:

- Enter the Down Phase and indicate the state `SD_CLIENT_SERVICE_DOWN` to the BswM by calling the API `BswM_Sd_ClientServiceCurrentState()`.
- For all subscribed eventgroups of this Client Service,
  - a StopSubscribeEventgroup shall be sent
  - the status shall be set to `SD_CONSUMED_EVENTGROUP_DOWN` and reported to BswM by calling the API `BswM_Sd_ConsumedEventGroupCurrentState()`.
- If SdSubscribeEventgroupRetryEnable is set to TRUE and if SdSubscribeEventgroupRetryMax is greater 0, cancel the corresponding client service subscription retry delay timer and reset subscription retry counter of all corresponding Eventgroups to 0.

⌋()

[SWS_SD_00713]⌈
If the Consumed Event Group is not requested anymore as indicated by a call of Sd_ConsumedEventGroupSetState with state `SD_CONSUMED_EVENTGROUP_RELEASED`, the Service Discovery module shall perform the following steps for the consumed event group:

- A StopSubscribeEventgroup shall be sent.
- The status shall be set to `SD_CONSUMED_EVENTGROUP_DOWN` and be reported to the BswM by calling the API BswM_Sd_ConsumedEventGroupCurrentState(), if the status is not currently `SD_CONSUMED_EVENTGROUP_DOWN`.
- If SdSubscribeEventgroupRetryEnable is set to TRUE and if SdSubscribeEventgroupRetryMax is greater 0, cancel the corresponding client service subscription retry delay timer and reset subscription retry counter of all corresponding Eventgroups to 0.

⌋()

[SWS_SD_00600]⌈
If the TTL Timer of a Client Service expires, the Service Discovery module shall perform the following steps:

- Enter the Initial Wait Phase and indicate the state `SD_CLIENT_SERVICE_DOWN` to the BswM by calling the API `BswM_Sd_ClientServiceCurrentState ()`.
- All subscribed Eventgroups of this Client Service shall expired in this instance (stop TTL timer) and the expiration shall be handled as describe in SWS_SD_00601**.**

⌋()

[SWS_SD_00601]⌈
If the TTL Timer of an Eventgroup expires, the Service Discovery module shall perform the following step(s):

- the status shall be set to `SD_CONSUMED_EVENTGROUP_DOWN` and reported to BswM by calling the API `BswM_Sd_ConsumedEventGroupCurrentState()`.

⌋()

[SWS_SD_00382]⌈
When the Main Phase is left,

- The API `SoAd_DisableSpecificRouting()` shall be called for all Socket Connections associated with this Client Service ID that have been opened before.
- Close all Socket Connections associated with this Client Service Instance that have been opened before.

⌋()

7.7.5 Fan in control

This section describes the interaction between Service Discovery and Socket Adaptor (SoAd) to configure the RX path for receiving events (fan in).

[SWS_SD_00702]⌈
If `SdConsumedEventGroupTcpActivationRef` is configured: When sending SubscribeEventgroup entries for this Eventgroup, the following shall be done:

- The relevant Routing Group shall be identified by following `SdConsumedEventGroupTcpActivationRef`.
- The relevant TCP Socket Connection shall be identified by `SdClientServiceTcpRef`.
- A TCP Endpoint option shall be constructed with these parameters.
- Only if this client is currently not subscribed yet:
  - `SoAd_EnableSpecificRouting` with the two parameters above.

⌋()

[SWS_SD_00703]⌈
If `SdConsumedEventGroupUdpActivationRef` is configured: When sending SubscribeEventgroup entries for this Eventgroup, the following shall be done:

- The relevant Routing Group shall be identified by following `SdConsumedEventGroupUdpActivationRef`.
- The relevant TCP Socket Connection shall be identified by `SdClientServiceUdpRef`.
- A UDP Endpoint option shall be constructed with these parameters.
- Only if this client is currently not subscribed yet:
  - `SoAd_EnableSpecificRouting` with the two parameters above.

⌋()

[SWS_SD_00704]⌈
If `SdConsumedEventGroupMulticastActivationRef` is configured: When receiving SubscribeEventgroupAck entries for this Eventgroup and with a referenced Multicast Endpoint Option, the following shall be done if this client is currently not subscribed yet:

- The relevant Routing Group shall be identified by following `SdConsumedEventGroupMulticastActivationRef`.
- The relevant UDP Socket Connection shall be identified:
  - Find the relevant Socket Connection Group using `SdConsumedEventGroupMulticastGroupRef` with the local Address and Port of the Multicast Endpoint Option or set one up.
  - Find the relevant Socket Connection in this Socket Connection Group by finding the Address and Port of this Services Endpoint or set one up.
- `SoAd_EnableSpecificRouting` with the two parameters above.

⌋()

[SWS_SD_00711]⌈
Routing Groups of EventGroups (see SdConsumedEventGroupTcpActivationRef, `SdConsumedEventGroupUdpActivationRef`, and `SdConsumedEventGroupMulticastActivationRef`)
shall be deactivated, if they are not needed anymore (Main phase was left, StopOffer received or ConsumedEventgroup was released).
⌋()

[SWS_SD_00706]⌈
Every wildcard socket connection shall be reset to wildcard using `ReleaseRemoteAddr()` if all of the following conditions apply:

- The remote address of the socket connection has been set by SD according to SWS_SD_00377.
- No Eventgroup Subscription for this socket connection is used anymore.

⌋()

[SWS_SD_00734]⌈
Every wildcard socket connection group shall be reset to wildcard using `SoAd_ReleaseIpAddrAssignment()` if all of the following conditions apply:

- Local address of the socket connection group has been set by SD according to SWS_SD_00377.
- All socket connections of this socket connection group have been released.

⌋()

7.8 Extended Production Errors

Error Name:	SD_E_OUT_OF_RES	
Short Description:	SD out of resources	
Long Description:	SD Instance does not have SoAd socket resources left to add client to Fan-Out.	
Recommended DTC:	N/A	
Detection Criteria:	FAIL	Every time when a Socket connection has to be opened but no Wildcard Socket Connection is available.
	PASS	After first startup until first error occurred.
Secondary Parameters:	Local IP-Address and Port Number of Socket Connection Group that has not enough Wildcard Socket Connections left	
Time Required:	N/A	
Monitor Frequency	Continuous	
MIL illumination:	N/A	

Error Name:	SD_E_MALFORMED_MSG	
Short Description:	SD received malformed SOME/IP-SD message	
Long Description:	The Service Discovery module received an inconsistent SOME/IP-SD message. This includes: • Inconsistent combination of SOME/IP length, entries length, and options length • Inconsistent length field of option • Illegal values of fields (e.g. IP Addresses and Ports).	
Recommended DTC:	N/A	
Detection Criteria:	FAIL	Every time a malformed SOME/IP-SD message has been received
	PASS	After first startup until first error occurred.
Secondary Parameters:	IP Address of Sender (Source IP Address)	
Time Required:	N/A	
Monitor Frequency	Continuous	
MIL illumination:	N/A	

Error Name:	SD_E_SUBSCR_NACK_RECV	
Short Description:	SD received SubscribeEventgroupNack entry	
Long Description:	The Service Discovery module received a SubscribeEventgroupNack entry, which is not expected.	
Recommended DTC:	N/A	
Detection Criteria:	FAIL	Every time a NACK is received.
	PASS	After first startup until first error occurred.
Secondary Parameters:	IP Address of Sender (Source IP Address)	
Time Required:	N/A	
Monitor Frequency	Continuous	
MIL illumination:	N/A	

7.9 Error classification

7.9.1 Development Errors

[SWS_SD_00107]⌈
Development error values are of type uint8.

Type or error	*Relevance*	*Related error code*	*Value [hex]*
SD has not been initialized	Development	SD_E_UNINIT	0x01
Null pointer has been passed as an argument	Development	SD_E_PARAM_POINTER	0x02
Invalid mode request	Development	SD_E_INV_MODE	0x03
Invalid Id	Development	SD_E_INV_ID	0x04
Initialization failed	Development	SD_E_INIT_FAILED	0x05

Table 3 – Error classification (Development Errors)

⌋()

7.9.2 Extended Production Errors

[SWS_SD_00707]⌈
The following table lists production errors that shall be distinguished by the Sd module:

Type or error	*Relevance*	*Related error code*	*Value [hex]*
Received Malformed Message	Extended Production	SD_E_MALFORMED_MSG	Assigned by DEM
Out of resources	Extended Production	SD_E_OUT_OF_RES	Assigned by DEM
Negative Acknowledge received	Extended Production	SD_E_SUBSCR_NACK_RECV	Assigned by DEM

Table 4 – Error classification (Extended Production Errors)

⌋()

7.9.3 Runtime Errors

[SWS_SD_00742]⌈

Type or error	*Relevance*	*Related error code*	*Value [hex]*
Retry was not successful	Runtime Error	SD_E_COUNT_OF_RETRY_SUBSCRIPTION_EXCEEDED	0x06

Table 5 – Error classification (Runtime Errors)

⌋()

7.10 Error detection

[SWS_SD_00108]⌈
The detection of development errors shall be configurable (*ON* / *OFF*) at pre-compile time. The switch `SdDevErrorDetect` (see chapter 10) shall activate or deactivate the detection of all development errors.
⌋()

[SWS_SD_00109]⌈
If the `SdDevErrorDetect` switch is enabled API parameter checking is enabled. The detailed description of the detected errors can be found in chapter 7.8 and chapter 8.
⌋()

Note: The detection of production code errors cannot be switched off.

7.11 Error notification

[SWS_SD_00110]⌈
Detected development errors shall be reported to the `Det_ReportError` service of the Default Error Tracer (DET) if the pre-processor switch `SdDevErrorDetect` is set (see chapter 10).
⌋()

[SWS_SD_00111]⌈
Production errors shall be reported to Diagnostic Event Manager.
⌋()

8 API specification

8.1 Imported Types

[SWS_SD_00117] [

Module	*Header File*	*Imported Type*
ComStack_Types	ComStackTypes.h	PduIdType
	ComStackTypes.h	PduInfoType
Dem	Rte_Dem_Type.h	Dem_EventIdType
	Rte_Dem_Type.h	Dem_EventStatusType
SoAd	SoAd.h	SoAd_RoutingGroupIdType
	SoAd.h	SoAd_SoConIdType
	SoAd.h	SoAd_SoConModeType
Std_Types	StandardTypes.h	Std_ReturnType
	StandardTypes.h	Std_VersionInfoType
TcpIp	TcpIp.h	TcpIp_IpAddrAssignmentType
	TcpIp.h	TcpIp_IpAddrStateType
	TcpIp.h	TcpIp_SockAddrType

] ()

8.2 Type definitions

8.2.1 Sd_ConfigType

[SWS_SD_00690] [

Name:	`Sd_ConfigType`	
Type:	`Structure`	
Range:	`implementation specific`	The content of the configuration data structure is implementation specific.
Description:	Configuration data structure of Sd module.	
Available via:	`Sd.h`	

] ()

8.2.2 Sd_ServerServiceSetStateType

[SWS_SD_00118] [

Name:	`Sd_ServerServiceSetStateType`		
Type:	`Enumeration`		
Range:	`SD_SERVER_SERVICE_DOWN`	0x00	--
	`SD_SERVER_SERVICE_AVAILABLE`	0x01	--
Description:	This type defines the Server states that are reported to the SD using the expected API Sd_ServerServiceSetState.		
Available via:	`Sd.h`		

] ()

8.2.3 Sd_ClientServiceSetStateType

[SWS_SD_00405] ⌈

Name:	Sd_ClientServiceSetStateType		
Type:	Enumeration		
Range:	SD_CLIENT_SERVICE_RELEASED	0x00	--
	SD_CLIENT_SERVICE_REQUESTED	0x01	--
Description:	This type defines the Client states that are reported to the BswM using the expected API Sd_ClientServiceSetState.		
Available via:	Sd.h		

⌋ ()

8.2.4 Sd_ConsumedEventGroupSetStateType

[SWS_SD_00550] ⌈

Name:	Sd_ConsumedEventGroupSetStateType		
Type:	Enumeration		
Range:	SD_CONSUMED_EVENTGROUP_RELEASED	0x00	--
	SD_CONSUMED_EVENTGROUP_REQUESTED	0x01	--
Description:	This type defines the subscription policy by consumed EventGroup for the Client Service.		
Available via:	Sd.h		

⌋ ()

8.2.5 Sd_ClientServiceCurrentStateType

[SWS_SD_00551] ⌈

Name:	Sd_ClientServiceCurrentStateType		
Type:	Enumeration		
Range:	SD_CLIENT_SERVICE_DOWN	0x00	--
	SD_CLIENT_SERVICE_AVAILABLE	0x01	--
Description:	This type defines the modes to indicate the current mode request of a Client Service.		
Available via:	Sd.h		

⌋ ()

8.2.6 Sd_ConsumedEventGroupCurrentStateType

[SWS_SD_00552] ⌈

Name:	Sd_ConsumedEventGroupCurrentStateType		
Type:	Enumeration		
Range:	SD_CONSUMED_EVENTGROUP_DOWN	0x00	--
	SD_CONSUMED_EVENTGROUP_AVAILABLE	0x01	--
Description:	This type defines the subscription policy by consumed EventGroup for the Client Service.		
Available via:	Sd.h		

⌋ ()

8.2.7 Sd_EventHandlerCurrentStateType

[SWS_SD_00553] [

Name:	Sd_EventHandlerCurrentStateType		
Type:	Enumeration		
Range:	SD_EVENT_HANDLER_RELEASED	0x00	--
	SD_EVENT_HANDLER_REQUESTED	0x01	--
Description:	This type defines the subscription policy by EventHandler for the Server Service.		
Available via:	Sd.h		

] ()

8.2.8 Sd_ConfigOptionStringType

[SWS_SD_91002] [

Name:	Sd_ConfigOptionStringType
Type:	const uint8*
Description:	Type for a zero-terminated string of configuration options.
Available via:	Sd.h

] ()

8.3 Function definitions

This is a list of functions provided for upper layer modules.

8.3.1 Sd_Init

[SWS_SD_00119] ⌈

Service name:	Sd_Init
Syntax:	`void Sd_Init( const Sd_ConfigType* ConfigPtr )`
Service ID[hex]:	0x01
Sync/Async:	Synchronous
Reentrancy:	Non Reentrant
Parameters (in):	ConfigPtr: Pointer to a selected configuration structure.
Parameters (inout):	None
Parameters (out):	None
Return value:	None
Description:	Initializes the Service Discovery.
Available via:	`Sd.h`

⌋ ()

[SWS_SD_00120]⌈
The Sd_Init function shall initialize the state machines for all Service Instances according to SWS_SD_00020 and SWS_SD_00021. ⌋()

[SWS_SD_00121]⌈
The `Sd_Init` function shall internally store the configuration data address to enable subsequent API calls to access the configuration data.
⌋()

[SWS_SD_00122]⌈
The `Sd_Init` function shall remember internally the successful initialization for other API functions to check for proper module initialization.
⌋()

8.3.2 Sd_GetVersionInfo

[SWS_SD_00124] ⌈

Service name:	Sd_GetVersionInfo
Syntax:	`void Sd_GetVersionInfo( Std_VersionInfoType* versioninfo )`
Service ID[hex]:	0x02
Sync/Async:	Synchronous
Reentrancy:	Reentrant
Parameters (in):	None
Parameters (inout):	None
Parameters (out):	versioninfo | Pointer to where to store the version information of this module.
Return value:	None
Description:	Returns the version information of this module.
Available via:	`Sd.h`

⌋ ()

[SWS_Sd_00125]⌈
The `Sd_GetVersionInfo` function shall return the version information of this module. The version information includes:

- Module Id
- Vendor Id
- Vendor specific version numbers

⌋()

[SWS_SD_00126]⌈
Configuration of `Sd_GetVersionInfo`: This function shall be pre compile time configurable `On/Off` by the configuration parameter: `SdVersionInfoApi`
⌋()

[SWS_SD_00497]⌈
If development error detection for the Service Discovery module is enabled, then the function `Sd_GetVersionInfo` shall check whether the parameter VersioninfoPtr is a NULL pointer (NULL_PTR). If VersioninfoPtr is a NULL pointer, then the function `Sd_GetVersionInfo` shall raise the development error `SD_E_PARAM_POINTER` and return. ⌋ ()

8.3.3 Sd_ServerServiceSetState

[SWS_SD_00496] ⌈

Service name:	Sd_ServerServiceSetState	
Syntax:	`Std_ReturnType Sd_ServerServiceSetState( uint16 SdServerServiceHandleId, Sd_ServerServiceSetStateType ServerServiceState )`	
Service ID[hex]:	0x07	
Sync/Async:	Asynchronous	
Reentrancy:	Reentrant	
Parameters (in):	SdServerServiceHandleId	ID to identify the Server Service Instance.
	ServerServiceState	The state the Server Service Instance shall be set to.
Parameters (inout):	None	
Parameters (out):	None	
Return value:	Std_ReturnType	E_OK: State accepted E_NOT_OK: State not accepted
Description:	This API function is used by the BswM to set the Server Service Instance state.	
Available via:	`Sd.h`	

⌋ ()

[SWS_SD_00407]⌈
If development error detection is enabled and the Service Discovery module has not been initialized using `Sd_Init()`, the `Sd_ServerServiceSetState` function shall raise the development error code `SD_E_UNINIT` and the `Sd_ServerServiceSetState` function shall return `E_NOT_OK`.
⌋()

[SWS_SD_00408]⌈
If the parameter ServerServiceState has an undefined value, the Service Discovery module shall not store the requested mode and return `E_NOT_OK`.
In case development error detection is enabled, the Service Discovery module shall additionally raise the development error code `SD_E_INV_MODE`.
⌋()

[SWS_SD_00607]⌈ If the parameter `SdServerServiceHandleId` has an invalid value, the Service Discovery Module shall not store the requested mode and return `E_NOT_OK`. In case development error detection is enabled, the Service Discovery module shall additionally raise the development error code `SD_E_INV_ID`.⌋ ()

8.3.4 Sd_ClientServiceSetState

[SWS_SD_00409] ⌈

Service name:	Sd_ClientServiceSetState	
Syntax:	`Std_ReturnType Sd_ClientServiceSetState( uint16 ClientServiceHandleId, Sd_ClientServiceSetStateType ClientServiceState )`	
Service ID[hex]:	0x08	
Sync/Async:	Asynchronous	
Reentrancy:	Reentrant	
Parameters (in):	ClientServiceHandleId	ID to identify the Client Service Instance.
	ClientServiceState	The state the Client Service Instance shall be set to.
Parameters (inout):	None	
Parameters (out):	None	
Return value:	Std_ReturnType	E_OK: State accepted E_NOT_OK: State not accepted
Description:	This API function is used by the BswM to set the Client Service Instance state.	
Available via:	`Sd.h`	

⌋ ()

[SWS_SD_00410]⌈
If development error detection is enabled and the Service Discovery module has not been initialized using `Sd_Init()`, the `Sd_ClientServiceSetState` function shall raise the development error code `SD_E_UNINIT` and the `Sd_ClientServiceSetState` function shall return `E_NOT_OK`.
⌋()

[SWS_SD_00411]⌈
If the parameter ClientServiceState has an undefined value, the Service Discovery module shall not store the requested mode and return `E_NOT_OK`.
In case development error detection is enabled, the Service Discovery module shall additionally raise the development error code `SD_E_INV_MODE`.
⌋()

[SWS_SD_00608]⌈ If the parameter `ClientServiceHandleId` has an invalid value, the Service Discovery module shall not store the requested mode and return `E_NOT_OK`. In case development error detection is enabled, the Service Discovery module shall additionally raise the development error code `SD_E_INV_ID`.⌋ ⌋ ()

8.3.5 Sd_ConsumedEventGroupSetState

[SWS_SD_00560] ⌈

Service name:	Sd_ConsumedEventGroupSetState	
Syntax:	`Std_ReturnType Sd_ConsumedEventGroupSetState( uint16 SdConsumedEventGroupHandleId, Sd_ConsumedEventGroupSetStateType ConsumedEventGroupState )`	
Service ID[hex]:	0x09	
Sync/Async:	Asynchronous	
Reentrancy:	Reentrant	
Parameters (in):	SdConsumedEventGroupHandleId	ID to identify the Consumed Eventgroup
	ConsumedEventGroupState	The state the EventGroup shall be set to.
Parameters (inout):	None	
Parameters (out):	None	
Return value:	Std_ReturnType	E_OK: State accepted E_NOT_OK: State not accepted
Description:	This API function is used by the BswM to set the requested state of the EventGroupStatus.	
Available via:	`Sd.h`	

⌋ ()

[SWS_SD_00469]⌈
If development error detection is enabled and the Service Discovery module has not been initialized using `Sd_Init()`, the `Sd_ConsumedEventGroupSetState` function shall raise the development error code `SD_E_UNINIT` and the `Sd_ConsumedEventGroupSetState` function shall return `E_NOT_OK`.
⌋()

[SWS_SD_00470]⌈
If `ConsumedEventGroupSetState` has an undefined value, the Service Discovery module shall not store the requested mode and return `E_NOT_OK`.
In case development error detection is enabled, the Service Discovery module shall additionally raise the development error code `SD_E_INV_MODE`.
⌋()

[SWS_SD_00609]⌈ If the parameter `SdConsumedEventGroupHandleId` has an invalid value, the Service Discovery module shall not store the requested mode and return `E_NOT_OK`. In case development error detection is enabled, the Service Discovery module shall additionally raise the development error code `SD_E_INV_ID`.⌋⌋ ()

8.3.6 Sd_LocalIpAddrAssignmentChg

[SWS_SD_00412] ⌈

Service name:	Sd_LocalIpAddrAssignmentChg	
Syntax:	`void Sd_LocalIpAddrAssignmentChg( SoAd_SoConIdType SoConId, TcpIp_IpAddrStateType State )`	
Service ID[hex]:	0x05	
Sync/Async:	Synchronous	
Reentrancy:	Reentrant for different SoConIds. Non Reentrant for the same SoConId.	
Parameters (in):	SoConId	socket connection index specifying the socket connection where the IP address assigment has changed.
	State	state of IP address assignment.
Parameters (inout):	None	
Parameters (out):	None	
Return value:	None	
Description:	This function gets called by the SoAd if an IP address assignment related to a socket connection changes (i.e. new address assigned or assigned address becomes invalid).	
Available via:	`Sd.h`	

⌋ ()

[SWS_SD_00471]⌈
If development error detection is enabled and the Service Discovery module has not been initialized using `Sd_Init()`, the `Sd_LocalIpAddrAssignmentChg` function shall raise the development error code `SD_E_UNINIT` and the `Sd_LocalIpAddrAssignmentChg` function shall return without further action.
⌋()

[SWS_SD_00472]⌈
If the parameter `State` has an undefined value, the Service Discovery module shall not store the requested mode and return.
In case development error detection is enabled, the Service Discovery module shall additionally raise the development error code `SD_E_INV_MODE`.
⌋()

[SWS_SD_00610] ⌈
If the parameter `SoConId` has an invalid value, the Service Discovery module shall not store the requested mode and return. In case development error detection is enabled, the Service Discovery module shall additionally raise the development error code `SD_E_INV_ID`.
⌋()

8.3.7 Sd_SoConModeChg

[SWS_SD_91002] ⌈

Service name:	Sd_SoConModeChg	

Syntax:	`void Sd_SoConModeChg(`
	`  SoAd_SoConIdType SoConId,`
	`  SoAd_SoConModeType Mode`
	`)`	

Service ID[hex]:	0x43	
Sync/Async:	Synchronous	
Reentrancy:	Reentrant for different SoConIds. Non reentrant for the same SoConId.	
Parameters (in):	SoConId	socket connection index specifying the socket connection with the mode change.
	Mode	new mode
Parameters (inout):	None	
Parameters (out):	None	
Return value:	None	
Description:	Notification about a SoAd socket connection state change, e.g. socket connection gets online	
Available via:	`Sd.h`	

⌋ ()

8.4 Call-back notifications

This is a list of functions provided for other modules.

8.4.1 Sd_RxIndication

[SWS_SD_00129] ⌈

Service name:	Sd_RxIndication	
Syntax:	`void Sd_RxIndication( PduIdType RxPduId, const PduInfoType* PduInfoPtr )`	
Service ID[hex]:	0x42	
Sync/Async:	Synchronous	
Reentrancy:	Reentrant for different PduIds. Non reentrant for the same PduId.	
Parameters (in):	RxPduId	ID of the received PDU.
	PduInfoPtr	Contains the length (SduLength) of the received PDU, a pointer to a buffer (SduDataPtr) containing the PDU, and the MetaData related to this PDU.
Parameters (inout):	None	
Parameters (out):	None	
Return value:	None	
Description:	Indication of a received PDU from a lower layer communication interface module.	
Available via:	`Sd.h`	

⌋ ()

[SWS_SD_00473]⌈
If development error detection is enabled and the Service Discovery module has not been initialized using `Sd_Init()`, the `Sd_RxIndication` function shall raise the development error code `SD_E_UNINIT` and the `Sd_RxIndication` function shall return without further action.
⌋()

[SWS_SD_00474]⌈
If `RxPduId` has an undefined value, the Service Discovery module shall discard the message and return without further action.
In case development error detection is enabled, the Service Discovery module shall additionally raise the development error code `SD_E_INV_ID`.
⌋()

[SWS_SD_00475]⌈
If development error detection is enabled: The function shall check parameter `PduInfoPtr` for being a null pointer. In this case, the function shall raise the development error `SD_E_PARAM_POINTER` and return without further action.
⌋()

8.5 Scheduled functions

The following functions are called directly by Basic Software Scheduler. The following functions shall have no return value and no parameter. All functions shall be non-reentrant.

8.5.1 Sd_MainFunction

[SWS_SD_00130] ⌈

Service name:	Sd_MainFunction

Syntax:	`void Sd_MainFunction(`
	`  void`
	`)`

Service ID[hex]:	0x06
Description:	--
Available via:	`SchM_Sd.h`

⌋ ()

[SWS_SD_00131]⌈
The Sd_MainFunction shall update all counters, timers, states and phases and prozess the Rx and Tx data path.
⌋()

8.6 Expected Interfaces

In this chapter, all interfaces required from other modules are listed.

8.6.1 Mandatory Interfaces

This chapter defines all interfaces, which are required to fulfill the core functionality of the module.

[SWS_SD_00133] ⌈

API function	*Header File*	*Description*
Dem_SetEventStatus	Dem.h	Called by SW-Cs or BSW modules to report monitor status information to the Dem. BSW modules calling Dem_SetEventStatus can safely ignore the return value.
SoAd_DisableSpecificRouting	SoAd.h	Disables routing of a group of PDUs in the SoAd related to the RoutingGroup specified by parameter id only on the socket connection identified by SoConId.
SoAd_EnableSpecificRouting	SoAd.h	Enables routing of a group of PDUs in the SoAd related to the RoutingGroup specified by parameter id only on the socket connection identified by SoConId.
SoAd_GetLocalAddr	SoAd.h	Retrieves the local address (IP address and port) actually used for the SoAd socket connection specified by SoConId, the netmask and default router
SoAd_GetPhysAddr	SoAd.h	Retrieves the physical source address of the EthIf controller used by the SoAd socket connection specified by SoConId.
SoAd_GetRemoteAddr	SoAd.h	Retrieves the remote address (IP address and port) actually used for the SoAd socket connection specified by SoConId
SoAd_GetSoConMode	SoAd.h	Returns current state of the socket connection specified by SoConId.
SoAd_IfSpecificRoutingGroupTransmit	SoAd.h	Triggers the transmission of all If-TxPDUs identified by the parameter id on the socket connection specified by SoConId after requesting the data from the related upper layer.
SoAd_IfTransmit	SoAd.h	Requests transmission of a PDU.
SoAd_ReleaseRemoteAddr	SoAd.h	By this API service the remote address (IP address and port) of the specified socket connection shall be released, i.e. set back to the configured remote address setting.
SoAd_SetRemoteAddr	SoAd.h	By this API service the remote address (IP address and port) of the specified socket connection shall be set.

⌋ ()

8.6.2 Optional Interfaces

This chapter defines all interfaces, which are required to fulfill an optional functionality of the module.

[SWS_SD_00134] ⌈

API function	*Header File*	*Description*
BswM_Sd_ClientServiceCurrentState	BswM_Sd.h	Function called by Service Discovery to indicate current state of the Client Service (available/down).
BswM_Sd_ConsumedEventGroupCurrentState	BswM_Sd.h	Function called by Service Discovery to indicate current status of the Consumed Eventgroup (available/down).
BswM_Sd_EventHandlerCurrentState	BswM_Sd.h	Function called by Service Discovery to indicate current status of the EventHandler (requested/released).
Det_ReportError	Det.h	Service to report development errors.
SoAd_CloseSoCon	SoAd.h	This service closes the socket connection specified by SoConId.
SoAd_DisableRouting	SoAd.h	Disables routing of a group of PDUs in the SoAd related to the RoutingGroup specified by parameter id. Routing of PDUs can be either forwarding of PDUs from the upper layer to a TCP or UDP socket of the TCP/IP stack specified by a PduRoute or the other way around specified by a SocketRoute.
SoAd_EnableRouting	SoAd.h	Enables routing of a group of PDUs in the SoAd related to the RoutingGroup specified by parameter id. Routing of PDUs can be either forwarding of PDUs from the upper layer to a TCP or UDP socket of the TCP/IP stack specified by a PduRoute or the other way around specified by a SocketRoute.
SoAd_GetSoConId	SoAd.h	Returns socket connection index related to the specified TxPduId.
SoAd_IfRoutingGroupTransmit	SoAd.h	Triggers the transmission of all If-TxPDUs identified by the parameter id after requesting the data from the related upper layer.
SoAd_OpenSoCon	SoAd.h	This service opens the socket connection specified by SoConId.
SoAd_ReleaseIpAddrAssignment	SoAd.h	By this API service the local IP address assignment used for the socket connection specified by SoConId is released.
SoAd_RequestIpAddrAssignment	SoAd.h	By this API service the local IP address assignment which shall be used for the socket connection specified by SoConId is initiated.
SoAd_SetUniqueRemoteAddr	SoAd.h	This API service shall either return the socket connection index of the SoAdSocketConnectionGroup where the specified remote address (IP address and

		port) is set or assign the remote address to an unused socket connection from the same SoAdSocketConnectionGroup.

] ()

8.6.3 Configurable Interfaces

8.6.3.1 Sd_CapabilityRecordMatchCallout

[SWS_SD_91001] ⌈

Service name:	<SdCapabilityRecordMatchCallout>	
Syntax:	`boolean <SdCapabilityRecordMatchCallout>( PduIdType pduID, uint8 type, uint16 serviceID, uint16 instanceID, uint8 majorVersion, uint32 minorVersion, const Sd_ConfigOptionStringType* receivedConfigOptionPtrArray, const Sd_ConfigOptionStringType* configuredConfigOptionPtrArray )`	
Service ID[hex]:	0x10	
Sync/Async:	Synchronous	
Reentrancy:	Reentrant for different PduIds. Non reentrant for the same PduId.	
Parameters (in):	pduID	ID of the received I-PDU (used to to distinguish between different SD instances)
	type	Content of the Type field of the received entry (see section 7.3.8)
	serviceID	Content of the Service ID field of the received entry (see section 7.3.8)
	instanceID	Content of the Instance ID field of the received entry (see section 7.3.8)
	majorVersion	Content of the Major Version field of the received entry (see section 7.3.8)
	minorVersion	Content of the Minor Version field of the received entry (see section 7.3.8)
	receivedConfigOptionPtrArray	NULL_PTR terminated array of pointers to zero-terminated configuration strings received in the incoming entry, i.e. received SD message (see Figure 6 - Configuration Option)
	configuredConfigOptionPtrArray	NULL_PTR terminated array of pointers to zero-terminated configuration strings configured in the local SD configuration (see Figure 6 - Configuration Option)
Parameters (inout):	None	
Parameters (out):	None	
Return value:	boolean	TRUE: The received configuration options match the configured ones. FALSE: The received configuration options do not match the configured ones.
Description:	This callout is invoked to determine whether the configuration options contained in a received SD message match the ones configured in the local SD configuration (i.e., SdServerCapabilityRecord or SdClientCapabilityRecord).	

Available via:	Sd_Externals.h

] ()

This callout must be configured in the SdCapabilityRecordMatchCallout container. The name of the callout functions is given by the `SdCapabilityRecordMatchCalloutName` configuration element.

9 Sequence diagrams

9.1 CLIENT / SERVER: Sd_RxIndication

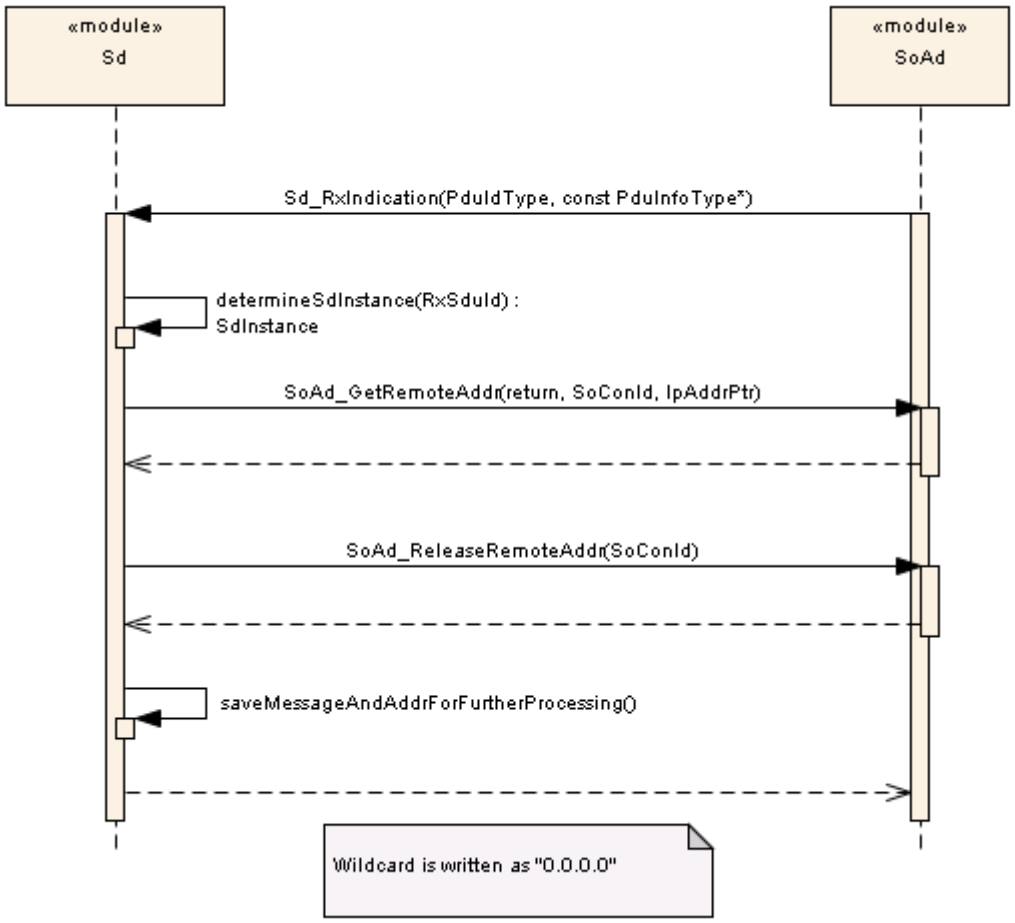


Figure 9.1: Sequence CLIENT / SERVER: Sd_RxIndication

9.2 SERVER: Response Behavior

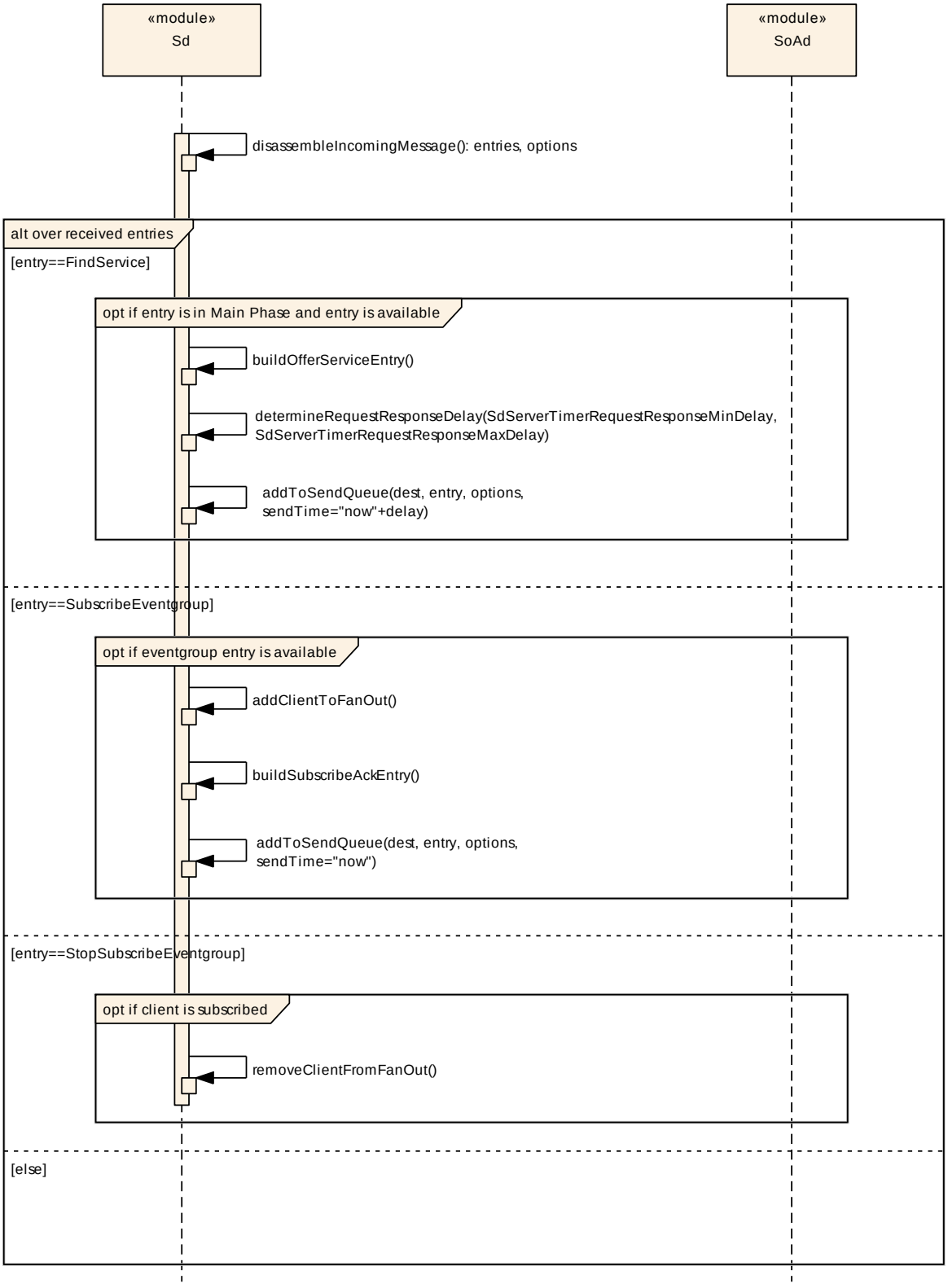


Figure 9.2: Sequence: SERVER: Response Behavior

9.3 CLIENT: Response Behavior

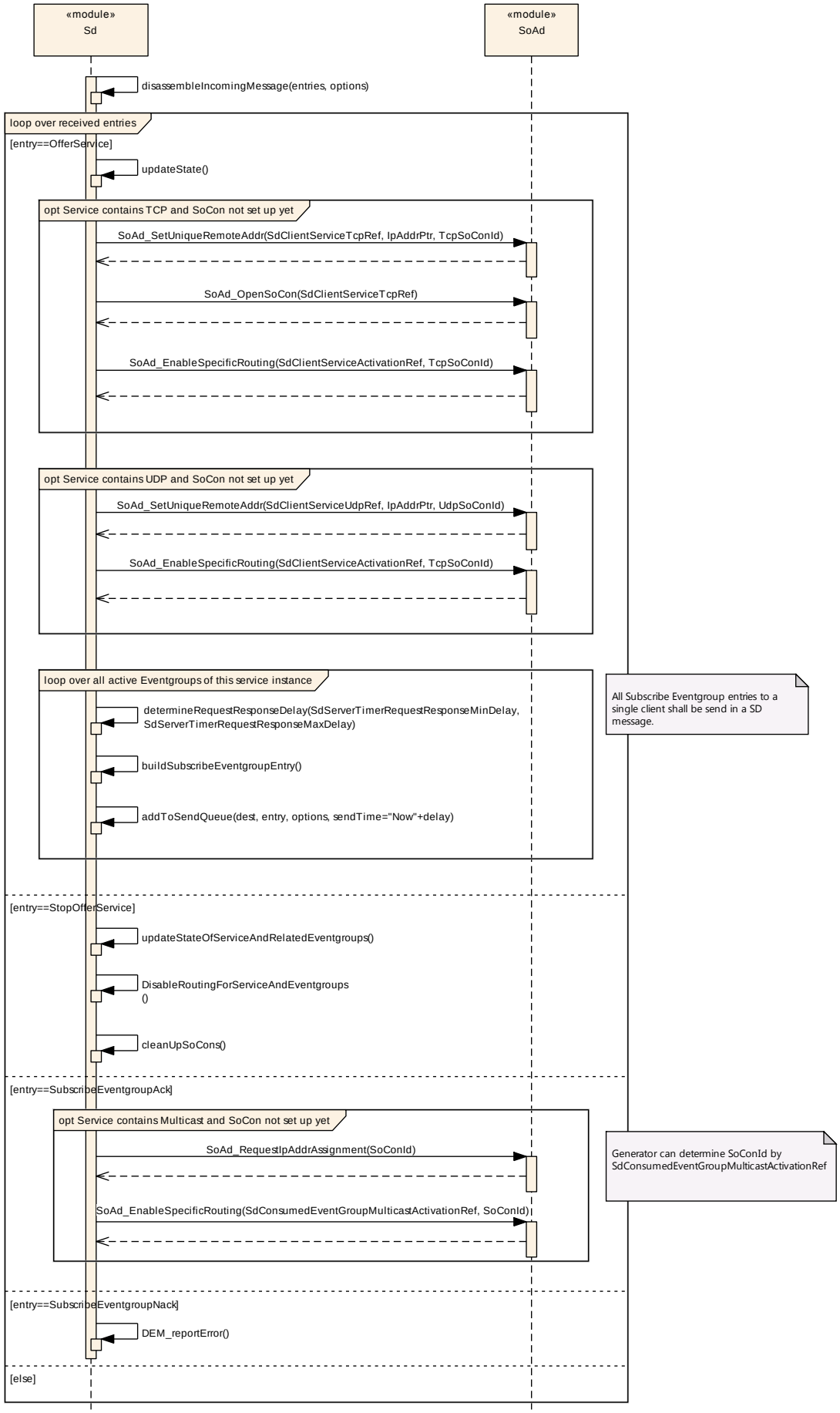

«module»
Sd
«module»
SoAd
disassembleIncomingMessage(entries, options)
loop over received entries
[entry==OfferService]
updateState()
opt Service contains TCP and SoCon not set up yet
SoAd_SetUniqueRemoteAddr(SdClientServiceTcpRef, IpAddrPtr, TcpSoConId)
SoAd_OpenSoCon(SdClientServiceTcpRef)
SoAd_EnableSpecificRouting(SdClientServiceActivationRef, TcpSoConId)
opt Service contains UDP and SoCon not set up yet
SoAd_SetUniqueRemoteAddr(SdClientServiceUdpRef, IpAddrPtr, UdpSoConId)
SoAd_EnableSpecificRouting(SdClientServiceActivationRef, TcpSoConId)
loop over all active Eventgroups of this service instance
determineRequestResponseDelay(SdServerTimerRequestResponseMinDelay, SdServerTimerRequestResponseMaxDelay)
buildSubscribeEventgroupEntry()
addToSendQueue(dest, entry, options, sendTime="Now"+delay)
All Subscribe Eventgroup entries to a single client shall be send in a SD message.
[entry==StopOfferService]
updateStateOfServiceAndRelatedEventgroups()
DisableRoutingForServiceAndEventgroups ()
cleanUpSoCons()
[entry==SubscribeEventgroupAck]
opt Service contains Multicast and SoCon not set up yet
SoAd_RequestIpAddrAssignment(SoConId)
SoAd_EnableSpecificRouting(SdConsumedEventGroupMulticastActivationRef, SoConId)
Generator can determine SoConId by SdConsumedEventGroupMulticastActivationRef
[entry==SubscribeEventgroupNack]
DEM_reportError()
[else]

Figure 9.3: Sequence CLIENT: Response Behavior

9.4 SERVER: buildOfferServiceEntry

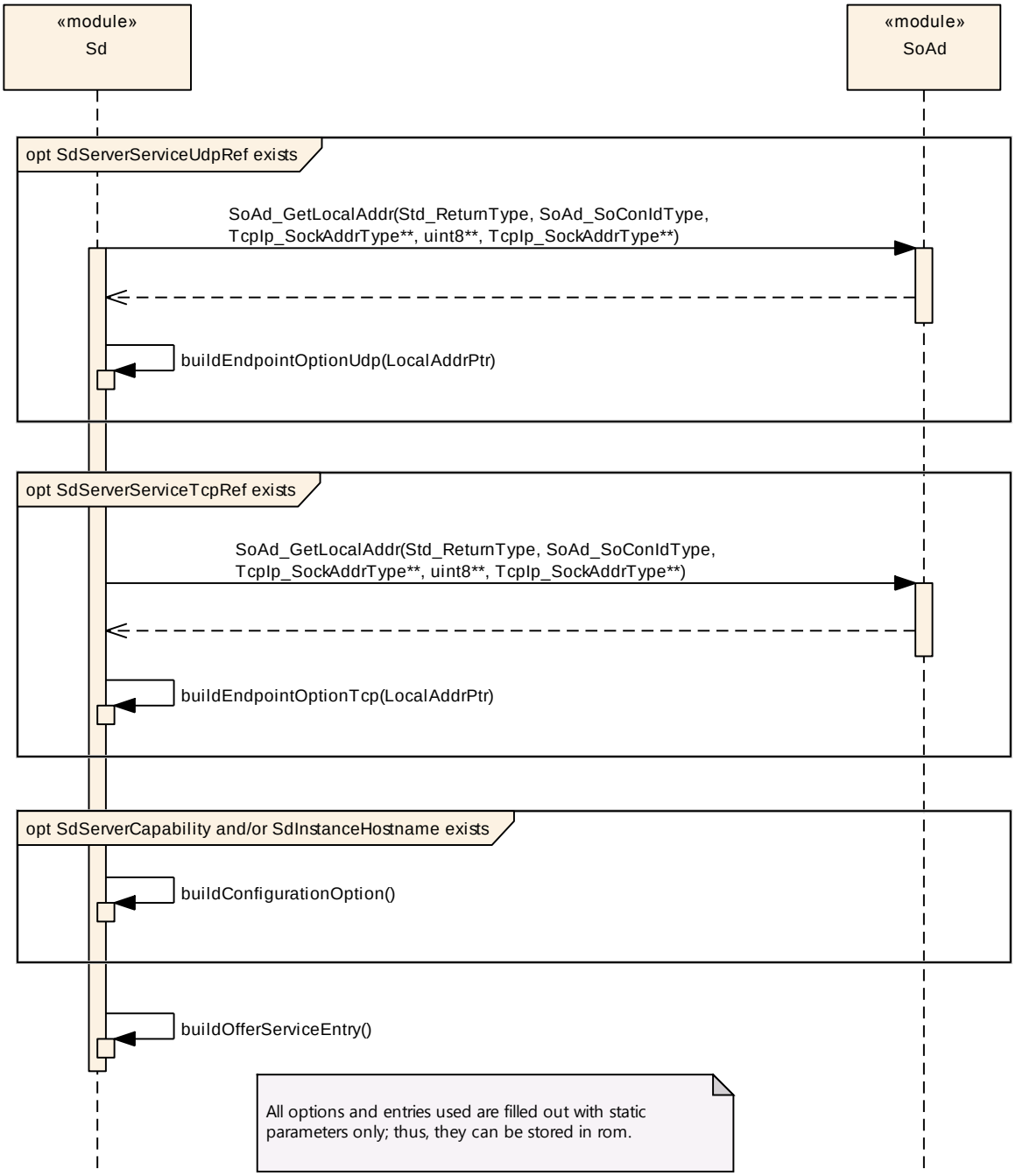


Figure 9.4: Sequence SERVER: buildOfferServiceEntry

9.5 CLIENT: buildSubscribeEventgroupEntry

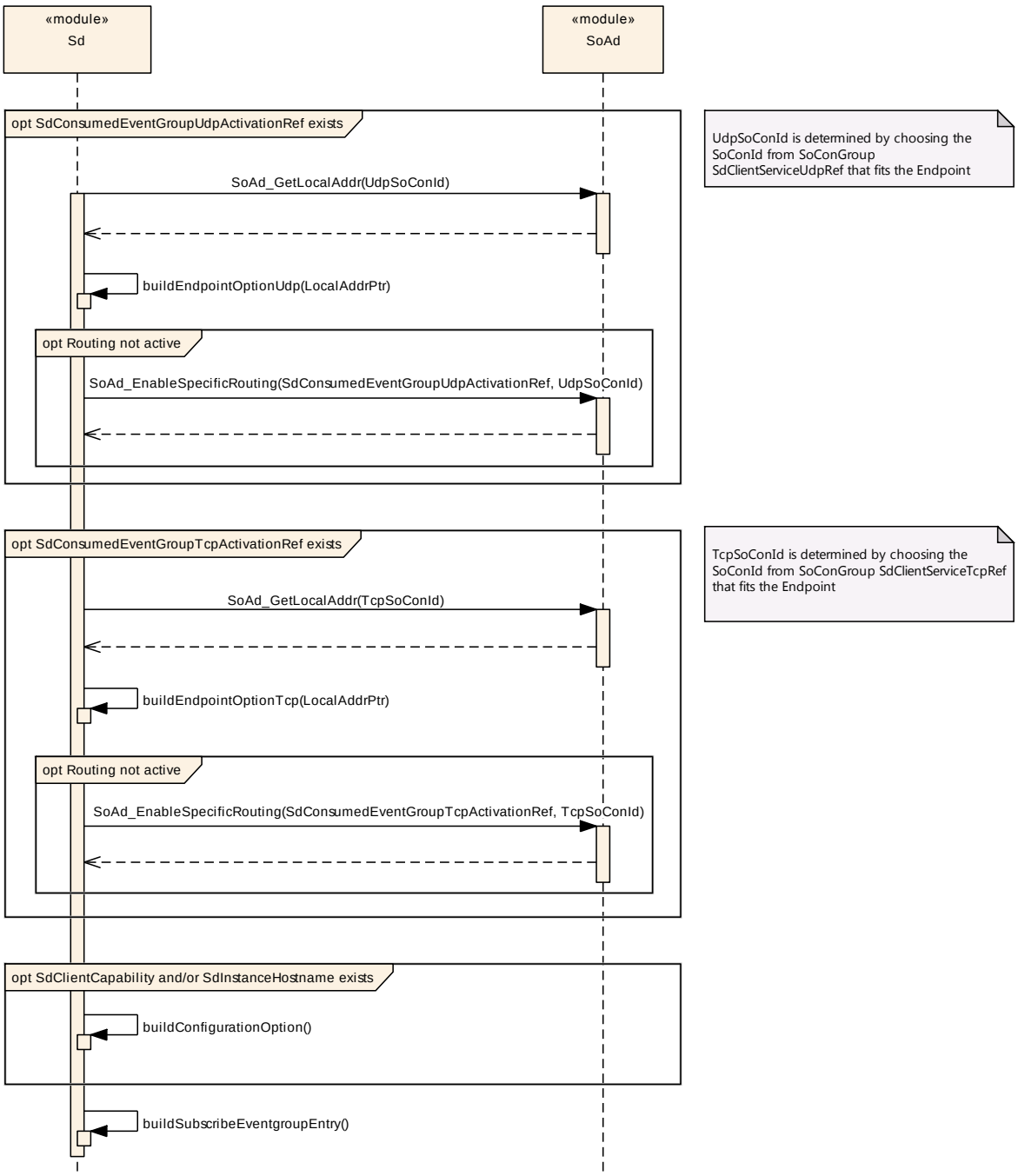


Figure 9.5: Sequence CLIENT: buildSubscribeEventgroupEntry

9.6 SERVER: buildSubscribeEventgroupAckEntry

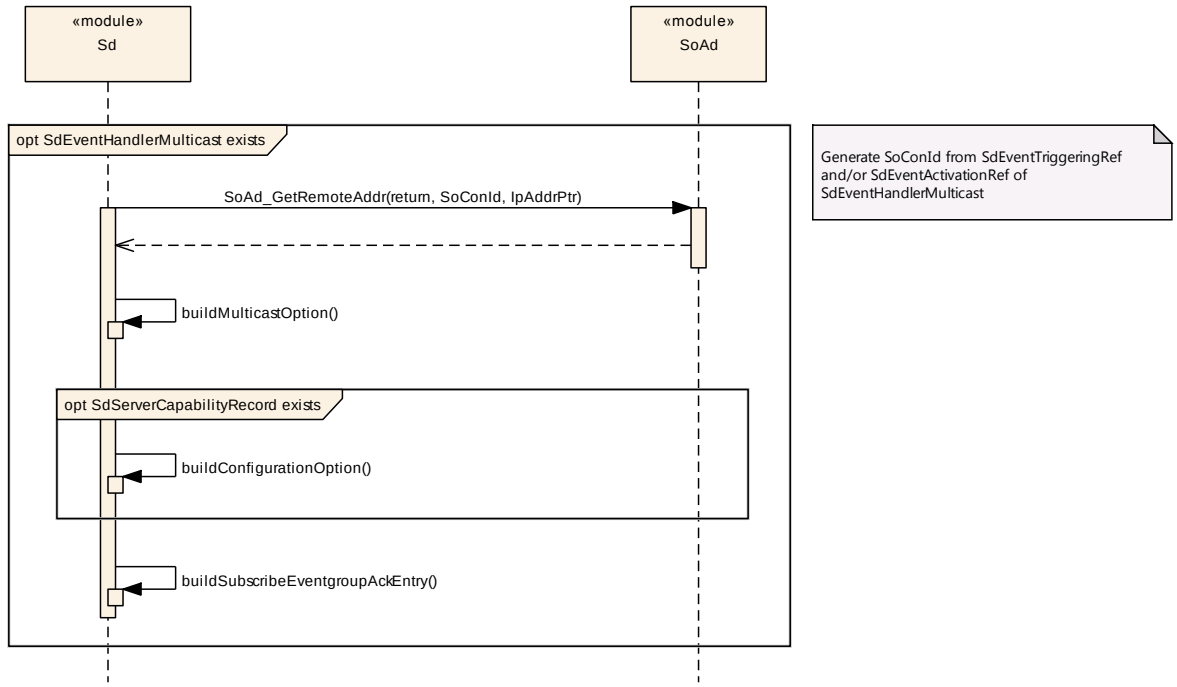


Figure 9.6: Sequence CLIENT: buildSubscribeEventgroupAckEntry

9.7 CLIENT / SERVER: TransmitSdMessage

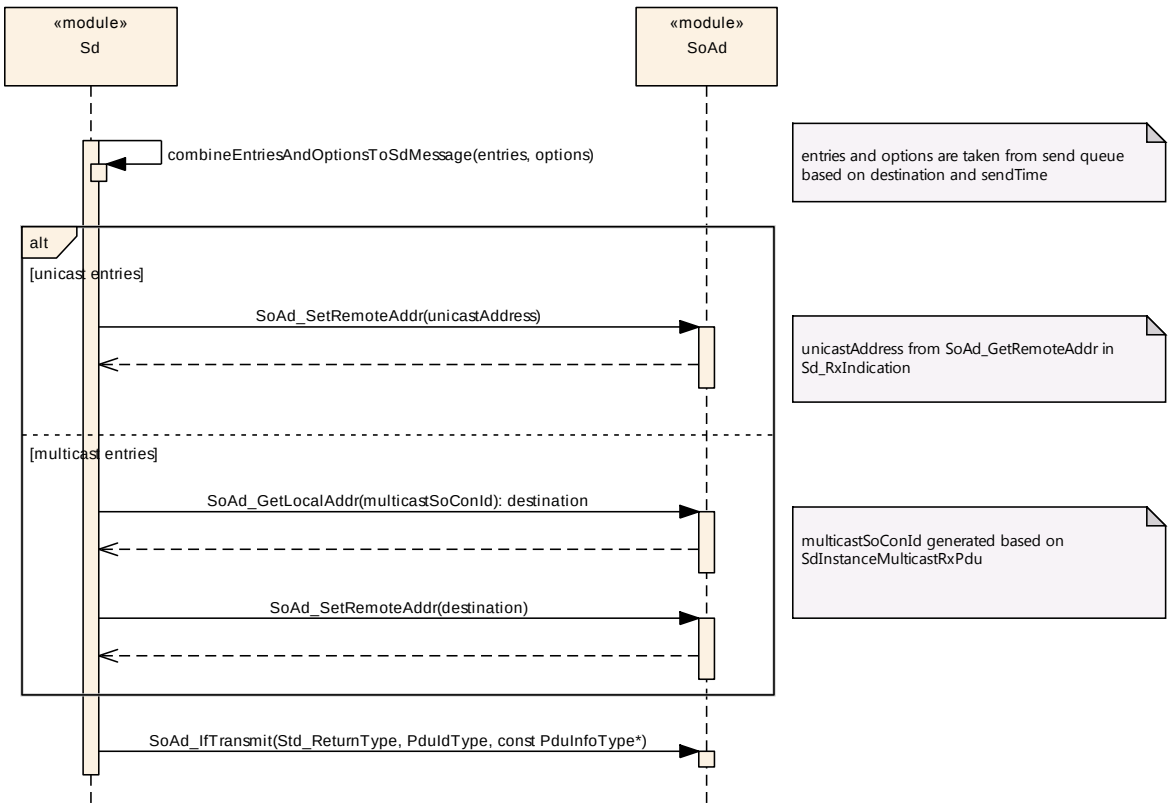


Figure 9.7: Sequence CLIENT / SERVER: TransmitSdMessage

9.8 SERVER: AddClientToFanOut

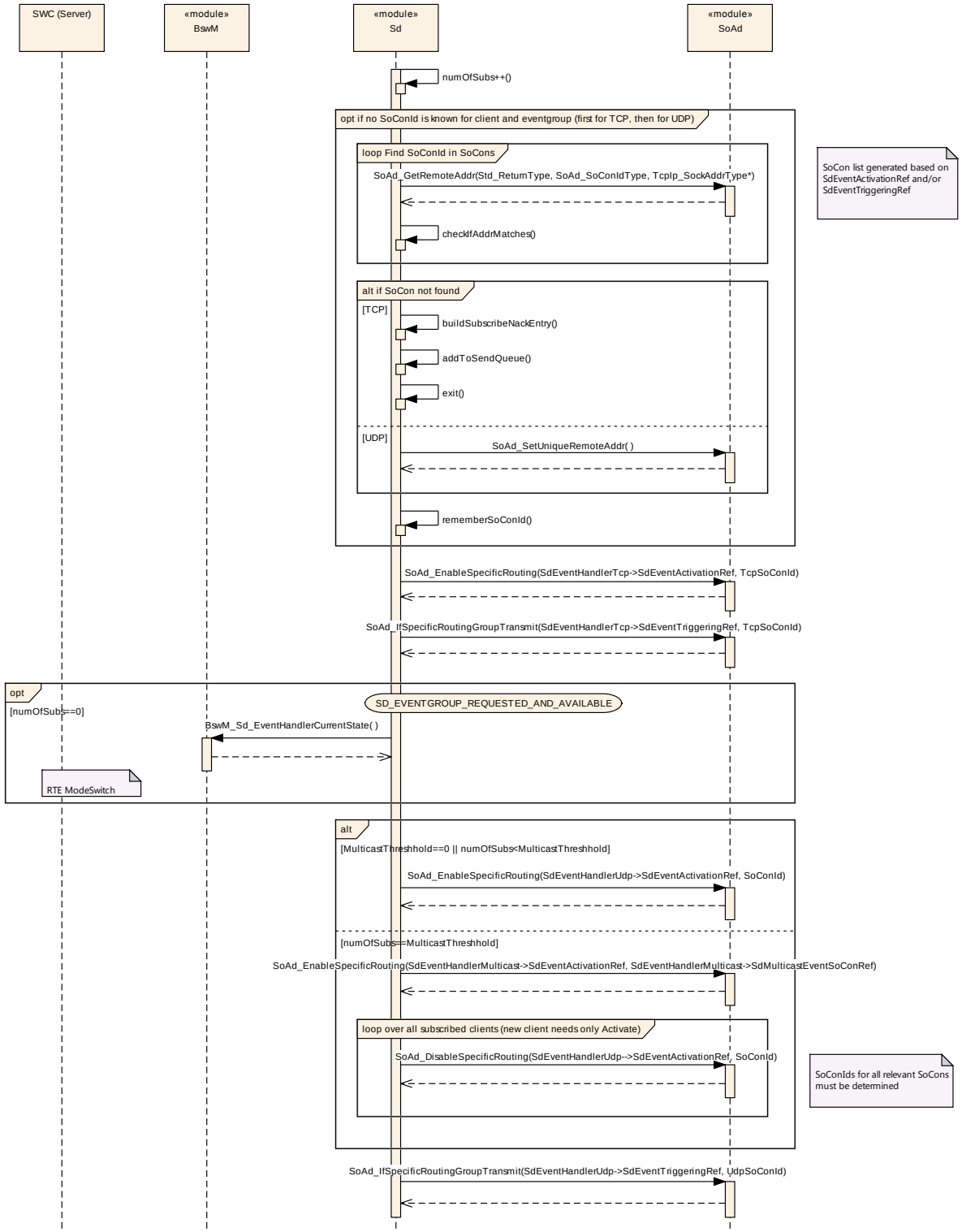


Figure 9.8: Sequence SERVER: AddClientToFanOut

9.9 SERVER: Start

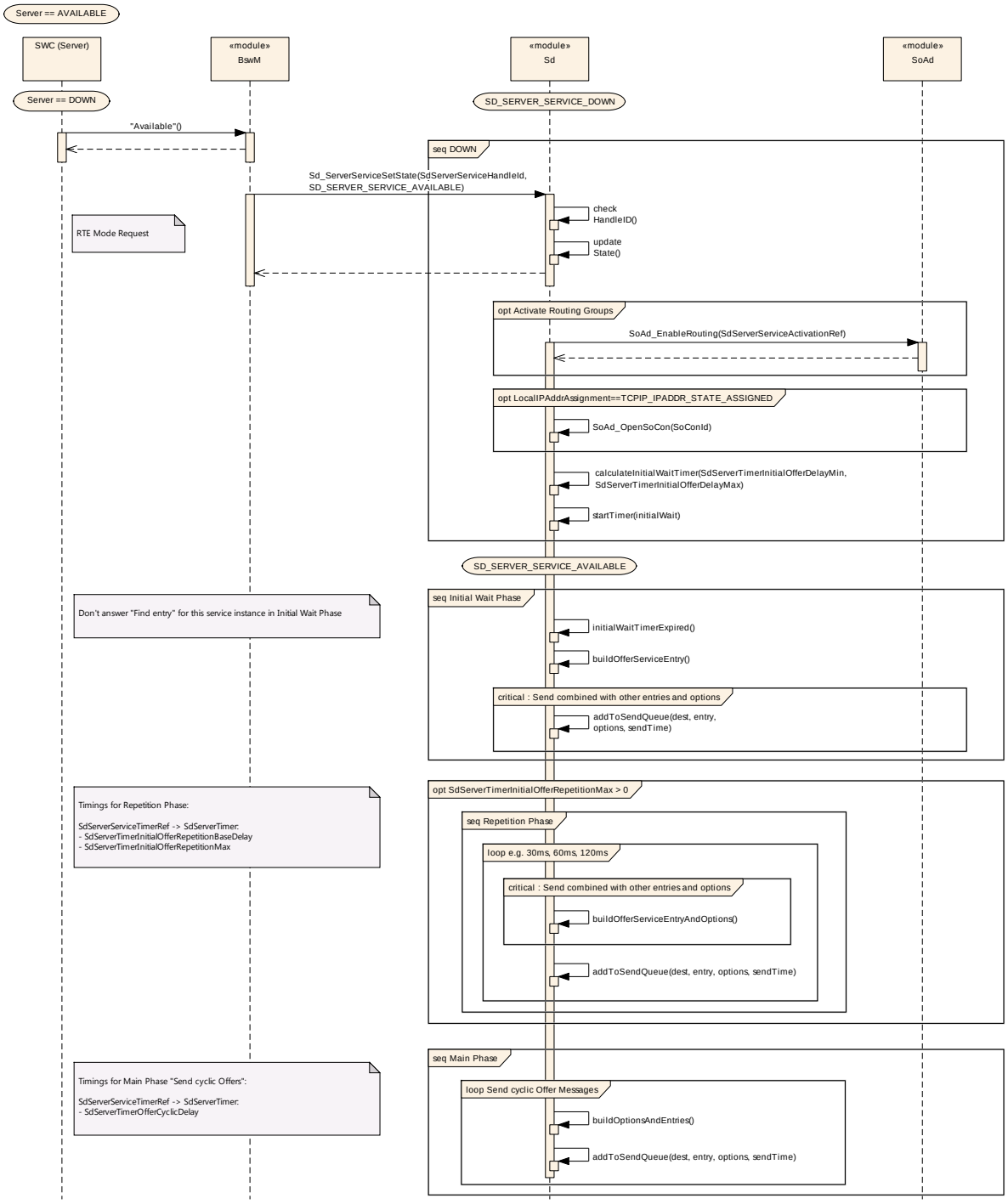


Figure 9.9: Sequence Sconfiguration variantsERVER: Start

9.10 CLIENT: Start

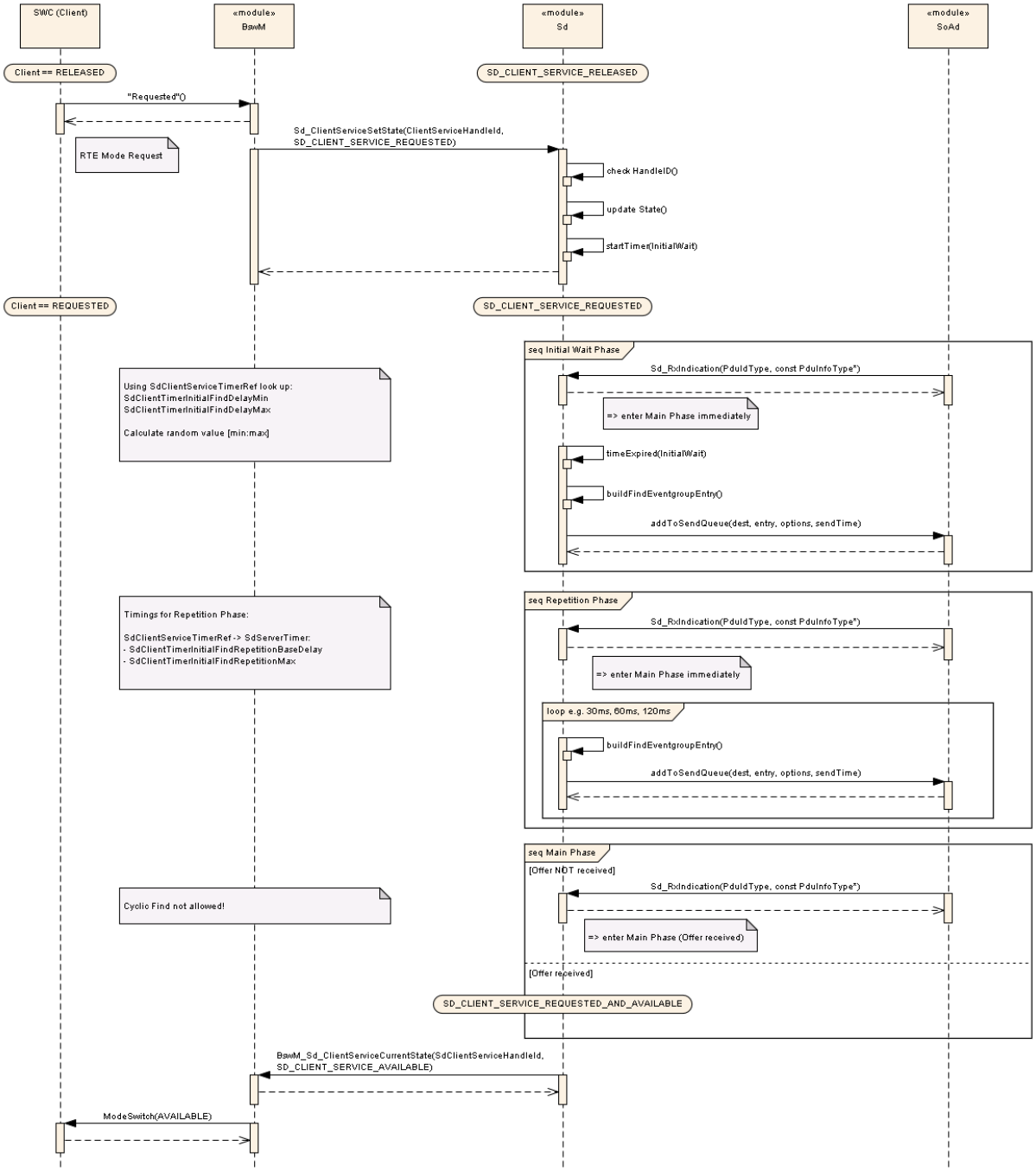


Figure 9.10: Sequence CLIENT: Start

10 Containers and configuration parameters

The following chapters summarize all configuration parameters. The detailed meanings of the parameters describe Chapters 7 and Chapter 8.

[SWS_SD_00135]⌈
The Service Discovery module shall support tool based configuration.
⌋()

[SWS_SD_00136]⌈
The configuration tool shall check the consistency of the configuration parameters at system configuration time.
⌋()

10.1 How to read this chapter

For details refer to the chapter 10.1 “Introduction to configuration specification” in SWS_BSWGeneral.

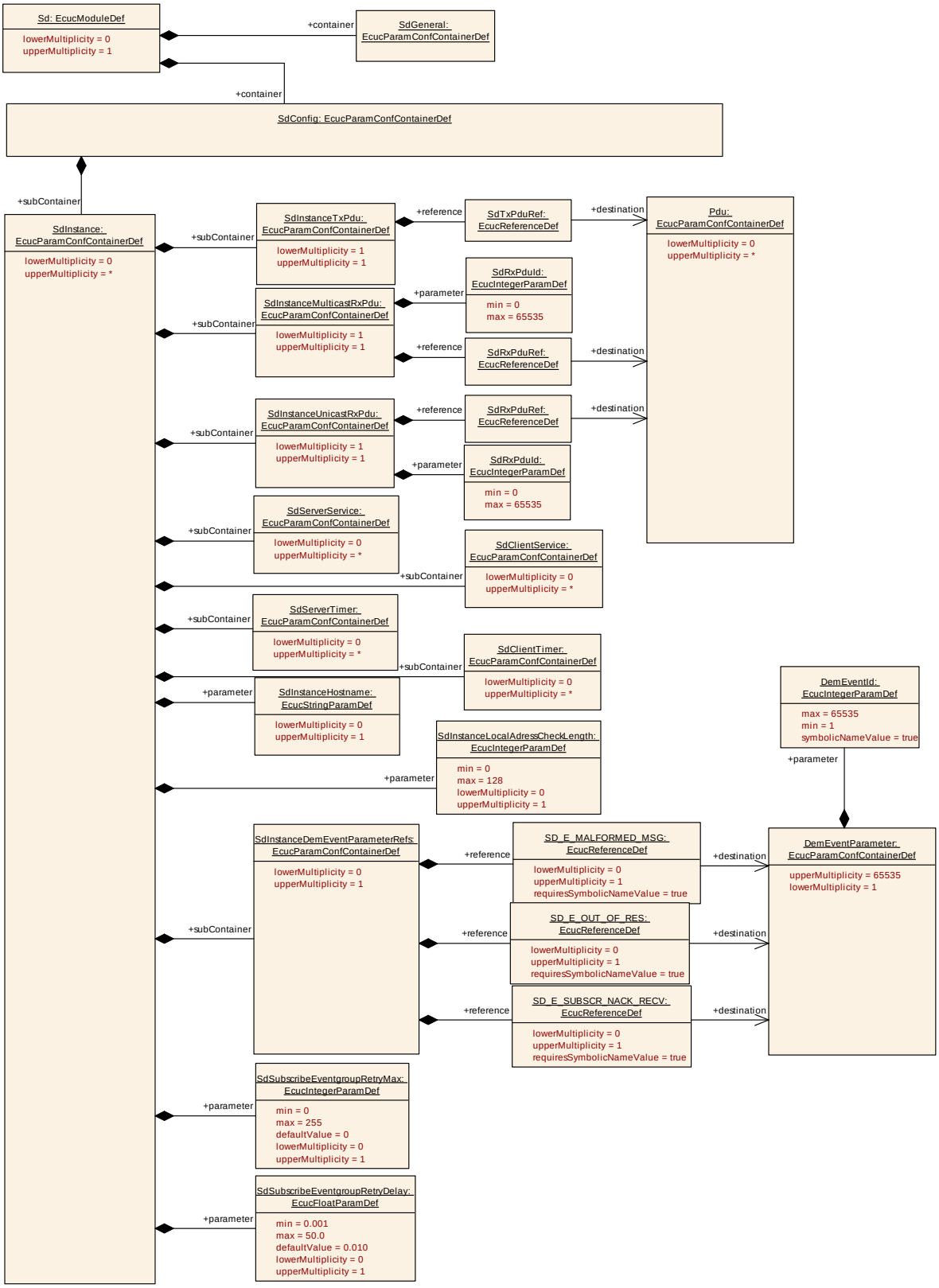
10.2 Containers and configuration parameters

The configuration parameters as defined in this chapter are used to create a data model for an AUTOSAR tool chain. The realization in the code is implementation specific.

10.2.1 Sd

SWS Item	**ECUC_SD_00001 :**
Module Name	*Sd*
Module Description	Configuration of the Service Discovery module.
Post-Build Variant Support	true
Supported Config Variants	VARIANT-LINK-TIME, VARIANT-POST-BUILD, VARIANT-PRE-COMPILE

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***
SdConfig	1	This container contains the configuration parameters and sub containers of the AUTOSAR Service Discovery module.
SdGeneral	1	This container lists the general configuration parameters for the Service Discovery module.


Sd: EcucModuleDef
lowerMultiplicity = 0
upperMultiplicity = 1
+container
SdGeneral: EcucParamConfContainerDef
+container
SdConfig: EcucParamConfContainerDef
+subContainer
SdInstance: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+subContainer
SdInstanceTxPdu: EcucParamConfContainerDef
lowerMultiplicity = 1
upperMultiplicity = 1
+reference
SdTxPduRef: EcucReferenceDef
+destination
Pdu: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+subContainer
SdInstanceMulticastRxPdu: EcucParamConfContainerDef
lowerMultiplicity = 1
upperMultiplicity = 1
+parameter
SdRxPduId: EcucIntegerParamDef
min = 0
max = 65535
+reference
SdRxPduRef: EcucReferenceDef
+destination
+subContainer
SdInstanceUnicastRxPdu: EcucParamConfContainerDef
lowerMultiplicity = 1
upperMultiplicity = 1
+reference
SdRxPduRef: EcucReferenceDef
+destination
+parameter
SdRxPduId: EcucIntegerParamDef
min = 0
max = 65535
+subContainer
SdServerService: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+subContainer
SdClientService: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+subContainer
SdServerTimer: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+subContainer
SdClientTimer: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+parameter
SdInstanceHostname: EcucStringParamDef
lowerMultiplicity = 0
upperMultiplicity = 1
+parameter
SdInstanceLocalAdressCheckLength: EcucIntegerParamDef
min = 0
max = 128
lowerMultiplicity = 0
upperMultiplicity = 1
DemEventId: EcucIntegerParamDef
max = 65535
min = 1
symbolicNameValue = true
+parameter
+subContainer
SdInstanceDemEventParameterRefs: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = 1
+reference
SD_E_MALFORMED_MSG: EcucReferenceDef
lowerMultiplicity = 0
upperMultiplicity = 1
requiresSymbolicNameValue = true
+destination
+reference
SD_E_OUT_OF_RES: EcucReferenceDef
lowerMultiplicity = 0
upperMultiplicity = 1
requiresSymbolicNameValue = true
+destination
+reference
SD_E_SUBSCR_NACK_RECV: EcucReferenceDef
lowerMultiplicity = 0
upperMultiplicity = 1
requiresSymbolicNameValue = true
+destination
DemEventParameter: EcucParamConfContainerDef
upperMultiplicity = 65535
lowerMultiplicity = 1
+parameter
SdSubscribeEventgroupRetryMax: EcucIntegerParamDef
min = 0
max = 255
defaultValue = 0
lowerMultiplicity = 0
upperMultiplicity = 1
+parameter
SdSubscribeEventgroupRetryDelay: EcucFloatParamDef
min = 0.001
max = 50.0
defaultValue = 0.010
lowerMultiplicity = 0
upperMultiplicity = 1
+parameter

10.2.2 SdGeneral

SWS Item	**ECUC_SD_00002 :**		
Container Name	SdGeneral		
Description	This container lists the general configuration parameters for the Service Discovery module.		
Configuration Parameters			

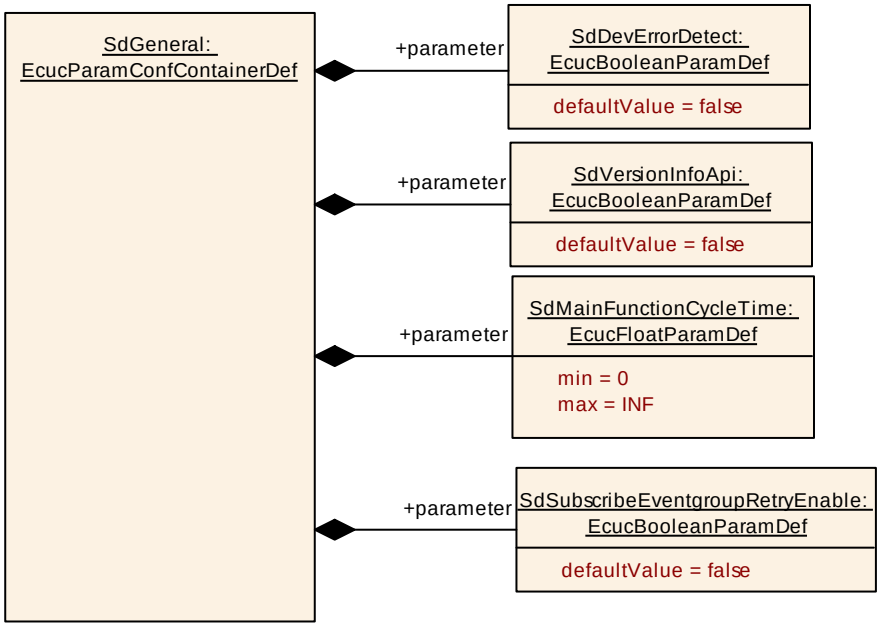
SWS Item	**ECUC_SD_00006 :**		
Name	SdDevErrorDetect		
Parent Container	SdGeneral		
Description	Switches the development error detection and notification on or off. • true: detection and notification is enabled. • false: detection and notification is disabled.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
Post-Build Variant Value	false		
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00008 :**		
Name	SdMainFunctionCycleTime		
Parent Container	SdGeneral		
Description	This parameter defines the cycle time in seconds of the periodic calling of Sd main function.		
Multiplicity	1		
Type	EcucFloatParamDef		
Range	]0 .. INF[		
Default value	--		
Post-Build Variant Value	false		
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_Sd_00131 :**		
Name	SdSubscribeEventgroupRetryEnable		
Parent Container	SdGeneral		
Description	Switch to enable or disable the retry functionality to subscribe to Eventgroups of ServerServices with TTL set to 0xFFFFFF.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
Post-Build Variant Value	false		
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00007 :**		
Name	SdVersionInfoApi		
Parent Container	SdGeneral		
Description	Enables and disables the version info API.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
Post-Build Variant Value	false		
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

No Included Containers



10.2.3 SdConfig

SWS Item	**ECUC_SD_00003 :**
Container Name	SdConfig
Description	This container contains the configuration parameters and sub containers of the AUTOSAR Service Discovery module.
Configuration Parameters	

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***
SdCapabilityRecordMatchCallout	0..*	Callout that is invoked by the Sd implementation to determine whether the configuration options contained in the entries of a received SD message match the capability record elements configured in SdServerCapabilityRecord or SdClientCapabilityRecord.
SdInstance	0..*	This container represents an instance of the SD; i.e. the

		SD configuration for a certain link.

10.2.4 SdCapabilityRecordMatchCallout

SWS Item	**ECUC_Sd_00124 :**
Container Name	SdCapabilityRecordMatchCallout
Description	Callout that is invoked by the Sd implementation to determine whether the configuration options contained in the entries of a received SD message match the capability record elements configured in SdServerCapabilityRecord or SdClientCapabilityRecord.
Post-Build Variant Multiplicity	false
Configuration Parameters	

SWS Item	**ECUC_Sd_00125 :**		
Name	SdCapabilityRecordMatchCalloutName		
Parent Container	SdCapabilityRecordMatchCallout		
Description	Function name (i.e., C-identifier) of the SdCapabilityRecordMatchCallout.		
Multiplicity	1		
Type	EcucFunctionNameDef		
Default value	--		
maxLength	--		
minLength	--		
regularExpression	--		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	--	
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME, VARIANT-POST-BUILD
	Post-build time	--	
Scope / Dependency	scope: local		

No Included Containers

10.2.5 SdInstance

SWS Item	**ECUC_SD_00084 :**
Container Name	SdInstance
Description	This container represents an instance of the SD; i.e. the SD configuration for a certain link.
Configuration Parameters	

SWS Item	**ECUC_SD_00012 :**
Name	SdInstanceHostname
Parent Container	SdInstance
Description	Configuration parameter to specify the Hostname.
Multiplicity	0..1
Type	EcucStringParamDef

Default value	--		
maxLength	--		
minLength	--		
regularExpression	--		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_Sd_00128 :**		
Name	SdInstanceLocalAdressCheckLength		
Parent Container	SdInstance		
Description	This item describes on how many bits of the addresses shall be compared to determine, if a remote address is acceptable to be used. This shall support IPv4 (0..32) and IPv6 (0..128). If this item is not present, the security checks use the configured netmask instead. "0" meaning not to check at all. For example "8" means that the first 8 bits of a remote address must be equal to the local address to be considered acceptable.		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 128		
Default value	--		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_Sd_00133 :**		
Name	SdSubscribeEventgroupRetryDelay		
Parent Container	SdInstance		
Description	Time in seconds when a subscription to an event group shall be retriggered, if no SubscribeEventGroupAck or SubscribeEventGroupNack was received.		
Multiplicity	0..1		
Type	EcucFloatParamDef		
Range	[0.001 .. 50]		
Default value	0.01		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD

Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local dependency: SdSubscribeEventgroupRetryDelay is only applicable if SdSubscribeEventgroupRetryEnable is set to TRUE and SdSubscribeEventgroupRetryMax > 0.		

SWS Item	**ECUC_Sd_00132 :**		
Name	SdSubscribeEventgroupRetryMax		
Parent Container	SdInstance		
Description	Maximum count of retry a subscription, if a subscription to an event group is not acknowledged by SubscribeEventGroupAck or SubscribeEventGroupNack. 0x0=no retry, 0xFF=retry forever (as long as the event group is requested)		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 255		
Default value	0		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local dependency: SdSubscribeEventgroupRetryMax is only applicable if SdSubscribeEventgroupRetryEnable is set to TRUE		

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***
SdClientService	0..*	This container specifies all parameters used by Client services.
SdClientTimer	0..*	This container specifies all timers used by the Service Discovery module for Client Services.
SdInstanceDemEventParameterRefs	0..1	Container for the references to DemEventParameter elements which shall be invoked using the API Dem_SetEventStatus in case the corresponding error occurs. The EventId is taken from the referenced DemEventParameter's DemEventId symbolic value. The standardized errors are provided in this container and can be extended by vendor-specific error references.
SdInstanceMulticastRxPdu	1	This container specifies the received PDU.
SdInstanceTxPdu	1	This container specifies the transmitted PDU.
SdInstanceUnicastRxPdu	1	This container specifies the received PDU.
SdServerService	0..*	This container specifies all parameters used by Server services.
SdServerTimer	0..*	This container specifies all timers used by the Service Discovery module for Server Services.

10.2.6 SdClientTimer

SWS Item	**ECUC_SD_00043 :**
Container Name	SdClientTimer
Description	This container specifies all timers used by the Service Discovery module for Client Services.
Configuration Parameters	

SWS Item	**ECUC_SD_00063 :**		
Name	SdClientTimerInitialFindDelayMax		
Parent Container	SdClientTimer		
Description	Max value in [s] to delay randomly the transmission of a find message. This parameter is mandatory for ClientService.		
Multiplicity	0..1		
Type	EcucFloatParamDef		
Range	[0 .. INF]		
Default value	--		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00044 :**		
Name	SdClientTimerInitialFindDelayMin		
Parent Container	SdClientTimer		
Description	Min value in [s] to delay randomly the transmission of a find message. This parameter is mandatory for ClientService.		
Multiplicity	0..1		
Type	EcucFloatParamDef		
Range	[0 .. INF]		
Default value	--		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00047 :**
Name	SdClientTimerInitialFindRepetitionsBaseDelay
Parent Container	SdClientTimer
Description	The base delay in [s] for find repetitions. Successive finds have an exponential back off delay (1x base delay, 2x base delay, 4x base delay, ...). This parameter is mandatory for ClientService.
Multiplicity	0..1
Type	EcucFloatParamDef

Range	[0 .. INF]		
Default value	--		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00046 :**		
Name	SdClientTimerInitialFindRepetitionsMax		
Parent Container	SdClientTimer		
Description	Configuration for the maximum number of find repetitions. This parameter is mandatory for ClientService.		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 10		
Default value	--		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

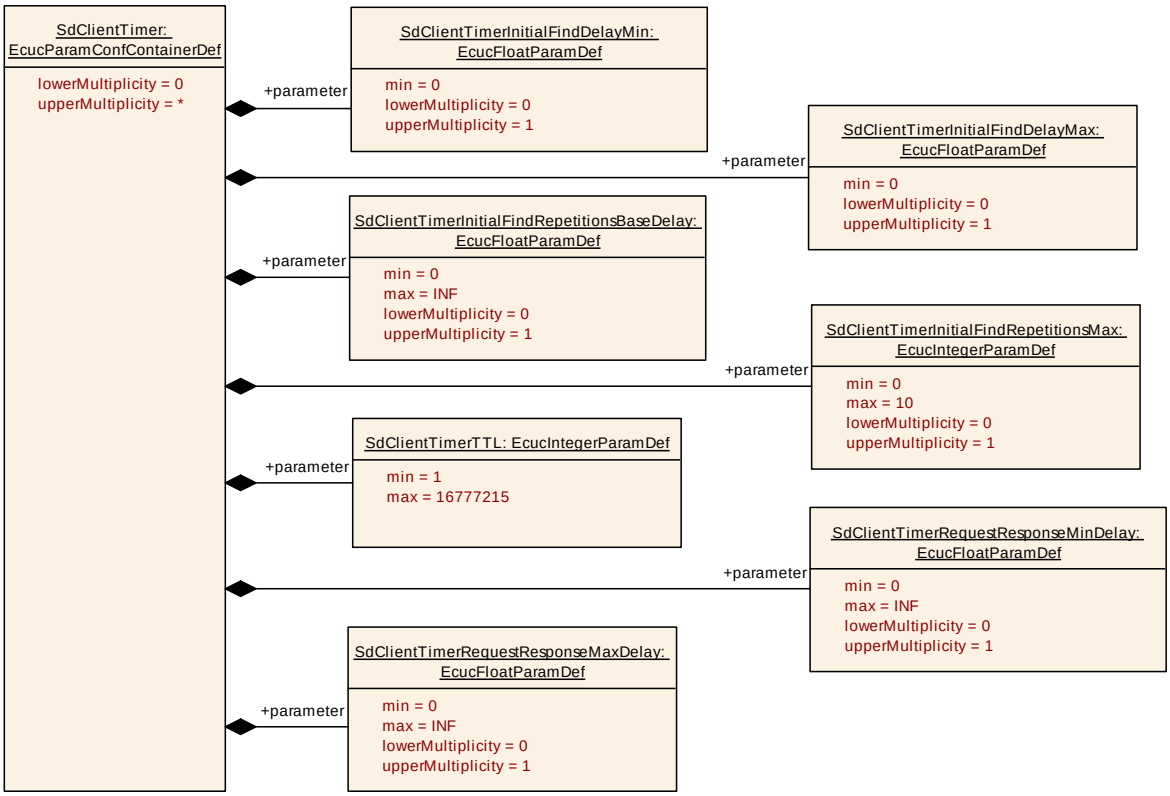
SWS Item	**ECUC_SD_00036 :**		
Name	SdClientTimerRequestResponseMaxDelay		
Parent Container	SdClientTimer		
Description	Maximum allowable response delay to entries received by multicast in seconds. This parameter is mandatory for ConsumedEventGroups.		
Multiplicity	0..1		
Type	EcucFloatParamDef		
Range	[0 .. INF]		
Default value	--		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00064 :**
Name	SdClientTimerRequestResponseMinDelay
Parent Container	SdClientTimer

Description	Minimum allowable response delay to the find message in seconds. This parameter is mandatory for ConsumedEventGroups.		
Multiplicity	0..1		
Type	EcucFloatParamDef		
Range	[0 .. INF]		
Default value	--		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00075 :**		
Name	SdClientTimerTTL		
Parent Container	SdClientTimer		
Description	Time to live for find and subscribe messages.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	1 .. 16777215		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

No Included Containers



10.2.7 SdServerTimer

SWS Item	**ECUC_SD_00035 :**
Container Name	SdServerTimer
Description	This container specifies all timers used by the Service Discovery module for Server Services.
Configuration Parameters	

SWS Item	**ECUC_SD_00039 :**		
Name	SdServerTimerInitialOfferDelayMax		
Parent Container	SdServerTimer		
Description	Max value in [s] to delay randomly the first offer. This parameter is mandatory for ServerService.		
Multiplicity	0..1		
Type	EcucFloatParamDef		
Range	[0 .. INF]		
Default value	--		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00038 :**		
Name	SdServerTimerInitialOfferDelayMin		
Parent Container	SdServerTimer		
Description	Min value in [s] to delay randomly the first offer. This parameter is mandatory for ServerService.		
Multiplicity	0..1		
Type	EcucFloatParamDef		
Range	[0 .. INF]		
Default value	--		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00041 :**		
Name	SdServerTimerInitialOfferRepetitionBaseDelay		
Parent Container	SdServerTimer		
Description	The base delay in [s] for offer repetitions. Successive offers have an exponential back off delay (1x base delay, 2x base delay, 4x base delay, ...). This parameter is mandatory for ServerService.		
Multiplicity	0..1		
Type	EcucFloatParamDef		
Range	[0 .. INF]		
Default value	--		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00040 :**		
Name	SdServerTimerInitialOfferRepetitionsMax		
Parent Container	SdServerTimer		
Description	Configure the maximum amount of offer repetition. This parameter is mandatory for ServerService.		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 10		
Default value	--		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD

Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00076 :**		
Name	SdServerTimerOfferCyclicDelay		
Parent Container	SdServerTimer		
Description	Interval between cyclic offers in the main phase. This parameter is mandatory for ServerService.		
Multiplicity	0..1		
Type	EcucFloatParamDef		
Range	[0 .. INF]		
Default value	--		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

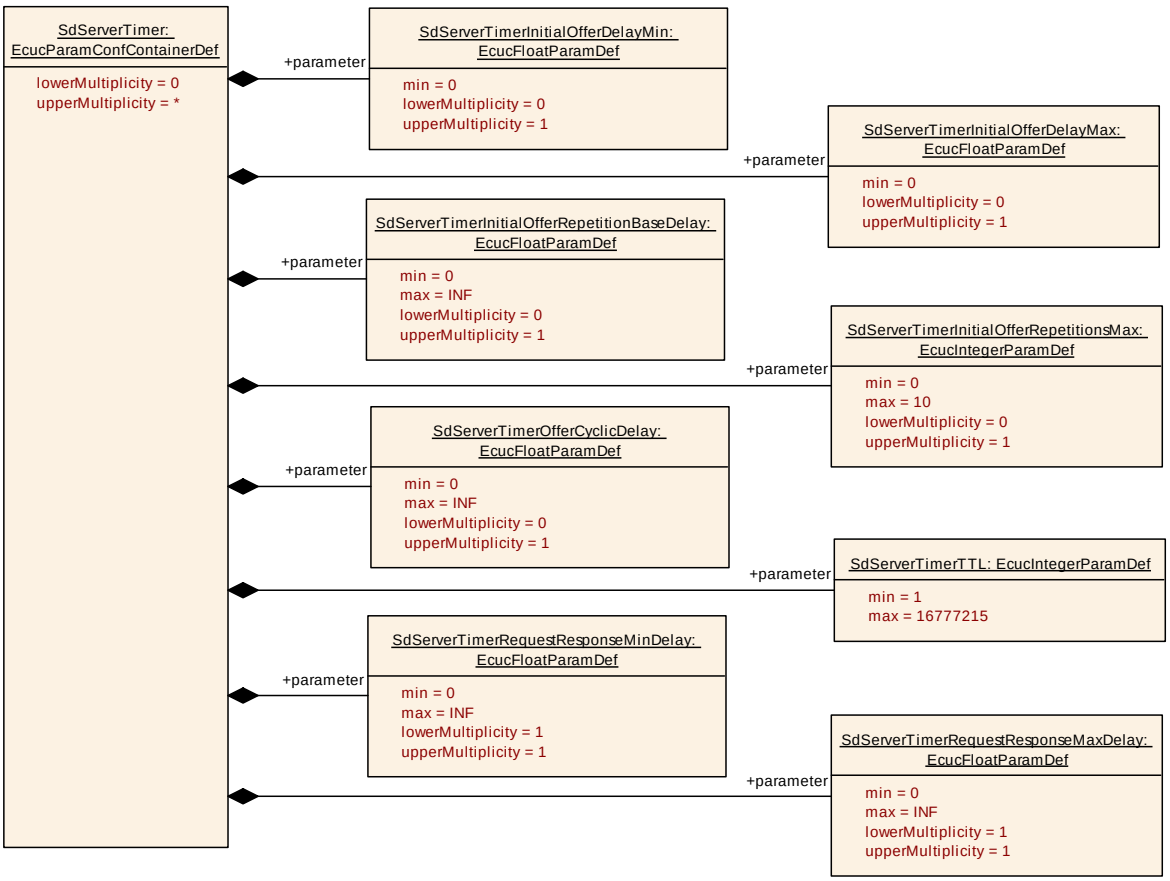
SWS Item	**ECUC_SD_00114 :**		
Name	SdServerTimerRequestResponseMaxDelay		
Parent Container	SdServerTimer		
Description	Maximum allowable response delay to entries received by multicast in seconds.		
Multiplicity	1		
Type	EcucFloatParamDef		
Range	[0 .. INF]		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00115 :**		
Name	SdServerTimerRequestResponseMinDelay		
Parent Container	SdServerTimer		
Description	Minimum allowable response delay to entries received by multicast in seconds.		
Multiplicity	1		
Type	EcucFloatParamDef		
Range	[0 .. INF]		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00037 :**

Name	SdServerTimerTTL		
Parent Container	SdServerTimer		
Description	Time to live for offer service.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	1 .. 16777215		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

No Included Containers



10.2.8 SdInstanceTxPdu

SWS Item	**ECUC_SD_00030 :**
Container Name	SdInstanceTxPdu
Description	This container specifies the transmitted PDU.
Configuration Parameters	

SWS Item	**ECUC_SD_00109 :**
Name	SdTxPduRef
Parent Container	SdInstanceTxPdu
Description	Reference to the "global" Pdu structure to allow harmonization of handle

	IDs in the COM-Stack.		
Multiplicity	1		
Type	Reference to [Pdu]		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

No Included Containers

10.2.9 SdInstanceMulticastRxPdu

SWS Item	**ECUC_SD_00081 :**
Container Name	SdInstanceMulticastRxPdu
Description	This container specifies the received PDU.
Configuration Parameters	

SWS Item	**ECUC_SD_00028 :**		
Name	SdRxPduId		
Parent Container	SdInstanceMulticastRxPdu		
Description	ID of the PDU that will be received via the API Sd_SoAdIfRxIndication().		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00029 :**		
Name	SdRxPduRef		
Parent Container	SdInstanceMulticastRxPdu		
Description	Reference to the "global" Pdu structure to allow harmonization of handle IDs in the COM-Stack.		
Multiplicity	1		
Type	Reference to [Pdu]		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

No Included Containers

10.2.10 SdInstanceUnicastRxPdu

SWS Item	**ECUC_SD_00027 :**
Container Name	SdInstanceUnicastRxPdu
Description	This container specifies the received PDU.
Configuration Parameters	

SWS Item	**ECUC_SD_00082 :**		
Name	SdRxPduId		
Parent Container	SdInstanceUnicastRxPdu		
Description	ID of the PDU that will be received via the API Sd_SoAdIfRxIndication().		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00083 :**		
Name	SdRxPduRef		
Parent Container	SdInstanceUnicastRxPdu		
Description	Reference to the "global" Pdu structure to allow harmonization of handle IDs in the COM-Stack.		
Multiplicity	1		
Type	Reference to [Pdu]		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

No Included Containers

10.2.11 SdServerService

SWS Item	**ECUC_SD_00004 :**		
Container Name	SdServerService		
Description	This container specifies all parameters used by Server services.		
Configuration Parameters			

SWS Item	**ECUC_SoAd_00085 :**		
Name	SdServerServiceAutoAvailable		
Parent Container	SdServerService		
Description	If existing and set to true, this Service will be set to "Available" on start.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00110 :**		
Name	SdServerServiceHandleId		
Parent Container	SdServerService		
Description	The HandleId by which the BswM can identify this Server Service Instance.		
Multiplicity	1		
Type	EcucIntegerParamDef (Symbolic Name generated for this parameter)		
Range	0 .. 65535		
Default value	--		
Post-Build Variant Value	false		
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00009 :**		
Name	SdServerServiceId		
Parent Container	SdServerService		
Description	Id to identify the service. This is unique for the service interface.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 65534		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00011 :**
Name	SdServerServiceInstanceId
Parent Container	SdServerService
Description	Configuration parameter to specify Instance Id of the Service implemented by the Server Service.

Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 65534		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_Sd_00129 :**		
Name	SdServerServiceLoadBalancingPriority		
Parent Container	SdServerService		
Description	Defines the value to be used for load balancing priority in the service offer. Lower value means higher priority.		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_Sd_00130 :**		
Name	SdServerServiceLoadBalancingWeight		
Parent Container	SdServerService		
Description	Defines the value to be used for load balancing weight in the service offer. Higher value means higher probability to be chosen.		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00068 :**		
Name	SdServerServiceMajorVersion		
Parent Container	SdServerService		
Description	Major version number of the Service as used in SD Entries.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 254		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00069 :**
Name	SdServerServiceMinorVersion

Parent Container	SdServerService		
Description	Minor version number of the Service as used e.g. in Offer Service entries.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 4294967294		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_Sd_00126 :**		
Name	SdServerCapabilityRecordMatchCalloutRef		
Parent Container	SdServerService		
Description	Reference to a SdCapabilityRecordMatchCallout, The referenced SdCapabilityRecordMatchCallout is invoked to determine whether the configuration options contained in the entries of a received SD message match the server's configured SdServerCapabilityRecord elements.		
Multiplicity	0..1		
Type	Reference to [SdCapabilityRecordMatchCallout]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

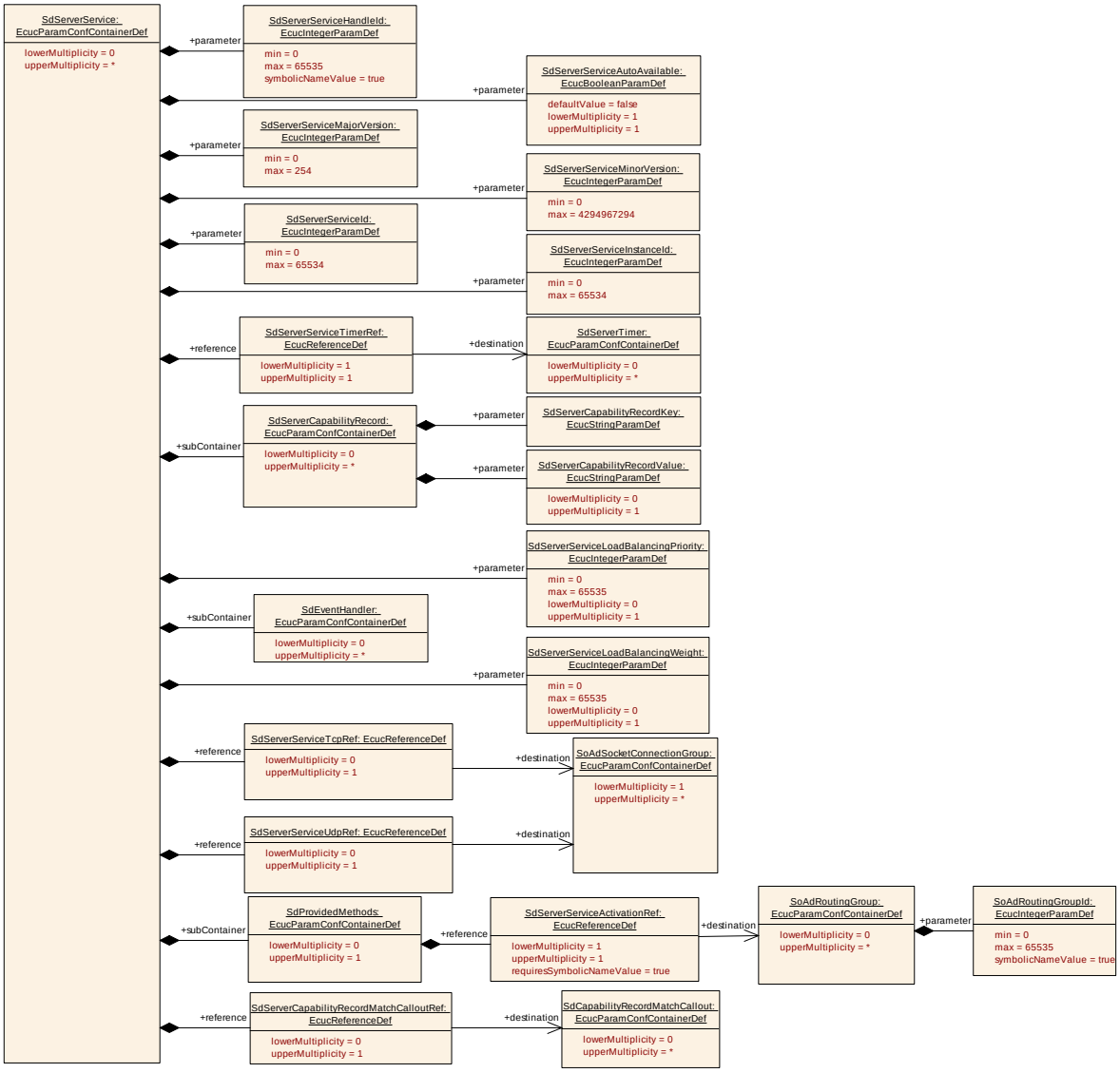
SWS Item	**ECUC_SD_00088 :**		
Name	SdServerServiceTcpRef		
Parent Container	SdServerService		
Description	Reference to SoAdSocketConnectionGroup used for methods. This is used to access the local IP address and port for building the endpoint option for offers of this service.		
Multiplicity	0..1		
Type	Reference to [SoAdSocketConnectionGroup]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00086 :**
Name	SdServerServiceTimerRef
Parent Container	SdServerService
Description	The reference of the SdServerTimer container for this service.
Multiplicity	1

Type	Reference to [SdServerTimer]		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00089 :**		
Name	SdServerServiceUdpRef		
Parent Container	SdServerService		
Description	Reference to SoAdSocketConnectionGroup used for methods. This is used to access the local IP address and port for building the endpoint option for offers of this service.		
Multiplicity	0..1		
Type	Reference to [SoAdSocketConnectionGroup]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***
SdEventHandler	0..*	Container Element for representing an EventGroup as part of the Service Instance.
SdProvidedMethods	0..1	Container element for representing the needed elements of the data path for the methods provided by the service.
SdServerCapabilityRecord	0..*	Sd uses capability records to store arbitrary name/value pairs conveying additional information about the named service. The following use cases are supported: 1) Key present, with no value (e.g. "passreq" -- password required for this service) 2) Key present, with empty value (e.g. "PlugIns=" server supports plugins, but none are presently installed) 3) Key present, with non-empty value (e.g. "PlugIns=JPEG,MPEG2,MPEG4")


SdServerService: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+parameter
SdServerServiceHandleId: EcucIntegerParamDef
min = 0
max = 65535
symbolicNameValue = true
+parameter
SdServerServiceAutoAvailable: EcucBooleanParamDef
defaultValue = false
lowerMultiplicity = 1
upperMultiplicity = 1
+parameter
SdServerServiceMajorVersion: EcucIntegerParamDef
min = 0
max = 254
+parameter
SdServerServiceMinorVersion: EcucIntegerParamDef
min = 0
max = 4294967294
+parameter
SdServerServiceId: EcucIntegerParamDef
min = 0
max = 65534
+parameter
SdServerServiceInstanceId: EcucIntegerParamDef
min = 0
max = 65534
+reference
SdServerServiceTimerRef: EcucReferenceDef
lowerMultiplicity = 1
upperMultiplicity = 1
+destination
SdServerTimer: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+subContainer
SdServerCapabilityRecord: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+parameter
SdServerCapabilityRecordKey: EcucStringParamDef
+parameter
SdServerCapabilityRecordValue: EcucStringParamDef
lowerMultiplicity = 0
upperMultiplicity = 1
+parameter
SdServerServiceLoadBalancingPriority: EcucIntegerParamDef
min = 0
max = 65535
lowerMultiplicity = 0
upperMultiplicity = 1
+subContainer
SdEventHandler: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+parameter
SdServerServiceLoadBalancingWeight: EcucIntegerParamDef
min = 0
max = 65535
lowerMultiplicity = 0
upperMultiplicity = 1
+reference
SdServerServiceTcpRef: EcucReferenceDef
lowerMultiplicity = 0
upperMultiplicity = 1
+destination
SoAdSocketConnectionGroup: EcucParamConfContainerDef
lowerMultiplicity = 1
upperMultiplicity = *
+reference
SdServerServiceUdpRef: EcucReferenceDef
lowerMultiplicity = 0
upperMultiplicity = 1
+destination
+subContainer
SdProvidedMethods: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = 1
+reference
SdServerServiceActivationRef: EcucReferenceDef
lowerMultiplicity = 1
upperMultiplicity = 1
requiresSymbolicNameValue = true
+destination
SoAdRoutingGroup: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+parameter
SoAdRoutingGroupId: EcucIntegerParamDef
min = 0
max = 65535
symbolicNameValue = true
+reference
SdServerCapabilityRecordMatchCalloutRef: EcucReferenceDef
lowerMultiplicity = 0
upperMultiplicity = 1
+destination
SdCapabilityRecordMatchCallout: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *

10.2.12 SdClientService

SWS Item	**ECUC_SD_00005 :**		
Container Name	SdClientService		
Description	This container specifies all parameters used by Client services.		
Configuration Parameters			

SWS Item	**ECUC_SoAd_00098 :**		
Name	SdClientServiceAutoRequire		
Parent Container	SdClientService		
Description	If existing and set to true, this Service will be set to "required" on start.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00079 :**		
Name	SdClientServiceHandleId		
Parent Container	SdClientService		
Description	The HandleId by which the BswM can identify this Client Service Instance.		
Multiplicity	1		
Type	EcucIntegerParamDef (Symbolic Name generated for this parameter)		
Range	0 .. 65535		
Default value	--		
Post-Build Variant Value	false		
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00020 :**		
Name	SdClientServiceId		
Parent Container	SdClientService		
Description	Id to identify the service. This is unique for the service interface.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 65534		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00022 :**
Name	SdClientServiceInstanceId
Parent Container	SdClientService
Description	Configuration parameter to specify Instance Id of the service as used in SD entries.

Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 65534		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00070 :**		
Name	SdClientServiceMajorVersion		
Parent Container	SdClientService		
Description	Major version number of the Service as used in the SD entries.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 254		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00071 :**		
Name	SdClientServiceMinorVersion		
Parent Container	SdClientService		
Description	Minor version number of the Service as used in the SD Service Entries. If configured to 0xffffffff (any), SD will accept all Minor Versions.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 4294967295		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_Sd_00127 :**		
Name	SdClientCapabilityRecordMatchCalloutRef		
Parent Container	SdClientService		
Description	Reference to a SdCapabilityRecordMatchCallout, The referenced SdCapabilityRecordMatchCallout is invoked to determine whether the configuration options contained in the entries of a received SD message match the client's configured SdClientCapabilityRecord elements.		
Multiplicity	0..1		
Type	Reference to [SdCapabilityRecordMatchCallout]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME

	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

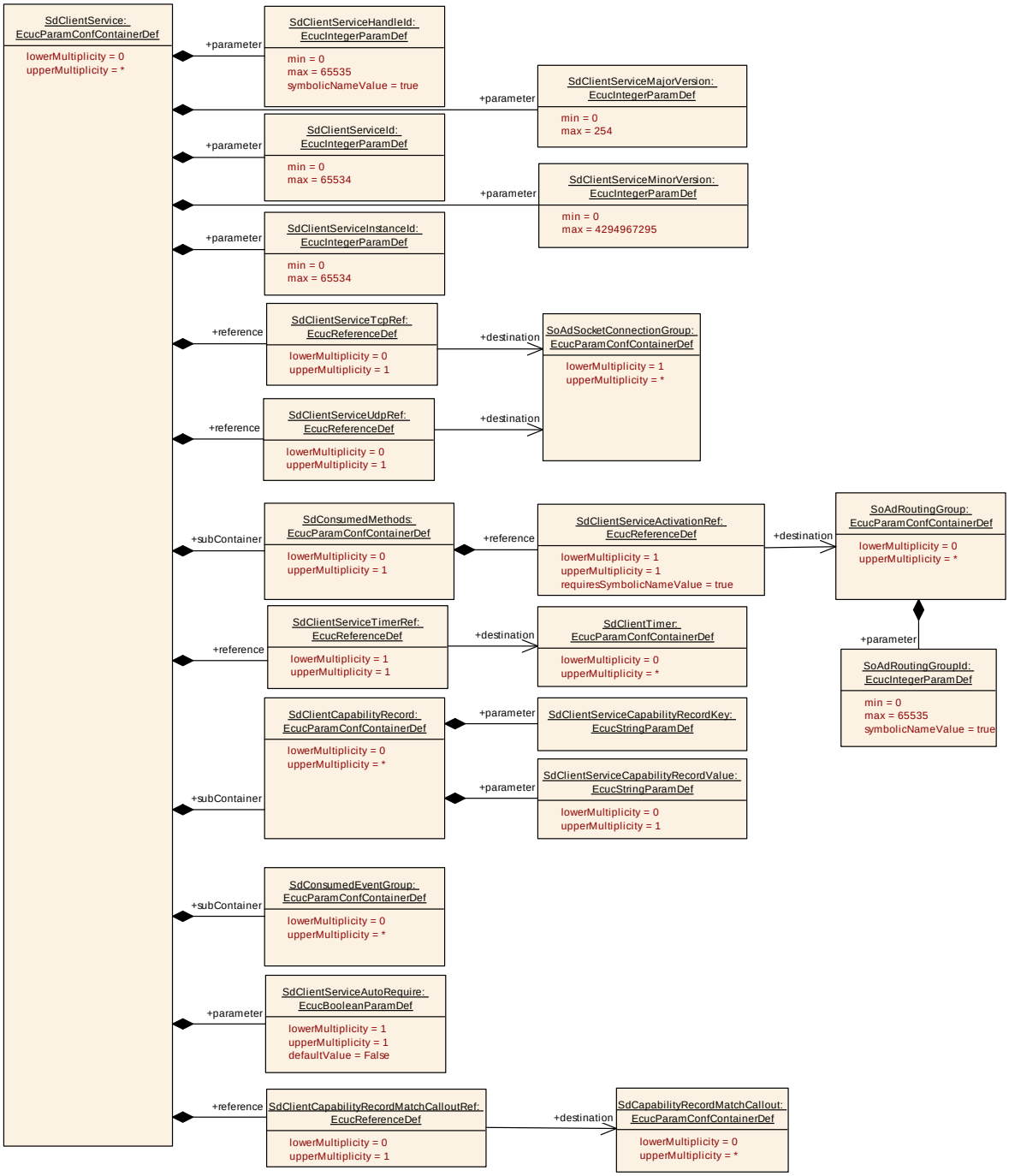
SWS Item	**ECUC_SD_00100 :**		
Name	SdClientServiceTcpRef		
Parent Container	SdClientService		
Description	Reference to the SoAdSocketConnection representing the data path (TCP) for communication with methods. This element is also used to set the remote address of the server and to open the TCP connection.		
Multiplicity	0..1		
Type	Reference to [SoAdSocketConnectionGroup]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00103 :**		
Name	SdClientServiceTimerRef		
Parent Container	SdClientService		
Description	The reference of the SdClientTimer container for this service.		
Multiplicity	1		
Type	Reference to [SdClientTimer]		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00101 :**		
Name	SdClientServiceUdpRef		
Parent Container	SdClientService		
Description	Reference to the SoAdSocketConnection representing the data path (UDP) for communication with methods. This element is also used to set the remote address of the server.		
Multiplicity	0..1		
Type	Reference to [SoAdSocketConnectionGroup]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***

SdClientCapabilityRecord	0..*	Sd uses capability records to store arbitrary name/value pairs conveying additional information about the named service. The following use cases are supported: 1) Key present, with no value (e.g. "passreq" -- password required for this service) 2) Key present, with empty value (e.g. "PlugIns=" server supports plugins, but none are presently installed) 3) Key present, with non-empty value (e.g. "PlugIns=JPEG,MPEG2,MPEG4")
SdConsumedEventGroup	0..*	This container specifies all parameters for consumed event groups.
SdConsumedMethods	0..1	Container element for representing the data path for accessing the server methods.


SdClientService: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+parameter
SdClientServiceHandleId: EcucIntegerParamDef
min = 0
max = 65535
symbolicNameValue = true
+parameter
SdClientServiceMajorVersion: EcucIntegerParamDef
min = 0
max = 254
+parameter
SdClientServiceId: EcucIntegerParamDef
min = 0
max = 65534
+parameter
SdClientServiceMinorVersion: EcucIntegerParamDef
min = 0
max = 4294967295
+parameter
SdClientServiceInstanceId: EcucIntegerParamDef
min = 0
max = 65534
+reference
SdClientServiceTcpRef: EcucReferenceDef
lowerMultiplicity = 0
upperMultiplicity = 1
+destination
SoAdSocketConnectionGroup: EcucParamConfContainerDef
lowerMultiplicity = 1
upperMultiplicity = *
+reference
SdClientServiceUdpRef: EcucReferenceDef
lowerMultiplicity = 0
upperMultiplicity = 1
+destination
+subContainer
SdConsumedMethods: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = 1
+reference
SdClientServiceActivationRef: EcucReferenceDef
lowerMultiplicity = 1
upperMultiplicity = 1
requiresSymbolicNameValue = true
+destination
SoAdRoutingGroup: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+parameter
SoAdRoutingGroupId: EcucIntegerParamDef
min = 0
max = 65535
symbolicNameValue = true
+reference
SdClientServiceTimerRef: EcucReferenceDef
lowerMultiplicity = 1
upperMultiplicity = 1
+destination
SdClientTimer: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+subContainer
SdClientCapabilityRecord: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+parameter
SdClientServiceCapabilityRecordKey: EcucStringParamDef
+parameter
SdClientServiceCapabilityRecordValue: EcucStringParamDef
lowerMultiplicity = 0
upperMultiplicity = 1
+subContainer
SdConsumedEventGroup: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+parameter
SdClientServiceAutoRequire: EcucBooleanParamDef
lowerMultiplicity = 1
upperMultiplicity = 1
defaultValue = False
+reference
SdClientCapabilityRecordMatchCalloutRef: EcucReferenceDef
lowerMultiplicity = 0
upperMultiplicity = 1
+destination
SdCapabilityRecordMatchCallout: EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *

10.2.13 SdClientCapabilityRecord

SWS Item	**ECUC_SD_00072 :**		
Container Name	SdClientCapabilityRecord		
Description	Sd uses capability records to store arbitrary name/value pairs conveying additional information about the named service. The following use cases are supported: 1) Key present, with no value (e.g. "passreq" -- password required for this service) 2) Key present, with empty value (e.g. "PlugIns=" server supports plugins, but none are presently installed) 3) Key present, with non-empty value (e.g. "PlugIns=JPEG,MPEG2,MPEG4")		
Configuration Parameters			

SWS Item	**ECUC_SD_00073 :**		
Name	SdClientServiceCapabilityRecordKey		
Parent Container	SdClientCapabilityRecord		
Description	Defines a CapabilityRecord key.		
Multiplicity	1		
Type	EcucStringParamDef		
Default value	--		
maxLength	--		
minLength	--		
regularExpression	--		
Post-Build Variant Value	false		
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00074 :**		
Name	SdClientServiceCapabilityRecordValue		
Parent Container	SdClientCapabilityRecord		
Description	Defines the corresponding CapabilityRecord value.		
Multiplicity	0..1		
Type	EcucStringParamDef		
Default value	--		
maxLength	--		
minLength	--		
regularExpression	--		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

No Included Containers

10.2.14 SdConsumedEventGroup

SWS Item	**ECUC_SD_00056 :**
Container Name	SdConsumedEventGroup
Description	A Service may have event groups which can be consumed. A service consumer has to subscribe to the corresponding event-group. After the subscription the event consumer takes the role of a server and the event provider that of a client.
Configuration Parameters	

SWS Item	**ECUC_SoAd_00108 :**		
Name	SdConsumedEventGroupAutoRequire		
Parent Container	SdConsumedEventGroup		
Description	If existing and set to true, this EventGroup will be set to "required" on start.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00116 :**		
Name	SdConsumedEventGroupHandleId		
Parent Container	SdConsumedEventGroup		
Description	The HandleId by which the BswM can identify this EventGroup.		
Multiplicity	1		
Type	EcucIntegerParamDef (Symbolic Name generated for this parameter)		
Range	0 .. 65535		
Default value	--		
Post-Build Variant Value	false		
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00057 :**		
Name	SdConsumedEventGroupId		
Parent Container	SdConsumedEventGroup		
Description	The Eventgroup Id of this eventGroup as a unique identifier of the eventgroup in this service. This identifier is used for EventGroup entries as well.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 65534		
Default value	--		
Post-Build Variant Value	false		
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	

	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00106 :**		
Name	SdConsumedEventGroupMulticastActivationRef		
Parent Container	SdConsumedEventGroup		
Description	The reference of a Routing Group in order to activate and setup the Socket Connection for Multicast Events of this EventGroup. The multicast address from the received Multicast option is setup by SoAd_RequestIpAddrAssignment. The local address is the same as for the unicast events; thus, it was sent in the UDP Endpoint option of the Subscribe EventGroup entry. This is usually equal to the SdConsumedEventGroupUdpActivationRef.		
Multiplicity	0..1		
Type	Symbolic name reference to [SoAdRoutingGroup]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00119 :**		
Name	SdConsumedEventGroupMulticastGroupRef		
Parent Container	SdConsumedEventGroup		
Description	Reference to the SoAdSocketConnectionGroup representing the multicast data path (UDP).		
Multiplicity	0..*		
Type	Reference to [SoAdSocketConnectionGroup]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

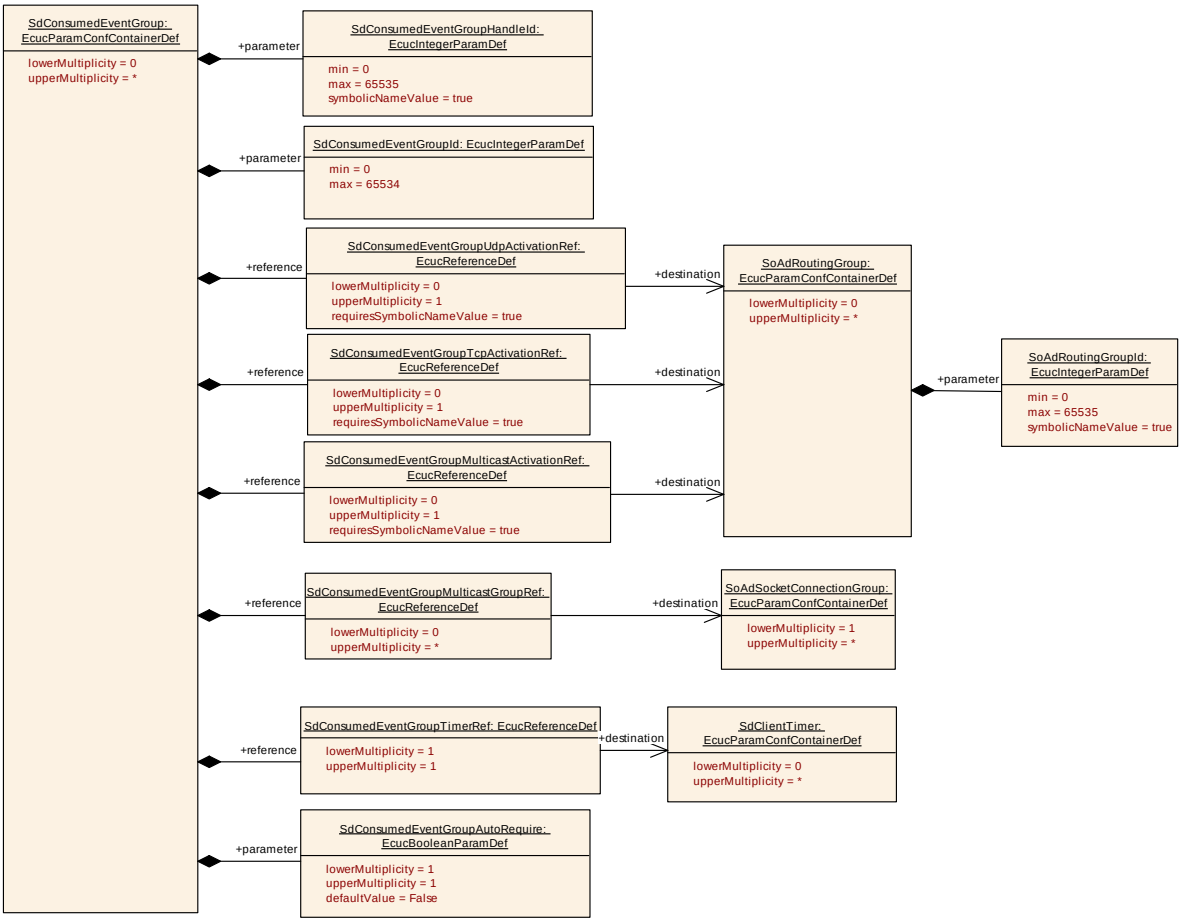
SWS Item	**ECUC_SD_00105 :**
Name	SdConsumedEventGroupTcpActivationRef
Parent Container	SdConsumedEventGroup
Description	The reference of the Routing Group for activation of the data path for receiving TCP events. This element is also being used for getting the IP address and port number for building the TCP endpoint option for the Subscribe EventGroup entry. If no TCP methods are used in the service, this element is also being used for setting the remote address (TCP Endpoint option referenced by the Offer Service entry) and opening the TCP connection to the server before sending the Subscribe EventGroup entry. If multiple EventGroups of the

	same Service Instance are subscribed the TCP connection will be shared and must be opened only once.		
Multiplicity	0..1		
Type	Symbolic name reference to [SoAdRoutingGroup]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00107 :**		
Name	SdConsumedEventGroupTimerRef		
Parent Container	SdConsumedEventGroup		
Description	The reference of the SdClientTimer container for this eventGroup.		
Multiplicity	1		
Type	Reference to [SdClientTimer]		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00104 :**		
Name	SdConsumedEventGroupUdpActivationRef		
Parent Container	SdConsumedEventGroup		
Description	The reference of the Routing Group for activation of the data path for receiving UDP events. This element is also being used for getting the IP address and port number for building the UDP endpoint option for the Subscribe EventGroup entry. If no UDP methods are used in the service, this element is also being used for setting the remote address (UDP Endpoint option referenced by the Offer Service entry). If multiple EventGroups of the same Service Instance are subscribed the UDP Socket Connection will be shared and must be set only once.		
Multiplicity	0..1		
Type	Symbolic name reference to [SoAdRoutingGroup]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

No Included Containers



10.2.15 SdConsumedMethods

SWS Item	**ECUC_SD_00099 :**
Container Name	SdConsumedMethods
Description	Container element for representing the data path for accessing the server methods.
Configuration Parameters	

SWS Item	**ECUC_SD_00102 :**		
Name	SdClientServiceActivationRef		
Parent Container	SdConsumedMethods		
Description	Reference to a SoAdRoutingGroupRef to activate/deactivate the data path for the methods.		
Multiplicity	1		
Type	Symbolic name reference to [SoAdRoutingGroup]		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

No Included Containers

10.2.16 SdEventHandler

SWS Item	**ECUC_SD_00055 :**		
Container Name	SdEventHandler		
Description	Container Element for representing an EventGroup as part of the Service Instance.		
Configuration Parameters			

SWS Item	**ECUC_SD_00061 :**		
Name	SdEventHandlerEventGroupId		
Parent Container	SdEventHandler		
Description	The EventGroup Id of this EventGroup as a unique identifier of the EventGroup in this service. This identifier is used for EventGroup entries as well.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 65534		
Default value	--		
Post-Build Variant Value	false		
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

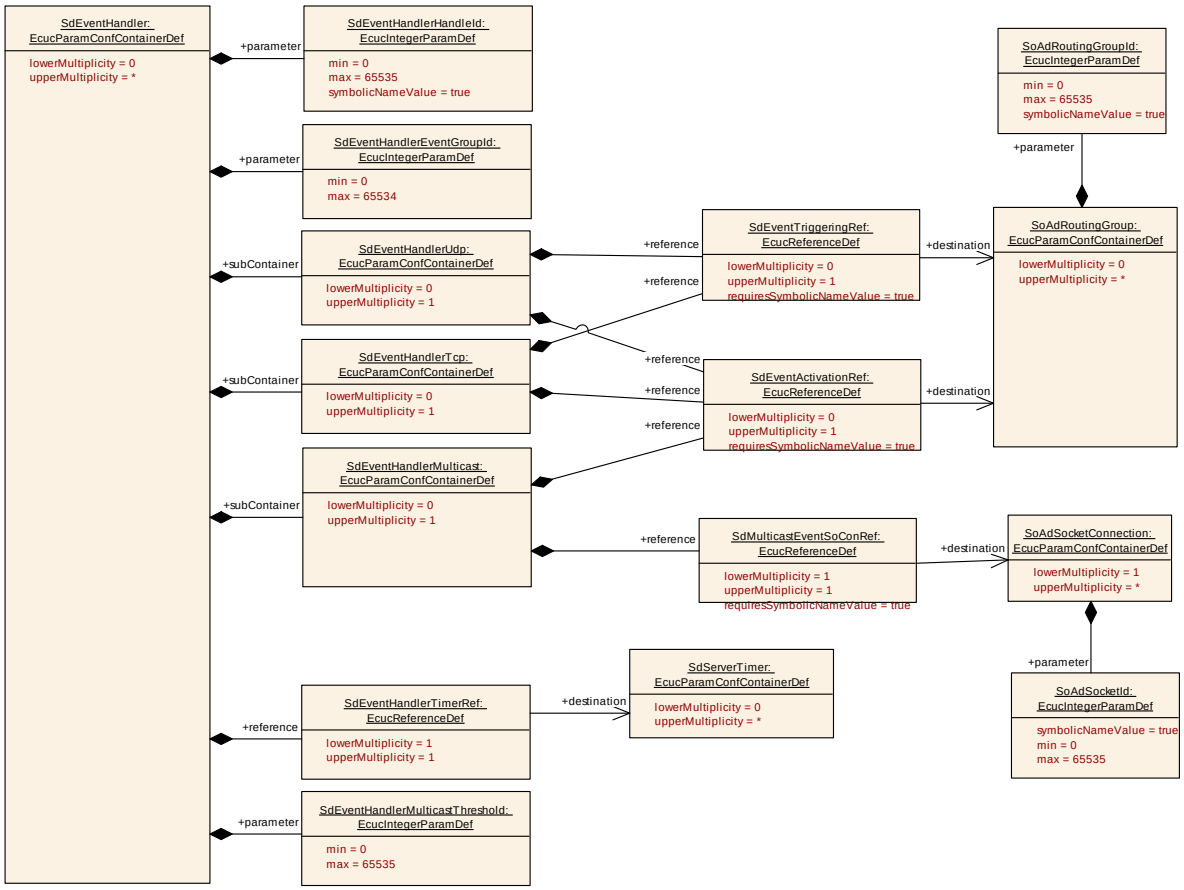
SWS Item	**ECUC_SD_00112 :**		
Name	SdEventHandlerHandleId		
Parent Container	SdEventHandler		
Description	The HandleId by which the BswM can identify this EventGroup.		
Multiplicity	1		
Type	EcucIntegerParamDef (Symbolic Name generated for this parameter)		
Range	0 .. 65535		
Default value	--		
Post-Build Variant Value	false		
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: ECU		

SWS Item	**ECUC_SD_00097 :**		
Name	SdEventHandlerMulticastThreshold		
Parent Container	SdEventHandler		
Description	Specifies the number of subscribed clients that trigger the Server to change the transmission of events to Multicast. If configured to 0 only unicast will be used. If configured to 1 the first client will be already served by multicast. If configured to 2 the first client will be served with unicast and as soon as the second client arrives both will be served by multicast. This does not influence the handling of initial events, which are served using unicast only.		
Multiplicity	1		
Type	EcucIntegerParamDef		
Range	0 .. 65535		
Default value	--		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE

	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00113 :**		
Name	SdEventHandlerTimerRef		
Parent Container	SdEventHandler		
Description	The reference of the SdServerTimer container for this EventGroup.		
Multiplicity	1		
Type	Reference to [SdServerTimer]		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***
SdEventHandlerMulticast	0..1	The subcontainer including the Routing Group for Activation of Events sent over Multicast. The activation ref is also being used for identification of the related Socket Connection in order to find the Multicast Address used in the Multicast Option referenced by the Subscribe EventGroup Ack entry.
SdEventHandlerTcp	0..1	The subcontainer including the Routing Groups for Activation and Trigger Transmit for Events sent over TCP. The activation ref (or triggering ref if no activation ref exists) is also being used for identification of the related socket connections in order to find the related client by iterating the SdEventHandlerTcp elements (remote address statically configured or automatically set by opening TCP connection before subscription).
SdEventHandlerUdp	0..1	The subcontainer including the Routing Groups for Activation and Trigger Transmit for Events sent over UDP. The activation ref (or triggering ref if no activation ref exists) is also being used for identification of the related socket connections in order to set the remote address of the client or find the related client by iterating the SdEventHandlerUdp elements (remote address statically configured or automatically set by method call before subscription).


SdEventHandler:
EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+parameter
SdEventHandlerHandleId:
EcucIntegerParamDef
min = 0
max = 65535
symbolicNameValue = true
+parameter
SdEventHandlerEventGroupId:
EcucIntegerParamDef
min = 0
max = 65534
+subContainer
SdEventHandlerUdp:
EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = 1
+subContainer
SdEventHandlerTcp:
EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = 1
+subContainer
SdEventHandlerMulticast:
EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = 1
+reference
SdEventHandlerTimerRef:
EcucReferenceDef
lowerMultiplicity = 1
upperMultiplicity = 1
+destination
SdServerTimer:
EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+parameter
SdEventHandlerMulticastThreshold:
EcucIntegerParamDef
min = 0
max = 65535
+reference
SdEventTriggeringRef:
EcucReferenceDef
lowerMultiplicity = 0
upperMultiplicity = 1
requiresSymbolicNameValue = true
+destination
SoAdRoutingGroup:
EcucParamConfContainerDef
lowerMultiplicity = 0
upperMultiplicity = *
+reference
SdEventActivationRef:
EcucReferenceDef
lowerMultiplicity = 0
upperMultiplicity = 1
requiresSymbolicNameValue = true
+destination
+reference
SdMulticastEventSoConRef:
EcucReferenceDef
lowerMultiplicity = 1
upperMultiplicity = 1
requiresSymbolicNameValue = true
+destination
SoAdSocketConnection:
EcucParamConfContainerDef
lowerMultiplicity = 1
upperMultiplicity = *
+parameter
SoAdSocketId:
EcucIntegerParamDef
symbolicNameValue = true
min = 0
max = 65535
SoAdRoutingGroupId:
EcucIntegerParamDef
min = 0
max = 65535
symbolicNameValue = true
+parameter

10.2.17 SdEventHandlerMulticast

SWS Item	**ECUC_SD_00094 :**
Container Name	SdEventHandlerMulticast
Description	The subcontainer including the Routing Group for Activation of Events sent over Multicast. The activation ref is also being used for identification of the related Socket Connection in order to find the Multicast Address used in the Multicast Option referenced by the Subscribe EventGroup Ack entry.
Configuration Parameters	

SWS Item	**ECUC_SD_00096 :**		
Name	SdEventActivationRef		
Parent Container	SdEventHandlerMulticast		
Description	Reference to a SoAdRoutingGroup for activation of the data path for a subscribed client (start sending events after subscribe). This is usually equal to the SdEventActivationRef referenced by SdEventHandlerUdp		
Multiplicity	0..1		
Type	Symbolic name reference to [SoAdRoutingGroup]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00118 :**		
Name	SdMulticastEventSoConRef		
Parent Container	SdEventHandlerMulticast		
Description	Reference to the SoAdSocketConnection representing the multicast data path (UDP).		
Multiplicity	1		
Type	Symbolic name reference to [SoAdSocketConnection]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

No Included Containers

10.2.18 SdEventHandlerTcp

SWS Item	**ECUC_SD_00093 :**
Container Name	SdEventHandlerTcp
Description	The subcontainer including the Routing Groups for Activation and Trigger Transmit for Events sent over TCP. The activation ref (or triggering ref if no activation ref exists) is also being used for identification of the related socket connections in order to find the related client by iterating the SdEventHandlerTcp elements (remote address statically configured or automatically set by opening TCP connection before subscription).
Configuration Parameters	

SWS Item	**ECUC_SD_00096 :**		
Name	SdEventActivationRef		
Parent Container	SdEventHandlerTcp		
Description	Reference to a SoAdRoutingGroup for activation of the data path for a subscribed client (start sending events after subscribe). This is usually equal to the SdEventActivationRef referenced by SdEventHandlerUdp		
Multiplicity	0..1		
Type	Symbolic name reference to [SoAdRoutingGroup]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00095 :**		
Name	SdEventTriggeringRef		
Parent Container	SdEventHandlerTcp		
Description	Reference to a SoAdRoutingGroup that is used for triggered transmit. Triggering is needed to sent out initial events on the server side after a client got subscribed.		
Multiplicity	0..1		
Type	Symbolic name reference to [SoAdRoutingGroup]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

No Included Containers

10.2.19 SdEventHandlerUdp

SWS Item	**ECUC_SD_00092 :**
Container Name	SdEventHandlerUdp
Description	The subcontainer including the Routing Groups for Activation and Trigger Transmit for Events sent over UDP. The activation ref (or triggering ref if no activation ref exists) is also being used for identification of the related socket connections in order to set the remote address of the client or find the related client by iterating the SdEventHandlerUdp elements (remote address statically configured or automatically set by method call before subscription).
Configuration Parameters	

SWS Item	**ECUC_SD_00096 :**		
Name	SdEventActivationRef		
Parent Container	SdEventHandlerUdp		
Description	Reference to a SoAdRoutingGroup for activation of the data path for a subscribed client (start sending events after subscribe). This is usually equal to the SdEventActivationRef referenced by SdEventHandlerUdp		
Multiplicity	0..1		
Type	Symbolic name reference to [SoAdRoutingGroup]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00095 :**		
Name	SdEventTriggeringRef		
Parent Container	SdEventHandlerUdp		
Description	Reference to a SoAdRoutingGroup that is used for triggered transmit. Triggering is needed to sent out initial events on the server side after a client got subscribed.		
Multiplicity	0..1		
Type	Symbolic name reference to [SoAdRoutingGroup]		
Post-Build Variant Multiplicity	true		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

No Included Containers

10.2.20 SdProvidedMethods

SWS Item	**ECUC_SD_00087 :**
Container Name	SdProvidedMethods
Description	Container element for representing the needed elements of the data path for the methods provided by the service.
Configuration Parameters	

SWS Item	**ECUC_SD_00090 :**		
Name	SdServerServiceActivationRef		
Parent Container	SdProvidedMethods		
Description	Reference to a SoAdRoutingGroup to activated and deactivate the data path for methods of the service.		
Multiplicity	1		
Type	Symbolic name reference to [SoAdRoutingGroup]		
Post-Build Variant Value	true		
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: ECU		

No Included Containers

10.2.21 SdServerCapabilityRecord

SWS Item	**ECUC_SD_00032 :**		
Container Name	SdServerCapabilityRecord		
Description	Sd uses capability records to store arbitrary name/value pairs conveying additional information about the named service. The following use cases are supported: 1) Key present, with no value (e.g. "passreq" -- password required for this service) 2) Key present, with empty value (e.g. "PlugIns=" server supports plugins, but none are presently installed) 3) Key present, with non-empty value (e.g. "PlugIns=JPEG,MPEG2,MPEG4")		
Configuration Parameters			

SWS Item	**ECUC_SD_00033 :**		
Name	SdServerCapabilityRecordKey		
Parent Container	SdServerCapabilityRecord		
Description	Defines a CapabilityRecord key.		
Multiplicity	1		
Type	EcucStringParamDef		
Default value	--		
maxLength	--		
minLength	--		
regularExpression	--		
Post-Build Variant Value	false		
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00034 :**		
Name	SdServerCapabilityRecordValue		
Parent Container	SdServerCapabilityRecord		
Description	Defines the corresponding CapabilityRecord value.		
Multiplicity	0..1		
Type	EcucStringParamDef		
Default value	--		
maxLength	--		
minLength	--		
regularExpression	--		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	false		
Multiplicity Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Value Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

No Included Containers

10.2.22 SdInstanceDemEventParameterRefs

SWS Item	**ECUC_SD_00120 :**
Container Name	SdInstanceDemEventParameterRefs
Description	Container for the references to DemEventParameter elements which shall be invoked using the API Dem_SetEventStatus in case the corresponding error occurs. The EventId is taken from the referenced DemEventParameter's DemEventId symbolic value. The standardized errors are provided in this container and can be extended by vendor-specific error references.
Configuration Parameters	

SWS Item	**ECUC_SD_00121 :**		
Name	SD_E_MALFORMED_MSG		
Parent Container	SdInstanceDemEventParameterRefs		
Description	Reference to the DemEventParameter which shall be issued when the SD Instance received malformed messsage.		
Multiplicity	0..1		
Type	Symbolic name reference to [DemEventParameter]		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	true		
Multiplicity Configuration Class	*Pre-compile time*	X	All Variants
	Link time	--	
	Post-build time	--	
Value Configuration Class	*Pre-compile time*	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00122 :**		
Name	SD_E_OUT_OF_RES		
Parent Container	SdInstanceDemEventParameterRefs		
Description	Reference to the DemEventParameter which shall be issued when the SD Instance does not have enough resources to handle client.		
Multiplicity	0..1		
Type	Symbolic name reference to [DemEventParameter]		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	true		
Multiplicity Configuration Class	*Pre-compile time*	X	All Variants
	Link time	--	
	Post-build time	--	
Value Configuration Class	*Pre-compile time*	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

SWS Item	**ECUC_SD_00123 :**
Name	SD_E_SUBSCR_NACK_RECV

Parent Container	SdInstanceDemEventParameterRefs		
Description	Reference to the DemEventParameter which shall be issued when receiving SubscribeEventgroupNack entry.		
Multiplicity	0..1		
Type	Symbolic name reference to [DemEventParameter]		
Post-Build Variant Multiplicity	false		
Post-Build Variant Value	true		
Multiplicity Configuration Class	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Value Configuration Class	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	X	VARIANT-POST-BUILD
Scope / Dependency	scope: local		

No Included Containers

10.3 Published Information

Published information contains data defined by the implementer of the SW module that does not change when the module is adapted (i.e. configured) to the actual HW/SW environment. It thus contains version and manufacturer information.

For details refer to the chapter 10.3 “Published Information” in *SWS_BSWGeneral.*