Document Title	Requirements on SOME/IP Service Discovery Protocol
Document Owner	AUTOSAR
Document Responsibility	AUTOSAR
Document Identification No	801

Document Status	Final
Part of AUTOSAR Standard	Foundation
Part of Standard Release	1.3.0

Document Change History				
Date	**Release**	**Changed by**	**Description**
2017-12-08	1.3.0	AUTOSAR Release Management	• No content changes
2017-10-27	1.2.0	AUTOSAR Release Management	• Editorial changes
2017-03-31	1.1.0	AUTOSAR Release Management	• Editorial changes
2016-11-30	1.0.0	AUTOSAR Release Management	• Initial release

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1 Scope of this document

The main tasks of Service Discovery is managing the availability (Find/Offer) of functional entities - called services - in the in-vehicle communication as well as managing the need for sending event messages to the network. This allows sending only event messages to receivers requiring them (Publish/Subscribe).

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

This document contains the requirements that shall be fulfilled by the SOME/IP Service Discovery protocol to offer this functionality based on SOME/IP communication mechanisms underneath.

1.1 Document Conventions

The representation of requirements in AUTOSAR documents follows the table specified in [TPS_STDT_00078], see Standardization Template, chapter Support for Traceability ([1]).

The verbal forms for the expression of obligation specified in [TPS_STDT_00053] shall be used to indicate requirements, see Standardization Template, chapter Support for Traceability ([1]).

2 Acronyms and Abbreviations

The glossary below includes acronyms and abbreviations relevant to the SOME/IP specification that are not included in the [2, AUTOSAR glossary].

Abbreviation / Acronym:	Description:
Client	The ECU using the service instance of a server shall be called client in the context of this service instance.
Event	A uni-directional data transmission that is only invoked on changes or cyclically and is sent from the producer of data to the consumers.
Eventgroup	A logical grouping of events and notification events of fields inside a service in order to allow subscription
Field	A field does represent a status and thus has an valid value at all times on which getter, setter and notifier act upon.
Finding a service instance	Sending a SOME/IP-SD message in order to find a needed service instance.
Getter	A Request/Response call that allows read access to a field.
Method	A method, procedure, function, or subroutine that is called/invoked.
Notification Event	An event message of the notifier of a field.
Notifier	Sends out event message with a new value on change of the value of the field.
Offering a service instance	An ECU implements an instance of a service and tells other ECUs using SOME/IP-SD that they may use it.
Server	The ECU offering a service instance shall be called server in the context of this service instance.
Service	A logical combination of zero or more methods, zero or more events, and zero or more fields.
Service Instance	Implementation of a service, which can exist more than once in the vehicle and more than once on an ECU
Setter	A Request/Response call that allows write access to a field.
TTL	Time-to-Live

Table 2.1: Acronyms and Abbreviations

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3   Requirements Tracing

The following table references the requirements fulfilled by this document.

Feature	Description	Satisfied by
[RS_Main_00280]	AUTOSAR shall provide standardized communication interfaces for the onboard data exchange between ECUs with different software platforms	[RS_SOMEIPSD_00001] [RS_SOMEIPSD_00002] [RS_SOMEIPSD_00003] [RS_SOMEIPSD_00004] [RS_SOMEIPSD_00005] [RS_SOMEIPSD_00006] [RS_SOMEIPSD_00007] [RS_SOMEIPSD_00008] [RS_SOMEIPSD_00009] [RS_SOMEIPSD_00010] [RS_SOMEIPSD_00011] [RS_SOMEIPSD_00012] [RS_SOMEIPSD_00013] [RS_SOMEIPSD_00014] [RS_SOMEIPSD_00015] [RS_SOMEIPSD_00016] [RS_SOMEIPSD_00017] [RS_SOMEIPSD_00018] [RS_SOMEIPSD_00019] [RS_SOMEIPSD_00020] [RS_SOMEIPSD_00021] [RS_SOMEIPSD_00022] [RS_SOMEIPSD_00024] [RS_SOMEIPSD_00025]
[RS_Main_01002]	AUTOSAR shall support service-oriented communication	[RS_SOMEIPSD_00004] [RS_SOMEIPSD_00005] [RS_SOMEIPSD_00008] [RS_SOMEIPSD_00009] [RS_SOMEIPSD_00011] [RS_SOMEIPSD_00012] [RS_SOMEIPSD_00013] [RS_SOMEIPSD_00014] [RS_SOMEIPSD_00015] [RS_SOMEIPSD_00016] [RS_SOMEIPSD_00017] [RS_SOMEIPSD_00018] [RS_SOMEIPSD_00021] [RS_SOMEIPSD_00022] [RS_SOMEIPSD_00025]

4 Requirements

4.1 General

[RS_SOMEIPSD_00021] SOME/IP Service Discovery protocol shall provide functionality to discover services ⌈

Type:	valid
Description:	SOME/IP Service Discovery protocol shall provide functionality to discovery services and communication paths during runtime.
Rationale:	Service discovery in combination with service-based communication allows a communication which was not predefined during system design phase.
Use Case:	Communication between partners is not statically defined during system design phase.
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋ *(RS_Main_00280, RS_Main_01002)*

[RS_SOMEIPSD_00001] SOME/IP Service Discovery Protocol shall be used on top of SOME/IP Protocol ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall be used on top of SOME/IP Protocol to serialize and communicate service discovery related messages.
Rationale:	SOME/IP Service Discovery is specialized on SOME/IP based communication, common functionality needs only to be designed and implemented once.
Use Case:	Service discovery of SOME/IP services.
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋ *(RS_Main_00280)*

[RS_SOMEIPSD_00002] SOME/IP Service Discovery Protocol shall support unicast messages ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall support unicast Service Discovery messages which are sent to exactly one receiver.
Rationale:	Unicast messages are a mechanism to hide data for certain receivers that do not need to spend processing resources on reception of unwanted data. Furthermore, also in switched network segments that don't contain any receivers the bandwidth usage is reduced.
Use Case:	SD message that offers the service is sent as answer to a find message to exactly one receiver.
Applies to:	FO

Dependencies:	–
Supporting Material:	–

⌋(*RS_Main_00280*)

[RS_SOMEIPSD_00003] SOME/IP Service Discovery Protocol shall support multicast messages ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall support multicast Service Discovery messages which are sent from one sender to many receivers.
Rationale:	Low bandwidth consumption in comparison with unicast because multicast can be used to save data transmission if many receivers shall receive the same data.
Use Case:	SD message that offers the service is sent via IP multicast.
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋(*RS_Main_00280*)

[RS_SOMEIPSD_00004] SOME/IP Service Discovery Protocol shall support SOME/IP and non-SOME/IP services ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall support to publish and subscribe to data which belong SOME/IP and non-SOME/IP services. Non-SOME/IP services can be discovered and subscribed using SOME/IP SD but they are used afterwards without SOME/IP.
Rationale:	All services in the vehicle can be coordinated by the same service discovery protocol.
Use Case:	Use service discovery for legacy and new communication
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋(*RS_Main_00280*, *RS_Main_01002*)

[RS_SOMEIPSD_00005] SOME/IP Service Discovery Protocol shall support different versions of the same service ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall support different versions of the same service with different levels of functionality.
Rationale:	New ECUs can understand multiple versions of a service and can be reused in older vehicles.

Use Case:	Reusage of new ECUs in older vehicles.
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋*(RS_Main_00280, RS_Main_01002)*

[RS_SOMEIPSD_00006] SOME/IP Service Discovery Protocol shall define the format of the Service Discovery message ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall define the format of the Service Discovery header and payload
Rationale:	Header and payload needs to be defined to enable communication of service discovery between different parties
Use Case:	Service Discovery between different parties.
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋*(RS_Main_00280)*

[RS_SOMEIPSD_00007] SOME/IP Service Discovery Protocol shall define ordered feature sets for compliance of implementations ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall define ordered feature sets for compliance of implementations which provide different levels of functionality. The lowest level shall be supported by every implementation.
Rationale:	Enable small ECUs with low resource to participate at service discovery with a basic feature set.
Use Case:	Small ECUs can implement fewer features than large ECUs with a lot of resources.
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋*(RS_Main_00280)*

[RS_SOMEIPSD_00022] SOME/IP Service Discovery shall operate in a distributed manner ⌈

Type:	valid
Description:	SOME/IP Service Discovery shall operate in a distributed manner with no centralized service directory.

Rationale:	A centralized service directory would impose a single point of failure and could become a performance bottleneck.
Use Case:	Robustness if single ECUs fail.
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋(*RS_Main_00280*, *RS_Main_01002*)

[RS_SOMEIPSD_00024] SOME/IP Service Discovery shall support configurable timings ⌈

Type:	valid
Description:	SOME/IP Service Discovery shall support configurable timings to enable state changes after a certain time has passed.
Rationale:	The times need to be configurable to meet different in vehicle network requirements.
Use Case:	Configuration of period of cyclic offers
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋(*RS_Main_00280*)

4.2 Service Offering and Finding

[RS_SOMEIPSD_00008] SOME/IP Service Discovery Protocol shall support to find the location of service instances ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall support to find the location of service instances within the local network.
Rationale:	Locations of services needs to be known to the communication partners.
Use Case:	Communicate with a service instance which location is unknown to the other party.
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋(*RS_Main_00280*, *RS_Main_01002*)

[RS_SOMEIPSD_00025] SOME/IP Service Discovery messages shall contain information how to contact the communication partner ⌈

Type:	valid
Description:	SOME/IP Service Discovery messages shall contain information how to contact the communication partner. This information how to talk with the communication partner shall be aware of the underlying transport protocol.
Rationale:	To establish communication with a remote partner endpoint information are needed, these depend on the used transport protocol.
Use Case:	Support IPv4 and IPv6 in parallel.
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋*(RS_Main_00280, RS_Main_01002)*

[RS_SOMEIPSD_00009] SOME/IP Service Discovery Protocol shall support to transport text-based names of services ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall support to transport text-based names (human readable) of services additional to the unique identifiers.
Rationale:	During debugging text-based names are easier to understand.
Use Case:	Human readable identification of service during debugging.
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋*(RS_Main_00280, RS_Main_01002)*

[RS_SOMEIPSD_00010] SOME/IP Service Discovery Protocol shall provide support to transport optional data ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall provide support to transport optional data in addition to the standardized data.
Rationale:	During service discovery additional non standardized data might be needed.
Use Case:	Instance selection based on additional criteria
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋*(RS_Main_00280)*

[RS_SOMEIPSD_00011] SOME/IP Service Discovery Protocol shall provide support for load balancing ⌈

Type:	valid

Description:	SOME/IP Service Discovery Protocol shall provide support for load balancing to distribute service subscriptions evenly.
Rationale:	Load balancing can be necessary if the load is not totally clear during system design phase.
Use Case:	Multiple providers provide the same service to the subscribers. The load shall be evenly balanced.
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋(*RS_Main_00280*, *RS_Main_01002*)

[RS_SOMEIPSD_00012] SOME/IP Service Discovery Protocol shall support to detect whether service instances are active ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall support to detect whether published service instances are active or terminated and inform subscribers.
Rationale:	Services can shutdown ungracefully; some applications want to detect this.
Use Case:	Detection of ungraceful shutdown.
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋(*RS_Main_00280*, *RS_Main_01002*)

[RS_SOMEIPSD_00013] SOME/IP Service Discovery Protocol shall support to offer published services ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall support to actively offer published services to other communication partners within the local network.
Rationale:	Active propagation of services.
Use Case:	Detection of available services without cyclic find messages
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋(*RS_Main_00280*, *RS_Main_01002*)

[RS_SOMEIPSD_00014] SOME/IP Service Discovery Protocol shall support to stop offering services ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall support to actively stop offering services to notify other parties.

Rationale:	When a published service was gracefully terminated, it is necessary to inform the other parties that the service is not available anymore.
Use Case:	Graceful termination of published services
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋*(RS_Main_00280, RS_Main_01002)*

4.3   Event Subscriptions

[RS_SOMEIPSD_00015] SOME/IP Service Discovery Protocol shall support to subscribe to events ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall support to subscribe to events which are provided by a service instance.
Rationale:	Service based event communication is based on a publish/subscribe pattern to control the communication.
Use Case:	Reception of events
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋*(RS_Main_00280, RS_Main_01002)*

[RS_SOMEIPSD_00016] SOME/IP Service Discovery Protocol shall support to deny subscriptions ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall support to actively deny requested subscriptions to events.
Rationale:	If a publisher cannot provide the requested event to a requester, it is necessary to inform the subscriber about the rejection
Use Case:	Prevention of overload of publisher
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋*(RS_Main_00280, RS_Main_01002)*

[RS_SOMEIPSD_00017] SOME/IP Service Discovery Protocol shall support to stop subscriptions to events ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall support to actively stop a subscription of subscribed events.
Rationale:	When the data of an event are not needed any more by the receiver, the communication needs to be stopped.
Use Case:	Events provided by another party are not used any more.
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋(*RS_Main_00280*, *RS_Main_01002*)

4.4 Error Handling

[RS_SOMEIPSD_00018] SOME/IP Service Discovery Protocol shall support reboot detection of service providers ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall support a detection whether service provider were rebooted.
Rationale:	An ECU reboot can lead to lost internal state of a service provider and hence to data which do not fit the expectation of the subscriber.
Use Case:	Detection of ECU reboot
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋(*RS_Main_00280*, *RS_Main_01002*)

[RS_SOMEIPSD_00019] SOME/IP Service Discovery Protocol shall standardize error handling ⌈

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall standardize error handling if unexpected situations occur.
Rationale:	Graceful error handling necessary if unexpected situations occur. The protocol needs to support this to give the applications the possibility to react on these.
Use Case:	Reaction to errors.
Applies to:	FO
Dependencies:	–
Supporting Material:	–

⌋(*RS_Main_00280*)

[RS_SOMEIPSD_00020] SOME/IP Service Discovery Protocol shall support TTL

Type:	valid
Description:	SOME/IP Service Discovery Protocol shall support TTL for service discovery functionality that can be subject for timely expiration, e.g service offers.
Rationale:	TTL prevents that service discovery states (e.g. a service is offered) persists endlessly if updates of the sate (e.g. stop of a service offer) are omitted due to faulty implementations, configurations or due to other errors in the system.
Use Case:	Limit erroneous state of service discovery to a maximal amount of time.
Applies to:	FO
Dependencies:	–
Supporting Material:	–

(RS_Main_00280)

Document ID 801: AUTOSAR_RS_SOMEIPServiceDiscoveryProtocol

5 References

Bibliography

[1] Standardization Template
AUTOSAR_TPS_StandardizationTemplate

[2] Glossary
AUTOSAR_TR_Glossary