

# **RobotFramework\_UDS**

**v. 0.1.5**

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10.10.2024

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# Chapter 1

## Introduction

The library **RobotFramework-UDS** provides a set of **Robot Framework** keywords for sending UDS (Unified Diagnostic Services) requests and interpreting responses from automotive electronic control units (ECUs).

Whether you're testing diagnostic sessions, reading data, or controlling routines on an ECU, the UDS Library simplifies these tasks by offering specific keywords like `DiagnosticSessionControl` , `ReadDataByIdentifier` , and `RoutineControl` .

These keywords are designed to handle the complexity of UDS communication, enabling you to write efficient and reliable automated tests.

Moreover, you can now refer to UDS services by their readable names rather than hexadecimal IDs e.g `ReadDataByName` , `RoutineControlByName` . It helps to make your tests more intuitive and easier to maintain.

## Chapter 2

# Description

### 2.1 Overview

The **RobotFramework-UDS** is designed to interface with automotive ECUs using the UDS protocol over the DoIP (Diagnostic over IP) transport layer. This library abstracts the complexities of UDS communication, allowing users to focus on writing high-level test cases that validate specific diagnostic services and responses.

### 2.2 UDS Connector (DoIP)

Currently, the library supports the [DoIP](#) (Diagnostic over IP) transport layer, which is commonly used in modern vehicles for diagnostic communication. DoIP allows for faster data transfer rates and easier integration with network-based systems compared to traditional CAN-based diagnostics.

### 2.3 Configuration

In order to connect and send/receive message properly using the **RobotFramework-UDS** certain configurations must be set up:

- DoIP Configuration: The library requires the IP address and port of the ECU or the gateway through which the ECU is accessed.
- Data Identifiers and Codec: Define the Data Identifiers (DIDs) and corresponding codecs in the library's configuration. This enables correct encoding and decoding of data between the test cases and the ECU.
- Session Management: Some UDS services may require the ECU to be in a specific diagnostic session (e.g., extended diagnostics). The library should be configured to manage these session transitions seamlessly.

### 2.4 Supported UDS Services

The **RobotFramework-UDS** library supports almost UDS service as defined in [ISO 14229](#), providing comprehensive coverage for ECU diagnostics.

For detailed information on specific services and how to use them, please refer to the next section.

### 2.5 Enhancements Usability with ODXTools Integration

The **RobotFramework-UDS** library comes with [odxtools](#) fully integrated, allowing you to use readable service names instead of dealing with hex IDs.

You can now specify service names directly in your test cases, making them more readable and user-friendly.

The **RobotFramework\_UDS** can be extended to manage multiple connections simultaneously. This is beneficial when working with complex vehicle systems or simultaneously testing multiple ECUs.

[illegible]

```

Log      Create a uds Connector
Create UDS Connector    ecu_ip_address= ${SUT_IP_ADDRESS}
...                    ecu_logical_address= ${SUT_LOGICAL_ADDRESS}
...                    client_ip_address= ${TB_IP_ADDRESS}
...                    client_logical_address= ${TB_LOGICAL_ADDRESS}
...                    activation_type= ${ACTIVATION_TYPE}
Log      Using UDS Connector
Connect UDS Connector
Log      Open uds connection
Open UDS Connection
Using pdx

Disconnect
Log      Close uds connection
Close UDS Connection

Using pdx
Load PDX      ${FILE}      ${VARIANT}

*** Test Cases ***
Test user can use Tester Present service on ECU
Log      Use Tester Present service
${response}= Tester Present

Test user can use ECU Reset service on ECU
Log      Use ECU Reset service

Log      Hard reset
${response_hr}= ECU Reset      1

Log      Key off on reset
${response_k}= ECU Reset      2

Log      Soft reset
${response_sr}= ECU Reset      3

Log      Enable rapid power shut down
${response_e}= ECU Reset      4

Log      disable rapid power shut down
${response_d}= ECU Reset      5

Test user can use Read Data By Name service on ECU
Log      Use Read Data By Name service

Log      Use Read Data By Identifier - 25392

${list_identifiers}= Create List      0x6330
${res}= Read Data By Identifier      ${list_identifiers}
Log      ${res}      console=True
Log      ${res[0x6330]}      console=True

Log      readCPUClockFrequencies_Read

${service_name_list}= Create List      readCPUClockFrequencies_Read
${responses}= Read Data By Name      ${service_name_list}
Log      ${responses}      console=True

FOR      ${request_did}      IN      @{responses.keys()}
Log      Key: ${request_did}, Value: ${responses["${request_did}"]}      console=True
${response}= Set Variable      ${responses["${request_did}"]}
FOR      ${item}      IN      @{response.keys()}
Log      ${item} : ${response["${item}"]}      console=True
END
END

Test user can use Routine Control By Name service on ECU
Log      Routine Control By Name service: StartIperfServer_Start

```

```

${param_dict}=    Create Dictionary    port=5101    argument=-i 0.5 -B 192.168.1.
${response}=      Routine Control By Name    StartIperfServer_Start    ${param_dict}

Log    ${response}    console=True
FOR    ${item}    IN    @{{response.keys()}}
    Log    ${item} : {{response["${item}"]}}    console=True
END

Test user can use Diagnostic Session Control service on ECU
    Log    Diagnostic Session Control service

        Diagnostic Session Control    1

Test user can use Write Data By Name service on ECU
    Log    Write Data By Name service

        Log    RealTimeClock_Write
        ${PARAM_DICT}=    Create Dictionary    Day=26    Month=September    Year=2024    ↵
        ↵ Hour=10    Second=45    Minute=0
        ${res}=    Write Data By Name    RealTimeClock_Write    ${PARAM_DICT}
        Log    ${res}    console=True

        ${DICT}=    Create Dictionary    ipAddress=155
        ${res}=    Write Data By Name    CTS_IPAddress_Write    ${DICT}
        Log    ${res}    console=True

        Log    Using service did instead service's name
        ${res}=    Write Data By Identifier    25382    ${PARAM_DICT}
        Log    ${res}    console=True

Test Get Encoded Request Message - Simple request parameters
    Log    Test Get Encoded Request Message - mainCPUSTressTest_Start
    ${service_name}=    Set Variable    mainCPUSTressTest_Start
    ${param_dict}=    Create Dictionary    cores=5    load=50
    ${res}=    Get Encoded Request Message    ${service_name}    ${param_dict}
    Log    ${res}    console=True
    Log    ${res.hex()}    console=True

Test Get Encoded Request Message - Complex request parameters
    Load PDX    ↵
    ↵ C:/Users/MAR3HC/Desktop/UDS/robotframework-uds/test/pdx/XTS_MPCI_MaaS_1.23.45.pdx    ↵
    ↵ XTS_MPCI_MaaS

    Log    Test Get Encoded Request Message - CAN_MasterSlaveEnduranceRun_Start
    ${service_name}=    Set Variable    CAN_MasterSlaveEnduranceRun_Start
    ${res}=    Get Encoded Request Message    ${service_name}    ${canConfig}
    Log    ${res}    console=True
    Log    ${res.hex()}    console=True

Test Get Decoded Response Message
    Log    Test Get Decoded Response Message
    ${service_name}=    Set Variable    StartIperfServer_Start
    ${response_str}=    Set Variable    \x012#\x00\x00\x18\x05H
    ${response_byte}=    Convert To Bytes    ${response_str}
    ${res}=    Get Decoded Response Message    ${service_name}    ${response_byte}
    Log    ${res}    console=True

Test Read List Services
    ${list_read_services}=    Create List    TestManager_SWVersion_Read
    ...                      CTSSWVersion_Read
    ...                      CPUload_Read

    FOR    ${service_name}    IN    @{{list_read_services}}
        Log    Read Data of ${service_name}    console=True
        ${list_service}=    Create List    ${service_name}
        ${res}=    Read Data By Name    ${list_service}
        Log    ${res}    console=True

```



```

END
# ${res}=      Read Data By Name    ${list_read_services}
# Log         ${res}      console=True

```

### \*\*\* Settings \*\*\*

```

Library      RobotFramework_TestsuitesManagement    WITH NAME    testsuites
Library      RobotFramework_UDS

```

### \*\*\* Variables \*\*\*

```

${SUT_IP_ADDRESS_1}=    192.168.0.7
${SUT_LOGICAL_ADDRESS_1}=    1863
${TB_IP_ADDRESS_1}=    192.168.0.240
${TB_LOGICAL_ADDRESS_1}=    1895
${ACTIVATION_TYPE_1}=    0
${DEVICE_NAME_1}=    UDS Connector 1
${FILE_1}=    C:/Users/MAR3HC/Desktop/UDS/robotframework-uds/test/pdx/CTS_STLA_V1_15_2.pdx
${VARIANT_1}=    CTS_STLA_Brain

```

```

${SUT_IP_ADDRESS_2}=    192.168.0.4
${SUT_LOGICAL_ADDRESS_2}=    1863
${TB_IP_ADDRESS_2}=    192.168.0.240
${TB_LOGICAL_ADDRESS_2}=    1895
${ACTIVATION_TYPE_2}=    0
${DEVICE_NAME_2}=    UDS Connector 2
${FILE_2}=    C:/Data/Git/mpci_rack_nau2kor/project/testbench/hil/uds/XTS_S32G_1.0.356.pdx
${VARIANT_2}=    XTS_S32G

```

```

${ERROR_STR}=    NegativeResponseException: ReadDataByIdentifier service execution ↵
                  ↳ returned a negative response IncorrectMessageLengthOrInvalidFormat (0x13)

```

### \*\*\* Test Cases \*\*\*

Test user can connect single UDS connection

```

Log      Test user can connect single UDS connection
Log      If no device_name is provided, it will default to 'default'

```

```

Create UDS Connector    ecu_ip_address= ${SUT_IP_ADDRESS_1}
...                    ecu_logical_address= ${SUT_LOGICAL_ADDRESS_1}
...                    client_ip_address= ${TB_IP_ADDRESS_1}
...                    client_logical_address= ${TB_LOGICAL_ADDRESS_1}
...                    activation_type= ${ACTIVATION_TYPE_1}

```

Connect UDS Connector

Open UDS Connection

```

Load PDX    ${FILE_1}    ${VARIANT_1}
${service_name_list}=    Create List    readCPUClockFrequencies_Read
Read Data By Name    ${service_name_list}
Close UDS Connection

```

Test user can connect multiple UDS connection

Log Test user can connect multiple UDS connection

Log Connect to device 1

```

Create UDS Connector    device_name= ${DEVICE_NAME_1}
...                    ecu_ip_address= ${SUT_IP_ADDRESS_1}
...                    ecu_logical_address= ${SUT_LOGICAL_ADDRESS_1}
...                    client_ip_address= ${TB_IP_ADDRESS_1}
...                    client_logical_address= ${TB_LOGICAL_ADDRESS_1}
...                    activation_type= ${ACTIVATION_TYPE_1}
Connect UDS Connector    device_name= ${DEVICE_NAME_1}

```

Open UDS Connection device\_name= \${DEVICE\_NAME\_1}

```

Load PDX    ${FILE_1}    ${VARIANT_1}    device_name= ${DEVICE_NAME_1}
${service_name_list_1}=    Create List    readCPUClockFrequencies_Read
Read Data By Name    ${service_name_list_1}    device_name= ${DEVICE_NAME_1}

```

Log Connect to device 2

```

Create UDS Connector    device_name= ${DEVICE_NAME_2}
...                    ecu_ip_address= ${SUT_IP_ADDRESS_2}
...                    ecu_logical_address= ${SUT_LOGICAL_ADDRESS_2}

```

```

...           client_ip_address= ${TB_IP_ADDRESS_2}
...           client_logical_address= ${TB_LOGICAL_ADDRESS_2}
...           activation_type= ${ACTIVATION_TYPE_2}
Connect UDS Connector    device_name= ${DEVICE_NAME_2}

Open UDS Connection    device_name= ${DEVICE_NAME_2}
Load PDX    ${FILE_2}    ${VARIANT_2}    device_name= ${DEVICE_NAME_2}
${service_name_list_2}=    Create List    CPULoad_Read
Log    Expected device 2 cannot send readCPUClockFrequencies_Read service like ↩
↪ device 1
Run Keyword And Expect Error    ${ERROR_STR}    Read Data By Name    ↩
↪ ${service_name_list_1}    device_name= ${DEVICE_NAME_2}

Read Data By Name    ${service_name_list_2}    device_name= ${DEVICE_NAME_2}

Test user can connect multiple UDS connection but connect to the same ECU
Log    Test user can connect multiple UDS connection
Log    Connect to device 1
Create UDS Connector    device_name= ${DEVICE_NAME_1}
...           ecu_ip_address= ${SUT_IP_ADDRESS_1}
...           ecu_logical_address= ${SUT_LOGICAL_ADDRESS_1}
...           client_ip_address= ${TB_IP_ADDRESS_1}
...           client_logical_address= ${TB_LOGICAL_ADDRESS_1}
...           activation_type= ${ACTIVATION_TYPE_1}
Connect UDS Connector    device_name= ${DEVICE_NAME_1}

Log    Open uds connection
Open UDS Connection    device_name= ${DEVICE_NAME_1}
Load PDX    ${FILE_1}    ${VARIANT_1}    device_name= ${DEVICE_NAME_1}
${service_name_list_1}=    Create List    readCPUClockFrequencies_Read
Read Data By Name    ${service_name_list_1}    device_name= ${DEVICE_NAME_1}

Log    Connect to device 2 but same IP as device 1
Log    The expected test case result in an error
Run Keyword And Expect Error    TimeoutError: ECU failed to respond in time    ↩
↪ Create UDS Connector    device_name= ${DEVICE_NAME_2}
...           ↩
↪           ecu_ip_address= ${SUT_IP_ADDRESS_1}           ↩
...           ↩
↪           ecu_logical_address= ${SUT_LOGICAL_ADDRESS_1} ↩
...           ↩
↪           client_ip_address= ${TB_IP_ADDRESS_1}         ↩
...           ↩
↪           client_logical_address= ${TB_LOGICAL_ADDRESS_1} ↩
...           ↩
↪           activation_type= ${ACTIVATION_TYPE_1}         ↩

Test users can reconnect to the closed ECU
Log    Connect to device 2
Create UDS Connector    device_name= ${DEVICE_NAME_2}
...           ecu_ip_address= ${SUT_IP_ADDRESS_2}
...           ecu_logical_address= ${SUT_LOGICAL_ADDRESS_2}
...           client_ip_address= ${TB_IP_ADDRESS_2}
...           client_logical_address= ${TB_LOGICAL_ADDRESS_2}
...           activation_type= ${ACTIVATION_TYPE_1}
Connect UDS Connector    device_name= ${DEVICE_NAME_2}

Open UDS Connection    device_name= ${DEVICE_NAME_2}
Load PDX    ${FILE_2}    ${VARIANT_2}    device_name= ${DEVICE_NAME_2}
${service_name_list_2}=    Create List    CPULoad_Read
Read Data By Name    ${service_name_list_2}    device_name= ${DEVICE_NAME_2}
Close UDS Connection    device_name= ${DEVICE_NAME_2}

Log    Connect to device 1
Create UDS Connector    device_name= ${DEVICE_NAME_1}
...           ecu_ip_address= ${SUT_IP_ADDRESS_1}
...           ecu_logical_address= ${SUT_LOGICAL_ADDRESS_1}
...           client_ip_address= ${TB_IP_ADDRESS_1}

```

```

...                client_logical_address= ${TB_LOGICAL_ADDRESS_1}
...                activation_type= ${ACTIVATION_TYPE_1}
Connect UDS Connector    device_name= ${DEVICE_NAME_1}

Open UDS Connection    device_name= ${DEVICE_NAME_1}
Load PDX    ${FILE_1}    ${VARIANT_1}    device_name= ${DEVICE_NAME_1}
${service_name_list_1}=    Create List    readCPUClockFrequencies_Read
Read Data By Name    ${service_name_list_1}    device_name= ${DEVICE_NAME_1}
Close UDS Connection    device_name= ${DEVICE_NAME_1}

Log    Re-open uds connection device 2
Open UDS Connection    device_name= ${DEVICE_NAME_2}
Read Data By Name    ${service_name_list_2}    device_name= ${DEVICE_NAME_2}

Log    Expected device 2 cannot send readCPUClockFrequencies_Read service like ↩
↩ device 1
Run Keyword And Expect Error    ${ERROR_STR}    Read Data By Name    ↩
↩ ${service_name_list_1}    device_name= ${DEVICE_NAME_2}
Close UDS Connection    device_name= ${DEVICE_NAME_2}

```

## Chapter 3

# DiagnosticServices.py

### 3.1 Class: DiagnosticServices

*Imported by:*

```
from RobotFrameworkUDS.DiagnosticServices import DiagnosticServices
```

#### 3.1.1 Method: convert\_sub\_param

Recursive convert sub parameters in given request to correct data type

#### 3.1.2 Method: convert\_request\_data\_type

Convert given request parameters (dictionary) to correct data type

#### 3.1.3 Method: get\_diag\_service\_by\_name

#### 3.1.4 Method: get\_encoded\_request\_message

#### 3.1.5 Method: get\_decode\_response\_message

#### 3.1.6 Method: get\_full\_positive\_response\_data

#### 3.1.7 Method: get\_did\_codec

### 3.2 Class: PDXCodec

*Imported by:*

```
from RobotFrameworkUDS.DiagnosticServices import PDXCodec
```

#### 3.2.1 Method: decode

#### 3.2.2 Method: encode

## Chapter 4

# UDSKeywords.py

### 4.1 Class: UDSDeviceManager

*Imported by:*

```
from RobotFramework-UDS.UDSKeywords import UDSDeviceManager
```

#### 4.1.1 Method: is\_device\_exist

### 4.2 Class: UDSDevice

*Imported by:*

```
from RobotFramework-UDS.UDSKeywords import UDSDevice
```

### 4.3 Class: UDSKeywords

*Imported by:*

```
from RobotFramework-UDS.UDSKeywords import UDSKeywords
```

#### 4.3.1 Method: connect\_uds\_connector

#### 4.3.2 Method: create\_uds\_connector

**Description:** Create a connection to establish

**Parameters:**

- param `communication_name`: Name of communication
  - `doip`: Establish a doip connection to an (ECU)
- type `communication_name`: str
- param **`ecu_ip_address` (required)**: The IP address of the ECU to establish a connection. This should be an address like "192.168.1.1" or an IPv6 address like "2001:db8::".
- type `ecu_ip_address`: str
- param `ecu_logical_address` (required): The logical address of the ECU.
- type `ecu_logical_address`: any
- param `tcp_port` (optional): The TCP port used for unsecured data communication (default is `TCP_DATA_UNSECURED`).

- type tcp\_port: int
- param udp\_port (optional): The UDP port used for ECU discovery (default is **UDP\_DISCOVERY**).
- type udp\_port: int
- param activation\_type (optional): The type of activation, which can be the default value (ActivationTypeDefault) or a specific value based on application-specific settings.
- type activation\_type: RoutingActivationRequest.ActivationType,
- param protocol\_version (optional): The version of the protocol used for the connection (default is 0x02).
- type protocol\_version: int
- **param client\_logical\_address (optional): The logical address that this DoIP client will use to identify itself. This should be 0x0E00 to 0x0FFF. Can typically be left as default.**
- type client\_logical\_address: int
- **param client\_ip\_address (optional): If specified, attempts to bind to this IP as the source for both outgoing and incoming connections. Useful if you have multiple network adapters. Can be an IPv4 or IPv6 address just like ecu\_ip\_address, though the type should match.**
- type client\_ip\_address: str
- **param use\_secure (optional): Enables TLS. If set to True, a default SSL context is used. For more information on how to pass an SSL context can be passed directly. Untested. Should be combined with changing tcp\_port to 3496.**
- type use\_secure: Union[bool,ssl.SSLContext]
- param auto\_reconnect\_tcp (optional): Attempt to automatically reconnect TCP sockets that were closed by peer
- type auto\_reconnect\_tcp: bool

### 4.3.3 Method: load\_pdx

Load PDX **Arguments:** \*pdx\_file

/ Type: str /  
PDX file path

- variant
- / Type: str /

### 4.3.4 Method: create\_config

**Description:** Create a config for UDS connector

**Parameters:**

- param 'exception\_on\_negative\_response': When set to True, the client will raise a NegativeResponseException when the server responds with a negative response. When set to False, the returned Response will have its property positive set to False
- type 'exception\_on\_negative\_response': bool
- param 'exception\_on\_invalid\_response': When set to True, the client will raise a InvalidResponseException when the underlying service interpret\_response raises the same exception. When set to False, the returned Response will have its property valid set to False
- type 'exception\_on\_invalid\_response': bool
- param 'exception\_on\_unexpected\_response': When set to True, the client will raise a UnexpectedResponseException when the server returns a response that is not expected. For instance, a response for a different service or when the subfunction echo doesn't match the request. When set to False, the returned Response will have its property unexpected set to True in the same case.
- type 'exception\_on\_unexpected\_response': bool
- param 'security\_algo': The implementation of the security algorithm necessary for the SecurityAccess service.

- type 'security\_algo': This function must have the following signatures:  
SomeAlgorithm(level, seed, params)  
Parameters:  
  - level (int) - The requested security level.
  - seed (bytes) - The seed given by the server
  - params - The value provided by the client configuration security\_algo.params
Returns: The security key Return type: byte
- param 'security\_algo\_params': This value will be given to the security algorithm defined in config['security\_algo'].
- type 'security\_algo\_params': object | dict
- param 'data\_identifiers': This configuration is a dictionary that is mapping an integer (the data identifier) with a DidCodec. These codecs will be used to convert values to byte payload and vice-versa when sending/receiving data for a service that needs a DID, i.e
  - ReadDataByIdentifier
  - ReadDataByName
  - WriteDataByIdentifier
  - ReadDTCInformation with subfunction reportDTCSnapshotRecordByDTCNumber and reportDTCSnapshotRecordByRecordNumber
- type 'data\_identifiers': dict Possible configuration values are - string : The string will be used as a pack/unpack string when processing the data - DidCodec (class or instance) : The encode/decode method will be used to process the data
- param 'input\_output': This configuration is a dictionary that is mapping an integer (the IO data identifier) with a DidCodec specifically for the InputOutputControlByIdentifier service. Just like config[data\_identifiers], these codecs will be used to convert values to byte payload and vice-versa when sending/receiving data. Since InputOutputControlByIdentifier supports composite codecs, it is possible to provide a sub-dictionary as a codec specifying the bitmasks.
- type 'input\_output': dict Possible configuration values are: - string : The string will be used as a pack/unpack string when processing the data - DidCodec (class or instance) : The encode/decode method will be used to process the data - dict : The dictionary entry indicates a composite DID. Three subkeys must be defined as: - codec : The codec, a string or a DidCodec class/instance - mask : A dictionary mapping the mask name with a bit - mask\_size : An integer indicating on how many bytes must the mask be encode  
The special dictionary key default can be used to specify a fallback codec if an operation is done on a codec not part of the configuration. Useful for scanning a range of DID
- param 'tolerate\_zero\_padding': This value will be passed to the services interpret\_response when the parameter is supported as in ReadDataByIdentifier, ReadDTCInformation. It has to ignore trailing zeros in the response data to avoid falsely raising InvalidResponseException if the underlying protocol uses some zero-padding.
- type 'tolerate\_zero\_padding': bool
- param ignore\_all\_zero\_dtc This value is used with the ReadDTCInformation service when reading DTCs. It will skip any DTC that has an ID of 0x000000. If the underlying protocol uses zero-padding, it may generate a valid response data of all zeros. This parameter is different from config['tolerate\_zero\_padding']. Read <https://udsoncan.readthedocs.io/en/latest/udsoncan/client.html#configuration> for more info.
- type 'ignore\_all\_zero\_dtc': bool
- param 'server\_address\_format': The MemoryLocation server\_address\_format is the value to use when none is specified explicitly for methods expecting a parameter of type MemoryLocation.
- type 'server\_address\_format': int
- param 'server\_memorysize\_format': The MemoryLocation server\_memorysize\_format is the value to use when none is specified explicitly for methods expecting a parameter of type MemoryLocation
- type 'server\_memorysize\_format': int
- param 'extended\_data\_size': This is the description of all the DTC extended data record sizes. This value is used to decode the server response when requesting a DTC extended data.

**The value must be specified as follows** `config['extended_data_size'] = {`  
     `0x123456 : 45, # Extended data for DTC 0x123456 is 45 bytes long`  
     `0x123457 : 23 # Extended data for DTC 0x123457 is 23 bytes long`  
`}`

- type `'extended_data_size': dict[int] = int`
- param `'dtc_snapshot_did_size':` The number of bytes used to encode a data identifier specifically for Read-DTCInformation subfunction reportDTCSnapshotRecordByDTCNumber and reportDTCSnapshotRecordByRecordNumber. The UDS standard does not specify a DID size although all other services expect a DID encoded over 2 bytes (16 bits). Default value of 2
- type `'dtc_snapshot_did_size': int`
- param `'standard_version':` The standard version to use, valid values are : 2006, 2013, 2020. Default value is 2020
- type `'standard_version': int`
- param `'request_timeout':` Maximum amount of time in seconds to wait for a response of any kind, positive or negative, after sending a request. After this time is elapsed, a TimeoutException will be raised regardless of other timeouts value or previous client responses. In particular even if the server requests that the client wait, by returning response requestCorrectlyReceived-ResponsePending (0x78), this timeout will still trigger. If you wish to disable this behaviour and have your server wait for as long as it takes for the ECU to finish whatever activity you have requested, set this value to None. Default value of 5
- type `'request_timeout': float`
- param `'p2_timeout':` Maximum amount of time in seconds to wait for a first response (positive, negative, or NRC 0x78). After this time is elapsed, a TimeoutException will be raised if no response has been received. See ISO 14229-2:2013 (UDS Session Layer Services) for more details. Default value of 1
- type `'p2_timeout': float`
- param `'p2_star_timeout':` Maximum amount of time in seconds to wait for a response (positive, negative, or NRC 0x78) after the reception of a negative response with code 0x78 (requestCorrectlyReceived-ResponsePending). After this time is elapsed, a TimeoutException will be raised if no response has been received. See ISO 14229-2:2013 (UDS Session Layer Services) for more details. Default value of 5
- type `'p2_star_timeout': float`
- param `'use_server_timing':` When using 2013 standard or above, the server is required to provide its P2 and P2\* timing values with a DiagnosticSessionControl request. By setting this parameter to True, the value received from the server will be used. When False, these timing values will be ignored and local configuration timing will be used. Note that no timeout value can exceed the `config['request_timeout']` as it is meant to avoid the client from hanging for too long. This parameter has no effect when `config['standard_version']` is set to 2006. Default value is True
- type `'use_server_timing': bool`

#### 4.3.5 Method: set\_config

This method sets the UDS config.

##### Arguments:

- No specific arguments for this method.

##### Returns:

- `config`  
     / Type: Configuration /

Returns the new UDS configuration created by `create_configure` or the default config if none is provided.

#### 4.3.6 Method: connect

Opens a UDS connection.

##### Arguments:

- No specific arguments for this method.



### 4.3.7 Method: disconnect

Closes a UDS connection.

#### Arguments:

- No specific arguments for this method.

### 4.3.8 Method: access\_timing\_parameter

Sends a generic request for AccessTimingParameter service.

#### Arguments:

- `access_type`  
/ *Condition*: required / *Type*: int /  
The service subfunction:
  - `readExtendedTimingParameterSet` = 1
  - `setTimingParametersToDefaultValues` = 2
  - `readCurrentlyActiveTimingParameters` = 3
  - `setTimingParametersToGivenValues` = 4
- `timing_param_record`  
/ *Condition*: optional / *Type*: bytes /  
The parameters data. Specific to each ECU.

#### Returns:

- `response`  
/ *Type*: Response /  
The response from the AccessTimingParameter service request.

### 4.3.9 Method: clear\_dianostic\_infomation

Requests the server to clear its active Diagnostic Trouble Codes.

#### Arguments:

- `group`  
/ *Type*: int /  
The group of DTCs to clear. It may refer to Powertrain DTCs, Chassis DTCs, etc. Values are defined by the ECU manufacturer except for two specific values:
  - `0x000000` : Emissions-related systems
  - `0xFFFFFFFF` : All DTCs
- `memory_selection`  
/ *Condition*: optional / *Type*: int /  
MemorySelection byte (0-0xFF). This value is user-defined and introduced in the 2020 version of ISO-14229-1. Only added to the request payload when different from None. Default: None.

#### Returns:

- `response`  
/ *Type*: Response /  
The response from the server after attempting to clear the active Diagnostic Trouble Codes.

### 4.3.10 Method: communication\_control

Switches the transmission or reception of certain messages on/off with CommunicationControl service.

#### Arguments:

- `control_type`

/ *Condition*: required / *Type*: int /

The action to request such as enabling or disabling some messages. This value can also be ECU manufacturer-specific:

- `enableRxAndTx` = 0
- `enableRxAndDisableTx` = 1
- `disableRxAndEnableTx` = 2
- `disableRxAndTx` = 3
- `enableRxAndDisableTxWithEnhancedAddressInformation` = 4
- `enableRxAndTxWithEnhancedAddressInformation` = 5

- `communication_type`

/ *Condition*: required / *Type*: `CommunicationType<CommunicationType>`, bytes, int /

Indicates what section of the network and the type of message that should be affected by the command. Refer to `CommunicationType<CommunicationType>` for more details. If an integer or bytes is given, the value will be decoded to create the required `CommunicationType<CommunicationType>` object.

- `node_id`

/ *Condition*: optional / *Type*: int /

DTC memory identifier (`nodeIdentificationNumber`). This value is user-defined and introduced in the 2013 version of ISO-14229-1. Possible only when control type is `enableRxAndDisableTxWithEnhancedAddressInformation` or `enableRxAndTxWithEnhancedAddressInformation`. Only added to the request payload when different from None. Default: None.

#### Returns:

- `response`

/ *Type*: `Response` /

The response from the CommunicationControl service request.

### 4.3.11 Method: control\_dtc\_setting

Controls some settings related to the Diagnostic Trouble Codes by sending a `ControlDTCSetting` service request. It can enable/disable some DTCs or perform some ECU-specific configuration.

#### Arguments:

- `setting_type`

/ *Condition*: required / *Type*: int /

Allowed values are from 0 to 0x7F:

- `on` = 1
- `off` = 2
- `vehicleManufacturerSpecific` = (0x40, 0x5F) # For logging purposes only.
- `systemSupplierSpecific` = (0x60, 0x7E) # For logging purposes only.

- `data`

/ *Condition*: optional / *Type*: bytes /

Optional additional data sent with the request called `DTCSettingControlOptionRecord`.

#### Returns:

- `response`

/ *Type*: `Response` /

The response from the `ControlDTCSetting` service request.

#### 4.3.12 Method: diagnostic\_session\_control

Requests the server to change the diagnostic session with a DiagnosticSessionControl service request.

##### Arguments:

- newsession  
/ Condition: required / Type: int /  
The session to try to switch:
  - defaultSession = 1
  - programmingSession = 2
  - extendedDiagnosticSession = 3
  - safetySystemDiagnosticSession = 4

##### Returns:

- response  
/ Type: Response /  
The response from the DiagnosticSessionControl service request.

#### 4.3.13 Method: dynamically\_define\_did

Defines a dynamically defined DID.

##### Arguments:

- did  
/ Type: int /  
The data identifier to define.
- did.definition  
/ Type: DynamicDidDefinition<DynamicDidDefinition> or MemoryLocation<MemoryLocation> /  
The definition of the DID. Can be defined by source DID or memory address. If a MemoryLocation<MemoryLocation> object is given, the definition will automatically be by memory address.

##### Returns:

- response  
/ Type: Response /  
The response from the request to define the dynamically defined DID.

#### 4.3.14 Method: ecu\_reset

Requests the server to execute a reset sequence through the ECUReset service.

##### Arguments:

- reset\_type  
/ Condition: required / Type: int /  
The type of reset to perform:
  - hardReset = 1
  - keyOffOnReset = 2
  - softReset = 3
  - enableRapidPowerShutDown = 4
  - disableRapidPowerShutDown = 5

**Returns:**

- response  
/ *Type*: Response /  
The response from the ECUReset service request.

**4.3.15 Method: io\_control**

Substitutes the value of an input signal or overrides the state of an output by sending an InputOutputControlByIdentifier service request.

**Arguments:**

- did  
/ *Condition*: required / *Type*: int /  
Data identifier to represent the IO.
- control\_param  
/ *Condition*: optional / *Type*: int /  
Control parameters:
  - returnControlToECU = 0
  - resetToDefault = 1
  - freezeCurrentState = 2
  - shortTermAdjustment = 3
- values  
/ *Condition*: optional / *Type*: list, dict, IOValues<IOValues> /  
Optional values to send to the server. This parameter will be given to DidCodec<DidCodec>.encode() method. It can be:
  - A list for positional arguments
  - A dict for named arguments
  - An instance of IOValues<IOValues> for mixed arguments
- masks  
/ *Condition*: optional / *Type*: list, dict, IOMask<IOMask>, bool /  
Optional mask record for composite values. The mask definition must be included in config['input\_output']. It can be:
  - A list naming the bit mask to set
  - A dict with the mask name as a key and a boolean setting or clearing the mask as the value
  - An instance of IOMask<IOMask>
  - A boolean value to set all masks to the same value.

**Returns:**

- response  
/ *Type*: Response /  
The response from the InputOutputControlByIdentifier service request.

#### 4.3.16 Method: link\_control

Controls the communication baudrate by sending a LinkControl service request.

##### Arguments:

- `control_type`  
*/ Condition: required / Type: int /*  
 Allowed values are from 0 to 0xFF:
  - `verifyBaudrateTransitionWithFixedBaudrate` = 1
  - `verifyBaudrateTransitionWithSpecificBaudrate` = 2
  - `transitionBaudrate` = 3
- `baudrate`  
*/ Condition: required / Type: Baudrate<Baudrate> /*  
 Required baudrate value when `control_type` is either `verifyBaudrateTransitionWithFixedBaudrate` (1) or `verifyBaudrateTransitionWithSpecificBaudrate` (2).

##### Returns:

- `response`  
*/ Type: Response /*  
 The response from the LinkControl service request.

#### 4.3.17 Method: read\_data\_by\_identifier

Requests a value associated with a data identifier (DID) through the ReadDataByIdentifier service.

##### Arguments:

- `data_id_list`  
*/ Type: int | list[int] /*  
 The list of DIDs to be read.

##### Returns:

- `response`  
*/ Type: Response /*  
 The response from the ReadDataByIdentifier service request.

#### 4.3.18 Method: read\_dtc\_information

Performs a ReadDiagnosticInformation service request.

##### Arguments:

- `subfunction`  
*/ Condition: required / Type: int /*  
 The subfunction for the ReadDiagnosticInformation service.
- `status_mask`  
*/ Condition: optional / Type: int /*  
 Status mask to filter the diagnostic information.
- `severity_mask`  
*/ Condition: optional / Type: int /*  
 Severity mask to filter the diagnostic information.

- `dtc`  
/ *Condition*: optional / *Type*: int | Dtc /  
The Diagnostic Trouble Code to query. Can be an integer or a Dtc object.
- `snapshot_record_number`  
/ *Condition*: optional / *Type*: int /  
Snapshot record number to specify the snapshot to read.
- `extended_data_record_number`  
/ *Condition*: optional / *Type*: int /  
Extended data record number to specify the extended data to read.
- `extended_data_size`  
/ *Condition*: optional / *Type*: int /  
Size of the extended data to read.
- `memory_selection`  
/ *Condition*: optional / *Type*: int /  
Memory selection to specify the memory to be accessed.

**Returns:**

- `response`  
/ *Type*: Response /  
The response from the ReadDiagnosticInformation service request.

**4.3.19 Method: read\_memory\_by\_address**

Reads a block of memory from the server by sending a ReadMemoryByAddress service request.

**Arguments:**

- `memory_location`  
/ *Condition*: required / *Type*: MemoryLocation<MemoryLocation> /  
The address and the size of the memory block to read.

**Returns:**

- `response`  
/ *Type*: Response /  
The response from the ReadMemoryByAddress service request.

**4.3.20 Method: request\_download**

Informs the server that the client wants to initiate a download from the client to the server by sending a Request-Download service request.

**Arguments:**

- `memory_location`  
/ *Condition*: required / *Type*: MemoryLocation<MemoryLocation> /  
The address and size of the memory block to be written.
- `dfi`  
/ *Condition*: optional / *Type*: DataFormatIdentifier<DataFormatIdentifier> /  
Optional defining the compression and encryption scheme of the data. If not specified, the default value of 00 will be used, specifying no encryption and no compression.

**Returns:**

- response  
/ *Type*: Response /  
The response from the RequestDownload service request.

**4.3.21 Method: request\_transfer\_exit**

Informes the server that the client wants to stop the data transfer by sending a RequestTransferExit service request.

**Arguments:**

- data  
/ *Condition*: optional / *Type*: bytes /  
Optional additional data to send to the server.

**Returns:**

- response  
/ *Type*: Response /  
The response from the RequestTransferExit service request.

**4.3.22 Method: request\_upload**

Informes the server that the client wants to initiate an upload from the server to the client by sending a RequestUpload service request.

**Arguments:**

- memory\_location  
/ *Condition*: required / *Type*: MemoryLocation<MemoryLocation> /  
The address and size of the memory block to be written.
- dfi  
/ *Condition*: optional / *Type*: DataFormatIdentifier<DataFormatIdentifier> /  
Optional defining the compression and encryption scheme of the data. If not specified, the default value of 00 will be used, specifying no encryption and no compression.

**Returns:**

- response  
/ *Type*: Response /  
The response from the RequestUpload service request.

**4.3.23 Method: routine\_control**

Sends a generic request for the RoutineControl service.

**Arguments:**

- routine\_id  
/ *Condition*: required / *Type*: int /  
The 16-bit numerical ID of the routine.
- control\_type  
/ *Condition*: required / *Type*: int /  
The service subfunction. Valid values are:

- startRoutine = 1
  - stopRoutine = 2
  - requestRoutineResults = 3
- data  
/ *Condition*: optional / *Type*: bytes /  
Optional additional data to give to the server.

**Returns:**

- response  
/ *Type*: Response /  
The response from the RoutineControl service request.

**4.3.24 Method: security\_access**

Successively calls request\_seed and send\_key to unlock a security level with the SecurityAccess service. The key computation is done by calling config['security\_algo'].

**Arguments:**

- level  
/ *Condition*: required / *Type*: int /  
The level to unlock. Can be the odd or even variant of it.
- seed\_params  
/ *Condition*: optional / *Type*: bytes /  
Optional data to attach to the RequestSeed request (securityAccessDataRecord).

**Returns:**

- response  
/ *Type*: Response /  
The response from the SecurityAccess service request.

**4.3.25 Method: tester\_present**

Sends a TesterPresent request to keep the session active.

**Arguments:**

- No specific arguments for this method.

**Returns:**

- response  
/ *Type*: Response /  
The response from the TesterPresent request.

**4.3.26 Method: transfer\_data**

Transfers a block of data to/from the client to/from the server by sending a TransferData service request and returning the server response.

**Arguments:**



- `sequence_number`  
/ *Condition*: required / *Type*: int /  
Corresponds to an 8-bit counter that should increment for each new block transferred. Allowed values are from 0 to 0xFF.
- `data`  
/ *Condition*: optional / *Type*: bytes /  
Optional additional data to send to the server.

**Returns:**

- `response`  
/ *Type*: Response /  
The response from the TransferData service request.

**4.3.27 Method: write\_data\_by\_identifier**

Requests to write a value associated with a data identifier (DID) through the WriteDataByIdentifier service.

**Arguments:**

- `did`  
/ *Condition*: required / *Type*: int /  
The DID to write its value.
- `value`  
/ *Condition*: required / *Type*: dict /  
Value given to the DidCodec.encode method. The payload returned by the codec will be sent to the server.

**Returns:**

- `response`  
/ *Type*: Response /  
The response from the WriteDataByIdentifier service request.

**4.3.28 Method: write\_memory\_by\_address**

Writes a block of memory in the server by sending a WriteMemoryByAddress service request.

**Arguments:**

- `memory_location`  
/ *Condition*: required / *Type*: MemoryLocation<MemoryLocation> /  
The address and the size of the memory block to write.
- `data`  
/ *Condition*: required / *Type*: bytes /  
The data to write into memory.

**Returns:**

- `response`  
/ *Type*: Response /  
The response from the WriteMemoryByAddress service request.

### 4.3.29 Method: request\_file\_transfer

Sends a RequestFileTransfer request **Arguments:**

- `noop`  
*/ Condition: required / Type: int /*  
 Mode of operation:
  - `AddFile` = 1
  - `DeleteFile` = 2
  - `ReplaceFile` = 3
  - `ReadFile` = 4
  - `ReadDir` = 5
  - `ResumeFile` = 6
- `path`  
*/ Condition: required / Type: str /*  
 The path of the file or directory.
- `dfi`  
*/ Condition: optional / Type: DataFormatIdentifier /*  
 DataFormatIdentifier defining the compression and encryption scheme of the data. Defaults to no compression and no encryption. Use for:
  - `AddFile` = 1
  - `ReplaceFile` = 3
  - `ReadFile` = 4
  - `ResumeFile` = 6
- `filesize`  
*/ Condition: optional / Type: int | Filesize /*  
 The filesize of the file to write. If Filesize, uncompressed and compressed sizes will be encoded as needed. Use for:
  - `AddFile` = 1
  - `ReplaceFile` = 3
  - `ResumeFile` = 6

**Returns:**

- `response`  
*/ Type: Response /*  
 The response from the file operation.

### 4.3.30 Method: authentication

Sends an Authentication request introduced in 2020 version of ISO-14229-1. **Arguments:**

- `authentication_task`  
*/ Condition: required / Type: int /*  
 The authentication task (subfunction) to use:
  - `deAuthenticate` = 0
  - `verifyCertificateUnidirectional` = 1
  - `verifyCertificateBidirectional` = 2

- proofOfOwnership = 3
- transmitCertificate = 4
- requestChallengeForAuthentication = 5
- verifyProofOfOwnershipUnidirectional = 6
- verifyProofOfOwnershipBidirectional = 7
- authenticationConfiguration = 8

- communication\_configuration

/ *Condition*: optional / *Type*: int /

Configuration about security in future diagnostic communication (vehicle manufacturer specific). Allowed values are from 0 to 255.

- certificate\_client

/ *Condition*: optional / *Type*: bytes /

The certificate to verify.

- challenge\_client

/ *Condition*: optional / *Type*: bytes /

Client challenge containing vehicle manufacturer-specific data or a random number.

- algorithm\_indicator

/ *Condition*: optional / *Type*: bytes /

Algorithm used in Proof of Ownership (POWN). This is a 16-byte value containing the BER-encoded OID of the algorithm.

- certificate\_evaluation\_id

/ *Condition*: optional / *Type*: int /

Unique ID for evaluating the transmitted certificate. Allowed values are from 0 to 0xFFFF.

- certificate\_data

/ *Condition*: optional / *Type*: bytes /

Certificate data for verification.

- proof\_of\_ownership\_client

/ *Condition*: optional / *Type*: bytes /

Proof of Ownership of the challenge to be verified by the server.

- ephemeral\_public\_key\_client

/ *Condition*: optional / *Type*: bytes /

Client's ephemeral public key for Diffie-Hellman key agreement.

- additional\_parameter

/ *Condition*: optional / *Type*: bytes /

Additional parameter provided if required by the server.

## Returns:

- response

/ *Type*: Response /

The server's response to the authentication request.

#### 4.3.31 Method: routine\_control\_by\_name

Sends a request for the RoutineControl service by routine name.

**Arguments:**

- param routine\_name (required): Name of the routine
  - type routine\_name: str
- param data (optional): Optional additional data to give to the server
  - type data: bytes

**Returns:**

- response / *Type*: Response / The server's response to the RoutineControl request.

#### 4.3.32 Method: read\_data\_by\_name

Get diagnostic service list by a list of service names.

**Arguments:**

- param service\_name\_list: List of service names
  - type service\_name\_list: list[str]
- param parameters: Parameter list
  - type parameters: list[]

**Returns:**

- response / *Type*: Response / The server's response containing the diagnostic service list.

#### 4.3.33 Method: get\_encoded\_request\_message

Get diagnostic service encoded request (bytes value).

**Arguments:**

- param service\_name: Diagnostic service's name
  - type service\_name: string
- param parameters\_dict: Parameter dictionary
  - type parameters\_dict: dict

**Returns:**

- encoded\_message / *Type*: bytes / The encoded message in bytes value.

#### 4.3.34 Method: get\_decoded\_positive\_response\_message

Get diagnostic service decoded positive response message.

**Arguments:**

- param service\_name: Diagnostic service's name
  - type service\_name: string

- param response\_data: Bytes data from the response
  - type parameters\_dict: bytes
- param device\_name: Name of the device
  - type device\_name: string

**Returns:**

- decode\_message / *Type*: dict / The decode message in dictionary.

**4.3.35 Method: write\_data\_by\_name**

Requests to write a value associated with a name of service through the WriteDataByName service.

**Arguments:**

- did
  - / *Condition*: required / *Type*: int /
  - The DID to write its value.
- value
  - / *Condition*: required / *Type*: dict /
  - Value given to the DidCodec.encode method. The payload returned by the codec will be sent to the server.

**Returns:**

- response
  - / *Type*: Response /
  - The response from the WriteDataByIdentifier service request.

## Chapter 5

### `__init__.py`

#### 5.1 Class: `RobotFramework_UDS`

*Imported by:*

```
from RobotFramework_UDS.__init__ import RobotFramework_UDS
```

`RobotFramework_UDS` is a Robot Framework library aimed to provide UDP client to handle request/response.

## Chapter 6

# Appendix

### About this package:

Table 6.1: Package setup

Setup parameter	Value
Name	RobotFramework_UDS
Version	0.1.5
Date	10.10.2024
Description	Robot Framework keywords for UDS (Unified Diagnostic Services) communication
Package URL	<a href="#">robotframework-uds</a>
Author	Mai Minh Tri
Email	<a href="mailto:tri.maiMinh@vn.bosch.com">tri.maiMinh@vn.bosch.com</a>
Language	Programming Language :: Python :: 3
License	License :: OSI Approved :: Apache Software License
OS	Operating System :: OS Independent
Python required	>=3.0
Development status	Development Status :: 4 - Beta
Intended audience	Intended Audience :: Developers
Topic	Topic :: Software Development

## Chapter 7

# History

<b>0.1.0</b>	09/2024
<i>Initial version</i>	
<b>0.1.4</b>	09/2024
- Update <code>Write Data By Name</code> keyword to return response with given service name instead of did.	
<b>0.1.5</b>	10/2024
- Update <code>Read Data By Name</code> keyword to return response with given service name instead of did. - Update <code>Get Encoded Request Message</code> keyword to support convert string to proper data type for request parameters. - Update <code>Get Decoded Response Message</code> keyword to support decoded response data.	