

TCNOpen TRDP

Prototype

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Mon Jun 4 15:28:49 2012

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Chapter 1

The TRDP Light Library API Specification



1.1 General Information

1.1.1 Purpose

The TRDP protocol has been defined as the standard communication protocol in IP-enabled trains. It allows communication via process data (periodically transmitted data using UDP/IP) and message data (client - server messaging using UDP/IP or TCP/IP) This document describes the light API of the TRDP Library.

1.1.2 Scope

The intended audience of this document is the developers and project members of the TRDP project. TRDP Client Applications are programs using the TRDP protocol library to access the services of TRDP. Programmers developing such applications are the main target audience for this documentation.

1.1.3 Related documents

TCN-TRDP2-D-BOM-004-01 IEC61375-2-3_CD_ANNEXA Protocol definition of the TRDP standard

1.1.4 Abbreviations and Definitions

- API* Application Programming Interface
- ECN* Ethernet Consist Network
- TRDP* Train Real-time Data Protocol
- TCMS* Train Control Management System

1.2 Terminology

The API documented here is mainly concerned with three bodies of code:

- *TRDP Client Applications* (or 'client applications' for short): These are programs using the API to access the services of TRDP. Programmers developing such applications are the main target audience for this documentation.
- *TRDP Light Implementations* (or just 'TRDP implementation'): These are libraries realising the API as documented here. Programmers developing such implementations will find useful definitions about syntax and semantics of the API within this documentation.
- *VOS Subsystem* (Virtual Operating System): An OS and hardware abstraction layer which offers memory, networking, threading, queues and debug functions. The VOS API is documented here.

The following diagram shows how these pieces of software are interrelated.

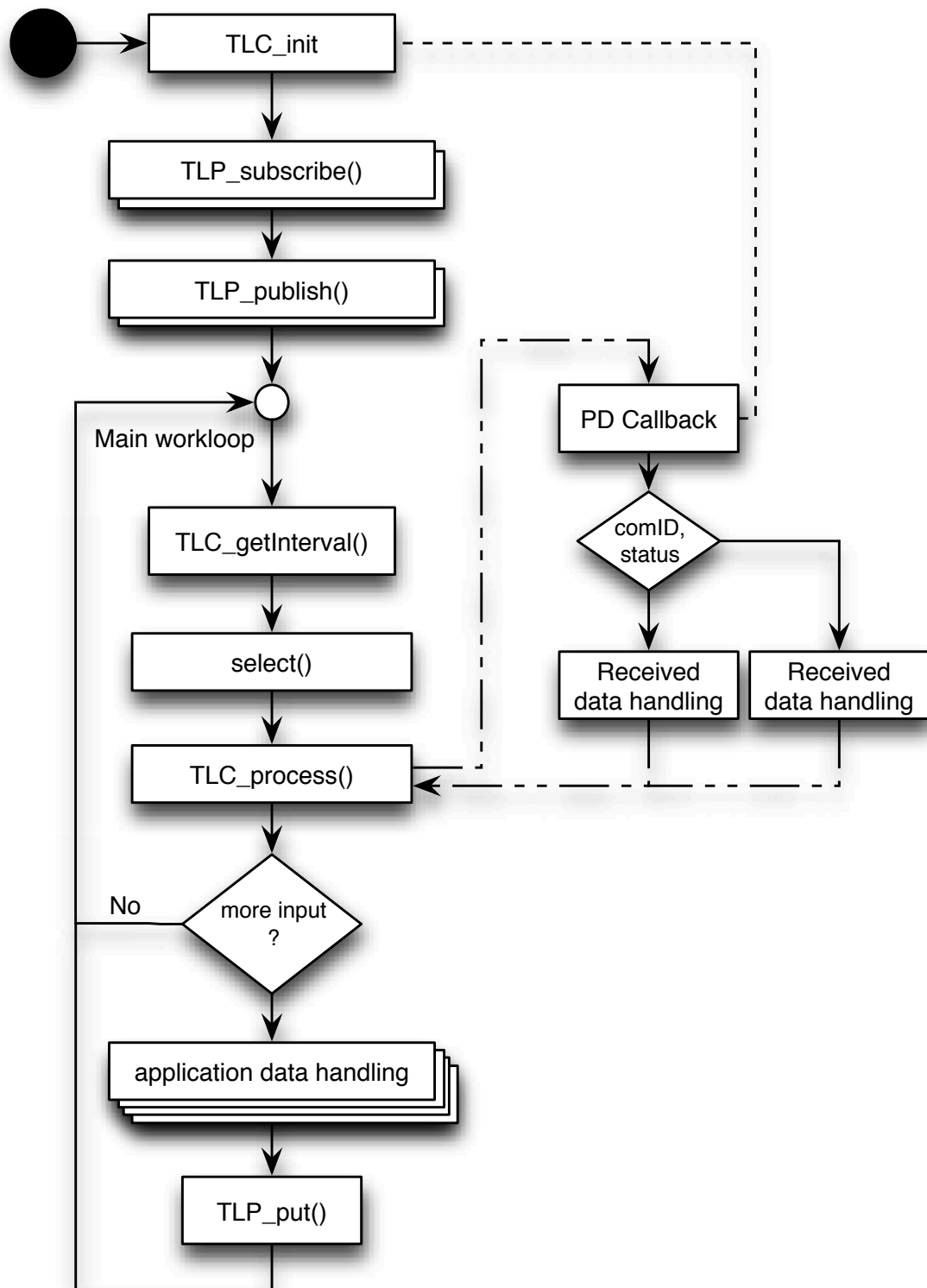


Figure 1.1: Sample client workflow

1.3 Conventions of the API

The API comprises a set of C header files that can also be used from client applications written in C++. These header files are contained in a directory named `trdp/api` and a subdirectory called `trdp/vos/api` with declarations not topical to TRDP but needed by the stack. Client applications shall include these header files like:

```
#include "trdp_if_light.h"
```

and, if VOS functions are needed, also the corresponding headers:

```
#include "vos_thread.h"
```

for example.

The subdirectory `trdp/doc` contains files needed for the API documentation.

Generally client application source code including API headers will only compile if the parent directory of the `trdp` directory is part of the include path of the used compiler. No other subdirectories of the API should be added to the compiler's include path.

The client API doesn't support a "catch-all" header file that includes all declarations in one step; rather the client application has to include individual headers for each feature set it wants to use.

Chapter 2

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Chapter 4

Data Structure Documentation

4.1 __attribute__ Struct Reference

TRDP process data header - network order and alignment.

```
#include <trdp_private.h>
```

Data Fields

- UINT32 [sequenceCounter](#)
Unique counter (autom incremented).
- UINT16 [protocolVersion](#)
fix value for compatibility (set by the API)
- UINT16 [msgType](#)
of datagram: PD Request (0x5072) or PD_MSG (0x5064)
- UINT32 [comId](#)
set by user: unique id
- UINT32 [topoCount](#)
set by user: ETB to use, '0' to deactivate
- UINT32 [datasetLength](#)
length of the data to transmit 0.
- UINT16 [subsAndReserved](#)
first bit (MSB): indicates substitution transmission
- UINT16 [offsetAddress](#)
for process data in traffic store
- UINT32 [replyComId](#)
used in PD request

- UINT32 [replyIpAddress](#)
used for PD request
- INT32 [replyStatus](#)
0 = OK
- UINT8 [sessionID](#) [16]
UUID as a byte stream.
- UINT32 [replyTimeout](#)
in us
- UINT8 [sourceURI](#) [32]
User part of URI.
- UINT8 [destinationURI](#) [32]
User part of URI.

4.1.1 Detailed Description

TRDP process data header - network order and alignment.

TRDP message data header - network order and alignment.

4.1.2 Field Documentation

4.1.2.1 UINT16 __attribute__::protocolVersion

fix value for compatibility (set by the API)

fix value for compatibility

4.1.2.2 UINT16 __attribute__::msgType

of datagram: PD Request (0x5072) or PD_MSG (0x5064)

of datagram: Mn, Mr, Mp, Mq, Mc or Me

4.1.2.3 UINT32 __attribute__::datasetLength

length of the data to transmit 0.

defined by user: length of data to transmit

..1436 without padding and FCS

The documentation for this struct was generated from the following file:

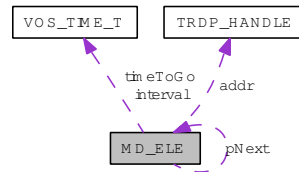
- [trdp_private.h](#)

4.2 MD_ELE Struct Reference

Queue element for MD packets to send or receive or acknowledge.

```
#include <trdp_private.h>
```

Collaboration diagram for MD_ELE:



Data Fields

- struct [MD_ELE](#) * [pNext](#)
pointer to next element or NULL
- [TRDP_ADDRESSES](#) [addr](#)
handle of publisher/subscriber
- [TRDP_PRIV_FLAGS_T](#) [privFlags](#)
private flags
- [TRDP_TIME_T](#) [interval](#)
time out value for received packets or interval for packets to send (set from ms)
- [TRDP_TIME_T](#) [timeToGo](#)
next time this packet must be sent/rcv
- INT32 [dataSize](#)
net data size
- INT32 [socketIdx](#)
index into the socket list
- [MD_HEADER_T](#) [frameHead](#)
Packet header in network byte order.
- UINT8 [data](#) [0]
data ready to be sent (with CRCs)

4.2.1 Detailed Description

Queue element for MD packets to send or receive or acknowledge.

The documentation for this struct was generated from the following file:

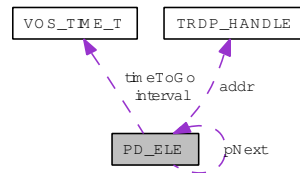
- [trdp_private.h](#)

4.3 PD_ELE Struct Reference

Queue element for PD packets to send or receive.

```
#include <trdp_private.h>
```

Collaboration diagram for PD_ELE:



Data Fields

- struct [PD_ELE](#) * [pNext](#)
pointer to next element or NULL
- [TRDP_ADDRESSES](#) [addr](#)
handle of publisher/subscriber
- [TRDP_PRIV_FLAGS_T](#) [privFlags](#)
private flags
- [TRDP_FLAGS_T](#) [pktFlags](#)
flags
- [TRDP_TIME_T](#) [interval](#)
time out value for received packets or interval for packets to send (set from ms)
- [TRDP_TIME_T](#) [timeToGo](#)
next time this packet must be sent/rcv
- INT32 [dataSize](#)
net data size
- INT32 [grossSize](#)
complete packet size (header, data, padding, FCS)
- INT32 [socketIdx](#)
index into the socket list
- const void * [userRef](#)
from subscribe()
- [PD_HEADER_T](#) [frameHead](#)
Packet header in network byte order.

- `UINT8 data [MAX_PD_PACKET_SIZE]`
data ready to be sent or received (with CRCs)

4.3.1 Detailed Description

Queue element for PD packets to send or receive.

The documentation for this struct was generated from the following file:

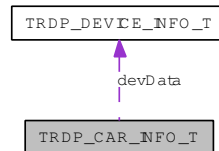
- [trdp_private.h](#)

4.4 TRDP_CAR_INFO_T Struct Reference

car information structure.

```
#include <tau_addr.h>
```

Collaboration diagram for TRDP_CAR_INFO_T:



Data Fields

- TRDP_LABEL_T [id](#)
Unique car identifier (Label) / UIC identification number.
- TRDP_LABEL_T [type](#)
Car type.
- UINT8 [cstCarNo](#)
sequence number of car in consist
- UINT8 [trnOrient](#)
opposite(0) or same(1) orientation rel.
- UINT8 [cstOrient](#)
opposite(0) or same(1) orientation rel.
- UINT8 [reserved1](#)
reserved for alignment and future use
- UINT16 [devCnt](#)
number of devices in the car
- [TRDP_DEVICE_INFO_T devData](#) [1]
device data list.

4.4.1 Detailed Description

car information structure.

4.4.2 Field Documentation

4.4.2.1 UINT8 TRDP_CAR_INFO_T::trnOrient

opposite(0) or same(1) orientation rel.

to train

4.4.2.2 UINT8 TRDP_CAR_INFO_T::cstOrient

opposite(0) or same(1) orientation rel.

to consist

4.4.2.3 TRDP_DEVICE_INFO_T TRDP_CAR_INFO_T::devData[1]

device data list.

The list size '1' is just a proxy definition for the real size (devCnt) in order to satisfy C-Language

The documentation for this struct was generated from the following file:

- [tau_addr.h](#)

4.5 TRDP_DATASET_ELEMENT_T Struct Reference

Dataset element definition.

```
#include <trdp_types.h>
```

Data Fields

- INT32 [type](#)
Data type or dataset id.
- UINT32 [size](#)
Number of items or TDRP_VAR_SIZE (0).

4.5.1 Detailed Description

Dataset element definition.

The documentation for this struct was generated from the following file:

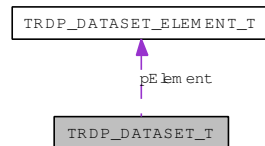
- [trdp_types.h](#)

4.6 TRDP_DATASET_T Struct Reference

Dataset definition.

```
#include <trdp_types.h>
```

Collaboration diagram for TRDP_DATASET_T:



Data Fields

- INT32 [id](#)
dataset identifier
- UINT16 [reserved1](#)
Reserved for future use, must be zero.
- UINT16 [numElement](#)
Number of elements.
- [TRDP_DATASET_ELEMENT_T](#) * [pElement](#)
Pointer to a dataset element, used as array.

4.6.1 Detailed Description

Dataset definition.

The documentation for this struct was generated from the following file:

- [trdp_types.h](#)

4.7 TRDP_DBG_CONFIG_T Struct Reference

Control for debug output device/file on application level.

```
#include <tau_xml.h>
```

Data Fields

- TRDP_DEBUG_OPTION_T [option](#)
Debug printout options for application use.
- UINT32 [maxFileSize](#)
Maximal file size.
- TRDP_FILE_NAME_T [fileName](#)
Debug file name and path.

4.7.1 Detailed Description

Control for debug output device/file on application level.

The documentation for this struct was generated from the following file:

- [tau_xml.h](#)

4.8 TRDP_DEVICE_INFO_T Struct Reference

device information structure

```
#include <tau_addr.h>
```

Data Fields

- TRDP_IP_ADDR [ipAddr](#)
device IP address
- TRDP_LABEL_T [id](#)
device identifier (Label) / host name
- TRDP_LABEL_T [type](#)
device type
- UINT8 [orient](#)
device orientation 0=opposite, 1=same rel.
- UINT8 [reserved1](#)
reserved for alignment and future use
- UINT16 [length](#)
length related to car
- UINT16 [width](#)
width related to car
- UINT16 [hight](#)
hight related to car

4.8.1 Detailed Description

device information structure

4.8.2 Field Documentation

4.8.2.1 UINT8 TRDP_DEVICE_INFO_T::orient

device orientation 0=opposite, 1=same rel.

to car

The documentation for this struct was generated from the following file:

- [tau_addr.h](#)

4.9 TRDP_HANDLE Struct Reference

Hidden handle definition, used as unique addressing item.

```
#include <trdp_private.h>
```

Data Fields

- [UINT32 comId](#)
comId for packets to send/receive
- [TRDP_IP_ADDR_T srcIpAddr](#)
source IP for PD
- [TRDP_IP_ADDR_T destIpAddr](#)
destination IP for PD
- [TRDP_IP_ADDR_T mcGroup](#)
multicast group to join for PD

4.9.1 Detailed Description

Hidden handle definition, used as unique addressing item.

The documentation for this struct was generated from the following file:

- [trdp_private.h](#)

4.10 TRDP_LIST_STATISTICS_T Struct Reference

Information about a particular MD listener.

```
#include <trdp_types.h>
```

Data Fields

- [UINT32 comId](#)
ComId to listen to.
- [TRDP_URI_USER_T uri](#)
URI user part to listen to.
- [TRDP_IP_ADDR_T joinedAddr](#)
Joined IP address.
- [UINT32 callBack](#)
Call back function reference if used.
- [UINT32 queue](#)
Queue reference if used.
- [UINT32 userRef](#)
User reference if used.
- [UINT32 numRecv](#)
Number of received packets.

4.10.1 Detailed Description

Information about a particular MD listener.

The documentation for this struct was generated from the following file:

- [trdp_types.h](#)

4.11 TRDP_MARSHALL_CONFIG_T Struct Reference

Marshaling/unmarshalling configuration.

```
#include <trdp_types.h>
```

Data Fields

- [TRDP_MARSHALL_T pCbMarshal](#)
Pointer to marshall callback function.
- [TRDP_UNMARSHALL_T pCbUnmarshall](#)
Pointer to unmarshall callback function.
- void * [pRefCon](#)
Pointer to user context for call back.

4.11.1 Detailed Description

Marshaling/unmarshalling configuration.

The documentation for this struct was generated from the following file:

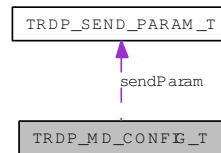
- [trdp_types.h](#)

4.12 TRDP_MD_CONFIG_T Struct Reference

Default MD configuration.

```
#include <trdp_types.h>
```

Collaboration diagram for TRDP_MD_CONFIG_T:



Data Fields

- [TRDP_MD_CALLBACK_T pCbFunction](#)
Pointer to MD callback function.
- `void *` [pRefCon](#)
Pointer to user context for call back.
- [TRDP_SEND_PARAM_T sendParam](#)
Default send parameters.
- [TRDP_FLAGS_T flags](#)
Default flags for MD packets.
- `UINT32` [replyTimeout](#)
Default timeout in us.
- `UINT32` [confirmTimeout](#)
Default timeout in us.
- `UINT32` [udpPort](#)
Port to be used for UDP MD communication.
- `UINT32` [tcpPort](#)
Port to be used for TCP MD communication.

4.12.1 Detailed Description

Default MD configuration.

The documentation for this struct was generated from the following file:

- [trdp_types.h](#)

4.13 TRDP_MD_INFO_T Struct Reference

Message data info from received telegram; allows the application to generate responses.

```
#include <trdp_types.h>
```

Data Fields

- [TRDP_IP_ADDR_T srcIpAddr](#)
source IP address for filtering
- [TRDP_IP_ADDR_T destIpAddr](#)
destination IP address for filtering
- [UINT32 seqCount](#)
sequence counter
- [UINT16 protVersion](#)
Protocol version.
- [TRDP_MSG_T msgType](#)
Protocol ('PD', 'MD', .
- [UINT32 comId](#)
ComID.
- [UINT32 topoCount](#)
received topocount
- [UINT16 userStatus](#)
error code, user stat
- [TRDP_REPLY_STATUS_T replyStatus](#)
reply status
- [TRDP_UUID_T sessionId](#)
for response
- [UINT32 replyTimeout](#)
reply timeout in us given with the request
- [TRDP_URI_USER_T destURI](#)
destination URI user part from MD header
- [TRDP_URI_USER_T srcURI](#)
source URI user part from MD header
- [UINT32 noOfReplies](#)
actual number of replies for the request

- `const void * pUserRef`
User reference given with the local call.
- `TRDP_ERR_T resultCode`
error code

4.13.1 Detailed Description

Message data info from received telegram; allows the application to generate responses.

Note: Not all fields are relevant for each message type!

4.13.2 Field Documentation

4.13.2.1 `TRDP_MSG_T TRDP_MD_INFO_T::msgType`

Protocol ('PD', 'MD', .

..)

The documentation for this struct was generated from the following file:

- [trdp_types.h](#)

4.14 TRDP_MD_STATISTICS Struct Reference

Message data statistics.

```
#include <trdp_private.h>
```

Data Fields

- UINT32 [headerInPackets](#)
Incoming packets.
- UINT32 [headerInCRCErr](#)
Incoming CRC errors.
- UINT32 [headerInProtoErr](#)
Incoming protocol errors.
- UINT32 [headerInTimeOuts](#)
Incoming timing errors.
- UINT32 [headerInFrameErr](#)
Incoming timing errors.
- UINT32 [headerOutPackets](#)
Outgoing packets.
- UINT32 [headerAckErr](#)
Missing acknowledge.

4.14.1 Detailed Description

Message data statistics.

The documentation for this struct was generated from the following file:

- [trdp_private.h](#)

4.15 TRDP_MD_STATISTICS_T Struct Reference

Structure containing all general MD statistics information.

```
#include <trdp_types.h>
```

Data Fields

- UINT32 [defQos](#)
default QoS for MD
- UINT32 [defTtl](#)
default TTL for MD
- UINT32 [defReplyTimeout](#)
default reply timeout in us for MD
- UINT32 [defConfirmTimeout](#)
default confirm timeout in us for MD
- UINT32 [numList](#)
number of listeners
- UINT32 [numRcv](#)
number of received MD packets
- UINT32 [numCrcErr](#)
number of received MD packets with CRC err
- UINT32 [numProtErr](#)
number of received MD packets with protocol err
- UINT32 [numTopoErr](#)
number of received MD packets with wrong topo count
- UINT32 [numNoListener](#)
number of received MD packets without listener
- UINT32 [numReplyTimeout](#)
number of reply timeouts
- UINT32 [numConfirmTimeout](#)
number of confirm timeouts
- UINT32 [numSend](#)
number of sent MD packets

4.15.1 Detailed Description

Structure containing all general MD statistics information.

The documentation for this struct was generated from the following file:

- [trdp_types.h](#)

4.16 TRDP_MEM_CONFIG_T Struct Reference

Structure describing memory (and its pre-fragmentation).

```
#include <trdp_types.h>
```

Data Fields

- `UINT8 * p`
pointer to static or allocated memory
- `UINT32 size`
size of static or allocated memory
- `UINT32 prealloc [TRDP_MEM_BLK_524288+1]`
memory block structure

4.16.1 Detailed Description

Structure describing memory (and its pre-fragmentation).

The documentation for this struct was generated from the following file:

- [trdp_types.h](#)

4.17 TRDP_MEM_STATISTICS_T Struct Reference

TRDP statistics type definitions.

```
#include <trdp_types.h>
```

Data Fields

- [UINT32 total](#)
total memory size
- [UINT32 free](#)
free memory size
- [UINT32 minFree](#)
minimal free memory size in statistics interval
- [UINT32 numAllocBlocks](#)
allocated memory blocks
- [UINT32 numAllocErr](#)
allocation errors
- [UINT32 numFreeErr](#)
free errors
- [UINT32 allocBlockSize](#) [TRDP_MEM_BLK_524288+1]
allocated memory blocks
- [UINT32 usedBlockSize](#) [TRDP_MEM_BLK_524288+1]
used memory blocks

4.17.1 Detailed Description

TRDP statistics type definitions.

Statistical data regarding the former info provided via SNMP the following information was left out/can be implemented additionally using MD:

- PD subscr table: ComId, sourceIpAddr, destIpAddr, cbFct?, timeout, toBehaviour, counter
- PD publish table: ComId, destIpAddr, redId, redState cycle, ttl, qos, counter
- PD join table: joined MC address table
- MD listener table: ComId destIpAddr, destUri, cbFct?, counter
- Memory usage Structure containing all general memory statistics information.

The documentation for this struct was generated from the following file:

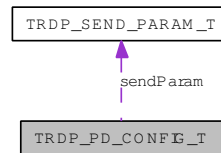
- [trdp_types.h](#)

4.18 TRDP_PD_CONFIG_T Struct Reference

Default PD configuration.

```
#include <trdp_types.h>
```

Collaboration diagram for TRDP_PD_CONFIG_T:



Data Fields

- [TRDP_PD_CALLBACK_T pCbFunction](#)
Pointer to PD callback function.
- void * [pRefCon](#)
Pointer to user context for call back.
- [TRDP_SEND_PARAM_T sendParam](#)
Default send parameters.
- [TRDP_FLAGS_T flags](#)
Default flags for PD packets.
- UINT32 [timeout](#)
Default timeout in us.
- [TRDP_TO_BEHAVIOR_T toBehavior](#)
Default timeout behaviour.
- UINT32 [port](#)
Port to be used for PD communication.

4.18.1 Detailed Description

Default PD configuration.

The documentation for this struct was generated from the following file:

- [trdp_types.h](#)

4.19 TRDP_PD_INFO_T Struct Reference

Process data info from received telegram; allows the application to generate responses.

```
#include <trdp_types.h>
```

Data Fields

- [TRDP_IP_ADDR_T srcIpAddr](#)
source IP address for filtering
- [TRDP_IP_ADDR_T destIpAddr](#)
destination IP address for filtering
- [UINT32 seqCount](#)
sequence counter
- [UINT16 protVersion](#)
Protocol version.
- [TRDP_MSG_T msgType](#)
Protocol ('PD', 'MD', .
- [UINT32 comId](#)
ComID.
- [UINT32 topoCount](#)
received topocount
- [BOOL subs](#)
substitution
- [UINT16 offsetAddr](#)
offset address for ladder architecture
- [UINT32 replyComId](#)
ComID for reply (request only).
- [TRDP_IP_ADDR_T replyIpAddr](#)
IP address for reply (request only).
- [const void * pUserRef](#)
User reference given with the local subscribe.
- [TRDP_ERR_T resultCode](#)
error code

4.19.1 Detailed Description

Process data info from received telegram; allows the application to generate responses.

Note: Not all fields are relevant for each message type!

4.19.2 Field Documentation

4.19.2.1 TRDP_MSG_T TRDP_PD_INFO_T::msgType

Protocol ('PD', 'MD', .

..)

The documentation for this struct was generated from the following file:

- [trdp_types.h](#)

4.20 TRDP_PD_STATISTICS Struct Reference

Process data statistics.

```
#include <trdp_private.h>
```

Data Fields

- UINT32 [headerInPackets](#)
Incoming packets.
- UINT32 [headerInCRCErr](#)
Incoming CRC errors.
- UINT32 [headerInProtoErr](#)
Incoming protocol errors.
- UINT32 [headerInTimeOuts](#)
Incoming timing errors.
- UINT32 [headerInFrameErr](#)
Incoming timing errors.
- UINT32 [headerOutPackets](#)
Outgoing packets.

4.20.1 Detailed Description

Process data statistics.

The documentation for this struct was generated from the following file:

- [trdp_private.h](#)

4.21 TRDP_PD_STATISTICS_T Struct Reference

Structure containing all general PD statistics information.

```
#include <trdp_types.h>
```

Data Fields

- UINT32 [defQos](#)
default QoS for PD
- UINT32 [defTtl](#)
default TTL for PD
- UINT32 [defTimeout](#)
default timeout in us for PD
- UINT32 [numSubs](#)
number of subscribed ComId's
- UINT32 [numPub](#)
number of published ComId's
- UINT32 [numRcv](#)
number of received PD packets
- UINT32 [numCrcErr](#)
number of received PD packets with CRC err
- UINT32 [numProtErr](#)
number of received PD packets with protocol err
- UINT32 [numTopoErr](#)
number of received PD packets with wrong topo count
- UINT32 [numNoSubs](#)
number of received PD push packets without subscription
- UINT32 [numNoPub](#)
number of received PD pull packets without publisher
- UINT32 [numTimeout](#)
number of PD timeouts
- UINT32 [numSend](#)
number of sent PD packets

4.21.1 Detailed Description

Structure containing all general PD statistics information.

The documentation for this struct was generated from the following file:

- [trdp_types.h](#)

4.22 TRDP_PROCESS_CONFIG_T Struct Reference

Types to read out the XML configuration.

```
#include <tau_xml.h>
```

Data Fields

- TRDP_LABEL_T [hostName](#)
Host name.
- TRDP_LABEL_T [leaderName](#)
Leader name dependant on redundanca concept.
- TRDP_IP_ADDR [hostIp](#)
Host IP address.
- TRDP_IP_ADDR [leaderIp](#)
Leader IP address dependant on redundancy concept.
- UINT32 [cycleTime](#)
TRDP main process cycle time in usec.
- UINT32 [priority](#)
TRDP main process priority.
- TRDP_OPTION_T [options](#)
TRDP default options.

4.22.1 Detailed Description

Types to read out the XML configuration.

Configuration of TRDP main process.

The documentation for this struct was generated from the following file:

- [tau_xml.h](#)

4.23 TRDP_PUB_STATISTICS_T Struct Reference

Table containing particular PD publishing information.

```
#include <trdp_types.h>
```

Data Fields

- [UINT32 comId](#)
Published ComId.
- [TRDP_IP_ADDR_T destAddr](#)
IP address of destination for this publishing.
- [UINT32 cycle](#)
Publishing cycle in us.
- [UINT32 redId](#)
Redundancy group id.
- [UINT32 redState](#)
Redundant state.Leader or Follower.
- [UINT32 numPut](#)
Number of packet updates.
- [UINT32 numSend](#)
Number of packets sent out.

4.23.1 Detailed Description

Table containing particular PD publishing information.

4.23.2 Field Documentation

4.23.2.1 TRDP_IP_ADDR_T TRDP_PUB_STATISTICS_T::destAddr

IP address of destination for this publishing.

The documentation for this struct was generated from the following file:

- [trdp_types.h](#)

4.24 TRDP_RED_STATISTICS_T Struct Reference

A table containing PD redundant group information.

```
#include <trdp_types.h>
```

Data Fields

- [UINT32 id](#)
Redundant Id.
- [TRDP_RED_STATE_T state](#)
Redundant state.Leader or Follower.

4.24.1 Detailed Description

A table containing PD redundant group information.

The documentation for this struct was generated from the following file:

- [trdp_types.h](#)

4.25 TRDP_SEND_PARAM_T Struct Reference

Quality/type of service and time to live.

```
#include <trdp_types.h>
```

4.25.1 Detailed Description

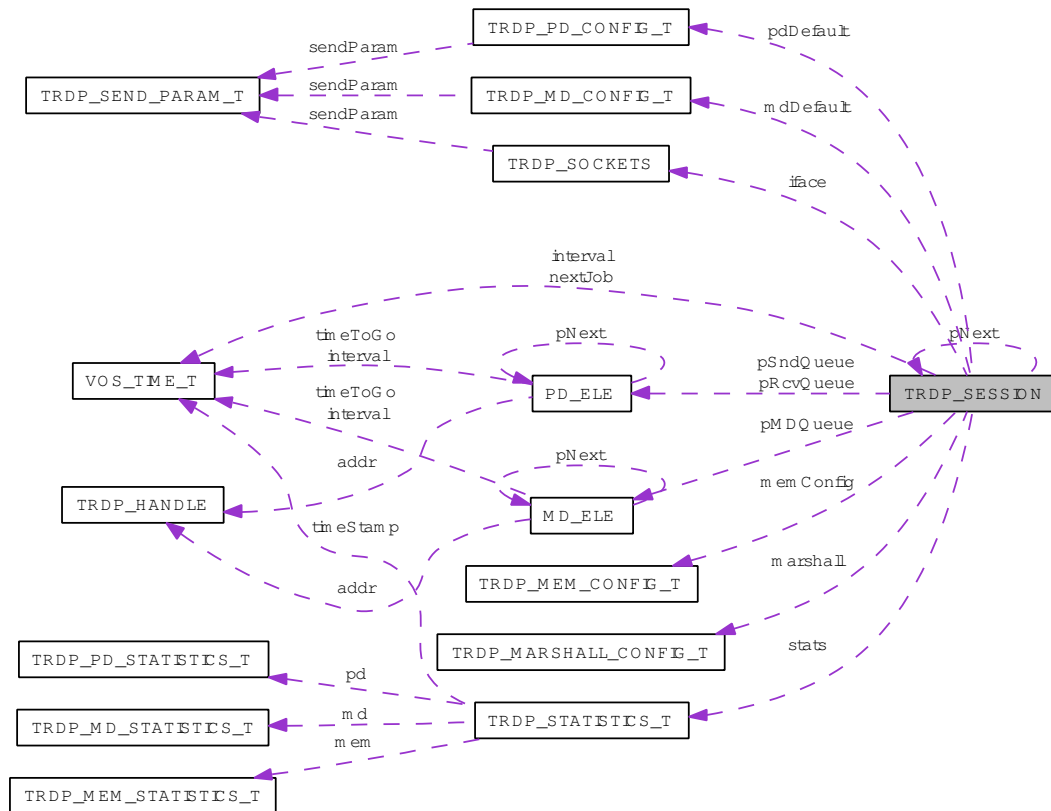
Quality/type of service and time to live.

The documentation for this struct was generated from the following file:

- [trdp_types.h](#)

Session/application variables store.

Collaboration diagram for TRDP_SESSION:



- struct **TRDP_SESSION** * **pNext**
Pointer to next session.
- **VOS_MUTEX_T** **mutex**
protect this session
- **TRDP_IP_ADDR_T** **realIP**
Real IP address.
- **TRDP_IP_ADDR_T** **virtualIP**
Virtual IP address.
- **BOOL** **beQuiet**
if set, only react on ownIP requests

- [UINT32 redID](#)
redundant comId
- [UINT32 topoCount](#)
current valid topocount or zero
- [TRDP_TIME_T interval](#)
Store for next select interval.
- [TRDP_PD_CONFIG_T pdDefault](#)
Default configuration for process data.
- [TRDP_SOCKETS_T iface](#) [VOS_MAX_SOCKET_CNT]
Collection of sockets to use.
- [PD_ELE_T * pSndQueue](#)
pointer to first element of send queue
- [PD_ELE_T * pRcvQueue](#)
pointer to first element of rcv queue
- [MD_ELE_T * pMDQueue](#)
pointer to first element of MD session
- [TRDP_STATISTICS_T stats](#)
statistics of this session

4.26.1 Detailed Description

Session/application variables store.

The documentation for this struct was generated from the following file:

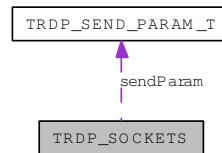
- [trdp_private.h](#)

4.27 TRDP_SOCKETS Struct Reference

Socket item.

```
#include <trdp_private.h>
```

Collaboration diagram for TRDP_SOCKETS:



Data Fields

- [INT32 sock](#)
vos socket descriptor to use
- [TRDP_IP_ADDR_T bindAddr](#)
Defines the interface to use.
- [TRDP_SEND_PARAM_T sendParam](#)
Send parameters.
- [TRDP SOCK_TYPE_T type](#)
Usage of this socket.
- [UINT16 usage](#)
No.

4.27.1 Detailed Description

Socket item.

4.27.2 Field Documentation

4.27.2.1 UINT16 TRDP_SOCKETS::usage

No.

of current users of this socket

The documentation for this struct was generated from the following file:

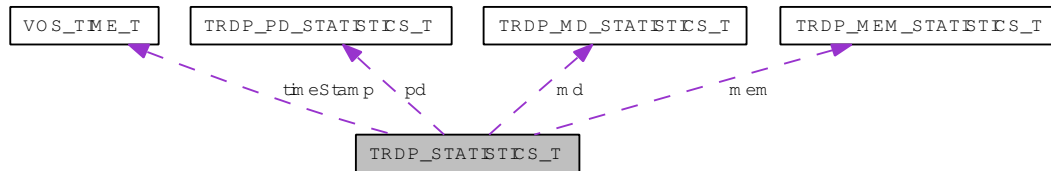
- [trdp_private.h](#)

4.28 TRDP_STATISTICS_T Struct Reference

Structure containing all general memory, PD and MD statistics information.

```
#include <trdp_types.h>
```

Collaboration diagram for TRDP_STATISTICS_T:



Data Fields

- [UINT32 version](#)
TRDP version.
- [TRDP_TIME_T timeStamp](#)
actual time stamp
- [UINT32 upTime](#)
time in sec since last initialisation
- [UINT32 statisticTime](#)
time in sec since last reset of statistics
- [TRDP_LABEL_T hostName](#)
host name
- [TRDP_LABEL_T leaderName](#)
leader host name
- [TRDP_IP_ADDR_T ownIpAddr](#)
own IP address
- [TRDP_IP_ADDR_T leaderIpAddr](#)
leader IP address
- [UINT32 processPrio](#)
priority of TRDP process
- [UINT32 processCycle](#)
cycle time of TRDP process in microseconds
- [TRDP_MEM_STATISTICS_T mem](#)
memory statistics

- [TRDP_PD_STATISTICS_T](#) `pd`
pd statistics
- [TRDP_MD_STATISTICS_T](#) `md`
md statistics

4.28.1 Detailed Description

Structure containing all general memory, PD and MD statistics information.

The documentation for this struct was generated from the following file:

- [trdp_types.h](#)

4.29 TRDP_SUBS_STATISTICS_T Struct Reference

Table containing particular PD subscription information.

```
#include <trdp_types.h>
```

Data Fields

- [UINT32 comId](#)
Subscribed ComId.
- [TRDP_IP_ADDR_T joinedAddr](#)
Joined IP address.
- [TRDP_IP_ADDR_T filterAddr](#)
Filter IP address, i.e IP address of the sender for this subscription, 0.0.0.0 in case all senders.
- [UINT32 callBack](#)
Reference for call back function if used.
- [UINT32 timeout](#)
Time-out value in us.
- [TRDP_ERR_T status](#)
Receive status information TRDP_NO_ERR, TRDP_TIMEOUT_ERR.
- [TRDP_TO_BEHAVIOR_T toBehav](#)
Behaviour at time-out.
- [UINT32 numRecv](#)
Number of packets received for this subscription.

4.29.1 Detailed Description

Table containing particular PD subscription information.

4.29.2 Field Documentation

4.29.2.1 TRDP_IP_ADDR_T TRDP_SUBS_STATISTICS_T::filterAddr

Filter IP address, i.e IP address of the sender for this subscription, 0.0.0.0 in case all senders.

4.29.2.2 UINT32 TRDP_SUBS_STATISTICS_T::timeout

Time-out value in us.

0 = No time-out supervision

4.29.2.3 TRDP_TO_BEHAVIOR_T TRDP_SUBS_STATISTICS_T::toBehav

Behaviour at time-out.

Set data to zero / keep last value

4.29.2.4 UINT32 TRDP_SUBS_STATISTICS_T::numRecv

Number of packets received for this subscription.

The documentation for this struct was generated from the following file:

- [trdp_types.h](#)

4.30 TRDP_UIC_CAR_INFO_T Struct Reference

UIC car information structure.

```
#include <tau_addr.h>
```

Data Fields

- `UINT8 cstProp` [TRDP_UIC_CST_PROPERTY_LEN]
consist properties
- `UINT8 carProp` [TRDP_UIC_CAR_PROPERTY_LEN]
car properties
- `UINT8 uicIdent` [TRDP_UIC_IDENTIFIER_LEN]
UIC identification number.
- `UINT8 cstSeqNo`
consist sequence number in UIC Train
- `UINT8 carSeqNo`
car sequence number in UIC ref direction
- `UINT16 seatResNo`
car number for seat reservation
- `INT8 contrCarCnt`
total number of controlled cars in consist
- `UINT8 operat`
consist operator type (s.
- `UINT8 owner`
consist owner type (s.
- `UINT8 natAppl`
national application type (s.
- `UINT8 natVer`
national application version (s.
- `UINT8 trnOrient`
0 if car orientation is opposite to Train
- `UINT8 cstOrient`
0 if car orientation is opposite to Consist
- `UINT8 isLeading`
0 if car is not leading

- UINT8 [isLeadRequ](#)
0 if no leading request
- UINT8 [trnSwInCarCnt](#)
total number of train switches in car

4.30.1 Detailed Description

UIC car information structure.

4.30.2 Field Documentation

4.30.2.1 UINT8 TRDP_UIC_CAR_INFO_T::operat

consist operator type (s.
UIC 556)

4.30.2.2 UINT8 TRDP_UIC_CAR_INFO_T::owner

consist owner type (s.
UIC 556)

4.30.2.3 UINT8 TRDP_UIC_CAR_INFO_T::natAppl

national application type (s.
UIC 556)

4.30.2.4 UINT8 TRDP_UIC_CAR_INFO_T::natVer

national application version (s.
UIC 556)

The documentation for this struct was generated from the following file:

- [tau_addr.h](#)

4.31 TRDP_UIC_TRAIN_INFO_T Struct Reference

UIC train information structure.

```
#include <tau_addr.h>
```

Data Fields

- UINT32 [trnCarCnt](#)
Total number of UIC cars.
- UINT8 [confPos](#) [TRDP_UIC_CONF_POS_LEN]
confirmed position of unreachable cars
- UINT8 [confPosAvail](#)
0 if conf.
- UINT8 [operatAvail](#)
0 if operator/owner is not available
- UINT8 [natApplAvail](#)
0 if national Application/Version is not available
- UINT8 [cstPropAvail](#)
0 if UIC consist properties are not available
- UINT8 [carPropAvail](#)
0 if UIC car properties are not available
- UINT8 [seatResNoAvail](#)
0 if if reservation number is not available
- UINT8 [inaugFrameVer](#)
inauguration frame version, s.
- UINT8 [rDataVer](#)
supported R-Telegram Version, s.
- UINT8 [inaugState](#)
UIC inauguration state.
- UINT32 [topoCnt](#)
UIC (i.e.
- UINT8 [orient](#)
0 if UIC reference orientation is opposite to IPT
- UINT8 [notAllConf](#)
0 if feature is not available

- UINT8 [confCancelled](#)
0 if feature is not available

4.31.1 Detailed Description

UIC train information structure.

4.31.2 Field Documentation

4.31.2.1 UINT8 TRDP_UIC_TRAIN_INFO_T::confPosAvail

0 if conf.

Position is not available

4.31.2.2 UINT8 TRDP_UIC_TRAIN_INFO_T::inaugFrameVer

inauguration frame version, s.

Leaflet 556 Ann. C.3

4.31.2.3 UINT8 TRDP_UIC_TRAIN_INFO_T::rDataVer

supported R-Telegram Version, s.

Leaflet 556 Ann. A

4.31.2.4 UINT32 TRDP_UIC_TRAIN_INFO_T::topoCnt

UIC (i.e.

TCN) topography counter

The documentation for this struct was generated from the following file:

- [tau_addr.h](#)

4.32 VOS_SOCKET_OPT_T Struct Reference

Common socket options.

```
#include <vos_sock.h>
```

Data Fields

- `UINT8 qos`
quality/type of service 0.
- `UINT8 ttl`
time to live for unicast (default 64)
- `UINT8 ttl_multicast`
time to live for multicast
- `BOOL reuseAddrPort`
allow reuse of address and port
- `BOOL nonBlocking`
use non blocking calls

4.32.1 Detailed Description

Common socket options.

4.32.2 Field Documentation

4.32.2.1 `UINT8 VOS_SOCKET_OPT_T::qos`

quality/type of service 0.

..7

The documentation for this struct was generated from the following file:

- `vos_sock.h`

4.33 VOS_TIME_T Struct Reference

Timer value compatible with timeval / select.

```
#include <vos_types.h>
```

Data Fields

- [UINT32 tv_sec](#)
full seconds
- [UINT32 tv_usec](#)
Micro seconds (max.

4.33.1 Detailed Description

Timer value compatible with timeval / select.

Relative or absolute date, depending on usage

4.33.2 Field Documentation

4.33.2.1 UINT32 VOS_TIME_T::tv_usec

Micro seconds (max.

value 999999)

The documentation for this struct was generated from the following file:

- [vos_types.h](#)

Chapter 5

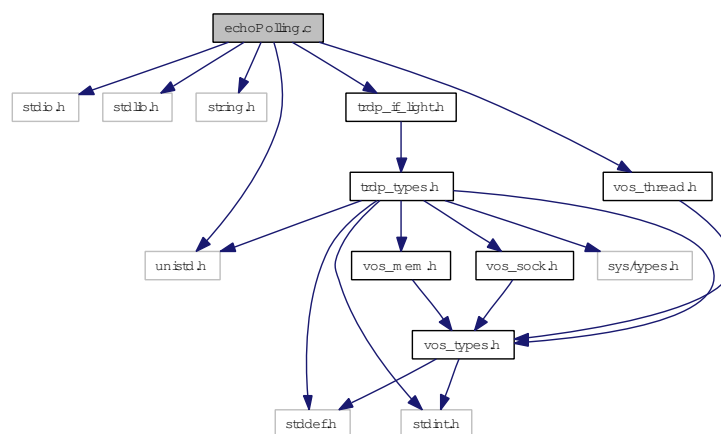
File Documentation

5.1 echoPolling.c File Reference

Demo echoing application for TRDP.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include "trdp_if_light.h"
#include "vos_thread.h"
```

Include dependency graph for echoPolling.c:



Functions

- void [dbgOut](#) (void *pRefCon, [TRDP_LOG_T](#) category, const CHAR8 *pTime, const CHAR8 *pFile, UINT16 LineNumber, const CHAR8 *pMsgStr)
callback routine for TRDP logging/error output

- `int main (int argc, char **argv)`
main entry

5.1.1 Detailed Description

Demo echoing application for TRDP.

Receive and send process data, single threaded polling, static memory

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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Id

[echoPolling.c](#) 2 2012-06-04 11:25:16Z 97025

5.1.2 Function Documentation

5.1.2.1 `void dbgOut (void * pRefCon, TRDP_LOG_T category, const CHAR8 * pTime, const CHAR8 * pFile, UINT16 LineNumber, const CHAR8 * pMsgStr)`

callback routine for TRDP logging/error output

Parameters:

- ← *pRefCon* user supplied context pointer
- ← *category* Log category (Error, Warning, Info etc.)
- ← *pTime* pointer to NULL-terminated string of time stamp
- ← *pFile* pointer to NULL-terminated string of source module
- ← *LineNumber* line
- ← *pMsgStr* pointer to NULL-terminated string

Return values:

none

5.1.2.2 `int main (int argc, char ** argv)`

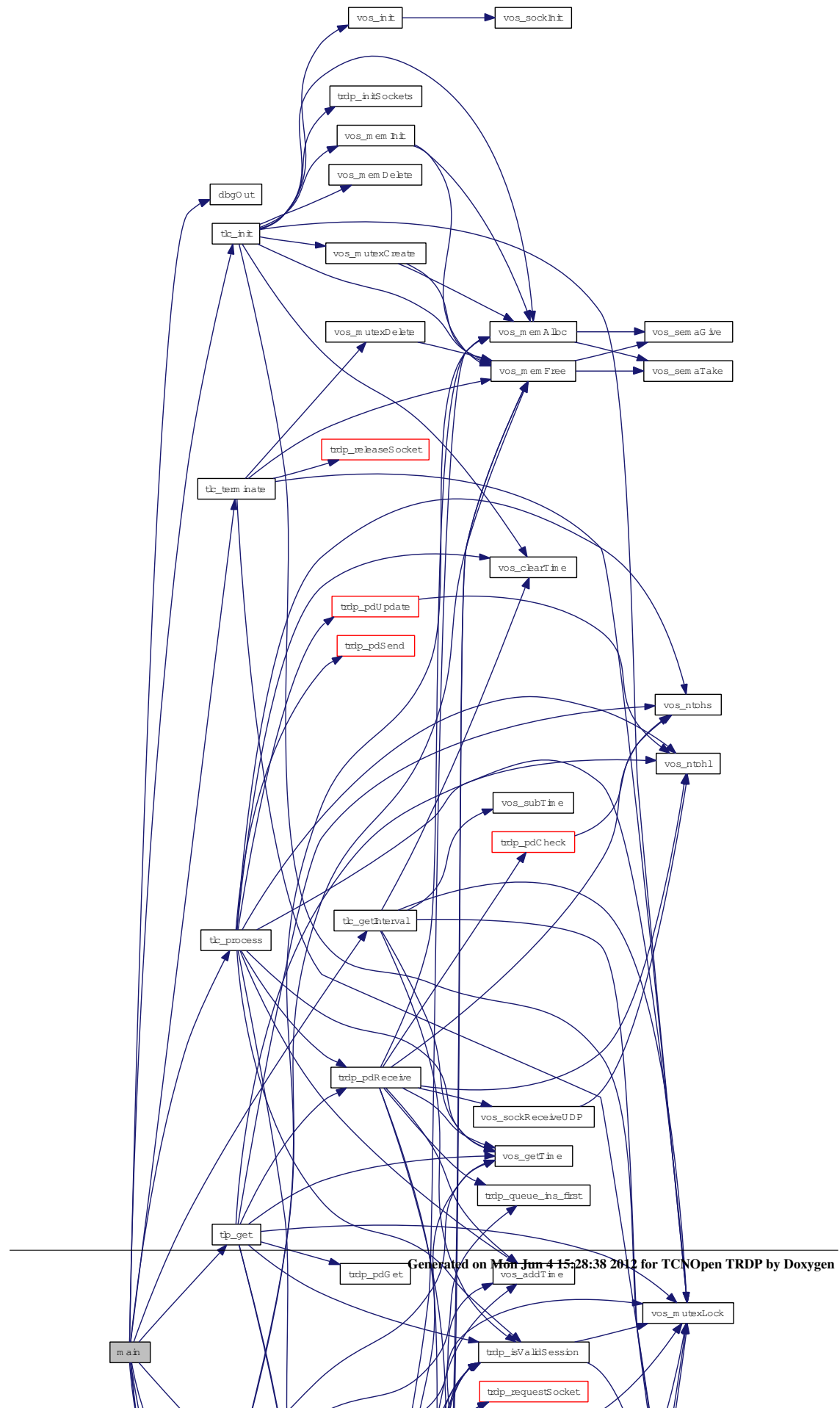
main entry

Return values:

0 no error

1 some error

Here is the call graph for this function:

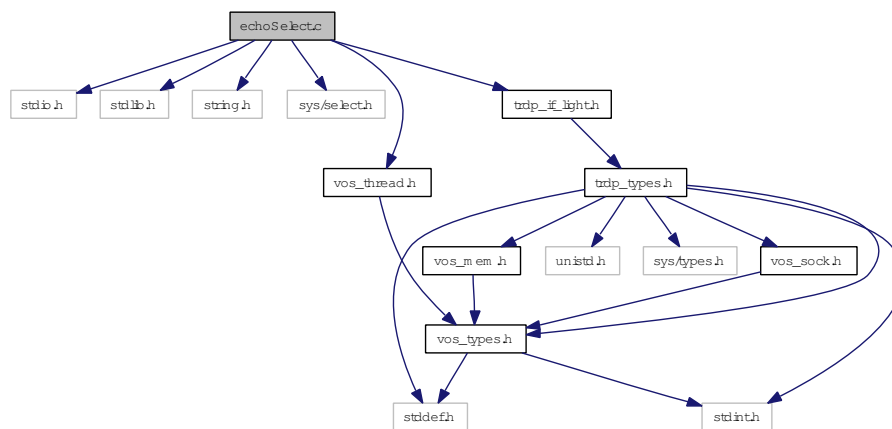


5.2 echoSelect.c File Reference

Demo echoing application for TRDP.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/select.h>
#include "trdp_if_light.h"
#include "vos_thread.h"
```

Include dependency graph for echoSelect.c:



Functions

- void **dbgOut** (void *pRefCon, [TRDP_LOG_T](#) category, const CHAR8 *pTime, const CHAR8 *pFile, UINT16 LineNumber, const CHAR8 *pMsgStr)
callback routine for TRDP logging/error output
- void **myPDcallback** (void *pRefCon, const [TRDP_PD_INFO_T](#) *pMsg, UINT8 *pData, UINT32 dataSize)
callback routine for receiving TRDP traffic
- int **main** (int argc, char **argv)
main entry

5.2.1 Detailed Description

Demo echoing application for TRDP.

Receive and send process data, single threaded using select() and heap memory

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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Id

[echoSelect.c](#) 2 2012-06-04 11:25:16Z 97025

5.2.2 Function Documentation

5.2.2.1 void dbgOut (void * *pRefCon*, TRDP_LOG_T *category*, const CHAR8 * *pTime*, const CHAR8 * *pFile*, UINT16 *LineNumber*, const CHAR8 * *pMsgStr*)

callback routine for TRDP logging/error output

Parameters:

- ← *pRefCon* user supplied context pointer
- ← *category* Log category (Error, Warning, Info etc.)
- ← *pTime* pointer to NULL-terminated string of time stamp
- ← *pFile* pointer to NULL-terminated string of source module
- ← *LineNumber* line
- ← *pMsgStr* pointer to NULL-terminated string

Return values:

none

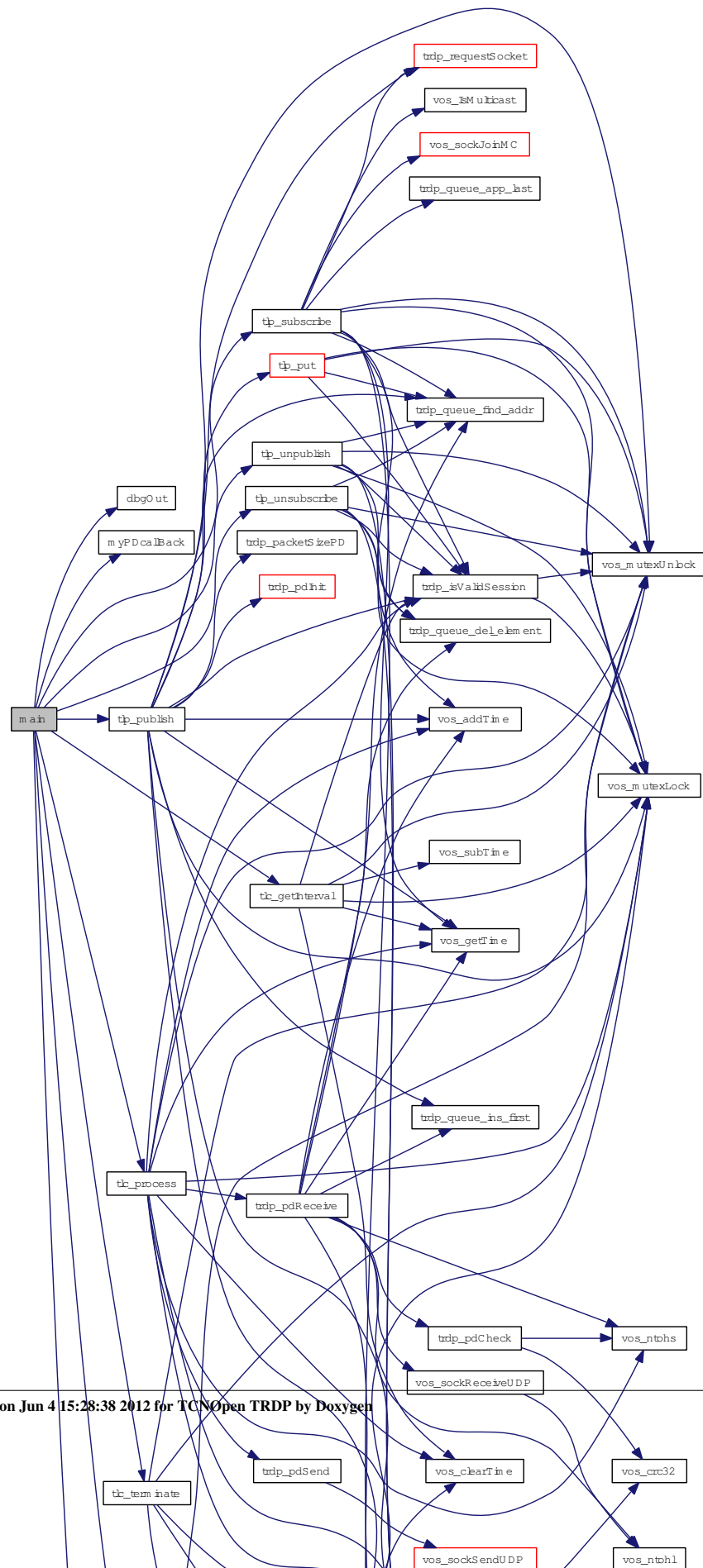
5.2.2.2 int main (int *argc*, char ** *argv*)

main entry

Return values:

- 0* no error
- 1* some error

Here is the call graph for this function:



5.2.2.3 void myPDcallback (void * *pRefCon*, const TRDP_PD_INFO_T * *pMsg*, UINT8 * *pData*, UINT32 *dataSize*)

callback routine for receiving TRDP traffic

Parameters:

- ← *pRefCon* user supplied context pointer
- ← *pMsg* pointer to header/packet infos
- ← *pData* pointer to data block
- ← *dataSize* pointer to data size

Return values:

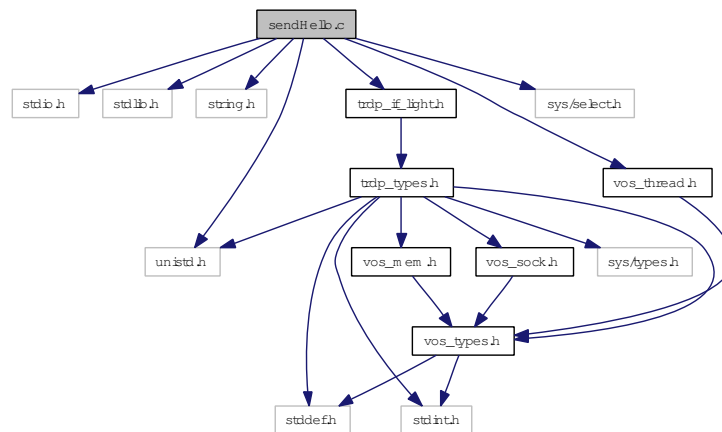
none

5.3 sendHello.c File Reference

Demo application for TRDP.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <sys/select.h>
#include "trdp_if_light.h"
#include "vos_thread.h"
```

Include dependency graph for sendHello.c:



Functions

- `int main (int argc, char *argv[])`
main entry

5.3.1 Detailed Description

Demo application for TRDP.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr and Florian Weispfenning, NewTec GmbH

Remarks:

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Id

[sendHello.c](#) 2 2012-06-04 11:25:16Z 97025

5.3.2 Function Documentation

5.3.2.1 `int main (int argc, char * argv[])`

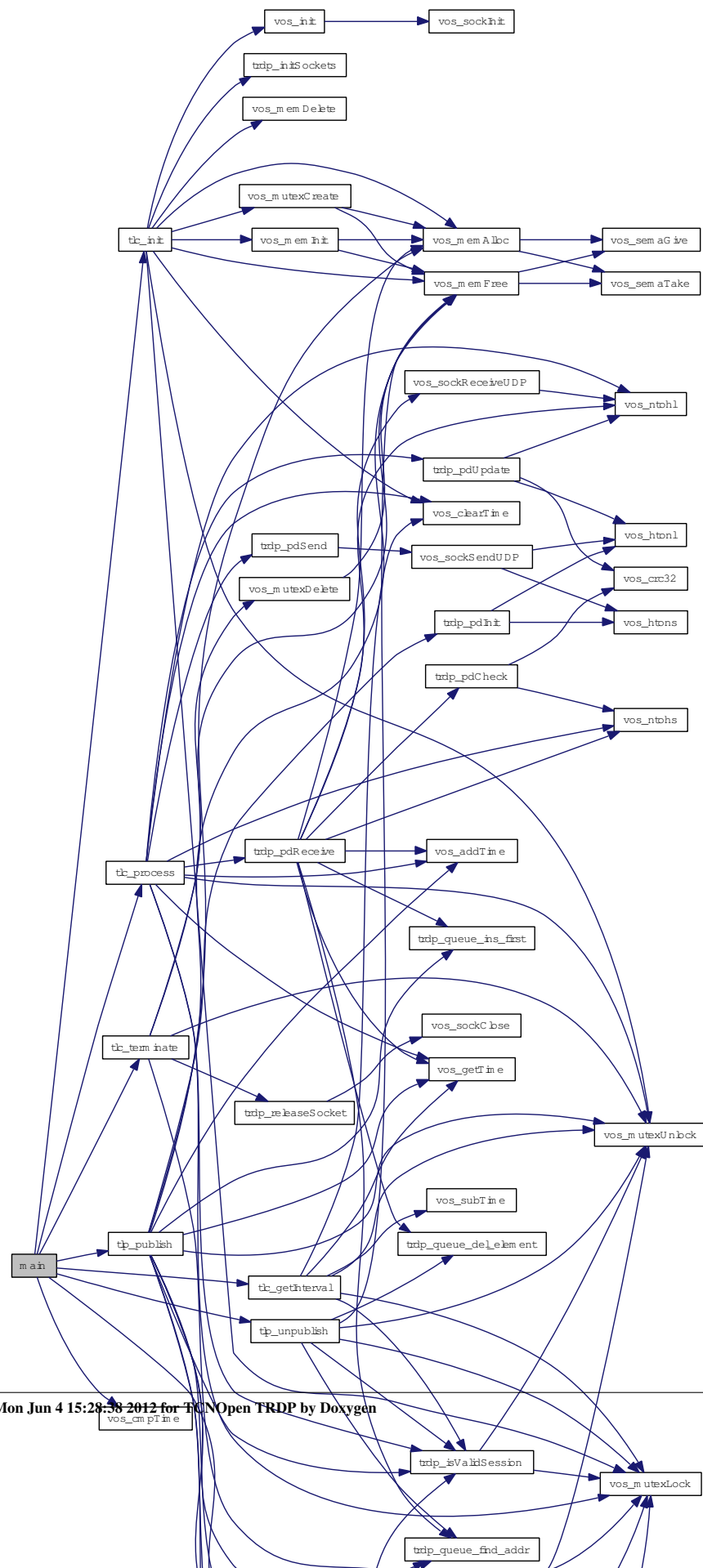
main entry

Return values:

0 no error

1 some error

Here is the call graph for this function:



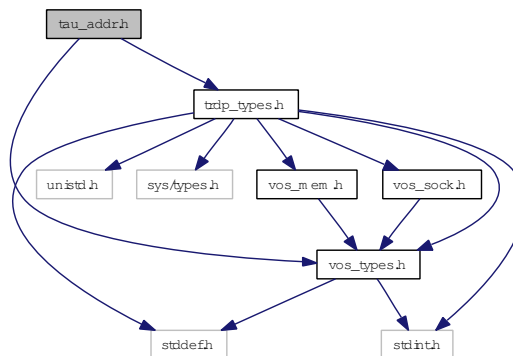
5.4 tau_addr.h File Reference

TRDP utility interface definitions.

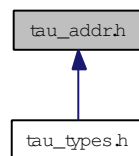
```
#include "vos_types.h"
```

```
#include "trdp_types.h"
```

Include dependency graph for tau_addr.h:



This graph shows which files directly or indirectly include this file:



Data Structures

- struct [TRDP_DEVICE_INFO_T](#)
device information structure
- struct [TRDP_CAR_INFO_T](#)
car information structure.
- struct [TRDP_UIC_TRAIN_INFO_T](#)
UIC train information structure.
- struct [TRDP_UIC_CAR_INFO_T](#)
UIC car information structure.

Enumerations

- enum [TRDP_INAUGSTATE_T](#) {
 [TRDP_INAUGSTATE_FAULT](#),
 [TRDP_INAUGSTATE_OK](#) = 2 }

Types for address conversion and inauguration information.

Functions

- EXT_DECL [TRDP_ERR_T tau_getTrnBackboneType](#) (UINT8 *pTbType, TRDP_IP_ADDR *pGatewayIpAddr)
Function to retrieve the train backbone type.
- EXT_DECL [TRDP_ERR_T tau_getEtbState](#) (TRDP_INAUGSTATE_T *pInaugState, UINT32 *pTopoCnt)
Function to retrieve the inauguration state and the topography counter.
- EXT_DECL [TRDP_ERR_T tau_getOwnIds](#) (TRDP_LABEL_T devId, TRDP_LABEL_T carId, TRDP_LABEL_T cstId)
Who am I ?.
- EXT_DECL [TRDP_ERR_T tau_getAddrByName](#) (const TRDP_URI_T uri, TRDP_IP_ADDR *pIpAddr, UINT32 *pTopoCnt)
Function to convert a URI to an IP address.
- EXT_DECL [TRDP_ERR_T tau_getUriHostPart](#) (TRDP_IP_ADDR ipAddr, TRDP_URI_HOST_T uri, UINT32 *pTopoCnt)
Function to get the host part of an URI.
- EXT_DECL [TRDP_ERR_T tau_label2CarId](#) (const TRDP_LABEL_T carLabel, const TRDP_LABEL_T cstLabel, TRDP_LABEL_T pCarId, UINT32 *pTopoCnt)
Function to convert a label to a carID.
- EXT_DECL [TRDP_ERR_T tau_label2CarNo](#) (const TRDP_LABEL_T carLabel, const TRDP_LABEL_T cstLabel, UINT8 *pCarNo, UINT32 *pTopoCnt)
The function delivers the car number to the given label.
- EXT_DECL [TRDP_ERR_T tau_addr2CarId](#) (TRDP_IP_ADDR ipAddr, TRDP_LABEL_T carId, UINT32 *pTopoCnt)
Function to get the carId from an IP address.
- EXT_DECL [TRDP_ERR_T tau_label2CstId](#) (const TRDP_LABEL_T carLabel, TRDP_LABEL_T cstId, UINT32 *pTopoCnt)
Function to.
- EXT_DECL [TRDP_ERR_T tau_addr2CstId](#) (TRDP_IP_ADDR ipAddr, TRDP_LABEL_T cstId, UINT32 *pTopoCnt)
Function to.
- EXT_DECL [TRDP_ERR_T tau_cstNo2CstId](#) (UINT8 trnCstNo, TRDP_LABEL_T cstId, UINT32 *pTopoCnt)
Function to.
- EXT_DECL [TRDP_ERR_T tau_label2TrnCstNo](#) (const TRDP_LABEL_T carLabel, UINT8 *pTrnCstNo, UINT32 *pTopoCnt)

Function to.

- EXT_DECL [TRDP_ERR_T tau_addr2TrnCstNo](#) (TRDP_IP_ADDR ipAddr, UINT8 *pTrnCstNo, UINT32 *pTopoCnt)

Function to.

- EXT_DECL [TRDP_ERR_T tau_getTrnCstCnt](#) (UINT8 *pCstCnt, UINT32 *pTopoCnt)

Function to.

- EXT_DECL [TRDP_ERR_T tau_getCstCarCnt](#) (const TRDP_LABEL_T cstLabel, UINT8 *pCarCnt, UINT32 *pTopoCnt)

Function to.

- EXT_DECL [TRDP_ERR_T tau_getCarDevCnt](#) (const TRDP_LABEL_T carLabel, const TRDP_LABEL_T cstLabel, UINT16 *pDevCnt, UINT32 *pTopoCnt)

Function to.

- EXT_DECL [TRDP_ERR_T tau_getCarInfo](#) (const TRDP_LABEL_T carLabel, const TRDP_LABEL_T cstLabel, UINT16 maxDev, [TRDP_CAR_INFO_T](#) *pCarData, UINT32 *pTopoCnt)

Function to tbd.

- EXT_DECL [TRDP_ERR_T tau_getUicState](#) (UINT8 **pInaugState, UINT32 **pTopoCnt)

Function to tbd.

- EXT_DECL [TRDP_ERR_T tau_getUicCarData](#) (UINT8 carSeqNo, TRDP_UIC_CAR_DATA_T *pCarData, UINT32 *pTopoCnt)

Function to tbd.

- EXT_DECL [TRDP_ERR_T tau_Label2UicCarSeqNo](#) (const TRDP_LABEL_T carLabel, const TRDP_LABEL_T cstLabel, UINT8 *pCarSeqNo, UINT32 *pTopoCnt)

Function to tbd.

- EXT_DECL [TRDP_ERR_T tau_Addr2UicCarSeqNo](#) (TRDP_IP_ADDR ipAddr, UINT8 *pCarSeqNo, UINT8 *pTopoCnt)

Function to tbd.

- EXT_DECL [TRDP_ERR_T tau_UicCarSeqNo2Ids](#) (UINT8 carSeqNo, TRDP_LABEL_T carId, TRDP_LABEL_T cstId, UINT32 *pTopoCnt)

Function to tbd.

- EXT_DECL [TRDP_ERR_T tau_getCarOrient](#) (TRDP_LABEL_T carId, TRDP_LABEL_T cstId, UINT8 *pCarOrient, UINT8 *pCstOrient, UINT8 *pUicCarOrient, UINT8 *pUicCstOrient, UINT32 *pTopoCnt)

Function to retrieve the orientation of the given car.

- EXT_DECL [TRDP_ERR_T tau_getCarOrient](#) (TRDP_LABEL_T cstId, UINT8 *pCstOrient, UINT8 *pUicCstOrient, UINT32 *pTopoCnt)

Function to retrieve the orientation of the given consist.

5.4.1 Detailed Description

TRDP utility interface definitions.

This module provides the interface to the following utilities

- IP - URI address translation and train configuration access

Note:

Project: TCNOpen TRDP prototype stack

Author:

Armin-H. Weiss (initial version)

Remarks:

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Id

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5.4.2 Enumeration Type Documentation

5.4.2.1 enum TRDP_INAUGSTATE_T

Types for address conversion and inauguration information.

inauguration states

Enumerator:

TRDP_INAUGSTATE_FAULT DNS not or not yet available, no address transformation possible.
ongoing train inauguration, trainwide communication not possible

TRDP_INAUGSTATE_OK inauguration done, trainwide communication possible

5.4.3 Function Documentation

5.4.3.1 EXT_DECL TRDP_ERR_T tau_addr2CarId (TRDP_IP_ADDR *ipAddr*, TRDP_LABEL_T *carId*, UINT32 * *pTopoCnt*)

Function to get the carId from an IP address.

Parameters:

← *ipAddr* IP address
→ *carId* Car ID
↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

TRDP_NO_ERR no error
TRDP_PARAM_ERR Parameter error

5.4.3.2 EXT_DECL TRDP_ERR_T tau_addr2CstId (TRDP_IP_ADDR *ipAddr*, TRDP_LABEL_T *cstId*, UINT32 * *pTopoCnt*)

Function to.

Parameters:

← *ipAddr*

→ *cstId*

↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

TRDP_NO_ERR no error

TRDP_PARAM_ERR Parameter error

5.4.3.3 EXT_DECL TRDP_ERR_T tau_addr2TrnCstNo (TRDP_IP_ADDR *ipAddr*, UINT8 * *pTrnCstNo*, UINT32 * *pTopoCnt*)

Function to.

Parameters:

← *ipAddr* IP address

→ *pTrnCstNo*

↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

TRDP_NO_ERR no error

TRDP_PARAM_ERR Parameter error

5.4.3.4 EXT_DECL TRDP_ERR_T tau_Addr2UicCarSeqNo (TRDP_IP_ADDR *ipAddr*, UINT8 * *pCarSeqNo*, UINT8 * *pTopoCnt*)

Function to tbd.

Parameters:

← *ipAddr* tbd

→ *pCarSeqNo* tbd

↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

TRDP_NO_ERR no error

TRDP_PARAM_ERR Parameter error

5.4.3.5 EXT_DECL TRDP_ERR_T tau_cstNo2CstId (UINT8 *trnCstNo*, TRDP_LABEL_T *cstId*, UINT32 * *pTopoCnt*)

Function to.

Parameters:

← *trnCstNo*

→ *cstId*

↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

TRDP_NO_ERR no error

TRDP_PARAM_ERR Parameter error

5.4.3.6 EXT_DECL TRDP_ERR_T tau_getAddrByName (const TRDP_URI_T *uri*, TRDP_IP_ADDR * *pIpAddr*, UINT32 * *pTopoCnt*)

Function to convert a URI to an IP address.

Receives a URI as input variable and translates this URI to an IP-Address. The URI may specify either a unicast or a multicast IP-Address. The caller may specify a topographic counter, which will be checked.

Parameters:

← *uri* Pointer to a URI or an IP Address string

→ *pIpAddr* Pointer to return the IP address

↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

TRDP_NO_ERR no error

TRDP_PARAM_ERR Parameter error

5.4.3.7 EXT_DECL TRDP_ERR_T tau_getCarDevCnt (const TRDP_LABEL_T *carLabel*, const TRDP_LABEL_T *cstLabel*, UINT16 * *pDevCnt*, UINT32 * *pTopoCnt*)

Function to.

Parameters:

← *carLabel*

← *cstLabel*

→ *pDevCnt*

↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

TRDP_NO_ERR no error

TRDP_PARAM_ERR Parameter error

5.4.3.8 EXT_DECL TRDP_ERR_T tau_getCarInfo (const TRDP_LABEL_T *carLabel*, const TRDP_LABEL_T *cstLabel*, UINT16 *maxDev*, TRDP_CAR_INFO_T * *pCarData*, UINT32 * *pTopoCnt*)

Function to tbd.

Parameters:

- ← *carLabel* tbd
- ← *cstLabel* tbd
- ← *maxDev* tbd
- *pCarData* tbd
- ↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* Parameter error

5.4.3.9 *****EXT_DECL TRDP_ERR_T tau_getCarOrient (TRDP_LABEL_T *cstId*, UINT8 * *pCstOrient*, UINT8 * *pUicCstOrient*, UINT32 * *pTopoCnt*)

Function to retrieve the orientation of the given consist.

Parameters:

- ← *cstId* *cstId* = NULL means own consist
- *pCstOrient* tbd
- *pUicCstOrient* tbd
- ↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* Parameter error

Parameters:

- ← *cstId* *cstId* = NULL means own consist
- *pCstOrient* tbd
- *pUicCstOrient* tbd
- ↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* Parameter error

5.4.3.10 EXT_DECL TRDP_ERR_T tau_getCarOrient (TRDP_LABEL_T *carId*, TRDP_LABEL_T *cstId*, UINT8 * *pCarOrient*, UINT8 * *pCstOrient*, UINT8 * *pUicCarOrient*, UINT8 * *pUicCstOrient*, UINT32 * *pTopoCnt*)

Function to retrieve the orientation of the given car.

Parameters:

- ← *carId* *carId* = NULL means own car
- ← *cstId* *cstId* = NULL means own consist
- *pCarOrient* tbd
- *pCstOrient* tbd
- *pUicCarOrient* tbd
- *pUicCstOrient* tbd
- ↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* Parameter error

5.4.3.11 EXT_DECL TRDP_ERR_T tau_getCstCarCnt (const TRDP_LABEL_T *cstLabel*, UINT8 * *pCarCnt*, UINT32 * *pTopoCnt*)

Function to.

Parameters:

- ← *cstLabel*
- *pCarCnt*
- ↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* Parameter error

5.4.3.12 EXT_DECL TRDP_ERR_T tau_getEtbState (TRDP_INAUGSTATE_T * *pInaugState*, UINT32 * *pTopoCnt*)

Function to retrieve the inauguration state and the topography counter.

Parameters:

- *pInaugState* Pointer to an inauguration state variable.
- *pTopoCnt* Pointer to a topo counter variable.

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* Parameter error

5.4.3.13 EXT_DECL TRDP_ERR_T tau_getOwnIds (TRDP_LABEL_T *devId*, TRDP_LABEL_T *carId*, TRDP_LABEL_T *cstId*)

Who am I ?.

Realizes a kind of Who am I function. It is used to determine the own identifiers (i.e. the own labels), which may be used as host part of the own fully qualified domain name.

Parameters:

- *devId* Returns the device label (host name)
- *carId* Returns the car label
- *cstId* Returns the consist label

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* Parameter error

5.4.3.14 EXT_DECL TRDP_ERR_T tau_getTrnBackboneType (UINT8 * *pTbType*, TRDP_IP_ADDR * *pGatewayIpAddr*)

Function to retrieve the train backbone type.

Parameters:

- *pTbType* Pointer to return the train backbone type. 0=ETB, 1= WTB
- *pGatewayIpAddr* IP address of active gateway to train backbone. This parameter may be a NULL pointer if the caller is not interested in the address.

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* Parameter error

5.4.3.15 EXT_DECL TRDP_ERR_T tau_getTrnCstCnt (UINT8 * *pCstCnt*, UINT32 * *pTopoCnt*)

Function to.

Parameters:

- *pCstCnt*
- ↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* Parameter error

5.4.3.16 EXT_DECL TRDP_ERR_T tau_getUicCarData (UINT8 *carSeqNo*, TRDP_UIC_CAR_DATA_T * *pCarData*, UINT32 * *pTopoCnt*)

Function to tbd.

Parameters:

- ← *carSeqNo* tbd
- *pCarData* tbd
- ↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* Parameter error

5.4.3.17 EXT_DECL TRDP_ERR_T tau_getUicState (UINT8 ** *pInaugState*, UINT32 ** *pTopoCnt*)

Function to tbd.

Parameters:

- *pInaugState* tbd
- ↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* Parameter error

5.4.3.18 EXT_DECL TRDP_ERR_T tau_getUriHostPart (TRDP_IP_ADDR *ipAddr*, TRDP_URI_HOST_T *uri*, UINT32 * *pTopoCnt*)

Function to get the host part of an URI.

Receives an IP-Address and translates it into the host part of the corresponding URI; both unicast and multicast addresses are accepted. The caller may specify a topographic counter, which will be checked.

Parameters:

- ← *ipAddr* IP address
- *uri*
- ↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* Parameter error

5.4.3.19 EXT_DECL TRDP_ERR_T tau_label2CarId (const TRDP_LABEL_T *carLabel*, const TRDP_LABEL_T *cstLabel*, TRDP_LABEL_T *pCarId*, UINT32 * *pTopoCnt*)

Function to convert a label to a carID.

Parameters:

- ← *carLabel* Car label
- ← *cstLabel* Consist label
- *pCarId* Pointer to the carID returned
- ↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* Parameter error

5.4.3.20 EXT_DECL TRDP_ERR_T tau_label2CarNo (const TRDP_LABEL_T *carLabel*, const TRDP_LABEL_T *cstLabel*, UINT8 * *pCarNo*, UINT32 * *pTopoCnt*)

The function delivers the car number to the given label.

The first match of the table will be returned in case there is no unique label given.

Parameters:

- ← *carLabel* Car label
- ← *cstLabel* Consist label
- *pCarNo* Pointer to the carNo returned
- ↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* Parameter error

5.4.3.21 EXT_DECL TRDP_ERR_T tau_label2CstId (const TRDP_LABEL_T *carLabel*, TRDP_LABEL_T *cstId*, UINT32 * *pTopoCnt*)

Function to.

Parameters:

- ← *carLabel*
- *cstId*
- ↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* Parameter error

5.4.3.22 EXT_DECL TRDP_ERR_T tau_label2TrnCstNo (const TRDP_LABEL_T *carLabel*, UINT8 * *pTrnCstNo*, UINT32 * *pTopoCnt*)

Function to.

Parameters:

← *carLabel*

→ *pTrnCstNo*

↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

TRDP_NO_ERR no error

TRDP_PARAM_ERR Parameter error

5.4.3.23 EXT_DECL TRDP_ERR_T tau_Label2UicCarSeqNo (const TRDP_LABEL_T *carLabel*, const TRDP_LABEL_T *cstLabel*, UINT8 * *pCarSeqNo*, UINT32 * *pTopoCnt*)

Function to tbd.

Parameters:

← *carLabel* tbd

← *cstLabel* tbd

→ *pCarSeqNo* tbd

↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

TRDP_NO_ERR no error

TRDP_PARAM_ERR Parameter error

5.4.3.24 EXT_DECL TRDP_ERR_T tau_UicCarSeqNo2Ids (UINT8 *carSeqNo*, TRDP_LABEL_T *carId*, TRDP_LABEL_T *cstId*, UINT32 * *pTopoCnt*)

Function to tbd.

Parameters:

← *carSeqNo* tbd

→ *carId* tbd

→ *cstId* tbd

↔ *pTopoCnt* Pointer to the actual topo count. If !=0 will be checked. Returns the actual one.

Return values:

TRDP_NO_ERR no error

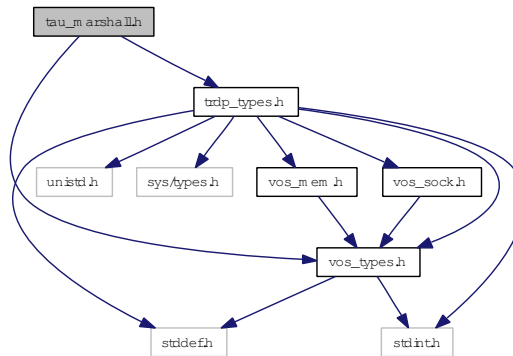
TRDP_PARAM_ERR Parameter error

5.5 tau_marshall.h File Reference

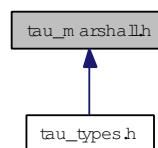
TRDP utility interface definitions.

```
#include "vos_types.h"
#include "trdp_types.h"
```

Include dependency graph for tau_marshall.h:



This graph shows which files directly or indirectly include this file:



Typedefs

- typedef [TRDP_ERR_T](#) `tau_marshall` (void *pRefCon, UINT32 comId, const UINT8 *pSrc, UINT8 *pDest, UINT32 *pDestSize)
marshall function.
- typedef [TRDP_ERR_T](#) `tau_unmarshall` (void *pRefCon, UINT32 comId, const UINT8 *pSrc, UINT8 *pDest, UINT32 *pDestSize)
unmarshall function.

Functions

- EXT_DECL [TRDP_ERR_T](#) `tau_initMarshall` (void **ppRefCon, UINT32 numDataSet, [TRDP_DATASET_T](#) *pDataset)
Types for marshalling / unmarshalling.

5.5.1 Detailed Description

TRDP utility interface definitions.

This module provides the interface to the following utilities

- marshall/unmarshall

Note:

Project: TCNOpen TRDP prototype stack

Author:

Armin-H. Weiss (initial version)

Remarks:

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5.5.2 Typedef Documentation

5.5.2.1 typedef TRDP_ERR_T tau_marshall(void *pRefCon, UINT32 comId, const UINT8 *pSrc, UINT8 *pDest, UINT32 *pDestSize)

marshall function.

Parameters:

- ← *pRefCon* pointer to user context
- ← *comId* ComId to identify the structure out of a configuration
- ← *pSrc* pointer to received original message
- ← *pDest* pointer to a buffer for the treated message
- ↔ *pDestSize* size of the provide buffer / size of the treated message

Return values:

- TRDP_NO_ERR* no error
- TRDP_MEM_ERR* provided buffer to small
- TRDP_INIT_ERR* marshallng not initialised
- TRDP_COMID_ERR* comid not existing

5.5.2.2 typedef TRDP_ERR_T tau_unmarshall(void *pRefCon, UINT32 comId, const UINT8 *pSrc, UINT8 *pDest, UINT32 *pDestSize)

unmarshall function.

Parameters:

- ← *pRefCon* pointer to user context
- ← *comId* ComId to identify the structure out of a configuration
- ← *pSrc* pointer to received original message
- ← *pDest* pointer to a buffer for the treated message
- ↔ *pDestSize* size of the provide buffer / size of the treated message

Return values:

- TRDP_NO_ERR* no error
- TRDP_MEM_ERR* provided buffer to small
- TRDP_INIT_ERR* marshalling not initialised
- TRDP_COMID_ERR* comid not existing

5.5.3 Function Documentation**5.5.3.1 EXT_DECL TRDP_ERR_T tau_initMarshall (void ** *ppRefCon*, UINT32 *numDataSet*, TRDP_DATASET_T * *pDataset*)**

Types for marshalling / unmarshalling.

Function to initialise the marshalling/unmarshalling.

Parameters:

- ↔ *ppRefCon* Returns a pointer to be used for the reference context of marshalling/unmarshalling
- ← *numDataSet* Number of datasets found in the configuration
- ← *pDataset* Pointer to an array of a structures of type [TRDP_DATASET_T](#)

Return values:

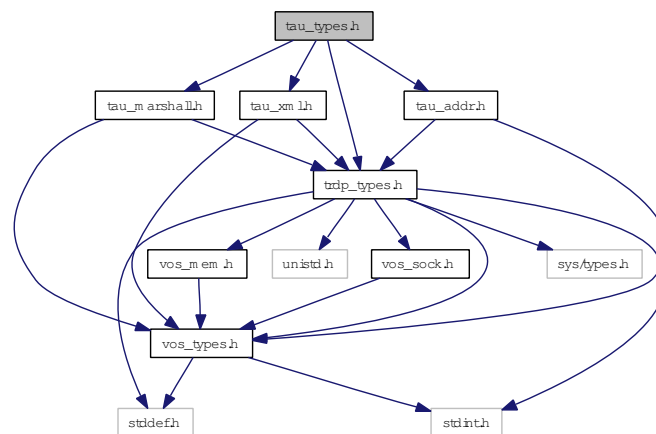
- TRDP_NO_ERR* no error
- TRDP_MEM_ERR* provided buffer to small
- TRDP_PARAM_ERR* Parameter error

5.6 tau_types.h File Reference

TRDP utility interface definitions.

```
#include "trdp_types.h"
#include "tau_addr.h"
#include "tau_marshall.h"
#include "tau_xml.h"
```

Include dependency graph for tau_types.h:



5.6.1 Detailed Description

TRDP utility interface definitions.

This module provides the interface to the following utilities

- marshalling/unmarshalling
- xml configuration interpreter
- IP - URI address translation

Note:

Project: TCNOpen TRDP prototype stack

Author:

Armin-H. Weiss (initial version)

Remarks:

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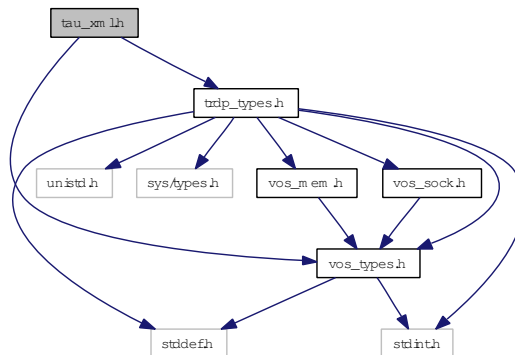
5.7 tau_xml.h File Reference

TRDP utility interface definitions.

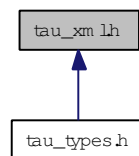
```
#include "vos_types.h"
```

```
#include "trdp_types.h"
```

Include dependency graph for tau_xml.h:



This graph shows which files directly or indirectly include this file:



Data Structures

- struct [TRDP_PROCESS_CONFIG_T](#)
Types to read out the XML configuration.
- struct [TRDP_DBG_CONFIG_T](#)
Control for debug output device/file on application level.

Enumerations

- enum [TRDP_DBG_OPTION_T](#) {
[TRDP_DBG_DEFAULT](#) = 0,
[TRDP_DBG_OFF](#) = 0x01,
[TRDP_DBG_ERR](#) = 0x02,
[TRDP_DBG_WARN](#) = 0x04,
[TRDP_DBG_INFO](#) = 0x08,
[TRDP_DBG_DBG](#) = 0x10,

```

TRDP_DBG_TIME = 0x20,
TRDP_DBG_LOC = 0x40,
TRDP_DBG_CAT = 0x80 }

```

Control for debug output format on application level.

Functions

- EXT_DECL [TRDP_ERR_T](#) [tau_readXmlConfig](#) (const CHAR8 *pFileName, [TRDP_PROCESS_CONFIG_T](#) *pProcessConfig, [TRDP_MEM_CONFIG_T](#) *pMemConfig, [TRDP_PD_CONFIG_T](#) *pPdConfig, [TRDP_MD_CONFIG_T](#) *pMdConfig, UINT32 *pNumExchgPar, [TRDP_EXCHG_PAR_T](#) **ppExchgPar, UINT32 *pNumComPar, [TRDP_COM_PAR_T](#) **ppComPar, [TRDP_DBG_CONFIG_T](#) *pDbgPar)

Function to read the TRDP configuration parameters out of the XML configuration file.

- EXT_DECL [TRDP_ERR_T](#) [tau_readXmlDatasetConfig](#) (const CHAR8 *pFileName, UINT32 *pNumDataset, [TRDP_DATASET_T](#) **ppDataset)

Function to read the DataSet configuration out of the XML configuration file.

5.7.1 Detailed Description

TRDP utility interface definitions.

This module provides the interface to the following utilities

- read xml configuration interpreter

Note:

Project: TCNOpen TRDP prototype stack

Author:

Armin-H. Weiss (initial version)

Remarks:

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5.7.2 Enumeration Type Documentation

5.7.2.1 enum TRDP_DBG_OPTION_T

Control for debug output format on application level.

Enumerator:

TRDP_DBG_DEFAULT Printout default.

TRDP_DBG_OFF Printout off.
TRDP_DBG_ERR Printout error.
TRDP_DBG_WARN Printout warning and error.
TRDP_DBG_INFO Printout info, warning and error.
TRDP_DBG_DBG Printout debug, info, warning and error.
TRDP_DBG_TIME Printout timestamp.
TRDP_DBG_LOC Printout file name and line.
TRDP_DBG_CAT Printout category (DBG, INFO, WARN, ERR).

5.7.3 Function Documentation

5.7.3.1 `EXT_DECL TRDP_ERR_T tau_readXmlConfig (const CHAR8 * pFileName,
TRDP_PROCESS_CONFIG_T * pProcessConfig, TRDP_MEM_CONFIG_T *
pMemConfig, TRDP_PD_CONFIG_T * pPdConfig, TRDP_MD_CONFIG_T *
pMdConfig, UINT32 * pNumExchgPar, TRDP_EXCHG_PAR_T ** ppExchgPar, UINT32
* pNumComPar, TRDP_COM_PAR_T ** ppComPar, TRDP_DBG_CONFIG_T *
pDbgPar)`

Function to read the TRDP configuration parameters out of the XML configuration file.

Parameters:

← *pFileName* Path and filename of the xml configuration file
→ *pProcessConfig* TRDP main process configuration
→ *pMemConfig* Memory configuration
→ *pPdConfig* PD default configuration
→ *pMdConfig* MD default configuration
→ *pNumExchgPar* Number of configured telegrams
→ *ppExchgPar* Pointer to array of telegram configurations
→ *pNumComPar* Number of configured com parameters
→ *ppComPar* Pointer to array of com parameters
→ *pDbgPar* Debug printout options for application use

Return values:

TRDP_NO_ERR no error
TRDP_MEM_ERR provided buffer too small
TRDP_PARAM_ERR File not existing

5.7.3.2 `EXT_DECL TRDP_ERR_T tau_readXmlDatasetConfig (const CHAR8 * pFileName,
UINT32 * pNumDataset, TRDP_DATASET_T ** ppDataset)`

Function to read the DataSet configuration out of the XML configuration file.

Parameters:

← *pFileName* Path and filename of the xml configuration file

- *pNumDataset* Pointer to the number of datasets found in the configuration
- *ppDataset* Pointer to an array of a structures of type [TRDP_DATASET_T](#)

Return values:

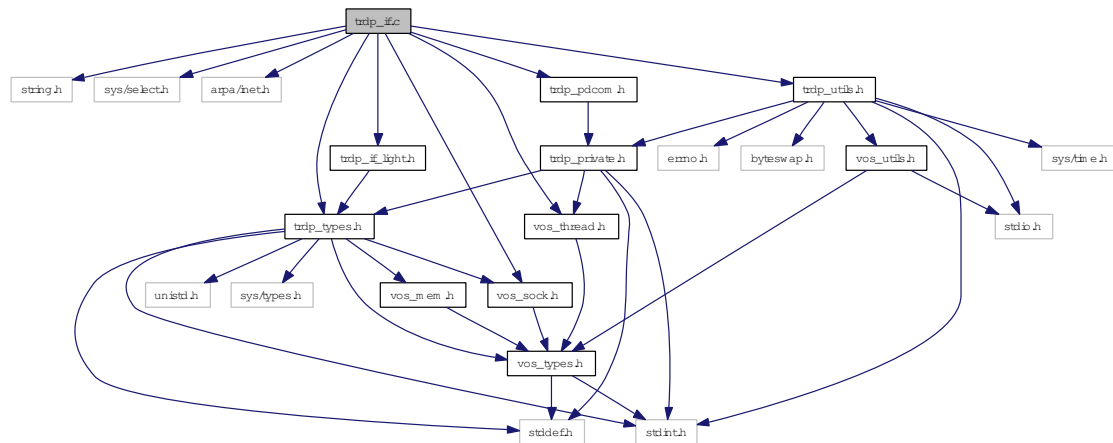
- TRDP_NO_ERR* no error
- TRDP_MEM_ERR* provided buffer to small
- TRDP_PARAM_ERR* File not existing

5.8 trdp_if.c File Reference

Functions for ECN communication.

```
#include <string.h>
#include <sys/select.h>
#include <arpa/inet.h>
#include "trdp_types.h"
#include "trdp_if_light.h"
#include "trdp_utils.h"
#include "trdp_pdcom.h"
#include "vos_thread.h"
#include "vos_sock.h"
```

Include dependency graph for trdp_if.c:



Functions

- **BOOL** [trdp_isValidSession](#) ([TRDP_APP_SESSION_T](#) pSessionHandle)
Check if the session handle is valid.
- [TRDP_APP_SESSION_T](#) * [trdp_sessionQueue](#) (void)
Get the session queue head pointer.
- **EXT_DECL** [TRDP_ERR_T](#) [tlc_init](#) ([TRDP_APP_SESSION_T](#) *pAppHandle, [TRDP_IP_ADDR_T](#) ownIpAddr, [TRDP_IP_ADDR_T](#) leaderIpAddr, const [TRDP_PRINT_DBG_T](#) pPrintDebugString, const [TRDP_MARSHALL_CONFIG_T](#) *pMarshall, const [TRDP_PD_CONFIG_T](#) *pPdDefault, const [TRDP_MD_CONFIG_T](#) *pMdDefault, const [TRDP_MEM_CONFIG_T](#) *pMemConfig, [TRDP_OPTION_T](#) option)
Initialize the TRDP stack.
- [TRDP_ERR_T](#) [tlc_terminate](#) ([TRDP_APP_SESSION_T](#) appHandle)
Un-Initialize Clean up when app quits.

- [TRDP_ERR_T tlc_reinit](#) ([TRDP_APP_SESSION_T](#) appHandle)
Re-Initialize Should be called by the application when a link-down/link-up event has occurred during normal operation.
- `const char *` [tlc_getVersion](#) (`void`)
Return a human readable version representation.
- [TRDP_ERR_T tlp_setRedundant](#) ([TRDP_APP_SESSION_T](#) appHandle, `UINT32` redId, `BOOL` leader)
Do not send non-redundant PDs when we are follower.
- `EXT_DECL` [TRDP_ERR_T tlp_getRedundant](#) ([TRDP_APP_SESSION_T](#) appHandle, `UINT32` redId, `BOOL` *pLeader)
Get status of redundant ComIds.
- `void` [tlc_setTopoCount](#) (`UINT32` topoCount)
Set new topocount for trainwide communication.
- `EXT_DECL` [TRDP_ERR_T tlp_publish](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_PUB_T](#) *pPubHandle, `UINT32` comId, `UINT32` topoCount, [TRDP_IP_ADDR_T](#) srcIpAddr, [TRDP_IP_ADDR_T](#) destIpAddr, `UINT32` interval, `UINT32` redId, [TRDP_FLAGS_T](#) pktFlags, `const` [TRDP_SEND_PARAM_T](#) *pSendParam, `const` `UINT8` *pData, `UINT32` dataSize, `BOOL` subs, `UINT16` offsetAddress)
Prepare for sending PD messages.
- [TRDP_ERR_T tlp_unpublish](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_PUB_T](#) pubHandle)
Stop sending PD messages.
- [TRDP_ERR_T tlp_put](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_PUB_T](#) pubHandle, `const` `UINT8` *pData, `UINT32` dataSize)
Update the process data to send.
- `EXT_DECL` [TRDP_ERR_T tlc_getInterval](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_TIME_T](#) *pInterval, [TRDP_FDS_T](#) *pFileDesc, `INT32` *pNoDesc)
Get the lowest time interval for PDs.
- `EXT_DECL` [TRDP_ERR_T tlc_process](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_FDS_T](#) *pRfds, `INT32` *pCount)
Work loop of the TRDP handler.
- `EXT_DECL` [TRDP_ERR_T tlp_subscribe](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_SUB_T](#) *pSubHandle, `const` `void` *pUserRef, `UINT32` comId, `UINT32` topoCount, [TRDP_IP_ADDR_T](#) srcIpAddr1, [TRDP_IP_ADDR_T](#) srcIpAddr2, [TRDP_IP_ADDR_T](#) destIpAddr, `UINT32` timeout, [TRDP_TO_BEHAVIOR_T](#) toBehavior, `UINT32` maxDataSize)
Prepare for receiving PD messages.
- `EXT_DECL` [TRDP_ERR_T tlp_unsubscribe](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_SUB_T](#) subHandle)
Stop receiving PD messages.

- EXT_DECL [TRDP_ERR_T](#) [tlp_get](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_SUB_T](#) subHandle, [TRDP_FLAGS_T](#) pktFlags, [TRDP_PD_INFO_T](#) *pPdInfo, UINT8 *pData, UINT32 *pDataSize)

Get the last valid PD message.

5.8.1 Detailed Description

Functions for ECN communication.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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Id

[trdp_if.c](#) 3 2012-06-04 12:52:54Z 97025

5.8.2 Function Documentation

5.8.2.1 EXT_DECL [TRDP_ERR_T](#) [tlc_getInterval](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_TIME_T](#) *pInterval, [TRDP_FDS_T](#) *pFileDesc, INT32 *pNoDesc)

Get the lowest time interval for PDs.

Return the maximum time interval suitable for 'select()' so that we can send due PD packets in time. If the PD send queue is empty, return zero time

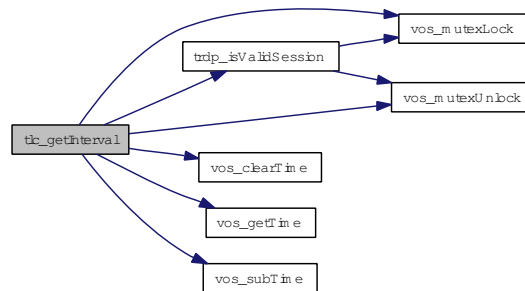
Parameters:

- ← **appHandle** The handle returned by [tlc_init](#)
- **pInterval** pointer to needed interval
- ↔ **pFileDesc** pointer to file descriptor set
- **pNoDesc** pointer to put no of used descriptors (for select())

Return values:

- TRDP_NO_ERR** no error
- TRDP_NOINIT_ERR** handle invalid

Here is the call graph for this function:



5.8.2.2 const char* tlc_getVersion (void)

Return a human readable version representation.

Return string in the form 'v.r.u.b'

Return values:

const string

5.8.2.3 EXT_DECL TRDP_ERR_T tlc_init (TRDP_APP_SESSION_T * pAppHandle, TRDP_IP_ADDR_T ownIpAddr, TRDP_IP_ADDR_T leaderIpAddr, const TRDP_PRINT_DBG_T pPrintDebugString, const TRDP_MARSHALL_CONFIG_T * pMarshall, const TRDP_PD_CONFIG_T * pPdDefault, const TRDP_MD_CONFIG_T * pMdDefault, const TRDP_MEM_CONFIG_T * pMemConfig, TRDP_OPTION_T option)

Initialize the TRDP stack.

tlc_init returns in pAppHandle a unique handle to be used in further calls to the stack.

Parameters:

- *pAppHandle* A handle for further calls to the trdp stack
- ← *ownIpAddr* Own IP address, can be different for each process in multiprocessing systems
- ← *leaderIpAddr* IP address of redundancy leader
- ← *pPrintDebugString* Pointer to debug print function
- ← *pMarshall* Pointer to marshall configuration
- ← *pPdDefault* Pointer to default PD configuration
- ← *pMdDefault* Pointer to default MD configuration
- ← *pMemConfig* Pointer to memory configuration
- ← *option* options for library behavior

Return values:

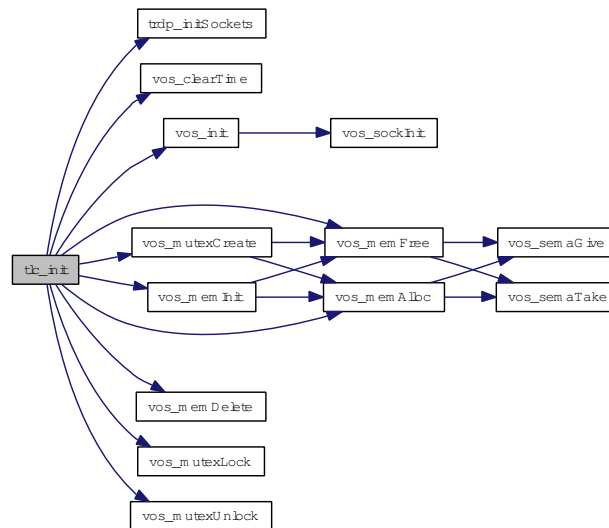
TRDP_NO_ERR no error

TRDP_MEM_ERR memory allocation failed

TRDP_PARAM_ERR initialization error

TRDP SOCK_ERR socket error

Here is the call graph for this function:



5.8.2.4 EXT_DECL TRDP_ERR_T tlc_process (TRDP_APP_SESSION_T appHandle, TRDP_FDS_T *pRfds, INT32 *pCount)

Work loop of the TRDP handler.

Search the queue for pending PDs to be sent Search the receive queue for pending PDs (time out)

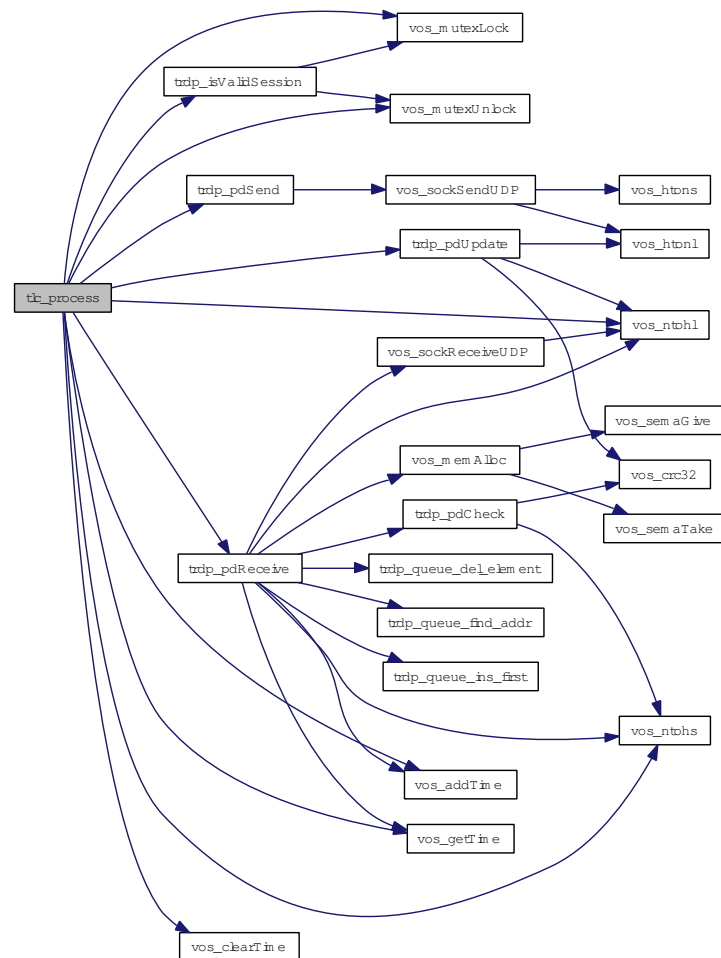
Parameters:

- ← **appHandle** The handle returned by tlc_init
- ← **pRfds** pointer to set of ready descriptors
- ↔ **pCount** pointer to number of ready descriptors

Return values:

- TRDP_NO_ERR** no error
- TRDP_NOINIT_ERR** handle invalid

Here is the call graph for this function:



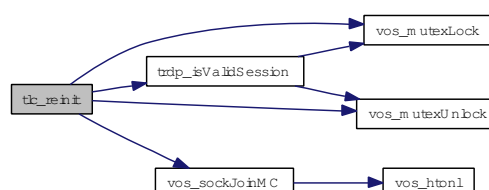
5.8.2.5 TRDP_ERR_T trdp_reinit (TRDP_APP_SESSION_T appHandle)

Re-Initialize Should be called by the application when a link-down/link-up event has occurred during normal operation.

Re-Initialize.

We re-join

Here is the call graph for this function:



5.8.2.6 void tlc_setTopoCount (UINT32 topoCount)

Set new topocount for trainwide communication.

This value is used for validating outgoing and incoming packets only!

Parameters:

← *topoCount* New topoCount value

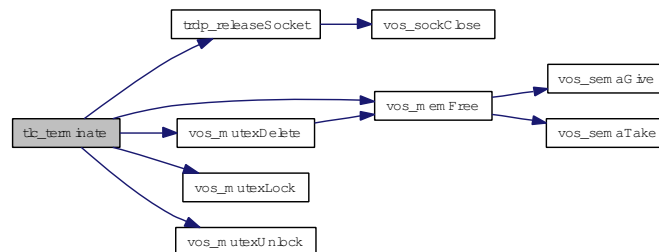
5.8.2.7 TRDP_ERR_T tlc_terminate (TRDP_APP_SESSION_T appHandle)

Un-Initialize Clean up when app quits.

Un-Initialize.

Mainly used for debugging/test runs

Here is the call graph for this function:



5.8.2.8 EXT_DECL TRDP_ERR_T tlp_get (TRDP_APP_SESSION_T appHandle, TRDP_SUB_T subHandle, TRDP_FLAGS_T pktFlags, TRDP_PD_INFO_T *pPdInfo, UINT8 *pData, UINT32 *pDataSize)

Get the last valid PD message.

This allows polling of PDs instead of event driven handling by callbacks

Parameters:

← *appHandle* the handle returned by tlc_init
 ← *subHandle* the handle returned by subscription
 ← *pktFlags* OPTION: TRDP_FLAGS_MARSHALL
 ↔ *pPdInfo* pointer to application's info buffer
 ↔ *pData* pointer to application's data buffer
 ↔ *pDataSize* in: size of buffer, out: size of data

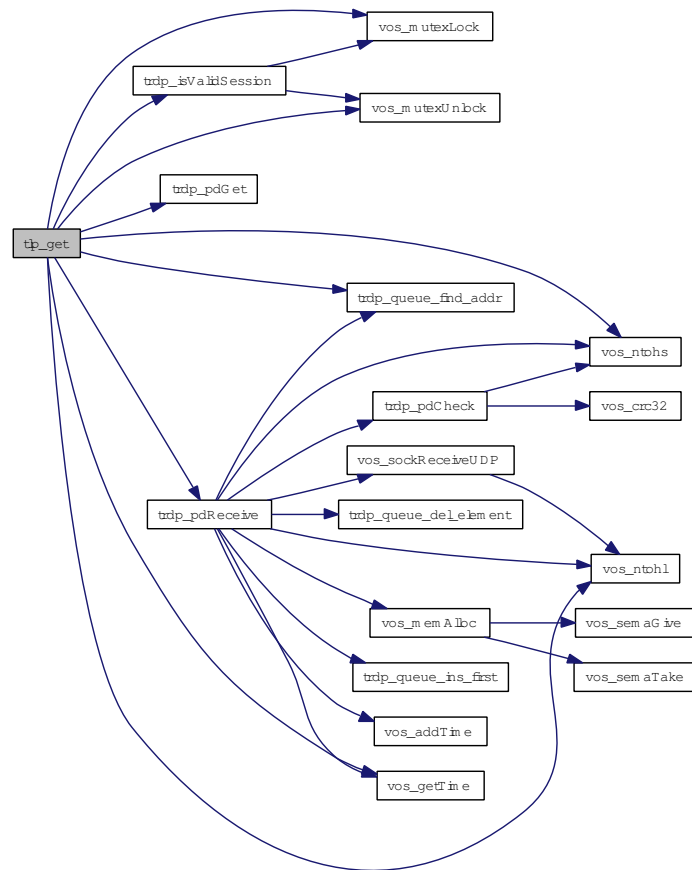
Return values:

TRDP_NO_ERR no error
TRDP_PARAM_ERR parameter error
TRDP_SUB_ERR not subscribed

TRDP_TIMEOUT_ERR packet timed out

TRDP_NOINIT_ERR handle invalid

Here is the call graph for this function:



5.8.2.9 EXT_DECL TRDP_ERR_T tlp_getRedundant (TRDP_APP_SESSION_T appHandle, UINT32 redId, BOOL * pLeader)

Get status of redundant ComIds.

Parameters:

- ← **appHandle** the handle returned by tlc_init
- ← **redId** will be returned for all ComID's with the given redId, 0 for all redId
- ↔ **pLeader** TRUE if we send (leader)

Return values:

TRDP_NO_ERR no error

TRDP_PARAM_ERR parameter error / redId not existing

TRDP_NOINIT_ERR handle invalid

Here is the call graph for this function:



5.8.2.10 EXT_DECL TRDP_ERR_T tlp_publish (TRDP_APP_SESSION_T *appHandle*, TRDP_PUB_T * *pPubHandle*, UINT32 *comId*, UINT32 *topoCount*, TRDP_IP_ADDR_T *srcIpAddr*, TRDP_IP_ADDR_T *destIpAddr*, UINT32 *interval*, UINT32 *redId*, TRDP_FLAGS_T *pktFlags*, const TRDP_SEND_PARAM_T * *pSendParam*, const UINT8 * *pData*, UINT32 *dataSize*, BOOL *subs*, UINT16 *offsetAddress*)

Prepare for sending PD messages.

Queue a PD message, it will be send when trdp_work has been called

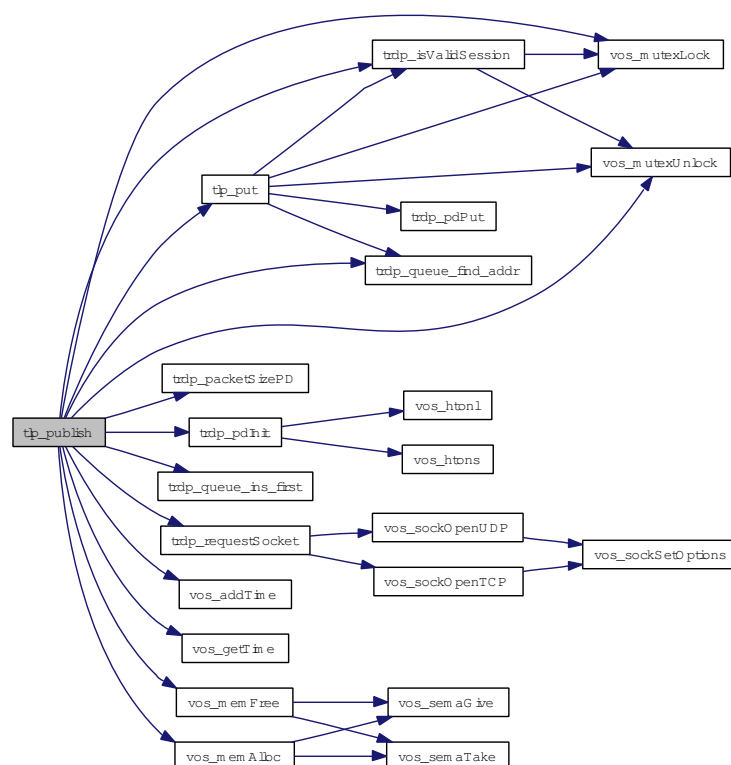
Parameters:

- ← *appHandle* the handle returned by tlc_init
- *pPubHandle* returned handle for related unprepare
- ← *comId* comId of packet to send
- ← *topoCount* valid topocount, 0 for local consist
- ← *srcIpAddr* own IP address, 0 - srcIP will be set by the stack
- ← *destIpAddr* where to send the packet to
- ← *interval* frequency of PD packet (>= 10ms) in usec
- ← *redId* 0 - Non-redundant, > 0 valid redundancy group
- ← *pktFlags* OPTIONS: TRDP_FLAGS_MARSHALL, TRDP_FLAGS_CALLBACK
- ← *pSendParam* optional pointer to send parameter, NULL - default parameters are used
- ← *pData* pointer to packet data / dataset
- ← *dataSize* size of packet data <= 1436 without FCS
- ← *subs* substitution (Ladder)
- ← *offsetAddress* offset (Ladder)

Return values:

- TRDP_NO_ERR** no error
- TRDP_PARAM_ERR** parameter error
- TRDP_MEM_ERR** could not insert (out of memory)
- TRDP_NOINIT_ERR** handle invalid
- TRDP_NOPUB_ERR** Already published

Here is the call graph for this function:



5.8.2.11 TRDP_ERR_T trdp_put (TRDP_APP_SESSION_T *appHandle*, TRDP_PUB_T *pubHandle*, const UINT8 * *pData*, UINT32 *dataSize*)

Update the process data to send.

Update previously published data. The new telegram will be sent earliest when tlc_process is called.

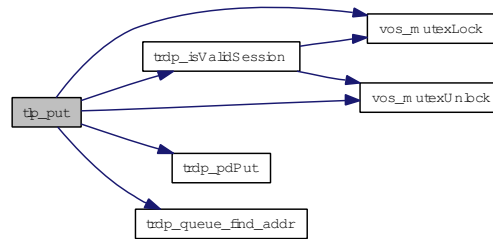
Parameters:

- ← *appHandle* the handle returned by tlc_init
- ← *pubHandle* the handle returned by publish
- ↔ *pData* pointer to application's data buffer
- ↔ *dataSize* size of data

Return values:

- TRDP_NO_ERR** no error
- TRDP_PARAM_ERR** parameter error
- TRDP_NOPUB_ERR** not published
- TRDP_NOINIT_ERR** handle invalid

Here is the call graph for this function:



5.8.2.12 TRDP_ERR_T tlp_setRedundant (TRDP_APP_SESSION_T *appHandle*, UINT32 *redId*, BOOL *leader*)

Do not send non-redundant PDs when we are follower.

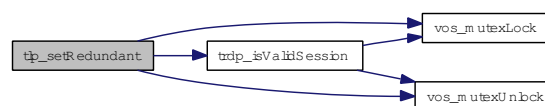
Parameters:

- ← *appHandle* the handle returned by tlc_init
- ← *redId* will be set for all ComID's with the given redId, 0 to change for all redId
- ← *leader* TRUE if we send

Return values:

- TRDP_NO_ERR** no error
- TRDP_PARAM_ERR** parameter error / redId not existing
- TRDP_NOINIT_ERR** handle invalid

Here is the call graph for this function:



5.8.2.13 EXT_DECL TRDP_ERR_T tlp_subscribe (TRDP_APP_SESSION_T *appHandle*, TRDP_SUB_T * *pSubHandle*, const void * *pUserRef*, UINT32 *comId*, UINT32 *topoCount*, TRDP_IP_ADDR_T *srcIpAddr1*, TRDP_IP_ADDR_T *srcIpAddr2*, TRDP_IP_ADDR_T *destIpAddr*, UINT32 *timeout*, TRDP_TO_BEHAVIOR_T *toBehavior*, UINT32 *maxDataSize*)

Prepare for receiving PD messages.

Subscribe to a specific PD ComID and source IP To unsubscribe, set maxDataSize to zero!

Parameters:

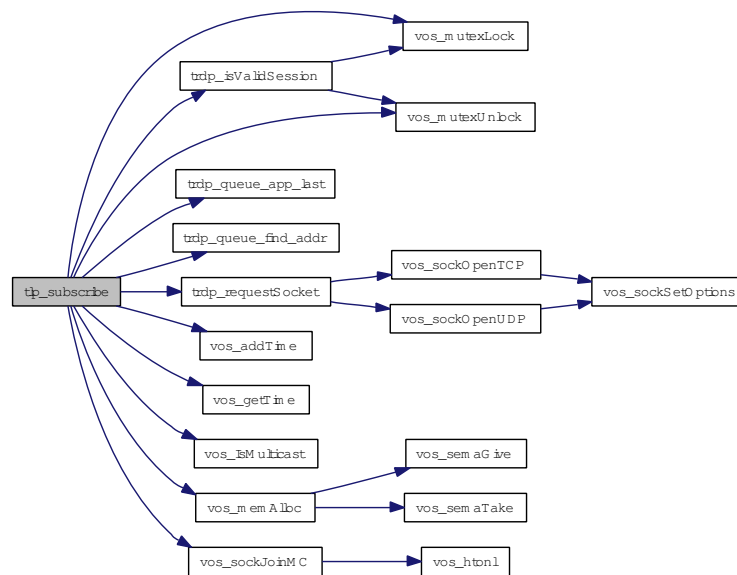
- ← *appHandle* the handle returned by tlc_init

- **pSubHandle** return a handle for these messages
- ← **pUserRef** user supplied value returned within the info structure
- ← **comId** comId of packet to receive
- ← **topoCount** valid topocount, 0 for local consist
- ← **srcIpAddr1** IP for source filtering, set 0 if not used
- ← **srcIpAddr2** Second source IP address for source filtering, set to zero if not used. Used e.g. for source filtering of redundant devices.
- ← **destIpAddr** IP address to join
- ← **timeout** timeout (≥ 10 ms) in usec
- ← **toBehavior** timeout behavior
- ← **maxDataSize** expected max. size of packet data

Return values:

- TRDP_NO_ERR** no error
- TRDP_PARAM_ERR** parameter error
- TRDP_MEM_ERR** could not reserve memory (out of memory)
- TRDP_NOINIT_ERR** handle invalid

Here is the call graph for this function:



5.8.2.14 TRDP_ERR_T tlp_unpublish (TRDP_APP_SESSION_T appHandle, TRDP_PUB_T pubHandle)

Stop sending PD messages.

Parameters:

- ← **appHandle** the handle returned by tlc_init

← *pubHandle* the handle returned by prepare

Return values:

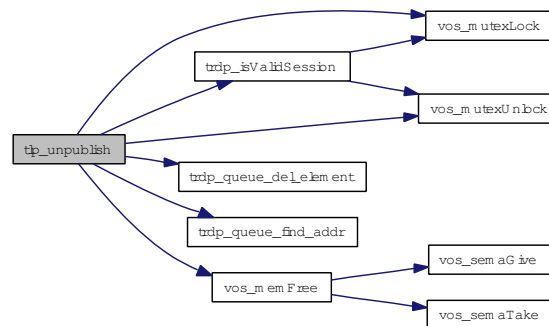
TRDP_NO_ERR no error

TRDP_PARAM_ERR parameter error

TRDP_NOPUB_ERR not published

TRDP_NOINIT_ERR handle invalid

Here is the call graph for this function:



5.8.2.15 EXT_DECL TRDP_ERR_T tlp_unsubscribe (TRDP_APP_SESSION_T appHandle, TRDP_SUB_T subHandle)

Stop receiving PD messages.

Unsubscribe to a specific PD ComID

Parameters:

← *appHandle* the handle returned by tlc_init

← *subHandle* the handle returned by subscription

Return values:

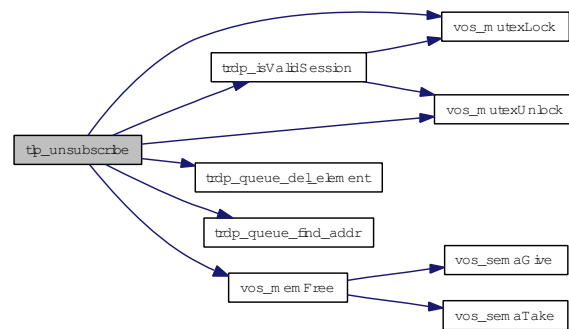
TRDP_NO_ERR no error

TRDP_PARAM_ERR parameter error

TRDP_SUB_ERR not subscribed

TRDP_NOINIT_ERR handle invalid

Here is the call graph for this function:



5.8.2.16 **BOOL** trdp_isValidSession (TRDP_APP_SESSION_T *pSessionHandle*)

Check if the session handle is valid.

Parameters:

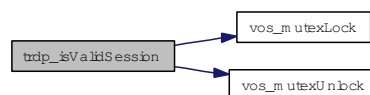
← *pSessionHandle* pointer to packet data (dataset)

Return values:

TRUE is valid

FALSE is invalid

Here is the call graph for this function:



5.8.2.17 **TRDP_APP_SESSION_T*** trdp_sessionQueue (void)

Get the session queue head pointer.

Return values:

&sSession

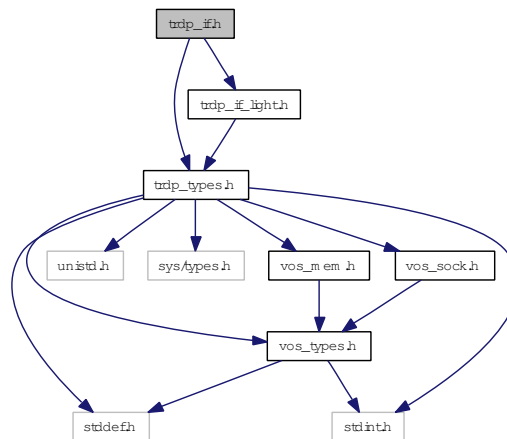
5.9 trdp_if.h File Reference

Typedefs for TRDP communication.

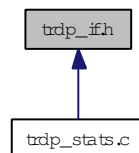
```
#include "trdp_types.h"
```

```
#include "trdp_if_light.h"
```

Include dependency graph for trdp_if.h:



This graph shows which files directly or indirectly include this file:



Functions

- [BOOL trdp_isValidSession](#) ([TRDP_APP_SESSION_T](#) pSessionHandle)
Check if the session handle is valid.
- [TRDP_APP_SESSION_T *](#) [trdp_sessionQueue](#) (void)
Get the session queue head pointer.

5.9.1 Detailed Description

Typedefs for TRDP communication.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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Id

[trdp_if.h](#) 3 2012-06-04 12:52:54Z 97025

5.9.2 Function Documentation**5.9.2.1 BOOL trdp_isValidSession (TRDP_APP_SESSION_T *pSessionHandle*)**

Check if the session handle is valid.

Parameters:

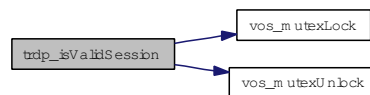
← *pSessionHandle* pointer to packet data (dataset)

Return values:

TRUE is valid

FALSE is invalid

Here is the call graph for this function:

**5.9.2.2 TRDP_APP_SESSION_T* trdp_sessionQueue (void)**

Get the session queue head pointer.

Return values:

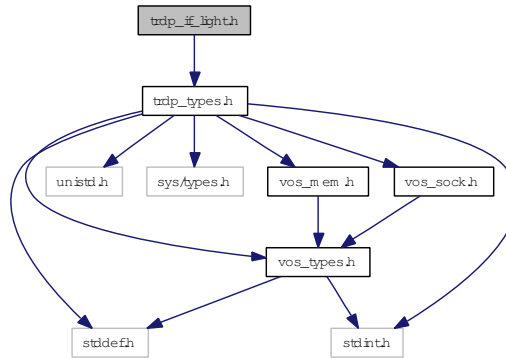
&sSession

5.10 trdp_if_light.h File Reference

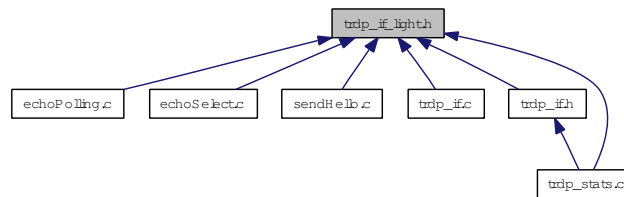
TRDP Light interface functions (API).

```
#include "trdp_types.h"
```

Include dependency graph for trdp_if_light.h:



This graph shows which files directly or indirectly include this file:



Defines

- `#define MD_SUPPORT 1`

Support for message data can only be excluded during compile time!

Functions

- `EXT_DECL TRDP_ERR_T tlc_init (TRDP_APP_SESSION_T *pAppHandle, TRDP_IP_ADDR_T ownIpAddr, TRDP_IP_ADDR_T leaderIpAddr, const TRDP_PRINT_DBG_T pPrintDebugString, const TRDP_MARSHALL_CONFIG_T *pMarshall, const TRDP_PD_CONFIG_T *pPdDefault, const TRDP_MD_CONFIG_T *pMdDefault, const TRDP_MEM_CONFIG_T *pMemConfig, TRDP_OPTION_T option)`

Initialize the TRDP stack.

- `EXT_DECL TRDP_ERR_T tlc_reinit (TRDP_APP_SESSION_T appHandle)`

Re-Initialize.

- `EXT_DECL TRDP_ERR_T tlc_terminate (TRDP_APP_SESSION_T appHandle)`

Un-Initialize.

- EXT_DECL void [tlc_setTopoCount](#) (UINT32 topoCount)
Set new topocount for trainwide communication.
- EXT_DECL [TRDP_ERR_T tlc_freeBuf](#) ([TRDP_APP_SESSION_T](#) appHandle, char *pBuf)
Frees the buffer reserved by the TRDP layer.
- EXT_DECL [TRDP_ERR_T tlc_getInterval](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_TIME_T](#) *pInterval, [TRDP_FDS_T](#) *pFileDesc, INT32 *pNoDesc)
Get the lowest time interval for PDs.
- EXT_DECL [TRDP_ERR_T tlc_process](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_FDS_T](#) *pRfds, INT32 *pCount)
Work loop of the TRDP handler.
- EXT_DECL [TRDP_ERR_T tlp_publish](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_PUB_T](#) *pPubHandle, UINT32 comId, UINT32 topoCount, [TRDP_IP_ADDR_T](#) srcIpAddr, [TRDP_IP_ADDR_T](#) destIpAddr, UINT32 interval, UINT32 redId, [TRDP_FLAGS_T](#) pktFlags, const [TRDP_SEND_PARAM_T](#) *pSendParam, const UINT8 *pData, UINT32 dataSize, BOOL subs, UINT16 offsetAddress)
Prepare for sending PD messages.
- EXT_DECL [TRDP_ERR_T tlp_unpublish](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_PUB_T](#) pubHandle)
Stop sending PD messages.
- EXT_DECL [TRDP_ERR_T tlp_put](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_PUB_T](#) pubHandle, const UINT8 *pData, UINT32 dataSize)
Update the process data to send.
- EXT_DECL [TRDP_ERR_T tlp_setRedundant](#) ([TRDP_APP_SESSION_T](#) appHandle, UINT32 redId, BOOL leader)
Do not send non-redundant PDs when we are follower.
- EXT_DECL [TRDP_ERR_T tlp_getRedundant](#) ([TRDP_APP_SESSION_T](#) appHandle, UINT32 redId, BOOL *pLeader)
Get status of redundant ComIds.
- EXT_DECL [TRDP_ERR_T tlp_request](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_SUB_T](#) subHandle, UINT32 comId, UINT32 topoCount, [TRDP_IP_ADDR_T](#) srcIpAddr, [TRDP_IP_ADDR_T](#) destIpAddr, UINT32 redId, [TRDP_FLAGS_T](#) pktFlags, const [TRDP_SEND_PARAM_T](#) *pSendParam, const UINT8 *pData, UINT32 dataSize, UINT32 replyComId, [TRDP_IP_ADDR_T](#) replyIpAddr, BOOL subs, UINT16 offsetAddr)
Initiate sending PD messages (PULL).
- EXT_DECL [TRDP_ERR_T tlp_subscribe](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_SUB_T](#) *pSubHandle, const void *pUserRef, UINT32 comId, UINT32 topoCount, [TRDP_IP_ADDR_T](#) srcIpAddr1, [TRDP_IP_ADDR_T](#) srcIpAddr2, [TRDP_IP_ADDR_T](#) destIpAddr, UINT32 timeout, [TRDP_TO_BEHAVIOR_T](#) toBehavior, UINT32 maxDataSize)
Prepare for receiving PD messages.

- EXT_DECL [TRDP_ERR_T tlp_unsubscribe](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_SUB_T](#) subHandle)
Stop receiving PD messages.
- EXT_DECL [TRDP_ERR_T tlp_get](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_SUB_T](#) subHandle, [TRDP_FLAGS_T](#) pktFlags, [TRDP_PD_INFO_T](#) *pPdInfo, [UINT8](#) *pData, [UINT32](#) *pDataSize)
Get the last valid PD message.
- EXT_DECL [TRDP_ERR_T tlm_notify](#) ([TRDP_APP_SESSION_T](#) appHandle, [const void](#) *pUserRef, [UINT32](#) comId, [UINT32](#) topoCount, [TRDP_IP_ADDR_T](#) srcIpAddr, [TRDP_IP_ADDR_T](#) destIpAddr, [TRDP_FLAGS_T](#) pktFlags, [const TRDP_SEND_PARAM_T](#) *pSendParam, [const UINT8](#) *pData, [UINT32](#) dataSize, [const TRDP_URI_USER_T](#) sourceURI, [const TRDP_URI_USER_T](#) destURI)
Initiate sending MD notification message.
- EXT_DECL [TRDP_ERR_T tlm_request](#) ([TRDP_APP_SESSION_T](#) appHandle, [const void](#) *pUserRef, [TRDP_UUID_T](#) *pSessionId, [UINT32](#) comId, [UINT32](#) topoCount, [TRDP_IP_ADDR_T](#) srcIpAddr, [TRDP_IP_ADDR_T](#) destIpAddr, [TRDP_FLAGS_T](#) pktFlags, [UINT32](#) noOfReplifiers, [UINT32](#) replyTimeout, [const TRDP_SEND_PARAM_T](#) *pSendParam, [const UINT8](#) *pData, [UINT32](#) dataSize, [const TRDP_URI_USER_T](#) srcURI, [const TRDP_URI_USER_T](#) destURI)
Initiate sending MD request message.
- EXT_DECL [TRDP_ERR_T tlm_confirm](#) ([TRDP_APP_SESSION_T](#) appHandle, [const void](#) *pUserRef, [const TRDP_UUID_T](#) *pSessionId, [UINT32](#) comId, [UINT32](#) topoCount, [TRDP_IP_ADDR_T](#) srcIpAddr, [TRDP_IP_ADDR_T](#) destIpAddr, [TRDP_FLAGS_T](#) pktFlags, [UINT16](#) userStatus, [TRDP_REPLY_STATUS_T](#) replyStatus, [const TRDP_SEND_PARAM_T](#) *pSendParam, [const TRDP_URI_USER_T](#) srcURI, [const TRDP_URI_USER_T](#) destURI)
Initiate sending MD confirm message.
- EXT_DECL [TRDP_ERR_T tlm_abortSession](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_UUID_T](#) *pSessionId)
Cancel an open session.
- EXT_DECL [TRDP_ERR_T tlm_addListener](#) ([TRDP_APP_SESSION_T](#) appHandle, [UINT32](#) *pListenHandle, [const void](#) *pUserRef, [UINT32](#) comId, [UINT32](#) topoCount, [TRDP_IP_ADDR_T](#) destIpAddr, [TRDP_FLAGS_T](#) pktFlags, [const TRDP_URI_USER_T](#) destURI)
Subscribe to MD messages.
- EXT_DECL [TRDP_ERR_T tlm_delListener](#) ([TRDP_APP_SESSION_T](#) appHandle, [UINT32](#) listenHandle)
Remove Listener.
- EXT_DECL [TRDP_ERR_T tlm_reply](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_MSG_T](#) msgType, [void](#) *pUserRef, [TRDP_UUID_T](#) *pSessionId, [UINT32](#) topoCount, [UINT32](#) comId, [TRDP_IP_ADDR_T](#) srcIpAddr, [TRDP_IP_ADDR_T](#) destIpAddr, [TRDP_FLAGS_T](#) pktFlags, [UINT16](#) userStatus, [TRDP_REPLY_STATUS_T](#) replyState, [UINT32](#) replyTimeout, [const TRDP_SEND_PARAM_T](#) *pSendParam, [const UINT8](#) *pData, [UINT32](#) dataSize, [const TRDP_URI_USER_T](#) srcURI, [const TRDP_URI_USER_T](#) destURI)
Send a MD reply message.
- EXT_DECL [const CHAR8 * tlc_getVersion](#) ([void](#))

Return a human readable version representation.

- EXT_DECL [TRDP_ERR_T](#) [tlc_getStatistics](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_STATISTICS_T](#) **ppStatistics)

Return statistics.

- EXT_DECL [TRDP_ERR_T](#) [tlc_getSubsStatistics](#) ([TRDP_APP_SESSION_T](#) appHandle, [UINT16](#) *pNumSubs, [TRDP_SUBS_STATISTICS_T](#) **ppStatistics)

Return PD subscription statistics.

- EXT_DECL [TRDP_ERR_T](#) [tlc_getPubStatistics](#) ([TRDP_APP_SESSION_T](#) appHandle, [UINT16](#) *pNumPub, [TRDP_PUB_STATISTICS_T](#) **ppStatistics)

Return PD publish statistics.

- EXT_DECL [TRDP_ERR_T](#) [tlc_getListStatistics](#) ([TRDP_APP_SESSION_T](#) appHandle, [UINT16](#) *pNumList, [TRDP_LIST_STATISTICS_T](#) **ppStatistics)

Return MD listener statistics.

- EXT_DECL [TRDP_ERR_T](#) [tlc_getRedStatistics](#) ([TRDP_APP_SESSION_T](#) appHandle, [UINT16](#) *pNumRed, [TRDP_RED_STATISTICS_T](#) **ppStatistics)

Return redundancy group statistics.

- EXT_DECL [TRDP_ERR_T](#) [tlc_getJoinStatistics](#) ([TRDP_APP_SESSION_T](#) appHandle, [UINT16](#) *pNumJoin, [UINT32](#) **ppIpAddr)

Return join statistics.

- EXT_DECL [TRDP_ERR_T](#) [tlc_resetStatistics](#) ([TRDP_APP_SESSION_T](#) appHandle)

Reset statistics.

5.10.1 Detailed Description

TRDP Light interface functions (API).

Low level functions for communicating using the TRDP protocol

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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Id

[trdp_if_light.h](#) 2 2012-06-04 11:25:16Z 97025

5.10.2 Function Documentation

5.10.2.1 EXT_DECL TRDP_ERR_T tlc_freeBuf (TRDP_APP_SESSION_T *appHandle*, char * *pBuf*)

Frees the buffer reserved by the TRDP layer.

Parameters:

- ← *appHandle* The handle returned by tlc_init
- ← *pBuf* pointer to the buffer to be freed

Return values:

- TRDP_NO_ERR** no error
- TRDP_NOINIT_ERR** handle invalid
- TRDP_PARAM_ERR** buffer pointer invalid

5.10.2.2 EXT_DECL TRDP_ERR_T tlc_getInterval (TRDP_APP_SESSION_T *appHandle*, TRDP_TIME_T * *pInterval*, TRDP_FDS_T * *pFileDesc*, INT32 * *pNoDesc*)

Get the lowest time interval for PDs.

Return the maximum time interval suitable for 'select()' so that we can send due PD packets in time. If the PD send queue is empty, return zero time

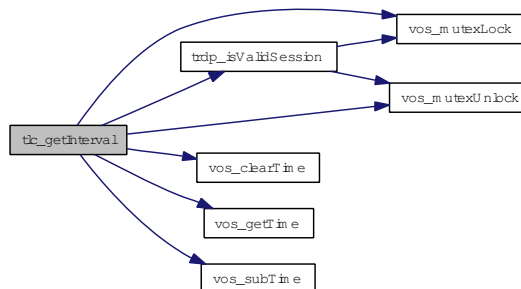
Parameters:

- ← *appHandle* The handle returned by tlc_init
- *pInterval* pointer to needed interval
- ↔ *pFileDesc* pointer to file descriptor set
- *pNoDesc* pointer to put no of used descriptors (for select())

Return values:

- TRDP_NO_ERR** no error
- TRDP_NOINIT_ERR** handle invalid

Here is the call graph for this function:



5.10.2.3 EXT_DECL TRDP_ERR_T tlc_getJoinStatistics (TRDP_APP_SESSION_T *appHandle*, UINT16 **pNumJoin*, UINT32 ***ppIpAddr*)

Return join statistics.

Memory for statistics information will be reserved by tlc layer and needs to be freed by the user.

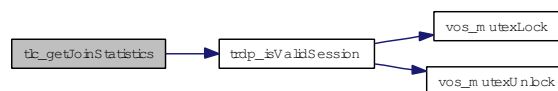
Parameters:

- ← *appHandle* the handle returned by tlc_init
- *pNumJoin* Pointer to the number of joined IP Adresses
- *ppIpAddr* Pointer to a list with the joined IP addresses

Return values:

- TRDP_NO_ERR** no error
- TRDP_NOINIT_ERR** handle invalid
- TRDP_PARAM_ERR** parameter error

Here is the call graph for this function:



5.10.2.4 EXT_DECL TRDP_ERR_T tlc_getListStatistics (TRDP_APP_SESSION_T *appHandle*, UINT16 **pNumList*, TRDP_LIST_STATISTICS_T ***ppStatistics*)

Return MD listener statistics.

Memory for statistics information will be reserved by tlc layer and needs to be freed by the user.

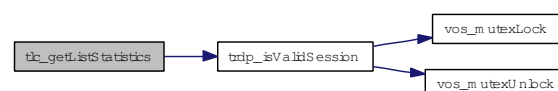
Parameters:

- ← *appHandle* the handle returned by tlc_init
- *pNumList* Pointer to the number of listeners
- *ppStatistics* Pointer to a list with the listener statistics information

Return values:

- TRDP_NO_ERR** no error
- TRDP_NOINIT_ERR** handle invalid
- TRDP_PARAM_ERR** parameter error

Here is the call graph for this function:



5.10.2.5 EXT_DECL TRDP_ERR_T tlc_getPubStatistics (TRDP_APP_SESSION_T appHandle, UINT16 *pNumPub, TRDP_PUB_STATISTICS_T **ppStatistics)

Return PD publish statistics.

Memory for statistics information will be reserved by tlc layer and needs to be freed by the user.

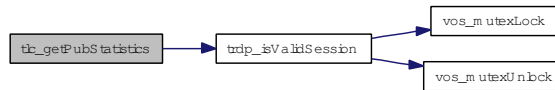
Parameters:

- ← *appHandle* the handle returned by tlc_init
- *pNumPub* Pointer to the number of publishers
- *ppStatistics* Pointer to a list with the publish statistics information

Return values:

- TRDP_NO_ERR* no error
- TRDP_NOINIT_ERR* handle invalid
- TRDP_PARAM_ERR* parameter error

Here is the call graph for this function:



5.10.2.6 EXT_DECL TRDP_ERR_T tlc_getRedStatistics (TRDP_APP_SESSION_T appHandle, UINT16 *pNumRed, TRDP_RED_STATISTICS_T **ppStatistics)

Return redundancy group statistics.

Memory for statistics information will be reserved by tlc layer and needs to be freed by the user.

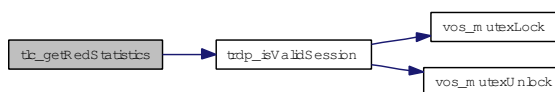
Parameters:

- ← *appHandle* the handle returned by tlc_init
- *pNumRed* Pointer to the number of redundancy groups
- *ppStatistics* Pointer to a list with the redundancy group information

Return values:

- TRDP_NO_ERR* no error
- TRDP_NOINIT_ERR* handle invalid
- TRDP_PARAM_ERR* parameter error

Here is the call graph for this function:



5.10.2.7 EXT_DECL TRDP_ERR_T tlc_getStatistics (TRDP_APP_SESSION_T *appHandle*, TRDP_STATISTICS_T ***ppStatistics*)

Return statistics.

Memory for statistics information will be reserved by tlc layer and needs to be freed by the user.

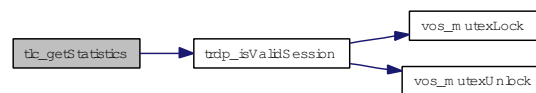
Parameters:

- ← *appHandle* the handle returned by tlc_init
- *ppStatistics* Statistics for this application session

Return values:

- TRDP_NO_ERR** no error
- TRDP_NOINIT_ERR** handle invalid
- TRDP_PARAM_ERR** parameter error

Here is the call graph for this function:



5.10.2.8 EXT_DECL TRDP_ERR_T tlc_getSubsStatistics (TRDP_APP_SESSION_T *appHandle*, UINT16 **pNumSubs*, TRDP_SUBS_STATISTICS_T ***ppStatistics*)

Return PD subscription statistics.

Memory for statistics information will be reserved by tlc layer and needs to be freed by the user.

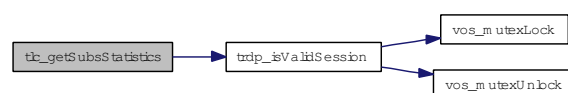
Parameters:

- ← *appHandle* the handle returned by tlc_init
- *pNumSubs* Pointer to the number of subscriptions
- *ppStatistics* Pointer to a list with the subscription statistics information

Return values:

- TRDP_NO_ERR** no error
- TRDP_NOINIT_ERR** handle invalid
- TRDP_PARAM_ERR** parameter error

Here is the call graph for this function:



5.10.2.9 EXT_DECL const CHAR8* tlc_getVersion (void)

Return a human readable version representation.

Return string in the form 'v.r.u.b'

Return values:

const string

5.10.2.10 EXT_DECL TRDP_ERR_T tlc_init (TRDP_APP_SESSION_T * pAppHandle, TRDP_IP_ADDR_T ownIpAddr, TRDP_IP_ADDR_T leaderIpAddr, const TRDP_PRINT_DBG_T pPrintDebugString, const TRDP_MARSHALL_CONFIG_T * pMarshall, const TRDP_PD_CONFIG_T * pPdDefault, const TRDP_MD_CONFIG_T * pMdDefault, const TRDP_MEM_CONFIG_T * pMemConfig, TRDP_OPTION_T option)

Initialize the TRDP stack.

tlc_init returns in pAppHandle a unique handle to be used in further calls to the stack.

Parameters:

- *pAppHandle* A handle for further calls to the trdp stack
- ← *ownIpAddr* Own IP address, can be different for each process in multiprocessing systems
- ← *leaderIpAddr* IP address of redundancy leader
- ← *pPrintDebugString* Pointer to debug print function
- ← *pMarshall* Pointer to marshalling configuration
- ← *pPdDefault* Pointer to default PD configuration
- ← *pMdDefault* Pointer to default MD configuration
- ← *pMemConfig* Pointer to memory configuration
- ← *option* options for library behavior

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* initialization error
- TRDP SOCK_ERR* socket error

tlc_init returns in pAppHandle a unique handle to be used in further calls to the stack.

Parameters:

- *pAppHandle* A handle for further calls to the trdp stack
- ← *ownIpAddr* Own IP address, can be different for each process in multiprocessing systems
- ← *leaderIpAddr* IP address of redundancy leader
- ← *pPrintDebugString* Pointer to debug print function
- ← *pMarshall* Pointer to marshalling configuration
- ← *pPdDefault* Pointer to default PD configuration
- ← *pMdDefault* Pointer to default MD configuration

← *pMemConfig* Pointer to memory configuration

← *option* options for library behavior

Return values:

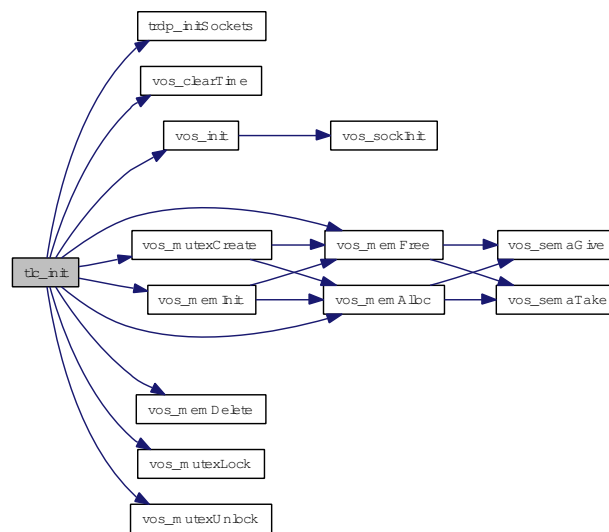
TRDP_NO_ERR no error

TRDP_MEM_ERR memory allocation failed

TRDP_PARAM_ERR initialization error

TRDP SOCK_ERR socket error

Here is the call graph for this function:



5.10.2.11 EXT_DECL TRDP_ERR_T tlc_process (TRDP_APP_SESSION_T appHandle, TRDP_FDS_T *pRfds, INT32 *pCount)

Work loop of the TRDP handler.

Search the queue for pending PDs to be sent Search the receive queue for pending PDs (time out)

Parameters:

← *appHandle* The handle returned by tlc_init

← *pRfds* pointer to set of ready descriptors

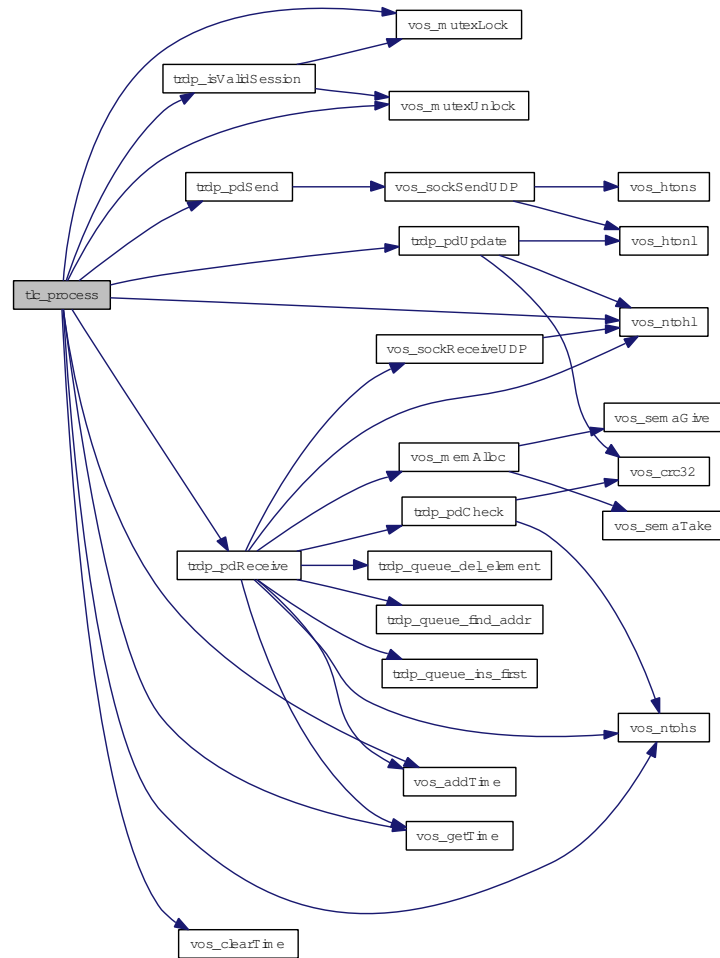
↔ *pCount* pointer to number of ready descriptors

Return values:

TRDP_NO_ERR no error

TRDP_NOINIT_ERR handle invalid

Here is the call graph for this function:



5.10.2.12 EXT_DECL TRDP_ERR_T tlc_reinit (TRDP_APP_SESSION_T appHandle)

Re-Initialize.

Should be called by the application when a link-down/link-up event has occurred during normal operation. We need to re-join the multicast groups...

Parameters:

← *appHandle* The handle returned by tlc_init

Return values:

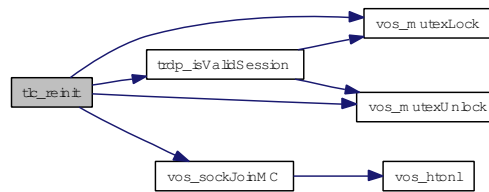
TRDP_NO_ERR no error

TRDP_NOINIT_ERR handle invalid

Re-Initialize.

We re-join

Here is the call graph for this function:



5.10.2.13 EXT_DECL TRDP_ERR_T tlc_resetStatistics (TRDP_APP_SESSION_T *appHandle*)

Reset statistics.

Parameters:

← *appHandle* the handle returned by tlc_init

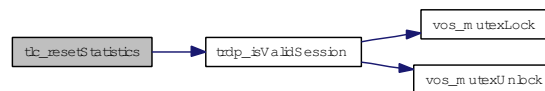
Return values:

TRDP_NO_ERR no error

TRDP_NOINIT_ERR handle invalid

TRDP_PARAM_ERR parameter error

Here is the call graph for this function:



5.10.2.14 EXT_DECL void tlc_setTopoCount (UINT32 *topoCount*)

Set new topocount for trainwide communication.

This value is used for validating outgoing and incoming packets only!

Parameters:

← *topoCount* New topocount value

This value is used for validating outgoing and incoming packets only!

Parameters:

← *topoCount* New topoCount value

5.10.2.15 EXT_DECL TRDP_ERR_T tlc_terminate (TRDP_APP_SESSION_T appHandle)

Un-Initialize.

Clean up when app quits. Mainly used for debugging/test runs. No further calls to library allowed

Parameters:

← *appHandle* The handle returned by tlc_init

Return values:

TRDP_NO_ERR no error

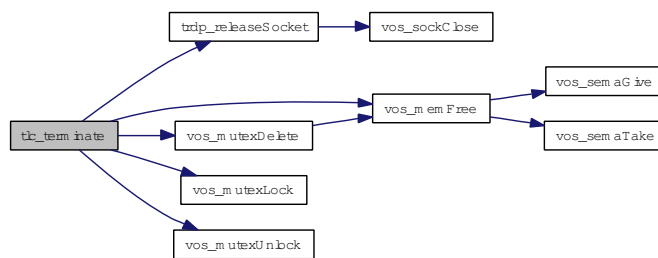
TRDP_NOINIT_ERR handle invalid

TRDP_PARAM_ERR handle NULL

Un-Initialize.

Mainly used for debugging/test runs

Here is the call graph for this function:



5.10.2.16 EXT_DECL TRDP_ERR_T tlm_abortSession (TRDP_APP_SESSION_T appHandle, TRDP_UUID_T *pSessionId)

Cancel an open session.

Abort an open session; any pending messages will be dropped; session id set to zero

Parameters:

← *appHandle* the handle returned by tlc_init

↔ *pSessionId* Session ID returned by request

Return values:

TRDP_NO_ERR no error

TRDP_NO_SESSION_ERR no such session

TRDP_NOINIT_ERR handle invalid

5.10.2.17 EXT_DECL TRDP_ERR_T tlm_addListener (TRDP_APP_SESSION_T *appHandle*, UINT32 * *pListenHandle*, const void * *pUserRef*, UINT32 *comId*, UINT32 *topoCount*, TRDP_IP_ADDR_T *destIpAddr*, TRDP_FLAGS_T *pktFlags*, const TRDP_URI_USER_T *destURI*)

Subscribe to MD messages.

Add a listener to TRDP to get notified when messages are received

Parameters:

- ← *appHandle* the handle returned by tlc_init
- *pListenHandle* Listener ID returned
- ← *pUserRef* user supplied value returned with reply
- ← *comId* comId to be observed
- ← *topoCount* topocount to use
- ← *destIpAddr* destination IP address
- ← *pktFlags* optional marshalling
- ← *destURI* only functional group of destination URI

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* parameter error
- TRDP_MEM_ERR* out of memory
- TRDP_NOINIT_ERR* handle invalid

5.10.2.18 EXT_DECL TRDP_ERR_T tlm_confirm (TRDP_APP_SESSION_T *appHandle*, const void * *pUserRef*, const TRDP_UUID_T * *pSessionId*, UINT32 *comId*, UINT32 *topoCount*, TRDP_IP_ADDR_T *srcIpAddr*, TRDP_IP_ADDR_T *destIpAddr*, TRDP_FLAGS_T *pktFlags*, UINT16 *userStatus*, TRDP_REPLY_STATUS_T *replyStatus*, const TRDP_SEND_PARAM_T * *pSendParam*, const TRDP_URI_USER_T *srcURI*, const TRDP_URI_USER_T *destURI*)

Initiate sending MD confirm message.

Send a MD confirmation message

Parameters:

- ← *appHandle* the handle returned by tlc_init
- ← *pUserRef* user supplied value returned with reply
- ← *pSessionId* Session ID returned by request
- ← *comId* comId of packet to be sent
- ← *topoCount* topocount to use
- ← *srcIpAddr* own IP address, 0 - srcIP will be set by the stack
- ← *destIpAddr* where to send the packet to
- ← *pktFlags* OPTION: TRDP_FLAGS_CALLBACK
- ← *userStatus* Info for requester about application errors

- ← *replyStatus* Info for requester about stack errors
- ← *pSendParam* Pointer to send parameters, NULL to use default send parameters
- ← *srcURI* only functional group of source URI
- ← *destURI* only functional group of destination URI

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* parameter error
- TRDP_MEM_ERR* out of memory
- TRDP_NO_SESSION_ERR* no such session
- TRDP_NOINIT_ERR* handle invalid

**5.10.2.19 EXT_DECL TRDP_ERR_T tlm_delListener (TRDP_APP_SESSION_T *appHandle*,
UINT32 *listenHandle*)**

Remove Listener.

Parameters:

- ← *appHandle* the handle returned by tlc_init
- *listenHandle* Listener ID returned

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* parameter error
- TRDP_NOINIT_ERR* handle invalid

**5.10.2.20 EXT_DECL TRDP_ERR_T tlm_notify (TRDP_APP_SESSION_T *appHandle*,
const void * *pUserRef*, UINT32 *comId*, UINT32 *topoCount*, TRDP_IP_ADDR_T
srcIpAddr, TRDP_IP_ADDR_T *destIpAddr*, TRDP_FLAGS_T *pktFlags*, const
TRDP_SEND_PARAM_T * *pSendParam*, const UINT8 * *pData*, UINT32 *dataSize*,
const TRDP_URI_USER_T *sourceURI*, const TRDP_URI_USER_T *destURI*)**

Initiate sending MD notification message.

Send a MD notification message

Parameters:

- ← *appHandle* the handle returned by tlc_init
- ← *pUserRef* user supplied value returned with reply
- ← *comId* comId of packet to be sent
- ← *topoCount* topocount to use
- ← *srcIpAddr* own IP address, 0 - srcIP will be set by the stack
- ← *destIpAddr* where to send the packet to
- ← *pktFlags* OPTIONS: TRDP_FLAGS_MARSHALL, TRDP_FLAGS_CALLBACK

- ← *pSendParam* optional pointer to send parameter, NULL - default parameters are used
- ← *pData* pointer to packet data / dataset
- ← *dataSize* size of packet data
- ← *sourceURI* only functional group of source URI
- ← *destURI* only functional group of destination URI

Return values:

- TRDP_NO_ERR* no error
- TRDP_PARAM_ERR* parameter error
- TRDP_MEM_ERR* out of memory
- TRDP_NOINIT_ERR* handle invalid

5.10.2.21 `EXT_DECL TRDP_ERR_T tlm_reply (TRDP_APP_SESSION_T appHandle, TRDP_MSG_T msgType, void * pUserRef, TRDP_UUID_T * pSessionId, UINT32 topoCount, UINT32 comId, TRDP_IP_ADDR_T srcIpAddr, TRDP_IP_ADDR_T destIpAddr, TRDP_FLAGS_T pktFlags, UINT16 userStatus, TRDP_REPLY_STATUS_T replyState, UINT32 replyTimeout, const TRDP_SEND_PARAM_T * pSendParam, const UINT8 * pData, UINT32 dataSize, const TRDP_URI_USER_T srcURI, const TRDP_URI_USER_T destURI)`

Send a MD reply message.

Send a MD reply message after receiving an request

Parameters:

- ← *appHandle* the handle returned by tlc_init
- ← *msgType* Type of message: 'Mp', 'Me', or 'Mq'
- ← *pUserRef* user supplied value returned with reply
- ← *pSessionId* Session ID returned by indication
- ← *topoCount* topocount to use
- ← *comId* comId of packet to be sent
- ← *srcIpAddr* own IP address, 0 - srcIP will be set by the stack
- ← *destIpAddr* where to send the packet to
- ← *pktFlags* optional marshalling
- ← *userStatus* Info for requester about application errors
- ← *replyState* Info for requester about stack errors
- ← *replyTimeout* timeout for reply
- ← *pSendParam* Pointer to send parameters, NULL to use default send parameters
- ← *pData* pointer to packet data / dataset
- ← *dataSize* size of packet data
- ← *srcURI* only user part of source URI
- ← *destURI* only user part of destination URI

Return values:

- TRDP_NO_ERR* no error

TRDP_PARAM_ERR parameter error

TRDP_MEM_ERR out of memory

TRDP_NO_SESSION_ERR no such session

TRDP_NOINIT_ERR handle invalid

5.10.2.22 **EXT_DECL** **TRDP_ERR_T** **tlm_request** (**TRDP_APP_SESSION_T** *appHandle*,
const void * *pUserRef*, **TRDP_UUID_T** * *pSessionId*, **UINT32** *comId*, **UINT32**
topoCount, **TRDP_IP_ADDR_T** *srcIpAddr*, **TRDP_IP_ADDR_T** *destIpAddr*,
TRDP_FLAGS_T *pktFlags*, **UINT32** *noOfRepliers*, **UINT32** *replyTimeout*, const
TRDP_SEND_PARAM_T * *pSendParam*, const **UINT8** * *pData*, **UINT32** *dataSize*,
const **TRDP_URI_USER_T** *srcURI*, const **TRDP_URI_USER_T** *destURI*)

Initiate sending MD request message.

Send a MD request message

Parameters:

- ← *appHandle* the handle returned by `tlc_init`
- ← *pUserRef* user supplied value returned with reply
- *pSessionId* return session ID
- ← *comId* comId of packet to be sent
- ← *topoCount* topocount to use
- ← *srcIpAddr* own IP address, 0 - srcIP will be set by the stack
- ← *destIpAddr* where to send the packet to
- ← *pktFlags* OPTIONS: **TRDP_FLAGS_MARSHALL**, **TRDP_FLAGS_CALLBACK**
- ← *noOfRepliers* number of expected repliers, 0 if unknown
- ← *replyTimeout* timeout for reply
- ← *pSendParam* Pointer to send parameters, NULL to use default send parameters
- ← *pData* pointer to packet data / dataset
- ← *dataSize* size of packet data
- ← *srcURI* only functional group of source URI
- ← *destURI* only functional group of destination URI

Return values:

TRDP_NO_ERR no error

TRDP_PARAM_ERR parameter error

TRDP_MEM_ERR out of memory

TRDP_NOINIT_ERR handle invalid

5.10.2.23 EXT_DECL TRDP_ERR_T tlp_get (TRDP_APP_SESSION_T *appHandle*, TRDP_SUB_T *subHandle*, TRDP_FLAGS_T *pktFlags*, TRDP_PD_INFO_T **pPdInfo*, UINT8 **pData*, UINT32 **pDataSize*)

Get the last valid PD message.

This allows polling of PDs instead of event driven handling by callback

Parameters:

- ← *appHandle* the handle returned by tlc_init
- ← *subHandle* the handle returned by subscription
- ← *pktFlags* OPTION: TRDP_FLAGS_MARSHALL
- ↔ *pPdInfo* pointer to application's info buffer
- ↔ *pData* pointer to application's data buffer
- ↔ *pDataSize* in: size of buffer, out: size of data

Return values:

- TRDP_NO_ERR** no error
- TRDP_PARAM_ERR** parameter error
- TRDP_SUB_ERR** not subscribed
- TRDP_TIMEOUT_ERR** packet timed out
- TRDP_NOINIT_ERR** handle invalid

This allows polling of PDs instead of event driven handling by callbacks

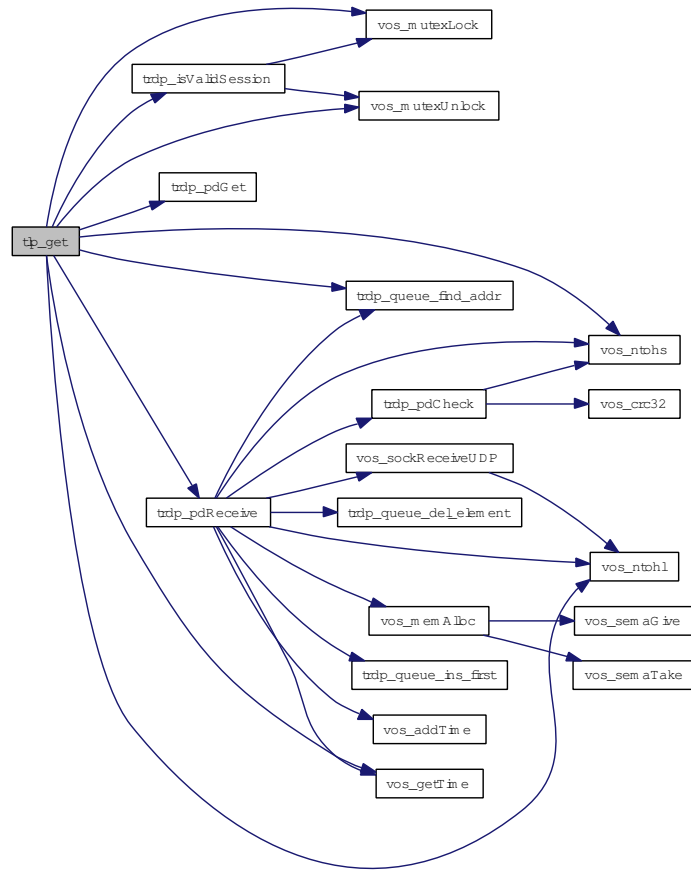
Parameters:

- ← *appHandle* the handle returned by tlc_init
- ← *subHandle* the handle returned by subscription
- ← *pktFlags* OPTION: TRDP_FLAGS_MARSHALL
- ↔ *pPdInfo* pointer to application's info buffer
- ↔ *pData* pointer to application's data buffer
- ↔ *pDataSize* in: size of buffer, out: size of data

Return values:

- TRDP_NO_ERR** no error
- TRDP_PARAM_ERR** parameter error
- TRDP_SUB_ERR** not subscribed
- TRDP_TIMEOUT_ERR** packet timed out
- TRDP_NOINIT_ERR** handle invalid

Here is the call graph for this function:



5.10.2.24 EXT_DECL TRDP_ERR_T tlp_getRedundant (TRDP_APP_SESSION_T appHandle, UINT32 redId, BOOL * pLeader)

Get status of redundant ComIds.

Parameters:

- ← **appHandle** the handle returned by tlc_init
- ← **redId** will be set for all ComID's with the given redId, 0 for all redId
- ↔ **pLeader** TRUE if we send (leader)

Return values:

- TRDP_NO_ERR** no error
- TRDP_PARAM_ERR** parameter error / redId not existing
- TRDP_NOINIT_ERR** handle invalid

Parameters:

- ← **appHandle** the handle returned by tlc_init

← **redId** will be returned for all ComID's with the given redId, 0 for all redId
 ↔ **pLeader** TRUE if we send (leader)

Return values:

TRDP_NO_ERR no error
TRDP_PARAM_ERR parameter error / redId not existing
TRDP_NOINIT_ERR handle invalid

Here is the call graph for this function:



5.10.2.25 **EXT_DECL** **TRDP_ERR_T** **tlp_publish** (**TRDP_APP_SESSION_T** *appHandle*, **TRDP_PUB_T** * *pPubHandle*, **UINT32** *comId*, **UINT32** *topoCount*, **TRDP_IP_ADDR_T** *srcIpAddr*, **TRDP_IP_ADDR_T** *destIpAddr*, **UINT32** *interval*, **UINT32** *redId*, **TRDP_FLAGS_T** *pktFlags*, **const** **TRDP_SEND_PARAM_T** * *pSendParam*, **const** **UINT8** * *pData*, **UINT32** *dataSize*, **BOOL** *subs*, **UINT16** *offsetAddress*)

Prepare for sending PD messages.

Queue a PD message, it will be send when trdp_work has been called

Parameters:

← **appHandle** the handle returned by tlc_init
 → **pPubHandle** returned handle for related unprepare
 ← **comId** comId of packet to send
 ← **topoCount** valid topocount, 0 for local consist
 ← **srcIpAddr** own IP address, 0 - srcIP will be set by the stack
 ← **destIpAddr** where to send the packet to
 ← **interval** frequency of PD packet (>= 10ms) in usec
 ← **redId** 0 - Non-redundant, > 0 valid redundancy group
 ← **pktFlags** OPTIONS: **TRDP_FLAGS_MARSHALL**, **TRDP_FLAGS_CALLBACK**
 ← **pSendParam** optional pointer to send parameter, NULL - default parameters are used
 ← **pData** pointer to packet data / dataset
 ← **dataSize** size of packet data
 ← **subs** substitution (Ladder)
 ← **offsetAddress** offset (Ladder)

Return values:

TRDP_NO_ERR no error

TRDP_PARAM_ERR parameter error

TRDP_MEM_ERR could not insert (out of memory)

TRDP_NOINIT_ERR handle invalid

Queue a PD message, it will be send when trdp_work has been called

Parameters:

- ← **appHandle** the handle returned by tlc_init
- **pPubHandle** returned handle for related unprepare
- ← **comId** comId of packet to send
- ← **topoCount** valid topocount, 0 for local consist
- ← **srcIpAddr** own IP address, 0 - srcIP will be set by the stack
- ← **destIpAddr** where to send the packet to
- ← **interval** frequency of PD packet (≥ 10 ms) in usec
- ← **redId** 0 - Non-redundant, > 0 valid redundancy group
- ← **pktFlags** OPTIONS: TRDP_FLAGS_MARSHALL, TRDP_FLAGS_CALLBACK
- ← **pSendParam** optional pointer to send parameter, NULL - default parameters are used
- ← **pData** pointer to packet data / dataset
- ← **dataSize** size of packet data ≤ 1436 without FCS
- ← **subs** substitution (Ladder)
- ← **offsetAddress** offset (Ladder)

Return values:

TRDP_NO_ERR no error

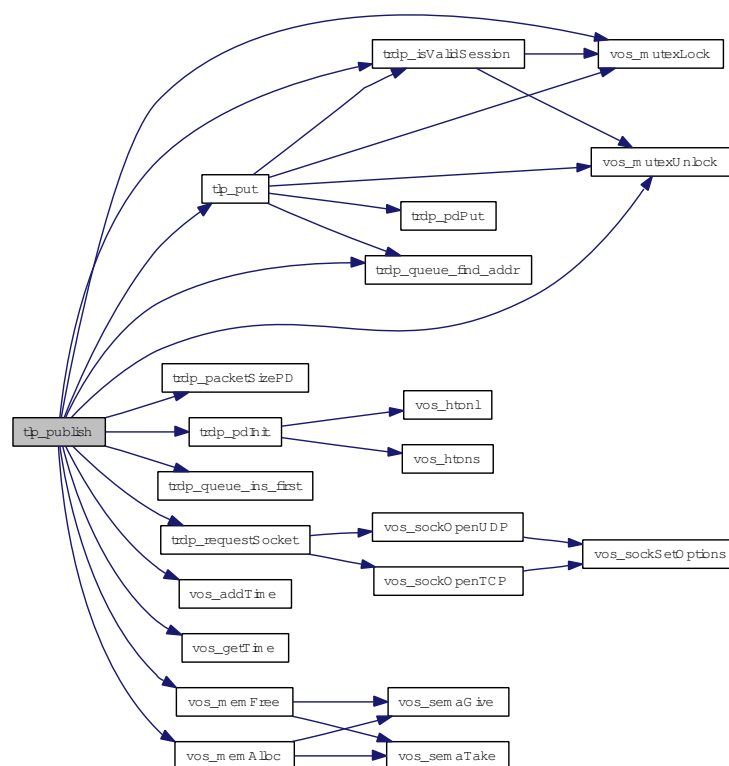
TRDP_PARAM_ERR parameter error

TRDP_MEM_ERR could not insert (out of memory)

TRDP_NOINIT_ERR handle invalid

TRDP_NOPUB_ERR Already published

Here is the call graph for this function:



5.10.2.26 EXT_DECL TRDP_ERR_T trdp_put (TRDP_APP_SESSION_T appHandle, TRDP_PUB_T pubHandle, const UINT8 * pData, UINT32 dataSize)

Update the process data to send.

Update previously published data. The new telegram will be sent earliest when tlc_process is called.

Parameters:

- ← *appHandle* the handle returned by tlc_init
- ← *pubHandle* the handle returned by publish
- ↔ *pData* pointer to application's data buffer
- ↔ *dataSize* size of data

Return values:

- TRDP_NO_ERR** no error
- TRDP_PARAM_ERR** parameter error
- TRDP_PUB_ERR** not published
- TRDP_NOINIT_ERR** handle invalid

Update previously published data. The new telegram will be sent earliest when tlc_process is called.

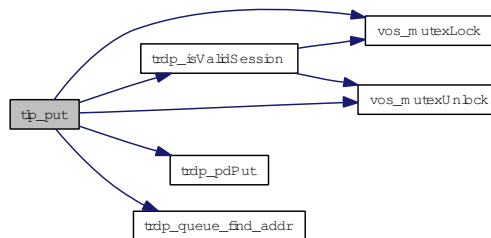
Parameters:

- ← *appHandle* the handle returned by `tlc_init`
- ← *pubHandle* the handle returned by `publish`
- ↔ *pData* pointer to application's data buffer
- ↔ *dataSize* size of data

Return values:

- TRDP_NO_ERR** no error
- TRDP_PARAM_ERR** parameter error
- TRDP_NOPUB_ERR** not published
- TRDP_NOINIT_ERR** handle invalid

Here is the call graph for this function:



5.10.2.27 `EXT_DECL TRDP_ERR_T tlp_request (TRDP_APP_SESSION_T appHandle, TRDP_SUB_T subHandle, UINT32 comId, UINT32 topoCount, TRDP_IP_ADDR_T srcIpAddr, TRDP_IP_ADDR_T destIpAddr, UINT32 redId, TRDP_FLAGS_T pktFlags, const TRDP_SEND_PARAM_T * pSendParam, const UINT8 * pData, UINT32 dataSize, UINT32 replyComId, TRDP_IP_ADDR_T replyIpAddr, BOOL subs, UINT16 offsetAddr)`

Initiate sending PD messages (PULL).

Send a PD request message

Parameters:

- ← *appHandle* the handle returned by `tlc_init`
- ← *subHandle* handle from related subscribe
- ← *comId* comId of packet to be sent
- ← *topoCount* valid topocount, 0 for local consist
- ← *srcIpAddr* own IP address, 0 - srcIP will be set by the stack
- ← *destIpAddr* where to send the packet to
- ← *redId* 0 - Non-redundant, > 0 valid redundancy group
- ← *pktFlags* OPTIONS: `TRDP_FLAGS_MARSHALL`, `TRDP_FLAGS_CALLBACK`
- ← *pSendParam* optional pointer to send parameter, NULL - default parameters are used
- ← *pData* pointer to packet data / dataset

- ← *dataSize* size of packet data
- ← *replyComId* comId of reply
- ← *replyIpAddr* IP for reply
- ← *subs* substitution (Ladder)
- ← *offsetAddr* offset (Ladder)

Return values:

- TRDP_NO_ERR** no error
- TRDP_PARAM_ERR** parameter error
- TRDP_MEM_ERR** could not insert (out of memory)
- TRDP_NOINIT_ERR** handle invalid

5.10.2.28 EXT_DECL TRDP_ERR_T tlp_setRedundant (TRDP_APP_SESSION_T *appHandle*, UINT32 *redId*, BOOL *leader*)

Do not send non-redundant PDs when we are follower.

Parameters:

- ← *appHandle* the handle returned by tlc_init
- ← *redId* will be set for all ComID's with the given redId, 0 to change for all redId
- ← *leader* TRUE if we send

Return values:

- TRDP_NO_ERR** no error
- TRDP_PARAM_ERR** parameter error / redId not existing
- TRDP_NOINIT_ERR** handle invalid

Here is the call graph for this function:



5.10.2.29 EXT_DECL TRDP_ERR_T tlp_subscribe (TRDP_APP_SESSION_T *appHandle*, TRDP_SUB_T * *pSubHandle*, const void * *pUserRef*, UINT32 *comId*, UINT32 *topoCount*, TRDP_IP_ADDR_T *srcIpAddr1*, TRDP_IP_ADDR_T *srcIpAddr2*, TRDP_IP_ADDR_T *destIpAddr*, UINT32 *timeout*, TRDP_TO_BEHAVIOR_T *toBehavior*, UINT32 *maxDataSize*)

Prepare for receiving PD messages.

Subscribe to a specific PD ComID and source IP To unsubscribe, set maxDataSize to zero!

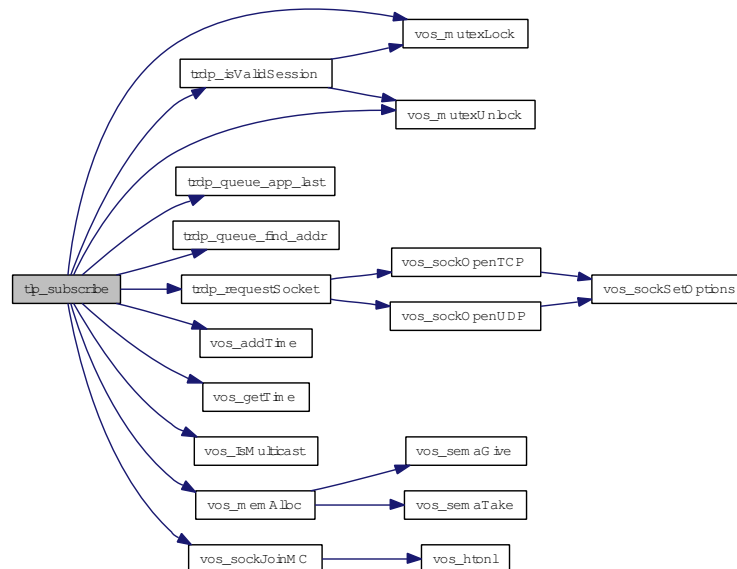
Parameters:

- ← *appHandle* the handle returned by `tlc_init`
- *pSubHandle* return a handle for these messages
- ← *pUserRef* user supplied value returned within the info structure
- ← *comId* comId of packet to receive
- ← *topoCount* valid topocount, 0 for local consist
- ← *srcIpAddr1* IP for source filtering, set 0 if not used
- ← *srcIpAddr2* Second source IP address for source filtering, set to zero if not used. Used e.g. for source filtering of redundant devices.
- ← *destIpAddr* IP address to join
- ← *timeout* timeout (≥ 10 ms) in usec
- ← *toBehavior* timeout behavior
- ← *maxDataSize* expected max. size of packet data

Return values:

- TRDP_NO_ERR** no error
- TRDP_PARAM_ERR** parameter error
- TRDP_MEM_ERR** could not reserve memory (out of memory)
- TRDP_NOINIT_ERR** handle invalid

Here is the call graph for this function:



5.10.2.30 EXT_DECL TRDP_ERR_T tlp_unpublish (TRDP_APP_SESSION_T appHandle, TRDP_PUB_T pubHandle)

Stop sending PD messages.

Parameters:

← *appHandle* the handle returned by tlc_init

← *pubHandle* the handle returned by prepare

Return values:

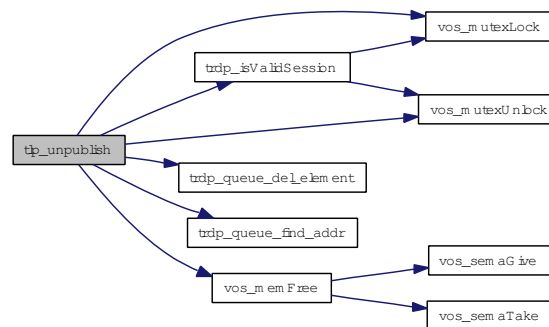
TRDP_NO_ERR no error

TRDP_PARAM_ERR parameter error

TRDP_NOPUB_ERR not published

TRDP_NOINIT_ERR handle invalid

Here is the call graph for this function:



5.10.2.31 EXT_DECL TRDP_ERR_T tlp_unsubscribe (TRDP_APP_SESSION_T *appHandle*, TRDP_SUB_T *subHandle*)

Stop receiving PD messages.

Unsubscribe to a specific PD ComID

Parameters:

← *appHandle* the handle returned by tlc_init

← *subHandle* the handle returned by subscription

Return values:

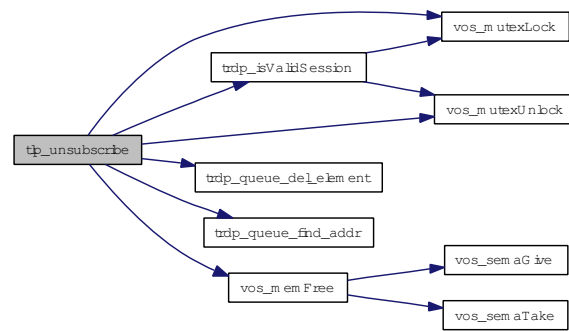
TRDP_NO_ERR no error

TRDP_PARAM_ERR parameter error

TRDP_SUB_ERR not subscribed

TRDP_NOINIT_ERR handle invalid

Here is the call graph for this function:



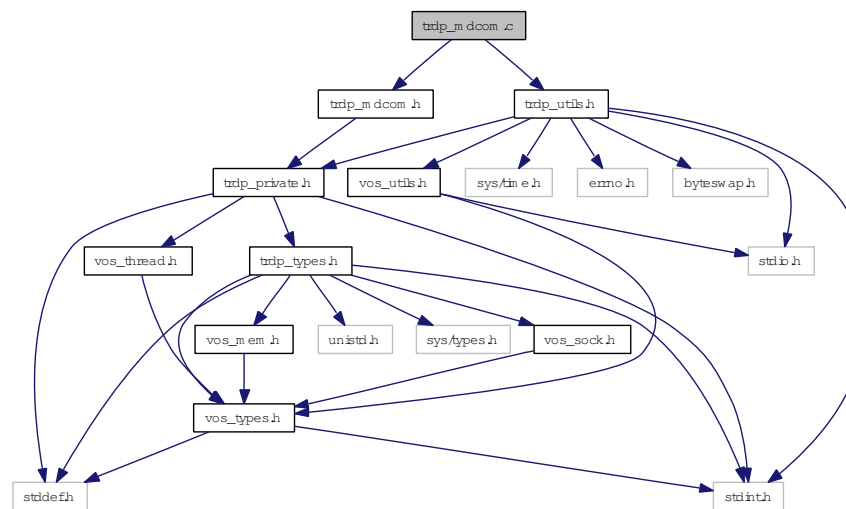
5.11 trdp_mdcom.c File Reference

Functions for MD communication.

```
#include "trdp_utils.h"
```

```
#include "trdp_mdcom.h"
```

Include dependency graph for trdp_mdcom.c:



Functions

- **TRDP_ERR_T trdp_sendMD** (int mdSock, const **MD_ELE_T** *pPacket)
Send MD packet.
- **TRDP_ERR_T trdp_rcvMD** (int mdSock, **MD_HEADER_T** **ppPacket, ssize_t *pSize, uint32_t *pIPAddr)
Receive MD packet.

5.11.1 Detailed Description

Functions for MD communication.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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5.11.2 Function Documentation

5.11.2.1 TRDP_ERR_T trdp_rcvMD (int *mdSock*, MD_HEADER_T ** *ppPacket*, ssize_t * *pSize*, uint32_t * *pIPAddr*)

Receive MD packet.

Parameters:

- ← *mdSock* socket descriptor
- *ppPacket* pointer to pointer to received packet
- *pSize* pointer to size of received packet
- *pIPAddr* pointer to source IP address of packet

Return values:

- TRDP_NO_ERR* no error
- TRDP_UNKNOWN_ERR* error

5.11.2.2 TRDP_ERR_T trdp_sendMD (int *mdSock*, const MD_ELE_T * *pPacket*)

Send MD packet.

Parameters:

- ← *mdSock* socket descriptor
- ← *pPacket* pointer to packet to be sent

Return values:

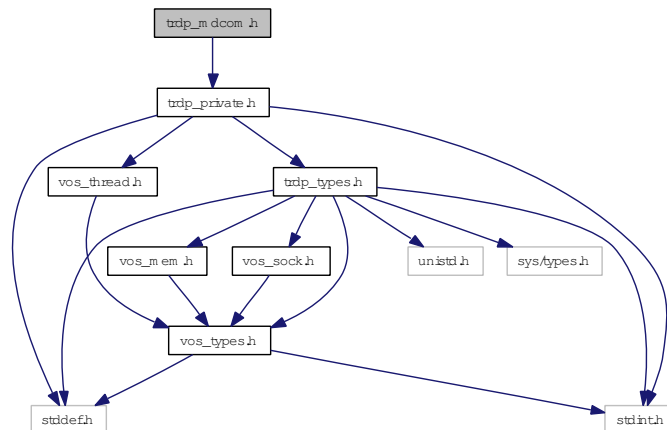
- TRDP_NO_ERR* no error
- TRDP_UNKNOWN_ERR* error

5.12 trdp_mdcom.h File Reference

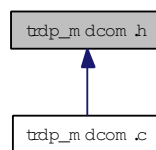
Functions for MD communication.

```
#include "trdp_private.h"
```

Include dependency graph for trdp_mdcom.h:



This graph shows which files directly or indirectly include this file:



Functions

- [TRDP_ERR_T trdp_sendMD](#) (int sock, const [MD_ELEM_T](#) *)
Send MD packet.
- [TRDP_ERR_T trdp_rcvMD](#) (int sock, MD_HEADER_T **pPacket, ssize_t *pSize, uint32_t *pIPAddr)
Receive MD packet.

5.12.1 Detailed Description

Functions for MD communication.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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5.12.2 Function Documentation**5.12.2.1 TRDP_ERR_T trdp_rcvMD (int *mdSock*, MD_HEADER_T ***ppPacket*, ssize_t **pSize*, uint32_t **pIPAddr*)**

Receive MD packet.

Parameters:

- ← *mdSock* socket descriptor
- *ppPacket* pointer to pointer to received packet
- *pSize* pointer to size of received packet
- *pIPAddr* pointer to source IP address of packet

Return values:

- TRDP_NO_ERR* no error
- TRDP_UNKNOWN_ERR* error

5.12.2.2 TRDP_ERR_T trdp_sendMD (int *mdSock*, const MD_ELE_T **pPacket*)

Send MD packet.

Parameters:

- ← *mdSock* socket descriptor
- ← *pPacket* pointer to packet to be sent

Return values:

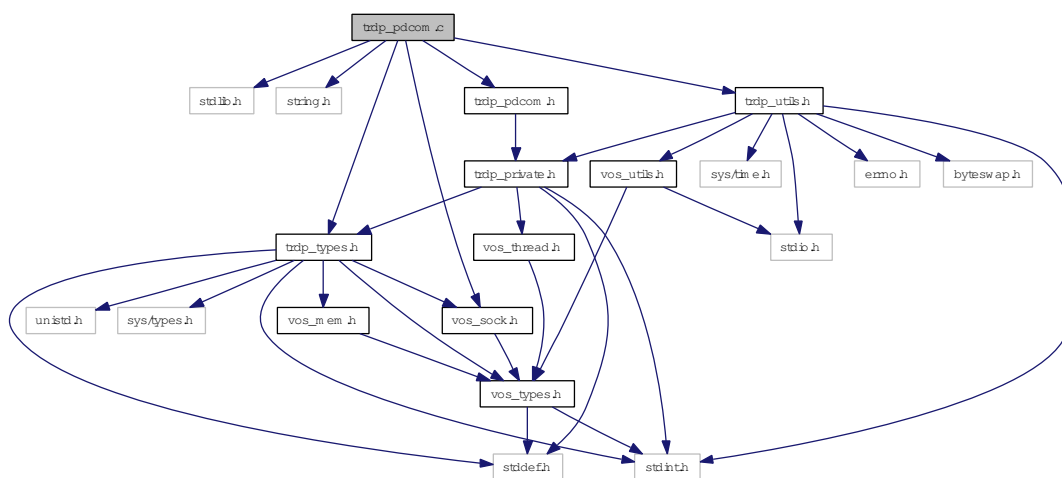
- TRDP_NO_ERR* no error
- TRDP_UNKNOWN_ERR* error

5.13 trdp_pdcom.c File Reference

Functions for PD communication.

```
#include <stdlib.h>
#include <string.h>
#include "trdp_types.h"
#include "trdp_utils.h"
#include "trdp_pdcom.h"
#include "vos_sock.h"
```

Include dependency graph for trdp_pdcom.c:



Functions

- void **trdp_pdInit** (**PD_ELE_T** *pPacket, **TRDP_MSG_T** type, **UINT32** topoCount)
Initialize/construct the packet Set the header infos.
- **TRDP_ERR_T** **trdp_pdPut** (**PD_ELE_T** *pPacket, **TRDP_MARSHALL_T** marshall, void *refCon, const **UINT8** *pData, **UINT32** dataSize)
Copy data Set the header infos.
- **TRDP_ERR_T** **trdp_pdGet** (**PD_ELE_T** *pPacket, **TRDP_UNMARSHALL_T** unmarshall, void *refCon, const **UINT8** *pData, **UINT32** dataSize)
Copy data Set the header infos.
- **TRDP_ERR_T** **trdp_pdReceive** (**TRDP_SESSION_PT** appHandle, **INT32** sock)
Receiving PD messages Read the receive socket for arriving PDs, copy the packet to a new PD_ELE_T Check for protocol errors and compare the received data to the data in our receive queue.
- void **trdp_pdUpdate** (**PD_ELE_T** *pPacket)
Update the header values.

- [TRDP_ERR_T trdp_pdCheck](#) (PD_HEADER_T *pPacket, INT32 packetSize)
Check if the PD header values are sane.
- [TRDP_ERR_T trdp_pdSend](#) (INT32 pdSock, const [PD_ELE_T](#) *pPacket)
Send PD packet.

5.13.1 Detailed Description

Functions for PD communication.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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Id

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5.13.2 Function Documentation

5.13.2.1 TRDP_ERR_T trdp_pdCheck (PD_HEADER_T *pPacket, INT32 packetSize)

Check if the PD header values are sane.

Parameters:

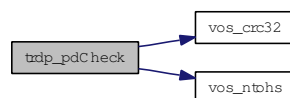
- ← *pPacket* pointer to the packet to update
- ← *packetSize* max size to check

Return values:

TRDP_NO_ERR

TRDP_CRC_ERR

Here is the call graph for this function:



5.13.2.2 void trdp_pdInit (PD_ELE_T * *pPacket*, TRDP_MSG_T *type*, UINT32 *topoCount*)

Initialize/construct the packet Set the header infos.

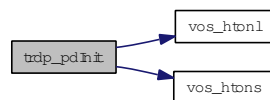
Parameters:

← *pPacket* pointer to the packet element to init

← *type* type the packet

← *topoCount* topocount to use for PD frame

Here is the call graph for this function:



5.13.2.3 TRDP_ERR_T trdp_pdReceive (TRDP_SESSION_PT *appHandle*, INT32 *sock*)

Receiving PD messages Read the receive socket for arriving PDs, copy the packet to a new PD_ELE_T Check for protocol errors and compare the received data to the data in our receive queue.

If it is a new packet, discard it (TBD: maybe for another session!). If it is an update, exchange the existing entry with the new one Call user's callback if needed

Parameters:

← *appHandle* session pointer

← *sock* the socket to read from

Return values:

TRDP_NO_ERR no error

TRDP_PARAM_ERR parameter error

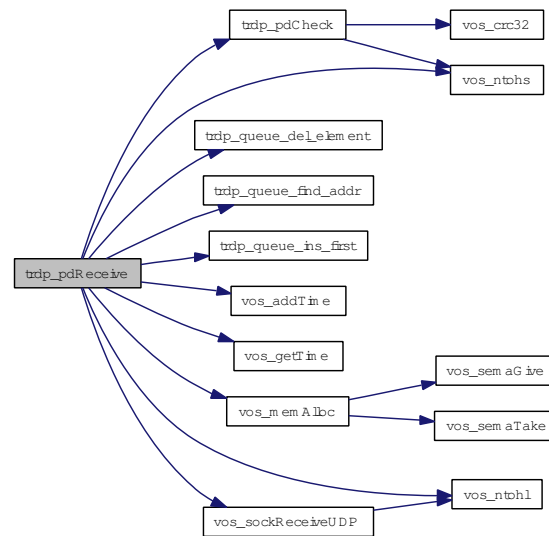
TRDP_WIRE_ERR protocol error (late packet, version mismatch)

TRDP_QUEUE_ERR not in queue

TRDP_CRC_ERR header checksum

TRDP_TOPOCOUNT_ERR invalid topocount

Here is the call graph for this function:



5.13.2.4 TRDP_ERR_T trdp_pdSend (INT32 *pdSock*, const PD_ELE_T * *pPacket*)

Send PD packet.

Parameters:

- ← *pdSock* socket descriptor
- ← *pPacket* pointer to packet to be sent

Return values:

!= NULL error

Here is the call graph for this function:



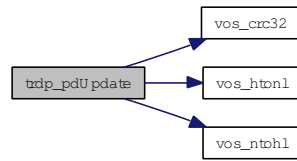
5.13.2.5 void trdp_pdUpdate (PD_ELE_T * *pPacket*)

Update the header values.

Parameters:

- ← *pPacket* pointer to the packet to update

Here is the call graph for this function:

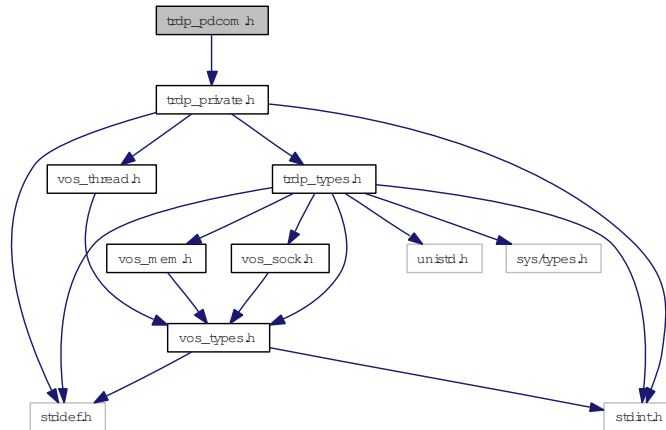


5.14 trdp_pdcom.h File Reference

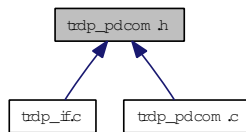
Functions for PD communication.

```
#include "trdp_private.h"
```

Include dependency graph for trdp_pdcom.h:



This graph shows which files directly or indirectly include this file:



Functions

- void [trdp_pdInit](#) (PD_ELE_T *, TRDP_MSG_T, UINT32 topCount)
Initialize/construct the packet Set the header infos.
- void [trdp_pdUpdate](#) (PD_ELE_T *)
Update the header values.
- TRDP_ERR_T [trdp_pdPut](#) (PD_ELE_T *, TRDP_MARSHALL_T func, void *refCon, const UINT8 *pData, UINT32 dataSize)
Copy data Set the header infos.
- TRDP_ERR_T [trdp_pdCheck](#) (PD_HEADER_T *pPacket, INT32 packetSize)
Check if the PD header values are sane.
- TRDP_ERR_T [trdp_pdSend](#) (INT32 sock, const PD_ELE_T *)
Send PD packet.
- TRDP_ERR_T [trdp_pdGet](#) (PD_ELE_T *pPacket, TRDP_UNMARSHALL_T unmarshall, void *refCon, const UINT8 *pData, UINT32 dataSize)

Copy data Set the header infos.

- [TRDP_ERR_T trdp_pdReceive](#) ([TRDP_SESSION_PT](#) pSessionHandle, INT32 sock)

*Receiving PD messages Read the receive socket for arriving PDs, copy the packet to a new PD_ELE_T
Check for protocol errors and compare the received data to the data in our receive queue.*

5.14.1 Detailed Description

Functions for PD communication.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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5.14.2 Function Documentation

5.14.2.1 TRDP_ERR_T trdp_pdCheck (PD_HEADER_T * pPacket, INT32 packetSize)

Check if the PD header values are sane.

Parameters:

← *pPacket* pointer to the packet to update

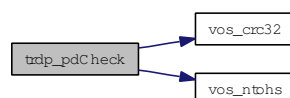
← *packetSize* max size to check

Return values:

TRDP_NO_ERR

TRDP_CRC_ERR

Here is the call graph for this function:



5.14.2.2 void trdp_pdInit (PD_ELE_T * *pPacket*, TRDP_MSG_T *type*, UINT32 *topoCount*)

Initialize/construct the packet Set the header infos.

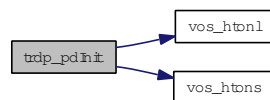
Parameters:

← *pPacket* pointer to the packet element to init

← *type* type the packet

← *topoCount* topocount to use for PD frame

Here is the call graph for this function:



5.14.2.3 TRDP_ERR_T trdp_pdReceive (TRDP_SESSION_PT *appHandle*, INT32 *sock*)

Receiving PD messages Read the receive socket for arriving PDs, copy the packet to a new PD_ELE_T Check for protocol errors and compare the received data to the data in our receive queue.

If it is a new packet, discard it (TBD: maybe for another session!). If it is an update, exchange the existing entry with the new one Call user's callback if needed

Parameters:

← *appHandle* session pointer

← *sock* the socket to read from

Return values:

TRDP_NO_ERR no error

TRDP_PARAM_ERR parameter error

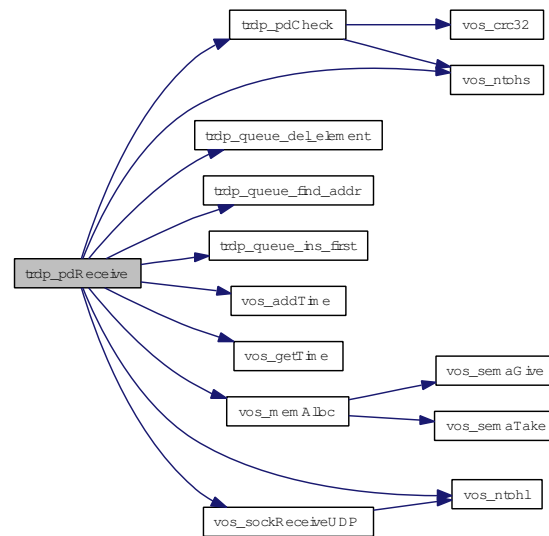
TRDP_WIRE_ERR protocol error (late packet, version mismatch)

TRDP_QUEUE_ERR not in queue

TRDP_CRC_ERR header checksum

TRDP_TOPOCOUNT_ERR invalid topocount

Here is the call graph for this function:



5.14.2.4 TRDP_ERR_T trdp_pdSend (INT32 *pdSock*, const PD_ELE_T * *pPacket*)

Send PD packet.

Parameters:

- ← *pdSock* socket descriptor
- ← *pPacket* pointer to packet to be sent

Return values:

!= NULL error

Here is the call graph for this function:



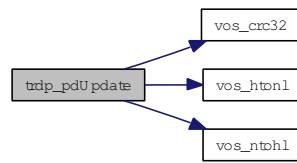
5.14.2.5 void trdp_pdUpdate (PD_ELE_T * *pPacket*)

Update the header values.

Parameters:

- ← *pPacket* pointer to the packet to update

Here is the call graph for this function:

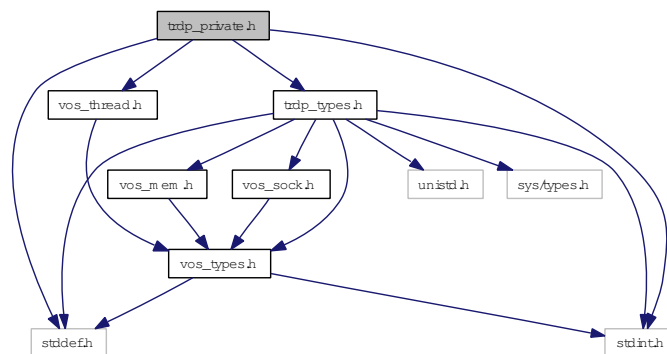


5.15 trdp_private.h File Reference

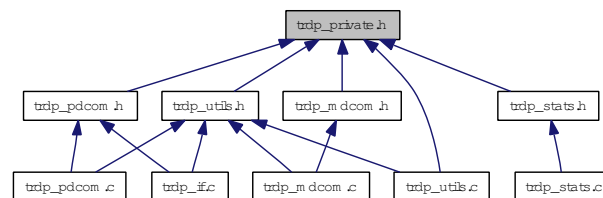
Typedefs for TRDP communication.

```
#include <stddef.h>
#include <stdint.h>
#include "trdp_types.h"
#include "vos_thread.h"
```

Include dependency graph for trdp_private.h:



This graph shows which files directly or indirectly include this file:



Data Structures

- struct [TRDP_HANDLE](#)
Hidden handle definition, used as unique addressing item.
- struct [TRDP_SOCKETS](#)
Socket item.
- struct [__attribute__](#)
TRDP process data header - network order and alignment.
- struct [__attribute__](#)
TRDP process data header - network order and alignment.
- struct [PD_ELE](#)
Queue element for PD packets to send or receive.

- struct [MD_ELE](#)
Queue element for MD packets to send or receive or acknowledge.
- struct [TRDP_SESSION](#)
Session/application variables store.
- struct [TRDP_PD_STATISTICS](#)
Process data statistics.
- struct [TRDP_MD_STATISTICS](#)
Message data statistics.

Defines

- #define [IP_PD_UDP_PORT](#) 20548
process data UDP port
- #define [IP_MD_UDP_PORT](#) 20550
message data UDP port
- #define [IP_PD_PROTO_VER](#) 0x0100
Protocol version.
- #define [ECHO_COMID](#) 110
comid used for echo
- #define [TIMER_GRANULARITY](#) 10000
granularity in us
- #define [MD_DEFAULT_REPLY_TIMEOUT](#) 10000000
default reply time out 10s
- #define [MD_DEFAULT_CONFIRM_TIMEOUT](#) 10000000
default reply time out 10s
- #define [MIN_PD_HEADER_SIZE](#) sizeof(PD_HEADER_T)
PD header size without FCS.
- #define [ACK_TIME_OUT_VAL_DEF](#) 500
Default value in milliseconds for waiting on acknowledge message.

Typedefs

- typedef struct [TRDP_HANDLE](#) [TRDP_ADDRESSES](#)
Hidden handle definition, used as unique addressing item.

- typedef struct [TRDP_SOCKETS](#) [TRDP_SOCKETS_T](#)
Socket item.
- typedef struct [PD_ELE](#) [PD_ELE_T](#)
Queue element for PD packets to send or receive.
- typedef struct [MD_ELE](#) [MD_ELE_T](#)
Queue element for MD packets to send or receive or acknowledge.
- typedef struct [TRDP_SESSION](#) [TRDP_SESSION_T](#)
Session/application variables store.
- typedef struct [TRDP_PD_STATISTICS](#) [TRDP_PD_STATS_T](#)
Process data statistics.
- typedef struct [TRDP_MD_STATISTICS](#) [TRDP_MD_STATS_T](#)
Message data statistics.

Enumerations

- enum [TRDP_PRIV_FLAGS_T](#) { , [TRDP_TIMED_OUT](#) = 0x2 }
Internal flags for packets.
- enum [TRDP SOCK_TYPE_T](#) {
 [TRDP SOCK_PD](#) = 0,
 [TRDP SOCK_MD_UDP](#) = 1,
 [TRDP SOCK_MD_TCP](#) = 2 }
Socket usage.

5.15.1 Detailed Description

Typedefs for TRDP communication.

TRDP internal type definitions

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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5.15.2 Enumeration Type Documentation

5.15.2.1 enum TRDP_PRIV_FLAGS_T

Internal flags for packets.

Enumerator:

TRDP_TIMED_OUT if set, informed the user

5.15.2.2 enum TRDP SOCK_TYPE_T

Socket usage.

Enumerator:

TRDP SOCK_PD Socket is used for UDP process data.

TRDP SOCK_MD_UDP Socket is used for UDP message data.

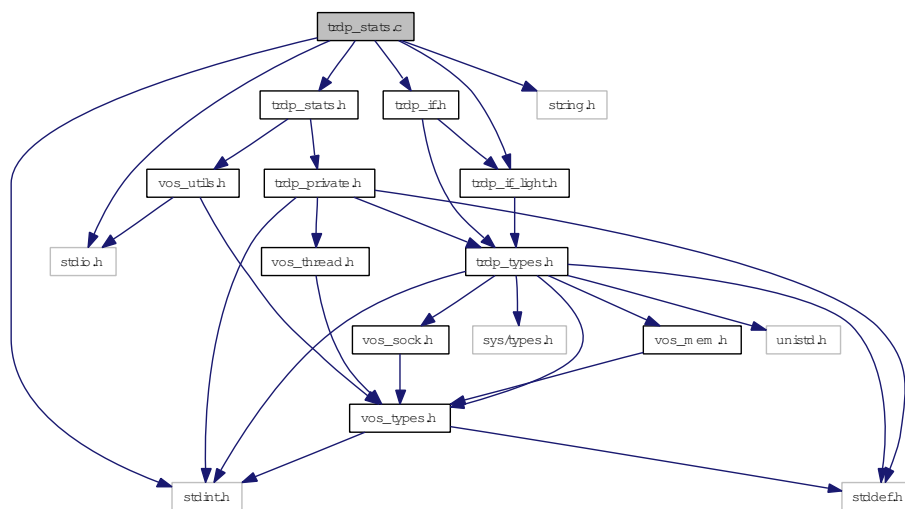
TRDP SOCK_MD_TCP Socket is used for TCP message data.

5.16 trdp_stats.c File Reference

Statistics functions for TRDP communication.

```
#include <stdio.h>
#include <stdint.h>
#include <string.h>
#include "trdp_stats.h"
#include "trdp_if_light.h"
#include "trdp_if.h"
```

Include dependency graph for trdp_stats.c:



Functions

- EXT_DECL [TRDP_ERR_T](#) [tlc_getStatistics](#) ([TRDP_APP_SESSION_T](#) appHandle, [TRDP_STATISTICS_T](#) **ppStatistics)
Return statistics.
- EXT_DECL [TRDP_ERR_T](#) [tlc_getSubsStatistics](#) ([TRDP_APP_SESSION_T](#) appHandle, [UINT16](#) *pNumSubs, [TRDP_SUBS_STATISTICS_T](#) **ppStatistics)
Return PD subscription statistics.
- EXT_DECL [TRDP_ERR_T](#) [tlc_getPubStatistics](#) ([TRDP_APP_SESSION_T](#) appHandle, [UINT16](#) *pNumPub, [TRDP_PUB_STATISTICS_T](#) **ppStatistics)
Return PD publish statistics.
- EXT_DECL [TRDP_ERR_T](#) [tlc_getListStatistics](#) ([TRDP_APP_SESSION_T](#) appHandle, [UINT16](#) *pNumList, [TRDP_LIST_STATISTICS_T](#) **ppStatistics)
Return MD listener statistics.
- EXT_DECL [TRDP_ERR_T](#) [tlc_getRedStatistics](#) ([TRDP_APP_SESSION_T](#) appHandle, [UINT16](#) *pNumRed, [TRDP_RED_STATISTICS_T](#) **ppStatistics)

Return redundancy group statistics.

- EXT_DECL [TRDP_ERR_T tlc_getJoinStatistics](#) ([TRDP_APP_SESSION_T](#) appHandle, [UINT16](#) *pNumJoin, [UINT32](#) **ppIpAddr)

Return join statistics.

- EXT_DECL [TRDP_ERR_T tlc_resetStatistics](#) ([TRDP_APP_SESSION_T](#) appHandle)

Reset statistics.

5.16.1 Detailed Description

Statistics functions for TRDP communication.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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5.16.2 Function Documentation

5.16.2.1 EXT_DECL [TRDP_ERR_T tlc_getJoinStatistics](#) ([TRDP_APP_SESSION_T](#) appHandle, [UINT16](#) *pNumJoin, [UINT32](#) **ppIpAddr)

Return join statistics.

Memory for statistics information will be reserved by tlc layer and needs to be freed by the user.

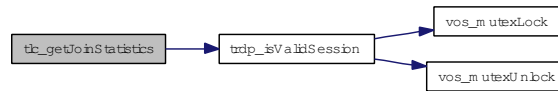
Parameters:

- ← **appHandle** the handle returned by tlc_init
- **pNumJoin** Pointer to the number of joined IP Adresses
- **ppIpAddr** Pointer to a list with the joined IP addresses

Return values:

- TRDP_NO_ERR** no error
- TRDP_NOINIT_ERR** handle invalid
- TRDP_PARAM_ERR** parameter error

Here is the call graph for this function:



5.16.2.2 EXT_DECL TRDP_ERR_T tlc_getListStatistics (TRDP_APP_SESSION_T *appHandle*, UINT16 **pNumList*, TRDP_LIST_STATISTICS_T ***ppStatistics*)

Return MD listener statistics.

Memory for statistics information will be reserved by tlc layer and needs to be freed by the user.

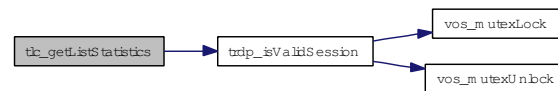
Parameters:

- ← *appHandle* the handle returned by tlc_init
- *pNumList* Pointer to the number of listeners
- *ppStatistics* Pointer to a list with the listener statistics information

Return values:

- TRDP_NO_ERR** no error
- TRDP_NOINIT_ERR** handle invalid
- TRDP_PARAM_ERR** parameter error

Here is the call graph for this function:



5.16.2.3 EXT_DECL TRDP_ERR_T tlc_getPubStatistics (TRDP_APP_SESSION_T *appHandle*, UINT16 **pNumPub*, TRDP_PUB_STATISTICS_T ***ppStatistics*)

Return PD publish statistics.

Memory for statistics information will be reserved by tlc layer and needs to be freed by the user.

Parameters:

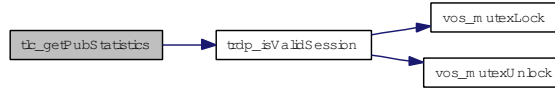
- ← *appHandle* the handle returned by tlc_init
- *pNumPub* Pointer to the number of publishers
- *ppStatistics* Pointer to a list with the publish statistics information

Return values:

- TRDP_NO_ERR** no error
- TRDP_NOINIT_ERR** handle invalid

TRDP_PARAM_ERR parameter error

Here is the call graph for this function:



5.16.2.4 EXT_DECL TRDP_ERR_T tlc_getRedStatistics (TRDP_APP_SESSION_T *appHandle*, UINT16 **pNumRed*, TRDP_RED_STATISTICS_T ***ppStatistics*)

Return redundancy group statistics.

Memory for statistics information will be reserved by tlc layer and needs to be freed by the user.

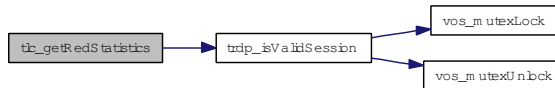
Parameters:

- ← *appHandle* the handle returned by tlc_init
- *pNumRed* Pointer to the number of redundancy groups
- *ppStatistics* Pointer to a list with the redundancy group information

Return values:

- TRDP_NO_ERR** no error
- TRDP_NOINIT_ERR** handle invalid
- TRDP_PARAM_ERR** parameter error

Here is the call graph for this function:



5.16.2.5 EXT_DECL TRDP_ERR_T tlc_getStatistics (TRDP_APP_SESSION_T *appHandle*, TRDP_STATISTICS_T ***ppStatistics*)

Return statistics.

Memory for statistics information will be reserved by tlc layer and needs to be freed by the user.

Parameters:

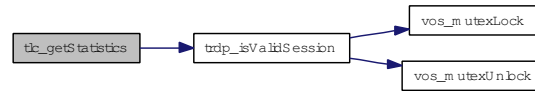
- ← *appHandle* the handle returned by tlc_init
- *ppStatistics* Statistics for this application session

Return values:

- TRDP_NO_ERR** no error

TRDP_NOINIT_ERR handle invalid
TRDP_PARAM_ERR parameter error

Here is the call graph for this function:



5.16.2.6 EXT_DECL TRDP_ERR_T tlc_getSubsStatistics (TRDP_APP_SESSION_T *appHandle*, UINT16 * *pNumSubs*, TRDP_SUBS_STATISTICS_T ** *ppStatistics*)

Return PD subscription statistics.

Memory for statistics information will be reserved by tlc layer and needs to be freed by the user.

Parameters:

- ← ***appHandle*** the handle returned by tlc_init
- ***pNumSubs*** Pointer to the number of subscriptions
- ***ppStatistics*** Pointer to a list with the subscription statistics information

Return values:

TRDP_NO_ERR no error
TRDP_NOINIT_ERR handle invalid
TRDP_PARAM_ERR parameter error

Here is the call graph for this function:



5.16.2.7 EXT_DECL TRDP_ERR_T tlc_resetStatistics (TRDP_APP_SESSION_T *appHandle*)

Reset statistics.

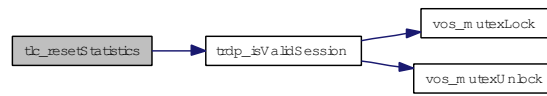
Parameters:

- ← ***appHandle*** the handle returned by tlc_init

Return values:

TRDP_NO_ERR no error
TRDP_NOINIT_ERR handle invalid
TRDP_PARAM_ERR parameter error

Here is the call graph for this function:



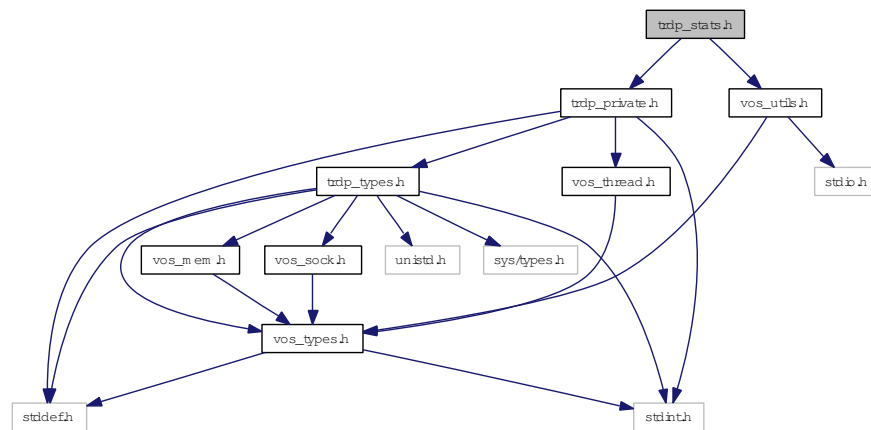
5.17 trdp_stats.h File Reference

Statistics for TRDP communication.

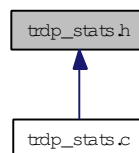
```
#include "trdp_private.h"
```

```
#include "vos_utils.h"
```

Include dependency graph for trdp_stats.h:



This graph shows which files directly or indirectly include this file:



5.17.1 Detailed Description

Statistics for TRDP communication.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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- struct [TRDP_DATASET_T](#)
Dataset definition.
- struct [TRDP_MEM_STATISTICS_T](#)
TRDP statistics type definitions.
- struct [TRDP_PD_STATISTICS_T](#)
Structure containing all general PD statistics information.
- struct [TRDP_MD_STATISTICS_T](#)
Structure containing all general MD statistics information.
- struct [TRDP_STATISTICS_T](#)
Structure containing all general memory, PD and MD statistics information.
- struct [TRDP_SUBS_STATISTICS_T](#)
Table containing particular PD subscription information.
- struct [TRDP_PUB_STATISTICS_T](#)
Table containing particular PD publishing information.
- struct [TRDP_LIST_STATISTICS_T](#)
Information about a particular MD listener.
- struct [TRDP_RED_STATISTICS_T](#)
A table containing PD redundant group information.
- struct [TRDP_MARSHALL_CONFIG_T](#)
Marshaling/unmarshalling configuration.
- struct [TRDP_PD_CONFIG_T](#)
Default PD configuration.
- struct [TRDP_MD_CONFIG_T](#)
Default MD configuration.
- struct [TRDP_MEM_CONFIG_T](#)
Structure describing memory (and its pre-fragmentation).

Defines

- #define [TRDP_MAX_LABEL_LEN](#) 16
Maximum values.
- #define [TRDP_MAX_URI_USER_LEN](#) (2 * TRDP_MAX_LABEL_LEN)
URI user part incl.
- #define [TRDP_MAX_URI_HOST_LEN](#) (4 * TRDP_MAX_LABEL_LEN)

URI host part length incl.

- #define [TRDP_MAX_URI_LEN](#) ((6 * TRDP_MAX_LABEL_LEN) + 8)
URI length incl.
- #define [TRDP_MAX_FILE_NAME_LEN](#) 128
path and file name length incl.
- #define [USE_HEAP](#) 0
If this is set, we can allocate dynamically memory.

Typedefs

- typedef UINT32 [TRDP_IP_ADDR_T](#)
TRDP general type definitions.
- typedef [VOS_TIME_T](#) [TRDP_TIME_T](#)
Timer value compatible with timeval / select.
- typedef struct fd_set [TRDP_FDS_T](#)
File descriptor set compatible with fd_set / select.
- typedef [VOS_UUID_T](#) [TRDP_UUID_T](#)
UUID definition reuses the VOS definition.
- typedef [VOS_PRINT_DBG_T](#) [TRDP_PRINT_DBG_T](#)
TRDP configuration type definitions.
- typedef [VOS_LOG_T](#) [TRDP_LOG_T](#)
Categories for logging, reuse of the VOS definition.
- typedef [TRDP_ERR_T](#)(* [TRDP_MARSHALL_T](#))(void *pRefCon, UINT32 comId, const UINT8 *pSrc, UINT8 *pDst, UINT32 *pDstSize)
Function type for marshalling .
- typedef [TRDP_ERR_T](#)(* [TRDP_UNMARSHALL_T](#))(void *pRefCon, UINT32 comId, const UINT8 *pSrc, UINT8 *pDst, UINT32 *pDstSize)
Function type for unmarshalling.
- typedef void(* [TRDP_PD_CALLBACK_T](#))(void *pRefCon, const [TRDP_PD_INFO_T](#) *pMsg, UINT8 *pData, UINT32 dataSize)
Callback for receiving indications, timeouts, releases, responses.
- typedef void(* [TRDP_MD_CALLBACK_T](#))(void *pRefCon, const [TRDP_MD_INFO_T](#) *pMsg, UINT8 *pData, UINT32 dataSize)
Callback for receiving indications, timeouts, releases, responses.
- typedef [VOS_MEM_BLK_T](#) [TRDP_MEM_BLK_T](#)
Enumeration type for memory pre-fragmentation, reuse of VOS definition.

Enumerations

- enum `TRDP_ERR_T` {
 `TRDP_NO_ERR` = 0,
 `TRDP_PARAM_ERR` = -1,
 `TRDP_INIT_ERR` = -2,
 `TRDP_NOINIT_ERR` = -3,
 `TRDP_TIMEOUT_ERR` = -4,
 `TRDP_NODATA_ERR` = -5,
 `TRDP SOCK_ERR` = -6,
 `TRDP_IO_ERR` = -7,
 `TRDP_MEM_ERR` = -8,
 `TRDP_SEMA_ERR` = -9,
 `TRDP_QUEUE_ERR` = -10,
 `TRDP_QUEUE_FULL_ERR` = -11,
 `TRDP_MUTEX_ERR` = -12,
 `TRDP_NOSESSION_ERR` = -13,
 `TRDP_SESSION_ABORT_ERR` = -14,
 `TRDP_NOSUB_ERR` = -15,
 `TRDP_NOPUB_ERR` = -16,
 `TRDP_NOLIST_ERR` = -17,
 `TRDP_CRC_ERR` = -18 ,
 `TRDP_TOPO_ERR` = -20,
 `TRDP_COMID_ERR` = -21,
 `TRDP_STATE_ERR` = -22,
 `TRDP_UNKNOWN_ERR` = -99 }
 Return codes for all API functions.
- enum `TRDP_MSG_T` {
 `TRDP_MSG_PD` = 0x5064,
 `TRDP_MSG_PR` = 0x5072,
 `TRDP_MSG_PE` = 0x5065,
 `TRDP_MSG_MN` = 0x4D6E,
 `TRDP_MSG_MR` = 0x4D72,
 `TRDP_MSG_MP` = 0x4D70,
 `TRDP_MSG_MQ` = 0x4D71,
 `TRDP_MSG_MC` = 0x4D63,
 `TRDP_MSG_ME` = 0x4D65 }
 TRDP data transfer type definitions.
- enum `TRDP_REPLY_STATUS_T`
 Reply status messages.

- enum `TRDP_FLAGS_T` { ,
 `TRDP_FLAGS_REDUNDANT` = 0x1,
 `TRDP_FLAGS_MARSHALL` = 0x2,
 `TRDP_FLAGS_CALLBACK` = 0x4,
 `TRDP_FLAGS_TCP` = 0x8 }

Various flags for PD and MD packets.

- enum `TRDP_RED_STATE_T` {
 `TRDP_RED_FOLLOWER` = 0,
 `TRDP_RED_LEADER` = 1 }

Redundancy states.

- enum `TRDP_TO_BEHAVIOR_T`

How invalid PD shall be handled.

- enum `TRDP_DATA_TYPE_T` {
 `TRDP_BOOLEAN` = -1,
 `TRDP_CHAR8` = -2,
 `TRDP_UTF16` = -3,
 `TRDP_INT8` = -4,
 `TRDP_INT16` = -5,
 `TRDP_INT32` = -6,
 `TRDP_INT64` = -7,
 `TRDP_UINT8` = -8,
 `TRDP_UINT16` = -9,
 `TRDP_UINT32` = -10,
 `TRDP_UINT64` = -11,
 `TRDP_REAL32` = -12,
 `TRDP_REAL64` = -13,
 `TRDP_STRING` = -14,
 `TRDP_ARRAY` = -15,
 `TRDP_RECORD` = -16,
 `TRDP_TIMEDATE32` = -17,
 `TRDP_TIMEDATE48` = -18,
 `TRDP_TIMEDATE64` = -19 }

TRDP dataset description definitions.

- enum `TRDP_OPTION_T` { ,
 `TRDP_OPTION_BLOCK` = 0x01,
 `TRDP_OPTION_TRAFFIC_SHAPING` = 0x02 }

Various flags/general TRDP options for library initialization.

5.18.1 Detailed Description

Typedefs for TRDP communication.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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Id

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5.18.2 Define Documentation

5.18.2.1 #define TRDP_MAX_FILE_NAME_LEN 128

path and file name length incl.

terminating '0'

5.18.2.2 #define TRDP_MAX_LABEL_LEN 16

Maximum values.

A uri is a string of the following form: trdp://[user part]@[host part] trdp://instLabel.funcLabel@devLabel.carLabel.cstLabel.trainLabel Hence the exact max. uri length is: 7 + (6 * 15) + 5 * (sizeof (separator)) + 1(terminating 0) to facilitate alignment the size will be increased by 1 byte label length incl. terminating '0'

5.18.2.3 #define TRDP_MAX_URI_HOST_LEN (4 * TRDP_MAX_LABEL_LEN)

URI host part length incl.

terminating '0'

5.18.2.4 #define TRDP_MAX_URI_LEN ((6 * TRDP_MAX_LABEL_LEN) + 8)

URI length incl.

terminating '0' and 1 padding byte

5.18.2.5 #define TRDP_MAX_URI_USER_LEN (2 * TRDP_MAX_LABEL_LEN)

URI user part incl.

terminating '0'

5.18.3 Typedef Documentation

5.18.3.1 typedef UINT32 TRDP_IP_ADDR_T

TRDP general type definitions.

5.18.3.2 typedef TRDP_ERR_T(* TRDP_MARSHALL_T)(void *pRefCon, UINT32 comId, const UINT8 *pSrc, UINT8 *pDst, UINT32 *pDstSize)

Function type for marshalling .

The function must know about the dataset's alignment etc.

Parameters:

- ← **pRefCon* pointer to user context
- ← *comId* ComId to identify the structure out of a configuration
- ← **pSrc* pointer to received original message
- ← **pDst* pointer to a buffer for the treated message
- ↔ **pDstSize* size of the provide buffer / size of the treated message

Return values:

- TRDP_NO_ERR* no error
- TRDP_MEM_ERR* provided buffer to small
- TRDP_COMID_ERR* comid not existing

5.18.3.3 typedef void(* TRDP_MD_CALLBACK_T)(void *pRefCon, const TRDP_MD_INFO_T *pMsg, UINT8 *pData, UINT32 dataSize)

Callback for receiving indications, timeouts, releases, responses.

Parameters:

- ← **pRefCon* pointer to user context
- ← **pMsg* pointer to received message information
- ← **pData* pointer to received data
- ← *dataSize* size of received data pointer to received data excl. padding and FCS !!!!

5.18.3.4 typedef void(* TRDP_PD_CALLBACK_T)(void *pRefCon, const TRDP_PD_INFO_T *pMsg, UINT8 *pData, UINT32 dataSize)

Callback for receiving indications, timeouts, releases, responses.

Parameters:

- ← **pRefCon* pointer to user context
- ← **pMsg* pointer to received message information
- ← **pData* pointer to received data
- ← *dataSize* size of received data pointer to received data excl. padding and FCS !!!!

5.18.3.5 typedef VOS_PRINT_DBG_T TRDP_PRINT_DBG_T

TRDP configuration type definitions.

Callback function definition for error/debug output, reuse of the VOS defined function.

5.18.3.6 typedef VOS_TIME_T TRDP_TIME_T

Timer value compatible with timeval / select.

Relative or absolute date, depending on usage

5.18.3.7 typedef TRDP_ERR_T(* TRDP_UNMARSHALL_T)(void *pRefCon, UINT32 comId, const UINT8 *pSrc, UINT8 *pDst, UINT32 *pDstSize)

Function type for unmarshalling.

The function must know about the dataset's alignment etc.

Parameters:

- ← **pRefCon* pointer to user context
- ← *comId* ComId to identify the structure out of a configuration
- ← **pSrc* pointer to received original message
- ← **pDst* pointer to a buffer for the treated message
- ↔ **pDstSize* size of the provide buffer / size of the treated message

Return values:

- TRDP_NO_ERR* no error
- TRDP_MEM_ERR* provide buffer to small
- TRDP_COMID_ERR* comid not existing

5.18.4 Enumeration Type Documentation**5.18.4.1 enum TRDP_DATA_TYPE_T**

TRDP dataset description definitions.

Dataset element definition

Enumerator:

- TRDP_BOOLEAN* =UINT8, 1 bit relevant (equal to zero = false, not equal to zero = true)
- TRDP_CHAR8* char, can be used also as UTF8
- TRDP_UTF16* Unicode UTF-16 character.
- TRDP_INT8* Signed integer, 8 bit.
- TRDP_INT16* Signed integer, 16 bit.
- TRDP_INT32* Signed integer, 32 bit.
- TRDP_INT64* Signed integer, 64 bit.
- TRDP_UINT8* Unsigned integer, 8 bit.

TRDP_UINT16 Unsigned integer, 16 bit.
TRDP_UINT32 Unsigned integer, 32 bit.
TRDP_UINT64 Unsigned integer, 64 bit.
TRDP_REAL32 Floating point real, 32 bit.
TRDP_REAL64 Floating point real, 64 bit.
TRDP_STRING Zero-terminated array of CHAR8, fixed size.
TRDP_ARRAY Array.
TRDP_RECORD Record.
TRDP_TIMEDATE32 32 bit UNIX time
TRDP_TIMEDATE48 48 bit TCN time (32 bit UNIX time and 16 bit ticks)
TRDP_TIMEDATE64 32 bit UNIX time + 32 bit milliseconds

5.18.4.2 enum TRDP_ERR_T

Return codes for all API functions.

Enumerator:

TRDP_NO_ERR No error.
TRDP_PARAM_ERR Parameter missing or out of range.
TRDP_INIT_ERR Call without valid initialization.
TRDP_NOINIT_ERR Call with invalid handle.
TRDP_TIMEOUT_ERR Timeout.
TRDP_NODATA_ERR Non blocking mode: no data received.
TRDP SOCK_ERR Socket error / option not supported.
TRDP_IO_ERR Socket IO error, data can't be received/sent.
TRDP_MEM_ERR No more memory available.
TRDP_SEMA_ERR Semaphore not available.
TRDP_QUEUE_ERR Queue empty.
TRDP_QUEUE_FULL_ERR Queue full.
TRDP_MUTEX_ERR Mutex not available.
TRDP_NOSESSION_ERR No such session.
TRDP_SESSION_ABORT_ERR Session aborted.
TRDP_NOSUB_ERR No subscriber.
TRDP_NOPUB_ERR No publisher.
TRDP_NOLIST_ERR No listener.
TRDP_CRC_ERR Wrong CRC.
TRDP_TOPO_ERR Invalid topo count.
TRDP_COMID_ERR Unknown ComId.
TRDP_STATE_ERR Call in wrong state.
TRDP_UNKNOWN_ERR Unspecified error.

5.18.4.3 enum TRDP_FLAGS_T

Various flags for PD and MD packets.

Enumerator:

TRDP_FLAGS_REDUNDANT Redundant.
TRDP_FLAGS_MARSHALL Optional marshalling/unmarshalling in TRDP stack.
TRDP_FLAGS_CALLBACK Use of callback function.
TRDP_FLAGS_TCP Use TCP for message data.

5.18.4.4 enum TRDP_MSG_T

TRDP data transfer type definitions.

Message Types

Enumerator:

TRDP_MSG_PD 'Pd' PD Data (Reply)
TRDP_MSG_PR 'Pr' PD Request
TRDP_MSG_PE 'Pe' PD Error
TRDP_MSG_MN 'Mn' MD Notification (Request without reply)
TRDP_MSG_MR 'Mr' MD Request with reply
TRDP_MSG_MP 'Mp' MD Reply without confirmation
TRDP_MSG_MQ 'Mq' MD Reply with confirmation
TRDP_MSG_MC 'Mc' MD Confirm
TRDP_MSG_ME 'Me' MD Error

5.18.4.5 enum TRDP_OPTION_T

Various flags/general TRDP options for library initialization.

Enumerator:

TRDP_OPTION_BLOCK Default: Use nonblocking I/O calls, polling necessary Set: Read calls will block, use select().
TRDP_OPTION_TRAFFIC_SHAPING Use traffic shaping - distribute packet sending.

5.18.4.6 enum TRDP_RED_STATE_T

Redundancy states.

Enumerator:

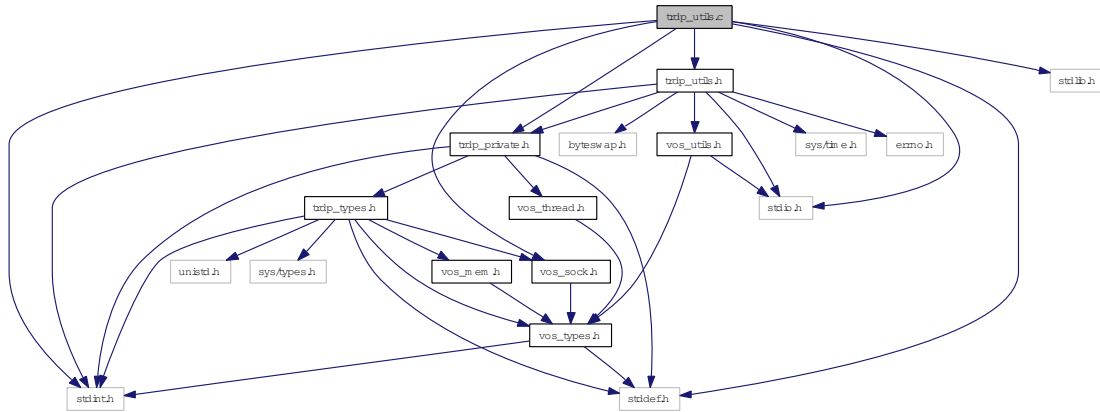
TRDP_RED_FOLLOWER Redundancy follower - redundant PD will be not sent out.
TRDP_RED_LEADER Redundancy leader - redundant PD will be sent out.

5.19 trdp_utils.c File Reference

Helper functions for TRDP communication.

```
#include <stdio.h>
#include <stddef.h>
#include <stdint.h>
#include <stdlib.h>
#include "vos_sock.h"
#include "trdp_private.h"
#include "trdp_utils.h"
```

Include dependency graph for trdp_utils.c:



Functions

- `int am_big_endian ()`
Determine if we are Big or Little endian.
- `PD_ELEMENT * trdp_util_getnext (PD_ELEMENT *pHead, const struct timeval *pNow, PD_ELEMENT **ppNextElement)`
Find the packet which has to be send next.
- `UINT32 trdp_packetSizePD (UINT32 dataSize)`
Get the packet size from the raw data size.
- `PD_ELEMENT * trdp_queue_find_comId (PD_ELEMENT **ppHead, uint32_t comId)`
Return the element with same comId.
- `PD_ELEMENT * trdp_queue_find_addr (PD_ELEMENT *pHead, TRDP_ADDRESSES *addr)`
Return the element with same comId.
- `void trdp_queue_del_element (PD_ELEMENT **ppHead, PD_ELEMENT *pDelete)`
Delete an element.

- void [trdp_queue_app_last](#) ([PD_ELE_T](#) **ppHead, [PD_ELE_T](#) *pNew)
Append an element at end of queue.
- void [trdp_queue_ins_first](#) ([PD_ELE_T](#) **ppHead, [PD_ELE_T](#) *pNew)
Insert an element at front of queue.
- void [trdp_initSockets](#) ([TRDP_SOCKETS_T](#) iface[])
Handle the socket pool: Initialize it.
- [TRDP_ERR_T](#) [trdp_requestSocket](#) ([TRDP_SOCKETS_T](#) iface[], const [TRDP_SEND_PARAM_T](#) *params, [TRDP_IP_ADDR_T](#) srcIP, [TRDP SOCK_TYPE_T](#) usage, [TRDP_OPTION_T](#) options, [INT32](#) *pIndex)
Handle the socket pool: Request a socket from our socket pool.
- [TRDP_ERR_T](#) [trdp_releaseSocket](#) ([TRDP_SOCKETS_T](#) iface[], [INT32](#) index)
Handle the socket pool: Release a socket from our socket pool.

5.19.1 Detailed Description

Helper functions for TRDP communication.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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Id

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5.19.2 Function Documentation

5.19.2.1 [int am_big_endian](#) ()

Determine if we are Big or Little endian.

Return values:

!= 0 we are big endian

0 we are little endian

5.19.2.2 void trdp_initSockets (TRDP_SOCKETS_T *iface*[])

Handle the socket pool: Initialize it.

Parameters:

← *iface* pointer to the socket pool

5.19.2.3 UINT32 trdp_packetSizePD (UINT32 *dataSize*)

Get the packet size from the raw data size.

Parameters:

← *dataSize* net data size (without padding or FCS)

Return values:

packet size the size of the complete packet to be sent or received

5.19.2.4 void trdp_queue_app_last (PD_ELE_T ***ppHead*, PD_ELE_T **pNew*)

Append an element at end of queue.

Parameters:

← *ppHead* pointer to pointer to head of queue

← *pNew* pointer to element to append

5.19.2.5 void trdp_queue_del_element (PD_ELE_T ***ppHead*, PD_ELE_T **pDelete*)

Delete an element.

Parameters:

← *ppHead* pointer to pointer to head of queue

← *pDelete* pointer to element to delete

5.19.2.6 PD_ELE_T* trdp_queue_find_addr (PD_ELE_T **pHead*, TRDP_ADDRESSES **addr*)

Return the element with same comId.

Parameters:

← *pHead* pointer to head of queue

← *addr* Pub/Sub handle (Address, ComID, srcIP & dest IP) to search for

Return values:

!= NULL pointer to PD element

NULL No PD element found

5.19.2.7 PD_ELE_T* trdp_queue_find_comId (PD_ELE_T ** ppHead, uint32_t comId)

Return the element with same comId.

Parameters:

- ← *ppHead* pointer to pointer to head of queue
- ← *comId* ComID to search for

Return values:

- !=* NULL pointer to PD element
- NULL* No PD element found

5.19.2.8 void trdp_queue_ins_first (PD_ELE_T ** ppHead, PD_ELE_T * pNew)

Insert an element at front of queue.

Parameters:

- ← *ppHead* pointer to pointer to head of queue
- ← *pNew* pointer to element to insert

5.19.2.9 TRDP_ERR_T trdp_releaseSocket (TRDP_SOCKETS_T iface[], INT32 index)

Handle the socket pool: Release a socket from our socket pool.

Parameters:

- ↔ *iface* socket pool
- ← *index* index of socket to release

Return values:

- TRDP_NO_ERR*
- TRDP_PARAM_ERR*

Here is the call graph for this function:

**5.19.2.10 TRDP_ERR_T trdp_requestSocket (TRDP_SOCKETS_T iface[], const TRDP_SEND_PARAM_T * params, TRDP_IP_ADDR_T srcIP, TRDP SOCK_TYPE_T usage, TRDP_OPTION_T options, INT32 * pIndex)**

Handle the socket pool: Request a socket from our socket pool.

Parameters:

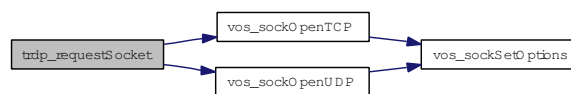
- ↔ *iface* socket pool

← *params* parameters to use
 ← *srcIP* IP to bind to (0 = any address)
 ← *usage* type and port to bind to
 ← *options* blocking/nonblocking
 → *pIndex* returned index of socket pool

Return values:

TRDP_NO_ERR
TRDP_PARAM_ERR

Here is the call graph for this function:



5.19.2.11 PD_ELE_T* trdp_util_getnext (PD_ELE_T * *pHead*, const struct timeval * *pNow*, PD_ELE_T ** *ppNextElement*)

Find the packet which has to be send next.

Parameters:

← *pHead* pointer to first queue element
 ← *pNow* Current time
 → *ppNextElement* pointer to pointer to PD element

Return values:

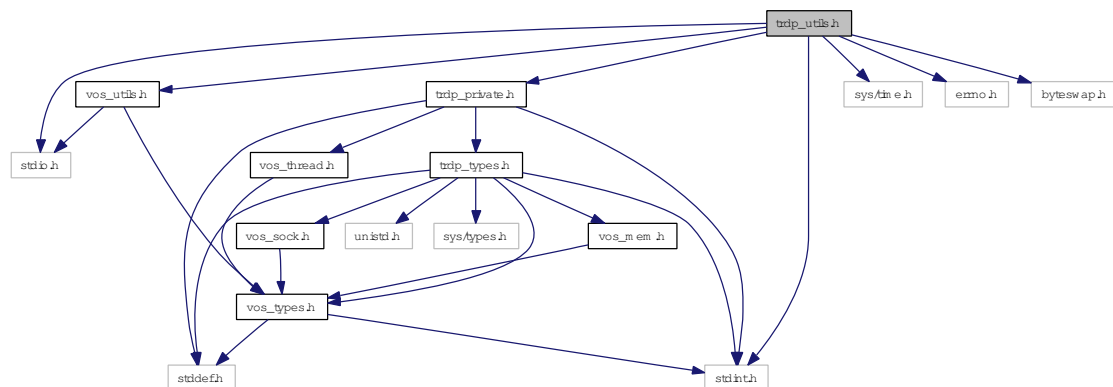
!= NULL pointer to PD packet
 NULL No PD packet found

5.20 trdp_utils.h File Reference

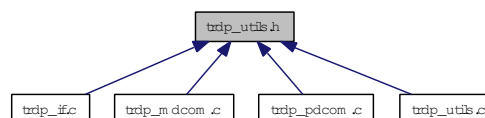
Common utilities for TRDP communication.

```
#include <stdio.h>
#include <stdint.h>
#include <sys/time.h>
#include <errno.h>
#include <byteswap.h>
#include "trdp_private.h"
#include "vos_utils.h"
```

Include dependency graph for trdp_utils.h:



This graph shows which files directly or indirectly include this file:



Functions

- `int am_big_endian ()`
Determine if we are Big or Little endian.
- `PD_ELE_T * trdp_util_getnext (PD_ELE_T *pHead, const struct timeval *pNow, PD_ELE_T **ppEle)`
Find the packet which has to be send next.
- `PD_ELE_T * trdp_queue_find_addr (PD_ELE_T *pHead, TRDP_ADDRESSES *pAddr)`
Return the element with same comId.
- `void trdp_queue_del_element (PD_ELE_T **pHead, PD_ELE_T *pDelete)`

Delete an element.

- void [trdp_queue_app_last](#) (PD_ELE_T **pHead, PD_ELE_T *pNew)
Append an element at end of queue.
- void [trdp_queue_ins_first](#) (PD_ELE_T **pHead, PD_ELE_T *pNew)
Insert an element at front of queue.
- void [trdp_initSockets](#) (TRDP_SOCKETS_T iface[])
Handle the socket pool: Initialize it.
- TRDP_ERR_T [trdp_requestSocket](#) (TRDP_SOCKETS_T iface[], const TRDP_SEND_PARAM_T *params, TRDP_IP_ADDR_T srcIP, TRDP SOCK_TYPE_T usage, TRDP_OPTION_T options, INT32 *pIndex)
Handle the socket pool: Request a socket from our socket pool.
- TRDP_ERR_T [trdp_releaseSocket](#) (TRDP_SOCKETS_T iface[], INT32 index)
Handle the socket pool: Release a socket from our socket pool.
- UINT32 [trdp_packetSizePD](#) (UINT32 dataSize)
Get the packet size from the raw data size.

5.20.1 Detailed Description

Common utilities for TRDP communication.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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5.20.2 Function Documentation

5.20.2.1 int am_big_endian ()

Determine if we are Big or Little endian.

Return values:

!= 0 we are big endian

0 we are little endian

5.20.2.2 void trdp_initSockets (TRDP_SOCKETS_T *iface*[])

Handle the socket pool: Initialize it.

Parameters:

← *iface* pointer to the socket pool

5.20.2.3 UINT32 trdp_packetSizePD (UINT32 *dataSize*)

Get the packet size from the raw data size.

Parameters:

← *dataSize* net data size (without padding or FCS)

Return values:

packet size the size of the complete packet to be sent or received

5.20.2.4 void trdp_queue_app_last (PD_ELE_T *ppHead*, PD_ELE_T **pNew*)**

Append an element at end of queue.

Parameters:

← *ppHead* pointer to pointer to head of queue

← *pNew* pointer to element to append

5.20.2.5 void trdp_queue_del_element (PD_ELE_T *ppHead*, PD_ELE_T **pDelete*)**

Delete an element.

Parameters:

← *ppHead* pointer to pointer to head of queue

← *pDelete* pointer to element to delete

5.20.2.6 PD_ELE_T* trdp_queue_find_addr (PD_ELE_T **pHead*, TRDP_ADDRESSES **addr*)

Return the element with same comId.

Parameters:

← *pHead* pointer to head of queue

← *addr* Pub/Sub handle (Address, ComID, srcIP & dest IP) to search for

Return values:

!= NULL pointer to PD element

NULL No PD element found

5.20.2.7 void trdp_queue_ins_first (PD_ELE_T ** *ppHead*, PD_ELE_T * *pNew*)

Insert an element at front of queue.

Parameters:

- ← *ppHead* pointer to pointer to head of queue
- ← *pNew* pointer to element to insert

5.20.2.8 TRDP_ERR_T trdp_releaseSocket (TRDP_SOCKETS_T *iface*[], INT32 *index*)

Handle the socket pool: Release a socket from our socket pool.

Parameters:

- ↔ *iface* socket pool
- ← *index* index of socket to release

Return values:

- TRDP_NO_ERR*
- TRDP_PARAM_ERR*

Here is the call graph for this function:



5.20.2.9 TRDP_ERR_T trdp_requestSocket (TRDP_SOCKETS_T *iface*[], const TRDP_SEND_PARAM_T * *params*, TRDP_IP_ADDR_T *srcIP*, TRDP SOCK_TYPE_T *usage*, TRDP_OPTION_T *options*, INT32 * *pIndex*)

Handle the socket pool: Request a socket from our socket pool.

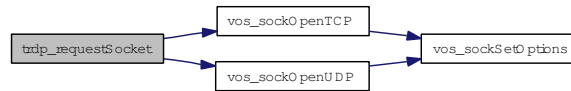
Parameters:

- ↔ *iface* socket pool
- ← *params* parameters to use
- ← *srcIP* IP to bind to (0 = any address)
- ← *usage* type and port to bind to
- ← *options* blocking/nonblocking
- *pIndex* returned index of socket pool

Return values:

- TRDP_NO_ERR*
- TRDP_PARAM_ERR*

Here is the call graph for this function:



5.20.2.10 PD_ELE_T* trdp_util_getnext (PD_ELE_T * *pHead*, const struct timeval * *pNow*, PD_ELE_T ** *ppNextElement*)

Find the packet which has to be send next.

Parameters:

- ← *pHead* pointer to first queue element
- ← *pNow* Current time
- *ppNextElement* pointer to pointer to PD element

Return values:

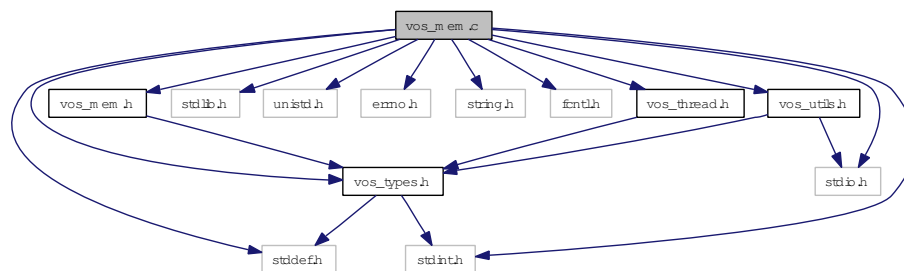
- != NULL pointer to PD packet
- NULL No PD packet found

5.21 vos_mem.c File Reference

Memory functions.

```
#include <stdio.h>
#include <stddef.h>
#include <stdint.h>
#include <stdlib.h>
#include <unistd.h>
#include <errno.h>
#include <string.h>
#include <fcntl.h>
#include "vos_types.h"
#include "vos_utils.h"
#include "vos_mem.h"
#include "vos_thread.h"
```

Include dependency graph for vos_mem.c:



Functions

- EXT_DECL [VOS_ERR_T vos_memInit](#) (UINT8 *pMemoryArea, UINT32 size, const UINT32 fragMem[VOS_MEM_NBLOCKSIZES])
Initialize the memory unit.
- EXT_DECL [VOS_ERR_T vos_memDelete](#) (UINT8 *pMemoryArea)
Delete the memory area.
- EXT_DECL [UINT8 * vos_memAlloc](#) (UINT32 size)
Allocate a block of memory (from memory area above).
- EXT_DECL [VOS_ERR_T vos_memFree](#) (void *pMemBlock)
Deallocate a block of memory (from memory area above).
- EXT_DECL [VOS_ERR_T vos_memCount](#) (UINT32 *pAllocatedMemory, UINT32 *pFreeMemory, UINT32 *pFragMem[VOS_MEM_NBLOCKSIZES])
Return used and available memory (of memory area above).

- EXT_DECL [VOS_ERR_T vos_queueCreate](#) (const CHAR8 *pKey, [VOS_QUEUE_T](#) *pQueueID, UINT32 maxNoMsg, UINT32 maxLength)
Initialize a message queue.
- EXT_DECL [VOS_ERR_T vos_queueDestroy](#) ([VOS_QUEUE_T](#) queueID)
Destroy a message queue.
- EXT_DECL [VOS_ERR_T vos_queueSend](#) ([VOS_QUEUE_T](#) queueID, const UINT8 *pMsg, UINT32 size)
Send a message.
- EXT_DECL [VOS_ERR_T vos_queueReceive](#) ([VOS_QUEUE_T](#) queueID, UINT8 *pMsg, UINT32 *pSize, UINT32 usTimeout)
Get a message.
- EXT_DECL [VOS_ERR_T vos_sharedOpen](#) (const CHAR8 *pKey, [VOS_SHRD_T](#) *pHandle, UINT8 **ppMemoryArea, UINT32 *pSize)
Create a shared memory area or attach to existing one.
- EXT_DECL [VOS_ERR_T vos_sharedClose](#) ([VOS_SHRD_T](#) handle, const UINT8 *pMemoryArea)
Close connection to the shared memory area.

5.21.1 Detailed Description

Memory functions.

OS abstraction of memory access and control

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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5.21.2 Function Documentation

5.21.2.1 EXT_DECL UINT8* vos_memAlloc (UINT32 size)

Allocate a block of memory (from memory area above).

Parameters:

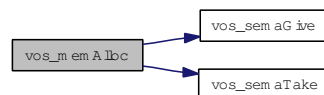
← *size* Size of requested block

Return values:

Pointer to memory area

NULL if no memory available

Here is the call graph for this function:



5.21.2.2 EXT_DECL VOS_ERR_T vos_memCount (UINT32 * *pAllocatedMemory*, UINT32 * *pFreeMemory*, UINT32 * *pFragMem*[VOS_MEM_NBLOCKSIZES])

Return used and available memory (of memory area above).

Parameters:

→ *pAllocatedMemory* Pointer to allocated memory size

→ *pFreeMemory* Pointer to free memory size

→ *pFragMem* Pointer to list of used memory blocks

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_PARAM_ERR parameter out of range/invalid

5.21.2.3 EXT_DECL VOS_ERR_T vos_memDelete (UINT8 * *pMemoryArea*)

Delete the memory area.

This will eventually invalidate any previously allocated memory blocks! It should be called last before the application quits. No further access to the memory blocks is allowed after this call.

Parameters:

← *pMemoryArea* Pointer to memory area to use

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_PARAM_ERR parameter out of range/invalid

5.21.2.4 EXT_DECL VOS_ERR_T vos_memFree (void * *pMemBlock*)

Deallocate a block of memory (from memory area above).

Parameters:

← *pMemBlock* Pointer to memory block to be freed

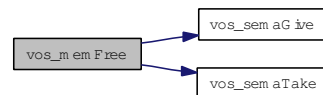
Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_PARAM_ERR parameter out of range/invalid

Here is the call graph for this function:



5.21.2.5 EXT_DECL VOS_ERR_T vos_memInit (UINT8 * *pMemoryArea*, UINT32 *size*, const UINT32 *fragMem*[VOS_MEM_NBBLOCKSIZES])

Initialize the memory unit.

Init a supplied block of memory and prepare it for use with vos_alloc and vos_dealloc. The used block sizes can be supplied and will be preallocated.

Parameters:

← *pMemoryArea* Pointer to memory area to use

← *size* Size of provided memory area

← *fragMem* Pointer to list of preallocated block sizes, used to fragment memory for large blocks

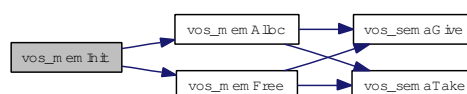
Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR parameter out of range/invalid

VOS_MEM_ERR no memory available

Here is the call graph for this function:



5.21.2.6 EXT_DECL VOS_ERR_T vos_queueCreate (const CHAR8 * *pKey*, VOS_QUEUE_T * *pQueueID*, UINT32 *maxNoMsg*, UINT32 *maxLength*)

Initialize a message queue.

Returns a handle for further calls

Parameters:

- ← *pKey* Unique identifier (file name)
- *pQueueID* Pointer to returned queue handle
- ← *maxNoMsg* maximum number of messages
- ← *maxLength* maximum size of one messages

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised
- VOS_NOINIT_ERR* invalid handle
- VOS_PARAM_ERR* parameter out of range/invalid
- VOS_INIT_ERR* not supported
- VOS_QUEUE_ERR* error creating queue

5.21.2.7 EXT_DECL VOS_ERR_T vos_queueDestroy (VOS_QUEUE_T *queueID*)

Destroy a message queue.

Free all resources used by this queue

Parameters:

- ← *queueID* Queue handle

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised
- VOS_NOINIT_ERR* invalid handle
- VOS_PARAM_ERR* parameter out of range/invalid

5.21.2.8 EXT_DECL VOS_ERR_T vos_queueReceive (VOS_QUEUE_T *queueID*, UINT8 * *pMsg*, UINT32 * *pSize*, UINT32 *usTimeout*)

Get a message.

Parameters:

- ← *queueID* Queue handle
- *pMsg* Pointer to message to be received
- ↔ *pSize* Pointer to max. message size on entry, actual size on exit

← *usTimeout* Maximum time to wait for a message in usec

Return values:

VOS_NO_ERR no error
VOS_INIT_ERR module not initialised
VOS_NOINIT_ERR invalid handle
VOS_PARAM_ERR parameter out of range/invalid
VOS_QUEUE_ERR queue is empty

**5.21.2.9 EXT_DECL VOS_ERR_T vos_queueSend (VOS_QUEUE_T *queueID*, const UINT8 *
pMsg, UINT32 *size*)**

Send a message.

Parameters:

← *queueID* Queue handle
 ← *pMsg* Pointer to message to be sent
 ← *size* Message size

Return values:

VOS_NO_ERR no error
VOS_INIT_ERR module not initialised
VOS_NOINIT_ERR invalid handle
VOS_PARAM_ERR parameter out of range/invalid
VOS_QUEUE_FULL queue is full

**5.21.2.10 EXT_DECL VOS_ERR_T vos_sharedClose (VOS_SHRD_T *handle*, const UINT8 *
pMemoryArea)**

Close connection to the shared memory area.

If the area was created by the calling process, the area will be closed (freed). If the area was attached, it will be detached. This function is not available in each target implementation.

Parameters:

← *handle* Returned handle
 ← *pMemoryArea* Pointer to memory area

Return values:

VOS_NO_ERR no error
VOS_INIT_ERR module not initialised
VOS_NOINIT_ERR invalid handle
VOS_PARAM_ERR parameter out of range/invalid

5.21.2.11 EXT_DECL VOS_ERR_T vos_sharedOpen (const CHAR8 * *pKey*, VOS_SHRD_T * *pHandle*, UINT8 ** *ppMemoryArea*, UINT32 * *pSize*)

Create a shared memory area or attach to existing one.

The first call with the a specified key will create a shared memory area with the supplied size and will return a handle and a pointer to that area. If the area already exists, the area will be attached. This function is not available in each target implementation.

Parameters:

- ← *pKey* Unique identifier (file name)
- *pHandle* Pointer to returned handle
- *ppMemoryArea* Pointer to pointer to memory area
- ↔ *pSize* Pointer to size of area to allocate, on return actual size after attach

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised
- VOS_NOINIT_ERR* invalid handle
- VOS_PARAM_ERR* parameter out of range/invalid
- VOS_MEM_ERR* no memory available

Functions

- EXT_DECL [VOS_ERR_T vos_memInit](#) (UINT8 *pMemoryArea, UINT32 size, const UINT32 fragMem[VOS_MEM_NBLOCKSIZES])
Initialize the memory unit.
- EXT_DECL [VOS_ERR_T vos_memDelete](#) (UINT8 *pMemoryArea)
Delete the memory area.
- EXT_DECL UINT8 * [vos_memAlloc](#) (UINT32 size)
Allocate a block of memory (from memory area above).
- EXT_DECL [VOS_ERR_T vos_memFree](#) (void *pMemBlock)
Deallocate a block of memory (from memory area above).
- EXT_DECL [VOS_ERR_T vos_memCount](#) (UINT32 *pAllocatedMemory, UINT32 *pFreeMemory, UINT32 *pFragMem[VOS_MEM_NBLOCKSIZES])
Return used and available memory (of memory area above).
- EXT_DECL [VOS_ERR_T vos_queueCreate](#) (const CHAR8 *pKey, [VOS_QUEUE_T](#) *pQueueId, UINT32 maxNoMsg, UINT32 maxLength)
Initialize a message queue.
- EXT_DECL [VOS_ERR_T vos_queueDestroy](#) ([VOS_QUEUE_T](#) queueID)
Destroy a message queue.
- EXT_DECL [VOS_ERR_T vos_queueSend](#) ([VOS_QUEUE_T](#) queueID, const UINT8 *pMsg, UINT32 size)
Send a message.
- EXT_DECL [VOS_ERR_T vos_queueReceive](#) ([VOS_QUEUE_T](#) queueID, UINT8 *pMsg, UINT32 *pSize, UINT32 usTimeout)
Get a message.
- EXT_DECL [VOS_ERR_T vos_sharedOpen](#) (const CHAR8 *pKey, [VOS_SHRD_T](#) *pHandle, UINT8 **ppMemoryArea, UINT32 *pSize)
Create a shared memory area or attach to existing one.
- EXT_DECL [VOS_ERR_T vos_sharedClose](#) ([VOS_SHRD_T](#) handle, const UINT8 *pMemoryArea)
Close connection to the shared memory area.

5.22.1 Detailed Description

Memory and queue functions for OS abstraction.

This module provides three services: 1. A memory control supervisor

- Private memory management with optimised fragmentation handling

- A message queue handler (system-wide on supported systems)
- Access to shared memory (on supported systems only) Within the prototype TRDP stack, only the memory management unit is currently in use.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH Peter Brander (Memory scheme)

Remarks:

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5.22.2 Define Documentation**5.22.2.1 #define VOS_MEM_BLOCKSIZEs****Value:**

```
{32, 64, 128, 256, 512, 1024, 2048, 4096, 8192, \
    16384, 32768, 65536, 131072, 262144, 524288}
```

We internally allocate memory always by these block sizes.

The largest available block is 524288 Bytes, provided the overall size of the used memory allocation area is larger.

5.22.2.2 #define VOS_MEM_PREALLOCATE {0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 4, 0, 0}

Default pre-allocation of free memory blocks.

To avoid problems with too many small blocks and no large one. Specify how many of each block size that should be pre-allocated (and freed!) to pre-segment the memory area.

5.22.3 Function Documentation**5.22.3.1 EXT_DECL UINT8* vos_memAlloc (UINT32 *size*)**

Allocate a block of memory (from memory area above).

Parameters:

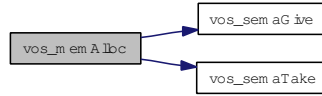
← *size* Size of requested block

Return values:

Pointer to memory area

NULL if no memory available

Here is the call graph for this function:



5.22.3.2 EXT_DECL VOS_ERR_T vos_memCount (UINT32 * *pAllocatedMemory*, UINT32 * *pFreeMemory*, UINT32 * *pFragMem*[VOS_MEM_NBLOCKSIZES])

Return used and available memory (of memory area above).

Parameters:

- *pAllocatedMemory* Pointer to allocated memory size
- *pFreeMemory* Pointer to free memory size
- *pFragMem* Pointer to list of used memory blocks

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised
- VOS_PARAM_ERR* parameter out of range/invalid

5.22.3.3 EXT_DECL VOS_ERR_T vos_memDelete (UINT8 * *pMemoryArea*)

Delete the memory area.

This will eventually invalidate any previously allocated memory blocks! It should be called last before the application quits. No further access to the memory blocks is allowed after this call.

Parameters:

- ← *pMemoryArea* Pointer to memory area to use

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised
- VOS_PARAM_ERR* parameter out of range/invalid

5.22.3.4 EXT_DECL VOS_ERR_T vos_memFree (void * *pMemBlock*)

Deallocate a block of memory (from memory area above).

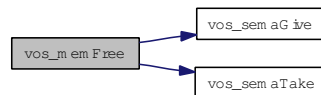
Parameters:

- ← *pMemBlock* Pointer to memory block to be freed

Return values:

VOS_NO_ERR no error
VOS_INIT_ERR module not initialised
VOS_PARAM_ERR parameter out of range/invalid

Here is the call graph for this function:



5.22.3.5 EXT_DECL VOS_ERR_T vos_memInit (UINT8 *pMemoryArea, UINT32 size, const UINT32 fragMem[VOS_MEM_NBLOCKSIZES])

Initialize the memory unit.

Init a supplied block of memory and prepare it for use with vos_alloc and vos_dealloc. The used block sizes can be supplied and will be preallocated.

Parameters:

← **pMemoryArea** Pointer to memory area to use
 ← **size** Size of provided memory area
 ← **fragMem** Pointer to list of preallocate block sizes, used to fragment memory for large blocks

Return values:

VOS_NO_ERR no error
VOS_PARAM_ERR parameter out of range/invalid
VOS_MEM_ERR no memory available

Init a supplied block of memory and prepare it for use with vos_alloc and vos_dealloc. The used block sizes can be supplied and will be preallocated.

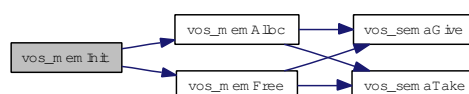
Parameters:

← **pMemoryArea** Pointer to memory area to use
 ← **size** Size of provided memory area
 ← **fragMem** Pointer to list of preallocated block sizes, used to fragment memory for large blocks

Return values:

VOS_NO_ERR no error
VOS_PARAM_ERR parameter out of range/invalid
VOS_MEM_ERR no memory available

Here is the call graph for this function:



5.22.3.6 EXT_DECL VOS_ERR_T vos_queueCreate (const CHAR8 * *pKey*, VOS_QUEUE_T * *pQueueID*, UINT32 *maxNoMsg*, UINT32 *maxLength*)

Initialize a message queue.

Returns a handle for further calls

Parameters:

- ← *pKey* Unique identifier (file name)
- *pQueueID* Pointer to returned queue handle
- ← *maxNoMsg* maximum number of messages
- ← *maxLength* maximum size of one messages

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised
- VOS_NOINIT_ERR* invalid handle
- VOS_PARAM_ERR* parameter out of range/invalid
- VOS_INIT_ERR* not supported
- VOS_QUEUE_ERR* error creating queue

5.22.3.7 EXT_DECL VOS_ERR_T vos_queueDestroy (VOS_QUEUE_T *queueID*)

Destroy a message queue.

Free all resources used by this queue

Parameters:

- ← *queueID* Queue handle

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised
- VOS_NOINIT_ERR* invalid handle
- VOS_PARAM_ERR* parameter out of range/invalid

5.22.3.8 EXT_DECL VOS_ERR_T vos_queueReceive (VOS_QUEUE_T *queueID*, UINT8 * *pMsg*, UINT32 * *pSize*, UINT32 *usTimeout*)

Get a message.

Parameters:

- ← *queueID* Queue handle
- *pMsg* Pointer to message to be received
- ↔ *pSize* Pointer to max. message size on entry, actual size on exit

← *usTimeout* Maximum time to wait for a message in usec

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_NOINIT_ERR invalid handle

VOS_PARAM_ERR parameter out of range/invalid

VOS_QUEUE_ERR queue is empty

5.22.3.9 EXT_DECL VOS_ERR_T vos_queueSend (VOS_QUEUE_T *queueID*, const UINT8 **pMsg*, UINT32 *size*)

Send a message.

Parameters:

← *queueID* Queue handle

← *pMsg* Pointer to message to be sent

← *size* Message size

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_NOINIT_ERR invalid handle

VOS_PARAM_ERR parameter out of range/invalid

VOS_QUEUE_FULL queue is full

5.22.3.10 EXT_DECL VOS_ERR_T vos_sharedClose (VOS_SHRD_T *handle*, const UINT8 **pMemoryArea*)

Close connection to the shared memory area.

If the area was created by the calling process, the area will be closed (freed). If the area was attached, it will be detached. This function is not available in each target implementation.

Parameters:

← *handle* Returned handle

← *pMemoryArea* Pointer to memory area

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_NOINIT_ERR invalid handle

VOS_PARAM_ERR parameter out of range/invalid

5.22.3.11 EXT_DECL VOS_ERR_T vos_sharedOpen (const CHAR8 * *pKey*, VOS_SHRD_T * *pHandle*, UINT8 ** *ppMemoryArea*, UINT32 * *pSize*)

Create a shared memory area or attach to existing one.

The first call with the a specified key will create a shared memory area with the supplied size and will return a handle and a pointer to that area. If the area already exists, the area will be attached. This function is not available in each target implementation.

Parameters:

- ← *pKey* Unique identifier (file name)
- *pHandle* Pointer to returned handle
- *ppMemoryArea* Pointer to pointer to memory area
- ↔ *pSize* Pointer to size of area to allocate, on return actual size after attach

Return values:

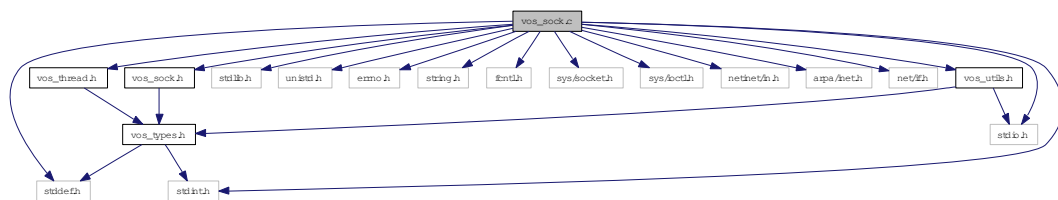
- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised
- VOS_NOINIT_ERR* invalid handle
- VOS_PARAM_ERR* parameter out of range/invalid
- VOS_MEM_ERR* no memory available

5.23 vos_sock.c File Reference

Socket functions.

```
#include <stdio.h>
#include <stddef.h>
#include <stdint.h>
#include <stdlib.h>
#include <unistd.h>
#include <errno.h>
#include <string.h>
#include <fcntl.h>
#include <sys/socket.h>
#include <sys/ioctl.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <net/if.h>
#include "vos_utils.h"
#include "vos_sock.h"
#include "vos_thread.h"
```

Include dependency graph for vos_sock.c:



Functions

- EXT_DECL UINT16 [vos_htons](#) (UINT16 val)
Byte swapping.
- EXT_DECL UINT16 [vos_ntohs](#) (UINT16 val)
Byte swapping 2 Bytes.
- EXT_DECL UINT32 [vos_htonl](#) (UINT32 val)
Byte swapping 4 Bytes.
- EXT_DECL UINT32 [vos_ntohl](#) (UINT32 val)
Byte swapping 4 Bytes.

- EXT_DECL BOOL [vos_IsMulticast](#) (UINT32 ipAddress)
Check if the supplied address is a multicast group address.
- EXT_DECL [VOS_ERR_T vos_sockInit](#) (void)
Initialize the socket library.
- EXT_DECL [VOS_ERR_T vos_sockOpenUDP](#) (INT32 *pSock, const [VOS_SOCKET_OPT_T](#) *pOptions)
Create an UDP socket.
- EXT_DECL [VOS_ERR_T vos_sockOpenTCP](#) (INT32 *pSock, const [VOS_SOCKET_OPT_T](#) *pOptions)
Create a TCP socket.
- EXT_DECL [VOS_ERR_T vos_sockClose](#) (INT32 sock)
Close a socket.
- EXT_DECL [VOS_ERR_T vos_sockSetOptions](#) (INT32 sock, const [VOS_SOCKET_OPT_T](#) *pOptions)
Set socket options.
- EXT_DECL [VOS_ERR_T vos_sockJoinMC](#) (INT32 sock, UINT32 mcAddress, UINT32 ipAddress)
Join a multicast group.
- EXT_DECL [VOS_ERR_T vos_sockLeaveMC](#) (INT32 sock, UINT32 mcAddress, UINT32 ipAddress)
Leave a multicast group.
- EXT_DECL [VOS_ERR_T vos_sockSendUDP](#) (INT32 sock, const UINT8 *pBuffer, UINT32 size, UINT32 ipAddress, UINT16 port)
Send UDP data.
- EXT_DECL [VOS_ERR_T vos_sockReceiveUDP](#) (INT32 sock, UINT8 *pBuffer, INT32 *pSize, UINT32 *pIPAddr)
Receive UDP data.
- EXT_DECL [VOS_ERR_T vos_sockBind](#) (INT32 sock, UINT32 ipAddress, UINT16 port)
Bind a socket to an address and port.
- EXT_DECL [VOS_ERR_T vos_sockListen](#) (INT32 sock, UINT32 backlog)
Listen for incoming connections.
- EXT_DECL [VOS_ERR_T vos_sockAccept](#) (INT32 sock, INT32 *pSock, UINT32 *pIPAddress, UINT16 *pPort)
Accept an incoming TCP connection.
- EXT_DECL [VOS_ERR_T vos_sockConnect](#) (INT32 sock, UINT32 ipAddress, UINT16 port)
Open a TCP connection.

- EXT_DECL [VOS_ERR_T vos_sockSendTCP](#) (INT32 sock, const UINT8 *pBuffer, UINT32 size)
Send TCP data.
- EXT_DECL [VOS_ERR_T vos_sockReceiveTCP](#) (INT32 sock, UINT8 *pBuffer, INT32 *pSize)
Receive TCP data.

5.23.1 Detailed Description

Socket functions.

OS abstraction of IP socket functions for UDP and TCP

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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5.23.2 Function Documentation

5.23.2.1 EXT_DECL UINT32 vos_htonl (UINT32 *val*)

Byte swapping 4 Bytes.

Parameters:

← *val* Initial value.

Return values:

swapped value

5.23.2.2 EXT_DECL UINT16 vos_htons (UINT16 *val*)

Byte swapping.

Byte swapping 2 Bytes.

Parameters:

← *val* Initial value.

Return values:

swapped value

5.23.2.3 EXT_DECL BOOL vos_IsMulticast (UINT32 *ipAddress*)

Check if the supplied address is a multicast group address.

Parameters:

← *ipAddress* IP address to check.

Return values:

TRUE address is multicast

FALSE address is not a multicast address

5.23.2.4 EXT_DECL UINT32 vos_ntohl (UINT32 *val*)

Byte swapping 4 Bytes.

Parameters:

← *val* Initial value.

Return values:

swapped value

5.23.2.5 EXT_DECL UINT16 vos_ntohs (UINT16 *val*)

Byte swapping 2 Bytes.

Parameters:

← *val* Initial value.

Return values:

swapped value

5.23.2.6 EXT_DECL VOS_ERR_T vos_sockAccept (INT32 *sock*, INT32 * *pSock*, UINT32 * *pIPAddress*, UINT16 * *pPort*)

Accept an incoming TCP connection.

Accept incoming connections on the provided socket. May block and will return a new socket descriptor when accepting a connection. The original socket *pSock, remains open.

Parameters:

← *sock* Socket descriptor

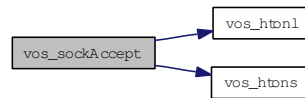
→ *pSock* Pointer to socket descriptor, on exit new socket

→ *pIPAddress* source IP to receive on, 0 for any

→ *pPort* port to receive on, 20548 for PD

Return values:**VOS_NO_ERR** no error**VOS_PARAM_ERR** NULL parameter, parameter error**VOS_UNKNOWN_ERR** sock descriptor unknown error

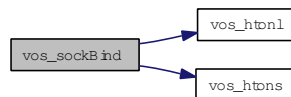
Here is the call graph for this function:

**5.23.2.7 EXT_DECL VOS_ERR_T vos_sockBind (INT32 sock, UINT32 ipAddress, UINT16 port)**

Bind a socket to an address and port.

Parameters:← **sock** socket descriptor← **ipAddress** source IP to receive on, 0 for any← **port** port to receive on, 20548 for PD**Return values:****VOS_NO_ERR** no error**VOS_PARAM_ERR** sock descriptor unknown, parameter error**VOS_IO_ERR** Input/Output error**VOS_MEM_ERR** resource error

Here is the call graph for this function:

**5.23.2.8 EXT_DECL VOS_ERR_T vos_sockClose (INT32 sock)**

Close a socket.

Release any resources acquired by this socket

Parameters:← **sock** socket descriptor**Return values:****VOS_NO_ERR** no error**VOS_PARAM_ERR** sock descriptor unknown

5.23.2.9 EXT_DECL VOS_ERR_T vos_sockConnect (INT32 *sock*, UINT32 *ipAddress*, UINT16 *port*)

Open a TCP connection.

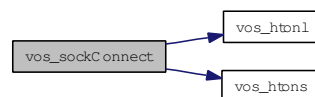
Parameters:

- ← *sock* socket descriptor
- ← *ipAddress* destination IP
- ← *port* destination port

Return values:

- VOS_NO_ERR** no error
- VOS_PARAM_ERR** sock descriptor unknown, parameter error
- VOS_IO_ERR** Input/Output error
- VOS_MEM_ERR** resource error

Here is the call graph for this function:



5.23.2.10 EXT_DECL VOS_ERR_T vos_sockInit (void)

Initialize the socket library.

Must be called once before any other call

Return values:

- VOS_NO_ERR** no error
- VOS SOCK_ERR** sockets not supported

5.23.2.11 EXT_DECL VOS_ERR_T vos_sockJoinMC (INT32 *sock*, UINT32 *mcAddress*, UINT32 *ipAddress*)

Join a multicast group.

Note: Some targeted systems might not support this option.

Parameters:

- ← *sock* socket descriptor
- ← *mcAddress* multicast group to join
- ← *ipAddress* depicts interface on which to join, default 0 for any

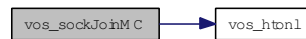
Return values:

- VOS_NO_ERR** no error

VOS_PARAM_ERR sock descriptor unknown, parameter error

VOS SOCK_ERR option not supported

Here is the call graph for this function:



5.23.2.12 EXT_DECL VOS_ERR_T vos_sockLeaveMC (INT32 *sock*, UINT32 *mcAddress*, UINT32 *ipAddress*)

Leave a multicast group.

Note: Some targeted systems might not support this option.

Parameters:

← *sock* socket descriptor

← *mcAddress* multicast group to join

← *ipAddress* depicts interface on which to leave, default 0 for any

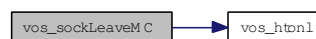
Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR sock descriptor unknown, parameter error

VOS SOCK_ERR option not supported

Here is the call graph for this function:



5.23.2.13 EXT_DECL VOS_ERR_T vos_sockListen (INT32 *sock*, UINT32 *backlog*)

Listen for incoming connections.

Listen for incoming TCP connections.

Parameters:

← *sock* socket descriptor

← *backlog* maximum connection attempts if system is busy

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR sock descriptor unknown, parameter error

VOS_IO_ERR Input/Output error

VOS_MEM_ERR resource error

5.23.2.14 EXT_DECL VOS_ERR_T vos_sockOpenTCP (INT32 * *pSock*, const VOS SOCK_OPT_T * *pOptions*)

Create a TCP socket.

Return a socket descriptor for further calls. The socket options are optional and can be applied later.

Parameters:

- *pSock* pointer to socket descriptor returned
- ← *pOptions* pointer to socket options (optional)

Return values:

- VOS_NO_ERR** no error
- VOS_PARAM_ERR** *pSock* == NULL
- VOS SOCK_ERR** socket not available or option not supported

Here is the call graph for this function:



5.23.2.15 EXT_DECL VOS_ERR_T vos_sockOpenUDP (INT32 * *pSock*, const VOS SOCK_OPT_T * *pOptions*)

Create an UDP socket.

Return a socket descriptor for further calls. The socket options are optional and can be applied later. Note: Some targeted systems might not support every option.

Parameters:

- *pSock* pointer to socket descriptor returned
- ← *pOptions* pointer to socket options (optional)

Return values:

- VOS_NO_ERR** no error
- VOS_PARAM_ERR** *pSock* == NULL
- VOS SOCK_ERR** socket not available or option not supported

Here is the call graph for this function:



5.23.2.16 EXT_DECL VOS_ERR_T vos_sockReceiveTCP (INT32 *sock*, UINT8 * *pBuffer*, INT32 * *pSize*)

Receive TCP data.

The caller must provide a sufficient sized buffer. If the supplied buffer is smaller than the bytes received, *pSize will reflect the number of copied bytes and the call should be repeated until *pSize is 0 (zero). If the socket was created in blocking-mode (default), then this call will block and will only return if data has been received or the socket was closed or an error occurred. If called in non-blocking mode, and no data is available, VOS_NODATA_ERR will be returned.

Parameters:

- ← *sock* socket descriptor
- *pBuffer* pointer to applications data buffer
- ↔ *pSize* pointer to the received data size

Return values:

- VOS_NO_ERR** no error
- VOS_PARAM_ERR** sock descriptor unknown, parameter error
- VOS_IO_ERR** data could not be read
- VOS_NODATA_ERR** no data in non-blocking

5.23.2.17 EXT_DECL VOS_ERR_T vos_sockReceiveUDP (INT32 *sock*, UINT8 * *pBuffer*, INT32 * *pSize*, UINT32 * *pIPAddr*)

Receive UDP data.

The caller must provide a sufficient sized buffer. If the supplied buffer is smaller than the bytes received, *pSize will reflect the number of copied bytes and the call should be repeated until *pSize is 0 (zero). If the socket was created in blocking-mode (default), then this call will block and will only return if data has been received or the socket was closed or an error occurred. If called in non-blocking mode, and no data is available, VOS_NODATA_ERR will be returned.

Parameters:

- ← *sock* socket descriptor
- *pBuffer* pointer to applications data buffer
- ↔ *pSize* pointer to the received data size
- *pIPAddr* source IP

Return values:

- VOS_NO_ERR** no error
- VOS_PARAM_ERR** sock descriptor unknown, parameter error
- VOS_IO_ERR** data could not be read
- VOS_NODATA_ERR** no data in non-blocking

Here is the call graph for this function:



5.23.2.18 EXT_DECL VOS_ERR_T vos_sockSendTCP (INT32 *sock*, const UINT8 * *pBuffer*, UINT32 *size*)

Send TCP data.

Send data to the supplied address and port.

Parameters:

- ← *sock* socket descriptor
- ← *pBuffer* pointer to data to send
- ← *size* size of the data to send

Return values:

- VOS_NO_ERR* no error
- VOS_PARAM_ERR* sock descriptor unknown, parameter error
- VOS_IO_ERR* data could not be sent

5.23.2.19 EXT_DECL VOS_ERR_T vos_sockSendUDP (INT32 *sock*, const UINT8 * *pBuffer*, UINT32 *size*, UINT32 *ipAddress*, UINT16 *port*)

Send UDP data.

Send data to the supplied address and port.

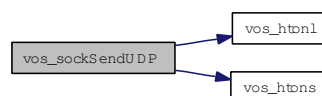
Parameters:

- ← *sock* socket descriptor
- ← *pBuffer* pointer to data to send
- ← *size* size of the data to send
- ← *ipAddress* destination IP
- ← *port* destination port

Return values:

- VOS_NO_ERR* no error
- VOS_PARAM_ERR* sock descriptor unknown, parameter error
- VOS_IO_ERR* data could not be sent
- VOS_MEM_ERR* resource error

Here is the call graph for this function:



5.23.2.20 EXT_DECL VOS_ERR_T vos_sockSetOptions (INT32 *sock*, const VOS_SOCK_OPT_T **pOptions*)

Set socket options.

Note: Some targeted systems might not support every option.

Parameters:

← *sock* socket descriptor

← *pOptions* pointer to socket options (optional)

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR sock descriptor unknown

- EXT_DECL UINT32 [vos_htonl](#) (UINT32 val)
Byte swapping 4 Bytes.
- EXT_DECL UINT32 [vos_ntohl](#) (UINT32 val)
Byte swapping 4 Bytes.
- EXT_DECL BOOL [vos_IsMulticast](#) (UINT32 ipAddress)
Check if the supplied address is a multicast group address.
- EXT_DECL [VOS_ERR_T](#) [vos_sockInit](#) (void)
Initialize the socket library.
- EXT_DECL [VOS_ERR_T](#) [vos_sockOpenUDP](#) (INT32 *pSock, const [VOS_SOCKET_OPT_T](#) *pOptions)
Create an UDP socket.
- EXT_DECL [VOS_ERR_T](#) [vos_sockOpenTCP](#) (INT32 *pSock, const [VOS_SOCKET_OPT_T](#) *pOptions)
Create a TCP socket.
- EXT_DECL [VOS_ERR_T](#) [vos_sockClose](#) (INT32 sock)
Close a socket.
- EXT_DECL [VOS_ERR_T](#) [vos_sockSetOptions](#) (INT32 sock, const [VOS_SOCKET_OPT_T](#) *pOptions)
Set socket options.
- EXT_DECL [VOS_ERR_T](#) [vos_sockJoinMC](#) (INT32 sock, UINT32 mcAddress, UINT32 ipAddress)
Join a multicast group.
- EXT_DECL [VOS_ERR_T](#) [vos_sockLeaveMC](#) (INT32 sock, UINT32 mcAddress, UINT32 ipAddress)
Leave a multicast group.
- EXT_DECL [VOS_ERR_T](#) [vos_sockSendUDP](#) (INT32 sock, const UINT8 *pBuffer, UINT32 size, UINT32 ipAddress, UINT16 port)
Send UDP data.
- EXT_DECL [VOS_ERR_T](#) [vos_sockReceiveUDP](#) (INT32 sock, UINT8 *pBuffer, INT32 *pSize, UINT32 *pIPAddr)
Receive UDP data.
- EXT_DECL [VOS_ERR_T](#) [vos_sockBind](#) (INT32 sock, UINT32 ipAddress, UINT16 port)
Bind a socket to an address and port.
- EXT_DECL [VOS_ERR_T](#) [vos_sockListen](#) (INT32 sock, UINT32 backlog)
Listen for incoming TCP connections.

- EXT_DECL [VOS_ERR_T vos_sockAccept](#) (INT32 sock, INT32 *pSock, UINT32 *pIPAddress, UINT16 *pPort)

Accept an incoming TCP connection.

- EXT_DECL [VOS_ERR_T vos_sockConnect](#) (INT32 sock, UINT32 ipAddress, UINT16 port)

Open a TCP connection.

- EXT_DECL [VOS_ERR_T vos_sockSendTCP](#) (INT32 sock, const UINT8 *pBuffer, UINT32 size)

Send TCP data.

- EXT_DECL [VOS_ERR_T vos_sockReceiveTCP](#) (INT32 sock, UINT8 *pBuffer, INT32 *pSize)

Receive TCP data.

5.24.1 Detailed Description

Typedefs for OS abstraction.

This is the declaration for the OS independend socket interface

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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Id

[vos_sock.h](#) 2 2012-06-04 11:25:16Z 97025

5.24.2 Function Documentation

5.24.2.1 EXT_DECL UINT32 vos_htonl (UINT32 val)

Byte swapping 4 Bytes.

Parameters:

← *val* Initial value.

Return values:

swapped value

5.24.2.2 EXT_DECL UINT16 vos_htons (UINT16 *val*)

Byte swapping 2 Bytes.

Parameters:

← *val* Initial value.

Return values:

swapped value

Byte swapping 2 Bytes.

Parameters:

← *val* Initial value.

Return values:

swapped value

5.24.2.3 EXT_DECL BOOL vos_IsMulticast (UINT32 *ipAddress*)

Check if the supplied address is a multicast group address.

Parameters:

← *ipAddress* IP address to check.

Return values:

TRUE address is multicast

FALSE address is not a multicast address

5.24.2.4 EXT_DECL UINT32 vos_ntohl (UINT32 *val*)

Byte swapping 4 Bytes.

Parameters:

← *val* Initial value.

Return values:

swapped value

5.24.2.5 EXT_DECL UINT16 vos_ntohs (UINT16 *val*)

Byte swapping 2 Bytes.

Parameters:

← *val* Initial value.

Return values:

swapped value

5.24.2.6 EXT_DECL VOS_ERR_T vos_sockAccept (INT32 *sock*, INT32 * *pSock*, UINT32 * *pIPAddress*, UINT16 * *pPort*)

Accept an incoming TCP connection.

Accept incoming connections on the provided socket. May block and will return a new socket descriptor when accepting a connection. The original socket *pSock, remains open.

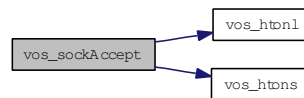
Parameters:

- ← *sock* Socket descriptor
- *pSock* Pointer to socket descriptor, on exit new socket
- *pIPAddress* source IP to receive on, 0 for any
- *pPort* port to receive on, 20548 for PD

Return values:

- VOS_NO_ERR** no error
- VOS_PARAM_ERR** NULL parameter, parameter error
- VOS_UNKNOWN_ERR** sock descriptor unknown error

Here is the call graph for this function:



5.24.2.7 EXT_DECL VOS_ERR_T vos_sockBind (INT32 *sock*, UINT32 *ipAddress*, UINT16 *port*)

Bind a socket to an address and port.

Parameters:

- ← *sock* socket descriptor
- ← *ipAddress* source IP to receive from, 0 for any
- ← *port* port to receive from

Return values:

- VOS_NO_ERR** no error
- VOS_INIT_ERR** module not initialised
- VOS_NOINIT_ERR** invalid handle
- VOS_PARAM_ERR** parameter out of range/invalid
- VOS_IO_ERR** Input/Output error
- VOS_MEM_ERR** resource error

Parameters:

- ← *sock* socket descriptor

← *ipAddress* source IP to receive on, 0 for any

← *port* port to receive on, 20548 for PD

Return values:

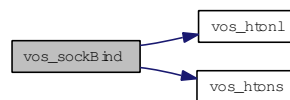
VOS_NO_ERR no error

VOS_PARAM_ERR sock descriptor unknown, parameter error

VOS_IO_ERR Input/Output error

VOS_MEM_ERR resource error

Here is the call graph for this function:



5.24.2.8 EXT_DECL VOS_ERR_T vos_sockClose (INT32 *sock*)

Close a socket.

Release any resources aquired by this socket

Parameters:

← *sock* socket descriptor

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_NOINIT_ERR invalid handle

Release any resources aquired by this socket

Parameters:

← *sock* socket descriptor

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR sock descriptor unknown

5.24.2.9 EXT_DECL VOS_ERR_T vos_sockConnect (INT32 *sock*, UINT32 *ipAddress*, UINT16 *port*)

Open a TCP connection.

Parameters:

← *sock* socket descriptor

← *ipAddress* destination IP

← *port* destination port

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_NOINIT_ERR invalid handle

VOS_PARAM_ERR parameter out of range/invalid

VOS_IO_ERR Input/Output error

VOS_MEM_ERR resource error

Parameters:

← *sock* socket descriptor

← *ipAddress* destination IP

← *port* destination port

Return values:

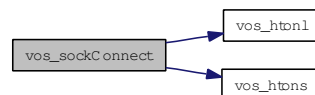
VOS_NO_ERR no error

VOS_PARAM_ERR sock descriptor unknown, parameter error

VOS_IO_ERR Input/Output error

VOS_MEM_ERR resource error

Here is the call graph for this function:



5.24.2.10 EXT_DECL VOS_ERR_T vos_sockInit (void)

Initialize the socket library.

Must be called once before any other call

Return values:

VOS_NO_ERR no error

VOS SOCK_ERR sockets not supported

5.24.2.11 EXT_DECL VOS_ERR_T vos_sockJoinMC (INT32 sock, UINT32 mcAddress, UINT32 ipAddress)

Join a multicast group.

Note: Some target systems might not support this option.

Parameters:

- ← *sock* socket descriptor
- ← *mcAddress* multicast group to join
- ← *ipAddress* depicts interface on which to join, default 0 for any

Return values:

- VOS_NO_ERR** no error
- VOS_INIT_ERR** module not initialised
- VOS_NOINIT_ERR** invalid handle
- VOS_PARAM_ERR** parameter out of range/invalid
- VOS SOCK_ERR** option not supported

Note: Some targeted systems might not support this option.

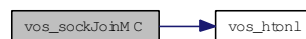
Parameters:

- ← *sock* socket descriptor
- ← *mcAddress* multicast group to join
- ← *ipAddress* depicts interface on which to join, default 0 for any

Return values:

- VOS_NO_ERR** no error
- VOS_PARAM_ERR** sock descriptor unknown, parameter error
- VOS SOCK_ERR** option not supported

Here is the call graph for this function:



5.24.2.12 EXT_DECL VOS_ERR_T vos_sockLeaveMC (INT32 *sock*, UINT32 *mcAddress*, UINT32 *ipAddress*)

Leave a multicast group.

Note: Some target systems might not support this option.

Parameters:

- ← *sock* socket descriptor
- ← *mcAddress* multicast group to join
- ← *ipAddress* depicts interface on which to leave, default 0 for any

Return values:

- VOS_NO_ERR** no error
- VOS_INIT_ERR** module not initialised

VOS_NOINIT_ERR invalid handle
VOS_PARAM_ERR parameter out of range/invalid
VOS SOCK_ERR option not supported

Note: Some targeted systems might not support this option.

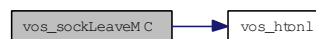
Parameters:

← **sock** socket descriptor
 ← **mcAddress** multicast group to join
 ← **ipAddress** depicts interface on which to leave, default 0 for any

Return values:

VOS_NO_ERR no error
VOS_PARAM_ERR sock descriptor unknown, parameter error
VOS SOCK_ERR option not supported

Here is the call graph for this function:



5.24.2.13 EXT_DECL VOS_ERR_T vos_sockListen (INT32 sock, UINT32 backlog)

Listen for incoming TCP connections.

Parameters:

← **sock** socket descriptor
 ← **backlog** maximum connection attempts if system is busy

Return values:

VOS_NO_ERR no error
VOS_INIT_ERR module not initialised
VOS_NOINIT_ERR invalid handle
VOS_PARAM_ERR parameter out of range/invalid
VOS_IO_ERR Input/Output error
VOS_MEM_ERR resource error

Listen for incoming TCP connections.

Parameters:

← **sock** socket descriptor
 ← **backlog** maximum connection attempts if system is busy

Return values:*VOS_NO_ERR* no error*VOS_PARAM_ERR* sock descriptor unknown, parameter error*VOS_IO_ERR* Input/Output error*VOS_MEM_ERR* resource error**5.24.2.14 EXT_DECL VOS_ERR_T vos_sockOpenTCP (INT32 * *pSock*, const VOS SOCK_OPT_T * *pOptions*)**

Create a TCP socket.

Return a socket descriptor for further calls. The socket options are optional and can be applied later.

Parameters:→ *pSock* pointer to socket descriptor returned← *pOptions* pointer to socket options (optional)**Return values:***VOS_NO_ERR* no error*VOS_INIT_ERR* module not initialised*VOS_PARAM_ERR* *pSock* == NULL*VOS SOCK_ERR* socket not available or option not supported

Return a socket descriptor for further calls. The socket options are optional and can be applied later.

Parameters:→ *pSock* pointer to socket descriptor returned← *pOptions* pointer to socket options (optional)**Return values:***VOS_NO_ERR* no error*VOS_PARAM_ERR* *pSock* == NULL*VOS SOCK_ERR* socket not available or option not supported

Here is the call graph for this function:

**5.24.2.15 EXT_DECL VOS_ERR_T vos_sockOpenUDP (INT32 * *pSock*, const VOS SOCK_OPT_T * *pOptions*)**

Create an UDP socket.

Return a socket descriptor for further calls. The socket options are optional and can be applied later. Note: Some target systems might not support every option.

Parameters:

- *pSock* pointer to socket descriptor returned
- ← *pOptions* pointer to socket options (optional)

Return values:

- VOS_NO_ERR** no error
- VOS_PARAM_ERR** pSock == NULL
- VOS SOCK_ERR** socket not available or option not supported

Return a socket descriptor for further calls. The socket options are optional and can be applied later. Note: Some targeted systems might not support every option.

Parameters:

- *pSock* pointer to socket descriptor returned
- ← *pOptions* pointer to socket options (optional)

Return values:

- VOS_NO_ERR** no error
- VOS_PARAM_ERR** pSock == NULL
- VOS SOCK_ERR** socket not available or option not supported

Here is the call graph for this function:



5.24.2.16 EXT_DECL VOS_ERR_T vos_sockReceiveTCP (INT32 *sock*, UINT8 * *pBuffer*, INT32 * *pSize*)

Receive TCP data.

The caller must provide a sufficient sized buffer. If the supplied buffer is smaller than the bytes received, *pSize will reflect the number of copied bytes and the call should be repeated until *pSize is 0 (zero). If the socket was created in blocking-mode (default), then this call will block and will only return if data has been received or the socket was closed or an error occurred. If called in non-blocking mode, and no data is available, VOS_NODATA_ERR will be returned.

Parameters:

- ← *sock* socket descriptor
- *pBuffer* pointer to applications data buffer
- ↔ *pSize* pointer to the received data size

Return values:

- VOS_NO_ERR** no error
- VOS_INIT_ERR** module not initialised

VOS_NOINIT_ERR invalid handle
VOS_PARAM_ERR parameter out of range/invalid
VOS_IO_ERR data could not be read
VOS_MEM_ERR resource error
VOS_NODATA_ERR no data in non-blocking

The caller must provide a sufficient sized buffer. If the supplied buffer is smaller than the bytes received, *pSize will reflect the number of copied bytes and the call should be repeated until *pSize is 0 (zero). If the socket was created in blocking-mode (default), then this call will block and will only return if data has been received or the socket was closed or an error occurred. If called in non-blocking mode, and no data is available, VOS_NODATA_ERR will be returned.

Parameters:

← **sock** socket descriptor
→ **pBuffer** pointer to applications data buffer
↔ **pSize** pointer to the received data size

Return values:

VOS_NO_ERR no error
VOS_PARAM_ERR sock descriptor unknown, parameter error
VOS_IO_ERR data could not be read
VOS_NODATA_ERR no data in non-blocking

5.24.2.17 EXT_DECL VOS_ERR_T vos_sockReceiveUDP (INT32 sock, UINT8 * pBuffer, INT32 * pSize, UINT32 * pIPAddr)

Receive UDP data.

The caller must provide a sufficient sized buffer. If the supplied buffer is smaller than the bytes received, *pSize will reflect the number of copied bytes and the call should be repeated until *pSize is 0 (zero). If the socket was created in blocking-mode (default), then this call will block and will only return if data has been received or the socket was closed or an error occurred. If called in non-blocking mode, and no data is available, VOS_NODATA_ERR will be returned.

Parameters:

← **sock** socket descriptor
→ **pBuffer** pointer to applications data buffer
↔ **pSize** pointer to the received data size
→ **pIPAddr** source IP

Return values:

VOS_NO_ERR no error
VOS_INIT_ERR module not initialised
VOS_NOINIT_ERR invalid handle
VOS_PARAM_ERR parameter out of range/invalid

VOS_IO_ERR data could not be read

VOS_MEM_ERR resource error

VOS_NODATA_ERR no data in non-blocking

The caller must provide a sufficient sized buffer. If the supplied buffer is smaller than the bytes received, *pSize will reflect the number of copied bytes and the call should be repeated until *pSize is 0 (zero). If the socket was created in blocking-mode (default), then this call will block and will only return if data has been received or the socket was closed or an error occurred. If called in non-blocking mode, and no data is available, VOS_NODATA_ERR will be returned.

Parameters:

← **sock** socket descriptor

→ **pBuffer** pointer to applications data buffer

↔ **pSize** pointer to the received data size

→ **pIPAddr** source IP

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR sock descriptor unknown, parameter error

VOS_IO_ERR data could not be read

VOS_NODATA_ERR no data in non-blocking

Here is the call graph for this function:



5.24.2.18 EXT_DECL VOS_ERR_T vos_sockSendTCP (INT32 sock, const UINT8 * pBuffer, UINT32 size)

Send TCP data.

Send data to the given socket.

Parameters:

← **sock** socket descriptor

← **pBuffer** pointer to data to send

← **size** size of the data to send

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_NOINIT_ERR invalid handle

VOS_PARAM_ERR parameter out of range/invalid

VOS_IO_ERR data could not be sent

VOS_MEM_ERR resource error

Send data to the supplied address and port.

Parameters:

- ← *sock* socket descriptor
- ← *pBuffer* pointer to data to send
- ← *size* size of the data to send

Return values:

- VOS_NO_ERR** no error
- VOS_PARAM_ERR** sock descriptor unknown, parameter error
- VOS_IO_ERR** data could not be sent

**5.24.2.19 EXT_DECL VOS_ERR_T vos_sockSendUDP (INT32 *sock*, const UINT8 * *pBuffer*,
UINT32 *size*, UINT32 *ipAddress*, UINT16 *port*)**

Send UDP data.

Send data to the given address and port.

Parameters:

- ← *sock* socket descriptor
- ← *pBuffer* pointer to data to send
- ← *size* size of the data to send
- ← *ipAddress* destination IP
- ← *port* destination port

Return values:

- VOS_NO_ERR** no error
- VOS_INIT_ERR** module not initialised
- VOS_NOINIT_ERR** invalid handle
- VOS_PARAM_ERR** parameter out of range/invalid
- VOS_IO_ERR** data could not be sent
- VOS_MEM_ERR** resource error

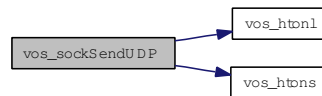
Send data to the supplied address and port.

Parameters:

- ← *sock* socket descriptor
- ← *pBuffer* pointer to data to send
- ← *size* size of the data to send
- ← *ipAddress* destination IP
- ← *port* destination port

Return values:**VOS_NO_ERR** no error**VOS_PARAM_ERR** sock descriptor unknown, parameter error**VOS_IO_ERR** data could not be sent**VOS_MEM_ERR** resource error

Here is the call graph for this function:



5.24.2.20 EXT_DECL VOS_ERR_T vos_sockSetOptions (INT32 sock, const VOS_SOCK_OPT_T *pOptions)

Set socket options.

Note: Some target systems might not support each option.

Parameters:← **sock** socket descriptor← **pOptions** pointer to socket options (optional)**Return values:****VOS_NO_ERR** no error**VOS_INIT_ERR** module not initialised**VOS_NOINIT_ERR** invalid handle**VOS_PARAM_ERR** parameter out of range/invalid**VOS_SOCK_ERR** socket not available or option not supported

Note: Some targeted systems might not support every option.

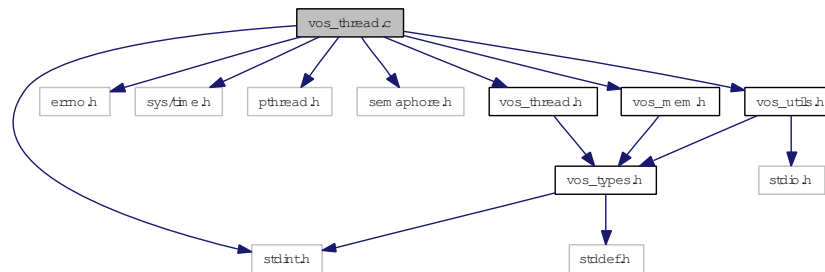
Parameters:← **sock** socket descriptor← **pOptions** pointer to socket options (optional)**Return values:****VOS_NO_ERR** no error**VOS_PARAM_ERR** sock descriptor unknown

5.25 vos_thread.c File Reference

Multitasking functions.

```
#include <stdint.h>
#include <errno.h>
#include <sys/time.h>
#include <pthread.h>
#include <semaphore.h>
#include "vos_thread.h"
#include "vos_mem.h"
#include "vos_utils.h"
```

Include dependency graph for vos_thread.c:



Functions

- void [cyclicThread](#) (UINT32 interval, [VOS_THREAD_FUNC_T](#) pFunction, void *pArguments)
Cyclic thread functions.
- EXT_DECL [VOS_ERR_T](#) [vos_threadInit](#) (void)
Initialize the thread library.
- EXT_DECL [VOS_ERR_T](#) [vos_threadCreate](#) ([VOS_THREAD_T](#) *pThread, const CHAR8 *pName, [VOS_THREAD_POLICY_T](#) policy, [VOS_THREAD_PRIORITY_T](#) priority, UINT32 interval, UINT32 stackSize, [VOS_THREAD_FUNC_T](#) pFunction, void *pArguments)
Create a thread.
- EXT_DECL [VOS_ERR_T](#) [vos_threadTerminate](#) ([VOS_THREAD_T](#) thread)
Terminate a thread.
- EXT_DECL [VOS_ERR_T](#) [vos_threadIsActive](#) ([VOS_THREAD_T](#) thread)
Is the thread still active? This call will return VOS_NO_ERR if the thread is still active, VOS_PARAM_ERR in case it ran out.
- EXT_DECL [VOS_ERR_T](#) [vos_threadDelay](#) (UINT32 delay)
Delay the execution of the current thread by the given delay in us.

- EXT_DECL [VOS_ERR_T](#) [vos_getTime](#) ([VOS_TIME_T](#) *pTime)
Return the current time in sec and us.
- EXT_DECL const [CHAR8](#) * [vos_getTimeStamp](#) (void)
Get a time-stamp string.
- EXT_DECL [VOS_ERR_T](#) [vos_clearTime](#) ([VOS_TIME_T](#) *pTime)
Clear the time stamp.
- EXT_DECL [VOS_ERR_T](#) [vos_addTime](#) ([VOS_TIME_T](#) *pTime, const [VOS_TIME_T](#) *pAdd)
Add the second to the first time stamp, return sum in first.
- EXT_DECL [VOS_ERR_T](#) [vos_subTime](#) ([VOS_TIME_T](#) *pTime, const [VOS_TIME_T](#) *pSub)
Subtract the second from the first time stamp, return diff in first.
- EXT_DECL [INT32](#) [vos_cmpTime](#) (const [VOS_TIME_T](#) *pTime, const [VOS_TIME_T](#) *pCmp)
Compare the second from the first time stamp, return diff in first.
- EXT_DECL [VOS_ERR_T](#) [vos_getUuid](#) ([VOS_UUID_T](#) pUulD)
Get a universal unique identifier according to RFC 4122 time based version.
- EXT_DECL [VOS_ERR_T](#) [vos_mutexCreate](#) ([VOS_MUTEX_T](#) *pMutex)
Create a recursive mutex.
- EXT_DECL [VOS_ERR_T](#) [vos_mutexDelete](#) ([VOS_MUTEX_T](#) mutex)
Delete a mutex.
- EXT_DECL [VOS_ERR_T](#) [vos_mutexLock](#) ([VOS_MUTEX_T](#) mutex)
Take a mutex.
- EXT_DECL [VOS_ERR_T](#) [vos_mutexTryLock](#) ([VOS_MUTEX_T](#) mutex)
Try to take a mutex.
- EXT_DECL [VOS_ERR_T](#) [vos_mutexUnlock](#) ([VOS_MUTEX_T](#) mutex)
Release a mutex.
- EXT_DECL [VOS_ERR_T](#) [vos_semaCreate](#) ([VOS_SEMA_T](#) *pSema, [VOS_SEMA_STATE_T](#) initialState)
Create a semaphore.
- EXT_DECL [VOS_ERR_T](#) [vos_semaDelete](#) ([VOS_SEMA_T](#) sema)
Delete a semaphore.
- EXT_DECL [VOS_ERR_T](#) [vos_semaTake](#) ([VOS_SEMA_T](#) sema, [UINT32](#) timeout)
Take a semaphore.
- EXT_DECL [VOS_ERR_T](#) [vos_semaGive](#) ([VOS_SEMA_T](#) sema)
Give a semaphore.

5.25.1 Detailed Description

Multitasking functions.

OS abstraction of thread-handling functions

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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Id

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5.25.2 Function Documentation

5.25.2.1 void cyclicThread (UINT32 *interval*, VOS_THREAD_FUNC_T *pFunction*, void * *pArguments*)

Cyclic thread functions.

Wrapper for cyclic threads. The thread function will be called cyclically with interval.

Parameters:

- ← *interval* Interval for cyclic threads in us (optional)
- ← *pFunction* Pointer to the thread function
- ← *pArguments* Pointer to the thread function parameters

Return values:

void

Here is the call graph for this function:



5.25.2.2 EXT_DECL VOS_ERR_T vos_addTime (VOS_TIME_T * *pTime*, const VOS_TIME_T * *pAdd*)

Add the second to the first time stamp, return sum in first.

Parameters:

- ↔ *pTime* Pointer to time value

← *pAdd* Pointer to time value

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR parameter must not be NULL

5.25.2.3 EXT_DECL VOS_ERR_T vos_clearTime (VOS_TIME_T * *pTime*)

Clear the time stamp.

Parameters:

→ *pTime* Pointer to time value

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR parameter must not be NULL

5.25.2.4 EXT_DECL INT32 vos_cmpTime (const VOS_TIME_T * *pTime*, const VOS_TIME_T * *pCmp*)

Compare the second from the first time stamp, return diff in first.

Parameters:

↔ *pTime* Pointer to time value

← *pCmp* Pointer to time value to compare

Return values:

0 *pTime* == *pCmp*

-1 *pTime* < *pCmp*

1 *pTime* > *pCmp*

5.25.2.5 EXT_DECL VOS_ERR_T vos_getTime (VOS_TIME_T * *pTime*)

Return the current time in sec and us.

Parameters:

→ *pTime* Pointer to time value

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR parameter out of range/invalid

5.25.2.6 EXT_DECL const CHAR8* vos_getTimeStamp (void)

Get a time-stamp string.

Get a time-stamp string for debugging in the form "yyyymmdd-hh:mm:ss.ms" Depending on the used OS / hardware the time might not be a real-time stamp but relative from start of system.

Return values:

timestamp "yyyymmdd-hh:mm:ss.ms"

5.25.2.7 EXT_DECL VOS_ERR_T vos_getUuid (VOS_UUID_T pUuid)

Get a universal unique identifier according to RFC 4122 time based version.

Parameters:

→ *pUuid* Pointer to a universal unique identifier

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

Here is the call graph for this function:



5.25.2.8 EXT_DECL VOS_ERR_T vos_mutexCreate (VOS_MUTEX_T * pMutex)

Create a recursive mutex.

Create a mutex.

Return a mutex handle. The mutex will be available at creation.

Parameters:

→ *pMutex* Pointer to mutex handle

Return values:

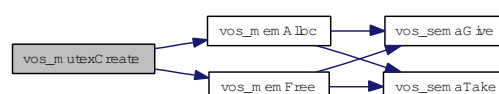
VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_PARAM_ERR pMutex == NULL

VOS_MUTEX_ERR no mutex available

Here is the call graph for this function:



5.25.2.9 EXT_DECL VOS_ERR_T vos_mutexDelete (VOS_MUTEX_T mutex)

Delete a mutex.

Release the resources taken by the mutex.

Parameters:

← *mutex* mutex handle

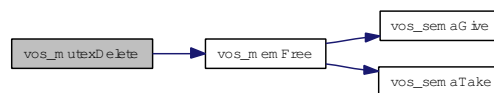
Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR pMutex == NULL or wrong type

VOS_MUTEX_ERR no such mutex

Here is the call graph for this function:



5.25.2.10 EXT_DECL VOS_ERR_T vos_mutexLock (VOS_MUTEX_T mutex)

Take a mutex.

Wait for the mutex to become available (lock).

Parameters:

← *mutex* mutex handle

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR pMutex == NULL or wrong type

VOS_MUTEX_ERR no such mutex

5.25.2.11 EXT_DECL VOS_ERR_T vos_mutexTryLock (VOS_MUTEX_T mutex)

Try to take a mutex.

If mutex is can't be taken VOS_MUTEX_ERR is returned.

Parameters:

← *mutex* mutex handle

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR pMutex == NULL or wrong type

VOS_MUTEX_ERR mutex not locked

5.25.2.12 EXT_DECL VOS_ERR_T vos_mutexUnlock (VOS_MUTEX_T *mutex*)

Release a mutex.

Unlock the mutex.

Parameters:

← *mutex* mutex handle

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR pMutex == NULL or wrong type

VOS_MUTEX_ERR no such mutex

5.25.2.13 EXT_DECL VOS_ERR_T vos_semaCreate (VOS_SEMA_T * *pSema*, VOS_SEMA_STATE_T *initialState*)

Create a semaphore.

Return a semaphore handle. Depending on the initial state the semaphore will be available on creation or not.

Parameters:

→ *pSema* Pointer to semaphore handle

← *initialState* The initial state of the semaphore

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_PARAM_ERR parameter out of range/invalid

VOS_SEMA_ERR no semaphore available

5.25.2.14 EXT_DECL VOS_ERR_T vos_semaDelete (VOS_SEMA_T *sema*)

Delete a semaphore.

This will eventually release any processes waiting for the semaphore.

Parameters:

← *sema* semaphore handle

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_NOINIT_ERR invalid handle

5.25.2.15 EXT_DECL VOS_ERR_T vos_semaGive (VOS_SEMA_T *sema*)

Give a semaphore.

Release (increase) a semaphore.

Parameters:

← *sema* semaphore handle

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_NOINIT_ERR invalid handle

VOS_SEM_ERR could not release semaphore

5.25.2.16 EXT_DECL VOS_ERR_T vos_semaTake (VOS_SEMA_T *sema*, UINT32 *timeout*)

Take a semaphore.

Try to get (decrease) a semaphore.

Parameters:

← *sema* semaphore handle

← *timeout* Max. time in us to wait, 0 means forever

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_NOINIT_ERR invalid handle

VOS_PARAM_ERR parameter out of range/invalid

VOS_SEMA_ERR could not get semaphore in time

5.25.2.17 EXT_DECL VOS_ERR_T vos_subTime (VOS_TIME_T * *pTime*, const VOS_TIME_T * *pSub*)

Subtract the second from the first time stamp, return diff in first.

Parameters:

↔ *pTime* Pointer to time value

← *pSub* Pointer to time value

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR parameter must not be NULL

5.25.2.18 `EXT_DECL VOS_ERR_T vos_threadCreate (VOS_THREAD_T * pThread, const CHAR8 * pName, VOS_THREAD_POLICY_T policy, VOS_THREAD_PRIORITY_T priority, UINT32 interval, UINT32 stackSize, VOS_THREAD_FUNC_T pFunction, void * pArguments)`

Create a thread.

Create a thread and return a thread handle for further requests. Not each parameter may be supported by all target systems!

Parameters:

- *pThread* Pointer to returned thread handle
- ← *pName* Pointer to name of the thread (optional)
- ← *policy* Scheduling policy (FIFO, Round Robin or other)
- ← *priority* Scheduling priority (1...255 (highest), default 0)
- ← *interval* Interval for cyclic threads in us (optional)
- ← *stackSize* Minimum stacksize, default 0: 16kB
- ← *pFunction* Pointer to the thread function
- ← *pArguments* Pointer to the thread function parameters

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised
- VOS_NOINIT_ERR* invalid handle
- VOS_PARAM_ERR* parameter out of range/invalid
- VOS_THREAD_ERR* thread creation error
- VOS_INIT_ERR* no threads available

5.25.2.19 `EXT_DECL VOS_ERR_T vos_threadDelay (UINT32 delay)`

Delay the execution of the current thread by the given delay in us.

Parameters:

- ← *delay* Delay in us

Return values:

- VOS_NO_ERR* no error
- VOS_PARAM_ERR* parameter out of range/invalid

5.25.2.20 `EXT_DECL VOS_ERR_T vos_threadInit (void)`

Initialize the thread library.

Must be called once before any other call

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* threading not supported

5.25.2.21 EXT_DECL VOS_ERR_T vos_threadIsActive (VOS_THREAD_T *thread*)

Is the thread still active? This call will return VOS_NO_ERR if the thread is still active, VOS_PARAM_ERR in case it ran out.

Parameters:

← *thread* Thread handle

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR parameter out of range/invalid

5.25.2.22 EXT_DECL VOS_ERR_T vos_threadTerminate (VOS_THREAD_T *thread*)

Terminate a thread.

This call will terminate the thread with the given threadId and release all resources. Depending on the underlying architectures, it may just block until the thread ran out.

Parameters:

← *thread* Thread handle (or NULL if current thread)

Return values:

VOS_NO_ERR no error

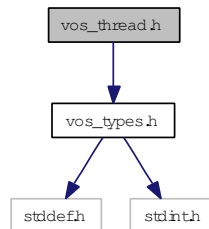
VOS_THREAD_ERR cancel failed

5.26 vos_thread.h File Reference

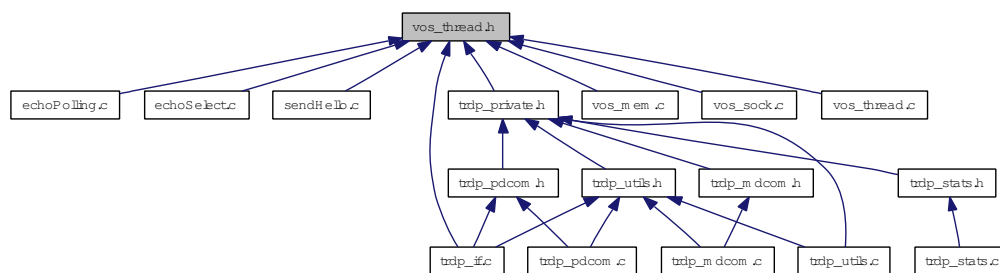
Threading functions for OS abstraction.

```
#include "vos_types.h"
```

Include dependency graph for vos_thread.h:



This graph shows which files directly or indirectly include this file:



Typedefs

- typedef uint8_t **VOS_THREAD_PRIORITY_T**
Thread priority range from 1 (highest) to 255 (lowest), 0 default of the target system.
- typedef void(__cdecl * **VOS_THREAD_FUNC_T**)(void *pArg)
Thread function definition.
- typedef struct **VOS_MUTEX_T** * **VOS_MUTEX_T**
Hidden mutex handle definition.
- typedef struct **VOS_SEMA_T** * **VOS_SEMA_T**
Hidden semaphore handle definition.
- typedef void * **VOS_THREAD_T**
Hidden thread handle definition.

Enumerations

- enum **VOS_THREAD_POLICY_T**

Thread policy matching pthread/Posix defines.

- enum [VOS_SEMA_STATE_T](#)

State of the semaphore.

Functions

- EXT_DECL [VOS_ERR_T](#) [vos_threadInit](#) (void)
Initialize the thread library.
- EXT_DECL [VOS_ERR_T](#) [vos_threadCreate](#) ([VOS_THREAD_T](#) *pThread, const CHAR8 *pName, [VOS_THREAD_POLICY_T](#) policy, [VOS_THREAD_PRIORITY_T](#) priority, UINT32 interval, UINT32 stackSize, [VOS_THREAD_FUNC_T](#) pFunction, void *pArguments)
Create a thread.
- EXT_DECL [VOS_ERR_T](#) [vos_threadTerminate](#) ([VOS_THREAD_T](#) thread)
Terminate a thread.
- EXT_DECL [VOS_ERR_T](#) [vos_threadIsActive](#) ([VOS_THREAD_T](#) thread)
Is the thread still active? This call will return VOS_NO_ERR if the thread is still active, VOS_PARAM_ERR in case it ran out.
- EXT_DECL [VOS_ERR_T](#) [vos_threadDelay](#) (UINT32 delay)
Delay the execution of the current thread by the given delay in us.
- EXT_DECL [VOS_ERR_T](#) [vos_getTime](#) ([VOS_TIME_T](#) *pTime)
Return the current time in sec and us.
- EXT_DECL const CHAR8 * [vos_getTimeStamp](#) (void)
Get a time-stamp string.
- EXT_DECL [VOS_ERR_T](#) [vos_clearTime](#) ([VOS_TIME_T](#) *pTime)
Clear the time stamp.
- EXT_DECL [VOS_ERR_T](#) [vos_addTime](#) ([VOS_TIME_T](#) *pTime, const [VOS_TIME_T](#) *pAdd)
Add the second to the first time stamp, return sum in first.
- EXT_DECL [VOS_ERR_T](#) [vos_subTime](#) ([VOS_TIME_T](#) *pTime, const [VOS_TIME_T](#) *pSub)
Subtract the second from the first time stamp, return diff in first.
- EXT_DECL INT32 [vos_cmpTime](#) (const [VOS_TIME_T](#) *pTime, const [VOS_TIME_T](#) *pCmp)
Compare the second from the first time stamp, return diff in first.
- EXT_DECL [VOS_ERR_T](#) [vos_getUuid](#) ([VOS_UUID_T](#) pUuid)
Get a universal unique identifier according to RFC 4122 time based version.
- EXT_DECL [VOS_ERR_T](#) [vos_mutexCreate](#) ([VOS_MUTEX_T](#) *pMutex)
Create a mutex.

- EXT_DECL [VOS_ERR_T](#) vos_mutexDelete ([VOS_MUTEX_T](#) mutex)
Delete a mutex.
- EXT_DECL [VOS_ERR_T](#) vos_mutexLock ([VOS_MUTEX_T](#) mutex)
Take a mutex.
- EXT_DECL [VOS_ERR_T](#) vos_mutexTryLock ([VOS_MUTEX_T](#) mutex)
Try to take a mutex.
- EXT_DECL [VOS_ERR_T](#) vos_mutexUnlock ([VOS_MUTEX_T](#) mutex)
Release a mutex.
- EXT_DECL [VOS_ERR_T](#) vos_semaCreate ([VOS_SEMA_T](#) *pSema, [VOS_SEMA_STATE_T](#) initialState)
Create a semaphore.
- EXT_DECL [VOS_ERR_T](#) vos_semaDelete ([VOS_SEMA_T](#) sema)
Delete a semaphore.
- EXT_DECL [VOS_ERR_T](#) vos_semaTake ([VOS_SEMA_T](#) sema, UINT32 timeout)
Take a semaphore.
- EXT_DECL [VOS_ERR_T](#) vos_semaGive ([VOS_SEMA_T](#) sema)
Give a semaphore.

5.26.1 Detailed Description

Threading functions for OS abstraction.

Thread-, semaphore- and time-handling functions

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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Id

[vos_thread.h](#) 2 2012-06-04 11:25:16Z 97025

5.26.2 Function Documentation

5.26.2.1 EXT_DECL VOS_ERR_T vos_addTime (VOS_TIME_T * *pTime*, const VOS_TIME_T * *pAdd*)

Add the second to the first time stamp, return sum in first.

Parameters:

↔ *pTime* Pointer to time value

← *pAdd* Pointer to time value

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR parameter must not be NULL

5.26.2.2 EXT_DECL VOS_ERR_T vos_clearTime (VOS_TIME_T * *pTime*)

Clear the time stamp.

Parameters:

→ *pTime* Pointer to time value

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR parameter must not be NULL

5.26.2.3 EXT_DECL INT32 vos_cmpTime (const VOS_TIME_T * *pTime*, const VOS_TIME_T * *pCmp*)

Compare the second from the first time stamp, return diff in first.

Parameters:

↔ *pTime* Pointer to time value

← *pCmp* Pointer to time value to compare

Return values:

0 *pTime* == *pCmp*

-1 *pTime* < *pCmp*

1 *pTime* > *pCmp*

5.26.2.4 EXT_DECL VOS_ERR_T vos_getTime (VOS_TIME_T * *pTime*)

Return the current time in sec and us.

Parameters:

→ *pTime* Pointer to time value

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

Parameters:

→ *pTime* Pointer to time value

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR parameter out of range/invalid

5.26.2.5 EXT_DECL const CHAR8* vos_getTimeStamp (void)

Get a time-stamp string.

Get a time-stamp string for debugging in the form "yyyymmdd-hh:mm:ss.ms" Depending on the used OS / hardware the time might not be a real-time stamp but relative from start of system.

Return values:

timestamp "yyyymmdd-hh:mm:ss.ms"

5.26.2.6 EXT_DECL VOS_ERR_T vos_getUuid (VOS_UUID_T *pUUID*)

Get a universal unique identifier according to RFC 4122 time based version.

Parameters:

→ *pUUID* Pointer to a universal unique identifier

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

Here is the call graph for this function:



5.26.2.7 EXT_DECL VOS_ERR_T vos_mutexCreate (VOS_MUTEX_T * *pMutex*)

Create a mutex.

Return a mutex handle. The mutex will be available at creation.

Parameters:

→ *pMutex* Pointer to mutex handle

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_PARAM_ERR *pMutex* == NULL

VOS_MUTEX_ERR no mutex available

Create a mutex.

Return a mutex handle. The mutex will be available at creation.

Parameters:

→ *pMutex* Pointer to mutex handle

Return values:

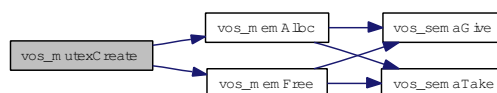
VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_PARAM_ERR *pMutex* == NULL

VOS_MUTEX_ERR no mutex available

Here is the call graph for this function:



5.26.2.8 EXT_DECL VOS_ERR_T vos_mutexDelete (VOS_MUTEX_T *mutex*)

Delete a mutex.

Release the resources taken by the mutex.

Parameters:

← *mutex* mutex handle

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_NOINIT_ERR invalid handle

VOS_MUTEX_ERR no such mutex

Release the resources taken by the mutex.

Parameters:

← *mutex* mutex handle

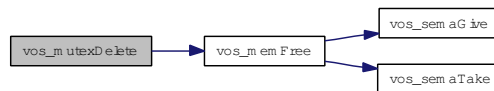
Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR pMutex == NULL or wrong type

VOS_MUTEX_ERR no such mutex

Here is the call graph for this function:



5.26.2.9 EXT_DECL VOS_ERR_T vos_mutexLock (VOS_MUTEX_T mutex)

Take a mutex.

Wait for the mutex to become available (lock).

Parameters:

← *mutex* mutex handle

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_NOINIT_ERR invalid handle

Wait for the mutex to become available (lock).

Parameters:

← *mutex* mutex handle

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR pMutex == NULL or wrong type

VOS_MUTEX_ERR no such mutex

5.26.2.10 EXT_DECL VOS_ERR_T vos_mutexTryLock (VOS_MUTEX_T *mutex*)

Try to take a mutex.

If mutex is can't be taken VOS_MUTEX_ERR is returned.

Parameters:

← *mutex* mutex handle

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_NOINIT_ERR invalid handle

VOS_MUTEX_ERR no mutex available

If mutex is can't be taken VOS_MUTEX_ERR is returned.

Parameters:

← *mutex* mutex handle

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR pMutex == NULL or wrong type

VOS_MUTEX_ERR mutex not locked

5.26.2.11 EXT_DECL VOS_ERR_T vos_mutexUnlock (VOS_MUTEX_T *mutex*)

Release a mutex.

Unlock the mutex.

Parameters:

← *mutex* mutex handle

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_NOINIT_ERR invalid handle

Unlock the mutex.

Parameters:

← *mutex* mutex handle

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR pMutex == NULL or wrong type

VOS_MUTEX_ERR no such mutex

5.26.2.12 EXT_DECL VOS_ERR_T vos_semaCreate (VOS_SEMA_T * *pSema*, VOS_SEMA_STATE_T *initialState*)

Create a semaphore.

Return a semaphore handle. Depending on the initial state the semaphore will be available on creation or not.

Parameters:

- *pSema* Pointer to semaphore handle
- ← *initialState* The initial state of the semaphore

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised
- VOS_PARAM_ERR* parameter out of range/invalid
- VOS_SEMA_ERR* no semaphore available

5.26.2.13 EXT_DECL VOS_ERR_T vos_semaDelete (VOS_SEMA_T *sema*)

Delete a semaphore.

This will eventually release any processes waiting for the semaphore.

Parameters:

- ← *sema* semaphore handle

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised
- VOS_NOINIT_ERR* invalid handle

5.26.2.14 EXT_DECL VOS_ERR_T vos_semaGive (VOS_SEMA_T *sema*)

Give a semaphore.

Release (increase) a semaphore.

Parameters:

- ← *sema* semaphore handle

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised
- VOS_NOINIT_ERR* invalid handle
- VOS_SEM_ERR* could not release semaphore

5.26.2.15 EXT_DECL VOS_ERR_T vos_semaTake (VOS_SEMA_T *sema*, UINT32 *timeout*)

Take a semaphore.

Try to get (decrease) a semaphore.

Parameters:

- ← *sema* semaphore handle
- ← *timeout* Max. time in us to wait, 0 means forever

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised
- VOS_NOINIT_ERR* invalid handle
- VOS_PARAM_ERR* parameter out of range/invalid
- VOS_SEMA_ERR* could not get semaphore in time

5.26.2.16 EXT_DECL VOS_ERR_T vos_subTime (VOS_TIME_T * *pTime*, const VOS_TIME_T * *pSub*)

Subtract the second from the first time stamp, return diff in first.

Parameters:

- ↔ *pTime* Pointer to time value
- ← *pSub* Pointer to time value

Return values:

- VOS_NO_ERR* no error
- VOS_PARAM_ERR* parameter must not be NULL

5.26.2.17 EXT_DECL VOS_ERR_T vos_threadCreate (VOS_THREAD_T * *pThread*, const CHAR8 * *pName*, VOS_THREAD_POLICY_T *policy*, VOS_THREAD_PRIORITY_T *priority*, UINT32 *interval*, UINT32 *stackSize*, VOS_THREAD_FUNC_T *pFunction*, void * *pArguments*)

Create a thread.

Create a thread and return a thread handle for further requests. Not each parameter may be supported by all target systems!

Parameters:

- *pThread* Pointer to returned thread handle
- ← *pName* Pointer to name of the thread (optional)
- ← *policy* Scheduling policy (FIFO, Round Robin or other)
- ← *priority* Scheduling priority (1...255 (highest), default 0)

- ← *interval* Interval for cyclic threads in us (optional)
- ← *stackSize* Minimum stacksize, default 0: 16kB
- ← *pFunction* Pointer to the thread function
- ← *pArguments* Pointer to the thread function parameters

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised
- VOS_NOINIT_ERR* invalid handle
- VOS_PARAM_ERR* parameter out of range/invalid
- VOS_INIT_ERR* no threads available

Create a thread and return a thread handle for further requests. Not each parameter may be supported by all target systems!

Parameters:

- *pThread* Pointer to returned thread handle
- ← *pName* Pointer to name of the thread (optional)
- ← *policy* Scheduling policy (FIFO, Round Robin or other)
- ← *priority* Scheduling priority (1...255 (highest), default 0)
- ← *interval* Interval for cyclic threads in us (optional)
- ← *stackSize* Minimum stacksize, default 0: 16kB
- ← *pFunction* Pointer to the thread function
- ← *pArguments* Pointer to the thread function parameters

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised
- VOS_NOINIT_ERR* invalid handle
- VOS_PARAM_ERR* parameter out of range/invalid
- VOS_THREAD_ERR* thread creation error
- VOS_INIT_ERR* no threads available

5.26.2.18 EXT_DECL VOS_ERR_T vos_threadDelay (UINT32 delay)

Delay the execution of the current thread by the given delay in us.

Parameters:

- ← *delay* Delay in us

Return values:

- VOS_NO_ERR* no error
- VOS_INIT_ERR* module not initialised

Parameters:

← *delay* Delay in us

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR parameter out of range/invalid

5.26.2.19 EXT_DECL VOS_ERR_T vos_threadInit (void)

Initialize the thread library.

Must be called once before any other call

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR threading not supported

5.26.2.20 EXT_DECL VOS_ERR_T vos_threadIsActive (VOS_THREAD_T *thread*)

Is the thread still active? This call will return *VOS_NO_ERR* if the thread is still active, *VOS_PARAM_ERR* in case it ran out.

Parameters:

← *thread* Thread handle

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_NOINIT_ERR invalid handle

VOS_PARAM_ERR parameter out of range/invalid

Parameters:

← *thread* Thread handle

Return values:

VOS_NO_ERR no error

VOS_PARAM_ERR parameter out of range/invalid

5.26.2.21 EXT_DECL VOS_ERR_T vos_threadTerminate (VOS_THREAD_T *thread*)

Terminate a thread.

This call will terminate the thread with the given threadId and release all resources. Depending on the underlying architectures, it may just block until the thread ran out.

Parameters:

← *thread* Thread handle (or NULL if current thread)

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR module not initialised

VOS_NOINIT_ERR invalid handle

VOS_PARAM_ERR parameter out of range/invalid

This call will terminate the thread with the given threadId and release all resources. Depending on the underlying architectures, it may just block until the thread ran out.

Parameters:

← *thread* Thread handle (or NULL if current thread)

Return values:

VOS_NO_ERR no error

VOS_THREAD_ERR cancel failed


```
VOS_NOINIT_ERR = -3,  
VOS_TIMEOUT_ERR = -4,  
VOS_NODATA_ERR = -5,  
VOS SOCK_ERR = -6,  
VOS_IO_ERR = -7,  
VOS_MEM_ERR = -8,  
VOS_SEMA_ERR = -9,  
VOS_QUEUE_ERR = -10,  
VOS_QUEUE_FULL_ERR = -11,  
VOS_MUTEX_ERR = -12,  
VOS_THREAD_ERR = -13,  
VOS_UNKNOWN_ERR = -99 }
```

Return codes for all VOS API functions.

- enum `VOS_LOG_T` {
 `VOS_LOG_ERROR` = 0,
 `VOS_LOG_WARNING` = 1,
 `VOS_LOG_INFO` = 2,
 `VOS_LOG_DBG` = 3 }

Categories for logging.

Functions

- EXT_DECL `VOS_ERR_T vos_init` (void *pRefCon, `VOS_PRINT_DBG_T` pDebugOutput)

Initialize the vos library.

5.27.1 Detailed Description

Typedefs for OS abstraction.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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Id

`vos_types.h` 2 2012-06-04 11:25:16Z 97025

5.27.2 Typedef Documentation

5.27.2.1 typedef void(* VOS_PRINT_DBG_T)(void *pRefCon, VOS_LOG_T category, const CHAR8 *pTime, const CHAR8 *pFile, UINT16 LineNumber, const CHAR8 *pMsgStr)

Function definition for error/debug output.

The function will be called for logging and error message output. The user can decide, what kind of info will be logged by filtering the category.

Parameters:

- ← *pRefCon* pointer to user context
- ← *category* Log category (Error, Warning, Info etc.)
- ← *pTime* pointer to NULL-terminated string of time stamp
- ← *pFile* pointer to NULL-terminated string of source module
- ← *LineNumber* Line number
- ← *pMsgStr* pointer to NULL-terminated string

Return values:

none

5.27.3 Enumeration Type Documentation

5.27.3.1 enum VOS_ERR_T

Return codes for all VOS API functions.

Enumerator:

- VOS_NO_ERR** No error.
- VOS_PARAM_ERR** Necessary parameter missing or out of range.
- VOS_INIT_ERR** Call without valid initialization.
- VOS_NOINIT_ERR** The supplied handle/reference is not valid.
- VOS_TIMEOUT_ERR** Timeout.
- VOS_NODATA_ERR** Non blocking mode: no data received.
- VOS SOCK_ERR** Socket option not supported.
- VOS_IO_ERR** Socket IO error, data can't be received/sent.
- VOS_MEM_ERR** No more memory available.
- VOS_SEMA_ERR** Semaphore not available.
- VOS_QUEUE_ERR** Queue empty.
- VOS_QUEUE_FULL_ERR** Queue full.
- VOS_MUTEX_ERR** Mutex not available.
- VOS_THREAD_ERR** Thread creation error.
- VOS_UNKNOWN_ERR** Unknown error.

5.27.3.2 enum VOS_LOG_T

Categories for logging.

Enumerator:

VOS_LOG_ERROR This is a critical error.

VOS_LOG_WARNING This is a warning.

VOS_LOG_INFO This is an info.

VOS_LOG_DBG This is a debug info.

5.27.4 Function Documentation

5.27.4.1 EXT_DECL VOS_ERR_T vos_init (void * *pRefCon*, VOS_PRINT_DBG_T *pDebugOutput*)

Initialize the vos library.

This is used to set the output function for all VOS error and debug output.

Parameters:

← **pRefCon* user context

← **pDebugOutput* pointer to debug output function

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR unsupported

Here is the call graph for this function:



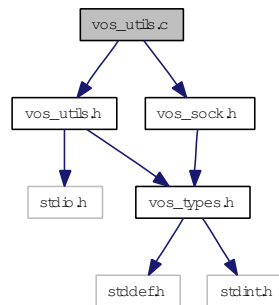
5.28 vos_utils.c File Reference

Common functions for VOS.

```
#include "vos_utils.h"
```

```
#include "vos_sock.h"
```

Include dependency graph for vos_utils.c:



Functions

- **VOS_ERR_T vos_init** (void *pRefCon, **VOS_PRINT_DBG_T** pDebugOutput)
Initialize the vos library.
- **UINT32 vos_crc32** (UINT32 crc, const **UINT8** *pData, **UINT32** dataLen)
Compute crc32 according to IEEE802.3.

5.28.1 Detailed Description

Common functions for VOS.

Common functions of the abstraction layer. Mainly debugging support.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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5.28.2 Function Documentation

5.28.2.1 `UINT32 vos_crc32 (UINT32 crc, const UINT8 * pData, UINT32 dataLen)`

Compute crc32 according to IEEE802.3.

Calculate CRC for the given buffer and length.

Parameters:

← *crc* Initial value.

↔ *pData* Pointer to data.

← *dataLen* length in bytes of data.

Return values:

crc32 according to IEEE802.3

5.28.2.2 `VOS_ERR_T vos_init (void * pRefCon, VOS_PRINT_DBG_T pDebugOutput)`

Initialize the vos library.

This is used to set the output function for all VOS error and debug output.

Parameters:

← **pRefCon* user context

← **pDebugOutput* pointer to debug output function

Return values:

VOS_NO_ERR no error

VOS_INIT_ERR unsupported

Here is the call graph for this function:

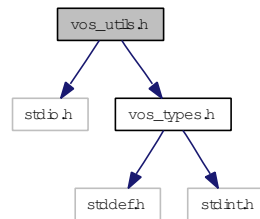


5.29 vos_utils.h File Reference

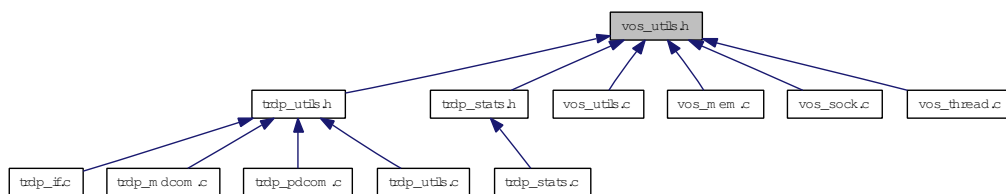
Typedefs for OS abstraction.

```
#include <stdio.h>
#include "vos_types.h"
```

Include dependency graph for vos_utils.h:



This graph shows which files directly or indirectly include this file:



Defines

- #define **vos_print**(level, string)
Debug output macro without formatting options.
- #define **vos_printf**(level, format, args...)
Debug output macro with formatting options.

Functions

- EXT_DECL UINT32 **vos_crc32** (UINT32 crc, const UINT8 *pData, UINT32 dataLen)
Calculate CRC for the given buffer and length.

5.29.1 Detailed Description

Typedefs for OS abstraction.

Note:

Project: TCNOpen TRDP prototype stack

Author:

Bernd Loehr, NewTec GmbH

Remarks:

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Id

[vos_utils.h](#) 2 2012-06-04 11:25:16Z 97025

5.29.2 Function Documentation

5.29.2.1 EXT_DECL UINT32 vos_crc32 (UINT32 *crc*, const UINT8 * *pData*, UINT32 *dataLen*)

Calculate CRC for the given buffer and length.

For TRDP FCS CRC calculation the CRC32 according to IEEE802.3 with start value 0xffffffff is used.

Parameters:

- ← *crc* Initial value.
- ↔ *pData* Pointer to data.
- ← *dataLen* length in bytes of data.

Return values:

crc32 according to IEEE802.3

Calculate CRC for the given buffer and length.

Parameters:

- ← *crc* Initial value.
- ↔ *pData* Pointer to data.
- ← *dataLen* length in bytes of data.

Return values:

crc32 according to IEEE802.3

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